

4th International Conference
on
Global Efforts on Agriculture
Forestry, Environment and Food Security
 (Theme: Climate Change and Its Impact)
(GAFEF-2022)

**Souvenir Cum Abstracts/
 Proceedings Book**



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Volume 2

September 17-19, 2022

Global Efforts on Agriculture, Forestry, Environment and Food Security (Climate Change and Its Impact)

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Tribhuvan University
OFFICE OF THE VICE CHANCELLOR

Kirtipur, Kathmandu, Nepal



Ref. No.:



Message

With immense pleasure and pride, I heartily congratulate the Institute of Forestry, Tribhuvan University for organizing the 4th **International Conference on “Global Efforts on Agriculture, Forestry, Environment and Food Security (GAFFEF-2022)”** with the *premise of Climate Change and Its Impact*, in collaboration with Agricultural & Environmental Technology Development Society (AETDS), U.S. Nagar, India; Faculty of Agriculture, Agriculture and Forestry University, Rampur, Chitwan, Nepal; Forest Research Centre for Eco-rehabilitation, Prayagraj (U.P.), India; Gandaki University, Kaski, Pokhara, Nepal & in association with Institute of Root Biology, Yangtze University, China and Soil, Water & Environment Research Institute, Giza, Egypt at Institute of Forestry, Tribhuvan University, Pokhara Campus Pokhara, Nepal on September 17-19, 2022.

In view of the focus of changing Global climate and world economy on agriculture, the organizers have very rightly selected the most relevant topic and is need of the hour and highly appreciable.

Agriculture and Forest are both important components of rural livelihoods. Scientist of both sciences are playing pivotal role for developing novel tools and technologies in the field. Combating climate change and ensuring food security are both extremely important. While protecting and restoring forests is critical for stopping climate change, but the big gains in improving food security will happen elsewhere. The 20-30 agenda for sustainable development, as well as the Paris agreement on climate change recognizes that we can no longer look at food security and the management of natural resources separately. There are clear linkages and synergies between agricultural production and sustainable forest management. If the sustainability of the agriculture and forests can be assured, food security, environmental safety and sustainable development would go in long-term perpetuity.

Participants from several organization of national and international repute around the world meet here to share their research findings. I am confident that the conference will provide an excellent opportunity for active interaction with Academicians, Eminent International Professors, Prominent Agriculturalists, Food Security Experts, Environmentalists and Authorities working in various fields of Life Sciences to discuss various issues related to Agriculture, Forestry, Environment and Allied Sciences. Moreover, deliberations and sharing of the core ideas, experiences, creative imaginations, innovations of different expertise under different sub-themes in the conference will be a milestone for the solutions of ongoing challenging issues of climate change and food security of the world. Indeed, I believe that, such kind of scholarly gatherings could play a vital role in making the world a better place and also make ready to tackle any difficult situations in the near future.



Tribhuvan University
OFFICE OF THE VICE CHANCELLOR

Kirtipur, Kathmandu, Nepal



Ref. No.:

I would like to appreciate the organizing institutes of this conference and congratulate Dr. Arjun Prasad Bastola, Associate professor, IOF/TU and Conference Director **GAFEF-2022**, Dr. Wajid Hasan, Secretary and Prof. C.P. Singh President AETDS, Society, U.S. Nagar, India for taking initiation and leadership.

I am confident that the participants will take the fullest advantages of this international conference and will enjoy the excellent weather of Pokhara.

Finally, I wish a grand success of the Conference for an eminent accomplishment in achieving its goal.

Prof. Dr. Dharma Kanta Baskota
Vice Chancellor



Dr.T.JANAKIRAM, ARS

Ph.D.(IARI), FISOH, FISVS, FHSI & FISHRD

Vice-Chancellor

In India, the horticulture industry provides roughly 33% of the Gross Value Addition and generates over 320 million tonnes of goods (GDA). Along with assuring the nation's food security, it also diversifies farming operations, creates alternative rural job options, and boosts farmers' income. Presently 320.48 million tonnes of horticultural products are produced in India, surpassing the production of food grains. The creative and cutting-edge methods used in horticulture have proved the profitable farming without causing much disturbance to the Natural Resources, Environment.

The production of horticultural crops grew by 38% in India during 2004–2005 and 2019–20. A balanced diet and a healthy lifestyle are enhanced by the wide variety of fruits and vegetables that are produced via horticulture. These foods are a valuable source of nutrients. Thus, as people's concerns about their health and wellbeing grow, so does the demand for these items. The demand for flowers for gifts and decorating has also expanded as a result of rising wealth and contemporary lifestyles.

In Andhra Pradesh, horticulture crops are grown on a total of 17.95 lakh hectares, producing 314.78 lakh MTs. Horticulture had 10.17% growth over the prior year and contributed Rs. 49,189 crore to Andhra Pradesh's GVA in 2020–21. In order to improve price realisation, the government of Andhra Pradesh has identified the horticulture industry as one of the growth engines, with a focus on increasing the production, productivity, and quality of different horticultural crops along with the development of value chains and marketing links.

Horticultural Crops address the climate resilience and quite suitable for off season / year round cultivation. Availability of quality planting material, Invasion of new insect pests and diseases, Post-harvest losses, lack of skilled personnel & mechanization, introduction of new crops & varieties by farmers themselves and climate change are some of the challenges in horticultural crops. In this direction, innovative extension strategies and programs to be organized for awareness, importance, production and productivity, sustainable way.

:2:

The horticulture sector as a diversified function of the agriculture sector has become a promising source of income opportunities. It contributes towards a steady growth for the sector as well as for the economy. A conscious effort is required to implement certain initiatives that would lead to the future growth and development of the horticulture sector. Adoption of package of practices, Integrated crop management including pest and disease control, organic cultivation of vegetables,.

I congratulate the organisers for selecting the appropriate themes during the 4th International Conference on "Global Efforts on Agriculture, Forestry, Environment and Food Security (GAFEF-2022)" and the three days deliberations during the international conference would bring new approaches, methodologies and policies for improvement of farm production and productivity in ecofriendly manner.


(T.JANAKIRAM)





कृषि तथा वन विज्ञान विश्वविद्यालय उपकुलपतिको कार्यालय

Agriculture and Forestry University
Office of the Vice Chancellor
Rampur, Chitwan, Nepal



MESSAGE

This is my honor and privilege to deliver this message on behalf of Agriculture and Forestry University for this important event of the International Conference on “Global Efforts on Agriculture, Forestry, Environment and Food Security (Theme: Climate Change and Its Impact) (GAFEF-2022) to be held during 17th - 19th September 2022. With most appreciation I am thankful to all organizers, namely, Agricultural & Environmental Technology Development Society (AETDS), U.S. Nagar, Uttarakhand, India; Institute of Forestry, Tribhuvan University, Pokhara Campus, Pokhara, Nepal; Faculty of Agriculture, Agriculture and Forestry University, Rampur, Chitwan, Nepal; Forest Research Centre for Eco-rehabilitation, Prayagraj (U.P.), India; Gandaki University, Pokhara, Nepal; and in association with Institute of Root Biology, Yangtze University, China and Soil, Water & Environment Research Institute, Giza, Egypt at Institute of Forestry, Tribhuvan University, Pokhara Campus Pokhara, Nepal.

The main challenge faced by the world community today is the global warming and associated climate change effects. The most damaging impacts of climate change for all south Asian countries are mostly related to water resources and agriculture. The agricultural sector is the major source of employment for all south Asian countries and we have to carefully plan as well act for the climate resilient agriculture. Loss of both agricultural land and production will adversely affect the livelihoods of agricultural communities.

The Earth, the one and only liveable habitat for humans, other animals, and plants, facing problems due to climate change effects and global pandemic COVID-19. In this respect, our responsibility is to develop coping strategies on mitigation and adaptation. Limited agricultural resources and continuous population increase in the south Asian countries ultimately lead to an ecological imbalance thus aggravating the food security issues in coming decades. In addition, under the present pandemic-led circumstance under changing climatic conditions, farmers and their farming have become more challenging and vulnerable to ensure food and nutritional security. Thus, there is a great need for institutional efforts and people’s participation to address issues related to food security, ecological safety, sustainable development, and conservation of natural resources. The linkages between science and society is essential. I am sure during the three days deliberations scientists from south Asia will be able to come up with solid recommendations and frame future strategies to improve agricultural productivity and sustainability in Asia. I wish the grand success of this conference.

Prof. Punya Prasad Regmi, Ph.D.
Vice Chancellor

UNIVERSITY OF AGRICULTURAL SCIENCES, RAICHUR

Lingasgur Road, Raichur - 584 104, Karnataka, India



Dr. K.N. KATTIMANI

M.Sc.(Agri.), Ph.D. FCHAI

Vice-Chancellor



MESSAGE

I am very happy to learn that **Agricultural & Environmental Technology Development Society, Uttarakhand, Institute of Forestry, Tribhuvan University, Pokhara, Nepal, Agriculture and Forestry University, Nepal, Forest Research Centre for Eco-rehabilitation, U.P., Gandaki University, Nepal in association with The Institute of Root Biology, Yangtze University, China, Soil, Water & Environment Research Institute, Giza, Egypt organized 4th International Conference on “Global Agriculture, Forestry, Environment and Food Security (GAFEF-2022)” commencing from September 17-19, 2022 with the theme of “Climate Change and It’s Impact”.**

Indian agriculture is experiencing a difficult situation because of high input costs compared to the farm output and over exploitation of natural resources like soil and water. During the last two decades, farmers' livelihood have depended precariously on a changing environment that they are unable to fully comprehend since they lack access to modern farming tools and methods.

Climate change poses a big challenge to all the diversions, including agriculture, forestry, and ecosystems, which in turn may lead to a threat to the food security of the country. To increase the profitability of cropping systems, forestry enrichment, farm mechanization, and balancing ecosystems need to be integrated. I am confident that deliberations made during the 4th International Conference will result in a concrete road map that will help us surmount a formidable road block and attain a major national objective of doubling farmers' income while restoring the ecosystem.

On this occasion of the 4th International Conference on "Global Agriculture, Forestry, Environment and Food Security (GAFEF-2022)," I extend my greetings to the faculty of different organizations and with a grand success by offering many more invaluable services to the farming community and the nation.

[**K.N. Kattimani**]

Vice-Chancellor



गण्डकी विश्वविद्यालय

गण्डकी प्रदेश, नेपाल

Gandaki University

Kaski, Nepal

प स-०७७/०७

August 29, 2022

MESSAGE

I am pleased to know that 4th International Conference on 'Global Agriculture, Forestry, Environment and Food Security (GAFF-2022)' is going to be held at the one of the world's touristic and beautiful city of Pokhara, Nepal in September 2022.

Organizing scientific events-conference, workshop, scientific meetings and similar activities always supports scientific communities to move forward in the direction of research, innovation and serving to the humankind in the short as well as long run. I am sure, this international scientific event will have tremendous importance to the all sectors of people-locally, regionally as well as globally.

One of the important parts of scientific event is producing conference souvenir book. Under this context, I am much delighted to know the publication of Abstract cum Souvenir Book (Conference Proceeding) of the 4th International Conference on the theme stated above that all the participants will be much benefitted with this collection. In this sense, hard work of organizing committee, workshop secretary and all other concerned stakeholders has been truly reflected in this Proceeding, and I would like to congratulate all team members for this achievement.

I wish all the best and for a grand success of the conference.

Prof. Naba Raj Devkota, PhD

Vice-Chancellor, Gandaki University, Gandaki Province, Nepal

Email: vc@gandakiuniversity.edu.np/ nabadevkota.gandaki@gmail.com

Mobile: [+977-9851194684](tel:+977-9851194684)



भाकृअनुप - कृषि प्रौद्योगिकी अनुप्रयोग अनुसंधान संस्थान, जोन-IV
गर्भूचक, जगदेवपथ, पटना -800014 (बिहार)

ICAR-Agricultural Technology Application Research Institute, Zone-IV
(Indian Council of Agricultural Research, Ministry of Agriculture and Farmers Welfare)
Garbhuchak, Jagdeopath, Patna- 800014, (Bihar)



MESSAGE

It gives me immense pleasure to know that the 4th International Conference on “Global Efforts on Agriculture, Forestry, Environment and Food Security (Theme: Climate Change and Its Impact) (GAFEF-2022)” being jointly organized by Agricultural & Environmental Technology Development Society (AETDS), U.S. Nagar, Uttarakhand, India, Institute of Forestry, Tribhuvan University, Pokhara Campus Pokhara, Nepal at Institute of Forestry, Tribhuvan University, Pokhara Campus Pokhara, Nepal on September 17-19, 2022, along with other reputed organizations around the world. The theme for this year conference “Climate Change and Its Impact” is of global priority today.

There is a great need for institutional efforts and peoples’ participation to address issues related to food security, environmental safety, sustainable development and preserving natural resources in general. To do so, the linkages between agricultural and applied sciences are essential. Collective efforts should be made by relevant institutions through ensuring participations of people from all walks. I am sure that this International Conference will focus on the various scientific tracks covering major areas of research on agriculture, biological and applied sciences and would become a platform for bringing together administrators, business bodies, policy makers and the members of global scientific community including scientists, researchers and distinguished professors to find out the key problems, challenges and pragmatic solutions which will help in in-depth understanding of the global food security and environmental safety issues in a long-lasting way.

There is a need to reach out further and communicate globally to increase multi-sectoral policy prioritization, interdisciplinary engagement, and public–private investment on the emerging issues. I do believe that the outcomes of this International Conference will help policy makers to formulate plans and take immediate actions appropriate for ensuring food and nutrition security and agricultural sustainability in the deprived regions of the world. I would like to appreciate the organizing institutes of this conference and thank the people whose dedicated efforts and creative plans will make the conference successful.

Finally, I wish a grand success of 4th International Conference on “Global Efforts on Agriculture, Forestry, Environment and Food Security (Theme: Climate Change and Its Impact) (GAFEF-2022)”.

Dr. Anjani Kumar



Ref: AETDS/SO/408

Date: 01.09.2022



From the Desk of the President AETDS, India

On behalf of the Organizing Committee, I welcome all members to the 4th International Conference on “Global Efforts on Agriculture, Forestry, Environment and Food Security (GAFEF-2022)”.

I am pleased to send greetings as President of AETDS and Chairperson of the International Conference which is going to be organized jointly by Agricultural & Environmental Technology Development Society (AETDS), U.S. Nagar, Uttarakhand, India; Institute of Forestry, Tribhuvan University, Pokhara Campus Pokhara, Nepal; Faculty of Agriculture, Agriculture and Forestry University, Rampur, Chitwan, Nepal; Forest Research Centre for Eco-rehabilitation, Prayagraj (U.P.), India; Gandaki University, Kaski, Pokhara, Nepal and in association with Institute of Root Biology, Yangtze University, China and Soil, Water and Environment Research Institute, Giza, Egypt at Institute of Forestry, Tribhuvan University, Pokhara Campus Pokhara, Nepal from September 17th-19th, 2022.

As the ecological relationship between environment, land, food, forestry and agriculture are highly diversified and complex, the interactive discussions by the international scientific community on the issues such as food security, environmental safety, conservation of natural resources and forestry are the need of the day for the sustainable global growth as well as solution for global warming due to climatic change. Thus, the interactive sessions among the global scientists would definitely come to the conclusion to formulate some useful recommendations for the upliftment and growth of end users worldwide.

We’re looking forward to an excellent meeting with renowned scientists, academicians, research scholars and youth from different countries around the world and sharing new and exciting results during the conference.

(Prof. C. P. Singh)

Conference Chairperson

President, AETDS, Society, U.S. Nagar, Uttarakhand, India

Former Prof. GBPUAT, Pantnagar, India



TRIBHUVAN UNIVERSITY
INSTITUTE OF FORESTRY
Office of the Dean

Kirtipur
Kathmandu, Nepal

Ref.No:

30 August 2022

Institute of Forestry is happy to be a part of an initiative in organizing 4th International Conference on “Global Agriculture, Forestry, Environment and Food Security (GAFEF-2022)” together with Agricultural & Environmental Technology Development Society, Uttarakhand, India and other esteemed Universities and partners to deliberate recent advances made by the researchers and in shedding light on the future research needs in the thematic areas of **Climate Change and Its Impact**. As we know that in recent decades’ global community particularly people residing in South Asia Regions are facing enormous problems caused due to over consumptions of the resources, population pressure, climate change, environmental degradation, and other social, political & economic inequalities. Among others, climate change has become the most profound threat to the security and well-being of human life and property. The shortage of food, fuel and the increasingly intense and more frequent occurrences of droughts, floods, earthquakes and hurricanes provide a grim picture of the impact of climate change. The common agenda for us now is to limit the impact of climate change and to cope effectively to its resultant impacts. Every country needs to be aware of the devastating impact of climate change and should be prepared to manage the situation in a systematic manner. I believe that the conference participants will bring forth innovative ideas to enlighten us and our collaborative efforts will help not only to generate the evidence based scientific knowledge but also contribute in finding solutions of the major problems caused due to climate change in the region.

Finally, I would like to wish a grand success of the three days’ international conference. I also would like to thank the distinguished guests and participants for sparing their valuable time for this conference and wish all your pleasant and fruitful stay at Pokhara.

Thank you !

.....
Prof. Bir Bahadur Khanal Chhetri, PhD
Dean



भा.कृ.अनु.प.- राष्ट्रीय अनार अनुसंधान केन्द्र, सोलापुर
ICAR - National Research Centre on Pomegranate
(ISO 9001:2015 Certified Institute)



डॉ.राजीव मराठे, निदेशक
Dr. Rajiv Marathe, Director



MESSAGE

I am glad to know that the Agricultural and Environmental Technology Development Society and Institute of Forestry, Tribhuvan University, Pokhara, Nepal, is organizing a 4th International Conference on “**Global Efforts on Agriculture, Forestry, Environment and Food Security (GAFEF-2022) from September 17-19, 2022.**”

Our planet is blessed with abundant natural resources, however, the growing population and unabated and careless misuse of these resources is posing a serious threat to their sustainability. It is high time for us to take necessary measures for the preservation and protection of these natural resources which otherwise may risk the existence of our future generations.

This event provides a common platform and witnesses with the participation of scientists working in different fields of Agriculture, Forestry, Environment, and Food Security. I strongly believe that the conference will result in concrete output in support of its topics. The conference will also provide a platform for brighter minds to get together and ponder on many global issues and suggest innovative actions to meet the challenges.

It is indeed a laudable endeavor on the part of AETDS, to organize the conference on such a large scale and provide a gathering of more than 1000 participants all around the globe.

I hope all the participants will enjoy this academic fest.

I wish the conference a grand success.

(R. A. Marathe)

कृषि तथा वन विज्ञान विश्वविद्यालय
कृषि संकाय
डीनको कार्यालय
रामपुर, चितवन, नेपाल



Agriculture and Forestry University
Faculty of Agriculture
Office of the Dean
Rampur, Chitwan, Nepal

प.सं./Ref. No.

च.नं.

मिति/Date:

MESSAGE

I am pleased to know that the Agricultural & Environmental Technology Development Society (AETDS), U.S Nagar, Uttarakhand, India, Institute of Forestry, Trichuvan University, Pokhara Campus Pokhara, Nepal, Faculty of Agriculture, Agriculture and Forestry University, Rampur, Chitwan, Nepal, Forest Research Centre for Eco-rehabilitation, Prayagraj (U.P.), India, Gandaki University, kaski, Pokhara, Nepal in association with Institute of Root Biology, Yangtze University, China and Soil, water & Environment Research institute, Giza, Egypt at Institute of Forestry, Tribhuvan University, Pokhara Campus Pokhara, Nepal is going to organize the 4th International Conference on "global Efforts on Agriculture, Forestry, Environment and Food Security (Theme: Climate Change and Its impact) (GAFEF-2022) Duting 17th-19th September 2022 to mark the occasion Published.

The Earth, the only liveable havitat for living creatures has been fecing tremendous environmental pressures in recent years. The scarce agricultural resources and continuous population increase in developing countries created an environmental inbalance and hence aggravating the food security. In addition under the present Covid-19 pandemic circumstance farming practice has become more challenging and vulnerable to ensure food and nutirional secutiry. Thus, there is a great need for institutional efforts and people's participation to address issues related to food security, encironmental safety, sustainable development, and preserving natural resources by strengthening linkages between agriculture and applied sciences. I am confident that during the three days deliveries, the scientists from south Asia will be able to come out with valid recommendations and future strategies to improve productivity, and sustainable utilization as well as expansion of crops and livestock in the context of global warming and changing climate. I wish grand sucess of the conference and

Prof. Jay Prakash Dutta
Dean
Faculty of Agriculture
Agriculture and Forestry University



पारि-पुनर्स्थापन वन अनुसंधान केन्द्र प्रयागराज
FOREST RESEARCH CENTRE FOR ECO-REHABILITATION PRAYAGRAJ
(भारतीय वानिकी अनुसंधान एवं शिक्षा परिषद)
(वन, पर्यावरण एवं जलवायु परिवर्तन मंत्रालय, भारत सरकार की एक स्वायत्त निकाय)
(A Centre of Indian Council of Forestry Research & Education, Dehradun,
an autonomous body of MoEF & CC, Govt of India)



No/ पत्रांक: .IV./27/2021./FRCE/R/Vol.2/ 401

Date/दिनांक: .05/09/2022

MESSAGE

Issues pertaining to Agriculture, forestry and environment, having direct impact on food security, are entwined in a complex manner that they are difficult to be viewed and understood in isolation. As per estimates food production will have to be increased by 60 % by 2050 to satisfy the growing demand driven by a projected 9.7 billion population. Well managed and diverse forests and incorporation of trees in agricultural systems also provides benefits in food security. However, climate change threatens this crusade against hunger and malnutrition cutting crop yields, especially in the world's most food-insecure regions. Both agriculture and forestry will be affected by climate change. Reforestation and reductions of deforestation have been recognized as efficient and effective alternatives to mitigate climate change.

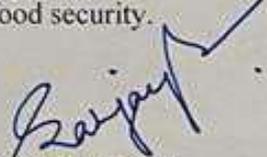


Globally, biodiversity for food and agriculture is in decline posing a serious threat to global food security, making agriculture less resilient to climate change, pests and diseases. Farmers' varieties and landraces are disappearing at an unprecedented speed resulting in increasingly homogenous global diets. Out of the 6,000 different plant species used as food, only nine contribute 66% of total crop production. There is therefore an urgent need to improve our knowledge on ecosystems for food and agriculture, and in particular, to study the role of associated biodiversity. This will help us to better understand, conserve and manage the diversity that underpins our food systems.

In addition to these challenges faced by agriculture; the direct impacts of unsound and invading agricultural practices on land cover and ecosystems, and on global and regional cycles of carbon, nutrients and water must also be accounted and addressed. At the global level, agriculture contributes to climate change through emission of greenhouse gases and reduction of carbon storage in vegetation and soil while at local level it reduces biodiversity and affects natural habitats through land conversion, eutrophication, pesticide inputs, irrigation and drainage.

I am happy that 4th International Conference on "Global Agriculture, Forestry, Environment and Food Security (GAFEF-2022) is being jointly organized by Agricultural & Environmental Technology Development Society (AETDS), U.S. Nagar, Uttarakhand, India, Institute of Forestry, Tribhuvan University, Pokhara, Nepal, Faculty of Agriculture, Agriculture and Forestry University, Rampur, Chitwan, Nepal, and Gandaki University, Kaski, Pokhara, Nepal

Hopefully the deliberations in this three days conference will results into better understanding for prudent management of global production systems and environment for ensured food security.


Dr. Sanjay Singh
Scientist G & Head



TRIBHUVAN UNIVERSITY
INSTITUTE OF FORESTRY
POKHARA CAMPUS
POKHARA, NEPAL

Ref No.:



Message

With great immense, I am pleased and honored to extend to you a warm invitation to attend 4th International Conference on “**Global Efforts on Agriculture, Forestry, Environment and Food Security (GAFEF-2022)**” to be held on 17-19 September 2022 at Tribhuvan University, Institute of Forestry, Pokhara Campus, Pokhara, Nepal.

I am sure that this conference will provide a forum to national and international researchers, academicians, students, and development workers to interact and involve in research and innovation to widen the horizons of their knowledge and work experience in the field of Agriculture, Forestry, Environment and Food Security with focus on climate change and its impacts.

I hope the conference will strive to offer plenty of networking opportunities, providing you with the opportunity to meet and interact with the leading scientists and researchers, friends and colleagues. I also expect you to take a little extra time to enjoy the spectacular and unique beauty of spectacular Pokhara city.

I sincerely appreciate the humble and joint efforts of the organizing partners in providing a platform for students, academicians, researchers and development workers to share their ideas and research outcome through the forum of this conference. I give my best wishes to all delegates and organizing committee to make this event a grand success.

Prof. Binod Prasad Heyojoo
Campus Chief



Arjun Prasad Bastola, PhD
Associate Professor
Tribhuvan University, Institute of Forestry
Pokhara Campus Pokhara - 33700, Nepal
Conference Director (GAFEF-2022)
Email: arjun.bastola@pc.tu.edu.np, Cell: +977 9845025781



Message from Conference Director

It gives me immense pleasure to be Conference Director and welcome you to the fourth International Conference “Global Efforts on Agriculture Forestry, Environment and Food Security (GAFEF; 2022)” from 17th to 19th September; 2022 at the Institute of Forestry Tribhuvan University, Pokhara Campus, Pokhara, Nepal. The event is jointly organised by Agricultural & Environmental Technology Development Society (AETDS) US Nagar, Uttarakhand, India; Institute of Forestry, Tribhuvan University, Nepal; Faculty of Agriculture (FOA), Agriculture and Forestry University, Chitwan, Nepal; Forest Research Centre of Eco-rehabilitation, Payagraj, Uttar Pradesh, India; Gandaki University (GU), Pokhara, Nepal; in association with, Institute of Root Biology, Yangtze University, China; Soil, Water and Environmental Research Institute (SWERI), Agriculture Research Center (ARC), Giza, Egypt.

The COVID-19 pandemic is still on-going. During the last couple of years, the world has experienced and realized how whimsical the nature could be at times and how badly the consequences could affect the entire mankind for food, treatment and shelters. As we know this world is still the one and only liveable habitat for human, other animals and plants which is facing tremendous environmental pressures in recent years due to regular advent of natural disasters. Limited agricultural resources and continuous population increase in developing countries ultimately leading to an environmental imbalance thus aggravating the food security issues in coming decades. In addition, under the present pandemic circumstance, farmers and their farming have become more challenging and vulnerable to ensure food and nutritional security. However, to comply with the SDGs’2030 we need to nurture our environmental resources in a sustainable way giving emphasis on sourcing renewable energies.

As a Director of the Organizing Committee, I am grateful to the researchers and academicians of national and international level and others who have offered their collaboration by submitting constructive papers and abstracts for this conference. Finally, I wish the conference an eminent accomplishment in achieving its goal towards food security, environmental safety and sustainable development thus enlightening global innovative in agricultural, forestry and applied sciences.


Dr. Arjun Prasad Bastola
Conference Director
Institute of Forestry
TU, Pokhara, Nepal



**Dr. Sanjay-Swami, Professor (SSAC)
& Organizing Convener: GAFEF-2022**
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MESSAGE

It is indeed a matter of great pride for me in organizing the 4th International Conference “*Global Efforts on Agriculture, Forestry, Environment and Food Security*” (GAFEF-2022) organized by the Agricultural & Environmental Technology Development Society (AETDS), U.S. Nagar, UK, India in association with many other reputed organizations at Institute of Forestry, Tribhuvan University, Pokhara Campus, Pokhara, Nepal from 17th to 19th September 2022 to address the global issues of climate change and its impacts.

As you are aware, climate change has already caused significant impacts on agriculture, natural resources, food security and human health throughout the world. With nearly 690 million people facing hunger, agri-food systems emitting one third of global anthropogenic GHG emissions and a growing public demand for climate action, it is pressing to achieve food security while adapting to - and mitigating - climate change.

The studies on climate change impacts and adaptation strategies are increasingly becoming major areas of scientific concern and the results of the published research on climate change reveal a regional specificity that is difficult to be extrapolated on a global scale to predict the response of climate change across ecosystems. The challenges and problems are complex, trans-boundary and difficult to be resolved by a single country, a single discipline, or single institution. There is a need to reach out further and communicate globally to increase multi-sectoral policy prioritization, interdisciplinary engagement, and public-private investment on the emerging issues.

I am confident that this International Conference will provide a right platform to the learned researchers from various backgrounds to deliberate on the risks associated with climate change, and will come-up with some concrete recommendations to face the challenges ahead.

I wish the International Conference a grand success.

Dated: 17-09-2022

(Sanjay Swami)



MESSAGE

It gives me great pleasure to congratulate it on the convening of the 4th International Conference on “Global Efforts on Agriculture, Forestry, Environment and Food Security (GAFEF-2022) organized by Agricultural and Environmental Technology Development Society and Institute of Forestry, Tribhuvan University, Pokhara, Nepal, on September 17-19, 2022.

As we all know, agriculture, forestry, environment and food are important resources for the survival of life on Earth, including human beings. Excessive exploitation and utilization, without attention to safety and sustainable development, will lead to the deterioration of the global climate, the destruction of the human living environment, and irreversible damage to various ecosystems. This will threaten our resources for the survival of future generations.

The upcoming convening of GAFEF-2022 provides a platform for scholars to communicate with each other, so that relevant opinions can be fully expressed in the conference. The results of such a meeting will also provide a lot of reference for relevant governments to make policy.

I believe this meeting will be held in two organizing committees (Agricultural and Environmental Technology Development Society and Institute of Forestry, Tribhuvan University), which arranged and organized the successful convening of the conference.

I also congratulate the conference on achieving its intended purpose and great success.





Agricultural & Environmental Technology Development Society (Regd.) AETDS, U.S. Nagar, UK, India

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Ref: AETDS/SO/410

Date: 01.09.2022



Message from Managing Chairman's Desk

The members of the organizing committee and I are very proud to present the 4th International Conference on “Global Efforts on Agriculture, Forestry, Environment and Food Security (GAFEF-2022)”, welcoming all participants to Pokhara, Nepal from 17th to 19th of September 2022.

It gives me immense pleasure to welcome you all as a Managing Chairman of the International Conference that is being jointly organized by Agricultural & Environmental Technology Development Society (AETDS), U.S. Nagar, Uttarakhand, India, Institute of Forestry, Tribhuvan University, Pokhara Campus Pokhara, Nepal, Faculty of Agriculture, Agriculture and Forestry University, Rampur, Chitwan, Nepal, Forest Research Centre for Eco-rehabilitation, Prayagraj (U.P.), India, Gandaki University, Kaski, Pokhara, Nepal & in association with Institute of Root Biology, Yangtze University, China and Soil, Water & Environment Research Institute. Giza, Egypt at Institute of Forestry, Tribhuvan University, Pokhara Campus Pokhara, Nepal. The conference aimed at expanding the program by including all aspects related to protected agriculture, forest, food, and greenhouse farming developing and integrating components for production and protection as a multidisciplinary approach for essential sustainable management. The various subthemes of the conference will offer many opportunities to delegate to learn new things and apply the same in their respective workplace. It will also be a platform to strengthen the friendship and collaboration among scientists, academia, and institutes. The diversity of specializations and related themes will enable us to achieve our targeted mandate and vision. Authors and attendees, from different continents including unique Key Note speakers, will show us their recent developments in varied fields in the world of agriculture, environment and food. The hard work and dedication of all the members of the organizing, scientific, technical, and financial committees during the preparation for this conference is highly appreciated. Without them, the event would not have been possible.

My personal respect goes out to all of you.
I look forward to welcoming all of you at GAFEF-2022.

(Dr. Huma Naz)

Managing Chairman (AETDS)



Er. Jeetendra Kumar,
Organizing Co-Convener: GAFEF-2022
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MESSAGE

It is matter of immense pleasure in organizing the 4th International Conference on “*Global Efforts on Agriculture, Forestry, Environment and Food Security*” (GAFEF-2022) organized by Agricultural & Environmental Technology Development Society (AETDS), U.S. Nagar, UK, India in association with many national and international organizations of repute at Institute of Forestry, Tribhuvan University, Pokhara Campus, Pokhara, Nepal from 17th to 19th September 2022 to address the global issues of climate change and its impacts.

Climate change refers to long-term change in temperatures and other weather parameters that may be natural or human made. It affects quantity as well as frequency of rainfall and also causes heat/cold wave that directly affects agricultural production. As climate change has great impacts on farming as well as natural resources, it affects food security and human health. Major population of not only Asian continent but the whole world is facing tragedy of global warming. GHG emissions and other concerns of climate change impacts have to be minimizing though development and implementation of suitable agricultural interventions to achieve food security.

Adaptation to climate change requires both short and long term strategies. In short term, one must use the experience and knowledge base to design and implement crop contingency plans according to changing weather conditions whereas in long term, strategic research are required to be developed and implemented for drought/flood situations. Heat tolerant crop varieties, livestock breeds as well as technologies for natural resources conservation are also need to be focused to sustain heat stress. Land and water management practices contribute to both adaptation and mitigation. Recourse management based strategies may include soil and water conservation, efficient use of irrigation water, use of renewable energy in farm operations and agro forestry system for carbon sequestration. Risk management through weather insurance also plays an important role in climate change adaptation for agriculture, forestry, environment and livestock. There is need of multidisciplinary research to resolve this problem and studies on climate change impacts and adaptation for any region should be shared among the researchers on a global scale to minimize the ill effects of climate change.

I am confident that the conference will provide right forum to national and international researchers, academicians, students, entrepreneurs and farming community to interact and involve in recent research work and innovations to spread their knowledge and work experience in the field of Agriculture, Forestry, Environment and Food Security with special emphasis on climate change and its impacts. Outcomes of the conference will be fruitful to cope up with climate change challenges.

I wish a grand success of the International Conference.

Dated: 17-09-2022

(Jeetendra Kumar)



प.सं./Ref. No.

च.नं.

मिति/Date: 02 September 2022

Message from Organizing Secretary's Desk

It gives me immense pleasure to welcome you all as an Organizing Secretary of the 4th International Conference on "Global Efforts on Agriculture, Forestry, Environment and Food Security (GAFEF-2022)" on 1-3 September 2022, which is being organized by the Agricultural & Environmental Technology Development Society (AETDS), U.S. Nagar, Uttarakhand, India, Institute of Forestry, Tribhuvan University, Pokhara Campus Pokhara, Nepal, Faculty of Agriculture (FoA), Agriculture and Forestry University (AFU), Rampur, Chitwan, Nepal, Forest Research Centre for Eco-rehabilitation, Prayagraj (U.P.), India, Gandaki University, Kaski, Nepal & in association with Institute of Root Biology, Yangtze University, China and Soil, Water & Environment Research Institute, Giza, Egypt at Institute of Forestry, Tribhuvan University, Pokhara Campus Pokhara, Nepal.

The theme, "Climate Change and Its Impact" is an auspicious occasion to assemble all stakeholders involved directly or indirectly in the fields related to Agriculture and Allied Science, the most impacted field of climate change. Climate change is real and its impacts may be irreversible if urgent measures are not taken. We have seen the devastating effects of extreme weather that resulted in economic loss and reduced quality of life. The most detrimental impacts of climate change for all south Asian countries will be on water resources and agriculture. Climate change induced adverse effects on agricultural land and production affect people's livelihoods, especially among the rural poor. Continuous research innovations and the implementation of adaptation and mitigation strategies are essential to reduce the impact of climate change. This conference brings together educators, researchers, as well as students from around the South Asian countries, providing them a networking platform to discuss ideas and research findings relative to climate change's impact on agriculture, and allied science. The various subthemes of the conference will offer many opportunities to delegate to learn new things and apply the same in their respective workplace. I hope that GAFEF-2022 will offer ample opportunities in sharing experiences, fostering research collaborations, and strengthening the friendship among scientists, academia, and institutes.

I look forward to welcoming you all to the beautiful city Pokhara, Nepal,

Santosh Marahatta, Ph.D.

Organizing Secretary



Ref: AETDS/SO/409

Date: 01.09.2022



From the Desk of the Chief Organising Secretary

It's indeed a matter of great pride and privilege to be chief organising secretary and welcome you to the fourth International Conference “**Global Efforts on Agriculture Forestry, Environment and Food Security (GAFEF; 2022)**” from **17th to 19th September; 2022**. The venue is the Institute of Forestry Tribhuvan University, Pokhara Campus, Pokhara, Nepal. The event is jointly organised by **Agricultural & Environmental Technology Development Society (AETDS) US Nagar, Uttarakhand, India**; Institute of Forestry, Tribhuvan University, Nepal; Faculty of Agriculture (FOA), Agriculture and Forestry University, Chitwan, Nepal; Forest Research Centre of Eco-rehabilitation, Payagraj, Uttar Pradesh, India; Gandaki University (GU), Pokhara, Nepal; in association with, Institute of Root Biology, Yangtze University, China; Soil, Water and Environmental Research Institute (SWERI), Agriculture Research Center (ARC), Giza, Egypt.

The world faces significant challenges such as; climate change, agricultural distress, habitat and biodiversity loss, the Covid-19 pandemic, health, agrarian distress, deforestation, food security and water scarcity. However, there are more unsung challenges, such as changes in consumption patterns and the increasing need for agroforestry products, redefining food, nutrition and food security. Therefore, there is a need for interaction among experts from diverse domains worldwide to address these challenges. The conference attempts to bring together researchers, scientists, academicians, scholars, students and entrepreneurs to discuss their latest research under different thematic areas that create an intersection with the agriculture sector.

I appreciate experts worldwide for their valuable time and willingness to share their wisdom through empirical evidence addressing different thematic areas of the conference.

I congratulate the GAFEF-2022 team for organising the conference.

I wish the conference a grand success.

Wajid Hasan, Ph.D., PDF

Chief Organising Secretary, GAFEF; 2022

Secretary, Agricultural and Environmental Technology Development Society (AETDS), U. S. Nagar, Uttarakhand, India

Krishi Vigyan Kendra, Jahanabad, Bihar Agricultural University, Bihar, India

4th International Conference on “*Global Efforts on Agriculture, Forestry, Environment and Food Security (Theme: Climate Change and Its Impact) (GAFF-2022)*”

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BIOLOGICAL AND ECONOMIC CHARACTERISTICS OF SILKWORM (*Bombyx mori*) SUPPLEMENTED WITH SPIRULINA WHEN EXPOSED TO THERMAL STRESS

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ABSTRACT

Nutrition and climate involve several chemical, physiological, and biochemical processes that transform food into body components in insects and silkworms. A diet rich in nutrients led to weight gain and increased body masses of insects. So, food is vital to growth, silk secretion, and reproductive functions; however, a significant amount of energy is used for cocoon and pupal formation, leading to silk production. Silkworm, a monophagous insect, derives almost all the nutrients required for its growth from the mulberry leaf. This study aims to determine the impact of thermal stresses on *Bombyx mori* with spirulina supplementation and to analyse biological and economic characteristics. The experiment was designed to expose fifth instar larval differentiate into four groups of temperatures ranging from 20°C to 35°C (20°C, 26°C, 30°C and 35°C) for one hour up to a spinning, followed by 2 hours of recovery at room temperature in addition to a control group. Each group is divided into four sub-groups based on nutritional supplementation of spirulina (100ppm, 200ppm and 300ppm) with one control in every temperature group. About four cocoons from each group were taken to analyse their economic traits. Economic traits like cocoon weight, pupae weight, cocoon shell ratio (%), filament length, and silk gland were analysed, and all groups are statically significant with control. The larval haemolymph of tested groups was subjected to protein analysis by sodium dodecyl sulfate-polyacrylamide gel electrophoresis (SDS-PAGE). All the experimental group's calculated ingesta, digesta, approximate digestibility, and reference ratios. Among the various test groups, nutrigenetic traits varied considerably.

Keywords: *Bombyx mori*, Thermal Stress, Nutrigenetic Traits, spirulina, Cocoon

ASSESSMENT OF THE STATUS OF LIVELIHOOD IMPROVEMENT THROUGH LEASEHOLD FOREST IN GORKHA DISTRICT, NEPAL

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ABSTRACT

In spite of the significant role of community forestry on rehabilitation and conservations of forests, equity in benefit sharing always remained as a problem. So, leasehold forestry evolved to address the gap or discrimination of the poor. Leasehold forestry (LHF) is a new avenue and only forestry program specially focused on the poor in Nepal with the aim of addressing ultra-overall poor's livelihood strategy at the rural households by conserving and proper utilizations of natural resources i.e., degraded forest land. Though LHF was initiated to resolve the issue of equity in benefit sharing in community forestry, study of the success of this innovation has not been given much more priority. In this backdrop, the purpose of this article is to examine the LHF's contribution to the improvement of the livelihoods of the Leasehold Forest User Group (LFUG) members in Gorkha district. The sustainable livelihood paradigm created by the Institute of

Development Studies (IDS) and later amended by DFID in 1999 was used to assess the contribution of Leasehold forestry to the livelihood of forest user communities. Changes in five distinct capitals (human, physical, social, financial, and natural) after implementing LHF program was estimated based on the judgmental scoring systems. Each capital's changes were examined using three different indicators. To assess the improvements, degradation, and no changes in the conditions of each of the indicators used for five capitals, three scores +1, -1, and 0 were assigned. The average scores obtained were then plotted in a spider web diagram. The natural, physical, human, social and financial capital received average score of 0.589, 0.951, 0.748, 0.778 and 0.722 respectively. Livelihood status was found most improved in Chyangli-Gaikhur cluster and most poor in Bhumlichowk cluster. The findings showed that LHF had made a good contribution in the improvement of livelihoods of poor people. Moreover, awareness campaign along with use of developed technologies would be more effective for improving livelihood of the poor people. So, the more focused programs with regular monitoring and inter-sectorial involvement and co-ordination are must.

Keywords: Assessment, Leasehold Forest, Livelihood

IMPORTANCE OF AGRONOMIC BIOFORTIFICATION FOR NUTRITIONAL IMPROVEMENT IN RICE FOR FUTURE FOOD SECURITY AND SUSTAINABILITY IN MALAYSIA

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Summary

Rice is the world's most important staple food and will continue to be so in the coming decades, be it in terms of food security, poverty alleviation, youth employment, use of scarce resources, or impact on the climate. More than 90% of rice is produced and consumed in Asia and greatly depend on rice. Worldwide one out of three humans suffer from micronutrient deficiencies called “hidden hunger”, which can be solved through the sustainable rice biofortification approaches for those people who mainly consume rice and have limited access to diversified food. Zinc (Zn) is a nutritionally fundamental trace element and is the second most abundant trace metal in the human body after iron. More than one billion people, particularly children and pregnant women suffer from Zn deficiency related health problems in Asia. Zinc regulates diverse physiological functions and its homeostasis is critical for sustaining proper immune function. The presently grown popular high yielding rice varieties are poor supplier of Zn in their polished form. Targeting the above important issues local rice cultivars can be enriched with high Zn content through sustainable way of agronomic biofortification by the application of different Zn containing fertilizers in combination with NPK ensuring proper nourishment of crops with adequate nutrient supply along with good agricultural practices to ensure future food security and sustainability especially for those who are mainly depends of rice consumption.

Review background

Micronutrient malnutrition has been recognized as a gigantic and rapidly growing public health problem not only amongst the poor but also across the whole spectrum of people living on an unbalanced diet dominated by a single staple grain such as rice (Mamin et al., 2015). Poor grain nutritive value of cereals is an important reason for widespread micronutrient malnutrition among populations eating rice as staple food (Chandel et al., 2010). However, as with many other staple foods crops rice contains low levels of important micronutrients especially Fe and Zn (Bouis and Welch, 2010; Mamin et al., 2015). Moreover, climate change, particularly rising atmospheric carbon dioxide concentration, reduces the grain Zn concentration (Nakandalage et al., 2016).

Consequently, zinc status is a critical factor that can influence antiviral immunity, particularly as zinc-deficient populations are of ten most at risk of acquiring viral infections such as HIV or hepatitis C virus (Read et al., 2019).

Conclusions

Solving “hidden hunger” through rice biofortification would be a sustainable approach for those people who mainly consume rice and have limited access to diversified food. White/polished milled rice grains lose essential nutrients through polishing. Therefore, seed-specific higher accumulation of essential nutrients is a necessity. With the existing significant genetic variability for high zinc in polished rice, the development of biofortified rice varieties is very urgent in Malaysia.

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EFFECT OF FEEDING YEAST (*Saccharomyces cerevisiae*) FERMENTED MOIST FEED ON THE PERFORMANCE OF BROILER

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Purpose

37 days feeding trial was conducted to investigate the impact of feeding yeast (*Saccharomyces cerevisiae*) fermented moist feed on the growth performance and bone mineralization in broiler.

Methods

Initially corn soya-based starter diet was fermented anaerobically at room temperature (28 degree centigrade) for 48 hours with 2% yeast and 50% moisture content. Starter feed and fermented feed was analysed for proximate components (Dry matter, Crude protein, Crude fibre, Ether extract, Nitrogen free extract and Ash). Afterward's a total of 180-day old Arber Acres commercial broiler chicks were allotted for study where initial 10 days offered commercial crumble diet for adaptation. From age 11 to 37 considered experimental period. Birds were randomly divided into 6 dietary groups (30 chicks each) with 6 replications (5 chicks each). The dietary groups were: 1) Starter dry (SD), 2) Starter moist (SM), 3) Starter dry with 2.0% yeast for 0 hours (SDY-0), 4) Starter moist with 2.0% yeast for 0 hours (SMY-0), 5) Starter dry with 2.0% yeast for 48 hours (SDY-48), and 6) Starter moist with 2.0% yeast for 48 hours (SMY-48), respectively. Feed and fresh water was supplied *ad libitum*. At the end of feeding trial, one bird from each replication was slaughtered for determination of carcass trait.

Results

After 48 hours fermentation, an increased crude protein content (20.75% to 21.94%) but decreased crude fibre content (7.84% to 6.33%) was observed. A significant ($P<0.05$) body weight gain was recorded 771, 830, 992g in SM, SMY-0 and SMY-48 respectively than SD (762g). Feed conversion ratio (FCR-Feed intake/live weight gain) was lower in SM (1.58), SMY-0 (1.57) and SMY-48 (1.57) than SD (1.75). Tibia ash was higher (35% than 29%) in SMY-48 ($P<0.05$). Carcass yield also increased (66% than 63%) after feeding fermented moist diet (SMY-48) ($P<0.05$).

Conclusions

Fermentation of feed using yeast (*Saccharomyces cerevisiae*) causes desirable chemical changes (increased CP content and decreased CF content), which also improve nutritive value of feed and found suitable for feeding the broilers as it is considering live weight gain, increased tibia ash content, carcass weight of broiler and decreased feed conversion ratio.

Keywords: *Saccharomyces cerevisiae*, fermentation, feed, broiler, performance.

COMPARISON AMONG NAPIER PUCKCHONG, NAPIER HYBRID, AND MAIZE FODDER FOR BIOMASS YIELD, ENSILING QUALITY, AND PROFITABILITY IN A CERTAIN AREA OF BANGLADESH

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Purpose

The aim of this study was to compare biomass yield and profitability of Napier Puckchong, and Napier Hybrid, Maize Fodder as well as to know the feasibility of their ensiling to ensure feed for livestock during scarcity of green grass.

Methods

The study was conducted at Melandaha Upazila of Jamalpur district in Bangladesh in 2022. Nine farmers were selected who were producing fodder and three farmers were considered for each type of fodder production. The harvesting period was considered 70 days for all three types of fodders. Costs of plowing, labor, cutting, irrigation, weeding, fertilizer, and harvesting were considered. Total biomass yield, chemical composition, and profitability from the selling of all the fodders were determined. Finally, the green grass was chopped to 1.0-2.0 cm and ensiled anaerobically in double-layer polythene bags for a period of 30 days. The quality of silage was also evaluated by determining P^H and proximate components.

Results

The biomass and dry matter yield from maize fodder were 18.15 ± 0.25 (4.07 ± 0.84) tonnes per acre of land which was substantially different from 15.50 ± 0.057 (2.49 ± 0.08) and 15.9 ± 0.50 (2.23 ± 0.25) tonnes of Napier Puckchong and Napier Hybrid. The production cost of Maize fodder was higher (55000.00 BDT per acre) in comparison to Napier Puckchong (27700.00) and Napier Hybrid (27483.00). Napier Puckchong was more profitable, generating 1.04 BDT per kilogram of green biomass in a contrast to 0.99 and 0.68 BDT for Napier hybrid and maize fodder, respectively. Quality of silage from Napier Puckchong was found best showing lower p^H (3.5) and higher fleigs point index of 86.88 ± 1.88 than Napier Hybrid and maize silage's p^H and fleigs point index 4.2, 4.5, and 69.36 ± 9.92 , 83.70 ± 4.60 respectively. Due to ensiling crude fiber has decreased, but crude fat and ash contents have increased in all types of silage ($p<0.01$). The Napier Puckchong silage had a crude protein content of 10.80 ± 0.01 g/100gDM which is much higher than the 8.93 ± 0.04 g and 8.96 ± 0.05 g of the Napier hybrid and Maize fodder respectively.

Conclusions

Ensiling has decreased the p^H and fiber content of all types of fodders under consideration, but biomass and dry matter yield of maize fodder were higher. Considering all aspects including profitability, silage quality, and changes of desirable chemical composition, Napier Puckchong may be a better option compared to Napier Hybrid and Maize Fodder.

Keywords: Biomass Yield, Profitability, Fermentation, Nutritive Value

EFFECT OF COVID-19 LOCKDOWN ON CARRYING OUT HIGHER EDUCATION AND ITS IMPACT ON MENTAL HEALTH OF STUDENTS

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Background: According to UNESCO's observing, more than 160 nations executed countrywide closures of universities offering higher education, which has affected over 87% of the global students' population. Moreover, various countries did employed closures to secondary and primary schools; overall it has led education disruption with millions of learners. Universities across the world are unclear about how long the coronavirus crisis will go on. To cope up with this situation universities need to get to know how it has affected the mental health of students and faculty. The psychological impact during this scenario is a critical disruptor to decide how to move on with opening of institutions or other strategies to deliver the education without interruption.

Method: The data were cross-checked with information from the main international newspapers.

Results: By discussing online and distance education, the coronavirus opens an important and urgent issue that affects mental health – these are virtually unexplored topics, and their results have not been validated yet. Online education is not limited to distance education, as it regards a grouping of learning/teaching procedures completed in cyberspace. Blended learning was, thus, introduced as a tool in personalized learning to adjust to new realities. These are unprecedented circumstances, and we understand they create stress, favoring anguish and a fierce search for new knowledge acquisition.

Conclusion: Current research highlights that in spite of anxiety among students, the mental status of students are moderate and has not affected the process of higher education. However, uncertainties and intensification of the lockdown is prevailing, opening/closure of higher institutions has no negative consequences on students' mindset. As it was expected that loneliness will increase under these circumstances and would lead to a negative impact on education. On the contrary, the current generation learners are capable to cope up situation to continue on-line education and, willing to join study place if provided an opportunity.

Keywords: Education, COVID-19, Mental Health

CLIMATE CHANGE AND ANTHROPOGENIC INTERFERENCES FOR THE MORPHOLOGICAL CHANGES OF THE PADMA RIVER IN BANGLADESH

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Purpose

The Padma, traditionally considered as a dominantly meandering river, is switching over into a braided river due to its highly susceptible nature of erosion and deposition. This research aims to identify the morphological changes of the Padma river due to the effects of anthropogenic climate change.

Methods

The morphological changes were measured by aerial satellite images and their historical comparison, terrestrial survey, sedimentation in the riverbed, water flow, water discharge, siltation, and erosion along the river etc. The Padma River has been analysed over the period from 1971 to 2020 using multitemporal Landsat images and long-term water flow data. The climatic parameters data related to temperature and rainfall were collected from 21 metrological stations distributed throughout Bangladesh over 50-year period (1965-2015) to evaluate the magnitude of these changes statistically and spatially.

Results

Results reveal that the tidal range is high during the dry season and increases from upstream to downstream of the river. Climate change may bring changes upstream by changing rainfall intensity, flood severity and extreme temperature. More inundation can occur due to sedimentation, and more bank erosion can occur at the same time. An exponential increase of morphological activity with increased river flow, water discharge, bank erosion might substantially increase in the future. The changes in the flow introduced by climate change would impact the morphology of the Padma river of Bangladesh during monsoon. A major change has been observed in the location of the bank and channel, as well as bars, along with their geometry and morphology over time. It is also observed that the bank line is not stable and migrated continuously. The overall width of the Padma River is varied significantly during the last 50 years. Maps and Landsat images represented that the river channel is shifting abnormally. Both climatic parameters and anthropogenic activity play an important role in fish biology and production.

Conclusions

From this study, it is hypothesized that this assessment's findings might help understand the overall hydrodynamic and morphological nature of the Padma River. It will suggest possible future developmental works that might be implemented on this river.

Keywords: Morphology of Padma River, River Bank Erosion, Climate Change Impact, Man-made activities.

MORPHOLOGICAL VARIABILITY IN *Hibiscus cannabinus* DUE TO IONIZING IRRADIATION (CO⁶⁰), AND ESTIMATION OF GAMMA-RAY LETHAL DOSE 50 (LD₅₀) FOR MUTATION BREEDING

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ABSTRACT

Kenaf (*Hibiscus cannabinus* L.) is an economically important fibre crop originated from Africa, and used in making animal feeds, fodder, clothes, bio-plastics, paper pulp and fibre based industrial products. It is very important to develop improved kenaf varieties due to its commercial values of industrial uses. Kenaf plant have low genetic diversity due to its self-pollination nature. So, efforts should be given to increase the genetic diversity of kenaf. Gamma ray mutation (ionizing radiation) has been used widely and proven to be effective as an alternative method of increasing the genetic diversity, fibre yield and qualities kenaf plant. The latest variety of kenaf developed by BJRI named BJRI Kenaf 4 (KE-3) having red stem, brownish green palmate leaves, petiole with red upper surface, waterlog tolerance, quick growing and high fibre yielding (2.8-3.3 t ha⁻¹) nature has been used for chronic gamma irradiation at Gamma Source Unit of Institute of Food and Radiation biology, Bangladesh Atomic Energy Commission, Dhaka, Bangladesh. Delivered irradiation dose has been measured using Fricke and Ceric-cerous dosimetry systems, and the irradiation doses were applied@ 17.10 Gy minute⁻¹ with a dose uniformity ratio (DUR) of 1.13. Kenaf seeds (100g) were irradiated with 0.0, 100, 200, 300, 400, 500, 600, 700, 800, 900, 1000, 1100 & 1200 Gy dose and irradiated seeds along with control were planted immediately in research field of BJRI at Manikganj and Dhaka. Seed germination percentages were recorded for each doses up to five days. Higher plant height, stem girth and morphological variations were observed at accumulated dose of 200 Gy, and 50% plants were died at accumulated dose of 305 Gy which indicates lethal dose (LD₅₀) for Kenaf plant. This finding will be useful in determining the most suitable dose rate for chronic gamma irradiation for Kenaf plant improvement in future.

ANALYSING FOREST MANAGEMENT PRACTICE THROUGH REGENERATION STATUS AND GROWTH PATTERN IN DIFFERENT FELLING SERIES: A CASE STUDY FROM COMMUNITY FOREST OF RUPANDEHI DISTRICT, NEPAL

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ABSTRACT

Forest regeneration means the renewal or development of new plant species in the forest area. Its growth and distribution in the forest imply the health and status of the overall forest. Assessment of regeneration status in any forest is vital to understanding forest dynamics and developing management strategies. Scientific Forest management (SciFM) in community forestry emphasizes establishing and growing regeneration adopting different silvicultural systems. In order to assess

the effectiveness of forest management practices, we examined the regeneration condition and its pattern in the forest with scientific forest management plan. Data relating to regeneration status and its growth pattern were collected from two community forest using stratified random sampling. The results depicted the good regeneration conditions (Seedling>5000, Sapling>2000) in all the felling series of both the forest. The number of seedlings and saplings were found highest in the sixth-year felling series (22,000 per ha) in Kanchan CF while it was highest in fifth year felling series (35,700 per ha) in case of Rajapani CF. The forest of both the CF was dominated by Sal (*Shorea robusta*) followed by Asna (*Terminalia alata*) and Karma (*Adina cordifolia*). The number of seedlings per hectare was found higher in the strata with latest regeneration felling while the number of poles per hectare is found higher in the strata with oldest regeneration felling in condition where there was less human pressure. The regeneration status in Kanchan CF showed increasing trend of seedlings and sampling in latest felled sub-blocks while irregular growth pattern in case of Rajapani CF. As the abundance, distribution, and composition of regeneration determines the health, vitality and productive capacity, and diversity of the forest, management strategies to promote regeneration play a significant role in ensuring sustainability in forests. This research contributes to assess forest sustainability based on regeneration growth and develop appropriate management strategies. It recommends the implementation of SciFM with proper monitoring and continuous management practices enhances the forest health and growth.

Keywords: Regeneration, Scientific Forest management, Silvicultural system, Sustainability, Growth pattern

A COMPARATIVE STUDY ON FATTY ACID AND PROXIMATE COMPOSITIONS OF CULTURED *Penaeus vannamei* (BOONE, 1931) WITH DIFFERENT STOCKING DENSITY DURING SUMMER AND MONSOON CROP IN THE PROVINCE OF GUJARAT STATE IN INDIA

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ABSTRACT

Culture of shrimp was conducted for 120 days of culture at commercial pond at Datardi village, Rajula (Gujarat). Every aquatic animal has their conducive environment, in which they normally grow without any health problem. Any deficiency within body directly affects the normal cellular and organelle function. Shrimp culture activity is usually taken up during summer and monsoon season, this seasonal effect over fatty acid and proximate composition directly affects the total biomass at harvest (kg). Macro and micro nutrients within aquatic medium, helps shrimp to flourish enzymetics action and good growth and survival. This study was conducted and sample of shrimp was collected at harvest period (120 days of culture) from total 18 numbers of culture ponds of size 0.5 ha and depth was 1.8 m. The experiment was conducted in as completely randomized design (CRD) with 6 treatments with 3 replications. Summer crop, treatment and stocking density was represented as S, T1 and 30 nos of shrimp/m² respectively denoted has ST1 30 nos/m² as on for 2nd treatment ST2 40 nos/m², ST3 50 nos/m², ST4 60 nos/m², ST5 70 nos/m², and ST6 80 nos/m² similarly for monsoon crop, represented as MT1 30 nos/m² upto MT6 80 nos/m². The present study was conducted to evaluate the effect of stocking density on *L. vannamei* with the emphasis on biochemical proximate and fatty acid composition. The proximate composition of *L. vannamei* during summer and monsoon crop showed higher protein(%) in low stocking density (30 nos/m²) treatment followed by crude fat (%), carbohydrate (%) and Ash (%) in ST1 and MT1 (30 pc/m²). During summer crop, the total 18 fatty acid were detected whereas during monsoon crop 16 fatty acid were detected in all treatment. The results indicated that during summer crop, the *L. vannamei* shrimp has higher values of SFA, PUFA, MUFA. The total

unsaturated fatty acids (USFAs) was higher in treatment ST2 with (66.15 µg/g of FAME) followed by ST3 (66.00µg/g of FAME), ST6 (65.58 µg/g of FAME), ST4(63.04 µg/g of FAME), ST1 (62.75 µg/g of FAME) and ST5 (62.08 µg/g of FAME), whereas during monsoon crop, the data revealed that the total unsaturated fatty acids (USFAs) was higher than SFAs in treatment MT3 with (59.3 µg/g of FAME) followed by MT1 (58.67µg/g of FAME), MT4 (57.5 µg/g of FAME), MT2 (56.08µg/g of FAME), MT5 (43.8µg/g of FAME) and low in MT6 (34.18µg/g of FAME). Comparing both the season, summer crop is better than monsoon, as summer crop showed higher level concentration of proximate composition to SFAs/MUFAs and PUFA may be due good quality and quantity of natural feed, water quality and conducive water parameter additionally higher stocking density (no/m²) also affect the level and concentration on proximate composition and fatty acid in both the season. So comparing both season and effect of stocking density of shrimp, there is clear evident that both the factor directly affect the proximate and fatty acid level in *L.vannamei* cultured shrimp.

Keywords: Shrimp; Fatty acid; Proximate composition; Summer crop; Monsoon crop.

COMPOSTING OF BIO WASTE MATERIALS USING BLACK SOLDIER FLY LARVAE: AN INNOVATIVE AND ECO-FRIENDLY APPROACH FOR BIO-WASTE MANAGEMENT

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Bio-waste management is a crucial necessity to slow down greenhouse gases emission in the world. Composting, since many years, is considered effective, inexpensive and eco-friendly method for bio- waste management. Since traditional composting is time taking, further an innovative and eco-friendly approach of composting using Black soldier fly larvae (*Hermetia illucens* L.) is being practiced in several countries worldwide and gaining popularity in developing countries. Hence, to study the advantage of using black soldier fly larvae in composting of bio-waste materials, and to analyze the nutrient content status in the prepared compost, a rigorous review was accomplished.

Methodology

Several research articles were searched randomly in scholarly sites and journals in Internet and around fifty articles were reviewed for the study. Different research articles related to biology of black soldier fly, effect of different substrates in composting, effectiveness of black soldier fly in composting of heavy metal infused organic waste, effectiveness of black soldier fly in composting improved protein and carbohydrate based bio-wastes, assessment of fertilizer value of residue obtained after using Black soldier fly larvae for composting, and so on were reviewed.

Summary Of Findings

Black soldier fly is an insect belonging to family Diptera under the order Stratiomyidae. Basically, the stage responsible for the conversion of bio-wastes into residual compost is larval stage, as their larvae are voracious feeder due to its strong mouth parts and high enzymatic activity of the gut. The review revealed that Black soldier fly can flourish in wide variety of bio-wastes such as mill by products, vegetable kitchen wastes, human feces, poultry slaughter house wastes, cow manure as their survival rates is noted as 90- 99 %. However, highest waste reduction percentage (58.4% and 56.4%) was recorded in vegetable kitchen wastes and mill by products among six different bio-wastes. It is revealed that fresh rotting bio-wastes materials like food wastes, kitchen wastes, and canteen wastes are decomposed much faster within 14 days as compared to human feces,

manures, and slaughter house wastes. Another study revealed that the nitrogen content of compost prepared by Black soldier fly residue was found 2.16 % which was similar to that of poultry manure i.e. 3.23 % whereas experimental household organic wastes (fresh), cow manure and horse manure recorded comparatively less nitrogen content in them. Similarly, pH value was around neutral (7.40), and electrical conductivity (EC) was highest (9.67 mS/cm) among all five fertilizer materials. Also, it is recorded that Black soldier fly residue as compost showed highest above ground dry weight of Komatsuna plant regardless of starting Nitrogen amount. Further, another study revealed that larval population decreased considerably and pupation took more time in compost samples with high and medium mercury concentrations (2000 and 3000 mg Hg/ Kg). Amount of mercury removed from mercury containing compost samples differed according to number of larvae present, 100 larvae removed 2.45 mg Hg whereas 300 larvae removed 11.33 mg Hg from 1st to 13th day duration. Waste reduction percent of mercury containing compost samples was recorded 65.3%, which revealed that Black soldier fly larvae can reduce heavy metal content in organic wastes below the threshold level. Also, another study revealed that successful incubation of 88 eggs were recorded within 4.18 days reared in fermented maize straw, and within 4.27 days when reared in fermented wheat bran. After bio conversion by black soldier fly larvae, crude protein percentage (CPRO %) of maize straw residue became 3.16% from 11.10 % and crude fat percent became 0.30% from 1.97 %, thus resulting successful conversion and reduction of fermented maize straw.

Conclusion

Based on the review, it is concluded that Black soldier fly are indeed beneficial insects and can play vital role in bio- waste management. Rotting food wastes and kitchen wastes are preferred substrates for black soldier fly larvae under favorable temperature and moisture condition. Larvae of this insects can reduced the heavy metal content from bio-wastes and composts and bring them below the threshold for fertilizer. As a result, these can be incorporated to decompose waste materials containing toxic heavy metals. Nitrogen content, pH, EC of compost prepared by black soldier flies are considerably suitable for the plant to improve their growth. Agricultural field wastes such as maize straw, wheat bran, rice straw can also be decomposed when fermented, thus reducing the chance of burning them. Therefore, Black soldier flies can reduce greenhouse gas emission from bio-waste materials, can replace mineral fertilizers, prolong the lifespan of landfills as well as provide new income opportunities for small entrepreneurs in low and middle-income countries.

Keywords: Black soldier fly, Bio waste materials, Compost, Larvae

DETERMINATION OF PRODUCTION PERFORMANCE OF HOLSTEIN CROSSBRED COWS UNDER THE EXISTING FARMING SYSTEM IN A CERTAIN AREA OF BANGLADESH

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Purpose

This study aimed to assess the effect of existing feeding system on milk yield and nutritional status and profitability of 75.0% and 87.5% Holstein crossbreed cows under existing farming system.

Methods

In a milk pocket area (Keraniganj, Dhaka), three farms termed F1, F2 and F3 were randomly selected having 34, 55 and 19 lactating cows in which 75% and 87.5% Holstein blood were 48 and 60, respectively. Using a well prepared questionnaire information like body weight, daily milk production, parity number, days in milking, blood percentage and feeding system of each animal

were noted throughout a year. All data of three farms were subjected to analyze in one-way ANOVA in terms of 75% and 87.5% Holstein cows, separately.

Results

The body weight (kg) of 75% Holstein were F1 (296), F2 (497) and F3 (496) cows ($P < 0.05$), while daily milk yield (kg) did not differ markedly among F1 (9.1), F2 (10.5) and F3 (13.9) ($P > 0.05$), respectively. 75% Holstein of F1 offered almost balance dry matter (DM), metabolizable energy (ME) and digestible crude protein (DCP), while cows of F2 and F3 fed daily insufficient DCP (-0.14kg) and over DCP (+0.47kg), respectively thus resulting in 37.2% less milk yield in F3 compared to F2 ($P < 0.05$). Besides, 87.5% cows of F1, F2 and F3 had 365, 528 and 566kg body weight ($P < 0.05$) and daily produced 10.5, 10.8 and 19.4kg milk ($P > 0.05$), respectively. However, 87.5% cows of F1 daily offered almost balance DM, ME and DCP, while the cows of F2 fed lower DM (-4.5kg) and DCP (-0.2kg). Then, cows of F3 daily fed excessive DM (+1.4kg) and DCP (+0.14kg) thus resulting in produced 8.6kg higher milk than cows of F2. Net return except depreciation cost from 75% cows of F1, F2 and F3 were 118, 170 and 145BDT, while 87.5% cows of F1, F2 and F3 were 189, 196, and 413BDT ($P > 0.05$), respectively.

Conclusions

Under existing feeding system and farming practices, cows with 75% and 87.5% Holstein blood had body weights of 430 and 486kg, daily milk production of 11.2 and 13.6kg, earning profits of 144 and 266BDT, respectively. Also, cows from the F1, F2, and F3 daily produced 9.8, 10.7 and 16.7kg of milk per day on average, generating 154, 183, and 279BDT in profit, respectively.

Keywords: Crossbred, milk yield, nutritional status, body weight and profit.

IONIZING IRRADIATION (CO⁶⁰) OF *Hibiscus sabdariffa* FOR MORPHOLOGICAL VARIABILITY, AND ESTIMATION OF GAMMA RAY LETHAL DOSE 50 FOR ITS MUTATION BREEDING

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ABSTRACT

Mesta (*Hibiscus sabdariffa* L.) commonly known as ‘Roselle or Red Sorrel’ is an annual or biennial plant belonging to the large family *Malvaceae* and is cultivated in tropical and sub-tropical regions for bast fibre, paper pulp or edible calyces, leaves and seed. Its fleshy fruits (Chukur) are used to prepare vegetable, jam, jelly, pickle, tea, etc. due to its attractive colour as well as nutritional values. The self-pollination nature is responsible for narrow genetic diversity of Mesta which can be solved through increasing the genetic diversity by gamma ray mutation. BJRI developed Mesta variety named ‘BJRI Mesta 2’ known as Vegetable Mesta 1 (VM-1) having coppery red stem with branches, finger shaped lobed leaves, fleshy fruits of red or green colour, grey colour seeds with 20% edible oil content, waterlog tolerance, quick growing and higher yield of calyces: 2.0-2.5 t ha⁻¹ and Leaves: 6-7 t ha⁻¹ has been used for chronic gamma irradiation at Gamma Source Unit of Institute of Food and Radiation biology, Bangladesh Atomic Energy Commission, Dhaka, Bangladesh. Delivered irradiation dose has been measured using Fricke and Ceric-cerous dosimetry systems, and the irradiation doses were applied @ 17.10 Gy minute⁻¹ with a dose uniformity ratio (DUR) of 1.13. Mesta seeds (100g) were irradiated with 0.0, 100, 200,

300, 400, 500, 600, 700, 800, 900, 1000, 1100 & 1200 Gy dose, and seeds were planted immediately in research field of BJRI at Manikganj and Dhaka stations. Seed germination percentages were recorded up to five days for each dose. Morphological variations were found in Mesta mutant plants at all accumulated doses of Co₆₀ but higher plant height, girth of stem, good plant growth were observed in mutants at the accumulated dose of 100 & 200 Gy than control plants, and 50% plants were died at accumulated dose of 315 Gy which indicates lethal dose (LD₅₀) for Mesta plant. Plants were dwarfed chronologically after 200 Gy treatment. The Roselle mutant plants having distinct variations (in leaves, flower and stem) and good growth than controls were selected and their seeds will be used for further studies. This finding will be useful in determining the most suitable dose rate for chronic gamma irradiation for Mesta plant improvement in future.

WATERSHED PRIORITIZATION OF KAILALI DISTRICT THROUGH MORPHOMETRIC PARAMETERS AND LANDUSE/LANDCOVER DATASETS USING GIS

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ABSTRACT

Watershed prioritization is considered as an important tool for soil and watershed management. This study focuses on watershed prioritization of kailali district in term of soil erosion considering morphometric and landuse landcover parameters along with soil erosion mapping using RUSLE model. Integrated approach of Principal Component Analysis (PCA) and Weighted Sum Analysis (WSA) were used for prioritization. PCA was used to define the significant parameters whereas WSA define weightage value to calculate Compound Value (CV) for sub-watershed prioritization. PCA integrated with WSA was found effective for prioritization. The finding showed that about 61.58% of watersheds area is under high priority category suggesting those areas as higher risk of erosion. The estimated soil loss was classified into 8 erosion risk class from very low to extremely high. Higher risk of erosion is observed in 0.238%, medium risk in 27.673% and lower risks in 72.058% of study area. Northern chure area is in higher erosion risk than southern flat terai area. Similarly, barren areas were found highly susceptible to erosion followed by rangelands, trees, crops and flooded vegetation. Therefore, different land rehabilitation programs and bioengineering techniques should be focused on the higher erosion risks areas to control further soil erosion. The adopted methodology of prioritization can also be performed for multi-hazard mapping.

Keywords: Watershed, GIS, Prioritization, RUSLE, Morphometric & Lulc parameters, PCA & WSA

PERFORMANCE AND EVALUATION OF DIFFERENT TREE SPECIES UNDER AGRI-SILVICULTURE

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One of the most important objectives of agroforestry is the conservation of biodiversity and its suitable utilization. Citrus is a major cash crop in the region. Nagpur oranges are known for its test and quality. The oranges produced in the region are sold in mandis, packed and transported to various part of the country for marketing. Packing of oranges, vegetables, flowers require wooden boxes. Earlier these boxes were made from the wood of mango, kadunim and savari. The local traditional mango plantations have been slaughtering for the purpose. This has forced now to cut any tree like babul, palas growing on farm. *Ailanthus excelsa* being a producing soft wood, fast growing, strong copier, having an option for growing under agroforestry offers. Therefore the experiment was planted to study the potential role of Maharukh (*Ailanthus excelsa*) in agroforestry.

Methods

Ailanthus excelsa was planted at spacing 5 m x 5 m along with tree species *Tectona grandis*, *Acacia albida*. Crops like cowpea in kharif and mustard in rabi were grown in the interspaces. The study was carried out with the objectives 1) To assess growth performance of different Multi-Purpose Tree Species and 2) To find out suitable fast growing tree species for Agroforestry. The experiment was planted during 1999 in Randomized Block Design with 07 replication.

Results

Height (m): Among MPTS, *Ailanthus excelsa* attained maximum plant height (14.00 m) followed by tree

species *Tectona grandis* and *Faderbia albida*.

GBH (cm): Among MPTS, *Ailanthus excelsa* attained maximum GBH (116.43 cm) followed by tree species

Tectona grandis and *Faderbia albida*.

Grain and Straw yield (q ha⁻¹): Maximum grain and straw yield of cowpea was recorded under *Ailanthus excelsa* i.e. 4.72 and 9.21 q ha⁻¹, respectively. The cowpea grain yield in *Ailanthus excelsa*+ Cowpea agroforestry system was 68.22 and 28.38 % higher over *Tectona grandis* + Cowpea and *Faderbia*+ Cowpea agroforestry system, respectively. Maximum grain (7.85 q ha⁻¹) and straw yield (14.95 qha⁻¹) of mustard was recorded under *Ailanthus excelsa* followed by *Federbia albida*.

Tree volume (m³ ha⁻¹): Maximum volume tree⁻¹ (1.186 m³), volume ha⁻¹ (474.45 m³ ha⁻¹) were recorded under *Ailanthus excelsa* followed by *Tectona grandis* and *Federbia albida*.

Above ground, below ground and Total biomass (t ha⁻¹): Maximum above ground biomass (227.73 t ha⁻¹), below ground biomass (59.21 t ha⁻¹) and total biomass (286.95 t ha⁻¹) were recorded under *Ailanthus excelsa* followed by *Tectona grandis* and *Federbia albida*.

Above ground, below ground and Total carbon sequestration (t ha⁻¹): Maximum above ground carbon (113.87 t ha⁻¹), below ground carbon (29.61 t ha⁻¹) and total carbon sequestered (143.47 t ha⁻¹) were recorded under *Ailanthus excelsa* followed by *Tectona grandis* and *Federbia albida*.

% Increase in height, GBH and Total carbon sequestration: The percent increase in plant height (30.64 and 25.71), GBH (29.45) and total carbon sequestration was (53.95 and 37.32) in *Ailanthus excelsa* over *Tectona grandis* over *Federbia albida*.

Conclusions

From the result it is concluded that the *Ailanthus excelsa* is performing better in respect of Girth, Height, Volume ha⁻¹, above ground biomass, below ground biomass, total

biomass, above ground, below ground and total carbon sequestration. The highest cow pea and mustard grain yield was recorded in *Ailanthus excelsa* (4.72 qha⁻¹ and 7.85 qha⁻¹)

Keywords: *Ailanthus excelsa*, *Federbia albida*, *Tectona grandis*, Agrisilviculture system

USE OF BUCKWHEAT (*Fagopyrum esculentum*) AS A NATURAL SOURCE OF PHYTASE IN CHICKEN DIET

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Purpose

Phytase can improve the digestibility of phytate phosphorus in chicken, as well as reduce the negative impact of inorganic phosphorus excretion to the environment. Addition of phytase rich cereals in chicken diet is getting positive approach in recent research. Buckwheat (*Fagopyrum esculentum*) is a phytase rich pseudocereal and germination process further influence this activity. Therefore, buckwheat seemed to be effective to use as a source of phytase in chicken diet. This study was conducted to ratify the above-mentioned points.

Methods

A feeding trial was conducted where a total of one hundred and five one-day-old Indian River broiler chicks were allotted to one of five dietary groups with three replicates in each, and were fed experimental diets from 3-35 d of age. Diets included a positive control (PC) contained 0.46% available phosphorus, negative control (NC) diet was based on PC diet with reduced level of available phosphorus (0.25%), NC diet with commercial phytase I (*Aspergillus niger* derived), NC diet with phytase II (*Escherichia Coli* derived), and NC diet with germinated buckwheat where 20% buckwheat was added at the expense of maize.

Results

Body weight gain, feed intake and feed conversion ratio in birds fed buckwheat added diet was comparable to birds' fed PC and commercial phytase added diets. Tibia ash and phosphorus contents in birds fed phytase II or buckwheat added diets were comparable to birds fed PC diet. In addition, percent of phosphorus retention was increased ($P < 0.05$) in birds fed NC diet with buckwheat compared to birds fed only NC diet, and phytase fed birds showed similar trend.

Conclusion

There is a promising prospect to use germinated buckwheat as a natural source of phytase in chicken diet.

Keywords: buckwheat, chicken, germination, phytase activity, retention

INVOLVEMENT OF TRIBAL FARM WOMEN IN AGRICULTURAL DEVELOPMENT IN MEGHALAYA

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ABSTRACT

The study was conducted in East Garo Hills district of Meghalaya state of NE region of India. Altogether 110 randomly selected rural women were included as sample of respondents for the study. The study reveals that more than 50 per cent tribal farm women participated jointly with family members in harvesting (63.34 %), intercultural operation (58.18 %), storing of harvested crops (55.45 %). In addition to this, a large percentage of tribal farm women (70.91%) did not contributed labour at all in application of pesticides, 68.18 per cent in land preparation and 64.55 per cent in seed treatment. It is also found that more than 50 per cent of tribal farm women contributed labour independently in cooking, care of children & elderly persons and washing of clothes. Again, more than 50 per cent of tribal farm women were jointly engaged in feeding and taking care of the animals. It is interesting to note that 80.00 per cent of tribal farm women independently engaged in weaving.

Keywords: Involvement, Tribal Farm Women, Meghalaya, Agricultural Development

WOODY SPECIES DIVERSITY, STRUCTURE AND REGENERATION STATUS OF SETEMA NATURAL FOREST, SETEMA DISTRICT, WESTERN ETHIOPIA

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ABSTRACT

This study was conducted on Setema Natural Forest, located in Setema District, Jimma Zone, Oromia National Regional State in Southwestern Ethiopia. The objective of the study was to assess the woody species diversity, structure and regeneration status of the forest. To collect the vegetation data, eight transects were laid with regular interval of 200m distance. Along each transect, plots of 20×20 (400m²) were systematically established at 25m interval (elevation). A total of 47 species belonging to 44 genera and 31 families were recorded and identified. Fabaceae was the most dominant family represented by six species followed by Rubaceae represented by five species and Euphorbiaceae represented by three species. The basal area of the forest was 50.7 m²ha⁻¹. The total IVI of all woody trees/shrubs in the forest was 295.57, of which; *Cordia africana* contributed 43.85 IVI (14.8%) making it the most ecologically important species in the forest. Six plant communities namely: - *Schefflera abyssinica* – *Podocarpus falcatus* Community type, *Ficus sur* – *Syzium guinense* Community type, *Cordia africana* – *Albizia schimperiana* Community type, *Clausena anisata* – *Apodytes dimidiata* Community type, *Prunus Africana* *Millettia ferruginea* Community type and *Polyscias fulva* - *Ficus sycomorus* Community type were identified. The densities for seedlings, saplings and mature woody tree/shrub were 1713.95, 1166.42 and 1628 individual's ha⁻¹ respectively. The regeneration status and population structure of the forest indicated that there are human-induced disturbances in the area and immediate conservation actions should be implemented.

Keywords: Setema Natural Forest, Woody Species Composition, Regeneration.

ASSESSMENT OF HISTORICAL SPATIO-TEMPORAL VARIABILITY IN RAINFALL AND DROUGHT OF KALYAN-KARNATAKA REGION, KARNATAKA, INDIA

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ABSTRACT

Meteorological drought assessment relies heavily on rainfall data to determine climate and water supply trends, which in turn helps identify the likelihood of drought as well as the severity it will have. When precipitation is lower than the average, there is a drought. Precipitation falls short of meeting human needs when this occurrence lasts for an extended length of time. With the use of Standardized Precipitation Index (SPI), we looked at long-term spatial and temporal variability of rainfall and its trend, as well as meteorological dryness in the research region. Non-parametric methods such as the Mann-Kendall test, Sen's slope estimator, and the Standardized Precipitation Index were used to evaluate rainfall data from thirty-one meteorological stations for the period 1960-2014. The rainfall variability maps were created using ArcGIS V.xx. The study's trend analysis shows both a positive and a negative tendency. The research also discloses the total yearly rainfall observed across the study region in the previous 55 years, which was geographically dispersed between 656.25 millimetres and 842.60 millimetres. Talukwise precipitation data were analysed for meteorological drought and showed a severe dryness and the severity of that situation. KalyanKarnataka region agricultural productivity in Karnataka state is heavily reliant on rainfall and the frequency of meteorological droughts in the Karnataka.

Keywords: Meteorological Drought, SPI, Mann-Kendall test, Sen's slope estimator

STUDIES ON PEACH BUDDING IN STOOL BEDS OF 'RUBIRA' ROOTSTOCK.

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ABSTRACT

Peach (*Prunus persica* L. Batsch) is commonly propagated by tongue grafting. 'Rubira' peach rootstock multiplied through mould layering becomes unsuitable for tongue grafting at the end of season due to excessive diameter of stool shoots forced to go for cleft grafting, which lead to reduction in graft take success. However, this rootstock can be budded in stool beds during summer or rainy season of the same year when the thickness of the rootstock is appropriate for budding to produce a budded plant within one year. The aim of the study was to standardize the ideal method and time of summer budding in peach in stool beds of 'Rubira' rootstock for higher bud take success and production of saleable budded plants within the same season.

Methods

The experiment was laid out during 2020-21 in a Randomized block design (Factorial) with three budding methods (chip, shield and patch beddings) performed at five different timings at 15-days interval between 22nd May and 21st July. There were total 15 treatment combinations which were replicated three times. The observation on bud take success, scion height, scion diameter, number of leaves per plant, fresh and dry weight of shoots, fresh and dry weight of roots, root-shoot

biomass and saleable plants were recorded as per standard procedures during the course of investigation.

Results

A significantly higher bud take success (100%) was recorded in chip budding performed on 21st June followed by 6th June (96.67%) and 22nd May (93.33%). The patch budding performed on 21st June and 6th July and shield budding performed on 6th July also exhibited 100 per cent bud take success. The chip budding performed on 22nd May also exhibited highest scion height (149.17 cm), scion diameter (12.70 mm), number of leaves per plant (128.87), fresh and dry weight of shoots (150.33 and 86.67 g, respectively) and root-shoot biomass (106 g). However, maximum number of saleable budded plants (93.33%) was obtained in shield and patch budding performed on 6th June but it was closely followed by chip budding performed on 22nd May.

Conclusions

Chip budding performed during 22nd May and 6th June was proved to be the best methods and time for budding of peach on ‘Rubira’ rootstock in the stool beds to produce quality nursery plants within one year on the basis of bud take success of more than 90 per cent and significantly higher growth of budded plants.

Keywords: Peach, Rubira, bud take and plant growth

INSECT BIODIVERSITY IN AN AGRICULTURAL ECOSYSTEM OF TARAI REGION OF RAMNAGAR, UTTARAKHAND

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ABSTRACT

Species diversity and abundance of insects associated in an agricultural ecosystem was studied in Tarai region of district Nainital in Ramnagar, Uttarakhand. Biodiversity is essential for maintaining the ecological functions and provides diverse functional roles in the ecosystems. Insects play crucial role in establishing ecosystems by influencing the relationship between flora and fauna. Insect diversity is essential for valuable services such as scavenger and pollination. Ramnagar the gateway of oldest National Park “Corbett” is located at foothills of Himalayan region and due to its unique geographical location covered with mixed forests and crops, it allured high insect diversity. The survival of these ecosystems and wildlife sustained are now threatened by human activities like harvesting, agricultural expansion, anthropogenic activities, population explosion, urbanization, pollution, lax implementation of environmental policies and tourism, the insect biodiversity of Ramnagar is getting extinct day by day. Not only does this affect the food chain, but also the livelihood and the culture of millions of Indians who depend on local biodiversity. Conservation is an ethic of assets use, allocation and protection. Its primary focus is upon maintaining the health of the natural world, its habits and biodiversity. Biodiversity preservation in ecosystems can provide information about maintenance of environmental resources and sustainable development. The aim of study is to conclude insect diversity, abundance and species richness of agricultural ecosystem of Ramnagar.

Keywords: Agricultural ecosystem, Abundance, Biodiversity, Insects, Tarai region.

APPLICATION OF REMOTE SENSING AND GEOGRAPHICAL INFORMATION SYSTEM IN AGRICULTURE AND NATURAL RESOURCES MANAGEMENT

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ABSTRACT

Agricultural production systems are highly vulnerable to variations in climate, soil and topography of different regions. For sustainable agricultural management, all these factors need to be analysed on a Spatio-temporal basis. Advanced techniques like remote sensing, global positioning system and geographical information system can be of great use for their assessment and management. Remote sensing and Geographical Information System (GIS) offers an abundant opportunity to monitor and manage natural resources at multi-temporal, multi-spectral and multi-spatial resolution. It is an urgent need to understand the specialized capabilities of an ever-expanding array of image sources and analysis techniques for natural resource managers. Remote sensing and Geographical Information Systems are essential tools with a wide range of applications to tackle these issues. These technologies have manifold applications in agriculture including crop discrimination, crop growth monitoring/stress detection, crop inventory, soil moisture estimation, computation of crop evapotranspiration, site-specific management/precision agriculture, crop acreage estimation and yield prediction. Timely and reliable information on crop acreage, growth condition and yield estimation can be highly beneficial to the producers, managers and policy planners for taking tactical decisions regarding food security, import/export and economic impact. Such information on a regional basis can be made available with the use of remote sensing and geographical information system techniques. Remote sensing and GIS can also be used very effectively in land use/land cover analysis as well as damage assessment because of drought, floods and other extreme weather events due to changing climatic scenarios.

Keywords: Geographical information system, Remote sensing, Natural resources management, Crop yield prediction

ONE CARRIER SPACE-CHARGE-LIMITED CURRENT FLOW IN INSULATOR

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ABSTRACT

The formation of space-charge near cathode occurs during the gathering of the current carriers. The further injection of space-charge current density is restricted due to the mutual repulsion between the individual current carriers. The carrier injection is called single injection, if a single type of current carrier is injected from cathode and collected at the anode of the insulated diode. It is a necessary condition to maintain the carrier injection in the insulator. It gives space-charge limited current flow which is known as SCL current in insulator. It is observed experimentally that the sufficient numbers of electrons are injected from the metal to the insulator even at room temperature. The applied voltage is developed across the diode is represented by $eV(L)$, here e is the electronic charge and L is the device length. The space-charge reservoir of electrons occurs near the source which is known as cathode, it creates the curvature of conduction. The holes may also be injected in a similar manner into the valence band of the diode with the help of suitable metallic contact. It gives an important mechanism of conduction in insulators.

Keywords: space-charge, insulator, current carriers, single injection.

BIOFORMULATION OF ENTOMOPATHOGENIC FUNGUS AGAINST HELOPELTISTHEIVORA WATERHOUSE (HEMIPTERA: MIRIDAE)”

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ABSTRACT

Pathogenicity test of 5 strains or isolate of entomopathogens on adult *Helopeltis theivora* were carried out in the Physiology Laboratory, Department of Entomology, Assam Agricultural University, Jorhat during 2019-2021. Among the strains or isolate, *Archips sp.* isolate showed the best results at concentration 1×10^7 conidia/ml. The radial growth of *Archips sp.* isolate was found to be 75.33 mm. At concentration 1×10^7 conidia/ml, the conidial density, germination and pathogenicity of *Archips sp.* isolate was 8.08×10^7 conidia/ml, 85.49% and 80%, respectively. Morphological characters of *Archips sp.* isolate were studied and its molecular characterization was carried out by using CP plant gDNA mini kit protocol and its accession no. was assigned as OM321438. While *Archips sp.* isolate when grown on liquid media supplemented with carbon, nitrogen and mineral sources (Glucose, Peptone and $MgCl_2$), the medium supplemented with the mineral source- $MgCl_2$ (0.75%) showed maximum conidial load (6.54×10^7 conidia/ml) and maximum germination (88.91%). Three talc-based formulations were prepared. One was prepared by using base material as harvested from PDB supplemented with 0.75% $MgCl_2$, second with combination of all the nutrients (0.75% Glucose, 0.75% Peptone and 0.75% $MgCl_2$) and third without nutrient. And among these formulations, all nutrients supplemented talc-based formulation showed maximum conidial density (11.52×10^7 conidia/ml) and germination (90.06%). Also, in order to increase the virulence and efficacy of the prepared bio-formulation, two stickers-Tween-80 and Triton-X@ 0.01% and two spreader oils-coconut oil and mustard oil@ 0.025% were tested. It was found that the formulation incorporated with Tween-80@ 0.01% and coconut oil @0.025% had maximum conidial load (13.12×10^7 conidia/ml) and spore germination (95.49%). Three doses viz., 5, 10, 15 gm/L were tested on the adults of *Helopeltis theivora*. Among these doses, the dose of 15 gm/L showed the highest mortality (88%) at 9th DOT.

SELECTION OF *Melia composita* WILLD. PLUS, TREES FOR GENETIC DIVERSITY ANALYSIS IN ARUNACHAL PRADESH, INDIA

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ABSTRACT

Melia composita is a fast-growing deciduous tree species native to India. It is an important multipurpose tree species suitable for agro and farm forestry, hugely valued for pulp and plywood. The continuous increase of population has put tremendous pressure on the resources of forests for various end uses. Recently, the demand for this tree species has rapidly increased as a result of its potential as a timber species in different parts of India for large-scale plantations. Genetic diversity analysis is important to produce genetically improved planting stocked to meet the unending demands of the species for which the selection of plus trees is crucial.

In the present study, a survey was conducted in 11 villages of East Siang district, Arunachal Pradesh. It was observed that the tree species were found scattered in tribal home gardens. Based on total tree height (h), clear bole height (cbh), girth at breast height (gbh), collar girth (cg), straightness (st.) and branching behavior (br.), an initial 65 candidate plus trees of *Melia composita* were selected. Using the selection index method, the selected trees were further screened to select potential *Melia* tree species for genetic diversity studies.

The total index value and the clear bole height showed maximum improvement percentage after selection. The mean values before selection for average h, cbh, gbh, cg, st., br. and index values were 1028.15, 307.38, 79.45, 93.33, 2.75, 2.69 and 44.32, which after selection were improved to 1141.18, 417.35, 93.54, 107.74, 3.59, 3.53 and 172.15, respectively. In terms of percent of improvement, substantial improvement for cbh and st. was recorded followed by br., gbh, cg and h. The recorded quantitative traits of the available trees were indexed and on a high index value basis and a total of 34 plus trees were selected.

The 34 phenotypically superior plus trees screened through the selection index method can be used for further analysis work.

Keywords: Genetic diversity, Plus trees, Selection index, Tribal home garden, *Melia composita*

ADAPTATION STRATEGIES OF CLIMATE CHANGE EFFECT AND FACTORS AFFECTING THE ADAPTATION CHOICES OF LARGE CARDAMOM FARMER IN SIKKIM OF NORTH EAST INDIA

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ABSTRACT

Adaptation to climate change has become a major concern to farmers as many researchers reported the contribution of climate change to the decline of large cardamom production. The paper aims to study the adaptation strategies of climate change and factors affecting the adaptation choices in large cardamom in East Sikkim district. Data for the study were collected from 114 farmers through personal interview, focus group discussions and participatory rural appraisal methods. Simple random sampling technique was used for selection of the households. Simple random sampling technique was used for selection of the households. Descriptive statistical measures such as frequency, mean, percentage, standard deviation, chi-square test of independence and binary logistic regression were used for analysis and interpretation of the data. The study identified 10

adaptation strategies followed by the sample farmers (73.68%) to cope up the changing climate and its impacts. Among the identified strategies, gap filling, change in cultivar and cultivate smaller area than usual were the major strategies adopted by the farmers. Binary logistic regression model reveals that four variables *viz.*, age, annual income, influence and extension agent contact were positively influencing the adaptation decision. Therefore, the study suggests more farmers will take up adaptation strategies if information about the climate change and adaptation strategies are made available and the gap between the farmers and extension agent were reduced through better trainings and follow up programmes.

REVIEW ON GENETICS AND GENOMIC BASIS OF STAYGREEN TRAIT TO MITIGATE STRESS/ DROUGHT CONDITIONS

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ABSTRACT

Staygreen is one such trait in which genotypes possessing this trait maintain more photo synthetically active leaves (& less senescent) than genotypes not possessing this trait and it has been identified as an important component in the genetic improvement of several crops to promote stress tolerance and yield gain. Although the stay-green phenotype is superficially similar in all species and genotypes, the genetic and physiological routes the traits are diverse. Photosynthetically active leaves for longer period depends on the concentration of chlorophyll pigment absorbing sunlight for photosynthesis. An multi-dimensional approach for studying the senescence pathway rather than studying only the physiological role made a significant role in improvement. Hence new approaches like genomics, proteomics and metabolomics studies are necessary to understand the various transcription factors involved in regulating the leaf senescence process. However, the current agricultural scenario, in which there are increasing demands for food, strong climate change and a concern with environment harm from agricultural production, plant breeders are rethinking, investing not only in the traditional criteria, such as yield, but also in the selection of genotypes with high productive efficiency, through the understanding of crop physiology and stress adaptation. Therefore, this review has aimed to bring light to major aspects of the stay-green character, showing its potential use in plant breeding.

PLANT DIVERSITY DISTRIBUTION PATTERN ALONG ELEVATIONAL GRADIENT OF DARJEELING HIMALAYA

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ABSTRACT

Careful and systematic studies on vegetation structure and dynamics including altitude-based plant distribution of forests are poorly explored for Darjeeling Himalayas causing difficulty in sustainable management of the forests. Darjeeling Himalaya with its complex topography and high diversity was thus addressed for dealing vegetation pattern along the altitudinal gradient. The study was conducted in Darjeeling Himalayas from January, 2016 to December, 2018 categorizing it into four altitudinal zones to analyze the physical, structural, compositional and functional variation among the forests in the sampled stratified random nested quadrates. Overall of the total listed plant species in the forests, majority of them were less present or rare. Overall 418 plant

species were listed, of which 161, 157, 181 and 92 species respectively were listed in the four different altitudinal classes (100-1000 m, 1000-2000 m, 2000-3000 m and > 3000 m), respectively with average plant species richness of 22.23-29.54 per quadrates across the elevational gradient. The plant distribution pattern with altitude remained inconclusive with two reverse pattern found at elevation steps of 100 m, 200 m and 300 m the distribution curve was reverse hump shaped with mid elevational nadir but at 1000 m elevation step the curve was general hump backed with mid elevational peak. This was because the species richness though was exhibiting significant inverse relationship with altitude but the relationship was very mild. Trees were the prominent life form found across the elevational gradient with poor regeneration status i.e. majority of the tree species were not found regenerating throughout the elevational gradient. However, the plant assemblages across the elevational gradient in the forest were highly diverse with no species dominating the other with species more or less equally distributed. Moreover, Sorenson's similarity index of 0.03 suggests intense dissimilarity or least similarity for species encountered across the elevational gradient because majority of the species encountered were unique to a particular altitudinal class. Of the total documented species, 5.74 % were endemics, 26.80 % were IUCN red listed species and more than 85 % rarely distributed species along with poor tree regeneration indicates immediate proper silvicultural management actions for sustainable growth and conservation of Darjeeling Himalayan forests. However, further detailed studies considering climatic, edaphic, internal biotic factors or interactions and anthropogenic disturbance are required to fully understand the plant distribution along the elevation gradient.

Keywords: Vegetation, Species richness, Life forms, Endemic species

FUNCTIONAL DIVERSITY AND ECOSYSTEM SERVICES OF HOMEGARDENS ALONG ALTITUDINAL GRADIENT OF DARJEELING HIMALAYAS

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ABSTRACT

Sustaining plant diversity and improving carbon stock in an agricultural landscape requires viable sustainable option like homegarden. The study was conducted in Darjeeling Himalayas from April 2018 to April 2020. The Darjeeling hills were categorized into three altitudinal zone to analyze the physical, structural, compositional and functional variation among the homegardens. A total of 150 homegardens were selected adopting multi-stage random sampling procedures. The homegardens were observed to be traditional and up to even a century old but were much smaller (av. 0.0745 ha) than the global inventory of homegardens. Owing to its smaller size, the homegardens didn't exhibit any particular trend across the altitudinal gradient with respect to its functional properties except some specialist or unique species. Overall, the plant species documented were found associated with 12 services within the four major ecosystem services dominantly of which was food, aesthetic, medicinal, domestic energy, soil conservation, fodder and timber. The owners didn't prefer exotics as they were less than half of the population of native species they selected. This refute the fear that increasing occurrence of exotic species in homegardens may threaten native diversity, traditional knowledge and food security rather the home gardeners were conserving native species based on traditional knowledge of farming, utilization and conservation.

Keywords: Vegetation, Utilization, Native Species, Homegarden

IMPACT OF NITROGEN SOURCES AND ELEVATED CO₂ FERTILIZATION ON PLANT PRODUCTIVITY AS A CONSEQUENCE OF PLANT BIOCHEMICAL, PHYSIOLOGICAL TRAITS

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ABSTRACT

Accumulation of carbon dioxide concentration in the atmosphere may have impact on crop growth, productivity and soil nutrients. An increase in atmospheric carbon dioxide concentration can boost crop productivity by increasing nutrient demand by the crop. This review is primarily concerned with how elevated CO₂ concentration in combination with nitrogen doses affects plant functioning in terms of growth and productivity. Numerous studies have found that increased plant growth under elevated CO₂ levels necessarily requires greater nutrient uptake and assimilation. Plant nutrient demand especially nitrogen may be altered in future climatic conditions due to increased CO₂ concentration. The increased CO₂ conditions influence the morphological, biochemical, and physiological functioning of the plant, resulting in a change in growth and productivity of the plant system. Elevated CO₂ concentrations with different nutrient applications increase plant growth and productivity, but beyond a certain limit of CO₂ and nutrient, the plant cannot perform efficiently. However, some plants are able to develop mitigation and adaptation mechanisms that allow them to perform better under high CO₂ and nutrient conditions. These plants have the potential to mitigate the impact of climate change by utilizing increased CO₂ levels to produce more capital in the form of biomass productivity and yield. Such behaviour of plant adaptation to deal with climate change. These plants can be recommended for roadside plantation to address the increased CO₂ problem in the future.

FOREST FIRE PATTERN AND RISK ASSESSMENT: COMMUNITY LEVEL MANAGEMENT APPROACH IN UDAYAPUR DISTRICT, NEPAL

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Purpose

To identify pattern and analyze risk of forest fire in Udayapur district along with the motive of highlighting strengths and gaps in managerial aspects to combat the fire hazard in study area.

Methods

Inductive approach:

The approach was used to develop the pattern of forest fire in the district based on active fire points and to analyse the forest fire risk pattern in the Udayapur district of Nepal where the risk levels to different categories of fire risk submodels were defined based on the score of percentage coverage of the active fire points to the respective category.

Deductive approach:

The approach was used to study the perception and managerial aspects in the community level towards forest fire where the Focus Group were provided with the theories to agree or disagree with and the data were derived based on it.

Results

The weightage to the submodels was derived from AHP with consistency ratio 0.089. Fire risk zones in the risk map were delineated in five classes ranging from very high to very low. More than 80% of the area was observed into high and very high risk category. The model was then

verified with the comparative analysis with the derived active fire points of 2012 – May 2020 from MODIS and from Focus Group Discussion. The integration of Remotely Sensed data and Geographical Information System (GIS) was used in the model preparation and in the process of validation. The methodology included key informants’ interview for extracting the causes, challenges, methods used to control forest fire and and further validate the results derived from analysis of satellite data. Then, the perception test and statistical tools was used among Ten CFUGs from each risk zones for developing priorities in managerial aspects in community level.

Conclusions

Udayapur district has been identified has a very high fire risk district with the 34.1% of the area under Very high-risk zones, 17.6% under High-risk Zones and 21.1% under Moderate risk zones. Only 18.1% of the area under low-risk zones followed by 9.1% of the area under very low risk.

Keywords: Spatio-Temporal, Geographical Information System (GIS), VIIRS (Visible Infrared

CONTROLLING INVASIVE ALIEN *LANTANA*: A STRATEGIC APPROACH TO SELECT VALUABLE PLANT SPECIES

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ABSTRACT

Invasive plant species can disturb natural habitats and risk endangered plants by strangling and covering native flora in various biogeographical zones. The settlement of aggressively spreading invasive species is widely recognized as one of the most serious challenges to biodiversity and natural resource management. They've also been seen to alter the local ecology, resulting in a decline in the native inhabitants that the invaded region supports. *Lantana camara* is one such invasive plant that affects the native flora and biodiversity and is considered one of the 10 worst weeds by IUCN. Competitive power fluctuates throughout environmental gradients, life phases and abundances. Hence competition outcome is very context-dependent. Native and indigenous species may develop to compete with invasive species, reducing invader fitness considering the above parameters. We conducted field surveys in Doon valley to identify the competitive species growing with *Lantana camara* and the potential competitor species based on the Domin-Krajina scale and IVI based on the field surveys. Furthermore, we conducted pot experiments for intra and interspecific competition, observing phenological growth patterns for these species with *Lantana*, followed by field experiments. We described the comparative interaction index on a scale of -0 to +1 for the selected species. We also suggested use of some species of grasses for the ecorestoration of Lantana infested landscape which can be used for reclamation found during our study. In our study, we suggest native and indigenous species that have the potential to reduce the invasiveness of *Lantana camara*.

RESPONSE OF DIFFERENT SOWING METHODS AND ORGANIC MANURES ON WHEAT (*Triticum aestivum*) GROWTH ATTRIBUTES, YIELD ATTRIBUTES, AND ECONOMICS

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ABSTRACT

Organic farming is one of the most ancient farming systems that play a significant role in global food and ecosystem security. To study the retaliation performances of various methodologies of sowing by accompanying organic manures on growth, yield, and all other yield attributes of wheat (*Triticum aestivum* L.) crop. A field experiment was executed during *the Rabi* season of 2020-21 at the crop research farm of SHUATS, Prayagraj to study the Response of different methods of sowing and organic manures on wheat growth, yield, and Economics. The experiment was laid out in the most commonly encountered Randomized Block Design (RBD) with three replications of each treatment for all traits. Given this experiment three methods of sowing, *i.e.* M1 (Broadcasting), M2 (Line sowing), M3 (System of Wheat Intensification) as well as three organic manures *i.e.* O1 (Farmyard manure 12 t/ha), O2 (Poultry manure 5 t/ha), O3 (Vermicompost 4 t/ha) and two liquid manures Panchagavya 3% and Jeevamrutha 500 l/ha. And the liquid manures were foliar sprayed at 15, 30, and 45 days after sowing (DAS). Results were revealed that the maximum number of tillers (10.53), Dry weight (18.00 g/plant), Effective tillers (10.43), Spike length (11.73 cm), and Grains per spike (58.38) were found to be significantly higher than the application of treatment SWI + Poultry manure (5 t/ha) + Panchagavya 3% FS + Jeevamrutha 500/h FS as compared to the other treatments. Maximum values were ensured with Plant height (78.30 cm), test weight (36.73 g), Grain yield (3.16 t/ha), Straw yield (4.48 t/ha), and harvest index (41.39 %). Whereas, the highest Gross return (Rs. 1,44,000.00/ha), net returns (Rs. 95,940.00/ha), and B: C ratio (1.99) were noticed in Line sowing + Poultry manure (5 t/ha) + panchagavya 3% FS + Jeevamrutha 500 l/ha FS recorded significantly higher compared to other treatments. Hence with the current experiment's outputs, this study concluded that Line sowing + Poultry manure (5 t/ha) + Panchagavya 3% FS + Jeevamrutha 500 l/ha FS were produced more grains and productivity as well as Economically viable compared to other organic treatment combinations.

Keywords: Economics, Organic Manures, Sowing methods, Wheat, Yield.

EDX AND FTIR ANALYSIS OF VERMICOMPOST *Eisenia fetida*

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ABSTARCT

Energy-dispersive X-ray (EDX) spectrum of elements such as O, N, Na, Mg, Al, Si, P, Cl, K, Ca and Fe were found in the cow manure vermicompost (*Eisenia fetida*). Oxygen was observed in the highest and sodium was least in cow manure of vermicompost. FT-IR analysis revealed that chemical compounds that was responsible for the improved the crop quality. The strong absorption bands observed between 3404.2 cm⁻¹ due to the bonded N–H stretching show the presence of primary amine. The variable strong bands observed at 2972.2 cm⁻¹ due to bonded C–H asymmetric stretching attribute the presence of alkene and alkane. The secondary structure of amine due to N–H bending observed between 1653.8 cm⁻¹. The bands observed at 1420.0 cm⁻¹ may be due to bonded C–O / O–H bending in alcohols and phenols. The spectral band observed at 1033.4 cm⁻¹

due to SO₃ symmetric stretching shows the presence of sulfur compounds. The medium bands observed at 785.5 cm⁻¹ due to C–H out-of-plane bending show the presence of aromatic compound with substitution of hydrogen.

Keywords: EDX, FTIR, Spectrum. Vermicompost, stretching

IMPACTS OF CLIMATE CHANGE ON APPLE CULTIVATION IN UTTARAKHAND HIMALAYAS AND FUTURE STRATEGIES

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ABSTARCT

Apple (*Malus pumila*) has been cultivated from time immemorial as an important temperate fruit that is widely produced after banana, orange and grapes. Among 10,000 known cultivars of Apple, 7,500 still exist while over 100 varieties are commercially grown world-wide. Apple has attained the distinction of being one of the most important fruit crops of north western Himalayan regions of India where it has revolutionized the socio-economic condition of people living in the hills as an important source of livelihood. Apple is mostly grown as perennial monocultures where pest and disease problems are complex in nature that have led to repeated and excessive use of chemical pesticides, thereby resulting in the development of resistant pathogens, besides causing environmental pollution. Over 93 diseases and 122 insect pests have been reported to affect the Apple crops resulting in reduction in yield, devolution in grade, foliage loss and operational expenditure. Wide-spread epidemic nature of the summer disease and insect pests varying from region to region are becoming serious and economically important stresses. Farmers of Indian Himalayan Region (IHR) grow many fruit crops, including pomes (apple and pear) and stone fruits (peach, plum, apricot and cherry) in considerable quantities. The Currently, the himalayan mountain ecosystem is facing challenges created due to increasing aridity, warmer winter season, variability in precipitation and unexpected frosts and storms, thereby affecting biodiversity, including agriculture and horticulture. Various data showed a decline of about 50% in productivity of apple farming in the Indian states of Uttarakhand. Jammu & Kashmir and Himachal Pradesh. As climate change manifests in changing weather patterns, farmers respond by altering their cropping patterns that could limit their access to nutritious foods. While there is a shift in apple growing regions in Himachal Pradesh to higher altitudes due to rise in annual mean temperatures at lower altitudes, peaches and plums have higher temperature tolerance than the other fruits and are, therefore typically found at lower elevations which could explain their growing prevalence in this region that also fetch better price when compared to other regional fruits, except apple. Apple farmers in the higher reaches of Uttarakhand are also shifting to other fruits that require lesser cold conditions.

Although, Uttarakhand’s contribution to the total apple production in the country is just 3.7%, the state, horticulture authorities have been making efforts to increase the area under apple cultivation, climate change challenges pose major hurdles. Need of hour is to organize and manage the horticultural sector in Uttarakhand to ensure the mitigation of climate change impacts on apple farmers. This includes access to improved and resilient germ-plasm, High Density Plantation Techniques, and better crop management. Selection and multiplication of clonal planting material through tissue culture for apple plantation would be preferred when compared to seedlings. Besides the apple producing countries are working on rootstock base cultivation that produces 8 to 10 times when compare to traditional apple farming. Apple germplasm with better adaption to lower hilly regions and plans is another option as demonstrated by the Himachal Pradesh

Horticultural Department. Options and opportunities to mitigate the adverse impacts of climate change in apple cultivation in the hills will be discussed.

Keywords: High Density Plantation, Rootstock, Climate Change, Tissue culture micro-propagation

ORGANIC CROP MANAGEMENT PRACTICES ON GROWTH AND YIELD OF SESAMUM UNDER CLUSTER FRONTLINE DEMONSTRATION ON OILSEEDS IN WEST GODAVARI DISTRICT OF ANDHRA PRADESH

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ABSTRACT

Organic farming has significantly increased in importance in recent decades. Organic farming is an agricultural system which deliberately renounces the use of synthetic and dangerous inputs. They usually include high risks long term contamination of land and water resources and intoxication risks for farmers and farm families. Organic farmers try to avoid direct and potentially harmful control measures. Kvk venkataramannagudem has conducted cluster frontline demonstration of oilseeds on sesamum crop from last 5 years. During the year 2021-22 improved sesamum seed YLM 66 and along with improved organic package of practices were demonstrated to 75 organic farmers. They belong to singarajupalem, pullalapadu and marlamudi villages in west Godavari district. Sesamum is one of the oldest oilseeds crop it is well adapted to harsh environment and constitute an alternative cash crop for small farmers. Farmers were adopted organic crop management practices in sesamum, from sowing to harvesting stage. sesamum seed is treated with raw cow milk this was helpful against the seed borne pathogens and also protect the crop up to 20 DAS from viral diseases. Before sesamum they grown navadanyalu and incorporated them into soils at 45 DAS. last ploughing farmers add nearly 5-6 tons of ghanajeevamrutham, 2kgs of bio fertilizers and 1kg of trichoderma & pseudomonas consortia to soils which are very helpful for controlling the soil borne pathogens. panchagavya along with jeevamrutham was used as plant growth promoting purpose and this one sprayed at an interval of 10 days at every 20DAS. Major pest and diseases like leaf webber, leaf hopper, phlody, sucking pest, dry root rot and alternaria blight were effectively controlled by spraying of agniastram along with neem cake at 40 & 65 DAS. Adoption of these practices' farmers got an average yield of 3 quintals/acre with a gross income 30000 rupees/ac and average cost of cultivation for one acre is 4850 rupees only.

Keywords: sesamum, organic farming, yield, gross income, pest and diseases

EFFECT OF DIFFERENT PLANTING DENSITIES AND TRAINING SYSTEMS ON FRUITING, FRUIT QUALITY AND TREE PHYSIOLOGY OF APPLE (*Malus × domestica* Borkh.)

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Purpose

To find out the most suitable plant spacing/planting density and training system for high density plantations of apple cv. Jeromine on M9 clonal rootstock.

Methods

The studies were carried out for two years during 2018-2020 in the Experimental Orchard of the Department of Fruit Science, Dr Y S Parmar University of Horticulture and Forestry, Nauni, Solan, Himachal Pradesh, India. The experiment was laid out in a Randomized Block Design (Factorial) with three planting densities viz., 4000 trees/ha (2.5×1.00 m), 3200 trees/ha (2.5×1.25 m) and 2666 trees/ha (2.5×1.50 m) and trained to two training systems (Tall Spindle and Vertical Axis systems). Each treatment was replicated thrice having two trees per replication. The observations on spur density, fruit set, fruit retention, yield, fruit quality and physiological parameters viz., light interception, leaf area index, photosynthesis, stomatal conductance and transpiration rate were recorded. Standard procedures were followed for recording of observations. Photosynthetic rate, stomatal conductance and transpiration rate were recorded with LI-6400XT (LI-COR) portable photosynthesis system. Two years' data was pooled and analysed as per the standard statistical procedure.

Results

The results of the study revealed that various planting densities and training systems had a significant influence on spur density, fruit set, yield, fruit quality and physiological parameters viz., light interception, leaf area index, photosynthetic rate, stomatal conductance and transpiration rate of apple cv. Jeromine/M9. Among the planting densities, 2666 trees/ha (2.5×1.50 m) showed highest spur density (0.23), fruit set (52.90%), fruit length (63.63 mm), fruit diameter (72.17 mm), fruit weight (151.97 g), fruit firmness (5.41 kg/cm²) and TSS (11.60°B). The highest values of total sugars (9.73%), reducing sugars (6.70%) and anthocyanin content (A₅₃₀-1.37) were also recorded under trees with planting density of 2666 trees/ha (2.5×1.50 m). On the other hand, maximum fruit retention (31.86 %), yield (37.60 MT/ha), light interception (62.17%), leaf area index (2.09 m² m⁻²), photosynthesis rate (14.88 μmol CO₂ m⁻² s⁻¹), stomatal conductance (0.271 mol H₂O m⁻²s⁻¹) and transpiration rate (4.016 mmol H₂O m⁻²s⁻¹) were recorded under 4000 trees/ha (2.5×1.00 m). In case of training systems, trees trained to Tall Spindle depicted maximum spur density (0.20), fruit set (51.69 %), fruit retention (30.11 %), yield (37.09 MT/ha), fruit length (61.08 mm), fruit diameter (67.37 mm), fruit weight (145.27 g) and TSS (11.07°B). Similarly, highest values of total sugars (9.29%), reducing sugars (6.43%), anthocyanin content (A₅₃₀-1.21), light interception (62.24%), photosynthesis rate (12.11 μmol CO₂ m⁻² s⁻¹), stomatal conductance (0.206 mol H₂O m⁻²s⁻¹) and transpiration rate (3.497 mmol H₂O m⁻²s⁻¹) were elucidated by the trees trained to Tall Spindle system. However, interaction of planting density and training system did not exert any significant effect on spur density, fruit set, yield, fruit quality, light interception, leaf area index, photosynthetic rate, stomatal conductance and transpiration rate.

Conclusion

A tree density of 2666 trees/ha (2.5×1.50 m) to 4000 trees/ha (2.5×1.0 m) and Tall Spindle training system were found most suitable for obtaining higher yields of better-quality fruits including

improvement in light interception, leaf area index, photosynthetic rate, stomatal conductance and transpiration rate in apple cv. Jeromine on M9 clonal rootstock.

Keywords: Apple, Planting densities, Training systems, Fruiting, Yield, Fruit quality and Tree Physiology.

ASSESSMENT OF FUNGICIDES IN POTATO CROP

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ABSTRACT

Potato is an important and popular crop of district Firozabad. However, there is high infestation of early blight disease. The crop disease infestation percentage is minimum in T₂ 9% by the spray of Hexaconazole plus Zineb 68% @ 1.5 gm/lt. of water spray at the 40-50 days after sowing seed and disease infestation was found 12% in T₃ due to spray of Mancozeb 64% plus Metalaxyl 8% @ 1gm/lt. of water than T₁ farmers practices (no use of proper fungicides. The maximum disease infestation percentage was found in T₁ farmers practices 19% due to no use of proper fungicides. Increased yield percentage of potato was found 12.34% in T₂ by the spray of fungicides Hexaconazole + Zineb 68% @ 1.5 ml/lt. of water at 40-50 days of interval after sowing of seed and 7.24 % increased yield was found in T₃ due to spray of Mancozeb 64% +Metalaxyl 8% @1gm/lt. of water at 40-50 days of interval after sowing of seed than F.P.- T₁. The maximum net return Rs. 146000.00/ha. Was found through T₂ and lowest net return Rs. 123500.00/ha. In T₁. There was more difference between T₂ and T₁ regarding net return. The highest B:C ratio 2.24 was found in T₂ and next 2.14 B:C in T₃ and minimum B:C ratio 2.11 in T₁.

INFLUENCE OF CULTURAL PRACTICES, BIOCONTROL AGENTS AND STORAGE CONDITIONS ON AFLATOXIN PRODUCTION IN PEANUT

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ABSTRACT

Aspergillus niger causes root rot along with other fungi to form root rot complex and *Aspergillus flavus* causes losses in storage conditions by producing aflatoxins which makes kernels unfit for both human and cattle consumption. To reduce the aflatoxin contamination, adaptation of good agricultural practices are gaining the importance since they are environmentally sustainable. In Punjab the scale of the disease is 22–30%, but 50% of losses have been reported as well. The field experiments were conducted to evaluate the effects of cultural practices viz., date of sowing, soil amendments like FYM & Lime and bioagents like *Trichoderma harzianum* & *Pseudomonas fluorescense* on aflatoxin production. It showed that early crop seeding in April reduces the collar rot infection, but aggravates the fungi producing aflatoxin. Application of FYM and lime reduces the aflatoxin contamination and, increased the pod yield of the groundnut. Likewise, bioagents also reduced the aflatoxin contamination. In an Another experiment to evaluate the effect of storage conditions on aflatoxin production, higher aflatoxin contamination (626 µg/kg of AFB1) was found in the pods (inoculated with toxigenic strain) stored at 35°C with >20 per cent moisture content, hence it is recommended to store the pods at 15°C with 12-15 per cent moisture content.

AGRO TOURISM IN NORTH EAST INDIA: ROLE AND ITS POTENTIAL

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ABSTRACT

Agritourism means travel organized around farming, small-scale food production or animal husbandry. Visiting a working farm or ranch for the purpose of enjoyment and education are key parts of this often-rural experience. The potential benefits of agritourism development extend to farmers, rural communities, and tourism operators. Increasing the long-term sustainability for farm businesses, providing a more energetic business environment for attracting other businesses and small industries. Many farmers, in addition to normal farming activity, have already turned to agritourism as a source of additional farm income and opportunities. There are numerous benefits from the development of agritourism: it may strengthen local economy, create job opportunities and new businesses; develop and promote training and certification programs to introduce young people to agriculture and environment. Agritourism helps preserve rural lifestyles and landscape and also offers the opportunity to provide "sustainable" or "green" tourism. Organic agriculture is a cultural revolution that finds its origins in an environmentalist culture. Furthermore, the focus on these products is due to demand on healthy foods with high quality standard limiting chemical substances usage. It's clear the link of the organic agriculture with agritourism and tourism services. They have a considerable role in the future development of rural areas. The purpose of this paper was to identify and examine those factors that have helped rural communities successfully develop agritourism, in particular organic agritourism and its entrepreneurship opportunities.

Keywords: Agro tourism; green; sustainable; entrepreneurship and opportunities.

TRADITIONAL HOMEGARDENS AND ETHNOMEDICINAL PLANTS: INSIGHTS FROM THE INDIAN SUB-HIMALAYAN REGION

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ABSTRACT

Homegardens are a traditional human-made microenvironment, socioeconomically connected to people's long-term survival. In India's sub-Himalayan region, studies have been conducted on many aspects of homegarden systems. However, little has been studied on ethnomedicinal plants from this region's traditional homegardens. The current study focuses on the diversity and population status of ethnomedicinal plants in homegardens and their folk therapeutic uses. The present work was conducted in West Bengal's Jalpaiguri District, part of the Terai zone. A purposive, multi-stage random sampling method was used to select 100 homegardens. Sixty-seven ethnomedicinal plant species representing 44 families and 60 genera including 22 trees, eight shrubs, 34 herbs, and three climber species were documented. The documented ethnomedicinal plants species were used as folk therapies to treat 39 diseases including some serious ailments like cancer. The most commonly employed plant part for therapeutic purposes were leaves (22 species) followed by fruits (seven species), whole plant (five species), rhizome (three species), tuber and young bud (two species). The use-value for the documented ethnomedicinal species varied from 0.56 (*Ocimum sanctum*) to 0.012 (*Lannea coromandelica*) while, the fidelity values ranged from

92.17% (*O. sanctum*) to 3.43% (*Streblus asper*). The value of cultural importance ranged from 0.384 (*Ocimum sanctum*) to 0.009 (*Corchorus capsularis* and *Nyctanthes arbor-tristis*). The above quantification of the ethnomedicinal plant species signifies the prominence of a species in cultural and folk therapeutic terms, i.e. higher the values, higher is the traditional importance of the species. The present documentation indicates rich traditional knowledge on medico-botanical aspects of the study area as diverse ethnomedicinal plant species were actively harboured and maintained in the homestead by the inhabitants for their primary health care and well-being that usually were supplemented prior to modern health care system. Diverse ethnomedicinal plant species being maintained in the homestead is significant in conservation of these species that too in a human dominated landscape when these plant species are threatened for existence due to habitat destruction and commercial exploitation in their natural habitats.

Keywords: Species richness, Utilization, Ethno-botanical, Homegarden, Himalayas

HERBICIDE RESISTANCE AND ITS MANAGEMENT IN WHEAT

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ABSTRACT

In the rice-wheat cropping system, little seed canary grass (*Phalaris minor*) is a destructive grass weed that is a very common wheat crop. profitability and wheat production in the northwest Indo-Gangetic plains of India *Phalaris minor* has a major impact on Punjab and Haryana. The sustainability of the rice-wheat cropping system in north-western India may be threatened by an increased infestation of *Medicago denticulata*, *Cirsium arvense*, and, *Convolvulus arvensis*, caused by the ongoing use of isoproturon. *Phalaris minor* has developed multiple herbicide resistance due to repeated use of herbicides with the same modes of action for weed management in wheat, which might endanger the sustainability of the rice-wheat cropping system in north-western India. In direct-seeded rice and soybean crops, herbicide resistance could potentially be a concern. However, subsequently, new weed species have developed resistance to, Photosystem II (PS II), Acetyl-CoA Carboxylase (ACCCase, acetolactate synthases (ALS) inhibitor herbicides, such as showing the resistance like those grassy weeds (*Monspeliensis* L., *Avena ludoviciana* Durieu, Polypogon and broad-leaved weeds (*Rumex dentatus*L. *Chenopodium album* L). The discovery that *Phalaris minor* has developed a biological defense against such new herbicides from Punjab and Haryana is evidence of such cross-resistance again shows *Phalaris minor* to be insensitive to the application of pinoxaden without any prior record of exposure. The most popular method is to chronologically apply various alternate herbicides, such as mixtures and single herbicides, or rotation of herbicides with various modes of action for several growing seasons to control weed flora in wheat crops. Since of there an introduction, of alternative herbicides such as fenoxaprop, clodinafop and sulfosulfuron gave effective control of isoproturon resistance against *Phalaris minor* and various weed flora in wheat. As well as other combinations of herbicides are needed to control weed flora in wheat as well as other crops, as either a tank mixture or single such as suitable herbicide Combination like that (mesosulfuron + iodosulfuron, sulfosulfuron + metsulfuron) and other application herbicide if not incompatible like that (clodinafop, pinoxaden, fenoxaprop, with 2, 4-D or metsulfuron) for control of weed flora in wheat. and use of Pendimethalin, 2,4-D, metribuzin, and carfentrazone, are some alternative herbicides for managing resistant *R. dentatus* weeds, of wheat crops while pre-emergence use of pendimethalin is particularly effective in reducing *R. dentatus* weeds in wheat and the efficacy of using herbicides on wheat crops can also be improved by using additive, safeners, adjuvants, and use suitable application technique uses of wheat crops.

INDIA'S AGRI EXPORTS

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ABSTARCT

Proactive measures taken by the government have ensured that India's agricultural and allied sector product exports crossed a record US \$ 50 billion in 2021-22, thus playing a key role in enhancing farmer income.

The Government of India's consistent and sustained thrust on boosting India's agricultural and allied sectors products exports have started to show results. Despite the unprecedented global pandemic- COVID-19, India has been able to meet rising global demand and is also emerging as a significant supplier of food and other agricultural products. India's exports of agricultural products, including marine and plantation products, for 2021- 22 rose to a record US \$ 50 billion, which was an increase of more than 20% from the previous financial year. As per the provisional figures released by the Ministry of Commerce and Industry, the export growth has been achieved mostly because of a surge in shipments of rice, marine products, sugar, buffalo meat, raw cotton and wheat.

"This growth in agricultural products exports has been achieved in spite of unprecedented logistical challenges in the form of high freight rates, container shortages etc," a statement by the Ministry of Commerce in April, 2022 had stated. It also stated that growth in agri-exports will go a long way in realising Prime Minister Narendra Modi's vision of improving farmers' income.

In 2021-22, highest ever exports have been achieved for commodities such as rice (\$ 9.65 billion), wheat (\$ 2.19 billion), sugar (\$ 4.6 billion) and other cereals (\$ 1.08 billion). Exports of wheat rose by more than 273% to \$ 2.19 billion in 2021-22 in comparison to previous year. The Commerce Ministry statement also stated that increase in agri-exports of these products has benefitted farmers in Punjab, Haryana, Uttar Pradesh, Bihar, West Bengal, Chhattisgarh, Madhya Pradesh, Telangana, Andhra Pradesh, Maharashtra etc.

"Meanwhile, India has also captured close to 50% of the global rice trade. In 2021-22, the export of marine products was at \$7.71 billion which had economically benefited farmers in the coastal states of West Bengal, Andhra Pradesh, Odisha, Tamil Nadu, Kerala, Maharashtra and Gujarat.

Spices exports rose to \$4 billion for the second year in a row in the last financial year, while despite facing tremendous supply side issues, coffee exports have crossed \$ 1 billion for the first time, which has improved realisations for coffee growers in Karnataka, Kerala and Tamil Nadu.

The major market for India's agriculture products were the United States, China, Bangladesh, UAE, Vietnam, Saudi Arabia, Indonesia, Nepal, Iran and Malaysia.

Officials from the Commerce Ministry have attributed the sharp rise in agri - exports to sustained efforts on the part of the Department of Commerce and its various export promotion agencies like Agricultural and Process Food Products Exports Development Authority (APEDA), Marine Products Export Development Authority (MPEDA), Coffee Board and various commodity boards.

Besides, the Commerce Minis-try also engaged with state governments and district administrations for promoting agriculture exports. The agricultural commodities have been exported from clusters like Varanasi (fresh vegetables, mangoes), Anantapur (banana), Nagpur (orange), Lucknow (mango), Theni (banana), Solapur (pomegranate), Krishna & Chittoor (mango) etc.

"During Covid-19 pandemic, while many countries were stockpiling their rice, wheat and other cereals, we took a proactive role in organising logistics and developing value chains which has given a boost to cereal exports," M Angamuthu, Chairman, APEDA said.

After October 2020, there has been a sharp spike in global agri-commodity prices, with the lifting of Covid-induced lockdowns and also the aftereffects of the massive financial infusion in the post pandemic phase.

According to Commerce Ministry officials, the focus of the government policies has been to provide the requisite support to export promotion bodies and the farmers so as to enable them to increase exports of agricultural products from the country. Several measures have been initiated in the last eight years for boosting India's agricultural and allied food products exports basket.

Some of the measures initiated include:

Agriculture Export Policy- To promote agricultural exports, the Government has introduced a comprehensive Agriculture Export Policy (AEP) in 2018 aimed at harnessing export potential of Indian agriculture, through suitable policy instruments, to make India a global power in agriculture, and raise farmers income.

Key objectives of the AEP:

- To diversify our export basket, destinations and boost high value- and value-added agricultural exports, including focus on perishables.
- To promote novel, indigenous, organic, ethnic, traditional and nontraditional Agri products exports.
- To provide an institutional mechanism for pursuing market access, tackling barriers and dealing with sanitary and phytosanitary issues.
- To strive to double India's share in world agri-exports by integrating with global value chains. Enable farmers to benefit from export opportunities in overseas markets.

So far 21 states - Maharashtra, Uttar Pradesh, Kerala, Nagaland, Tamil Nadu, Assam, Punjab, Karnataka, Gujarat, Rajasthan, Andhra Pradesh, Telangana, Manipur, Sikkim, Uttarakhand, M.P., Mizoram, Meghalaya, Tripura, Arunachal Pradesh and Himachal Pradesh and two Union Territories -- Ladakh and Andaman & Nicobar Islands have finalized their specific exports policy.

The government has identified 46 unique product district clusters for export promotion while 29 cluster level committees have been formed for promotion of agri exports. APEDA has formed Export Promotion Forums under its Chairmanship and having representatives of Department of Commerce, Department of Agriculture, State Govern-ments, National Referral Laboratories and ten leading exporters of Grapes, Onions, Mango, Banana, Pomegranate, Flori-culture, Rice, Dairy Products and Nutri cereals.

The Ministry of Commerce and Industry has also initiated several schemes to promote exports such as Trade Infrastructure for Export Scheme, Market Access Initiatives Scheme, Merchandise Exports from India Scheme etc. In addition, assistance to the exporters of agricultural products is also being provided under the Export Promotion Schemes of APEDA, Marine Products Export Development Authority (MPEDA), Tobacco Board, Tea Board, Coffee Board, Rubber Board and Spices Board. Besides, for boosting honey exports, India has made Nuclear Magnetic Resonance testing mandatory for honey exported to the USA.

Central Sector Scheme for providing Transport and Marketing Assistance

A new Central Sector Scheme - Transport and Marketing Assistance for Specified Agriculture Products - for providing assistance for the international component of freight, to mitigate the freight disadvantage for the export of agriculture products, and marketing of agricultural products has been brought about. A Farmer Connect Portal has been set up for providing a platform for farmers, Farmer Producer Organizations (FPOs) and cooperatives to interact with exporters.

APEDA in collaboration with other stakeholder in the value chain has organised BuyerSeller Meets (BSMs) in the clusters to provide export market linkages. Regular interactions, through videoconferences, have been held with the Indian Missions abroad to assess and exploit export opportunities. Besides that, country specific BSMs, through Indian Missions, have also been organized. Common Digital Platform for Certificate of Origin has been launched to facilitate trade and exports.

Thirteen dedicated 'AgriCells' in Indian embassies Vietnam, USA, Bangladesh, Nepal, United Arab Emirates, Iran, Saudi Arabia, Malaysia, Indonesia, Singapore, China, Japan and Argentina were created to provide inputs on real time for boosting exports.

APEDA, which has a share of more than 50% in India's agricultural and processed food products exports, initiated registration of pack-houses for horticulture products to meet the quality requirements of the international market. Registration of export units for peanut shelling and grading and processing units, for instance, is to ensure quality adherence for the European Union and non-EU countries.

The export promotion body has taken several initiatives to promote Geographical Identification (GI)-registered agricultural and processed food products in India by organising virtual buyer-seller meets with the major importing countries across the world. In order to ensure seamless quality certification of products to be exported, the export promotion body has recognised 220 labs across India to provide services of testing a wide range of products and exporters.

With these series of measures initiated, India's agricultural and allied food products are likely to continue to surge in coming years bringing in benefits to the farmers. This surge in exports has been achieved even while India's agricultural and allied sectors, on which more than half of the country's population depends for their livelihood, continue to provide food security to crores of people in the country.

EFFECT OF PRUNING AND DIFFERENT NUTRITIONAL COMBINATIONS ON THE PERFORMANCE OF DARJEELING MANDARIN ORANGE

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ABSTRACT

Darjeeling mandarin (*Citrus reticulata* Blanco.) is one of the important cash crops of hill and mountainous ecosystem of West Bengal. These fruits had a very glorious past, but in recent years, the production of Darjeeling mandarin has decreased many folds due to Citrus decline. The main factors associated with this malady are diseases, insect-pests, nutritional deficiencies. Considering the fact, an attempt has been made to study the efficacy of inorganic and organic amendments, growth regulators and micronutrients on the performance of Darjeeling mandarin (*Citrus reticulata* Blanco.) at different mandarin growing areas of Kalimpong district of West Bengal. It been found that that the combination of 30 cm pruning with NPK and FYM+Vermicompost+Pig manure along with GA₃ 15ppm and zinc and boron foliar spray was found best treatment in all the aspect from fruit yield and quality. As integrated nutrient management along with foliar spray of Zn and B along with growth regulators GA₃ and 2, 4-D was best combination for mandarin orange at Darjeeling district where high rainfall causes heavy leaching of nutrient and acidic nature of soil.

INCORPORATED MANAGEMENT OF POST-HARVEST MICROORGANISMS WITH THE NATURAL AGENESIS

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ABSTRACT

A ton of assortment in parasitic and bacterial microorganisms cause post-gather sickness in leafy foods. A portion of these taint produce before collect and afterward stay peaceful until conditions are better for infection improvement after gather. Different microbes contaminate produce during and after collect through surface wounds. In the improvement of techniques for post collect infectious prevention, it is basic to make a stride back and think about the creation and postharvest taking care of frameworks completely. Numerous preharvest factors straightforwardly and in a roundabout way impact the improvement of postharvest sickness, even on account of contaminations started after reap. Generally, fungicides play had a focal impact in postharvest infectious prevention. In any case, patterns towards diminished substance use in agriculture are driving the advancement of new procedures. Organic movement of *Trichoderma* spp towards Pathogen is broadly detailed which shown solid lessening consequences for the advancement these microbes with different components of opposing impact. The methanolic concentrate of plant extricate leaves additionally showed an antimicrobial action against Pathogen. This restorative plant can be utilized for the cure of irresistible sicknesses brought about by pathogenic growths. The inhibitory impact of plant extricate is available in the latex.of the plants.

Keywords: Integrated Management, Post-harvest, Pathogen, *Trichoderma* spp, plant extract

POWDER BASED FORMULATION FOR THE BIO CONTROL ACTION OF *Trichoderma* spp. AGAINST *S. rolfsi* In *Cicer arietinum* L.

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ABSTRACT

Advancements of reasonable item, plan of the BCA, conveyance and application strategy that license the full articulation are assessed. The current review uncovered that *Trichoderma* spp had performed best in every one of the in vitro and in vivo examinations. To set up a biocontrol bundle for *Trichoderma* spp. three transporter material viz: d ash powder, talc, cow dung and the composite of these two were tried. All the six-transporter material kept a level 10^7 cfu/ml of contagious count as long as multi month and every one of them showed beginning expansion in populace followed by slow steadiness. The definition was put away at low temperature at 5 to 25 o C. The spore populace was either expanded or diminished because of variety in temperature and dampness content. Greatest yield of *Trichoderma* spp. was acquired at 25 o C with the degree of 10^7 CFU/ml. The preliminaries demonstrate its high productivity against illness shriveling of *Cicer* when applied, Ash powder + Talc was viewed as more successful when contrasted with the other both in plants development advancement as well as decreasing DI (upto 28.02%). At the point when added substances were added there was no impact on time span of usability of *Trichoderma* spp. furthermore, cfu/ml was significant expanded.

Keywords: Powder Based Formulation, *Trichoderma* spp, *S. rolfsi* and *Cicer arietinum* L.

MORPHOLOGY, PRODUCTIVITY AND ECONOMIC EVALUATION OF THREE BAMBOO SPECIES UNDER AGROFORESTRY SYSTEM.

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ABSTRACT

The experiment was conducted for six years on research farm of AICRP on Agroforestry at College of Agriculture Nagpur, under Dr. Panjabrao Deshmukh Agriculture University Akola. Two levels of fertilizers 25:25 kg/ha (N: P) as recommended dose of fertiser and 31.25: 31.25 Kg /ha (N:P) as 125% dose of fertilizer was applied to intercrop –cowpea (*Vigna unguiculata*) . Three bamboo species namely *Bamboosa balcooa* (Bhima), *Dendrocalmus stocksii* (Manga) and *Dendrocalmus strictus* (Manvel) were planted at 8 X 4 m spacing under agroforestry system. Cowpea was grown as intercrop in kharif season. The total biomass ha⁻¹ varied from 65.23 to 166.24 t ha⁻¹. The highest total biomass clump⁻¹ 166.24 t ha⁻¹ was recorded under treatment *Bamboosa balcooa* + Cowpea 125% RDF. The Harvestable Biomass yield t ha⁻¹ were varied from 19.50 to 49.84 t ha⁻¹. The highest harvestable total biomass yield ha⁻¹ 49.84 t ha⁻¹ was recorded for treatment *Bamboosa balcooa* + Cowpea 125% RDF followed by *Bamboosa balcooa* + Cowpea(RDF) (43.29 t ha⁻¹) and *Dendrocalamus stokssi* (Clonal) + Cowpea 125% RDF *Dendrocalamus stokssi* (Clonal) + Cowpea 125% RDF (41.29 tha¹). Bamboo equivalent yield t ha⁻¹ varied from 38.89 to 77.80 t ha⁻¹. The highest bamboo equivalent yield 77.80 t ha⁻¹ was recorded for Treatment *Bamboosa balcooa* + Cowpea 125% RDF. The lowest value was recorded for treatment *Dendrocalamus strictus* (Manvel) + Cowpea+ RDF. The gross monetary return varied from Rs. 70381 to 267291/ha .The highest gross monetary return Rs 267291/ha was worked out for treatment *Bamboosa balcooa* + Cowpea 125% RDF followed by *Bamboosa balcooa* + Cowpea 125% RDF Rs248091/ha . Considering the cost establishment + cost of maintenance for five years + cost of harvesting and transportation the cost of Production was worked out .The Cost of Cultivation varied from Rs. 39600 to 119984 ha⁻¹. The highest Cost of production Rs ha⁻¹ 119984 was worked out for treatment *Bamboosa balcooa* + Cowpea 125% RDF followed by *Dendorcalamus stokssi* (Clonal) + Cowpea 125% RDF .The lowest cost Rs.39600 was worked out for Treatment Cowpea (Sole) + (RDF). Benefit: Cost Ratio: Considering the cost of production vs gross monetary returns the benefit: cost ratio (B:C) of cultivation of ten bamboo under agroforestry was worked out. The benefit : cost ratio varied from 1.88 to 3.50 .The highest benefit-cost ratio 3.50 was worked out for Treatment *Bamboosa balcooa* + Cowpea 125% RDF followed by *Dendrocalamus stokssi* (Clonal) + Cowpea 125% RDF (3.39) and Cowpea 125% RDF (3.28) . Based on findings of experiment plantation of *Bamboosa balcooa* + Cowpea with 125%RDF was recommended under agroforestry in central India.

Keywords: *Bamboosa balcooa*, *Dendrocalmus stocksii*, *Dendrocalmus strictus* , Bamboo , intercrops, agroforestry.

DIVERSITY OF CARABIDS IN CERTAIN IMPORTANT ORCHARD CROPS OF ASSAM

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An experiment was conducted in the Experimental Farm, Department of Horticulture, Assam Agricultural University, Jorhat-13 to study the diversity of carabids in certain important orchard crops of Assam. Carabid population was sampled from banana, citrus, cucumber and bean with the help of pitfall traps, light traps, sweep net and hand picking. A total of 9 species of carabids belonging to 5 genera viz., Clivina, Scarites, Harpalus, Pherosophus and Chlaenius were identified. Among the identified carabids, *S. Indus* (18.8%) was the highly abundant species followed by *C. assamensis* (17.9 %) and *S. inconspicuous* (16.6%). *Pherosophus* sp. (1.28 %) was the relatively less abundant species. In addition to this, different traps were used for the collection of carabids. The highest collection of carabids were obtained from pitfall trap (46%), followed by light trap (42%) and sweep net (12%). Moreover the species richness indices was highest in cucumber (2.312) followed by banana (1.058), citrus (0.843) and bean (0.774).

STRENGTHENING THE COTTON VALUE CHAIN IN INDIA

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ABSTRACT

Cotton is one of the most important natural fiber and commercial crop of India. Indian cotton industry ranks first in the agro-based industry that plays a governing role in the country's economy. Cotton cultivation is a major component in the agricultural development strategy that affords direct livelihood to 6 million farmers and about forty to fifty million people are engaged in cotton trade and its processing. Currently in India, there are about 3,660 ginning units and over 1,100 spinning mills. Annually, India earns about 2,500 million rupees of foreign exchange through exports of cotton textiles and finished goods.

The traditional Indian cotton value chain involves stakeholders likely cotton producers, trading agents, ginners, spinners, weavers, textile processors & manufacturers and customers. In an operative value chain of cotton, all these stakeholders are interlinked and are profited in terms of higher productivity and superior quality of lint and fine goods at every stage of value chain. In the traditional value chain of cotton, the seed cotton is transformed into lint then spun into yarn, knitted into fabric and lastly converted into garments for consumers and exportation.

Conversely, a predictable value chain faces difficulty in utilization of proper scientific knowledge on cotton cultivation and its effective use of by-products that has many poor and disconnecting linkages. These weakest links are constrained by excessive energy consumption, contaminated surroundings, low productivity and non-availability of quality measuring technologies for produced cotton. However, the spinning industry in India is measured as the most advanced sectors comparable to the progressive nations; there are enumerable concerns in weaving and knitting sectors. Hence there is an immediate need and proper attention to strengthen better value chain of cotton in India through better policy implications by public and private players.

Keywords: Cotton Value Chain, Cotton Stakeholders, Textile Processing, Agri-business Management

KNOWLEDGE OF WOMEN LABOURERS IN POST-HARVEST ACTIVITIES OF DRY CHILLI – AN ANALYSIS

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Extended Summary

India is the largest agricultural dependent country wherein, the culturally diverse population still depends on ‘agriculture’ and for them it is not merely a business but is the “True Culture of the nation” according to Kiranjot sidhu, (2007). Chilli is the ‘Universal Spice in India’ grown almost throughout the country and it is one of the major commercial crops of India. With respect to dry chilli production, especially in marketing of dry chilli, Karnataka stands in second place next to Andhra Pradesh. Badagi APMC is well known throughout world due to its high quality of dry chilli exports. Among all the 31 districts in Karnataka, Haveri district is the main producer and exporter of most varieties of chilli and chilli powders from India. Three villages which are near to Byadgi APMC were selected for the study. A well-known fact from the history is that, it is women who first domesticated the crops and initiated the art and science of farming. In feminist economics, the feminization of agriculture refers to measurable increase of women’s participation in the developing world Aggarwal *et al.* (2013). Hence an effort was made to know the knowledge of women in various post-harvest activities of dry chilli in Haveri district of Karnataka state

Method

The study entitles “knowledge of women labourers in post-harvest of dry chilli – An analysis” was conducted in 2019- 2020. Study was carried out in Haveri district of Karnataka with a sample size of 30 field level women labourers who were involved in various dry chilli post-harvest activities. Purposive random sampling technique was used to select the respondents. An interview schedule was developed to collect basic information. The schedule contained statements to measure knowledge in post-harvest activities of dry chilli. A teacher made test was developed to study the knowledge of women labourers about chilli post-harvest activities at field level. After pre-testing the interview schedule in a non-sample area, suitable modifications were made and the schedule was used to collect the data from the respondents through personal interview method. The data was tabulated and analyzed using frequency, percentage and correlation.

Results

The results from the study indicated that, knowledge index is 100.00 for Haveri field level women labourers about recommended varieties of dry chilli. Regarding harvesting of dry chilli knowledge index was 94.99, With respect to different methods of harvesting of dry chilli Haveri women labourers at field level scored 42.22. While in drying methods of dry chilli 36.66 was the knowledge index for Haveri labourers at field level. The knowledge indices regarding criteria for grading and sorting of dry chilli were 66.66 Haveri women labourers at filed level respectively. While different methods of grading dry chilli 56.66. Different packaging materials index was also quite high 67.50. Regarding storage 49.99 about marketing 56.66. The study also explains Correlation between the socio-personal characteristics between participation and knowledge of field level women labors. With regard to Haveri district field labourers’ education (0.703**), land holding (0.667**), mass media participation (0.853**), contact with extension agent (0.747**) were found to be highly and positively significant with knowledge at 1.00 per cent level of probability. Social participation (0.400*) and organizational participation (0.394*) was significant at 0.05 per cent level of probability. Age (-0.406*) was negatively significant at 0.05 per cent level of probability. Whereas annual income (0.184NS) was not related with knowledge. In Indian agriculture, women play multiple roles right from sowing to harvesting. She also plays crucial role in post-harvesting operations. Women are therefore key contributors in agricultural

production. They work as paid & unpaid labourers, cultivators, managers of certain aspects of agricultural production by way of labour supervision and participation in post-harvest operations.

Conclusion

The findings from the study revealed that women labourers participated in majority of dry chilli post-harvest activities. Their knowledge regarding post-harvest activities is medium and their extension contact is nil. Therefore, it is important to have more women extension agents to cater the needs of women labourers. It was observed that more than half of the women labourers were illiterates and most of them are not aware of the technologies like solar dryer, storage under refrigeration as well as under a modified or controlled atmosphere and transportation under controlled conditions. However, research findings revealed that, most of the women labourers were completely not aware of post-harvest technologies (PHT) released by KVK and developmental departments. Hence there is a need to educate the women labourers on these aspects to improve their knowledge level.

Keywords: Farm women, post-harvest activities, Feminization of women, Women labourers.

KNOWLEDGE OF FISHERWOMEN IN POST-HARVEST ACTIVITIES OF MARINE FISHERIES

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Women play an important role in post-harvest activities of Marine fisheries. Especially in coastal regions of India, fishing in has remained a traditional livelihood for many rural and poor households. It is said in the fishing communities that behind every fishing boat there is a woman, a family and a community. Fish handling, processing and marketing of fish is predominantly in the hands of women. Active marine fishing is generally carried out by men, although a small percentage of women do take part in fishing on the shore viz., picking of clams, mussels and oysters. After the fish lands it is the woman who takes care of the catch and sell the fish for money and food, contributing to household income, food security and to the local economy. Women also work as fish hawkers or run fish stalls in permanent market places or in weekly bazaars. Drying and curing of fish is done by women to a large extent. Net making which is the main income generating occupation is another important activity. Generally, in post-harvest activities fish sorting, grading, drying, curing and local marketing are done by fisherwomen. They were also involved in rearing, processing, washing, cleaning, salting, drying, and also in packaging. They do work in some fish processing plants also. The direct involvement of women in fisheries sector cleaning, fish trading, making value - added products, fish curing, etc. Women play indirect role in decision making, financial management, family can be seen mere in care (Ashaletha *et al.* 2002). Fisherwomen must be given an opportunity to acquire appropriate knowledge, develop skills and use appropriate technologies enabling them to make the greatest possible economic and social contribution (Khader, 2005).

Objective

The aim of the study is to know the knowledge of fisherwomen in post-harvest activities of marine fisheries.

and fishing communities, roles that are often not recognized or supported. Women's role in post-harvest operations such as fish processing and marketing has been a traditional one; in marine fishing in India,

Methods

The study was conducted in Nizampatnam and Repalle taluks of Guntur district of Andhra Pradesh during 2020-21. A total of 120 fisherwomen were selected through purposive random sampling technique. Primary data was collected from the respondents with the help of self-structured, pre-tested interview schedule. The data was analyzed using frequency, percentage, correlation and ‘t’-test.

Results

Cent per cent of the respondents had knowledge about criteria for grading/sorting, scaling, gutting, washing fish with potable water to remove dirt and slime of fish, traditional sun drying and insulated boxes helps to reduce ice melting and ice is the basic preservation technique, it keeps fish moist and had knowledge about YSR matsyakara bharosa scheme. A great majority of the respondents had knowledge about harvesting season and use of salt reduces bacterial action and dry salting is done to preserve fish. Majority of the respondents had knowledge about marketing of fish. Majority (81.67%) of the respondents knew that inadequate icing and storage facilities leads to spoilage/wastage of fish 67.50 per cent had known about fish by products. Most (62.50%) of the respondents had knowledge about gill net. Less than half (40.83%) of the respondents had knowledge about value addition. Only 09.17 per cent of the respondents knew that canning is preservation technique. A great majority (90.83%) of the respondents had medium level of knowledge about post-harvest activities.

Conclusion

Results of study emphasised fisherwomen had medium level of knowledge and they should be trained as per their training needs, to increase knowledge about post-harvest activities of marine fisheries. In order to utilize various development schemes for post-harvest activities this can generate self-employment for fisher women.

Keywords: Knowledge, Post-harvest activities, Fisherwomen, Marine fisheries

INTEGRATED PEST MANAGEMENT APPROACH TOWARDS *LEUCINODES ORBONALIS*

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ABSTRACT

Field studies were carried out to investigate a cost-effective management module against brinjal shoot and fruit borer, *Leucinodes orbonalis* Guenee, during 2018-19 and 2019-2020. Among the IPM modules evaluated against *Leucinodes orbonalis* the M3 comprising of Imidachloprid @ 0.5 ml/lit for seedling root dip treatment (for 3 hrs) + clean cultivation (weeding and hoeing) at 15 days interval +clipping of infested shoots and destruction of infested fruit + intercropping with coriander in 1:2 ratio and foliar spray of Spinosad 45 SC @ 0.5 ml/lit at 15 days interval thrice from 30 days after transplanting was found to be effective module to reduce shoot damage (61.58%) and fruit damage (80.01%) and (77.42 %) on number and weight basis in comparison to untreated control . Though the M4 comprising of Imidachloprid @ 0.5 ml/lit for seedling root dip treatment (for 3 hrs) + clean cultivation (weeding and hoeing) at 15 days interval +clipping of infested shoots and destruction of infested fruit + intercropping with coriander in 1:2 ratio and foliar spray of Thiacloprid@180gm a.i/ha at 15 days interval thrice from 30 days after transplanting has no significant difference in case of reduction of shoot damage (57.43%) and fruit damage (77.89%) and (75.18%) on number and weight basis over control, but yield (239.89 q/ha) and benefit- cost ratio (3.50) was less than M3. The M3 registered the significantly highest fruit yield (268.15 q/ha) and with maximum benefit -cost ratio (4.06). This module may be suggested to farmers for cost effective production of brinjal.

Keywords: brinjal, Spinosad, *Leucinodes orbonalis*

HASDEO BACHAO ANDOLAN: AN OVERVIEW

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ABSTRACT

A sprawling forest in the northern part of Chhattisgarh (India), Hasdeo Arand is known for its biodiversity and also its coal deposits. The forest falls under Korba, Sujapur and Surguja districts with sizeable tribal population. The Hasdeo river, a tributary of Mahanadi, flows through it.

Released in 2021, a report on the region by the Indian Council of Forestry Research and Education (ICFRE), an autonomous organization under the Ministry of Environment, Forest & Climate Change, termed Hasdeo Arand the “largest un-fragmented forests in Central India consisting of pristine Sal (*Shorea robusta*) and teak forests.”

The Hasdeo Arand Coal Field (HACF) is spread over nearly 1,880 sq km and comprises 23 coal blocks. The demand for mining picked up around 2010, when the Chhattisgarh government recommended forest clearance for diverting 1,898.328 hectares of forest land for Parsa East and Kente Basan (PEKB) coal fields. These were allotted to Rajasthan Rajya Vidyut Utpadan Nigam Limited (RRVUNL). The PEKB coal block is run by Adani Enterprises, the official Mine Developer and Operator in this venture.

However, this first move was followed by multiple court orders, forest assessment reports, and protests by forest-dwellers.

As of May 2022, two studies by the ICFRE and Wildlife Institute of India (WII) have come out. Both have underlined the importance of biodiversity in the region that mining will undoubtedly affect. They also address the issue of human-elephant conflicts, noting that while Chhattisgarh has less elephants compared to other states, it accounts for a significant percentage of conflict due to habitat loss or clearing of forests. Further deforestation could lead to elephant movements spilling over to urban areas, these studies have noted.

The ICFRE also noted the loss of the natural environment and the “serious impact on the community in form of loss of livelihood, identity, and culture” with regards to tribal people living in the area, if mining were to be allowed. But it backed considering mining in four blocks: Tara, Parsa, PEKB and Kente Extension with “strict environmental safeguards”. It further said that the PEKB block was a “habitat to rare, endangered and threatened flora and fauna”.

In March this year, the state government had granted final approval for non-forestry use of forest land for PEKB phase-II coal mining in Surguja district.

Keywords: Hasdeo, HACF, PEKB, RRVUNL, Bachao etc.

ROLE OF WILD EDIBLE MUSHROOMS FOR THE LIVELIHOOD OF TRIBAL COMMUNITY IN BILASPUR DISTRICT OF CHHATTISGARH

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ABSTRACT

Chhattisgarh a state of central India has 44.215% of its geographical area under forest that is a key source of income for the tribal community living there. The tribal population of Chhattisgarh has great knowledge about wild edible mushrooms that play a significant role in sustaining their livelihood. A survey was conducted to assess socio-economic benefits of wild edible mushrooms occurring in forest areas of Bilaspur Forest Division. In the present study, 175 informants from 5 forest range were interviewed and information was collected through semi-structured questionnaires. Gond, Baiga, Kwar and Majhi were dominating scheduled tribe that are actively involved in mushroom hunting. A total of 11 edible mushroom species were available and collected by these tribal community for food supplement and income generation during rainy season. Among all six species of mushrooms *Termitomyces* spp. yield was maximum and high economic value due to superior flavor and texture, and they contribute significantly to the income of many tribal households.

Keywords: Wild mushrooms, Edible, Socio-economic, Livelihood, Opportunity, Tribal, Income, *Termitomyces*, Yield.

MORPHOTAXONOMY OF SIX SPECIES OF FRUITFLY (DIPTERA: TEPHRITIDAE) FROM HORTICULTURAL ECOSYSTEM OF RI-BHOI, MEGHALAYA, A NORTH-EASTERN STATE OF INDIA

SUNITA CHETRY, KENNEDY NINGTHOUJAM, ANJUMONI DEVEE, MAHESH PATHAK, TANJIL RAHMAN, CHADA ANU REDDY

ABSTRACT

Fruit flies belong to the Tephritidae family are a significant pest of a wide variety of fruits and vegetables of Southeast Asian region. Tephritidae have gained economic importance due to their invasive behaviour like wide adaptability to new host, new region, polyphagous, multivoltine nature and high reproduction potential. The systematic information on available fruit fly species found in Meghalaya, India remains insufficient mainly due to various small publications. Three genera of Tephritidae belonging to *Bactrocera*, *Dacus* and *Zeugodacus* were collected from horticultural ecosystem of Ri-bhoi, Meghalaya during 2020-2021 and were described based on morphological characters. Various horticultural crops namely mango, papaya, guava, cucumber, bottle gourd, ridge gourd and pumpkin were selected and parapheromonic traps, food baits and infested crops were used for sampling. A total six species of fruit flies viz. *Bactrocera dorsalis* Hendel, *B. tuberculata* Bezzi, *B. aethriobasis* Hardy, *Dacus longicornis* Wiedemann, *Zeugodacus tau* Walker, and *Z. cucurbitae* Coquillett were identified on the basis of taxonomical characters, while *D. longicornis* was first time reported from Meghalaya. The collected species belongs to four sub genus *Bactrocera*, *Callantra*, *Zeugodacus* and *Cyphoderidae*. Species of *Bactrocera* and *Dacus* can be identified based on the abdominal study. Abdomen oval, elongated and tergites overlapping in lateral view in *Bactrocera*, while in *Dacus* abdomen oval, petiolate and tergite fused. In case of *Zeugodacus* species, lateral and medial postsutural yellow vittae present. Based on morphological characters field keys were developed for easy identification of these species in field level. Before initiating a management programme, a pest must be correctly identified, so our findings will help in development of management strategies.

RICEBEAN (*Vigna umbellata*): A MULTIPURPOSE UNDERUTILIZED GRAIN LEGUME CROP OF EASTERN HIMALAYAS

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ABSTRACT

Ricebean (*Vigna umbellata*) is a neglected and underutilized grain legume crop of Darjeeling and Sikkim Himalayas and mostly use as a minor food and fodder crop. It is a less known and underutilized legume, has emerged as a potential legume because of its nutritional potential. The nutritional quality of rice bean is higher as compared to many other legumes of *Vigna* family. It is used in different parts of the world under traditional and cultural practices and therefore, its cultivation is restricted to specialized geographical pockets in different agro-ecological regions, mainly by poor farming communities that derive their sustenance and livelihood from such crops. It is grown in various range of cropping system with maize during summer season, as a sole crop in the upland condition, on rice bunds or terraces and kitchen gardens. It is mainly grown for human consumption (such as dahl), for fodder and green manure. However, there has been very little research and development support for this crop, farmers mainly grown local landrace cultivars. Till date, there is no scientific literature regarding its area coverage, production, productivity, utilization and commercial importance or market value of this pulse crop remains unknown to the local people. The legume possesses immense capacity of nutrition and production, but its potential to be a boon in improving the livelihoods of many poor people is yet to be fully tapped. It is grown by subsistence farmers in a very limited scale and most of the produce is consumed at home, although there is a limited market for a short period each year. The crop contributes to household food and nutritional security; several food items are prepared from ricebean. It is culturally important and is thought to have important nutritional values. Ricebean foliage and dry straw are valuable livestock feed, and when used as a green manure it improves soil fertility. This paper describes the maintain diversity local landraces cultivars and agronomic management in Darjeeling Himalayas.

ENVIRONMENTAL PROBLEMS ASSOCIATED WITH BAMBOO ARTISANS AND ITS APPROACH TO TACKLE THE PROBLEMS

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Purpose

Bamboo weaving activity holds the number of traditional cottage industries as it is one of the oldest cottage industries in India. Bamboo is one of the most important forest products to poor man's timber. Bamboo is not only used as products but it is also used for religious purpose. In our Hindu religion bamboo is used as our culture, like during the cremation of dead body bamboo is used to carry the body and even during marriages some people worship bamboo after marriage, which is believed as an important traditional custom. There are number of polices and plans adopted by the central governments and state governments to protect the bamboo industry. However, the bamboo artisans are suffering from many problems related to occupation. Bamboo artisans are facing many problems while running bamboo products enterprise because bamboo workers are unorganized, uncohesive, socio economically backward and semi-skilled. Due to unorganized sector workers environment is another issue, as their workstation design is improper and unorganized, poor management of space, harsh temperature as they work in an open

environment, poor hygiene and insufficient workspace. So there is need to tackle the problem of bamboo artisans as bamboo products are environmental friendly and bamboo artisans should be encouraged to make more products and should be make sure that bamboo artisans are working in good environment to make a more output of work.

Methods

The study was conducted during 2019-2020 in North Karnataka districts of Dharwad, Belagavi and Uttar Kannada districts of Karnataka, India. Exploratory research design was used. Random sampling method was applied to select a sample size of 120 bamboo artisans’ family. The respondents were interviewed personally to elicit the primary information by using self structured interview schedule. Frequency, percentage and garret ranking was used elicit the data.

Results

Majority of the respondents work station was uncomfortable by having high temperature because the artisans’ workstation was in open environment and due to that artisans were directly affected by harsh temperature (75.00%) followed by excessive noise (71.70%) as the workstation was near or to the road and plenty of vehicles going by made the artisans disturbed. Bad sanitation was another problem due to lack of proper sanitation facility (71.70%) as the bamboo artisans belonged to low socio-economic status, improper ventilation (58.40%) was the problem to the artisans if they would work at home during rainy season as the they had a very small house with one hall and kitchen. And less than fifty per cent of the respondents had uncomfortable lighting condition. So due to these problems few suggestions were given to the artisans and artisans opined the suggestion based on their priority. According to the need priority wise ranking was given to the suggestions. The suggestion separate work station should be made to run the bamboo business was first priority (628) because artisans did not have separate workstation due to which they had to work in the open environment outside their home and artisans gave second rank (588) to the recommended suggestions workstation should be protected from high temperature, because of open workstation they use to face harsh temperature and due to that they faced many problems and could not work during rainy season whereas third rank was given for work station should be away from main roads to avoid noise pollution such as vehicles (412) which disturbed the artisans physically and mentally. And fourth rank was given for proper ventilation, the poor ventilation was then when artisans used to work inside home during rainy season and for few hours due to harsh sun. Artisans house have hall and kitchen and that would be difficult for the artisans to work inside home and made a poor ventilation and last rank was given for good hygienic work station should be provided as artisans did not have proper sanitation facilities at home.

Conclusion

Bamboo weaving activity is an unorganized sector and they face lots of problems. Among many problems workstation problem is one of them like harsh temperature due to working outside home in open workstation, poor ventilation when artisans worked inside home during rainy and harsh sun affecting them, and noise pollution was affecting their work and health physically and mentally, and this problem should be tackled to have a productive work by the artisans by making them feel safe and better mentally and physically. A proper workstation should be provided by government to artisans to bring the more output by the artisans as the bamboo products are environmentally friendly products and artisans should be given all the facilities to make products from bamboo and attract the consumers to bamboo products to buy them and distract them by buying plastic products which is harmful for our environment.

Keywords: Bamboo artisans, unorganized sector and semi-skilled

SITE SPECIFIC NUTRIENT MANAGEMENT (SSNM): A WAYS OF INCREASING AGRICULTURAL SUSTAINABILITY

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ABSTRACT

Nutrient management plays a crucial role in achieving self-sufficiency in food grain production. High price index of chemical fertilizers coupled with mount pollution problem gave rise to interest in precision nutrient management tools. Site-specific nutrient management (SSNM) involving use of inorganic or organic sources along with spatial and temporal soil variability, crop requirements of nutrients and cropping systems, soil capacity to supply nutrients, utilization efficiency of the nutrient and productive capacity of the varieties with improved NUE is the most ideal system that needs to be practiced to achieve the targeted goals.

Site specific nutrient management (SSNM) increases and maintains the yield by optimizing the balance between supply and demand of nutrients. Nutrient application as per SSNM concept resulted in significantly higher grain yields over recommended dose of fertilizers (RDF). The SSNM is real time feeding of crops with nutrients while recognizing the inherent spatial variability which enhances crop productivity, nutrient use efficiency (NUE) and avoids nutrient wastage. For effective SSNM, utilization of different sensing devices of soil and plant nutrient status, decision support systems, GIS, remote sensing, simulation models and nanoparticles play an important role. Traditional techniques like balanced fertilization, use of nitrification inhibitors and slow-release nitrogenous fertilizers (SRNF) are also used to attain higher productivity and reduce environmental pollution. This paper deals with the SSNM approaches which are able to enhance crop productivity, NUE and sustainability.

Site Specific Nutrient Management (SSNM) aims to optimize the supply of soil nutrients over time and space to match the requirements of crops through four key principles. The principles, called the “4 Rs”

Right product: Match the fertilizer product or nutrient source to crop needs and soil type.

Right rate: Match the quantity of fertilizer applied to crop needs.

Right time: Ensure nutrients are available when crops need.

Right place: Placing and keeping nutrients at the optimal distance from the crop and soil depth so that crops can use them is key to minimizing nutrient losses.

Principles of Site-Specific Nutrient Management-

There are five cardinal principles of SSNM:

1. Balanced fertilization based on crop requirement.
2. Plant based estimation of root nutrient supplies.
3. Need based N fertilizer management.
4. Sustainable P & K management.
5. Increasing profitability.

Benefits of SSNM

1. Higher profits.
2. Reduced nitrous oxide emissions.
3. Improved disease resistance.
4. Variable economic benefit

Conclusions

Site specific nutrient management (SSNM) is fundamental to precision nutrient applications in different crops. SSNM provides an approach for need-based feeding of crops with nutrients while

recognizing the inherent spatial variability. This makes the efficient utilization of nutrients by crop plants and avoids the wastages of fertilizers. The environmental footprints of chemical fertilizers are also reduced. Crop yields increase by over 15%, while amount of nutrients applied mostly decrease. Farm profitability and NUE increase convincingly by using this novel concept. For efficient and effective SSNM, use of soil and plant nutrient status sensing devices, remote sensing, GIS, decision support systems, simulation models, and machines for variable application of nutrients play an important role.

Although SSNM proved to be useful in improving yield and NUE indicative of soil health enhancement per se, still the nature of the SSNM approach need to be tailored to specific circumstances under different climatic conditions.

Keywords: - Balance Nutrition, Geospatial Technology, Higher Output, Need Based Fertilizer Application and Site-Specific Nutrient Management.

EFFECT OF INTEGRATED WEED MANAGEMENT PRACTICES ON WEED FLORA YIELD AND MONETARY RETURN OF RICE (*Oryza sativa* L.)

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ABSTRACT

Weeds are a significant stumbling block to crop production because of their ability to compete for resources and their impact on product quality. In the agroecosystems ideal environmental conditions provided for optimal crop productivity are being exploited by the associated weeds. Weed problems are projected to worsen, and with growing public awareness of environmental degradation, the focus will move in the future years to the development of environmentally friendly weed management methods. As the future weed problems will be multipronged, a holistic multi-disciplinary approach would be imperative. In this context, integrated weed management (IWM) may provide a more sustainable approach to crop production. The IWM system combines use of multiple-pest-resistant, high yield, well adapted crop cultivars that also resist weed competition, with precise placement and timing of fertilizers to give the crop a competitive advantage. Major rice weeds in India include: *Echinochloa crus-galli* (L.), *Echinochloa colona* (L.), *Cyperus rotundus* L., *Cyperus iria* Linn., *Cyperus difformis* L., red rice (*Oryza sativa* L.), *Leptochloa chinensis* (L.), *Ischaemum rugosum*, *Paspalum distichum* L., *Dactyloctenium aegyptium* (L.) Willd., *Cynodon dactylon* (L.), *Echinochloa crus galli* (L.), *Eleusine indica* (L.), and *Fimbristylis miliacea* (L.). The flora of weeds was found to differ depending on the region, type of rice establishment, cultural practices adopted, and the surrounding environment. Rice yield is significantly affected by IWM. Herbicides in combination with hand weeding are the most cost-effective, according to economic study. Weeds are dynamic and it is required to redesign the strategies from time to time for the successful management of ever increasing problem of weeds. IWM research in India must broaden beyond herbicide-centred weed management. Future IWM research in India should concentrate on decision-making processes, weed biology and ecology, ecologically and economically viable components of IWM techniques in cropping systems, herbicide resistance, transgenic plant environmental concerns, and possible weed advantages.

SMART AGRICULTURE AND TRANSFER OF TECHNOLOGY BY INFORMATION AND COMMUNICATION TECHNOLOGY

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ABSTRACT

The World Economic Forum predicts the global population will reach up to 9.8 billion by 2050, which means we have need to grow just double the amount of food we do today without significantly stretching land and water resources. According to FAO, the UN food and agriculture agency needs to be met through 70 per cent rise in agricultural production. This situation creates serious challenge to the member states of the UN specifically SDG-2 which aims to end world hunger by ensuring access for all, especially the poor and vulnerable to healthy, nutritious and sufficient food throughout the whole year. Global agriculture faces various challenges to meet the demand for food and fibers in the coming years because it needs to maintain overall productivity without further polluting soil, water and other agroecological systems (Finger et al., 2019; Cole et al., 2018). There is an urgent need to create modern and sustainable agricultural system to serve the society. Smart farming based on IoT technologies will enable growers and farmers to reduce waste and enhance productivity ranging from the quantity of fertilizer utilized to the number of journeys the farm vehicles have made. Digital farming has the potential to transform such agricultural systems to be more sustainable by using (Information and communication technologies) ICT. The digital transformation of agriculture impact across all aspects of farming. As far as modern farming technology concern, one needs to acknowledge the role of ICT as a decision support system for farmers. Through the assistance of ICT, farmers can stay updated with all recent scientific information. This includes data about newer and more advanced ways of enhancing crop quality and production.

Information and communication technologies (ICTs) in agriculture technology comprise those networks, mobiles, devices, services and applications that aid the processing, management and exchange of data, information, knowledge with a target audience. They include a broad range of converging technologies, including traditional telecommunications, television and video, radio, cell phones and smart devices and several modern technologies such as computers and the internet, sensors, Geographic Information Systems, satellites etc. Essentially, the purpose of ICT is to transfer information from one to another. About 60 per cent of the global population has access to the internet, and mobile internet is now the most widely-used channel for internet access worldwide. The tremendous adoption of ICTs has made it possible to facilitate better communication and ensure the delivery of services and information to people who previously lacked access.

Agriculture Information Management directly affects the degree of agricultural informatization and efficiency of agricultural production's decision. Drones simplify supervision tasks for farms by being able to cover hundreds of acres in one flight. The (Internet of Things) IoT makes it possible to optimise the monitoring of farms, mainly through smart sensors capable of measuring everything from solar radiation to leaf moisture and stem diameter, or the temperature of each animal in the case of livestock, making it easier to make all sorts of management decisions. IoT and image processing have been so far been applied for various applications independently. Their individual application in the field of agriculture exists and has achieved certain degree of success, however the combination of both these technologies so far is non-existent. Artificial intelligence and robotization are used mainly to interpret field images and apply fertilisers and pesticides with surgical precision, or for dealing with weeds. On a farm, for instance, it means that

microphones can be used to identify squealing piglets that are being squashed by their mother, and a vibration can be sent to her through a sensor to make her get up. The application of the above technologies has a positive impact on agriculture and cattle farming by optimisation of all the processes related to agriculture and livestock-rearing increases production rates.

Digital farming technologies cover a broad spectrum from small mobile apps for decision support, over in-field sensors and remote sensing technologies for data collection and to drones and robots for the automation of processes (OECD, 2019). A sustainable agriculture in the future will need digital farming technologies (Walter et al., 2017) which use Artificial Intelligence (AI), cloud computing, Internet of Things (IoT) and blockchain among others. There is a need to develop the necessary infrastructure, farmers' friendly ICT tools, the capability, mind set and strength of character to use ICT tools among the TOT experts, farmers, farm women and other human resource involved in agricultural development in harnessing tremendous the benefits of ICTs for agricultural development. Smart farming is about using the new technologies which have arisen at the dawn of the Fourth Industrial Revolution in the areas of agriculture to increase production quality and quantity by making maximum use of resources and minimising the environmental impact. Also, the implementation of technology in agriculture production will make it possible to boost food security throughout the world. Smart agriculture is an approach for developing agricultural strategies to modernize agricultural systems using digital techniques, aiming for sustainable agriculture and ensuring food security under climate change.

AN ANALYSIS OF SOCIAL MEDIA USAGE AND ADDICTION LEVELS AMONG EMERGING ADULTS

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The term 'Social Media' comprises of two words. The word 'Social' implies interaction or communication among persons or groups while the word 'Media' refers to medium used for information or communication (Dollarhide, 2021). In the world of mass communication, social media has its unique importance and has the power to influence many. Even many people access their jobs on some of the social media sites like LinkedIn, Face book and Twitter (Fardouly, 2016). Emerging adulthood is a developmental stage that spans the late teens to the twenties, with a concentration on ages 18 to 29 years. This age of entering higher education with prolonged job instability and marriage reflects the new deviations of this period (Arnett, 2000). Throughout the world, individuals between the ages 15 - 24 are much more likely to be internet and social media users than older adults, as it is providing millions of emerging adults throughout the world a remarkable access to communication, entertainment, education, knowledge. Rampant usage of social media sites by the college students on a regular basis leading to high addiction to these social media sites (Manjunatha, 2013). Hence efforts were made to know the social media usage and addiction levels among emerging adults studying in degree colleges of Dharwad district, Karnataka State.

Method

The study entitled “An Analysis of Social Media Usage and Addiction Levels among Emerging Adults” was conducted during the year 2020- 2021. Study was carried out in Dharwad district of Karnataka with a sample size of 160 degree college students studying in both arts and science streams. Purposive random sampling technique was used to select the respondents. A survey method was employed by using a self-structured questionnaire and social media addiction scale. Self structured questionnaire gathered information regarding social media usage which included

different social media sites used, number of apps used, amount of time spent on social media, amount of data used daily, purpose of using these social media sites, negative opinions about social media and overall impact of social media on well being. Social media addiction scale assessed addiction levels of emerging adults in low, medium and high categories. After pre-testing the tools in a non-sample area, suitable modifications were made and the questionnaires were used to collect the data from the respondents. The data was tabulated and analyzed using frequency, percentage.

Results

The results from the study indicated that cent per cent were using YouTube, followed by Instagram (95.60%), Face book (90.00%), Twitter (75.00%), Skype (58.80%), Messengers (54.00%), Yahoo (51.20%), Quora (43.80%) and LinkedIn (30.00%). Regarding number of apps used 44.00 percent of the participants used 7-9 apps, 34.00 per cent used 4-6 apps and 22.00 per cent used 1-3 apps. Regarding time spent on social media sites by emerging adults, 50.00 per cent of respondents were spending 4-6 hours on social media followed by 35.00 per cent were spending 2-4 hours and with regard to amount of data used daily by emerging adults majority (65.60%) were using 1-3GB per day, followed by 500MB-1GB (23.80%). Respondents were using social media sites for different purposes like entertainment (90.00%), online shopping (82.50%), browsing (71.90%), motivational (70.60%) and knowledge (70.00%). The study also found the negative perceptions and overall impact of social media usage by emerging adults where, majority of emerging adults considered using social media sites as time wasting (63.00%), followed by unrealistic expectations (55.00%), negative feelings (50.50%), mental health issues (47.50%) and cyber bullying (45.00%). In case of overall impact of excessive social media usage on well being, majority expressed that it has both positive and negative impact (36.20%), followed by negative impact (32.50%), positive impact (23.80%) and no impact (7.50%). Majority of the respondents found to have high social media addiction (49.30%), followed by medium social media addiction (30.00%)

Conclusion

The study investigated the usage of social media and addiction levels among emerging adults. It seems to be a new addiction for majority of the emerging adults where, they are using more number of social media apps like YouTube, Instagram, Facebook, Twitter and WhataApp for more than 5-6 hrs per day. Further, it was found that majority were using 1-3 GB of data per day for different purposes like communication, entertainment, browsing content, online shopping, getting knowledge and for motivational purposes. Majority of the respondents had negative perceptions about excessive usage of social media and expressed that usage of social media has both positive and negative effect on well being. Though there are positive benefits of using social media one has to monitor their usage levels and use it optimally for productive works.

Keywords: Social media sites, Emerging adults, Purpose of Usage, YouTube and Instagram.

BIO-INTENSIVE MANAGEMENT OF GREENHOUSE WHITEFLY, *Trialeurodes vaporariorum* IN TOMATO UNDER PROTECTED ENVIRONMENT

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ABSTRACT

Efficacy of biorationals comprising, organic products; *Darekastra* & fermented buttermilk (alternate foliar application), *Vermiwash* & *Tamarlassi* (alternate foliar application) and botanicals; azadirachtin 0.15 (soil application), azadirachtin 0.15% (foliar application), and chemical insecticides; cyantraniliprole 10.26OD (foliar application), cyantraniliprole 10.26OD, (foliar application at ETL), imidacloprid 17.8SL (soil application), imidacloprid 17.8SL (foliar application), spiromesifen 22.9SC and thiamethoxam 25WG (alternate foliar application), spiromesifen 22.9SC and thiamethoxam 25WG (alternate foliar application at ETL) were evaluated for the management of greenhouse whitefly, *Trialeurodes vaporariorum* on tomato under protected environment. Amongst biorationals, two soil applications of azadirachtin (0.0005%) at transplanting and 45 days after transplanting proved most efficacious and resulted in 60% reduction in whitefly population, followed by foliar application of azadirachtin (0.0003%) (59.6% reduction) and alternate foliar application of vermiwash and *Tamarlassi* (51.1% reduction) when used as preventive measure at 10 days interval. Among chemical insecticides, soil application of imidacloprid @ 0.009% proved to be most efficacious in bringing about reduction in whitefly population (78.4%), followed by foliar application of cyantraniliprole (0.02%) (74% reduction) and alternate application of spiromesifen (0.02%) & thiamethoxam (0.008%) (69.3% reduction).

Keywords: Biorationals, *Trialeurodes vaporariorum*, Tomato, Protected Environment

STUDIES ON POPULATION DYNAMICS AND DISEASE INCIDENCE OF BACTERIAL WILT INCITING PATHOGEN (*Ralstonia solanacearum*) Under Different Intercropping System.

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ABSTRACT

Ginger (*Zingiber officinale* Rose) is one of the important spice crops commonly grown in India. It is mostly grown organically in the hill region of West Bengal. Organic ginger production in this region is constrained by disease of various soil and rhizome borne pathogen. Among those green wilts inciting pathogen (*R. solanacearum*) causes devastating losses to the ginger growing communities. To manage the pathogen under organic management practices an experiment was conducted during 2019 and 2020 to study the influence of different intercropping patterns on yield, population dynamics, and disease incidence caused by *R. solanacearum* in ginger. Observation on population dynamics of *R. solanacearum* under different intercropping patterns revealed that the marigold when intercropped with ginger had a maximum influence on reducing the bacterial population thereby decreasing the disease incidence and increasing the yield as compared to the other treatments and ginger when grown as solo crop.

Keyword: Bacterial wilt, ginger, *R. solanacearum*, intercropping, organic management.

GENETIC DIVERSITY ANALYSIS IN INDIAN MUSTARD (*BRASSICA JUNCEA* L. CZERN AND COSS) THROUGH D² AND SSR MARKERS

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ABSTRACT

The present investigation was carried out to analyze the genetic variability, heritability, genetic advance, correlation, path analysis and genetic divergence for 12 quantitative traits. All the 45 genotypes were grown in Randomized Block Design (RBD) with three replications. The observations were recorded on three randomly selected plants from each genotype in each replication for the twelve characters *viz.* days to 50% flowering, seed filling period, days to maturity, length of main shoot, number of pods on main shoot, number of primary branches per plant, number of secondary branches per plant, plant height, number of seeds per pod, grain yield per plant, test weight and oil content. All the genotypes exhibited highly significant difference for all the traits under study. The high genotypic coefficient of variation (GCV) and phenotypic coefficient of variation (PCV) was observed for number of secondary branches per plant, grain yield per plant and number of primary branches per plant. High heritability coupled with high genetic advance observed for number of secondary branches per plant, grain yield per plant, number of primary branches per plant, length of main shoot, plant height, number of pods on main shoot, days to 50% flowering, test weight and number of seeds per pod. Hence direct selection of genotypes can be done through these characters for further improvement of genotypes of Indian mustard. In general, the genotypic correlation coefficient values were higher than the phenotypic values. Grain yield per plant had highly significant positive correlation with plant height, number of secondary branches per plant, length of main shoot, number of pods on main shoot, number of primary branches per plant and days to 50% flowering at both genotypic and phenotypic level, such association was noticed indicating less influence of environment on association. Hence, improvement of grain yield per plant can be achieved by improvement of these characters. Among the various traits studied, plant height, number of secondary branches per plant and number of seeds per pod had high positive direct effect at both genotypic and phenotypic levels. This indicated that these characters are most contributing towards grain yield per plant which can be easily improved by selection. Five clusters were formed by D² analysis using 12 quantitative traits. The clustering pattern is suggestive of the fact that geographic diversity is not efficient index of genetic diversity. Out of the five clusters, cluster IV was found as a largest cluster with a total number of 14 genotypes under this cluster followed by cluster with 11 genotypes, cluster III have eight genotypes, cluster II have 7 genotypes and 5 genotypes in cluster I. The maximum intra cluster distance was recorded in cluster III and lowest intra cluster distance was recorded for cluster IV. The maximum inter cluster distance was revealed between cluster II and III and minimum inter cluster distance was recorded between cluster IV and V. Nine primers amplified a total of 20 alleles, with an average of 2.2 alleles per primer. Each locus contained a maximum of four alleles and a minimum of one allele (BG50) (BG1). Primer BG109 had the greatest Polymorphic Information Content (PIC) value of 0.95, while primer BG12 had the lowest at 0.6. The average PIC value of all polymorphic primers was 0.66. The average resolving power (RP) is 1.856, with a minimum of 0.05 (BG109) and a maximum of 0.54 (BG50), followed by BG45 (0.53), BG92 (0.42), and BG1 (0.42). The range of similarity coefficients was found between 0.3 to 1. Based on Jacquard's coefficient of similarity values, among all combinations, the smallest GS value of 0.3 was observed between RH749 and KMR-15-1 which appears to be most distantly related the maximum similarity (1) was reported between 18 genotypes. By conducting D² analysis as well as molecular profiling of genotypes

using SSR markers, there was sufficient diversity among the genotypes that was used for study. The genotypes which exhibited low diversity at phenotypic level, also exhibited higher diversity at molecular level. For instance, the genotypes KMR-15-2, KMR-15-1 and KMR-17-4 were grouped together in cluster IV, indicating morphological similarity among themselves. Whereas, same genotypes were present in different clusters at molecular level. Many genotypes which were distributed in different clusters at morphological level were grouped into the same clusters at molecular level indicating higher degree of genetic similarity at molecular level.

THEORETICAL BASIS FOR INTRODUCTION OF CROPS IN NON-CONVENTIONAL ZONE IN ORGANIC PRODUCTION SYSTEM FOR CLIMATE RESILIENT AGRICULTURE

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A contextual sentence about your motivation behind your topic: The crop cultivation practices are dynamic in several dimensions and hence enriched as well as modulated by artificial and natural forces/stress/ peer pressure. Among this dynamism, shifting crop cultivation zones is one which was brought in front at present by climate change induced variations in agro-climatic conditions as well as increase in demand of provisional services.

A descriptive statement about the types of literature used in the review: As the agro-climatic diversity, socio-economic conditions and technology and infrastructural facilities are widely vary across the world, the agro-climatic condition of Indian state of Meghalaya is considered as case and arable crops cultivations input and package of practises are considered for modulating the cultivation practices for organic production system in non-conventional area.

Summarize your findings: The article gives the conceptual and theoretical details for introduction of crops/species of crops/variety in new area under the edges of shifting of crop cultivation zone. The significance and constraints for introduction of new crop/species in organic production system is discussed for Meghalaya (India state) considering the global variation across in agro-climatic condition. The details about steps in introduction of new crop/ species along with details of experimentation which can be implemented over larger section of world with special reference to organic farming.

Conclusion(s) based upon your findings: it can be concluded that, both successes and well as failure of introducing crop/species have significant outcome either in terms of research finding, academic excellence and policy intervention leading to human resource development. Therefore, overall evaluation of projects and quantification of total footprints on all sort of farming activity is considered in such project rather than considering the only success of introduction crop/species on economic and technological terms.

Keywords: Crop cultivation zone, experimentation, agro-climatic condition, organic farming.

PERFORMANCE EVALUATION OF SELF-PROPELLED POWER OPERATED CUTTER BAR MOWER

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ABSTRACT

The power-operated cutter bar mower unit was developed within the laboratory of Farm Machinery and Power Engineering, JNKVV, Jabalpur marginal and small farmers. The prime mower is powered by a 5hp diesel engine. The V-belt drive is provided to transfer power from the engine to the tow wheels. A flexible accelerator cable is connected to the controller by adjusting the engine speed for each need. The gear reduction unit is located on the axis with a speed reduction ratio of 20: 1. Two scarves were attached to cut the cutting bar, one on each side, to handle the cutting height. Performance tests of the mower resulted in a mean 0.08 ha/h effective field capacity, 1.40 L/h fuel consumption, 0.761 field efficiency, 2 km/hr of average speed, and 30 mm cutting height.

Keywords- Power unit, forage harvesting, mower, and cutter bar etc.

PREVALENCE OF PEA DISEASES IN MAJOR GROWING AREAS OF CENTRAL INDIA

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ABSTRACT

Pea (*Pisum sativum* L.) is one of the most important legume crops in India. Pea is generally sown in Rabi season in India from the beginning of October to mid of November in the plains. In India, vegetable pea is grown in about 0.37 million ha with annual production of 3.57 million tones. In Madhya Pradesh, the total area under vegetable pea is 0.057 million ha and production are 0.60 million tons (Horticulture Database, 2014). Pea is exported from India to other countries like Saudi Arabia, Nepal, United Arab Emirates, Bahrain, Bangladesh, Australia, Maldives, Oman, Guinea-Bissau etc. Uttar Pradesh ranks first in area (175.01 ha) and production (1877.93 MT). In Central India pea is covering an area over 53.45 thousand ha with 534.0 thousand million tones production and 10.0 MT/ha productivity (NHB, 2014). A variety of disease affects peas through number of pathogens including, insect vector and fungi (Hargedorn, 1974). Vascular wilt caused by *Fusarium* sp. is soil borne disease of worldwide distribution and it is one of the most important diseases of pea and broad bean (Phal and Choudhry, 1983; Crawford, 1927). Root rot of pea may be caused by any one or a combination of several common soil-borne fungi (Domsch et al., 1980, Avinash et al., 2005). Powdery mildew (*Erysiphe pisi*, Crawford, 1927) and downy mildew (*Peronospora viciae*, Snyder, 1934), (Marcinkowska, 2002) Bacterial blight (*Pseudomonas syriangae* PV. Pisi, Sackett, 1916) and Seed born Mosaic by (Khetrapal and Maury 1987, Jones, 1927). An investigation on prevalence and incidence of disease showed that the disease was prevalent in all the areas surveyed at four districts showing its wide spread occurrence during after sowing in Rabi season 2019. The highest mean observed of seedling disease incidence at Jabalpur 48% and lowest

mean at Mandla district 13.46%, Maximum Downy mildew disease incidence at Jabalpur 18.30% and lowest disease incidence at Katni district 2.26%, Maximum wilt disease incidence at Jabalpur 37.60% and lowest disease incidence at Mandla district 21.53%, Maximum Powdery mildew disease incidence at Jabalpur 56.90% and lowest disease incidence at Mandla district 33.59%.

EFFECT OF DOSES AND SOURCES OF NUTRIENTS ON GROWTH, YIELD AND QUALITY OF TIMELY SOWN IRRIGATED WHEAT (*Triticum aestivum* L.)

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ABSTRACT

Considering the food and nutritional security concerns and post green revolution's second generation problems i.e. increasing input use with declining efficiency trends, deteriorating soil health, depleting water resources, pollution and narrowing profits at the end of farmers, an investigation “Effect of doses and sources of nutrients on growth, yield and quality of timely sown irrigated wheat (*Triticum aestivum* L.)” was carried out on well drained sandy clay loam soil, low in organic carbon and available nitrogen, medium in available phosphorus, potassium and zinc and moderately alkaline in pH during 2020-21 at crop research centre of SVPUA&T, Meerut (U.P.) Novel nutrient sources and their modes of applications with 12 treatments consisting of control, basal application of recommended 100% NPK (150:60:40), 75% NPK (112.5:45:30) + NPK Consortia seed treatment (250 ml in 3 litre water 60 kg⁻¹ seed) + NPK (18:18:18 @ 15 g l⁻¹) + Bio-stimulant (625 ml ha⁻¹) + Nano N (4 ml l⁻¹) + Nano Zn (10 ml l⁻¹) in various combinations were attempted on wheat variety HD 2967 in RBD design with three replications.

The results of the study revealed that wheat grown with 75 % NPK + NPK Consortia + NPK + Bio-stimulant + Nano Zn spray attained significantly better growth as reflected by taller plants (110.6 cm), more no. of tillers m⁻¹ row length (68.9), higher dry matter accumulation g m⁻¹ row length (294.0), CGR (5.8 g m⁻² day⁻¹) and RGR (0.0022 g g⁻¹ day⁻¹) recorded at harvest over RDF. Yield attributes and yields viz. effective tillers m⁻² (301.0), number of grains spike⁻¹ (48.2), test weight (39.1 g), grain yield (55.9 q ha⁻¹) and straw yield (71.5 q ha⁻¹) were also higher in the crop as against respective value of 272.7, 44.2, 37.6, 49.1 & 71.9 with 100% NPK and 224.0, 37.1, 33.5, 28.3 & 47.9 with control. The crop contained 2.1% N, 0.25% P, 0.54% K and 53.4 ppm Zn in grain and 0.61% N, 0.12% P, 1.20% K and 32.1 ppm Zn in straw. Such crop accumulated 162.3 kg N, 22.8 kg P, 118.6 kg K and 535.1 g Zn ha⁻¹. Application of 75% NPK with NPK Consortia + NPK spray, NPK Consortia + NPK + Bio-stimulant spray, NPK Consortia + NPK + Bio-stimulant + Nano Zn spray, NPK Consortia + Nano Zn spray and NPK Consortia + Nano N + Nano Zn spray worked synergistically and increased grain yields by 6.3, 8.9, 13.8, 3.0 and 11.6% respectively over 100% NPK. Respective increase in protein yield was 116.3, 160.4, 250.6, 12.9 and 237.4 kg ha⁻¹ over 100% NPK. Nutrient use efficiency i.e. agronomic efficiency for N, P & K (24.5, 61.3 & 92.0 kg of grain in yield increase kg⁻¹ of nutrient applied), physiological efficiency for N, P & K (23.4, 156.9 & 37.7 kg of yield increase kg⁻¹ of nutrient absorbed) and partial factor productivity for N, P & K (49.7, 124.2 & 186.3 kg of grain kg⁻¹ of nutrient applied) was also better under treatment. Soil organic carbon (0.49 %), available N (196.2 kg ha⁻¹), available P (11.1 kg ha⁻¹), available K (149.1 kg ha⁻¹), available Zn (0.86 mg kg⁻¹), population of bacteria (0.78 No.×10⁶ cfu g⁻¹), fungi (0.67 No.×10⁴ cfu g⁻¹) & actinomycetes (0.63 No.×10³ cfu g⁻¹) was also higher with the treatment. The crop required an investment of ₹ 44241 ha⁻¹ and fetched net return of ₹102763 with B:C ratio of 3.3 with 100 % NPK + Bio-stimulant spray.

Thus, the wheat crop grown with application of 100 % NPK + Bio-stimulant spray had attained better growth (plant height, no. of tiller, dry matter accumulation, CGR, RGR, yield attributes (effective tillers, ear length, spikelets per spike, grains per spike, test weight) yield (grain, straw

and biological), nutrient use efficiency, nutrient content, nutrient uptake, protein content, protein yield and fetched higher net returns with higher B:C ratio. Soil physico-chemical (bulk density, particle density, aggregate stability, EC, pH, organic carbon), available nutrient N, P, K and Zn) and biological properties (bacteria, fungi & actinomycetes).

THE EFFECT OF DIFFERENT FEED ON WEIGHT GAIN IN FINGERLING *Cirrhinus Mrigala*

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ABSTRACT

Fingerlings of *Cirrhinus mrigala* were obtained from a certified fish hatchery and acclimatised in separate glass aquaria filled with water filtered through plankton net for two weeks, the first without feed and the second with experimental diets under laboratory conditions. Following that, 45 *Cirrhinus mrigala* fingerlings were divided into nine aquaria, each with three feeding groups in triplicate and controls. After recording initial weight and length, five fingerlings were released in each aquarium. Each aquarium's fingerlings were fed the following feed formulation. Mustard Oil Cake + Rice Bran, Groundnut Oil Cake + Rice Bran, and Rice Polish + Wheat Bran. After 90 days, the effect of different feed combinations on the mean values of gain in live body weight and length of *Cirrhinus mrigala* was different for each of the four treatments. Groundnut oil cake + Rice Bran @ (1:1) resulted in the greatest increase in live body weight and length of *Cirrhinus mrigala*. All three treatments had a growth-promoting effect, and the recorded data is highly significant in terms of weight and length gain in fingerlings when compared to the control.

Keywords: *Cirrhinus mrigala*, Mustard Oil Cake, Rice Bran, Groundnut Oil Cake, Rice Polish, Wheat Bran

ENTREPRENEURIAL BEHAVIOUR OF DAIRY FARM WOMEN

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The word “**entrepreneur**” is derived from the French word “**entreprendre**”, meaning “to do something” or “to undertake.” Entrepreneur, was being used to refer to the one who organizes, manages, undertakes a business venture, assumes the risks of a business or enterprise. Entrepreneurs are the key people to drive the process of economic development and technological change in each country. It is the contribution of individuals with entrepreneurial zeal that pushes a country forward in its development process. Entrepreneurship is now recognised as a concept that is important not only for the development of new industries, but also for the development of agriculture and related activities. Entrepreneurs emerge in a society as a result of a complex web of social, religious, cultural, psychological, and economic factors. Understanding how these factors interact is critical in creating an environment that encourages the development of entrepreneurial behaviour. Women entrepreneurs play a prominent role in developing country like India, where there are numerous opportunities to use innovations to exploit rich available resources, particularly in agriculture and related activities. Every woman is an entrepreneur because she manages, organizes, and ensures that her home is run properly. Rural women, in particular, shoulder a great deal of responsibility, not only at home, but also in agriculture and

related activities. She has the potential to transform the nation's economy and social development. Despite the fact that all women dairy farmers are self-employed, we have yet to recognize that the progress of dairy farming is also dependent on the entrepreneurial behaviour of these women dairy farmers.

Method

The study entitled “Entrepreneurial behaviour of dairy farm women” was conducted during the year 2020- 2021. Study was carried out in Vikarabad and Mahabubnagar districts of Telangana state. By using random sampling technique, from each district 60 dairy farm women were selected thus, making a total sample size of 120 dairy farm women. A survey method was employed by using a self-structured questionnaire and Entrepreneurial behaviour scale. Self-structured questionnaire gathered information regarding socio-economic characteristics such as Age, Education, Family composition, Marital status, land holding, Herd size, Dairy experience, Family annual income, Extension contact, Training attended, Source of Motivation and Organizational participation. Entrepreneurial behaviour scale consists of ten components such as innovativeness, risk taking ability, decision making ability, leadership ability, achievement motivation, knowledge of the enterprise, information seeking, ability to coordinate, assistance of management services, and cosmopolitanism in low, medium and high categories. The data was tabulated and analyzed using statistical methods such as mean, frequency, percentage, class interval and correlation.

Results

The socio-personal characteristic results showed that, 55.83 per cent of the dairy farm women belonged to the middle age group (31 to 50 years), 23.33 per cent had education upto PUC, 69.16 per cent were married, 70.83 per cent belonged to nuclear family, 60.83 per cent belonged to small size family, 33.34 per cent had small land holding (1 to 2.5 acre), 56.67 per cent had 12 to 23 years dairy experience, 53.33 per cent had medium herd size (4-7 animals) and 49.17 per cent had medium daily milk yield of 6 – 10 litres/day. 53.33 per cent were having their annual income in the medium range. The results regarding entrepreneurial behaviour showed that most of the dairy farm women had high level of achievement motivation (58.33 %), co-ordinating ability (56.67 %), risk taking ability (41.67 %), assistance of management service (36.67 %). They had medium level of cosmopolitanism (75.83 %), knowledge of the enterprise (50.83 %) and information seeking behavior (45.84 %), leadership ability and innovativeness (41.67 %). The dairy farm women had low level of decision-making ability (45.00 %).

Conclusion

Women in rural areas play an important role in dairy farming. They work on the farm and look after their livestock in addition to their household responsibilities. Their contribution is incalculable in terms of money. They have the potential to be successful entrepreneurs because they are good resource managers. As a result, has been established to investigate what entrepreneurial characteristics women possessed and to identify the areas and entrepreneurial skills that need to be developed in the dairy sector. Education also plays an important role in the adoption of dairy enterprise at commercial level because as the level of education increases experience also increases and rural women are able to adopt and understand new technologies in dairy farming. If women are educated, they can learn about new technologies and government initiatives taken for the betterment of women dairy enterprises. Govt must take initiatives and actions to increase the functional literacy for women via group approach so as to better perform in their enterprise management. Based on the findings it is suggested that, There is a need to provide appropriate production and processing technologies and motivation to dairy farm women by organizing more such trainings courses and also establishing good marketing network in nearby villages. Dairy farm women should be encouraged regarding clean milk production and preparation of value-added products so that productivity of milk and their income can be enhanced.

Keywords: Entrepreneur, Entrepreneurial behaviour, dairy farm women, dairy farming.

EFFECT OF CLIMATE CHNAGE ON GROWTH OF GROUNDNUT (*Arachis hypogaea* L.)

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ABSTARCT

The climate, which is the average of weather parameter variability, is a key factor in determining agricultural productivity. Climate change is a long term, persistent and significantly shift in the regions typical weather pattern is the amount of Co₂, methane, nitrous oxide and other greenhouse gases in the atmosphere which are known to trap heat from solar radiations, is directly related to climate change. The overall temperature rises along with concentration of greenhouse gases which causes different precipitation and sudden changes in crop yield.

The groundnut, often known as the king of oil seed crops is regarded as a significant source of vegetable, protein. It contains roughly 50% oil, 25-30% protein, 20% carbohydrates and 5% fibers, all of which are necessary for human nutrition and serve as excellent sources of vegetable protein. Groundnut is planted on 5.52 ha in India, with a productivity of 1750 kg per ha and the total production of 9.62 mt. Gujarat and Andhra Pradesh are the two biggest groundnut producing states contributes 90 %of the total groundnut production. The current study was carried out utilizing an open top chamber at PGI, MPKV, Rahuri during the kharif season to examine the impact of climate change on groundnut growth. and yield in the current experierment co₂ and temperature were regarded as primary treatments.

10 pots filled with red soil and vermicompost were used to cultivate a popular groundnut variety. Chemical fertilizer applied to each pot as directed. effect of temperature and co₂ an groundnut development at 45, 60 and 90 days following measurement of plant growth characteristics such as number of leaves per plants and plant height were taken groundnut cultivated in eCo₂ showed cosiderably incareased plant height with maximum number of leaves at 30 days after sowing, indicating that elevated co₂ and temperature had a major impact on the plants physiological, biochemical and yield parameters at various stages. The effects of Co₂ treatment on growth and yield under analyzed using one way ANOVA. least significant treatment difference was used to compare and separate treatment for analyseof impact of Co₂ treatment on growth and yield.

The faster growth rates in terms of plants height, number of leaves, leaf area index are proof that the climate change in terms of eCo₂ and temperature has favoured growth and development of groundnut. Along with yield parameters, the growth parameters demonstrated good trends, which lead to higher yield in eCo₂ treatment. Groundnut growth development and yield have been favoured by climate change whether measured in terms of eco₂, alone in conjunction with temperature. It is well known that the amount of Co₂ in the atmosphere is rising due to biological activity federal agencies have reported that Co₂ levels have increasing by 30% since the industrial revolution which is thought to be an cause of an increase in mean annual global surface temperature of about 0.66 C.

In the climate change treatment as compared to ambient treatment growth indices such as plant height leaf count. These findings show that plant height and leaf growth have increased under heightened conditions which may be explained by fact that Co₂ directly fertilizes plant growth . as a C₃ leguminous plant. Groundnut has been proven to have faster growth rate in high Co₂ environment numerous research that demonstrate faster groundnut growth in the presence of increasing Co₂ support these finding on growth characteristics. according to finding the current study temperature and eCo₂ have a beneficial influence on improving the plant growth parameters of plant height, leaf area index and number of leaves. Many earlier studies found that groundnut, a C₃ plant responded positively to Co₂ and increased photosynthetic rate, biomass,

plant height, root length compared to Co₂ condition other crops including cotton, lucern, soybean also showed greater plant height and leaf area under eCo₂ condition.

GROUP FARMING: AN INNOVATIVE APPROACH FOR STRENGTHENING SMALL HOLDER FARMERS

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ABSTRACT

Group farming is a collective approach wherein farmers pool their land, labour, capital and share costs and profits. It helps to improve farmers' access to markets and credit, by improving their knowledge, economies of scale, and bargaining power. It is important to study the impact of group farming towards economic, social, participatory, market linkage and technological point of view as it is one of the strong interpreters to boost productivity of smallholder agriculture. The study examined the economic, social, technological and participatory impacts of group farming on its participants. The study conducted survey in western zone of Maharashtra. Correlation coefficient was employed to examine the relationship between the independent variables with the impact and multiple regression analysis was used to analyse the extent of impact of group farming on economic, social, technological and participatory features. The results of the study found that, group-farming had positive and statistically significant effect on economic, social, technological and participatory features at 5% level of significance.

Keywords: Group farming, Economic impact, social impact, Participatory features, Market linkage, Technological gains

TO STUDY THE KNOWLEDGE AND ADOPTION LEVEL OF FARMERS ABOUT PRODUCTION TECHNOLOGY OF TOMATO CULTIVATION IN HARYANA

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ABSTRACT

The vegetable sector plays a vital role in farm income enhancement and alleviation of poverty in many developing countries. Whereas, tomato is one of the vegetable crops that has a high demand throughout the world. The annual production of fresh tomatoes accounts to approximately 180 million tonnes (FAO, 2019). In India the total production of tomato is 20.70 million tonnes from 796.87 thousand hectares area (FAOSTAT 2019-20). The present investigation was carried out in Haryana state, ranked at 13th position in the country in terms of tomato production. The data was collected with well-structured and developed interview schedule from 160 tomato growers, further it was tabulated and analysed by using suitable statistical tools. Findings revealed that nearly half of the farmers had sufficient knowledge about land preparation, sowing season, irrigation method and tomato harvesting and were belonged to medium category of knowledge level regarding production technologies/practices of tomato. Whereas, nearly half of the respondents had fully adopted practices viz., land preparation, sowing season, irrigation methods, and harvesting of tomato followed by other and were found under medium category of adoption level of farmers about recommended production technologies/practices of tomato. Multiple regression analysis between selected variables and knowledge level of the farmers towards production technology of

tomato was inferred that, all the eleven independent variables together contributed 52.30 per cent variation in the knowledge level of the farmers. Whereas, in case of adoption of production technology it was inferred that, all the eleven variables together contributed 51.20 per cent variation in the adoption level of the farmers towards production technology/practices.

Keywords: Production technology, Tomato, Growers, Regression and Correlation

INSECT PEST MANAGEMENT OF EGGPLANT IN THE TROPICAL AND SUB-TROPICAL REGIONS OF HIMACHAL PRADESH

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Purpose

Eggplant (*Solanum melongena*) is the most common and extensively grown vegetable all over the country. It has high water content (91.5%) and a low calorific value. One of the most attributed causes for the low productivity of brinjal is the damages sustained due to insect herbivory causing around 28-85% reduction in the yield.

Methods

In the present investigation, seasonal incidence of insect-pests associated with brinjal and their management during *Kharif* season under humid sub-tropical region is addressed. Need based control strategies, different IPM approaches, and biopesticides were used for reducing the pesticide consumption as well as maintaining minimum pest population levels for the survival of natural enemies.

Result

The present studies revealed that *Amrasca biguttula biguttula* and *Leucinodes orbonalis* were the serious pests in brinjal growing areas of Himachal Pradesh. The seasonal incidence of *A. biguttula biguttula* began apparently in July and the peak population was observed during September (8.11 jassids/ 3 leaves). The data on trap catches of *L. orbonalis* moths showed that the incidence started from the second week of September and the maximum number of moths were trapped during September (19 moths/ week). The organic products and biopesticides evaluated against pests like *agniastra*, *brahmastra*, cow urine, azadirachtin (0.03%) and Bt proved to be effective if sprays were initiated. After incidence, emamectin benzoate and chlorantraniliprole were found effective for the management of this pest.

Conclusions

It can be concluded that *L. orbonalis* and *A. biguttula biguttula* remained active throughout the vegetative and reproductive phases of the brinjal crop. Overall, results indicated that emamectin benzoate application provided relatively better and more consistent control. Whitefly, Aphids, Thrips, mites and Mealybug are not serious pests in Himachal Pradesh.

Keywords: Eggplant, incidence, pest, IPM, trap and biopesticides.

BARNYARD MILLET CUSTARD POWDER MIX – VALUE ADDITION TO MILLET TO ENHANCE NUTRITIONAL SECURITY

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Purpose

The increasing recognition of the coexistence of deficiencies has highlighted the importance of dietary diversification or modification as a strategy to prevent deficiencies. Dietary diversification or modification of food is attained through combination of food groups. For solving the problem of deep-rooted food insecurity and malnutrition, diversification of food production must be encouraged both at national and household level. Dietary diversification or modification of food is attained through combination of food groups. Custard is a dessert, which is consumed widely across the countries. Custards which are available commercially are of corn starch, which does not possess sufficient nutrients except energy. Hence corn starch can be replaced with nutri rich starches like tuber starch, millet starch, legume starch and some vegetable starch, so as to increase the nutritive value of custard. Millets are one of the reservoirs of carbohydrate, the starch content varies between 50-70 g per 100 g on dry weight basis depending upon the type of millet and its history of processing. The nature of the millet starch is beneficial in different food preparations or applications and becomes one of the strategies to attain dietary diversification. So, the main objective of the study was to attain nutritional security through development of nutritious millet-based custard powder mix.

Material and methodology

The primary ingredient used was millet, a rich source of dietary fibre, phytochemicals and micronutrients and are termed as nutri-cereals. The main objective of the study was to attain dietary diversification through development of nutritious millet-based custard mix. The study was undertaken in the department of Food Science and Nutrition, UAS, Dharwad. Millet based custard powder mix was prepared with millet and other suitable ingredients. Prepared custard mix was evaluated for sensory characters by semi-trained panellists using 9-point hedonic scale. The custard powder mix was analyzed for moisture, fat, protein, ash and crude fiber using standard AOAC methods (Anon., 2019). Total and available carbohydrate and energy were computed. The minerals like calcium, iron, copper, zinc and manganese were determined using Atomic Absorption Spectrophotometer (model: AAS GBS Avanta).

Results

The results showed that millet custard received higher sensory scores for appearance (8.07), colour (8.07), flavour (7.83), taste (7.91), consistency (8.83), overall acceptability (8.00) compared to corn starch custard and was nutritionally superior. The content of moisture, protein, fat, carbohydrate, fibre, ash and energy was 8.36g, 22.8g, 3.92g, 63.29g, 1.46g, 1.54g and 380Kcal respectively per 100g of mix. The barnyard millet custard powder mix contained 180.36 mg of calcium, 12.16 mg of iron and 0.88 mg of zinc per 100 g of dry mix. The manganese and copper contents were 2.8 mg and 1.6 mg per 100 g respectively. The higher amount of protein may be due to significant quality of protein in milk powder which would gain nutritional importance in most of the developing countries in combating protein malnutrition. Good amount of carbohydrate acts as a source of energy for the body. The fibre content of the barnyard millet based custard powder was higher than commercial mix. The calories provided can be served as a supplement to infant feeding and can be consumed as breakfast meal and also be a choice for sick. Besides major nutrients, minor nutrients like minerals play key role in protecting against deficiency disorders.

Conclusion

In India custards are consumed with or without fresh fruits, dry fruits and other ingredients. Because of umpteen health benefits of millet, this millet-based custard can be used as healthy dessert for different age groups and it is beneficial in sustenance of vulnerable groups. Barnyard millet-based custard can provide appreciable amounts of nutrients like protein which can help to provide nutritional security.

Keywords: Dietary diversification, nutritional security, millet, custard

GENETIC DIVERSITY OF QPM (*ZEA MAYS L.*) INBREDS USING MORPHOLOGICAL CHARACTERS

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ABSTRACT

Genetic divergence among parents is of paramount importance in selecting them for hybridization programme. D2 statistics used to measure the genetic divergence among the genotypes has been successfully utilized by the breeders to analyze the morphological diversity. Hybridization is one the tools to create variability. One may create more variability through hybridization when parents are diversified. Hence, genetic diversity in the parents is a prerequisite for crop improvement programmes. The genetic divergence among 25 genotypes of QPM inbreds were estimated by using Mahalanobis D2 statistic for eleven characters. The twenty-five maize genotypes were grouped into seven different clusters based on the inter-genetic distance. This indicates the presence of considerable diversity in the genotypes studied. Clustering pattern indicated that 15 out of 25 genotypes belongs to the same cluster that is cluster I followed by cluster IV with 4 genotypes, cluster III with 2 genotypes and cluster II, V, VI and VII having 1 genotype (mono-genotypic). The average intra cluster distance ranges from 3.19 to 12.11. The maximum intra cluster distance was observed in cluster IV (12.11), followed by cluster I (9.18), cluster III (3.19). Cluster II exhibited close proximity with cluster VI (9.22) and maximum divergence with cluster VII (50.23). Cluster III was nearest to cluster VII (15.32), while it was farthest from cluster II (33.02). Cluster IV showed close proximity with cluster V (19.13) and maximum divergence with cluster VI (29.47). Cluster V exhibited intimate relation with cluster VII (22.29) and wide diversity with cluster VI (57.85). Farthest clusters for Cluster VI are Cluster VII (39.07). Percent contribution of eleven quantitative characters to total divergence were found maximum for ear length (27.67 %) and minimum for number of kernel rows per ear (0.33 %). Therefore, these traits should be taken into consideration either simultaneously or alone for selecting a high yielding maize genotype. The analysis of variance indicated significant differences among parental lines for all the agro-morphological characters. On the basis of results obtained in the present investigation, it was concluded that the allelic diversity can be used for future breeding program.

Keywords: Genetic diversity, D2 statistics, QPM, quantitative characters

WOMEN PARTICIPATION AND GENDER PERSPECTIVES IN SUSTAINABLE FOREST MANAGEMENT IN CENTRAL INDIA

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ABSTRACT

Forest and trees play manifold roles in sustaining agriculture, providing livelihoods and energy resources for women and men. According to statistics from the World Bank and the FAO, over a billions of people dependence on forests for their use and livelihoods, including about 275 million people who live in or close to dense forests depend on such resources for both living and survival. People who live close to forested areas frequently have poor access to markets and making them even more rely on the forest for their daily needs. Women in particular may need safe access and legal rights to use these resources because they can rely on forests for up to 50% of their income. By reducing deforestation and forest degradation, sustainable forest management hopes to lessen poverty and provide other socioeconomic advantages. To study women participation and gender perspectives in sustainable forest management, we have reviewed 10 research papers and articles to find out and understand the role of women participation in Sustainable Forest Management and to sense the relationship between gender and Sustainable Forest Management and how it tracks innovative approaches in Sustainable Forest Management in central India. we have focused on women by strengthening their socioeconomic empowerment, women can be less vulnerable through sustainable forest management with a clear gender lens. This study concludes that Women may have more opportunity to speak out and take part in the forest conservation, policy-making processes if more women are represented in organizations for making decisions about the sustainability of forests. Women who actively participate in forest conservation and forest decision-making bodies have the chance to voice their problems, wants, and points of view as well as contribute their knowledge to the conversation of forest in particular and to all type of natural resources also.

Keywords: women, gender, forest conservation, sustainable forest management.

GENETIC VARIABILITY IN SWEET POTATO (*Ipomea batatas* L.)

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ABSTRACT

A study was undertaken on genetic variability by evaluating 20 genotypes of colour fleshed sweet potato considering fourteen quantitative characters *viz.* vine length(cm) at 60 and 120 days after planting, number of branches/plant at 60 and 120 days after planting, internode length(cm) at 60 and 120 days after planting, leaf area index, number of tubers/plant, total tuber yield/plant(g), tuber weight(g), tuber length(cm), tuber girth(cm), biological yield/plant(g) and harvest index(%). The analysis of variance revealed that mean squares due to genotypes were highly significant for all the studied characters. Wide range of variability was observed for the characters such as biological yield/plant, vine length, leaf area index, average tuber weight, harvest index and tuber yield/plant. The phenotypic coefficient of variation was more than genotypic coefficient of variation for all the characters studied. High heritability estimates coupled with high genetic advance as percent of means were observed for characters like vine length, leaf area index, number of tubers/plants, tuber yield/plant, average tuber weight, tuber girth, biological yield/plant and

harvest index indicating effectiveness of selection for these traits. Divergence studies categorized the 20 sweet potato genotypes into 4 distinct clusters. Cluster-I was the largest cluster having 10 genotypes followed by cluster-II with 8 genotypes and cluster-III and IV were mono-genotypic. Among four clusters, cluster-II showed maximum intra-cluster diversity ($D^2 = 7.58$) followed by cluster I ($D^2 = 7.37$). However, maximum inter cluster distance was exhibited between cluster II and III (17.78), followed by cluster II and IV (16.60) and cluster I and II (12.54) exhibiting sufficient genetic diversity among the genotypes of these clusters.

Keywords: Sweet potato, characters, variability, heritability, genetic diversity.

PROCESSING OF FENNEL

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Purpose

Fennel is a perennial herb belongs to umbelliferous family known as *Foeniculum vulgare Mill.* The most common Indian name is Saunf besides its many popular regional names. It is widely cultivated today throughout the temperate and subtropical regions of the world. In our study fennel-based squash is prepared and consumed in local market as health drink. It has soothing effect on intake and very much refreshing.

Methods

The experimental material procured from agriculture farm of School of Agricultural Sciences, Dabok, in the rabi season 2021, comprised of variety namely Abu fennel 440, grown in 1-Acre area at SoAS, Dabok. Fennel seeds were collected and soak 500 grams of fennel in 2.5 liters of water overnight. Then carried out fractional distillation of soaked fennel with water. Take 200 ml of Fennel distilled and add 800 ml of sugar syrup and mix it well. Add 2 gm of citric acid. Add few drops of green food colour. Filter it through muslin cloth. Add 600 mg of Sodium Benzoate i.e. 600 ppm. Fill in glass bottle.

Results

Take 200 ml of fennel drink and add 150 ml of water or Soda. Add some ice. Serve the same. Fennel syrup can be store for 12 months without adding any preservatives.

Health Benefits of Fennel are: Combat bad breath, improve digestion health, help to regulate blood pressure, reduce asthma and another respiratory ailment, promote lactation, improve skin appearance and purify blood.

Conclusions

It is concluded that the prepared fennel drink was highly acceptable by the consumers and can further be promoted for sale in the market. Served to elite peoples of the Udaipur and received remarkable appreciation.

Keywords: Beverages, Fennel, *Foeniculum vulgare Mill.*, preservative and Saunf.

OPINION OF INPUT DEALERS AND FARMERS ABOUT DAESI PROGRAMME

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Agriculture is the backbone of our country. About 58.00 per cent of population depends on agriculture for their livelihood. Agriculture development continues to remain as our crucial for economic growth, poverty reduction and ensuring food and nutritional security of our country besides meeting other mandates of the agricultural sector (DFI report 2017). Public extension system alone is not adequate to address the issues faced by the farming sector. Ministry of Agriculture, government of India stressed to have multi-agency extension services. Among all agencies the input dealers constitute 2.82 lakh and spread even in interior areas of country. They can become the most important source of information to farmers and can be transformed as para professionals. Keeping the importance of agricultural knowledge to the input dealers, DAESI programme was started in Karnataka during 2015-2016. State government institutes, SAUs, private institutions are offering DAESI programme for input dealers. DAESI operating institutions in Northern Karnataka are KVK centers, AECC centers, IAT centers and DATC centers. University of Agricultural Sciences, Dharwad under Directorate of Extension initiated DAESI programme during 2015. In this regard, this present study has been initiated with the following objectives:

- To study the input dealer’s opinion about the DAESI Programme
- To study the farmers opinion about services of DAESI input dealers

METHODOLOGY: The present study has been carried out during 2019-2020. The study has been conducted in Dharwad and Bagalakote districts of Karnataka with sample of 180 included DAESI, non-DAESI input dealers, & farmers as respondents. In the present study, dealers’ opinion about the DAESI Programme and farmer’s opinion about services of DAESI input dealers was considered. Purposive random sampling technique was used to select the respondents. A pre-tested and self-structured questionnaire and schedule was used to collect data from input dealers and farmers respectively. Data was analyzed through frequency, percentages, correlations and t-test.

Results

The findings of the investigation reported that, cent per cent (100.00%) of the DAESI input dealers had high opinion about DAESI programme. Opinion of DASEI input dealers had positive and significant relationship with education, years of experience as dealer, extension contact and decision making. Similarly, cent per cent (100.00 %) of farmer, respondents were expressed high satisfaction towards the services provided by input dealers of DAESI programme. Independent variables like age, education, income, land holding, farming experience, social media participation and extension contact tends positively correlated with opinion of farmers. The results were supported by findings of Srinivas (2013).

Conclusion

DAESI programme creates employment generation activities and reduces the unemployment problems and also provides the raw materials to agro- industries. thus, agriculture improves overall development of the nation economic source. Public extension system alone is not adequate to address the issues faced by the farming sector to meet the emerging challenges. In order to improve the employment opportunities and to improve the knowledge of the input dealers and the farmers Government of India had launched the DAESI programme. DAESI programme is self-financed one year training programme for dealers by providing required agricultural knowledge and to build their capacity in ordered to handling of agri-inputs according to laws and rules has

designed. And it helps to reduce the problem of technical know –how and do how, importantly on local problems in the farms. So DAESI course could make mandatory for all the input dealers to have adequate knowledge about farm implements, fertilizers, pest and diseases etc. As cent per cent of Desi input dealers expressed their satisfaction towards the course and even cent per cent of farmers were happy about the services of Desi input dealers.

Keywords: DEASI programme, opinion, input dealers

IDENTIFYING NOVEL SOURCES FOR TLB RESISTANCE IN MAIZE

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ABSTRACT

Turcicum leaf blight (TLB), which overwinters as dormant mycelium on host plant debris or as chlamydospores, is a widespread disease of maize in many countries, including India. Before the tasseling and grain-filling stages, it can induce significant defoliation, which can cause yield losses of greater than 50%. The most effective way to control yield losses is to identify additional sources of TLB resistance. Cultivars with efficient resistance are frequently utilized to prevent yield losses. The experiment was conducted to know about the disease reactions of TLB and to identify additional sources of disease resistance in different environments. In Varanasi, ten maize inbreds, including HKI-586, HUZM-53, CM-145, V-336, V-338, HKI-PC-8, HUZM-47, CM-104, CM-105 and CML-192 were found to be resistant, but only three inbreds, CM-104, V-336 and CM-145 were found to be resistant in Nagenahalli. A comparison of the two environments revealed that E₂ (Nagenahalli), which is known as a TLB hotspot in India, exhibited the highest disease severity. This study aims to identify new sources of TLB resistance in different environments, and these novel sources can be used in further resistance breeding programmes.

Keywords: Maize inbreds, Novel sources, Resistance, Turcicum leaf blight.

HYPERSPECTRAL SENSORS AND IMAGING TECHNOLOGIES IN PHYTOPATHOLOGY

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ABSTRACT

The generation we existing is really fast and innovative, particularly computer programming grounded technology is boon to us, because we can find and solve the problem quick. One of the notable technologies is the sensor technology, this technology upgrading to the next level in ages to make precision in effort. Newly, these types of technologies are on track with agriculture science to do sustainable precision farming. Usually, sensor detect events or changes in the physical environment and store the information as electromagnetic signals and these data are analyzed with various image classifier; ANN, SVM, SVAM etc. Sensors detect the light wave in wide range (VIS to SWIR) and convert into electromagnetic signals, which produce spectral

signature. Hyperspectral sensors (HS) are optical sensors, it collects information as a set of images (non-invasively) and combined to form a three dimensional hyperspectral data cube, which are generated from various platform - UAV and SAR. Interestingly HS technology is tied with imaging technology, for deeper classification (artificial machine learning). The goal of hyperspectral imaging (HSI) is to obtain the spectrum for each pixel in the image of a scene, with the purpose of finding objects, identifying materials, or detecting processes. Whereas the human eye grasps visible light (VIS - 400 to 700 nm) in mostly three bands (RGB colour). HSI divides the spectrum into many more bands from the VIS to SWIR range (400 to 2500 nm) and produce fine wavelength resolution (higher spatial resolution) and also cover a wide range of wavelengths (more bands). Because of this topnotch properties HSI technology are started using in phytopathology for various studies including, disease detection, phenotyping and plant pathogen interaction. Bohnenkamp and co-workers from Klein Altendorf research station, Germany reported field detection of wheat yellow rust using HSI and UAV, phytobike platforms in winter wheat cultivars, Bussard and Asano in 2019. In 2018 Mahlein *et al* worked with HSI on pathogenesis of *Cercospora* leaf spot and mentioned the spatial resolution 0.19 nm, sensitivity and accuracy is 96.25 %. Whereas, early detection of tomato spotted wilt virus is also observed (Ashourloo *et al* 2014). After acquiring the image (HSI) spectral signatures were processed with various algorithm (OR-AC-GAN) for classifying the image. Even though HSI has lot of importance in phytopathology research, still it has their own drawback like mixed pixel spectrum. Within the progress of digital technologies, the vision, which is increasingly discussed in the society and industry, includes smart and intuitive solutions for assessing plant features in plant phenotyping or for making decisions on plant protection measures in the context of phytopathology.

LONG TERM EFFECT OF ORGANIC, INTEGRATED AND INORGANIC NUTRIENT MANAGEMENT PRACTICES ON SOIL PROPERTIES IN A VERTISOLS

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ABSTRACT

A long term experiment on paddy for eleven years (2005-06 to 2016-17) was conducted on a clayey textured Vertisol at Agricultural Research Station, Gangavati, UAS, Raichur to compare the influence of organic and conventional farming systems on soil physical, chemical and biological properties of soil with the following treatments viz., T1: 100 % N through organics, T2: 75 % N through organics, T3: Integrated N management (50 % N through organics & 50 % N through organics), T4: 100 % N through inorganics along with FYM @ 7 t/ha, T5: 100 % RDF (150: 75:75 kg/ha). The experiment was laid out in a Randomized Block Design and treatments were replicated four times. Results revealed there was no such variation in physical properties of soil, particularly, bulk density and penetration resistance but maximum water holding capacity of soil differed significantly with different farming systems. The higher organic carbon content of 0.85 per cent was recorded due to 100 per cent substitution of N to paddy crop through organics. Available N (228 kg/ha-1) was higher in treatment containing complete organic farming treatment whereas higher available P and K (55.87 & 688.4 kg/ha-1) in treatment receiving 100 per cent N through in-organics along with FYM @ 7 t/ha. The DTPA extractable micronutrients Fe, Mn, Zn and Cu were significantly higher in treatment consisting of 100 per cent organics (7.4, 4.43, 0.73 and 0.56 ppm, respectively).

EVALUATION OF INTEGRATED NUTRIENT MANAGEMENT ON PERFORMANCE OF CHICKPEA AND MUSTARD CROPS AND SOIL PROPERTIES

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ABSTRACT

A field experiment was carried out on crops sesame and black gram during *Kharif* 2020, and the same field INM study was carried out in *Rabi* season 2020-21 on chickpea and mustard crops. The experiments were conducted on heavy clay soil at Agriculture Research Farm, College of Agriculture, Banda University of Agriculture & Technology, Banda. The experimental design was split-plot with main factor two cropping systems viz. Sesame – Chickpea and Blackgram-Mustard and sub-factor eight integrated nutrient management viz. farmer fertilizer practice (T₁), 100 % RDF (T₂), 100% RDF + FYM (T₃), 100 % RDF + FYM + Zn(10 kg ha⁻¹) (T₄), 125 % RDF + FYM+ biofertilizer consortia (BC) (*Rhizobium spp.*, PSB and *Azotobacter spp.*) (T₅), 100 % RDF + FYM+BC (T₆), 75% RDF + FYM+BC (T₇) and 50 % RDF +FYM+BC (T₈), all treatments were replicated thrice. The FYM was applied @ 5 t ha⁻¹. The physicochemical properties of experimental soil were as follows; neutral pH (7.58), electrical conductivity (0.16 dSm⁻¹), low in organic carbon (3.80 g kg⁻¹) and medium in available phosphorus (16.4 kg ha⁻¹), and available potassium (250.5 kg ha⁻¹). The experimental results revealed that application of 125% and 100 % RDF along with FYM and biofertilizer consortia increased significantly nodule number, nodule weight per plant and number of pods per plant, thereby increased grain yield of chickpea significantly in comparison to farmers fertilizer practice (T₁), sole application of 100 % RDF (T₂) and 50 % reduction of RDF along with FYM and biofertilizer consortia (T₈). The similar results were obtained with the mustard crop. The growth, yield attributes, and yield were significantly improved by applying 125% and 100 % RDF along with FYM and biofertilizer consortia (T₅ and T₆) treatments. The maximum B:C ratio was obtained with T₆ treatment (3.44) and minimum in T₈ i.e., 2.89, irrespective of the cropping systems. A slight improvement in organic carbon and available phosphorus was observed from the initial value. The water-soluble carbon (WSC) was higher in treatments T₅ and T₆ than sole fertilizer application in T₁ and T₂, irrespective of the cropping system. Sesame and chickpea cropping system also had higher WSC than a black gram –mustard system. The available phosphorus was also higher in T₅ and T₆ treatments than T₁-T₄ and T₈ treatments. Overall, the study recommends adding 100 % RDF with FYM (5 t ha⁻¹) and biofertilizer consortia to chickpea and mustard crops during the initial year of cultivation in low organic carbon and available phosphorus soils under both the cropping system for the better productivity, profitability and sustain of soil fertility. As 75 % RDF with FYM and biofertilizer also performed good and slight changes in soil fertility. Long-term studies on INM in various cropping systems are, thus, required in order to monitor changes in soil properties and reduce fertilizer dose across a wide range of ecologies.

MOLECULAR PROFILING IN RELATION TO SALINITY TOLERANCE OF RICE VARIETIES USING MOLECULAR MARKERS

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ABSTRACT

Eighteen rice varieties were characterized with the help of 14 ISSR markers for the purpose of their molecular profiling in relation to their salinity tolerance. Genetic profiling of 18 rice varieties with a panel of 14 ISSR markers generated altogether 483 allelic variants including 236 shared and 247 unique alleles with an average of 34.50 alleles per primer, revealing ample extent of genetic differentiation and divergence amongst the 18 rice varieties. Among these markers, 10 markers were found to be highly polymorphic and informative on the basis of their PIC and PP values. Hierarchical classification based on similarity indices in numerical taxonomic approach of classification unambiguously differentiated and classified the entries into four major groups. The first and fourth groups contained highly tolerant rice varieties, while the second and third groups were dominated by highly susceptible and highly tolerant rice varieties. Principal coordinate analysis completely supported the results obtained from hierarchical classification of the rice varieties. Thus, through molecular profiling, identified salt tolerant rice varieties can be used as parental donor in rice breeding programme to develop salt tolerant rice varieties.

Keywords: Molecular markers, Rice, Salt stress

MOLECULAR CHARACTERIZATION OF RICE GENOTYPES IN RELATION TO DROUGHT TOLERANCE USING MICROSATELLITE MARKERS

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ABSTRACT

Molecular characterization was done of the genomic DNA using a set of 23 microsatellite primer pairs. A total 179 shared and 73 unique allelic variants were detected among the eighteen rice genotypes with an average of 7.8 alleles per primer. The primers RM 5359, RM 7025, RM 10772 and RM 11008, appeared to be highly polymorphic and comparatively more informative primers. Analysis of divergence pattern based on microsatellite markers allowed differentiation and classification of rice genotypes into two groups. The first multi-genotypic group consisted of ten genotypes whereas the second multi-genotypic group consisted of eight genotypes. The magnitude of similarity coefficient between Anandidhan and Dangar (0.739) was found to be the maximum which indicating that these were more closely related. A set of microsatellite markers used for

molecular characterization in the present study showed very high degree of efficiency in discrimination of genotypes in relation to drought tolerance.

Keywords: Microsatellite markers, Rice, Drought stress

BIO-PESTICIDE AN ECOFRIENDLY APPROACH FOR PEST CONTROL

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ABSTRACT

Over the past 50 years, crop protection has relied heavily on synthetic chemical pesticides, but their availability is now declining as a result of new legislation and the evolution of resistance in pest populations. Therefore, alternative pest management tactics are needed. Biopesticides are certain types of pesticides derived from such natural materials as animals, plants, bacteria, and certain minerals. For example, canola oil and baking soda have pesticidal applications and are considered biopesticides. They do not affect the plant and in fact, reduce soil pollution and erosion. Hence, organic farming requires biopesticides for good crop production. Biopesticides are as effective as synthetic pesticides in management of crop pests. Natural products are also eco-friendly since they are easily biodegradable and therefore do not pollute the environment.

It is pest management agents based on living micro-organisms or natural products. They have proven potential for pest management and they are being used across the world. However, they are regulated by systems designed originally for chemical pesticides that have created market entry barriers by imposing burdensome costs on the biopesticide industry. There are also significant technical barriers to making biopesticides more effective. In the European Union, a greater emphasis on Integrated Pest Management (IPM) as part of agricultural policy may lead to innovations in the way that biopesticides are regulated. There are also new opportunities for developing biopesticides in IPM by combining ecological science with post-genomics technologies. The new biopesticide products that will result from this research will bring with them new regulatory and economic challenges that must be addressed through joint working between social and natural scientists, policy makers and industry.

Keywords: Adoption, Biopesticide, Integrated Pest Management, Pest Control and Regulation.

EFFECT OF PRUNING AND DIFFERENT NUTRITIONAL COMBINATIONS ON THE PERFORMANCE OF DARJEELING MANDARIN ORANGE

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ABSTRACT

Darjeeling mandarin (*Citrus reticulata* Blanco.) is one of the important cash crops of hill and mountainous ecosystem of West Bengal. These fruits had a very glorious past, but in recent years, the production of Darjeeling mandarin has decreased many folds due to Citrus decline. The main factors associated with this malady are diseases, insect-pests, nutritional deficiencies. Considering the fact, an attempt has been made to study the efficacy of inorganic and organic amendments, growth regulators and micronutrients on the performance of Darjeeling mandarin (*Citrus reticulata* Blanco.) at different mandarin growing areas of Kalimpong district of West Bengal. It been found that that the combination of 30 cm pruning with NPK and FYM+Vermicompost+Pig manure along with GA₃ 15ppm and zinc and boron foliar spray was found best treatment in all the

aspect from fruit yield and quality . As integrated nutrient management along with foliar spray of Zn and B along with growth regulators GA₃ and 2, 4-D was best combination for mandarin orange at Darjeeling district where high rainfall causes heavy leaching of nutrient and acidic nature of soil.

DEVELOPMENT OF MANUAL VEGETABLE TRANSPLANTER FOR SMALL AND MARGINAL FARMERS

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ABSTRACT

Purpose: Vegetables play an important role in human nutrition and their diet. In present scenario, there is growing demand in the vegetable and fruit sectors which offers considerable opportunities for farmers to increase income and human nutrition. In peak season due to unavailability of labours, timely transplanting is not possible. Cost of labours being increased day by day and therefore manual transplanting is becoming uneconomical.

Methods: Double row manual vegetable transplanter was developed for small and marginal farmers performing vegetable cultivation. Three different vegetable seedlings namely: chilli, tomato and brinjal were taken for transplanting of seedlings in the field by manual transplanter.

Result: The missing percentage while transplanting was found 1-2%. The average theoretical field capacity of transplanter was 0.021 ha/h and effective field capacity of transplanter was 0.019ha/h and field efficiency 88.14%. The cost of operation for vegetable transplanting was calculated 1850 Rs/ha which was Rs 3150 less than the manual cost. It was further ergonomically evaluated to make it gender friendly.

Conclusion: From the study it was suggested that developed transplanter comparatively increases the field capacity than manual transplanting, reduces drudgery and cost of transplanting. The design transplanter was ergonomically compatible and gender friendly.

Keywords: Vegetable, Transplanter, Small and marginal farmers, Farm Mechanization.

STUDIES ON ARBUSCULAR MYCORRHIZAL FUNGI OF LANDSLIDE AREAS IN GARHWAL REGION, UTTARAKHAND< INDIA

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ABSTRACT

Landslides are particularly common in Uttarakhand along two zones lying in close proximity of two major tectonic discontinuities- Main Boundary Thrust (MBT) and Main Central Thrust (MCT). Many landslides have occurred in Uttarakhand in the past. During August 1998, 103 people were died in landslides which had struck in Madhmaheshwar and Kali Ganga valley. In 2001, approximately 20 people died in landslides in Phata and Gad area of Uttarakhand. About 16 people were killed in another landslide event on 5 July, 2004 that took place in Badrinath.

Besides the above, in almost every monsoon season, landslide of about 400-700 cu.m / Km of road occur along hill roads. From 1960-1990, the yearly losses from landslides were 1,500 million US\$. Based on the general experiences with landslides, the rough estimates of loss in economy to India are of the order of Rs. 250-300 crore/annum, for the country as a whole.

The contribution of plant root systems to slope stability and soil erosion control has received a lot of attention in recent years. It's well known that mycorrhizal fungi strengthen soil structure and start to be used as a tool in soil restoration. Indeed, the hyphal network of AM fungi link soil particles to

each other and to plant roots. It is well recognized that vegetation prevents landslides, and that root morphology is important in increasing the shear strength of soil. Mycorrhizal fungi bind the soil in ways that the plants alone cannot do. In addition, mycorrhizal fungi promote the formation of soil structure, allowing movement of air and water through the rooting volume rather than across the surface. These have obvious implications for erosion control. In addition, erosion control plants introduced without inoculation may have a difficult time becoming self-reliant. In that case, non-host weeds may quickly claim the site, reducing it to an unsightly, easily eroded condition. During last 2-3 efforts are going on to isolate the AM fungi from landslide areas.

EFFECT OF PHOSPHORUS, SULPHUR AND GIBBERELIC ACID ON QUALITY OF SOYBEAN

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ABSTRACT

An experiment entitled during *kharif* season 2020 on effect of phosphorus, sulphur and gibberellic acid on growth, yield and quality of soybean [*Glycine max* (L.) Merrill] at Instructional Farm, College of Agriculture, Ummedganj, Agriculture University, Kota (Rajasthan) on clay loam soil. The experiment comprised 24 treatment combinations, having four levels of phosphorus *viz.*, 0, 20, 40 and 60 kg ha⁻¹, three levels of sulphur *viz.*, 15, 30 and 45 kg ha⁻¹ and foliar spray of gibberellic acid *viz.*, no spray and spray of GA₃ @ 75 ppm laid out in sub-sub split plot design with three replications. Application of 60 kg P₂O₅ ha⁻¹ was produced significantly higher protein content (40.44 %), protein yield (787 kg ha⁻¹) and oil content (21.01 %) over 20 kg P₂O₅ ha⁻¹ and control. However, it was found at par with application of 40 kg P₂O₅ ha⁻¹. Significantly higher protein content (40.30 %), protein yield (700 kg ha⁻¹) and oil content (20.67 %) were recorded with the application of 45 kg sulphur ha⁻¹, which was found at par with 30 kg sulphur ha⁻¹ over application of 15 kg sulphur ha⁻¹. Application of GA₃ @ 75 ppm as foliar spray gave higher protein content (39.36 per cent), protein yield (695 kg ha⁻¹) and oil content (20.08 per cent) in seed of soybean over no spray.

Keywords: Phosphorus, soybean, spray and levels

A REVIEW ON SURFACE WATER CONSERVATION AND MANAGEMENT IN MAND WATERSHED AREA, A PART OF MAHANADI RIVER BASIN OF CHHATTISGARH, INDIA

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ABSTRACT

Water is considered as the most critical and essential resource for sustainable agricultural development all over the world. Agriculture production is highly dependent on water and increasingly subject to water risks. Climate change is increasing the fluctuations in precipitation and surface water supplies, and affecting crops water requirements. These water challenges are expected to strongly impact agriculture – a highly water-dependent sector – undermining the productivity of rain-fed and irrigated crops and livestock activities. The requirement of irrigation will increase in upcoming years, while freshwater supplies will be shifted from agriculture to meet the increasing demand of domestic and industrial use. So, under scarcity conditions and climate change considerable effort has been devoted over time to introduce policies aiming to increase

water efficiency and also on the assertion that more can be achieved with less water through better management. The watersheds are the potential site for managing the water resources due to their multiple inlets which drain the precipitation to a common outlet. The surface water and groundwater are the two major resources of water that are available for domestic, agricultural, and industrial use. More extraction of the ground water may lead to the depletion of the water table. On the other hand, less seasonal use of surface water may lead to scarcity of water in the off-season. So, surface water conservation in the watershed level is a practical solution for the future increasing demand and present need.

Various research paper related to surface watershed conservation and management on the Mahanadi River basin and its tributary river watersheds of Chhattisgarh has been reviewed. The review have focused to get information on the management and sustainable development of the local population for surface water availability and utilization in Chhattisgarh. River watersheds viz. Mand, Hasdeo, Shivnath etc. has been studied for the conservation of the surface water. Various tools and technologies, especially Remote Sensing and GIS has been used for the analysis. The Mahanadi River basin has a catchment area of 1,41,589 sq. km spread over Chhattisgarh and Odisha. The Mand river watershed, one of the major tributaries of the Mahanadi River has a catchment area of 5413 sq. km in the eastern part of Chhattisgarh. The river flows for a total length of 260 kms, it originates from Mainpat plateau of Sarguja district and meet Mahanadi River near Chandrapur in Jangir Champa district in Chhattisgarh (India-WRIS 2022). The most of river catchment is dominated by agricultural land, followed by forest, scrubland, water bodies, mines and settlements (Rabindra & Singh 2016). Before year 1990 most of the area in the watershed is rainfed but gradually due to the construction of various surface water structures and groundwater lift irrigation, crop production is enhanced. The Mand major irrigation canal network irrigates around 13.10 thousand hectares in Raigarh and Janjgir -Champa in Chhattisgarh. The northern part is having intensive sugarcane cultivation due to the presence of the sugar industry whereas lower part has paddy cultivation. The government constructed two major stop dams and various small structures on the Mand river itself. There are 15 major dams that are larger than 10 hectares in size is constructed in Mand river watershed in which Rabo dam on Kurkut river (a tributary of Mand river) is the largest. The canal system of major dams facilitates irrigation in the region. There are 55 small check dams were built in the tributaries of the Mand river which help in lift irrigation in the area. There are 442 surface water conservation have been purposed by the Chhattisgarh Forest department, out of which 67 structure will be outside forest area and 375 will be inside the forest (Chhattisgarh watershed report, 2019). The water of Mand river and its tributaries are being used for the industrial usage in the area. Most of the water is taken by coal-based industry/ washeries.

The existing structures are helpful in local water requirements in off-seasons as well as in groundwater recharge. The construction of more water conservation structures will decrease water runoff and soil erosion. It will helpful in improving soil fertility and decrease the drought. The forest cover in the watershed must be managed effectively to increase the precipitation and decrease water loss. The timely management of the watershed may lead to the holistic growth of the region.

Keywords- Irrigation, Water efficiency, Dam

BRASSINOLIDE AND ZINC INFLUENCING PHYSIO-BIOCHEMICAL TRAITS OF GARDEN PEA (*Pisum sativum* L.) UNDER WATER DEFICIT CONDITION

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Purpose

The study was aimed to evaluate the role of exogenously applied 24-epi-brassinolide (e-BL) and Zinc (Zn) concentrations on physio-biochemical processes in garden pea (*Pisum sativum* L.) under water-deficit stress.

Methods

A poly-house experiment was framed with a Completely Randomized Design with three replications by e-BL pretreated seeds of garden pea genotype HUP-2 with 0.01 and 0.05 mM and/or Zn under induced water deficit stress in different stages of crop growth i.e. before and after anthesis.

Results

Garden pea seeds pre-treated with e-BL in addition to Zn micronutrient supply resulted positive response against water deficit in terms of membrane stability and various enzymatic activity. The effect post anthesis water deficit, which is more potent to yield loss, found to be lessened by e-BL and Zn.

Conclusions

Seed pre-treatment with e-BL and basal application of Zn are having potency against water deficit in HUP-2 genotype of garden pea.

Keywords: physio-biochemical traits, garden pea, e-BL, Zn, water deficit

IMPACT OF CLIMATE CHANGE ON INSECT PESTS

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Climate change is the term used to describe a gradual increase in the average temperature of the Earth's atmosphere and its oceans, a change that is believed to be changing the Earth's climate forever. Global temperature has been steadily rising since 1900 with an increase of about 1°C since then. Anthropogenic CO₂ is almost twice more important for temperature increase than other long-lived greenhouse gases combined. Although increased CO₂ should not directly deleteriously affect insects, the temperature increases driven by the increase in anthropogenic CO₂ already affect insects in profound ways including their distribution, nutrition, phenology and role as disease vectors. Zvereva and Kozlov (2010) detected a significant negative effect of elevated CO₂ on insect herbivore performance. They observed that overall herbivore communities were lower on plants grown under elevated CO₂ vs. ambient CO₂. This is likely in part due to higher mortality rates due to both parasitoids and other natural enemies. Natural enemies are thought to have better success under elevated CO₂ because their prey are more apparent. Insects typically take longer to develop, making them more apparent in time to natural enemies. Higher consumption rates also cause increased leaf damage and increased frass production, both cues to natural enemies. Lower winter mortality of insects due to warmer winter temperatures could be

important in increasing insect populations (Harrington *et al.*, 2001). Insect species diversity per area tends to decrease with higher latitude and altitude (Andrew and Hughes, 2005), meaning that rising temperatures could result in more insect species attacking more hosts in temperate climates (Bale *et al.*, 2002). Fungal pathogens of insects are favored by high humidity and their incidence would be increased by climate changes that lengthen periods of high humidity and reduced by those that result in drier conditions. Some insects are sensitive to precipitation and are killed or removed from crops by heavy rains, this consideration is important when choosing management options for onion thrips (Reiners and Petzoldt, 2005). Species life history (evolutionary) adaptations may obscure our ability to detect species response to climate change - accordingly, species respond differently to changes in thermal environments. There are many interactions and it is extremely difficult to predict the impact of climate change on insect pests in the future, but we may expect an increase of certain primary pests as well as secondary pests and invasive species.

INTERACTION OF POLYETHYLENE GLYCOL 20 KDA WITH ALPHA-LACTALBUMIN INVESTIGATED VIA *IN VITRO* AND *IN SILICO* APPROACHES

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Purpose

To understand the stability and folding behaviour of non-heme proteins under various physiological conditions and an assessment of the effects of the crowding agents on non-heme proteins will be planned in this piece of work. Estimation of biophysical properties under a crowding environment in the presence of Polyethylene glycol 20 kDa will be helpful to understand the underlying mechanism and therapeutic implications in neurodegenerative disease due to protein misfolding.

Methods

Studies were performed at different pH monitored by various techniques for structural characterization and thermal stability.

Results

Structural characterization at different pH using Trp-fluorescence, near-UV CD and far-UV clearly shows perturbation of tertiary and secondary structure of a protein by crowder. However, the dynamic light scattering measurement shows that the protein is homogeneous under all conditions. Further, the heat-induced denaturation profile shows destabilization in terms of T_m and ΔG_D^0 .

Conclusions

Current findings and many works done by other groups suggest that crowding effects were subjected to both the excluded volume effect and non-specific protein-crowder interactions.

Keywords: Macromolecular crowding; Soft interaction; Structural characterization; Thermal stability.

TREE-CROP INTERACTION IN POPLAR-BASED AGROFORESTRY IN TERAJ REGION OF UTTAR PRADESH

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ABSTRACT

The study was conducted during rabi season of 2020-2021 in farmers' fields in district Rampur in Western Terai and Bhabhar region of Uttar Pradesh, India to determine the most suitable varieties of wheat and mustard crops for cultivation as pure crops and as intercrops under *Populus deltoides* (poplar). Three varieties of wheat, viz. HD-2967, HD-3086 and WH-1105 and three varieties of mustard, viz. Pant Pili Sarson-1, Goldi and Ulahas, were tested in pure and under poplar plantation (age 2, 3, 5 and 6 years). The experiments were conducted in split plot design with three replications.

The diameter and height of poplar trees were found to be significantly higher in intercropped fields than in pure plantations. The maximum seed yield of solo wheat was recorded in variety HD-2967 (49.5 q/ha), followed by HD-3086 (43.1q/ha) and WH-1105 (40.2 q/ha) in open fields. The pattern of straw yield was similar to the seed yield. The relative performance of varieties under poplar trees followed the same trend as in open fields with HD-2967 recording the highest seed and straw yields and WH-1105 registering the lowest values of these parameters.

In sole mustard crop, the seed yields of Pant Pili Sarson-1 (19.25q/ha), Goldi (17.41q/ha) and Ulahas (16.21 q/ha) were recorded in a decreasing order in open fields. The same pattern is observed in stover yield in pure as well as in intercropped fields. Seed yield of wheat and mustard crops was found to be higher in sole crops than as intercrops irrespective of the varieties tested. HD-2967 (wheat) and Pant pili sarson-1 (mustard) is recommended for cultivation with poplar trees under Terai of U.P due to better yield and profitable economic returns of these varieties than other varieties of the two crops.

It is found that the cost of cultivation of sole wheat and mustard and in intercropped stands was Rs.26875=00 and Rs. 19680=00/ha respectively.

Net Profit was found Rs.88502.50 and Rs. 108302.00/ha in wheat and Mustard respectively, while in intercropped it ranged from Rs. 13412=00 to Rs.71,875=00 under 2 to 6 yrs of age of poplar stands in all the three varieties of wheat and in mustard it was Rs.37395.20 to 97940=00/ha in all the three varieties taken.

Keywords: *Populus deltoides*, intercrops, siliqua, spikes, straw and stover.

INSECT PEST MANAGEMENT OF EGGPLANT IN THE TROPICAL AND SUB- TROPICAL REGIONS OF HIMACHAL PRADESH

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Purpose

Eggplant (*Solanum melongena*) is the most common and extensively grown vegetable all over the country. It has high water content (91.5%) and a low calorific value. One of the most attributed causes for the low productivity of brinjal is the damages sustained due to insect herbivory causing around 28-85% reduction in the yield.

Methods

In the present investigation, seasonal incidence of insect-pests associated with brinjal and their management during *Kharif* season under humid sub-tropical region is addressed. Need based

control strategies, different IPM approaches, and biopesticides were used for reducing the pesticide consumption as well as maintaining minimum pest population levels for the survival of natural enemies.

Result

The present studies revealed that *Amrasca biguttula biguttula* and *Leucinodes orbonalis* were the serious pests in brinjal growing areas of Himachal Pradesh. The seasonal incidence of *A. biguttula biguttula* began apparently in July and the peak population was observed during September (8.11 jassids/ 3 leaves). The data on trap catches of *L. orbonalis* moths showed that the incidence started from the second week of September and the maximum number of moths were trapped during September (19 moths/ week). The organic products and biopesticides evaluated against pests like *agniastra*, *brahmastra*, cow urine, azadirachtin (0.03%) and Bt proved to be effective if sprays were initiated. After incidence, emamectin benzoate and chlorantraniliprole were found effective for the management of this pest.

Conclusions

It can be concluded that *L. orbonalis* and *A. biguttula biguttula* remained active throughout the vegetative and reproductive phases of the brinjal crop. Overall, results indicated that emamectin benzoate application provided relatively better and more consistent control. Whitefly, Aphids, Thrips, mites and Mealybug are not serious pests in Himachal Pradesh.

Keywords: Eggplant, incidence, pest, IPM, trap and biopesticides.

IMPORTANCE OF MAJOR NUTRIENTS ON DRY DIRECT SEEDED RICE (DRY-DSR) USING SSNM APPROACH IN VERTISOL OF TBP COMMAND AREA

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ABSTRACT

Purpose

When N and P are used in unbalanced nutrient programs, they may be in excess of crop demand and result in losses from the soil-crop system, contributing to the nutrient load in streams, rivers, and other water bodies. TBP areas in our state are known for using imbalance dose of nutrients with higher tendency for N application. This also causes environmental damage and increase the total cost of production as heavy N use makes the rice crop more susceptible to pest and disease and thus increases cost of protection. In this approach we studied the importance of Major nutrients on Direct Seeded Rice (dry-DSR)

Methods

An experiment was conducted during *kharif*-2016 at ARS, Dhadesugur with ten treatments and three replications arranged in Randomized Block Design to evaluate the response of dry direct seeded rice to major nutrients in a *Vertisol* of Tunga Bhadra Project command area.

Results

The Results revealed that significantly higher dehydrogenase activity was noticed in treatment receiving SSNM approach followed by STCR approach and lowest dehydrogenase activity was observed in absolute control, pH of the soil was ranged from 8.51 in STCR approach to 8.04 in recommended dose of fertilizer. The higher (0.75 dS m⁻¹) electrical conductivity was recorded by K omission with recommended dose of N and P as per STL method, higher organic carbon was resulted with treatment receiving farmer practice (5.76 g kg⁻¹). Among the treatments, higher available nitrogen and potassium were resulted with treatment receiving farmers practice. However, higher available phosphorus found in STCR approach.

Conclusion

SSNM approach is highly significant with respect to nutrient use efficiency, soil health, nutrient balance, net returns and BC ratio. The main advantage of SSNM approach is that it reduced cost of fertilizers and it achieved targeted fixed yield, and apart from SSNM recorded higher NUE and minimum loss of soil nutrients.

Keywords: Site Specific Nutrient Management, Soil Test Crop Response, Nutrient use efficiency

EXPLORATION, COLLECTION AND EVALUATION OF ELITE DARJEELING MANDARIN (*Citrus reticulata* Blanco) GENOTYPES FOR GROWTH, YIELD, QUALITY FROM DARJEELING, KALIMPONG AND SIKKIM HILLS OF INDIA.

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ABSTRACT

Darjeeling mandarin is one of the most important cash crops for the farmers of Sikkim, Kalimpong and Darjeeling district of West Bengal. Darjeeling mandarin is similar to Sikkim mandarin, and Khasi mandarin and is known to be its ecotypes. Fruits are of excellent quality, fruit color, unique sugar-acid blend and shelf life. The area under Darjeeling mandarin is declining at an alarming rate, one of the main reasons for the decline is an attack of numerous pests and diseases and the lack of healthy, quality planting material. Therefore, a study was undertaken to collect, characterize and identify superior germplasm of Darjeeling mandarin in terms of growth, yield and quality attributes. Numerous surveys were conducted from 2016-2020 from different farmers orchards. A total of 20 superior germplasm were identified for health, vigour, yield and tolerance to biotic stress. Among the growth characters, SD-DM found to highest plant height (4.96 m), N-S spread (4.65 m), E-W spread (4.89 m) and crop canopy volume (48.56 m³). DS-DM recorded highest for yield attributing characters fruit weight (110.25g) and fruits per plant (586.67) and fruit yield per plant (102.54 kg). YK-DM recorded maximum TSS among the genotypes of (12.25° Brix) with minimum acidity (0.46%) also the same genotype was observed to be comparatively tolerant to biotic stresses.

Keywords: Darjeeling Mandarin, Quality, Yield, elite germplasm

EFFECT OF PLANT SPACING AND DATE OF TRANSPLANTING ON GROWTH, YIELD AND QUALITY OF WATERMELON

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ABSTRACT

A field experiment entitled “Effect of plant spacing and date of transplanting on growth, yield and quality of watermelon” was conducted at Instructional Farm, Department of Vegetable Science, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola during summer season of 2020 - 2021. The objectives were to study the effect of plant spacing on growth, yield and quality of watermelon and to find out the suitable plant spacing for better growth, yield and quality of watermelon. The experiment was laid out in Factorial Randomized Block Design (FRBD) with three replications and Eighteen treatments viz. S₁ D₁: 2.0 X 0.45 m + 1st December, S₁ D₂: 2.0 X 0.45 m + 16th

December, S₁ D₃: 2.0 X 0.45 m + 1st January, S₁ D₄: 2.0 X 0.45 m + 16th January, S₁ D₅: 2.0 X 0.45 m + 1st February, S₁ D₆: 2.0 X 0.45 m + 16th February, S₂ D₁: 2.0 X 0.60 m + 1st December, S₂ D₂: 2.0 X 0.60 m + 16th December, S₂ D₃: 2.0 X 0.60 m + 1st January, S₂ D₄: 2.0 X 0.60 m + 16th January, S₂ D₅: 2.0 X 0.60 m + 1st February, S₂ D₆: 2.0 X 0.60 m + 16th February, S₃ D₁: 2.0 X 1 m + 1st December, S₃ D₂: 2.0 X 1 m + 16th December, S₃ D₃: 2.0 X 1 m + 1st January, S₃ D₄: 2.0 X 1 m + 16th January, S₃ D₅: 2.0 X 1 m + 1st February, S₃ D₆: 2.0 X 1 m + 16th February. Observations in respect of plant growth, yield and quality of watermelon were recorded periodically. From the present findings, it was observed that the transplanting on 1st January at 2.0 m X 0.45 m was found to be significantly superior over rest of the treatments for obtaining better growth, quality, higher yield and monetary returns of watermelon.

Keyword: Watermelon, Spacing, Transplanting, Crop production

ROLE OF BIOFERTILIZERS ON SUSTAINABLE AGRICULTURE

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ABSTRACT

Biofertilizer is a substance which contain living microorganism which when applied to seed plant surface or soil colonize the rhizosphere or the interior of plant and promote growth by increasing the supply or availability of primary nutrient to host plant. They enhance soil productivity by fixing atmospheric nitrogen and solubilizing soil phosphorus and stimulating plant growth. Sustainable agriculture is the efficient production of safe, high quality agriculture product in a way that protect and improve the natural environment, The social and economic condition of farmers, their employees and local communities and safeguards the health and welfare of all farmed species, for sustainable agriculture system it is efficient use of biofertilizer which benefits the plant and cause no or minimum damage to the environment.

Biofertilizer are one of the greatest gifts of our agriculture as a replacement to chemical fertilizer. Biofertilizer is essential component of sustainable agriculture play a vital role in maintaining long term fertility and sustainability of crop production and they are “Eco friendly” Agro input of organic origin and work on conversion of unavailable essential element to available form through their routine metabolic activity. Biofertilizer help in slow and continuous release of nutrient by their metabolism and those form and important component of integrated nutrient management system. Biofertilizer help in enhancing nutrient availability and uptake by aiding nutrient solubilisation in sustainable agriculture productivity. Biofertilizer help in reducing green house emission pesticide, chemical fertilizer while maintaining the good physical and chemical properties of the soil.

Keywords: Biofertilizer, Microorganisms, Soil fertility, Plant Growth, Sustainable Agriculture

STUDY OF PLANT GROWTH PROMOTING ACTIVITIES OF ENDOPHYTIC BACTERIA ISOLATED FROM DIFFERENT VARIETIES OF SUGARCANE

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Purpose

The study was aimed to develop biofertilizer of native strains to enhance nutrient accessibility to the sugarcane crop.

Methods

A laboratory experiment was framed with a Completely Randomized Design with three replications where the endophytic bacteria were isolated from different parts of sugarcane on different nutritive media and morphologically and biochemically characterized for their nutrient solubilizing properties.

Results

A total of 71 endophytic bacteria (ESM1 to ESM71) of different morphotypes were isolated and out of which 41 isolates were identified as Gram-negative and 30 isolates as Gram-positive bacteria in which 17 were endospore producers. Among these isolates, 23 isolates showed phosphorus solubilization, 18 isolates showed Zn solubilization and 25 showed IAA production activity.

Conclusions

The best promising isolates which showed biofertilization and biostimulation activities are used as inoculant in biofertilizer for sugarcane crop.

Keywords: Endophyte, Sugarcane, Biofertilization, Biostimulation

ULTRA HIGH-DENSITY PLANTING TECHNIQUE OF MAIZE (*ZEA MAYS* L.) IN SIKKIM

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ABSTRACT

With the rise in population, global warming and urbanization, the cultivable land is steadily decreasing leading to lowering of crop production. Maize (*Zea mays* L.) is predominantly grown in Sikkim which is the only fully organic state being declared in India. Maize is cultivated in an area of 38.37(000') hectares in Sikkim with production of 67.908 (000') tonnes and productivity of 1769 kg/ha as per Agriculture Census & EARAS unit, Govt of Sikkim (2019-2020). Krishi Vigyan Kendra, Mangan, North Sikkim conducted about eight Off Farm Trails (OFTs) and more than 50 Front Line Demonstrations (FLDs) in a course of eight years and finally came up with a successful and new technique- Ultra/Improved High Density Planting which will certainly improve the crop productivity. Generally, the yield of maize crop in the state is only about 18 quintals/hectare which is much lower than the national average. Following this new Ultra High-Density Planting technique, productivity is generally found to be greater than 50 quintals/ha in all the locations in the state.

Keywords: Ultra High-Density Planting Technique, Maize, Productivity

ROLE OF AMF IN ARSENIC STRESS DEFENSE MECHANISM

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ABSTRACT

Plants are generally exposed to different abiotic stresses like temperature, drought, heavy metals and salts. All the stresses adversely affect development of plants by making oxidative pressure which eventually reduces the photosynthetic productivity and subsequently diminishes the plant development. Phytoremediation is a green system that utilizes hyper-accumulator plants and their rhizospheric microorganisms to eliminate, debase and detoxify harmful metals. According to past researches just modest bunch of as hyper-aggregator, so there is need to distinguish more plant which are exceptionally lenient and have wide region distribution. The AM symbiosis interaction is known to build resilience of plants to different abiotic stresses by advancing antioxidant defense system. Inoculated by AM fungi can play defensive role for vascular plants under as contamination by changing inorganic as in less harmful organic structures or by weakening as concentration. Arsenic-prompted oxidative pressure (generation of H₂O₂ and lipid peroxidation) in plants decreased essentially by AMF inoculation. Colonization of AMF brought about higher activities of the antioxidant enzymes (superoxide dismutase, catalase, and guaiacol peroxidase). The research uncovers diverse role of AMF in easing of as toxicity. Present study is based on the effects of mycorrhiza in growth of plants in arsenic affected soil. Data collected from the field trials of *Dalbergia sissoo* treated soil with *Glomus macrocarpum* and *Glomus fasciculatum* revealed significant positive response in reducing oxidative with respect to control.

Keywords: Phytoremediation, oxidative stress, hyper-accumulator, AMF.

INFLUENCE OF VARIETIES AND INTEGRATED NUTRIENT MANAGEMENT ON GROWTH AND YIELD PARAMETERS OF ISABGOL (*Plantago ovata* Forsk.) UNDER NORTHERN DRY ZONE OF KARNATAKA, INDIA

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ABSTRACT

The field experiment was conducted to evaluate the performance of two Isabgol cultivars for commercial production in northern dry zone of Karnataka during 2019-20 and 2020-21. The experiment was laid out in split plot design (SPD) with sixteen INM treatment combinations at the College of Horticulture, Bagalkot. Analysis of both year data with pooled data exhibited higher value for Vallabh Isabgol-1in growth parameters viz., 50% early seed germination (5.38), plant height (36.85cm), number of leaves per plant (46.24), number of tillers per plant (10.40), leaf area index per plant (33.18 cm²) and yield data, maximum number of seeds per spike (60.33), seed yield per plot (442.23 g plot⁻¹), seed yield (12.30 q ha⁻¹), husk yield (3.62 q ha⁻¹), straw yield (23.93q ha⁻¹), harvest index (23.93 %), test weight (2.25 g) as compared to Gujarat Isabgol-2. Whereas, the higher values with INM treatments with respect to plant growth parameters were observed in Viz. N₁₁-75 % RD of FYM (7.5 t ha⁻¹) + 75% RD of NPK (37.5:18.75:22.50 kg ha⁻¹) + *Azospirillum* (5kg ha⁻¹) + PSB (3kg ha⁻¹) + ZnSO₄ (15 kg ha⁻¹) + FeSO₄ (7.5 kg ha⁻¹) viz., and number of seeds per spike (71.79), seed yield per plot (555.66g), seed yield (15.43 q ha⁻¹), husk yield (5.38q ha⁻¹), straw yield (28.83 q ha⁻¹), harvest index (22.13) and test weight (2.57g). Higher values for interaction effect on growth parameters were recorded in V₁N₁₁.viz, number of seeds

per spike (72.50), seed yield per plot (557.97 g), seed yield (15.50 q ha⁻¹), husk yield (5.45q ha⁻¹) straw yield (29.30 q ha⁻¹), harvest index (22.34) and test weight (2.75 g).

EVALUATION OF INBREDS, INBRED CROSSES AND HYBRIDS OF COCOA (*Theobroma Cacao* L.).

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ABSTRACT

The genetic analysis of in bred, inbred crosses and hybrid was carried out at College of Horticulture and Cocoa Research Centre (CRC), Vellanikkara, Thrissur. A total of 113 in bred was evaluated for qualitative and quantitative characters. Cocoa is predominantly out breeding with highly complex genetic structure. The cross-pollinating nature coupled with existence of self/cross incompatibility, poses much difficulty to the cocoa breeders. The hybrid progeny from the same cross exhibit high level of variability due to heterogeneous nature of the parents. This can be overcome to certain extent by using fully homozygous in bred of diverse genotypes. The CRC succeeded in producing first ever fifth generation inbred and it was proved self-incompatible. In this context, the present study was formulated to quantify the magnitude of inbreeding depression in yield and yield attributes in various self-generations and to establish a physiological relationship between the vigour of in bred, inbred crosses and hybrids in the early stages of plant growth. The different pollination techniques were tested to overcome the self-incompatibility and the extraction of proteins from self-incompatible plants was attempted.

Morphological characterization of 113 in bred were carried out by recording qualitative characters such as pod shape, ridge colour, pod apex, pod basal constriction, pod rugosity and bean colour. High variability was observed for all qualitative characters except ridge colour. The pod and bean characterization for 21 characters expressed wide variation among the in bred and within the in bred of same genotype. Characterization of in bred based on the biochemical parameters such as fat and phenol expressed wide variability.

The inbreeding depression was estimated for 21 characters in 12 genotypes over generations. In S₁ generation of M 18.7, the husk furrow thickness and number of flat beans expressed negative inbreeding depression, whereas the average yield per tree per year has shown a very meager inbreeding depression over the preceding generation. In S₂ generation of M 18.7, pod value, conversion index and dry matter recovery have shown an inbreeding depression between 5 to 10 percent. Negative inbreeding depression was observed for husk ridge thickness, number of flat beans per pod, pod index, efficiency index and fat content. In S₃ generation of M 18.7, maximum inbreeding depression was observed for wet bean weight per pod followed by pod length. In S₄ generation of M 18.7, the highest inbreeding depression of 43.58 per cent was observed for amount of pods/tree/year. In S₁ generation of G II 7.4, positive inbreeding depression was observed for 10 characters out of 21. In S₂ generation of G II 7.4, positive inbreeding depression was observed for 15 characters. Only seven characters expressed positive inbreeding depression in S₃ generation of G II 7.4 genotype. In S₅ generation inbred, the maximum inbreeding depression (63.95%) was observed for husk furrow thickness, followed by husk ridge thickness (49.02%), In S₁ and S₂ generation of H1 1.2, positive inbreeding was observed in 16 characters. In general, inbreeding

depression was less for economic characters confirming that most of the characters are controlled by additive gene action and lethal gene canceled in heterozygous condition is less.

In the comparative evaluation of in bred, inbred crosses and hybrids, the inbreds were found superior over inbred crosses and hybrids for morphological characters such as plant height, collar girth, plant spread and leaf area. The in bred also had maximum chlorophyll content, leaf nutrient status and relative water content. The superiority of in bred was mainly attributed to the growing environmental condition with more of openness in the inbred plantation, which was confirmed with spherical densitometer, an instrument for measuring plantation overstorey density

It was concluded that the genotypes in S_5/S_6 can be crossed to get highly heterotic hybrids. For extraction of protein from cocoa flowers, fine tuning of the available methods under ideal laboratory conditions must be employed. Molecular basis of self-incompatibility has to be studied in detail.

EFFECT OF HERBICIDE ON ANTIOXIDANT ACTIVITY OF WHEAT PLANT

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Purpose

Weed infestation is a major bottleneck to higher wheat productivity, and accounts for more than 48% loss of potential wheat yield. Despite the undoubted effectiveness of herbicides in controlling weeds and improving crop yield, it affects plant by disturbing growth patterns and modulating the metabolic balance. However, plants have evolved various protective strategies to minimize herbicide toxicity. One of the protective mechanisms is the antioxidant system, which includes different types of enzymatic and non-enzymatic systems to scavenge reactive oxygen species. The present study reports the effect of different doses of herbicide pendimethalin on antioxidant activity in wheat seedlings.

Methods

wheat seedlings (10-days old) were treated with four different combination Recommended Field Dose (RFD). Leaf samples were collected from each treatment replications periodically at 3, 6, 10, 20, and 30 days after treatment (DAT). A portion of leaf samples was immediately used for enzymatic antioxidant assay and the rest was oven dried and used for non-enzymatic antioxidant analyses.

Results

The results of the study demonstrate that the stimulatory effect of pendimethalin on nonenzymatic antioxidant *viz.* total phenol increases with increasing application rates (0.5RFD < RFD < 1.5RFD < 2RFD). Among enzymatic antioxidants studied *viz.* PAL (Phenylalanine Ammonia Lyase) enzyme and POD (Phenol Oxidase) enzyme, PAL enzyme activity increased progressively with increasing dose of pendimethalin whereas, in case of POD enzyme, activity decreased with increasing dose of herbicide.

Conclusion

The results of the present investigation indicated that pendimethalin caused oxidative stress in plants and to combat this stress, the plant activated its antioxidant mechanism, which is a part of the defense mechanism of wheat against herbicide stress.

Keywords: Wheat, herbicide, pendimethalin, antioxidants, oxidative stress

ECOSYSTEM RESTORATION: A TOOL FOR GLOBAL CLIMATE CHANGE MITIGATION

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ABSTRACT

In the current world scenario, climate change is impacting the Earth’s ecosystem through long-term changes in average conditions such as temperature and weather patterns (United Nations) causing climate variability, coupled with other associated changes. These changes may be natural, but since the 1800s, human activities such as degradation, deforestation, and carbon emission have become the main reason for climate change. Like other countries, India is also experiencing a significant increase in extreme weather events like rising temperature and declining rainfall. The subject of concern is that this trend is predicted to accelerate in the future. To overcome this, we need to take actions for adaptation and mitigation against climate change's inevitable effects on our ecosystem. In this review, the available information in the form of books, papers, and other works of literature was studied and summarised based on the problem, opportunities, and possible solutions to mitigate global climate change through ecosystem restoration. Our ecosystems are under a lot of stress as a result of climate change but still, we are further disturbing the abilities of the ecosystems to recover by the addition of stresses like encroachment, pollution, over-harvesting, and the introduction of invasive species. The extent of the harm that climate change is causing and our capacity to handle it are directly linked to the ecosystems and their resilience. If we want to prevent ecosystems from collapsing and improve their ability to adapt to climate change, restoration of the ecosystem can be the tool as the aim of ecosystem restoration is to contribute to the conservation and sustainable use of biodiversity, halting and overturning degradation, cleaner air, and water, extreme weather mitigation, better human health as well as to mitigate and adapt to climate change (CBD, 2019). Keeping this into consideration, decade 2021-2030 has been declared as the ‘Decade on Ecosystem Restoration’ by the United Nations, a decade to facilitate global cooperation for the restoration of degraded and destroyed ecosystems. India is one of the seventeen mega-diverse countries of the world but also comprises a huge percentage of the global human and livestock population which is putting great pressure on its ecosystems and biodiversity. In response to this growing pressure, ecosystem restoration targets are acknowledged in many of India's key initiatives, like the *Green India Mission* (GIM) under the NAPCC which aims at enhancing and expanding tree cover of India, and the *National Afforestation Programme* (NAP) which focuses on the restoration of degraded forests and afforestation around forest areas as a strategy to adapt and mitigate global climate change. India has also pledged for increasing its forest and tree cover to produce a carbon sink of about 3 billion tonnes by the year 2030. Other than that, for the restoration of ecosystems, firstly, we need to encourage the research and development efforts on ecosystems and their restoration to understand them better and to identify how key elements of the complexity that enhance mitigation and adaptation can be supported. Second, we need an improved governance model that is multi-disciplinary and multi-agency to recognize the role of the communities in environmental governance. At last, we need to halt further damaging of the resources and simultaneously start conserving and sustainably utilizing the remaining resources. We need to ensure that our policies and regulations that are known to be the pillars of any constitutional action should be aiming for the conservation and restoration of ecosystems. Conclusively if we are into the conservation and restoration of ecosystems, with conflict of interest it is compulsorily important to study the complexity of connections that constitute them. Restoring the ecosystem is not only about procedures to repair and rebuild pieces

of the Earth deconstructed by human intervention, but rather about a commitment to safeguarding the Earth's future.

Keywords: ecosystem restoration, climate change, adaption, mitigation, UN decade

EFFECT OF INTEGRATED NUTRIENT MANAGEMENT ON GROWTH OF TOMATO (*Solanum lycopersicon* L.) cv. Pusa Ruby

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ABSTRACT

The present investigation entitles “Effect of integrated nutrient management on growth of Tomato (*Solanum lycopersicon* L.) cv. Pusa Ruby” was carried out at department of Horticulture Research Farm, Department of Horticulture, Babasaheb Bhimrao Ambedkar University (A Central University), Lucknow (Uttar Pradesh), during the year 2020-21. The treatment comprised of twelve level T1 Control (No treatment), T2 RDF (100%), T3 FYM (100%), T4 Azotobacter (100%), T5 Azospirillum (100%), T6 RDF+FYM (50% each), T7 RDF + Azotobacter (50% each), T8 RDF + Azospirillum (50% each), T9 FYM + Azotobacter (50% each), T10 FYM + Azospirillum (50% each), T11 Azotobacter + Azospirillum (50% each), T12 RDF + FYM + Azotobacter + Azospirillum (25% each). The experiment was laid out in Randomized block design (RBD), with three replications. The results indicated that among maximum plant height were recorded (16.15, 22.11, 26.59 and 30.53), respectively in treatment T12 at 30, 60, 90 and 120 DAT. The maximum number of branches were recorded (4.36 5.79, 6.31 and 7.04) in treatment T12 at 30, 60, 90 and 120 DAT. Minimum number of days required for flower blooming (32.44) In T12. A maximum number of flowers per plant (39.34) were recorded at T12, and also maximum number of clusters per plant was recorded (9.78) in T12.

Keyword: Integrated Nutrient Management, Tomato

SOIL HEALTH MANAGEMENT FOR SUSTAINABLE CROP PRODUCTIVITY

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ABSTRACT

As former president of USA, Franklin Roosevelt once said “A nation that destroys its soil destroys itself”. Soil works for you if you work for the soil by using several management practices that improves soil health and increase crop productivity. In other words, management of soil is the application of operations, practices and treatments to protect soil and enhance its performance such as soil fertility or soil mechanics. It includes soil conservation, soil amendment and optimal soil health.

Healthy soils maintain a diverse community of soil organisms that help to control plant disease, insects and pests. It is closely associated with sustainable agriculture, because soil microorganism diversity and activity are the main components of soil health. Therefore, a healthy soil acts as a dynamic living system that delivers multiple ecosystem services, such as sustaining water quality and plant productivity, controlling soil nutrient recycling decomposition and removing greenhouse gases from the atmosphere.

Keywords: Crop productivity, Soil health

ORGANIC FERTILIZATION OF TEASLE GOURD AND ITS IMPACT ON YIELD, NUTRIENT UPTAKE AND SOIL HEALTH

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Purpose

A field experiment was conducted by growing teasle gourd cv. Arka Bharath at experimental farm of Central Horticultural Experiment Station, Chettalli during 2021-22 to study the effect of soil application of NPK (19 ALL), Jeevamrutha and Arka Microbial Consortium (AMC) alone and in combinations on plant growth, yield, nutrient content and uptake and post-harvest changes in soil parameters.

Methods

Treatments were: 1. NPK (19 ALL- 2 g plant⁻¹); 2. Jeevamrutha (0.5 L plant⁻¹); 3. AMC (10 g plant⁻¹); 4. NPK + Jeevamrutha; 5. NPK + AMC; 6. Jeevamrutha+ AMC; and 7. NPK + Jeevamrutha + AMC. All these treatments were replicated thrice adopting Randomized Block Design (RBD). These treatments were imposed to plants 15 days after planting at 15 days interval over 12 times, through soil drenching by dissolving and mixing in 500 ml water. Apart from this 5 kg FYM was applied 10 days before planting on the bed of 1 m length as basal dose and mixed well with soil.

Results

The results revealed that significant increase in number of fruits, yield, and DMY per plant was observed in Jeevamrutha+ AMC (84, 5.59 kg and 1.85 kg); AMC+NPK (82.7, 5.55 kg and 1.83 kg); and Jeevamrutha+ AMC+NPK (77.7, 4.90 kg and 1.77 kg) treatments than that of AMC; NPK; Jeevamrutha; and Jeevamrutha+NPK treatments. Total uptake of N (42.1 g), P (7.64 g), K (38.3 g), Mg (5.57 g), S (3.73 g), Fe (758 mg), Cu (67.0 mg) and Zn (127 mg) per plant was also significantly higher in Jeevamrutha+AMC treated plants. Post harvest soil properties particularly SOC and available nutrients (N, K, Ca, Mg, Fe and Zn) were statistically higher in this treatment.

Conclusions

From the results it can be concluded that application of Jeevamrutha in combination with AMC is beneficial in improving plant and soil health, thus, in turn enhanced the plant nutrient uptake, dry matter yield and fruit yield of teasle gourd.

Keywords: Teasle gourd, organic cultivation, fruit yield, nutrient content and uptake, soil parameters

ASSESSMENT OF YIELD AND ECONOMIC INDICES ON FARMER'S FIELD USING INTERCROPPING OF LENTIL AND LINSEED

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Purpose

Lentil is a protein rich winter season pulse crop which leaves a reasonably good amount of atmospheric nitrogen in readily available form to the succeeding crop. Intercropping allows lower inputs through reduced fertilizer and pesticide requirements thus, minimizing environments impacts and helps the farmer for getting better returns by reducing the cost of cultivation. Keeping this in view the on-farm trials were conducted to determine the most profitable intercrop

combination of lentil and linseed to assess the production potential of lentil in sole cropping and intercropping.

Methods

The on-farm trials were conducted by KVK, Sagar under rained condition at 22 farmer’s field in three consecutive years *i.e.*, 2018–19 to 2020–21. Sowing was done at farmer’s field in 4:2 ratio in year 2018-19 and 2019-20 and 6:1 ratio during 2020–21 in *Rabi* season along with monoculture/sole lentil crop as farmers practices. The land equivalent ratio (LER) index was used to evaluate intercrop efficacies with respect to sole crop.

Results

It was observed that lentil equivalent yield was higher in 2019–2020 as 2167 kg/ha and LER was recorded greater than 1.0 indicated a yield advantage for intercrop. Lentil yield increases by 10.2–63.6% over the farmers practices as sole crop. Intercrop produced better lentil equivalent yield than their respective sole crop production. The economic performances were indicated that significantly higher B: C ratio with intercropping of lentil and linseed. Profit equivalent ratio received from 3.63–5.94 that also indicates higher relative profit and additional profit over the farmers practices.

Conclusions

It was concluded that intercropping system was most suitable for higher growth, productivity and profitability as well as disease management under the environment. Mono-cropping is less economical to meet the farmers need.

Keywords: Economic indices, Land equivalent ratio, Lentil equivalent yield, Lentil, Linseed

EFFECT OF DIFFERENT LAND USE SYSTEMS ON SOIL QUALITY UNDER SUBTROPICAL REGION OF JAMMU.

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ABSTRACT

Soil quality degradation is a major challenge in sub-tropical region of Jammu. This poses a great threat to soil quality of this particular area. Thus, a study was conducted to evaluate the effect of different land uses on physico-chemical, biological parameters and on soil quality. Geo-referenced soil samples were collected from five different land uses of subtropical region of Jammu and analyzed in the division of soil science and agricultural chemistry, FOA, SKUAST-J, Chatha for different physical, chemical, and biological attributes. The results showed that the forest land resulted in reduced surface and sub-surface compaction, highest water holding capacity and saturated hydraulic conductivity and better aggregate stability and pore-size distribution as compared to agriculture land use and higher water retention in surface and sub-surface soil depths, was registered in grassland followed by forest, agroforestry, horticulture and lowest in agriculture. Available N and K were highest in the soil depths of forest and lowest in agriculture land use but available P was highest under agriculture land use and lowest under horticulture land use. Forest land use registered highest organic carbon content in the surface and sub-surface soil depths and lowest in agriculture. Labile carbon was found to be highest in forest and lowest in grassland system. Highest CEC was recorded in forest land and lowest in agriculture land. Forest soils were found to have the highest content of exchangeable Ca and Mg and it was least in the agriculture soils. In case of sodium the horticulture land use registered highest content in both the depths and forest recorded the least. DTPA extractable zinc was highest in forest and lowest in grassland. Horticulture land use registered greatest content of DTPA extractable iron and copper in the surface and sub-surface soil depths and lowest in grassland. Whereas DTPA extractable iron and

lowest in grassland. Agriculture land use registered highest content of extractable manganese in the surface and sub-surface soil depths and lowest in grassland. Forest land use recorded highest soil DHA, SMBC, SMBN, alkaline phosphates and microbial population in the surface and sub-surface soil depths followed by grassland, horticulture, agroforestry and lowest in agriculture. The selected soil quality indicators from various land uses, namely DHA, macro aggregates, clay, and phosphorous, are most appropriate soil quality indicators. SQI as affected by different land uses was followed the trend Forest > Grassland > Agroforestry > Horticulture > Agriculture. The Forest land use obtained maximum SQI was at par with that in grassland but significantly higher than that in Agroforestry, Horticulture and Agriculture. Forest land use had 21.7 per cent higher SQI than that in agriculture

Keywords: Land uses, soil quality, soil quality index, subtropical

PROSPECT OF MILK PROCESSING ACTIVITIES IN EASTERN BIHAR

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ABSTRACT

The state of Bihar is producing around 10307 thousand tonnes of milk annually. In the year 2000-01 the annual milk production was only 2678 thousand tonnes. It means a significant increase in about 3.85 times of milk production in the state was registered. This increase in milk was mainly due to increase in the number of cattle populations 15.40 million and buffalo population 7.72 million (2019 census). Dairy farming plays an important role against the natural calamities and also provides good number of employment and income particularly to the rural small, marginal and land less farmers. This sector contributes about 6 percent in the state GSDP.

The eastern part of the state is facing chronic poverty since long period due to high growth of population, small & fragmented land holdings, impact of climate change, droughts, floods, poor infrastructure, etc. The dairy practices since long time used as risk mitigating tools against the calamities in this region. This is the reason that farmers were found raising milk animals in large extent as subsidiary business. As per the data of milk production during the year 2020-21 it was around 10307 thousand tonnes and out of it around 42.49 percent share constituted by this eastern region indicates its potential. It is also reported by various researchers in his studies that more than 80 percent of total produced milk consumed in raw form and only 20 percent processed into various forms like curd, butter, ghee, cheese, khoa, ice cream, milk shake, etc.

In this above back drop the present paper prepared with the aims of assessments of the scope of milk processing in the economically backward region of eastern Bihar under the following objectives :-

1. To assess the status of existing milk enterprises in study area.
2. To work out the income earned through processing of milk.
3. To critically assess the prospects of milk processing and suggests suitable measures.

For the purpose of study in Bhagalpur district Naugachia block was selected due to higher number of cows and buffaloes present in the block. This sampled block falls under agro climatic sub zone 2 and having higher amount of milk production in the district. In sampled block two milk processing potential villages were selected on the basis of several round discussions of the block level officials. After that a systematic approach was followed for selection of ultimate respondents. In the sampled village with the help of village head a detail list of milk processing units with persons employed were prepared. The prepared list was again categorized into three broad categories on the basis of number of persons employed in enterprise. First category was own account manufacturing enterprise (OAMEs) where only owner runs the unit, second category was non- directory manufacturing enterprise (NDMEs) five workers and one owner runs the unit

and third unit was directory manufacturing enterprise more than five workers and owner runs the unit. As per probability proportion from three categories of unit a total number of 12 enterprises were selected for in-depth study. The number of OAMEs was 06, NDMEs were 04 and DMEs were 02. The required data were collected through a well-structured and pre tested questionnaire. The study finds that in studied areas a large number of people engaged in extraction of butter from fluid milk. Average distance of the enterprise was recorded varied between 3, 5 km to 6.5 km from metallic road. Study also found that the quantities of produced butter or cream and their selling found varied with the variation of enterprises in study areas. It was worked out that on an average OAMEs produced cream 16.50 kgs, NDMEs 65.84 kgs and DMEs 98.30 kgs. per day. On the production of cream expenditure borne by the enterprises are OAMEs Rs. 15657.07, NDMEs Rs. 25239.78 and DMEs Rs. 39877.85 per day. The analysis further showed that highest per day earning received by DMEs Rs. 11375.80 followed by NDMEs Rs. 8456.11 and OAMEs Rs. 2025.88. The overall analysis reveals that there was a positive relationship in between the size of operation and profit. It is also evident that all the sampled enterprises were at the advantageous position. The higher B: C ratio was found in NDMEs due to proper management of employed labour.

The overall analysis concludes that milk processing units in studied areas was most profitable, economical, feasible, labour intensive and bright feature in the areas. This activity has potential to generate additional employment, income and capacity to positive change in the direction of development process. It will be hoped that in coming years more people adopt the business on commercial basis in the studied areas and solve the problems of livelihood and poverty in the area in particular and entire eastern region in general. In the state operation flood already functioning since long time and treated as a success non-credit cooperative society. Thus, number of processing units needs to be increase by taking suitable steps and by providing financial, technical, equipments, etc. support to the needy persons in the areas. The entrepreneurial modules like motivations, economical know how, technical skills and suitable policies are required to popularize the milk processing activities in the sampled area and the state.

The secondary data used in the text collected from various published sources like Economic Survey of Bihar and various websites.

Keywords: Milk processing, Prospect, Butter, Livelihood, Eastern Bihar

EXPLORATION OF ENDOPHYTIC FUNGI *BEAUVERIA BASSIANA* UHSB-END1 AGAINST MAJOR INSECT PESTS OF TOMATO

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ABSTRACT

Purpose: One of the basic principles of biological control is identifying indigenous isolates of Entomopathogenic fungi (EPF) to control the insect pests in crop protection. Despite of their efficacy, the application of epiphytic fungal isolates for the pest management meet more challenges in field conditions including direct exposure of propagules (conidia) to sunlight, UV light, higher temperature and lower moisture content in the environment. These bottlenecks associated with epiphytic isolates of fungi not popularized among the farming community at field their field usage. Hence, asymptomatic endophytic nature of many EPF especially *B. bassiana* having broad host range has been explored in the present study.

Methods: In the present study, a roving survey was conducted in northern districts of Karnataka. The tomato plants were collected during the survey and brought to the laboratories for isolation and identification of the endophytic fungus, *B. bassiana*. The colonization and persistence was

studied by leaf plating and molecular approaches. Further, the virulence of endophytic fungi was evaluated under laboratory, pot culture and field conditions.

Results: The isolated fungus was confirmed based on morphological and molecular basis. Further it was deposited in NCBI Gen-Bank with accession number OM131742 and designated as *B. bassiana* UHSB-END1. In addition, the isolate was also deposited at ICAR-National Bureau of Agriculturally Important Microorganisms (NBAIM), Mau Nath Bhanjan, Uttara Pradesh, India with an accession number NAIMCC-SF-0064. The collected isolate *B. bassiana* UHSB-END1 was effectual in colonizing the tomato plant at different interval of plant growth (40, 60, 80 and 120 dpi) by seed treatment, seedling root dip, soil drenching, foliar spray, combination. This indigenous isolate was well colonized in all plant parts (leaves, stem and roots) during vegetative stage and highly persisted in the reproductive stage. In addition, endophytic colonization of *B. bassiana* isolate UHSB-END1 was confirmed by molecular characterization at different intervals. The PCR amplified product band of approximately 650 base pairs (bp) specific to ITS region of tomato was observed in all the treatments along another amplified band around 566 bp specific to ITS region of fungal isolate. Thus, the endophytic colonization of *B. bassiana* isolate UHSB-END1 in tomato plant was confirmed both by tissue planting and molecular characterization. The study for the first time proved that the non-grass endophyte *B. bassiana* isolate UHSB-END1 get vertically transmitted to their progenies via seeds. Fungal colonization was 100 per cent from freshly obtained seed, seeds dried for 10 days and the 25 days old seedlings germinated from seeds of previous generation ensuring vertical transmission to the next generation seedling via seeds from colonized maternal plants. The sequences of the mother culture of *B. bassiana* isolate UHSB-END1(566 bp) and re-isolated fungus from next generation seedlings were 100% identical which proved vertical transmission at molecular level.

The investigation also confirmed the virulence of colonized tomato plants at 40, 80 and 120 dpi against *S. litura* under laboratory conditions by leaf feeding bioassay. The maximum mortality across different intervals ranged from 75.00-91.67 at 40 DAT, 71.67-98.33 at 80 DAT and reached upto 70.00-100.00 at 120 DAT. The plants in the combination of colonization methods and seed treatment were more virulent against *S. litura* compared to other methods of colonization. The growth and development of the larvae (% pupation, malformed pupae and adult emergence) fed on the colonized leaves from different treatments was also greatly altered. The effect of *B. bassiana* UHSB-END1 colonized plants by diverse treatments was also confirmed ‘*in planta*’ against *S. litura*. There was an immense effect of colonized plants which started soon after one day of releasing the larvae on the colonized plants directly. The mortality was maximum in the combination (100.00%) of colonization methods which was trailed by seedling root dip and foliar spray with equal per cent mortality (95.00%). The seed treatment (90.00%) and soil drenching (85.00%) were next best treatments in virulence against *S. litura*. The sub lethal effect such as per cent pupation, malformed pupa and adult emergence were also significantly affected. Almost the adult emergence was nil in most treatments.

As the virulence of *B. bassiana* UHSB-END1 against the test insect *S. litura* in the laboratory and pot experiment was confirmed. The efficacy of *B. bassiana* UHSB-END1 was also confirmed under field condition in the tomato crop by different methods of colonization. The larval population of the three major lepidopteran pests (*Helicoverpa armigera*, *Spodoptera litura* and *Tuta absoluta*) were critically lower in the endophytic fungal treatments compared to chloranthraniliprole, commercial formulation of *B. bassiana* and control at three intervals (60, 90 and 120 DAT) of treatment. The fruit damage in the endophytic fungal treatments ranged from 7.39-27.13 per cent in 1st harvest, 5.19-12.54 per cent in 2nd harvest and it was decreased at the 3rd harvest (2.48-10.32%). While, the *T. absoluta* fruit damage was not much noticed as compared to *H. armigera* and it ranged from 0.00 to 4.42 per cent in all the three harvest. Whereas, in case of *S. litura* the fruit damage was least and negligible (0.00-1.54%).

Conclusion: Thus, the endophytic isolate, UHSB-END1 of *B. bassiana* can be utilized as one of the Integrated Pest Management (IPM) component. Fungal isolates alone may not yield good result under field conditions, because it has to compete for moisture, nutrient, colonization in host plant with other endophytes of fungi or bacteria. Therefore, studying of this fungal endophyte and its interaction with pests and natural enemies can help further to incorporate this isolate with other non-chemical approaches such as use of botanical oils and soap, pheromone traps, trap crops, in IPM of tomato to produce pesticide free tomato. Hence, this study provides new insights to constitute a sustainable cost-effective strategy for management of pests affecting tomato as one of the components in IPM. It can be expanded for the management of insect pests on other commercially cultivated vegetable crops.

Keywords: Entomopathogenic fungi, Endophyte, *Beauveria bassiana*, tomato, *Spodoptera litura*, ITS marker, virulence

STUDIES ON PRESERVATION OF NAGPUR MANDARIN SEGMENTS IN SUGAR SYRUP

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ABSTRACT

An experiment entitled “Studies on preservation of Nagpur mandarin segments in sugar syrup” was carried out during the year 2017-18 at Post Harvest Technology Laboratory, Department of Horticulture, Post Graduate Institute, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola with the objectives to assess the effect of sugar concentrations on preservation of Nagpur mandarin segments and to study the physico-chemical changes in Nagpur mandarin segments during the storage. The experiment was conducted in RBD design consisting of eight treatments and three replications with using seedless Nagpur mandarin segments. Observations of Nagpur mandarin segments viz., physical, chemical and sensory evaluation were recorded periodically at an 15th day of interval. From the findings it was observed that, there was gradual increase in length, breadth and weight of Nagpur mandarin segments in sugar syrup concentrations during storage period of 120 days. In chemical analysis there was a gradual increase in TSS (%), reducing sugar (%), total sugar (%), non-reducing sugar (%) and there was no microbial infestation found up to four month of storage period. Further, the experimental data recorded on sensory qualities of Nagpur mandarin segments in sugar syrup at an interval of 15th days. The overall scores of Tastes, colour, flavour, texture found decrease in trend with the advancement of storage period.

Keywords: Nagpur mandarin segments, Preservation, Sugar syrup, Sensory quality

ORGANIC NUTRIENT MANAGEMENT ON GROWTH AND YIELD OF SOME LOCAL LAND RACE CULTIVARS OF RICEBEAN (*Vigna umbellata*) IN DARJEELING HIMALAYA REGION

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Ricebean (*Vigna umbellata*) is a neglected and underutilized grain legume crop of Darjeeling Himalayas and adjoining areas of North East India and mostly use as a minor food and fodder crop. It is a lesser known and underutilized legume, has emerged as a potential legume because of its nutritional potential. The nutritional quality of rice bean is higher as compared to many other legumes of *Vigna* family. However, cultivation of ricebean by farmers in this area in a very negligible or limited area and most of the produce is consumed at home, although there is a limited market for a short period each year. A field experiment was conducted at the Regional Research Station (Hill Zone), Uttar Banga Krishi Viswavidyalaya, Kalimpong, Darjeeling, West Bengal during *Kharif* season of 2019 and 2020 to study the effect of organic nutrient management on growth and yield of some local land race cultivars of Ricebean (*Vigna umbellata*). Four types of local land race cultivars of ricebean such as V₁, Red; V₂, yellow or creamy; V₃, black, were assigned to main plots. Different sources of nutrients were used to assign four different subplot treatments such as N₁, FYM (5.0 t/ha); N₂, vermicompost (2.0 t/ha); N₃, goat manure (0.5 t/ha); N₄, poultry manure (0.2 t/ha). The experiment was laid out in a split-plot design with 3 replications. From the result it was revealed that highest growth parameters such as plant height, number of branches, number of nodules, dry weight of nodule, dry matter accumulation recorded under cultivar yellow or creamy than other cultivars. Yield attributes and yield such as number of seeds per pod, pod length, test weight seed yield and stem yield produced maximum under cultivar V₂ (yellow/creamy) than other cultivars. Among the organic nutrient management, treatment supplied with vermicompost (N₂) produced maximum growth, yield attributes and yield followed by FYM (N₁) treatment. From this study, it is recommended to apply 2.0 t/ha vermicompost (N₂) along with cultivar yellow/creamy for obtaining overall gain under the Darjeeling region.

FARMERS KNOWLEDGE ABOUT INTEGRATED PEST MANAGEMENT IN PADDY UNDER FARMER FIRST PROJECT

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Purpose

Integrated Pest Management is broad based approach that integrates practices which are helpful for the effective to control the pest in Paddy. The knowledge about different components and practices of IPM is necessary to the farmers in better control of the pest

Methods

The study was conducted under farmer FIRST project of NDRI, Karnal. The awareness programme and demonstration were conducted and inputs were provided under the project. A knowledge test was developed with 8 statements under IPM in paddy. Total of 50 farmers were selected for the data collection

Results

The farmers had good knowledge about pest and their control measures. The farmers knowledge on chemical control brown plant hopper was highest (100%) followed by crop rotation practice (92.00 %) and pheromone traps being used in pest control (86.00%). The pooled knowledge was found to be 85.25 percent

Conclusions

The awareness and demonstrations on IPM components/practices helped the farmers to gain /update their knowledge on IPM practices which helped them in effective control of pests and to obtain good yields in paddy

Keywords: Integrated, Management, Farmers, Knowledge

EVALUATION OF BIOEFFICACY OF DIPEL 8L (*Bacillus thuringiensis* var. *kurstaki*) AGAINST FALL ARMYWORM INFESTING MAIZE CROP

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ABSTRACT

The field experiment for evaluation of bioefficacy and phytotoxicity of DIPEL 8L and Fipronil 5% SC on maize crop was conducted during kharif 2019 for the control of fall armyworm. The experiment was laid out in Randomized Block Design maintaining four replications. The bioefficacy evaluation of DIPEL 8L @500, 750, 1000, 1250 g/ha for the control of fall armyworm on maize crop was carried out. The results have been summarized here under: DIPEL 8L @ 1250 g/ha and 1000 g/ha was more effective than other treatments for the control of pests and in increasing the yield. DIPEL 8L @ 500, 750, 1000, 1250 and 2000 g/ha were found non-phytotoxic to maize crop. Based on the results, the use of DIPEL 8L @ 1000, 1250 g/ha is safe for natural enemies as well as maize crop canopy. DIPEL 8L @ 1000, 1250 g/ha be suggested for the effective control of fall armyworm on maize crop.

Keywords- Bioefficacy, DIPEL 8L, Fall armyworm, Maize.

THERMAL REQUIREMENTS, HEAT USE EFFICIENCY AND RESPONSES OF CHICKPEA (*Cicer arietinum*) CULTIVARS UNDER DIFFERENT SOWING ENVIRONMENTS.

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ABSTRACT

A field experiment was conducted during *Rabi* season of 2019-20 on the topic entitled “**Thermal requirements, heat use efficiency and responses of chickpea (*Cicer arietinum*) cultivars under different sowing environments.**” in sandy loam soil of C.S.A. University of Agriculture and Technology, Nawabganj, Kanpur (U.P.).The experiment consisted nine treatments combinations comprised of three sowing date/ sowing temperature viz., sowing on November 10 with temperature 22⁰C, November 20 with temperature 17⁰C and November 30 with temperature 16⁰C and three variety viz, KWR-108, KPG-59 and KGD-1168. Results revealed that sowing temperature 22⁰C which occurred on November 10 produced significantly higher growth yield attributes and yield due to fulfillment of optimum thermal requirement for various plant processes. High temperature during-

reproductive stage adversely affected the number of pods plant⁻¹, number of seed pod⁻¹ in late sowing (November 30) which ultimately resulted the lowest seed yield. Delay in sowing reduced the average temperature during the crop period and seed yield. Heat use efficiency was recorded when sowing was done on November 10 with temperature 22⁰C followed by sowing done on November 20 while lowest heat use efficiency was recorded when sowing was done on November 30 with sowing temperature 16⁰C. KGD-1168 variety was found more conducive for growth development seed yield and heat use efficiency. Heliothermal unit (15612.03⁰days hrs) and photothermal unit (20401.42⁰days hrs) from sowing to maturity produced the high yield of chickpea under agro climatic condition of central Uttar Pradesh.

Keywords: Chickpea, Temperature, Thermal and Yield

THE MINING AND BURNING OF COAL AFFECTS ON NATURE AND PUBLIC HEALTH: A STUDY AT DIPKA COALMINES AREA OF CHHATTISGARH, INDIA

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ABSTRACT

Coal is the major fossil fuel used for power generation in India. For producing more and more coal, mining activities are increasing day by day. Coal mining activities lead to environmental changes to a large extent such as degradation in quality of air, water, soil, changes in landform, land use/land cover and vegetation distribution.

The pursuit of additional energy, food, and infrastructure leaves behind environmental pollution and health risks for people. Electricity is produced by burning coal, a fossil fuel and nonrenewable energy source. A coal-fired power station is a massive source of environmental pollution, sending tonnes of particles into the atmosphere as aerosols. The breathing in of dangerous. There is an undetectable risk from pollutants including coal byproducts, nanoparticles, and microparticles. Nanoparticles, and its by-products constitutes an invisible risk to human health. Although coal is predominantly composed of carbon, there are many other constituents including sulfur, nitrogen, organometallic compounds, and minerals, that contribute to the formation of extremely toxic secondary compounds that come in contact with the atmosphere. The continuous inhalation of these hazardous substances triggers many diseases such respiratory and cardiovascular disease, systemic inflammation, and neurodegeneration. Due to coal heterogeneity, it is extremely complex to establish all the effects of the molecules in the organism.

Keywords-Environmental Changes, Neurodegeneration, Invisible Risk, Environmental Pollution

ROLE OF SOIL TESTING IN SUSTAINABLE AGRICULTURE

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ABSTRACT

Soil testing is the most commonly practiced tool for soil fertility evaluation. In the Indian context, soil testing is even considered synonymous to soil health evaluation. In present scenario, sustaining the declining productivity consequent upon depleting soil fertility due to imbalance use of fertilizers and thus deterioration of chemical, biological and or physical properties of soil is the

main concern of scientists. Balance use of fertilizers is one of the important indicators of better productivity, sustainable land management and better soil health. In order to attain higher productivity and profitability, farmers need to realize that fertility levels must be measured, so as the recommendations can be used to manage long-term soil fertility. Time to time evaluation of the inherent soil fertility status is essential for arriving at the crop and site-specific balanced fertilization program to sustain productivity.

The agreement with the fact that soil testing is the ultimate way towards sustainable agriculture and land management. Response to soil testing, in general, was reasonable but, still much attention is needed to inspire the farmers for soil testing practices by organizing trainings on its importance and role in soil fertility management for sustainable crop production followed by soil test and health campaigns. Sustainable agriculture aims to develop food and fiber production systems that benefit farmers and society both economically and environmentally. A key step toward that goal is helping farmers simultaneously use and improve the fundamental resources they have on their farms, such as air, water, soil, sunlight, labor, and capital. The more “tools”; farmers have for achieving that goal, the better they'll be able to meet their own and society's needs. Proper, timely soil testing and plant analysis can be very valuable tools, provided they are coupled with fertilizer recommendations based on realistic yield goals, appropriate credits for organic sources of plant nutrients, and field-proven crop response trials.

Keywords: Attitude, Productivity, Soil fertility, Soil testing and Sustainable Agriculture

LARGE-SCALE ATMOSPHERE MONITORING BY MOSSES IN DISTRICT CHAMPAWAT, UTTARAKHAND, INDIA

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Purpose

Biomonitoring using moss is a widely used approach to monitor atmospheric metal load. This approach would be suggested for annual, seasonal, and for large-scale multi-elemental monitoring. Measurements were carried out in District Champawat of Uttarakhand state of India using moss *Thuidium cyambifolium* C. Muell.

Method:

To achieve the same, widely distributed moss species were shortlisted on the basis of quadrat analysis, and later on, mosses were validated for their tolerance potential against metals (Zn, Pb, Cd, and Cu). The above-mentioned measurements omitted sensitive moss species while tolerant ones were calibrated for metal uptake before inducting for active seasonal monitoring. Metal intake calibration was made amongst shortlisted tolerant moss species, and the same is desired to optimize the choice of the alternative species in case the selected species is not available. Moss species having nearly the same accumulation potential was finally shortlisted for a large-scale bio-monitoring program. Moss transplants were carried out for three different weather seasons: summer, winter, and monsoon. Each season represents the data for four months.

Results:

Analyzed mosses exhibit a high concentration of Zn in rural areas. On the contrary, Pb and Cd were higher in moss harvested from urban areas. However, values were not critical. Indeed, Pb values were higher in proximity to the highways. That could be due to emissions spewed out from automobiles. The nearly same trend was observed by all the sites examined.

Conclusion:

The study was useful to sense the seasonal variations in atmospheric metal concentrations.

Keywords: metals, bio-monitoring, moss, validation of tolerance species

PARAMETRIC ANALYSIS OF SAVING AND INVESTMENT BEHAVIOUR OF HIGH SCHOOL AND COLLEGE TEACHERS IN SAMASTIPUR DISTRICT OF BIHAR

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ABSTRACT

The study was undertaken in Samastipur district of Bihar which was selected purposively, as this type of study on teachers were not undertaken in this area. A sample of 80 teachers (high school and college) were selected randomly, to study the socio-economic profile of the teachers, saving and investment behaviour, saving and investment avenues, factors affecting saving and investment behaviour and constraints faced by the respondents. The independent variables included personal, demographic and socio-economic factors, whereas saving and investment behaviour and preference regarding saving and investment institutions were taken as dependent variables. Data were collected with the help of a structured interview schedule. Appropriate statistical tests were applied viz., percentages, frequencies, regression coefficient, paired t-test and weighted mean score. Background profile of the respondents showed that more than 2/3rd of high school respondents was of middle age group (67.5%) followed by college respondents (47.5%) were age group i.e. 51 years, high school (teachers) were post-graduate (60%) followed by college (teachers) PhD (60%) and high school teachers, having joint families whereas college teachers, nuclear families with medium family size, getting family income of high school respondents Rs. up to Rs.1,00,000 per month whereas college respondents were Rs.1,00,001-3,00,000 per month followed by personal income of high school respondents up to 50,000 per month whereas college respondents were Rs.50,001-1,00,000 per month belonged to general caste. Paired-t-test for ‘saving’ and ‘investment behaviour’ were applied to examine the differences between High school and College teachers and it was found that the t-value (4.350**) and (9.793**) which were significant at 1% of probability level respectively. The findings of the study provide relevant information related with Socio- personal and economic characteristics of selected high school and college teachers and their saving and investment behavior that can be exploited for the policy making.

Keywords: Behaviour, Investment, Money, Savings, Spending, Teachers.

JAWAHAR MODEL AN APPROACH FOR ECONOMIC EMPOWERMENT OF MARGINAL FARMER WOMEN IN INDIA

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ABSTRACT

Agriculture is an important component of rural livelihoods. Almost 70% of India’s population of 1.2 bn– some 833 M persons lives in rural areas. Around 71% of women (36 M) in India are engaged in farm operations as main workers; from sowing to harvesting and storing in bins and bags. About 13.87% farm women farmers operate 11.57% of agricultural land. Empowerment of women workforce in agriculture, by ensuring equal access and opportunity will lead to a

foundational transformation in India’s rural economy, improving lives of millions. Gender specific and sensitive approach in terms of adaptation of best practices in agriculture, addressing structural inequalities is essential to realise the immense potential of farm women. They also being a home maker, starts her day by cleaning home, fetching water, collecting fuel and fodder, laundry, preparing food for family, and childcare apart from agricultural works.

The goal of doubling farmers' income can be achieved by enabling and empowering farm women. JNKVV Jabalpur has developed and evaluated ‘Jawahar model for doubling income of resource constrained marginal farmers. The basic concept of Jawahar model is to help timely sowing of their crop without waiting for the rain; diversify their crop production system to minimise risks while ensuring inflow of cash at short intervals for financial growth. Adopting this model, women farmers get employment and steady income throughout the year. In Jawahar model, used polypropylene bags (PPB) is filled with 45kg substrate consisting of a mixture of light soil and well rotten Farmyard manure (FYM). Pigeonpea Seeds are sowing in this PPB. spacing plant to plant and row to row is 6 feet. After the end of rainy season approximately 10 litres of water were given per plant during each irrigation at 10 days interval. High podding of pigeonpea in polypropylene bags is reported by many works range from 597.6 to 1433.8g seeds per plant. One pigeonpea plant lac yield 131.8 to 414.5g, seed yield (597.6 to 1433.8g), fuel wood yield (836.1 to 4746.6g) and economics of lac production per pigeonpea plant ranged from 72.5 to 195.9 rupees. About 10-12 q of pigeonpea and 1-1.5 q of lac can be obtained from 1 acre. Due to the wide spacing between plants, the incidence of insect pests are comparatively reduced and inter-variate crops is also taken in between, which gives additional income. Jawahar Model is for marginal farmers. There are opportunities for women farmers to supplement their income, even in the areas which are deficient in fertile cultivable land as well as Survival of crops during excess rain.

EFFECT OF DIFFERENT BLENDS OF AROMATIC POWDERS ON QUALITY OF DRUMSTICK LEAF GREEN TEA POWDER

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ABSTRACT

Drumstick (*Moringa oleifera* Lam.) is an under exploited perennial vegetable species of Moringaceae family, native to the Sub-Himalayan tracts of India, Pakistan, Bangladesh and Afghanistan. Drumstick leaves have been reported to be rich sources of several antioxidants such as polyphenols and carotenoids which may be beneficial for the prevention of several chronic degenerative disorders (CDDs). The leaf powder can provide 14 per cent of the protein, 40 per cent of the calcium, 23 per cent of the iron and most of the vitamin A needs of one- to three-year-old children. The present study was carried to know the effect of different blends *ie.*, tulsi ginger and lemongrass) at 2-6% concentration each on the quality of drumstick leaf green tea powder was carried out. An important aspect in this endeavour was to decide the optimum concentration of different aromatic powder to be included in the mixture and to know the quality. The experiment was laid out in a completely randomized design. Drumstick variety KDM-01 (Bhagya) leaves were used for the experiment. Significantly higher content of dry matter (92.31%), ash (17.40%) was recorded in T₉ (Drumstick leaf powder + 6 % lemongrass powder). Drumstick leaf green tea powder blended with lemongrass powder (6%) was recorded highest total chlorophyll content (31.93 mg/g) followed by drumstick green tea powder blended with tulsi (29.80 mg/g) and ginger (26.04 mg/g). The maximum level of both ascorbic acid (198.63mg/100 g), total phenols (196.63 mg GAE/100 g) and antioxidant activity (71.02%) was recorded in T₉ (Drumstick leaves powder

+ 6 % lemongrass powder). The higher concentration of lemongrass powder in T₉ might have contributed to appreciable mouth feel (7.63) and significantly maximum score for overall acceptability was recorded in T₉ (7.82).

EFFECT OF FOLIAR SPRAY OF MICRONUTRIENTS ON GROWTH ATTRIBUTES OF NAGPUR MANDARIN (*Citrus reticulata* Blanco.)

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ABSTRACT

A field experiment entitled “Effect of foliar spray of nutrients on yield and quality of Nagpur mandarin (*Citrus reticulata* Blanco.) ” was conducted during the year 2018-19, at the Fruit Instructional Farm, Department of Fruit Science, College of Horticulture and Forestry, Jhalawar. The experiment consisted of different treatments of nutrients including macro and micro-nutrients and was laid out in Randomized Block Design. Amongst different treatments application, treatment T₂₇(FeSO₄ 0.25% + K₂SO₄ 1.0%) foliar application was found significantly superior over other treatments in terms of growth parameters such as plant height and canopy volume. Whereas, foliar application of T₂₂ (FeSO₄ 0.25%+ CuSO₄ 0.25%) treatment was found significantly superior over other treatments in terms of N-S plant spread. Overall, T₂₇ treatment exhibited better growth except plant spread.

Keywords: Mandarin, Potassium Sulphate, Micro-nutrients, Growth

RISING THREATS TO FOOD SECURITY DUE TO THE CLIMATE CHANGE

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ABSTRACT

In several parts of the world, the challenges of climate change and its effects on food security are more widely acknowledged. According to the World Food Summit (1996), food security is when everyone has access to enough nutrient-dense food at all times to meet their dietary needs and for an active and healthy life. But continuous changes in the earth’s climate, temperature, and weather patterns have been affecting the sustainable development. However, the potential impact is less clear at regional scales, but it is likely that climate variability and changes will exacerbate food insecurity as the world food prices are increasing due to growing populations and less food production. Globally, efforts have been made each year, but climate change stands as an obstacle to reach the goal of food security. In 2016, Statistical Review on World Energy predicted that about 5 to 170 million people worldwide will be at danger of becoming hungry due to global warming, by the year 2080. Recently, The Global Food Policy Report (2022) has warned that climate change may push many Indians towards hunger by 2030 due to a decline in agricultural production and disruption in food supply chain. The report states that globally, around 65 million people are at risk due to climate change-induced hunger, with 17 million people in India facing hunger by 2030, the highest among all countries. Therefore, there is urgent need to find out determinants, develop location specific tolerant varieties with minimal inputs, manage

the natural resources, use of wastelands by plantation, avoid the off-seasonal crop production, reduce the use of fertilizers, chemicals which cause the groundwater depletion and aware the farmers to not sell their agricultural lands for housing or industrialization, because urbanization and technological adaption also having negative impact on climate. Thus, to deal with this emerging issue, mitigation and adaptation measures demanding much more research and developmental efforts as well as financial, institutional, and policy support from Government are required.

Keywords: Climate change, food Security, Agricultural production and supply etc.

RESPONSE OF SAFFLOWER (*Carthamus tinctorius* L.) TO FOLIAR APPLICATION OF MICRONUTRIENT MIXTURE

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ABSTRACT

Purpose

Safflower (*Carthamus tinctorius* L.) is an important oilseed crop in the world and ranks third next to groundnut and soybean in crop production. The spraying of micronutrients has led to improving the growth, yield and increased macro and micronutrient uptake To optimize the dosage of micronutrient mixture for foliar spray for enhancing growth, yield and oil content of safflower

Methodology

A field experiment on “response of safflower (*Carthamus tinctorius* L.) to foliar application of micronutrient mixture” was conducted during Rabi 2018, at MARS farm, Raichur. Experiment was laid out in Randomized complete block design with three replications and nine treatments.

Results

The foliar application of Grade-I multi micronutrient mixture (Fe-2%, Zn-3%, Mn-1% and B-0.5%) at 30 and 50 days after sowing @ 10 ml/litre and soil application of RDF (75:75:40 and 80 kg ha⁻¹ of NPK and gypsum, respectively) along with zinc sulphate @ 6 kg ha⁻¹ has recorded higher growth parameters viz., plant height, number of leaves, leaf area, leaf area index and total dry matter production at 25,50,75 DAS and at harvest stage. The treatment also recorded highest seed yield (1557 kg ha⁻¹), stalk yield (2478 kg ha⁻¹), protein yield (336.16 kg ha⁻¹), oil yield (434.30 kg ha⁻¹) and harvest index (38.59%).The yield and quality parameters like test weight (6.42 g), oil content (27.90 %), protein content (21.58 %) and uptake of nutrients viz., nitrogen (118.07 kg ha⁻¹), phosphorous (20.07 kg ha⁻¹), potassium (87.08 kg ha⁻¹), iron (629.21 g ha⁻¹), zinc (331.29 g ha⁻¹), manganese (113.32 g ha⁻¹), copper (103.34 g ha⁻¹) and boron (122.74 g ha⁻¹) and it was on par with the treatment receiving RDF(75:75:40 and 80 kg ha⁻¹ of NPK and gypsum, respectively) and along with foliar application of Grade-I micronutrient mixture @ 10 ml/litre and was superior to other treatments. The highest gross returns, net returns and B:C was recorded in treatment receiving foliar application of micronutrients along with RDF compare to other treatments.

Conclusion

From these results it can be concluded that foliar spray of Grade-I multi micronutrient mixture @ 10 ml /litre is economically feasible.

Keywords: micronutrient mixture, Safflower, Seed yield

RATIONALIZATION OF FERTILIZER UTILIZATION IN CABBAGE AND CAULIFLOWER

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ABSTRACT

An investigation on “Rationalization of fertilizer utilization in cabbage and cauliflower” was carried out at University of Horticultural Sciences, Bagalkot, Karnataka. The field experiment was laid out in Randomized Complete Block Design (RCBD) with three replications and foliar application of 13 treatments at different three stages of crop growth period (20, 40 and 60 DAT). Experiment results revealed with respect to growth, yield, quality, physico-chemical properties, economics and mode of uptake of nutrients have significantly influenced by foliar application instead of soil application alone. Among the various treatments-imposed treatment T₉ (66% RDF with 2.5% foliar application) and T₁₀ (66% RDF with 5% foliar application) have proved most beneficial manifested in the growth parameters like plant height, number of leaves, length, breadth, leaf area in both cabbage and cauliflower. While looking to the yield parameters both T₉ and T₁₀ treatments tremendously excelled in parameters like weight of the head, head diameter, total yield (54.09 t/ha in cabbage). The same increased trend has been noticed with the same treatments with respect to curd size, curd weight and total yield of the cauliflower (50.03 t/ha). With respect to B:C ratio T₉ and T₁₀ treatments were found to be significantly reduced the cost of fertilizers (34%) with highest net returns (1:4.26 in cabbage) and (1:5.89 in cauliflower). It was concluded by the experiment that both the treatments (T₉ and T₁₀) have not only remunerative and also increases efficacy of uptake of the plant nutrients and tremendously reduce the soil pollution with conservation of soil physico-chemical properties. Hence, the foliar fertilizer application is an important practical tool and novel measures for sustainable and successful cabbage and cauliflower production.

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PREVALENCE OF PROTOZOAN AND HELMINTHES PARASITIC INFECTION IN PALPA, NEPAL

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ABSTRACT

In rural areas of underdeveloped countries, parasitic infestation is a major public health issue for children and the elderly. The purpose of this study was to determine the prevalence of parasite infestations and risk variables related with Palpa parasitic infestations. The population sample was selected from the Tansen area's usual population, as determined by randomized cluster sampling. A total of 700 samples were collected, with 280 persons from urban regions and 420 from rural areas, for a total of 100 people from various categories in each health center. Data were collected for each person based on their age, gender, and place of residence (urban or rural), as well as through a semi-structured questionnaire and a personal interview. Each health center's laboratory technician team conducted the microscopic investigation of samples (blood, urine, and feces). Five protozoal and six helminth parasites were found among the 11 parasites, with eight kinds of gastrointestinal parasites and three species of blood parasites. The most frequent parasites were discovered to be *Entamoeba histolytica*, *Giardia lamblia*, and *Ascaris lumbricoides*. Females and those who live in rural areas are more likely to be parasite-infested. Prevalence was highest among

children under the age of 15 and the elderly. It is important for administrators, health experts, and the community to approve through improvements in the living environment and cleaning practices in order to break the transmission cycle of parasitic illnesses, health education, and community approval.

Keywords: Age group, infection, parasites, rural area, urban area

EXTERNAL TRAITS OF CHICKEN EGG FROM DIFFERENT BREEDS REARED UNDER BACKYARD PRODUCTION

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ABSTARCT

The present study was conducted at the Poultry Research and Training Centre, Sardar Vallabhbhai Patel University of Agriculture & Technology, Modipuram, Meerut- Uttar Pradesh, India. 50 eggs were collected for each breed from the Farmers door rearing these chickens under backyard Production System. The same (n=20) was also collected from the university farm at PRTC, SVPUAT to compare the egg quality traits under both farm conditions as well as field conditions. The eggs of CARI Hitkari, CARI-Upkari and CARI-Devendra were predominantly dark brown in colour. However, there were variations in colour from dark to light brown in these breeds both in farm as well as field conditions. The eggs of CARI Sonali and CARI Priya were white in colour in all eggs. Similar variation in egg colour was also observed in eggs collected from non-descript layer birds reared by local farmers under village conditions. The eggs were mostly clean in all varieties of chicken reared under backyard production system. The highest percentages of unclean eggs were found in CARI-Priya birds both in farm as well as field conditions. but the major issues are hen health and nutrition; The specific gravity of eggs from different varieties was found to be similar in all birds. Haunshiet *al.*, (2006) compared certain egg quality traits of Vanaraja and White Leghorn chicken and found higher values of specific gravity (1.098 and 1.086, respectively) in these eggs. Similarly, Singh *et al.* (2000) reported higher values in white leghorn chicken. There was no effect of management on specific gravity of egg, all eggs either from field or from farm having similar values of specific gravity. Similarly, the interaction effect was also non-significant (P<0.05). The egg specific gravity could be correlated to quality of the shell which determines important traits such as breaking strength, thickness, pore density, and elasticity. Hence, egg specific gravity may serve as an indicator of egg shell quality. The specific gravity of eggs is also related to porosity and hatchability of egg. At the same time, measurement of specific gravity is one of the cheapest, quickest and non-destructive methods of assessing shell strength. Due to its relation to shell strength, egg specific gravity defines the shell internal structure and microstructure, which affect the hatchability success. Eggs of proper specific gravity, ranging from 1.07 to 1.10 g/cm³, are usually properly shaped, which is particularly important in the case of hatching eggs. The results of present study indicate that the specific gravity of egg lye within the range and will hatch well.

Keywords: Egg quality traits

EUCALYPTUS OIL AS AN INNOVATIVE APPROACH FOR INCREASING FARMER’S INCOME

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Introduction

Many plant species produce mixtures of odorous and volatile compounds known as essential oils (EOs). These mixtures play important roles in Nature and have been utilized by mankind for different purposes, such as pharmaceuticals, agrochemicals, aromatherapy, and food flavorants. *Eucalyptus* trees have perennial leaves that are odorous because of the presence of EOs that are produced and stored in secretory cells.

Purpose

Why Eucalyptus leaves oil??

Eucalyptus plantation is utilized for paper making, timber and fire wood purpose leaving the leaves behind unused which is generally burn out or buried in soil after harvesting. Eucalyptus leaves is consist of many useful compounds for which it can be utilized and will help in increasing farmer’s income as well as eco-friendly and environment friendly management of plant diseases.

Use of Eucalyptus Oil

PHARMACEUTICALS: The Eucalyptus EOs utilized as pharmaceuticals are rich in 1,8-cineole, whereas those used in perfumery are rich in citronellal, citral and geranyl acetate.

ANTIMICROBIAL: Significant insecticide, antibacterial and fungicide effects have also been observed for EOs produced by *Eucalyptus* species.

BIOPESTICIDE: Eucalyptus oil can be used as an alternative to chemical or synthetic pesticides as a step towards sustainability in agricultural production. Biopesticides, when applied properly have an immense potential to add sustainability to agriculture and environmental safety.

PLANT GROWTH ENHANCERS: Biopesticides don’t have any residual effect and they are biodegradable; this makes them ecofriendly. The biopesticides also enhance the rhizosphere activity and plant growth & development as they encourage the growth of beneficial soil microbes. This also helps in achieving good yield and there by good income to the farmers.

Conclusion

The essential oil from Eucalyptus leaves contained citronellal, isopulegol and citronellol as the primary constituents and secondary metabolites such as phenolic compound that is found in essential oil with potent anti-microbial activities. EEO possessed a strong antibacterial and antifungal activity, indicating EEO had a broad application prospect in food and pharmaceutical products.

Keywords: Essential oils, 1,8-cineole, Parmaceuticals, Biopesticides and Sustainability

INVITRO PROPAGATION AND EFFECT OF PLANT GROWTH REGULATORS ON ROOTING OF ROHIDA

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Introduction

Rohida (*Tecomella undulata* Seem.) is deciduous, small size tree of monotypic genus *Tecomella* from the family Bignoniaceae which chiefly found in arid zone region. In *in vitro* shoot cultures from nodal explants of mature trees were established and multiplied. Tissue culture protocol remains ineffective due to lack of reproducible rooting methods. Therefore, there is a need of improvement in shoot multiplication and long-term subculturing and better knowledge of root induction in this species.

Purpose:

The natural regeneration of this tree is very poor, therefore cannot be supplemented with artificial regeneration. Because of its poor seed viability, dormancy, seed infertility, improper harvest from the tree, lack of uniformity and resemblance to mother tree, loss of valuable germplasm, high rate of cross-pollination leads to loss of desirable silvicultural traits. So, invitro propagation is preferred over natural regeneration. Invitro propagation provides uniformity to plants and gives large no. of plants in very short period of time.

Effect of Growth regulators

Tyagi and Tomar (2013) studied the factors effecting in vitro shoot proliferation and rooting of mature *Tecomella undulata* (Sm.) Seem Tree and revealed that the shoot cultures from nodal explants initiated on Murashige and Skoog medium in January-February months shown better results. Apical part of the shoot sub cultured on MS + 4.4 μ M BA medium will generate more rootable shoots. Rooting experiments done during January to March months with pre-treatment of IBA (492.1 μ M) and NAA (537 μ M) solution for 15 minutes followed by transfer to ½ B5 basal medium gave the best rooting results.

Conclusion:

Micropropagation of *T. undulata*. the shoot cultures from nodal explants initiated on MS basal medium. Advance micropropagation technique offers several advantages over macropropagation technique, such as, faster multiplication, regeneration of plants throughout the year, elimination of viruses through shoot tip culture, selection of normal clonal variants and preparation of artificial seeds through somatic embryogenesis.

Keywords: Micropropagation, stem cutting, nodal explant, MS medium and macropropagation.

INTEGRATED WEED MANAGEMENT

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ABSTRACT

A weed is a plant growing where it is not desired. Weeds directly compete with crops for limited resources which reduce crop yield and increase the cost of production. Integrated method is a system which brings all feasible methods of weed control harmonizing them into a single and coordinated system designed to maintain weeds below those levels at which they cause economic loss. Integrated weed management is a long-term weed management approach.

Methods

Integrated weed management is a method of weed control that uses multiple approaches. IWM uses knowledge of weed biology, (emergence, growth rate, fecundity) integrated with multiple weed control tools to manage weeds throughout the growing season. IWM includes many different methods to manage weeds *i.e.* mechanical weed control, cultural weed control, chemical control and biological control. IWM is designed to strategically target components of the life cycle of weeds to diminish their growth and development.

Results

Main goals of a weed management system is: reduced weed density, reduce the amount of damage that a given density of weeds inflicts on an associated crop, and alter the composition of weed communities towards less aggressive and easier-to-manage species. Economic analysis revealed that herbicides use in combination with hand weeding is most economical. IWM is becoming more prevalent around the world as the incidence of herbicide resistant weeds increases. Rotating of herbicides reduces the risk of developing herbicide-resistant weeds.

Conclusion

The integrated weed management is a sustainable, ecological approach and economical viable method. Future research in India must focus on decision-making processes, weed biology and ecology, environmentally and economically viable components of integrated weed management practices in cropping systems, herbicide resistance, environmental issues related to transgenic plants, and potential benefits of weeds.

Keywords: Integrated weed management, Weeds, weed competition.

EFFECT OF AMBIENT AIR QUALITY ON WHEAT CROP PROXIMATE TO PRISM CEMENT PLANT SATNA (M.P.)

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ABSTRACT

Cement manufacturing units are major air pollutant releasing industries. These industries release mainly PM_{2.5}, PM₁₀, NO_x, SO_x. Increased amount of these pollution affects not only human beings but also trees and crops as well as all biological systems. Present study was done to find out effect of air pollution caused by prism cement Satna on nearby cultivated wheat crop.

It was observed that crop growth and yield of wheat was less in those area where pollution level was high. Area which was far away from industry exhibited better wheat crop plant growth and yield

Keywords: Cement Industries, wheat plant, biological systems

GREEN COMPOSITES: SUSTAINABLE MATERIALS FOR FUTURE ERA

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ABSTRACT

Composite materials are materials made from two or more constituent materials with significantly different chemical and/or physical properties that, when combined, produce a material with characteristics different from the individual components. Composite materials are at peak demand due their extraordinary strength, high modulus and lower density when compared to the

conventional metals and wood materials in wide variety of applications. At this moment, the majority of high strength resins and fibres used in composite structures are produced from a non-renewable resource, petroleum that would be estimated to last only a few decades at current rate of consumption. Since 1932, Fiber Reinforced Plastics (FRPs) have been widely employed in aerospace, automobile, marine, transportation industries, buildings, sports equipment, pleasure boats, wind energy and so many areas. Due to the expanding applications of composites in recent decades, production has grown at an exponential rate with escalated plastic consumption. Their disposal at the end of their lives has become not just difficult but also costly. Thermoset resin-based composites are difficult to recycle or reuse in other applications. Over 90 percent of composite trash is disposed of in landfills, with only a small percentage being broken into powder for use as low-grade filler or burnt to recover energy. Further, these composites do not degrade in the natural environment. As a consequence, the major present-day research is pointed toward developing sustainable and eco-friendly ‘green’ composites with green resins using plant-based fibres and polymers. Green composites, also known as fully biodegradable composites are composites where both the reinforcement and matrix components are fully biodegradable. In green composites, natural fibres derived from renewable plant sources are used as reinforcement while resins derived from plants or plant products are used as a matrix component. The green composites not only replace the traditional materials such as steel and wood but also challenge certain non-biodegradable polymer composites. Plant-based products are renewable and tend to be carbon neutral as well. Green composites can be composted at the end of their lives to produce organic soil repurposed to grow more plants. Green composites based on plant proteins or starches and fibres suitable for use in packaging, housing or transportation panels, furniture, board sports and secondary structural applications. Meanwhile, green composites are facing some challenging issues which could be rectified with significant research and hence can find their way into the market. On the other hand, green composites have also addressed the problem of bio-degradability of synthetic polymer-based composites, which is the need of the hour. Hence, this paper is in effort towards showing the generalized advantageous characteristics of green composites than the synthetic ones and their way for future sustainable generation.

Keywords: Green composite, sustainable, eco-friendly, bio-degradability

FORMULATION AND QUALITY EVALUATION OF QUINOA AND MORINGA BASED VERSATILE FOOD MIX FOR GERIATRICS

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ABSTRACT

Ageing is an inevitable process of life which involves gradual degeneration of the structure and function of the organism. The cornerstone of geriatric nutrition is a well-balanced diet. However, there is a need to development of new and innovative versatile geriatric food mix. The supplementations of the quinoa, amaranth and moringa parts are very nutritious and fulfill the basic diet requirements of the old age people. The geriatric food mix was prepared using various combinations of quinoa, moringa pods powder and amaranth powder. Among all formulations of versatile geriatric food mix the formulations T8 (55% quinoa, 20% moringa pod powder and 15% amaranth) were found best in the sensory evaluation.

In this study an attempt has been made to formulate a geriatric food gruel mix with higher nutritive value. The results showed that acceptable geriatric food mix could be produced from quinoa, amaranth, moringa pods and green gram powder. The optimized quinoa and moringa based geriatric food mix showed good sensory acceptability revealing their potential for consumption by elder population. Thus, in the light of the scientific data it may be said that quinoa and moringa

are good source of macro and micro nutrients hence open the way of introducing these materials to daily food items to prevent health problems. The incorporation of these ingredients in the geriatric food could help to alleviate the deficit in protein, fibre, minerals in the elder population.
Keywords: Geriatric nutrition, supplementation, quinoa, moringa, geriatric food.

ENDOPHYTIC BACTERIA FOR BIOCONTROL ACTIVITY THROUGH ASSESSMENT OF PLANT GROWTH PROMOTING ABILITY

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Introduction

Endophytic bacteria are ubiquitous in various plants and they have been isolated from stems, roots, flowers, leaves, fruits and seeds. In contrast to phytopathogenic bacteria, they do not cause any disease symptoms; indeed, they can promote plant growth. Plant growth promoting bacterial endophytes (PGPBE's) facilitate plant growth *via* direct and indirect mechanisms.

Purpose:

Biological control and host plant resistance are considered as the most economical and eco-friendly method of management of plant diseases. Hence, efforts are being made to understand inheritance of resistance in plants as well as biological control agents are used to manage disease. Due to chemical control, pathogen has the ability to develop new pathogenic races leading to breakdown of resistance within few years.

Mechanism of Resistance:

In direct mechanism, promotion of plant growth occurs through the production of phytohormones like indole acetic acid (IAA), cytokinin, Zinc (Zn) and Phosphorous (P) solubilization with enhancement in assimilable nitrogen availability to host through biological nitrogen fixation (BNF). In indirect mechanism, bacterial endophytes produce secondary metabolites *i.e.* siderophore, antibiotics, hydrogen cyanide (HCN) and enzyme like 1-Aminocyclopropane-1-carboxylate (ACC) deaminase, cellulase and protease that play an important role in conferring tolerance to biotic and abiotic stresses.

Mwajita *et al.*, 2013 isolated the bacterial isolates from whole plant rice samples and screened for phosphate solubilization, nitrogenase activity and IAA production. Sharma and Johri (2003) reported that the production of siderophores by endophytes is advantageous for plants, as it is one of the mechanisms to outcompete phytopathogens by inhibiting their growth within the plants.

Conclusion

Siderophores produced by bacteria may promote the plant growth directly, by providing iron to plant, as iron accessibility to plants is usually low; therefore, organic chelators produced by bacteria will help in iron absorption or benefit plants indirectly, by obstructing the availability of iron to pathogens, thus restraining pathogen growth. This ultimately leads to increase in plant immune system as well as protects plant from infection by plant pathogens.

Keywords: Pathogenic races, phytohormones, siderophore, Phosphorous (P) solubilization and organic chelators.

ROLE OF ICT INNOVATION IN AGRICULTURE AND EMPOWERING FARMERS

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ABSTRACT

Agriculture is a vast sector of the Indian economy as its share to gross domestic product (GDP) is almost 17 per cent. Agriculture is the main occupation of over 60 per cent of the population of India. In the developing countries, agriculture plays a vital role in the global economy with the majority of the rural population depending on it. The depletion of natural resources makes improvement of agricultural production more important yet more difficult than ever. This is the reason that although the demand is constantly growing, Information and Communication Technology (ICT) offers to producers the adoption of sustainability and improvement of their daily living conditions. ICT offers timely and updated relevant information such as weather forecast, market prices, the occurrence of new diseases and varieties, *etc.* The new knowledge offers production enhancing technologies to the farmers and empowers them with modern agricultural technology. Therefore, it acts accordingly for increasing the agricultural production in a cost effective and profitable manner. The timely information and practical solutions of the agricultural problems helps the farmers to adopt good agricultural practices, make better choices of inputs and to plan the cultivation properly with farm management, marketing, logistics. Quality assurance need less time when ICT is used alone or in conjunction with other ICT systems, which increases productivity and better utilizes resources.

Keywords: - Agriculture, Empower Farmers, GDP, ICT.

PROSPECTS OF LOCATION SPECIFIC IMPLEMENTS AND DEVICES FOR AGRICULTURAL MECHANISATION IN KALIMPONG DISTRICT OF WEST BENGAL – A CASE STUDY

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ABSTRACT

The Kalimpong district of West Bengal is situated on the eastern part of Darjeeling Himalayas, where about 80% population living in rural areas depends directly or indirectly on agriculture for their livelihood. The district is rich in biodiversity and blessed with large varieties of flora and fauna. The high degree of topographical and climatic variation within small area favours cultivation of a wide range of crops like paddy, maize, finger-millet, soybean, mustard, potato, ginger, large cardamom, betel-nut Mandarin oranges, vegetables etc. However, the cost of production per unit area is high due to non-availability of location specific farm implements for unique topographical features and irregular-sized fields. A study was conducted to study the scope of improved farm implements and devices in Kalimpong district of West Bengal and, it is evident from study that the introduction of location specific agricultural implements and devices not only help in drudgery reduction but also increase the agricultural productivity per unit area.

ASOIL ENZYME ACTIVITIES AND ITS RELATIONSHIP WITH SOIL PHYSIOCHEMICAL PROPERTIES OF TROPICAL SAL FOREST IN CHHATTISGARH: ITS POTENTIAL ROLE ON RESTORATION OF SAL FOREST

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ABSTRACT

Soil enzymes play important role in nutrient dynamics such as biogeochemical cycle, catalyzing the reaction involving in organic matter decomposition, nutrient synthesis (C, N, P, K etc), which can be used as early sensitive indicator of soil nutrient changes. The soil enzymes are indicative of biological equilibrium, soil quality and changes in the biological status of soil and act as the sensor for soil degradation and microbial status too. Thus, the enzyme study is necessary for the soil health and nutrient management in Tropical Sal ecosystem. To keeping this in view, the present study was carried out to determine the influence of soil enzyme activities, available nutrients and physiochemical properties. Sampling was done in random manner to obtain soil samples from Tropical Sal Forest of Achanakmar-Amarkantak Biosphere Reserve (AABR), Bilaspur (C.G.). Composite soil samples from three different depths (i.e. 0-10 cm, 10-20 cm, 20-30 cm) were collected from 5-different quadrates of each growing stage. One part of it was dried and retained for the estimation of physiochemical parameters and other part was stored at freezing temperature for soil enzyme activity. Dehydrogenase enzyme determined by Casida et.al. (1977) and for Phosphatase use Tatabai and Bremner (1965). Comparative analysis of the soil enzymes with respect to different soil depths shows positively correlation with different physiochemical properties of soil. A statistically significantly higher dehydrogenase enzyme activity was observed in surface soil and gradually decreases with the increasing depth. Same pattern was followed by soil organic carbon storage, Nitrogen, potassium etc. In case of Phosphatase, there was also gradual decreasing with increase the depth of soil from each site and it shows the positively correlation with some soil properties such as phosphorus, pH etc. The enzymatic activities are higher in summer as compare to winter and did not significantly differ between different growing stages.

CHALLENGES OF SUGARCANE CULTIVATION IN WEST CHAMPARAN, BIHAR

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Purpose

Sugarcane is an important commercial and cash crop in India. The area, production and productivity of sugarcane in the West Champaran district of Bihar were 1,43,958 ha, 1,57,79,524 tons and 109.61 tons/ha, respectively. However, cane yield and sugar recovery are key factors to regulate sugar industries in India as well as in West Champaran, which was regulated by agro-climatic condition, resource availability, technology dissemination and adoption, policies, etc. Therefore, to identify the constraints faced by local sugarcane growers in cane production is the main focus of this investigation.

Methods

The present study was carried out during 2020–21 in the five villages *i.e.*, Badnihar, Gaunaha, Hardi, Katsikari and Samhauta of West Champaran district of Bihar. With a total sample size of 120 respondents, 24 farmers who cultivate sugarcane and have been doing so for the past three years were randomly chosen from each village. The constraints were delineated under the heads like situational, technological and economical.

Results

The constraints encountered by most of the respondents in adoption of sugarcane production and protection technology were irregular/unseasonal heavy rainfall followed by unavailability of safe/biopesticides at local market, irregular supply of electricity, shortage of fertilizers in the market, unavailability of labour in time for intercultural operation etc. Majority (93.33%) of respondents faced problems in high cost of insecticides/fungicides/herbicides followed by high cost of farm machinery (91.67%), high cost of agricultural labour (87.50%), high cost of fertilizers (85.00%), high cost of sugarcane seed setts (81.67%) under economic constraints.

Conclusions

Among the different types of constraints heavy rain fall from May to September was major situational constraints while, knowledge and adoption of natural enemies/friendly insects for pest management practices got 1st rank under technical constraints.

Keywords: Sugarcane, Economical constraints, Integrated pest management, Situational constraints, Technological constraints

INTEGRATED PEST MANAGEMENT (IPM) STRATEGIES ADOPTED BY SUGARCANE (*Saccharum officinarum* L.) PRODUCERS IN WEST CHAMPARAN, BIHAR

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Purpose

In India, the tropical belt accounts for 42.9% of total sugarcane growing area, while, the subtropical sugarcane zone accounts for around 57.1%. However, cane production and sugar recovery are key factors to regulate sugar industries in India, thus disseminating and adopting advanced agricultural technology might be a solution. Among the numerous technologies, one of the most essential components that cane producers should adopt was integrated pest management (IPM) practices.

Methods

The present study was carried out during 2020–21 in the five villages *i.e.*, Badnihar, Gaunaha, Hardi, Katsikari and Samhauta of West Champaran district of Bihar. With a total sample size of 120 respondents, 24 farmers who cultivate sugarcane and have been doing so for the past three years were randomly chosen from each village. The improved sugarcane cultivation and IPM practices were classified into four major categories, *viz.*, cultural, mechanical, biological and chemical practices and seven, three, two and two components were included in each category, respectively.

Results

The study revealed that 75% of the respondents belonged to low knowledge level of IPM practices whereas, only 8.33% respondents have high rate IPM adoption. Out of all cultural practices, 37.6% respondents were partially aware about cultural practices while, 27.9% respondents were unaware.

In case of mechanical and chemical control practices 34.3 and 31.3% respondents were fully aware, respectively. However, majority of the respondents (84.2%) were unaware about biological control practices followed by 11.1 and 4.72% partially and fully aware, respectively.

Conclusions

The respondents had low to medium level of adoption of IPM practices and only few respondents had high level of adoption. Most of the respondents were well aware about cultural, mechanical and chemical pest management practices but, they are not aware about biological pest control practices.

Keywords: Biological pest control, Cultural practices, Integrated pest management, Mechanical practices, Sugarcane

FEEDING PRACTICES FOR DAIRY ANIMALS IN WEST CHAMPARAN DISTRICT OF BIHAR

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Purpose

Balanced feeding practice is one of the most important aspects for the dairy farming since it not only affects the health of the animals but also the productivity and performance of the dairy animals. In dairy farming more than 60% recurring expenditure is involved in feeding of animals so proper feeding management is also important for the good benefit: cost ratio.

Methods

Present study was carried out in two sub divisions namely Narkatiaganj and Bagaha of West Champaran district by using the structured interview schedule and organizing participatory rural appraisal in 6 purposely selected villages of KVK, Narkatiaganj in which total 120 dairy owners were randomly selected. Direct observation technique and other primary and secondary sources were also used for data recording.

Results

Dry fodder feeding to the dairy animals was practiced by all the dairy farmers and quantity fed was found optimum for the majority (70%) of dairy owners. Green fodder feeding on regular basis was practiced by only (20%) and rest fed only during *Kharif* seasons also it was found not optimum quantity for the majority (55%) of the respondents who are regular in green fodder feeding practice also leguminous fodder production like barseem for feeding of dairy animals was practiced by only few (5%) dairy farmers. Concentrate feeding is practiced by 90% of the respondents but it was found non optimum quantity for almost all of the respondents and also majority (65%) of the dairy farmers fed improper concentrate mixture. Most (85%) of the farmers not providing mineral mixture to their dairy animals. Feeding of salt was practiced by most (90%) of the farmers. Green fodder preservation is not practiced by any farmers. Grazing for dairy animals is practiced by few (30%) farmers. Ad libitum water to the dairy animals was practiced by few (25%) dairy farmers and rest of the farmers practiced restricted type water supply.

Conclusions

Dairy animal feeding practice in studied area was found very poor and it is necessary to aware them regarding balance feeding of dairy animals and also by providing non conventional feed like azolla and others also by motivating them to grow improved varieties of leguminous fodder and feeding mineral mixtures to the dairy animals.

Keywords: Dairy Animals, Feeding Practice, Concentrate, Mineral Mixture, Green Fodder

FOOD DIVERSITY AND UTILIZATION PATTERN IN THE TRADITIONAL HOMEGARDENS OF PAPU VALLEY, EAST KAMENG DISTRICT, ARUNACHAL PRADESH

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ABSTRACT

The traditions of raising Homegardens have been a part and parcel of the tribal communities of Arunachal Pradesh. Even then only a single study has been done. The present investigation was carried out from March 2021-May 2022 to assess the diversity of homegardens in Papu valley, the rice bowl of East Kameng District, Arunachal Pradesh. The study was carried out in four villages at two different altitudinal gradients viz. Pipokoro(1200MSL) and Lumdung(1100 MSL) at high altitude and Nere(700MSL) and Sede(600 MSL) at low altitude. A total of 10 respondents of different economic statuses in each village with a total of 40 respondents were selected and interrogated for the information related to the study. It was found that 87% of households maintained HGs in the valley. Lack of landholdings was the major reason for not maintaining one followed by non-availability of cheap labor being the second reason. A total of 35 crops belonging to 18 different plant families were documented from the high altitude study sites and a total of 47 crops belonging to 35 different families were documented from low altitude study sites. 8 categories of economic crops were recorded during the survey. Vegetables had the highest occurrence (40%), while indigenous faith crops had the least occurrence (2%). Most of the crops were seasonal vegetable herbs followed by perennial vegetable shrubs and fruit trees. 79.03 % of the crops are used for food purposes and 20.97 % are used for non-food purposes.

ADOPTION OF RECOMMENDED ONION PRODUCTION TECHNOLOGY IN WEST CHAMPARAN OF BIHAR

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Purpose

Onion is cash crop of India which is grown in all over the state of India and it is second largest producer after china but in West Champaran of Bihar, farmers grown onion in 2.40 ha of which production is 61.92 million ton which is very low due to adopt poor production technology and lack of knowledge about the technology and big problems of water-logged area. Thus, Government should give proper training and extension strategies which will lead to the maximum adoption of recommended production practices in onion to increase their yield.

Methods

Hundred farmers were selected from different villages in district of west champaran which is cultivated of onion on small area under on farm testing of K.V.K., Narkatiaganj. Out of them, a total of 100 farmers were selected by proportionate random sampling method. Thus, 100 onion growers constituted the sample respondents for this study. The adoption index was developed and used to measure the adoption level of improved onion production technology. The data were collected by personal interview of the respondents. They were analyzed and interpreted in view of the objectives.

Results

Knowledge of farmers about adoption of improved technologies in cultivation of onion in west Champaran: The result showed that majority of the farmers was not adopted about improved technologies for onion cultivation. It was found that Suitable soil for onion cultivation (rank I), apply of Irrigation requirement (rank II), Herbicide application for onion (rank III), Pest and disease management (rank IV), Seed rate for one hectare (rank V) and preparatory tillage (rank VI). The probable reason for high adoption of Suitable soil for onion cultivation (rank I) may be due to most of farmers used Suitable soil for onion cultivation for protecting the crop from seed born disease.

Conclusion

It is concluded that the overall adoption level of the respondents regarding recommended cultivation technology of onion is low while Government should give proper training and extension strategies which can lead to the maximum adoption of recommended production practices in onion to increase their yield.

Keyword: OFT, yield, extension gap, technology gap

YIELD AND ECONOMIC BENEFIT ON MUSTARD (*BRASSICA JUNCEA*) AS INFLUENCED BY IMPROVED INPUT MANAGEMENT PRACTICES

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ABSTRACT

Purpose

India is the 5th largest oilseed economy in the world accounting 7.4% of world's oilseed output. In India, mustard contributes 28.6% in the total oilseeds production and sharing 27.8% in the India's oilseed economy. Mustard is an energy rich crop which requires the major, secondary and micronutrients in adequate quantity for higher production. However, imbalance fertilization, faulty cultural practices and inadequate disease management practices decline it's yield drastically.

Methods

Seed of improved mustard *var.* Rajendra sufalam was distributed among 103 farmers under cluster frontline demonstration (CFLD) for cultivation of 40 ha area trough KVK Narkatiaganj. Showing was done through zero tillage machine with a seed rate of 2 kg acre⁻¹ and treated with PSB @ 5 g kg seed⁻¹. Recommended doses of NPK were applied along with sulphur bentonite @ 25 kg acre⁻¹. For pest and disease management imidacloprid 17.8 SL @ 1 ml 2 L⁻¹ of water and mancozeb 75% WP @ 2 g L⁻¹ of water was applied.

Results

Results depicted that seed yield of mustard ranged from 9.8-16.8 q ha⁻¹ whereas, the average seed yield was 12.2 q ha⁻¹. In comparison to local variety the yield was enhanced by ~43.5%. In case of straw yield maximum and minimum value was 27.7 and 21.4 q ha⁻¹, respectively and the mean was 24.6 q ha⁻¹. Adoption of best management practices also enhance the net income within the range of Rs. 28,539 to Rs. 40,980 to the farmers with an average B:C ratio of 2.54.

Conclusions

Adoption of high yielding variety, balance fertilization, integrated pest management strategies and improved cultural practices enhance the yield of mustard crop as well as increases the net income.

The participatory farmer was satisfied with the technology transferred and enthusiastic to adopt this technology.

Keywords: Imidacloprid, Mancozeb, Mustard, Sulphur bentonite, Zero tillage

YIELD AND ECONOMICS OF INTERCROPPING COWPEA AND MARIGOLD IN ELEPHANT FOOT YAM

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ABSTRACT

In Bihar elephant foot yam cultivation is concentrated in the rich alluvial soil of Samastipur and Vaishali region. In rohtas district also few areas for cultivation of elephant foot yam. Productivity of these lands could be fully exploited by growing intercrops as intercropping system utilizes resources efficiently. An investigation was carried out at KVK Rohtas to know the suitability of cowpea and marigold as intercrops in elephant foot yam for years. The experiment conducted with three treatments replicated 7 times in Randomized block design. The treatment includes T₁ Elephant foot yam solo, T₂ Elephant foot yam intercropped with cowpea T₃ Elephant foot intercropped with marigold. The pooled data revealed that intercropping treatments, land equivalent ratio was consistently greater than unity. Highest elephant foot yam equivalent yield (52 t/ha) was recorded in elephant foot yam intercropped with marigold in (1:1) row arrangement. However maximum income per rupees investment (1.85) was obtained when elephant foot yam intercropped with cowpea (1:1) row arrangement. The highest B:C ratio is 3.39 is in T₃, and net profit per hectare was Rs 338500.00 (Three lakh thirty-eight thousand five hundred only) found.

Keywords: elephant foot yam, marigold, yield, and economics

IMPACT OF STUNTED FISH FINGERLING STOCKING ON THE GROWTH AND YIELD OF CARP FISH FARMING

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ABSTRACT

The fish farming in Rohtas district is dominated by pangassius fish species. Carp fish species are generally grown as polyculture along with pangassius. Although 13 percent of surveyed farmer were culturing carp fishes as composite culture. Semi intensive culture practices were adopted by 80 % of the fish farmers while 20 % were doing extensive culture. They used carp seed as stocking in stocking pond after every monsoon which were roughly 1 to 2.5 months old. Carp seeds of Improved Catla, Jayanti rohu and Amur carp of more than 9 months old were taken as stocking material. They were stocked at the rate of 5000 per hectare. The assessment was done for eight months from September to April. The fish production was recorded as 6.55 ton/ha in stunted fish seed while it was only 3.6 ton/ha in normal fish seed culture. The gross profit increased to Rupees 3,19,375 due to only change in stocking material in fish culture in the same time period. Many farmers were started stocking the stunted fish seed or the yearling in the district after the experiment.

Keywords: Yearling, Stunted fish seed, semi-intensive, extensive, Jayanti rohu, Amur carp

IMPACT OF SESBANIA INCORPORATION ON PHYSICO-CHEMICAL PROPERTIES OF SOIL IN RICE WHEAT CROPPING SYSTEM

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ABSTRACT

Dhaincha (*Sesbania aculeata*), a member of the Fabaceae, is the cheapest and best source as compared to other green manure crops for improving soil fertility due to its fast growth, high biomass production and ability to convert large amounts of atmospheric nitrogen into a usable form for plants. It also increases water holding capacity of soil and bears more nodules which fix atmospheric nitrogen. The experiment was laid out in a randomized complete block design with three replications of incorporation days ($T_1= 35$ DAS, $T_2=45$ DAS & $T_3= 55$ DAS). Seeds of dhaincha accessions were sown in experimental plot @ 20 kg/ha in the month of April. The 35, 45 and 55 days old dhaincha plants were incorporated in soil with the help of rotavator and soil samples were collected before sowing and after decomposition of dhaincha biomass (8 Days after incorporation) and analyzed following standard procedures.

Fresh weight ($g\ plant^{-1}$) was found to be significantly higher in T_3 (130 g) followed by T_2 (94.73 g), and T_1 (55.60 g). Highest biomass yield on fresh weight basis was observed in T_3 (37.82 t/ha), followed by T_2 (27.56 t/ha) and T_1 (16.18 t/ha). The maximum number of root nodules was also found in T_3 (88), followed by T_2 (62) and T_3 (28). All of these factors responded significant and positive on physico-chemical properties of soil. The pH increases in normal from 6.05 to 6.1, Electrical conductivity of the Soil ($dS\ m^{-1}$) was changed from 0.18 to 0.20. Organic carbon was also found in positive trend from 0.45 to 0.46 percentage. Nutrient status of nitrogen, phosphorous and potash increased to 29.41, 19.04 and 18.13 percentage, respectively due to dhaincha incorporation in soil at 55 days after sowing. Therefore, the experiment confirms that the dhaincha incorporation in soil at 55 days after sowing is positively significant on soil nutrient profile in comparison to 45 and 35 days after incorporation in soil.

Keywords: Dhaincha (*Sesbania aculeata* L.), biomass, soil fertility, green manuring.

ROLE OF INTEGRATED NUTRIENT MANAGEMENT PRACTICES ON ECONOMIC STATUS OF FARMERS

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ABSTRACT

Technologies have played a crucial role in helping them fulfill their services towards the farmers' ecosystem. Out of all the technologies Integrated Nutrient Management one of them, refers to the maintenance of soil fertility and of plant nutrient supply at an optimum level for sustaining the desired productivity through optimization of the benefits from all possible sources of organic, inorganic and biological components in an integrated manner. Keeping these facts in mind a field experiment was conducted at farmer field of Ballia district during 2020-21 to investigate the **role of Integrated Nutrient Management practices on economic status of Farmers**. The study was done in RBD with four treatments and six replications with variety Varunna of mustard to evaluate the observation regarding growth attributes, yield components and economics of mustard. The land was prepared in early November and nutrients are applied as per treatments ($T_1 =$ farmer

practices, T₂ = RDF through SSP, T₃ = soil test-based fertilizers application and T₄ = soil test-based fertilizers application (75% through chemical fertilizers + 25 % through organic fertilizers), respectively. Results revealed that different fertility levels had significant effect on all growth, yield and economical parameters i.e., number of branches, number of pods, length of plant, test weight, no of seed /pod, weight of seed, weight of straw, biological yield, harvesting index, cost of cultivation, net income and BC Ratio. The use of soil test-based fertilizers application through 75% chemical fertilizers and 25 % with organic manure resulted in significantly higher seed yield of mustard (18.34 q ha⁻¹) followed by soil test-based fertilizers application (14.60 q ha⁻¹), nutrient application as par RDF (13.21 q ha⁻¹) and farmers practices (10.18 q ha⁻¹), respectively. Balance fertilization at right time with proper method and sources nutrient uses efficiency and productivity of mustard. Twenty-five per cent inorganic fertilizers can be saved by use of FYM without deterioration in mustard yield. Due to cut the cost of cultivation and optimum yield and facilitate the market the farmer income improved.

Keywords: FYM, Nutrient use efficiency, mustard, yield, economics and net return

A STUDY ON INFORMATION SEEKING BEHAVIOUR OF FARMERS THROUGH MOBILE: STANDARDISEDMULTIVARIATE REGRESSION BASED ANALYSIS

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ABSTRACT

With the increasing gap between farmer and extension agencies, the end users are unable to get real-time information which is quite essential in modern agricultural. In the present era of information centricity, ICT, which is spreading rapidly among the people, is proving to be a boon in reducing the growing gap between the farmers and the extension agencies. A mobile phone is one of the ICT tools and is quite useful for farmers to seek real-time information from intended sources anywhere anytime. Sitapur district of Uttar Pradesh was selected as local of research purposively for present study. Two blocks from the district were also selected randomly. The randomly selected three villages from each block and each village contributed 15 respondents for a gross sample of 90 respondents for the present study. For this study there were fourteen variables selected as independent and one dependent variable, i.e., information-seeking behaviour farmers through mobile. The data collection was done by personally interviewing the respondents with the help of a semi-structured interview schedule. Statistical tools used for data processing and analysing such as frequency, percentage, arithmetic mean, standard deviation, Correlation, Multivariate linear regression analysis and Garrett ranking. Majority of with socio-economic and personal attributes respondents like age group, family size, family education status, farming experience, annual family income, mass media exposure and extension contact were falling under medium level. Rest of independent variables like gender (found male-dominated); family type (mostly nuclear family); educational status (majority had up to middle-level education); social participation (participation in one organisation by the large proportion of respondents); landholding (mostly small and marginal) and credit sources (commercial banks) were found. Most of the selected farmers had a medium level of information seeking behaviour through

mobile. Correlation analysis revealed that the independent variables like education, social participation, annual family income, credit sources, mass media exposure and extension contact were positively associated with dependent variable at 1% level of significance. In Regression analysis, R² value found 72.1% and the variables like education, social participation and annual family income appositively related at 1% level of significance and their standardised beta values were 0.282, 0.210 and 0.264 respectively. Variables like mass media exposure and extension contact observed positively significant at 5% level with its standardised beta values 0.235 and 0.188 respectively. Sources of credit were also found significant at 10% level with standardised beta value 0.107. The study demonstrated that the lack of literacy and Smartphone proficiency were observed major issues under awareness related constraints. The most critical miscellaneous constraints include privacy concerns and information negativism faced by farmers in using mobile as the source of information.

Keywords: Innovation, Information seeking behaviour, ICT, mass media exposure, mobile phone, standardised multivariate regression.

RESPONSE OF SAFFLOWER (*Carthamus tinctorius* L.) TO FOLIAR APPLICATION OF MICRONUTRIENT MIXTURE

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ABSTRACT

Purpose: Safflower (*Carthamus tinctorius* L.) is an important oilseed crop in the world and ranks third next to groundnut and soybean in crop production. The spraying of micronutrients has led to improving the growth, yield and increased macro and micronutrient uptake to optimize the dosage of micronutrient mixture for foliar spray for enhancing growth, yield and oil content of safflower

Methodology: A field experiment on “response of safflower (*Carthamus tinctorius* L.) to foliar application of micronutrient mixture” was conducted during Rabi 2018, at MARS farm, Raichur. Experiment was laid out in Randomized complete block design with three replications and nine treatments.

Results: The foliar application of Grade-I multi micronutrient mixture (Fe-2%, Zn-3%, Mn-1% and B-0.5%) at 30 and 50 days after sowing @ 10 ml/litre and soil application of RDF (75:75:40 and 80 kg ha⁻¹ of NPK and gypsum, respectively) along with zinc sulphate @ 6 kg ha⁻¹ has recorded higher growth parameters viz., plant height, number of leaves, leaf area, leaf area index and total dry matter production at 25, 50, 75 DAS and at harvest stage. The treatment also recorded highest seed yield (1557 kg ha⁻¹), stalk yield (2478 kg ha⁻¹), protein yield (336.16 kg ha⁻¹), oil yield (434.30 kg ha⁻¹) and harvest index (38.59%). The yield and quality parameters like test weight (6.42 g), oil content (27.90 %), protein content (21.58 %) and uptake of nutrients viz., nitrogen (118.07 kg ha⁻¹), phosphorous (20.07 kg ha⁻¹), potassium (87.08 kg ha⁻¹), iron (629.21 g ha⁻¹), zinc (331.29 g ha⁻¹), manganese (113.32 g ha⁻¹), copper (103.34 g ha⁻¹) and boron (122.74 g ha⁻¹) and it was on par with the treatment receiving RDF (75:75:40 and 80 kg ha⁻¹ of NPK and gypsum, respectively) and along with foliar application of Grade-I micronutrient mixture @ 10 ml/litre and was superior to other treatments. The highest gross returns, net returns and B:C was recorded in treatment receiving foliar application of micronutrients along with RDF compare to other treatments.

Conclusion: From these results it can be concluded that foliar spray of Grade-I multi micronutrient mixture @ 10 ml /litre is economically feasible.

Keywords: micronutrient mixture, Safflower, Seed yield

SOIL NUTRIENT DYNAMICS FOR SOIL FERTILITY EVALUATION AND FERTILIZER RECOMMENDATION

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ABSTRACT

Soil testing is primarily to provide service or relevant advice to the end-users for making fertilizer recommendations and any other corrective measures available to them in the form of a soil test report. Soil test information is compiled soil-wise or area-wise in the form of soil test summaries. The soil test summary of an area indicates the number of samples falling in the category of high, medium or low N, P or K content. This is useful in the matter of ascertaining the logistics of fertilizer distribution and consumption. Keeping in view of the above, a study was conducted during 2019-21, to assess the fertility (nutrient) status of the soils of East Siang district of Arunachal Pradesh, and to formulate the fertilizer recommendations through nutrient indexing. A total of 350 soil samples were collected in the East Siang district of the Arunachal Pradesh and were analyzed for the available N, P & K contents, following the standard procedures. Based on the fertility rating for N, P and K, the analytical results for the soil samples (N, P & K) were categorized as low, medium and high separately. The results revealed that 35, 250 & 65 soil samples were belonging to the category of low, medium and high nitrogen status respectively. It was observed from the results of available P, 305 and 45 soil samples were categorized as low and medium respectively and none of the samples were found to have high nutrient status for P. The results of available K content of the soils indicated that 270, 60 & 20 soil samples were low, medium and high in available K. From the above results, nutrient indices were calculated for N, P and K separately. Nutrient index for N, P and K were found to be 1.92, 1.12 and 1.27 respectively. It clearly indicates that the available N, P and K status of the soils of East Siang district of Arunachal Pradesh were medium, medium and low respectively. Based on the nutrient index values for N, P & K, the fertilizer recommendations were formulated. Accordingly, 100 % of the recommended dose of N and 125 % of the recommended dose of P and K for various crops should be applied, not only for increasing the crop productivity but also to sustain the soil fertility.

EFFECT OF DIFFERENT SHADE NET COLOUR AND INTENSITY ON YIELD AND QUALITY ATTRIBUTES OF TOMATO (*Lycopersicon esculentum* L.) IN WESTERN RAJASTHAN

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ABSTRACT

The investigations on “Effect of Different Shade Net Colour and Intensity on Yield and Quality of Tomato, (*Lycopersicon esculentum* L.) in Western Rajasthan” was conducted at Precision Farming Development Centre, Agricultural Research Station, SKRAU, Bikaner from November, 2020 to June, 2021. Different colour (Red, Black, White, and Green) shade net with varying shade intensities (35%, 50%) were found to be significantly influenced most of the yield and quality attributes of tomato.

The maximum number of flowers per cluster (1.58, 1.91, 4.32, 4.66), and maximum number of fruits per cluster (1.43, 1.56, 4.04, 4.24) at 50, 75, 100, 125 DAT were recorded under red colour shade net. Maximum number of fruits per plant (5.77, 9.94, 31.60, 39.20) at 50, 75, 100, 125 DAT

were recorded under red colour shade net with 50% shade intensity. Maximum fruit length (5.25cm), weight (80.90g) and diameter (5.11cm) were recorded under black colour shade net. Maximum fruit yield per hectare (601.33 quintal ha⁻¹) and highest B: C ratio (2.73) was recorded under red colour shade net with 50% shade intensity. Maximum TSS (4.65⁰ B), acidity (0.85%), ascorbic acid (15.96mg/100g), lycopene (6.15mg/100g) and firmness (4.15 Kg cm⁻²) were obtained in which fruits those were grown under red colour shade net.

Keywords: Tomato, shade net colour, shade intensity and Lycopene

SOLAR BASED AUTOMATIC IRRIGATION SYSTEM

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ABSTRACT

A proper usage of irrigation system is very necessary because the main reason is the shortage of land reserved water due to lack of rain, spontaneous use of water as a result large amounts of water goes waste. Hence the paper aims smart irrigation with smart control and intelligent decision making based on accurate real-time field data. An automation of farm irrigation and soil moisture control by Arduino using soil moisture sensor. The automatic irrigation system senses the moisture content of the soil and automatically switches the pump when the power is on. When soil goes dry pump will start watering. The sensor sends the data to microcontroller which is interfaced to single relay to operate pump motor to switch ON/OFF, and the status of the pump is displayed on an LCD screen. The water pump discharge rate was measured 1.27 l/min.

Keywords: Microcontroller, Irrigation system, Sensor, LCD screen, Tensiometer

CLIMATE CHANGE AND ITS IMPACT ON AGRICULTURE

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ABSTRACT

Global climate change is a change in the long-term weather patterns that characterize the regions of the world. The unimpeded growth of greenhouse gas emissions is raising the earth's temperature. The consequences include melting glaciers, more precipitation, more and more extreme weather events, and shifting seasons. The accelerating pace of climate change, combined with global population and income growth, threatens food security everywhere. The term "weather" refers to the short-term (daily) changes in temperature, wind, and precipitation of a region.

Agriculture is extremely vulnerable to climate change. Higher temperatures eventually reduce yields of desirable crops while encouraging weed and pest proliferation. Changes in precipitation patterns increase the likelihood of short-run crop failures and long-run production declines. In the long run, the climatic change could affect agriculture in several ways such as quantity and quality of crops in terms of productivity, growth rates, photosynthesis and transpiration rates, moisture availability etc. Climate change is likely to directly impact food production across the globe. Increase in the mean seasonal temperature can reduce the duration of many crops and hence reduce the yield. In areas where temperatures are already close to the physiological maxima for crops, warming will impact yields more immediately. Drivers of climate change through alterations in atmospheric composition can also influence food production directly by its impacts on plant

physiology. The consequences of agriculture’s contribution to climate change, and of climate change’s negative impact on agriculture, are severe which is projected to have a great impact on food production and may threaten the food security and hence, require special agricultural measures to combat with.

LAND USE/LAND COVER CHANGE ANALYSIS OF WATERSHEDS LOCATED IN ROPAR DISTRICT OF INDIAN PUNJAB USING GEOSPATIAL TECHNIQUES

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ABSTRACT

Land use/land cover (LU/LC) change analysis of two watersheds (Samlah and Paharpur) located in Ropar district of Indian Punjab was carried out using geospatial techniques. A significant increase in areas under built-up, degraded forest, water bodies and drainage by about 77.9, 100.2, 22.2 and 8.1%, respectively were recorded for Paharpur in one decade (2010-2020). Similarly, for Samlah, the areas under built-up, degraded forest and dense forest increased by about 239.0, 98.8 and 54.7%, respectively. Both the watersheds indicated drastic increase (>77.8%) in area under built-up and degraded forest, whereas a decrease under moderate dense forest by more than 64.0%. The accuracy of LU/LC analysis for both watersheds was achieved to be more than 90% with k values greater than and equal to 0.88 for both years (2010 and 2020), indicating accurate and successful image classification. Overall, the increasing rate of areas under degraded forest and built-up are the key reasons behind the drastic reduction in area under moderate dense forest in both watersheds. Such information on LU/LC change would be useful for implementing appropriate land and water management measures in the problem areas to have a balanced distribution of land under different segments from environmental protection.

Keywords: Land use, land cover, remote sensing, GIS, accuracy assessment

EMERGING PLANT BREEDING TECHNOLOGIES FOR NUTRITION RESPONSIVE AGRICULTURE

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ABSTRACT

The challenge of global population growth, climate change, and pressure darural resources requires producing more output with limited resources and balancing that productivity gain with reduced environmental impact. This approach of production need as stainable agricultural intensification. New plant breeding technologies (NPBTs). including genetically modified and gene edited crops, offer large potentials for sustainable agricultural development and food security while addressing shortcomings of the Green Revolution. GMOs have opened new horizons, as the genetic variation available for breeding has become much larger. With recombinant DNA techniques, individual genes: coding for desirable traits can be introduced to the plant without simultaneously making all the other genetic changes that occur through conventional crossbreeding or traditionally induced mutagenesis. Golden Rice-if widely consumed-could

significantly reduce child mortality, infectious diseases, and eyesight problems in developing countries.

Different gene editing methods are used, including zinc finger, TALEN, and the nowadays most widely used CRISPR/Cas system. Several fruits and vegetables with CRISPR/Cas-based nonbrowning traits are already on the market in North and South America. Such technologies could help to reduce food losses and also used to change the nutrient content of various food crops, all of which could have positive human health effects. Furthermore, it should be acknowledged that commercial breeding needs to be complemented by other initiatives and institutions that focus particularly on food and nutrition security of vulnerable groups. Any efforts to further harmonize agricultural, nutrition, health, vironmental, and educational policies, also with international policy frameworks and obligations, could help to create an enabling policy environment for NSA.

Keywords: Plant Breeding, Nutrition Sensitive Agriculture, CRISPR, Commercial breeding

SUGGESTIONS, RECOMMENDATIONS AND LEGISLATIVE SUPPORT TO THE FARMERS AGAINST ENVIRONMENTAL POLLUTION HAZARDS IN INDIA

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Purpose

Several studies have concluded the fact that better health conditions are found among non- farming community than the farming community. Since farmers face direct exposure to various pollutants, they are put at higher risks of physiological and psychological disorders. Many farmers continue to work despite being plagued by various health disorders due to the fear of losing their income and losses of productivity. In this regard, it is of utmost importance to impart suggestions and recommendations along with legislative policies to safeguard the farming community from the hazards of environmental pollution.

Methods

The study was conducted under Kerala Agricultural University, India. With respect to the different aspects of the suggestions and recommendations of environmental pollution, a total of 90 farmers were administered with a list consisting of 11 statements prepared by Mohapathra and Rath in 1997 with slight modifications. An open-ended discussion was conducted with 30 stakeholders comprising of Agricultural Officers, development personnels, local governance members, NGOs and the general public regarding legislative policies.

Result

The most important suggestion and recommendation perceived by majority of the farmers was ‘More utilization of mass media to know about environmental pollution and its detrimental effects’. ‘Improving the sanitization of the farms and living areas of the farmers’ was also considered an important suggestion and recommendation to the farmers. The least relevant suggestion as perceived by the farmers was the ‘technological control of automobile pollution’. Likewise, it was observed that majority of the stakeholders were unaware of the environmental legislative support and policies like ‘Zero Draft of Environmental Assessment Notification’, ‘Environmental Compensation’ and ‘Waste Management Rules’.

Conclusion

Through the recommendations and legislative support, the farmers could be enlightened about their vulnerability to environmental pollution. If farmers duly adopt these suggestions and recommendations, with monitoring of officials, they can safeguard themselves from the catastrophe of pollution.

Keywords: Pollution, Legislative, Farmers, Stakeholders

SUGGESTIONS, RECOMMENDATIONS AND LEGISLATIVE SUPPORT TO THE FARMERS AGAINST ENVIRONMENTAL POLLUTION HAZARDS IN INDIA

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Purpose

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COMMUNICABLE BACTERIAL INFECTION AND ANTIBIOTIC RESISTANCE CRISIS

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ABSTRACT

Antibiotic has always been considered as miracle medicine for any kinds of communicable bacterial infection, this is true, but the real wonder is the rise of antibiotic resistance in hospitals, communities, and the environment concomitant with their use. The most common infections are pneumonia, urinary tract infection and respiratory infection. This is true for agents used in the treatment of bacterial, fungal, parasitic, and viral infections and for treatment of chronic diseases

such as cancer and diabetes; it applies to ailments caused or suffered by any living organisms, including humans, animals, fish, plants, insects, etc. Antibiotic resistance is increasingly challenging health care. Antibiotics are a type of miracle drug, but their universal effectiveness is at an end. As first- and second line therapies become ineffective, providers end up using agents that may be more toxic and less effective. Even when effective antibiotics are available, evidence is mounting that antibiotic-resistant infections often take longer to treat, are costly, and are often associated with higher risk. A recent Center for Disease Control and Prevention publication estimated that about 2 million people develop infections with antibiotic-resistant pathogens each year, of those who develop infections, an estimated 23,000 people die each year as a direct result of these infections. UTI is very common in every age this is due to the Escherichia coli bacteria, Streptococcus is spread pneumonia antibiotic used to treat these pathogen for long time resistance of uropathogens to antibiotics is increased. A wide range of biochemical and physiological mechanisms may be responsible for resistance. In the specific case of antimicrobial agents, the complexity of the processes that contribute to emergence and dissemination of resistance cannot be overemphasized, and the lack of basic knowledge on these topics is one of the primary reasons that there has been so little significant achievement in the effective prevention and control of resistance development. Diligent hand hygiene before and after all patient interactions across the spectrum of health-care delivery and awareness about antibiotic resistance is the way to reduce the risk of transmitting antibiotic-resistant bacteria among the community.

Keywords: Communicable Infection, Antibiotics Resistance, Public Health.

AN ANALYSIS OF AWARENESS OF FARMERS ABOUT THE CAUSES AND ILL-EFFECTS OF ENVIRONMENTAL POLLUTION ON AGRICULTURAL SYSTEMS

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Purpose

To find out the awareness of farmers about the causes and ill-effects of environmental pollution on agricultural systems. Farmers are the backbone of every nation's progress, hence, their awareness regarding the causes and ill effects of environmental pollution on agriculture is of prime importance to safeguard their health and nutrition and also ensure nutritional security of the country.

Methods

The study was conducted under Kerala Agricultural University, India. In order to find the awareness of the farmers about the causes and ill effects of environmental pollution on agricultural systems based on farmers responses, a list of eight and nine statements prepared by Chaudhury in 2013 were used for causes and ill effects of environmental pollution on agricultural systems respectively. The farmer respondents were asked to indicate their responses. A total of 90 farmers were selected for the data collection.

Results

The farmers who had low awareness about the causes of environmental pollution were 18.89 per cent, while a majority (60%) farmers had medium awareness about the causes of environmental pollution. The percentage of farmers who had high awareness about the causes of environmental pollution was 21.11 per cent. None of the farmers had low awareness about the ill effects of environmental pollution, but 17.78 per cent farmers had medium awareness about the ill effects of environmental pollution. A very high percentage (82.22%) farmers showed high levels of awareness towards the ill effects of environmental pollution.

Conclusion

It was concluded that the farmers were very much aware about the hazardous ill effects of environmental pollution but were only moderately aware about the potential causes. Therefore, they must be made aware by mass media such as broadcasting through radio and TV programmes, campaign and folk media.

Keywords: Agricultural System, Farmers, Environmental Pollution, Ill effects

EFFECT OF INTEGRATED NUTRIENT MANAGEMENT PRACTICES ON QUALITY OF RICE VARIETIES

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Aromatic rice constitutes a small but an important and special sub-group of rice, aromatic varieties of rice are very much popular due to their aroma, grain dimension, cooking qualities and palatability among the users. Scented rice is rated best in quality and fetches much higher price than high quality non-aromatic rice in international market. Nearly 50-70 per cent of the Basmati rice produced in India and Pakistan are exported which contributes 10% of world trade. The India's first zinc rich rice variety “Chhattisgarh zinc rice-1” developed at Indira Gandhi Agriculture University, Raipur (CG).

METHODOLOGY

The experiment was laid out in split plot design with three replications having five different varieties as main plot and five management practices as sub plot treatments. The varieties were Trombay CG dubraj mutant-1 (Scented dwarf) (V₁), Tarunbhog mutant-1 (Scented dwarf) (V₂), Safri 17-48-2 (Non scentwd dwarf) (V₃), Trombay Raipur rice(Non scentwd dwarf) (V₄) and Zinco rice (Zinc rice dwarf) (V₅) and management practices were 20 X 10 cm spacing + 100% RDF (80:50:30 kg NPK ha⁻¹) through inorganic (standard check) (P₁), 20 X 10 cm spacing + 100% RDF (80:50:30 kg NPK ha⁻¹) through inorganic and organic (Topdressing of (vermicompost @ 2 q ha⁻¹ + DAP @ 25 kg ha⁻¹) at 25-30 DAT and remaining NPK through inorganic (P₂), 20 X 10 cm spacing + 150% RDF (80:50:30 kg NPK ha⁻¹) through inorganic and organic (Topdressing of (vermicompost @ 2 q ha⁻¹ + DAP @ 25 kg ha⁻¹) at 25-30 DAT and remaining NPK through inorganic (P₃), 15 X 10 cm spacing + 150% RDF (80:50:30 kg NPK ha⁻¹) through inorganic and organic (Topdressing of (vermicompost @ 2 q ha⁻¹ + DAP @ 25 kg ha⁻¹) at 25-30 DAT and remaining NPK through inorganic (P₄) and 20 X 10 cm spacing + 150% RDF (P₅).

RESULT

Results revealed that variety 17-48-2 (Non scentwd dwarf) (V₃) recorded significantly highest quality parameters *viz.* paddy length (mm), paddy breadth (mm), L:B ratio, kernel after cooking length (mm), kernel after cooking breadth (mm), kernel after cooking L:B ratio, elongation ratio, hulling (%), milling (%) and Head rice recovery (%) compared to rest of the varieties. The experiemntal results further suggest that rice sowing with 15 X 10 cm spacing + application of fertilizers @ 150% RDF (80:50:30 kg NPK ha⁻¹) through inorganic and organic (Topdressing of (vermicompost @ 2 q ha⁻¹ + DAP @ 25 kg ha⁻¹) at 25-30 DAT and remaining NPK through inorganic (P₄) observed maximum and significantly highest quality parameters *viz.* paddy length (mm), paddy breadth (mm), L:B ratio, kernel after cooking length (mm), kernel after cooking breadth (mm), kernel after cooking L:B ratio, elongation ratio, hulling (%), milling (%) and Head rice recovery (%) compared to rest of the treatments.

Keywords: Rice varieties, INM, Quality

SOIL HEALTH AND ITS MANAGEMENT TECHNIQUES

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ABSTARCT

Healthy soil constitutes the foundation of thriving ecosystem and societies and are directly linked to food and nutritional security, water quality, human health, climate change mitigation and adaptation and biodiversity. Globally, food systems face multiple challenges, including minimizing environmental impacts, adapting to a changing climate, increasing yields and maintaining or increasing crop nutritional quality. Management techniques that focus on soil health are promising solutions to mitigate some environmental impacts and may increase economic returns.

Yield outcomes of soil health management are of significance, as there are concerns that yield increases are insufficient to meet future food demand. Soil health indicators and metric, soil health management, and crop productivity, minimizing soil disturbance (no-till) and crop yields, cover crops and crop yields, resilience, yield stability and input reduction.

An experiment was conducted on soil health in maize crop and the result was significant with 100 per cent RDF along with 5 t ha⁻¹ FYM for kernel yield and addition of azotobacter with maize + legume intercropping gives better soil health. Soil health management techniques can have multifaceted environmental and economic benefits, yet it is still unclear as to where and when yield and yield stability benefits of soil health management may occur. Many researches on long term conservation agriculture, cover crop, integrated nutrient management gives better quality on crop, crop yield and yield stability.

Keywords: Soil health, environment, mitigation, yield

PRODUCTIVITY AND PROFITABILITY OF SUMMER COWPEA + BABY CORN INTERCROPPING SYSTEM AS INFLUENCED BY FERTILITY LEVELS AND STRESS MITIGATING CHEMICALS

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ABSTRACT

Cowpea (*Vigna unguiculata* L.) is a quick growing and high yielding crop belongs to the family *leguminosae*. It is a valuable multipurpose grain legume widely cultivated in arid and semiarid tropics. Cowpea is grown as intercrop, mixed crop, catch crop, mulch crop and green manure crop. The cowpea cultivation is gaining popularity among growers due to soil enriching habit, quick growing nature, short duration, higher yield and higher profitability per unit area that gradually replacing the other traditional summer legume crops. Babycorn is dehusked maize ear, harvested within 2-3 days of silk emergence but prior to fertilization and it is consumed as vegetable due to its sweet flavour. Great nutritional value, eco-friendly and crispy nature of baby corn has made it special choice for many traditional and continental dishes apart from canning in the elite society (Singh *et al.*, 2006). During summer season night temperature at the time of reproductive phase of crops in North-West India remains > 20°C which may adversely affect the flowering and seed setting in summer crops.

Methodology

Field experiment was conducted at agriculture research station, Ummedganj, Kota of Agriculture University, Kota, Rajasthan, India during *summer* of 2019 & 2020. The experiment was taken in Split split plot design with five intercropping systems [sole cowpea, sole babycorn,

cowpea+babycorn (2:1), cowpea+babycorn (3:1) and cowpea+babycorn (4:1)] in main plot, three fertility levels (100, 125 and 150% RDF) in sub plot and two stress mitigating chemicals (0.5% CaCl₂ and 1% KNO₃ at flowering and pod development stage of cowpea) in sub sub plot and replicated four time.

Findings

Results from data revealed that 2:1 row ratio of cowpea and babycorn significantly increased the cowpea equivalent yield, and economics (Gross return, net return, B:C ratio) of cowpea and babycorn intercropping system. In the sub plot cowpea equivalent yield, gross return, net return and B:C ratio were higher with the fertility level of 150% over lower levels (100% & 125%). Our results further suggest that foliar application of 0.5% of CaCl₂ at flowering and pod development stage were significantly increased the cowpea equivalent yield and economics (Gross return, net return, B:C ratio) of cowpea and babycorn intercropping system over 1% KNO₃.

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A REVIEW ON IMPORTANCE OF LITTLE MILLET AS DIETARY MEAL AND ASSOCIATED BIODIVERSITY

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ABSTRACT

-Little millet is a C4 plant and smart crop which can survive in climate change condition and a nutritious crop. It gives support to body as nutrient armor in war with different diseases. In India little millet is planting over an area of 2.34lakh ha with total production of about 1.27lakh tones and with productivity of 544 kg/ha during the year 2015-16(ICAR-AICRP on Small millets). Plant breeders haven't paid much attention to small millet as a crop source. The millet is a potential food component that may be used on a large scale in processed goods, snacks and infant meals. It also plays a significant part in promoting food security in impoverished and emerging nations economics. Whole grain foods are abundant in phytochemicals and dietary fibres, there is a growing awareness of them on a global scale. The phytates, polyphenols and tannins in millet meals can help with antioxidant activity, which is crucial for maintaining good health, anti-ageing and treating metabolic disorders. One may refer to little millets as a "food medicine." A diet high in carbohydrates can raise plasma glucose level and posses insulin resistance. Little millet is a food with a low glycemic index that is a rich source of dietary fibre and slowly digesting carbs. Because glucose takes longer to enter the system, blood sugar levels are steady. For diabetics who must manage the fast increase and fall of blood glucose.

Keywords: Phytochemical, dietary fibres, food medicine, glycemic index.

ROLE OF LIQUID (Foliar) FERTILIZATION IN ENHANCING CROP PRODUCTION a review

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ABSTRACT

Foliar feeding is a technique of feeding plants by applying liquid fertilizer directly to their leaves. Plants are able to absorb essential elements through their leaves. The absorption takes place through their stomata and also through their epidermis. It is the application of fertilizers to foliage of the crop as spray solution is known as foliar spray. This method is suitable for application of small quantities of fertilizers, especially micronutrients. Major nutrients can also be applied by this method when there is no adequate moisture in top layer of soil. Foliar application is no substitute for soil application, but only a supplement to it. More recently, foliar feeding has been widely used and accepted as an essential part of crop production and horticultural crops.

Foliar feeding is a common agricultural management practice used to increase plant growth and yield. Generally, pulse and oilseed crops are raised under rained conditions with low input and poor management practices leading to lower productivity level (Lal *et al.*, 2015). Foliar application of nutrients is effective in supplementing high nutrient demand at some crucial crop growth stages, correcting nutrient deficiencies in field crops. These fertilizers have different ratios of N, P and K which are highly water soluble and so applicable for foliar application (Jaya bal *et al.*, 1999).

Keywords: Foliar, Fertilizer, Crop, Nutrition

ROLE OF BIOSORBENTS IN RESTORATION OF CONTAMINATED SOIL AND WATER: PROSPECTS AND CHALLENGES

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ABSTARCT

Contamination of soil and water with heavy metal and other pollutants which are non-biodegradable is a serious global environmental problem. Industrialization and urbanization have rendered the environment severely contaminated with inorganic and organic pollutants (Rana *et al.*, 2021). Among major sources of contaminants in soil and water, heavy metals, dye, pesticides, organic pollutants and petroleum waste are important. Continuous discharge of industrial wastewaters has resulted in significant deposition of heavy metals and other pollutant in soil and water. Various physico-chemical approaches such as incineration, soil washing, and chemical methods in particular available for remediation of contaminants from soil and water are cost-intensive and generate waste which require safe disposal (Yang *et al.*, 2015). Therefore, green, cheap and sustainable approaches need to be explored for large-scale application. Different biosorbents such as microbial and agricultural biomass have been exploited for heavy metal immobilization in soil and sorptive removal in waters by various research groups (Ayangbenro and Babalola, 2017; Dhanarani *et al.*, 2016; Oyewole *et al.*, 2019). Microbial and agricultural biomass and their modified forms such as nanocomposites and carbonaceous materials (viz., biochar, nanobiochar, biocarbon), might be useful for sequestration of contaminants in soil via adsorption, ion exchange, complexation, precipitation, and enzymatic trans formation mechanisms (Rana *et al.*, 2021). In case of dye removal biosorption largely depend on pH of the medium as well as adsorbent dose

(Irem *et al.*, 2013. The microbial adsorbents in combination with agricultural biomasses show improved performance, stability, reusability, and effectively immobilize organic and inorganic contaminants from soil and water (Sinha *et al.*, 2019). All the biosorbents are efficient in lab studies, but there are very few reported studies and assessment for their feasibility at industrial scale. So, Efforts should make to explore new materials, increase the efficiency of existing biosorbents and design hybrid technologies targeting multicomponent biosorption. In the future, researchers may consider the modified composites, encapsulated biosorbents for soil and water remediation.

Keywords: Absorbents, Biosorbents, Contaminants, Soil and Water.

GENETIC VARIABILITY AND MOLECULAR CHARACTERIZATION OF LOCAL mango (*Mangifera indica* L.) GERMPLASM

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ABSTRACT

The present investigation was conducted at experimental orchard of AICRP on Fruits at Agricultural Research Station, Banswara, Department of Horticulture & Department of MBBT, RCA, MPUAT, Udaipur, during January, 2018 to August, 2018 to characterize local mango (*Mangifera indica* L.) germplasm at morphological And molecular level. The experiment was carried out as completely randomized design with fourteen local mango (*Mangifera indica* L.) germplasm with three replications. On the basis of fruit morphological and biochemical characters IC No. 589756 was found to be over all best germplasm with respect to fruit length, fruit width, fruit weight, pulp weight, TSS/Acid ratio, pH and low acidity followed by IC No. 589746 exhibiting maximum pulp per cent and highest TSS accompanied with lowest stone weight and stone per cent as compared to other germplasm under study. The dendrogram and cluster analyses revealed that the local mango germplasm for chloroplast marker psbA-trnH and trnCD F'-R' depicted the relationship among the germplasm and clearly divided them into two main clusters at a similarity coefficient 0.035 and 0.15, respectively. The first cluster includes only 1 germplasm at similarity and cluster – II contain 13 germplasm.

Keywords - Molecular Characterization, germplasm, biochemical etc.

EFFECT OF DIFFERENT SHADE NET COLOUR AND INTENSITY ON YIELD AND QUALITY ATTRIBUTES OF TOMATO (*Lycopersicon esculentum* L.) IN WESTERN RAJASTHAN

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ABSTRACT

The investigations on “Effect of Different Shade Net Colour and Intensity on Yield and Quality of Tomato, (*Lycopersicon esculentum* L.) in Western Rajasthan” was conducted at Precision Farming Development Centre, Agricultural Research Station, SKRAU, Bikaner from November, 2020 to June, 2021. Different colour (Red, Black, White, and Green) shade net with varying shade intensities (35%, 50%) were found to be significantly influenced most of the yield and quality attributes of tomato.

The maximum number of flowers per cluster (1.58, 1.91, 4.32, 4.66), and maximum number of fruits per cluster (1.43, 1.56, 4.04, 4.24) at 50, 75, 100,125 DAT were recorded under red colour

shade net. Maximum number of fruit per plant (5.77, 9.94, 31.60, 39.20) at 50, 75, 100, 125 DAT were recorded under red colour shade net with 50% shade intensity. Maximum fruit length (5.25cm), weight (80.90g) and diameter (5.11cm) were recorded under black colour shade net. Maximum fruit yield per hectare (601.33 quintal ha⁻¹) and highest B: C ratio (2.73) was recorded under red colour shade net with 50% shade intensity. Maximum TSS (4.65⁰ B), acidity (0.85%), ascorbic acid (15.96mg/100g), lycopene (6.15mg/100g) and firmness (4.15 Kg cm⁻²) were obtained in which fruits those were grown under red colour shade net.

Keywords: Tomato, shade net colour, shade intensity and Lycopene

SPEED BREEDING: A PROMISING APPROACH TO ACCELERATE CROP BREEDING

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ABSTRACT

Accelerated breeding methods like that Speed Breeding (SB) which help in shortens generation time and research programmes achieve up to 6 generations per year for spring wheat, durum wheat, barley, chickpea, pea and 4 generations for canola, instead of 2-3 under normal glasshouse conditions. SB is a new technique which involves extending photoperiod and controlled growing conditions like temperature, soil media, spacing etc in glasshouses, enabling rapid generation advancement results shortening the breeding cycle. Speed breeding in fully-enclosed controlled-environment growth chambers can accelerate plant development for research purposes, including phenotyping of adult plant traits, mutant studies, and transformation studies. During 1990s, the National Aeronautics and Space Administration (NASA), USA, works with Utah State University examine the possibilities of growing rapid cycling wheat in space station; this has led to the development of new dwarf variety ‘USU Apogee’. These technique divine plant scientists at the University of Queensland, the John Innes centre Australia and the University of Sydney, who have improved the technique and coined the term ‘SPEED BREEDING’ [by Dr. Lee.T. Hickey and co-workers in wheat and peanut].

Different techniques for speed breeding; Speed Breeding I - controlled environment chamber conditions in which Photoperiod: 22 Hrs (light)/2 Hrs Dark and Temperature: 22°C (photoperiod)/17°C (Dark), Speed Breeding II - glasshouse conditions in which, a temperature-controlled glasshouse fitted with high pressure sodium vapour lamp is use, Speed Breeding III - Low cost homemade growth room design, Photoperiod is to be set 12 Hrs-12 Hrs (Light-Dark) for 4 weeks then increased 18 Hrs to 6 Hrs and Temperature: 21°C (photoperiod)/18°C (Dark). First wheat variety developed by using Speed Breeding was DS Faraday. An integrated approach by utilizing speed breeding helps in development of new well-adapted cultivars in a shortest possible time to meet the future demand.

Keywords: Speed breeding, accelerated breeding, photoperiod, genome editing, phenotyping.

IMPACT OF AGRICULTURAL PRICE POLICY ON KHARIF PADDY IN MAHARASHTRA

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ABSTRACT

Paddy is the major staple food of more than 60 per cent of the world's population. In Maharashtra state, the area under kharif paddy cultivation during 2020-21 was 15473.64 (00) hectares with total production of 31193.73 (00) tonnes and yield of 2015.93 kgs per hectares. Maharashtra ranks 13th place in rice production in country. Agriculture policy is considered of the most important national economic policies through which the country can achieve the goal of improving the level of national agricultural income thus the economic and social standards for workers in the agriculture sector in particular and whole population in general. The present study based on secondary data from 1990-91 to 2020-21 and the time series data on MSP, FHP, WSP, area, production and productivity of kharif paddy. The study indicates that, the area growth of paddy stagnant over a period of study, the production growth in the kharif paddy was significantly increased during study period. Productivity growths were significantly increased of kharif paddy in Maharashtra State of India. As the variability in WSPs were high in kharif paddy of the study, it denotes all the crops were volatile in terms of prices and also that large variability in MSP were observed of kharif paddy during study period. The compound growth rates of MSP were slightly higher than FHP and WSP of the study. Significantly positive growth rates were observed for FHP and MSP of kharif paddy. It concluded that, significance gap between FHP, WSP and MSP do not differ significantly. As about the deviation of FHPs vis-à-vis MSPs, it was observed that, frequency of negative deviation occurred 3 and 4 times while about positive deviation it was 28 and 27 times of kharif paddy respectively. The adjusted difference (positive) between MSP and FHP was above as above 90 per cent of the MSP and the negative difference was very low and the adjusted difference (positive) between WSP and FHP was above as above 87 per cent of the MSP and the negative difference was very low i.e. 13 per cent. The impact of MSP on area is inferior in kharif paddy crop but there is lower impact of MSP on production and productivity. The impact of FHP on area is poorer but there is subordinate impact of MSP on production and productivity and same results originate that in case of impact WSP on area, production and productivity of kharif paddy in Maharashtra.

GROWTH PERFORMANCE OF FAST-GROWING TREE SPECIES UNDER HIGH-DENSITY IN THREE YEARS

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ABSTRACT

Studied the growth performance of fast-growing trees, viz. *Eucalyptus* spp. (*Eucalyptus*), *Casuarina equisetifolia* (*Casuarina*), *Gmelina arborea* (*Gmelina*) and *Melia dubia* (*Melia*) in high-density plantation in Prayagraj, Uttar Pradesh, India with different spacings, viz. 1×1 m, 1.25×1.25 m and 1.5×1.5 m and the data was recorded in third year. The maximum height was found in *Eucalyptus* (1×1 m) 10.48 m followed by *Eucalyptus* (1.50×1.50 m) 9.12 m and minimum in *Gmelina* (1.50×1.50 m) 6.28 m. In current year, maximum annual height increment is in *Eucalyptus* (1×1 m) 3.53 m followed by *Eucalyptus* (1.50×1.50 m) 3.50 m and

minimum in Casuarina (1.50×1.50 m) 1.26 m whereas maximum mean annual increment was found in Eucalyptus (1×1 m) 3.49 m followed by Eucalyptus (1.50×1.50 m) 3.04 m and minimum in Gmelina (1.50×1.50 m) 2.09 m. The diameter of tree maximum found in Eucalyptus (1×1 m) 8.25 cm followed by Melia (1×1 m) 7.58 cm and minimum Melia (1.50×1.50 m) 4.84 cm. In current year, maximum annual diameter increment in Melia (1×1 m) 2.61 cm followed by Gmelina (1.25×1.25 m) 2.19 cm and minimum in Casuarina (1×1 m) 1.02 cm whereas maximum mean annual increment was found in Eucalyptus (1×1 m) 2.75 cm followed by Eucalyptus Melia (1×1 m) 2.53 cm and minimum in Melia (1.50×1.50 m) 1.61 cm. Among four the best performing species is Eucalyptus in 1×1 m spacing.

Keywords: Growth, Fast growing species, Height, Diameter, Increment.

ASSESSMENT OF VARIATION IN LEAF ESSENTIAL OIL CONTENT IN CLONES / SPECIES OF EUCALYPTUS

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ABSTRACT

Essential oil is a volatile oil which differs greatly from traditional vegetable oils in the way that they are quite dry, non-greasy, and easily absorbed by the skin. It occurs in different parts of plants viz. leaves, blooms, buds, trunks, stems, and roots of the trees; however, very few species are commercially valuable for these oils, The essential oils possess its distinctive scent. Eucalyptus species are important commercial species for timber as well as for leaf essential oil. Eucalyptus oil (C₁₀H₁₈O) is one among the foremost significant volatile oil. The oil is separated from new and fresh/dried leaves. Eucalyptus oil is light yellowish colour and it has aromatic odour. The main component is 1,8-cineole and other major chemical components are limonene, α-pinene, p-cymene, terpine 1-ol, globulol. The research work was carried out during April to June 2022 at Central Nursery, Pandila, FRCER, Prayagraj, Uttar Pradesh (India) for studying essential oil contents in different clones of *Eucalyptus camaldulensis*. Fresh leaf samples (20) of three eucalyptus species (*E. hybrid*, *E. tereticornis* and *E. camaldulensis*) of 19 clones 413, 07, 526, K-25, 288, 2013, 2023, 2070, 2136, 3018, 2031, P-13, P-14, P-23, P-32, P-45, P-50, P-66, IFGTB-4 and one control plant were collected. The quantitative estimation of essential oil was done with Clevenger assembly following hydro-distillation method for all 20 samples. The highest essential oil yield was obtained from 2136 (1.84 %) , clone of *E. camaldulensis* followed by K-25(1.77%), P-13(1.59%) and lowest oil yield was found in 0-7(0.40%), clone of *E. tereticornis* followed by 3018(1.02%), clone of *E. hybrid*. It can be stated that the essential oil yield was higher in clones of *E. camaldulensis* as compared to *E. hybrid* and *E. tereticornis*. Thus, these identified clones can be suitably planted in Eucalyptus based agroforestry models for utilizing its leaves in essential oil industries.

Keywords: Eucalyptus species, essential oil, clones, oil yield, industrial value

WEED MANAGEMENT IN CHICKPEA (*CICER ARIETINUM L.*)

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ABSTRACT

The experiment was conducted at Research area, College of Agriculture, Gwalior (M.P.) during Rabi 2019-2020 to find out weed management in irrigated chickpea (*Cicer arietinum L.*). The experiment was laid out in the Randomized Block Design with three replications. Each replication was comprised of ten treatment combinations of chickpea variety RVG - 202 consisting of different treatment combination Oxyfluorfen, Quizalafop-p-Ethyl, Propaquizafop-p-Ethyl and Clodinofof-p-Ethyl with one hoeing at 40 days after sowing. The recommended dose of fertilizers (20:50:20 kg NPK ha⁻¹) was applied in the form of urea, DAP and muriate of potash as per treatments. The observations were recorded on various pre-harvest observations of crop (viz., plant population per meter row length at 20 DAS and at harvest, plant height, number of branches and dry matter production at 30, 60, 90 DAS and at harvest) were recorded in treatment T 2 (Oxyfluorfen @ 150 g/ha (PE) + Quizalafop-p-Ethyl @ 50 g/ha (PoE) at 25 DAS) and it was most effective treatment for weed control as compared to other treatment. Similarly, post-harvest observations of crop (viz., number of pods/plants, number of seeds/pods, test weight, seed and straw yield per plot, per hectare and harvest index), treatment T 2 (Oxyfluorfen @ 150 g/ha (PE) + Quizalafop-p-Ethyl @ 50 g/ha (PoE) at 25 DAS) was found significantly superior as compared to all other treatments. Quality parameters (viz., protein content and protein yield) were recorded in treatment T 2 (Oxyfluorfen @ 150g/ha (PE) + Quizalafop-p-Ethyl @ 50 g/ha (PoE) at 25 DAS) as compared to other treatment. Weed study (viz., weeds population at 30, 60, 90 DAS and harvest, weeds dry weight m² at 30, 60, 90 DAS and harvest, weed control efficiency and weed index) were recorded in treatment T 2 (Oxyfluorfen @ 150 g/ha (PE) + Quizalafop-p-Ethyl @ 50 g/ha (PoE) at 25 DAS) and it was most effective treatment for weed control as compared to other treatment and weedy check plot. Nutrient study (viz., NPK content in crop and NPK uptake by crop) were recorded in treatment T2 (Oxyfluorfen @ 150 g/ha (PE) + Quizalafop-p-Ethyl @ 50 g/ha (PoE) at 25 DAS) and it was significantly superior as compared to other treatment and weedy check plot. and economics of the treatments (viz., cost of cultivation, gross returns, net returns and benefit:cost ratio), The maximum cost of cultivation was found in treatment T 7 (Propaquizafop-p-Ethyl @ 75 g/ha (PoE) at 25 DAS + one hoeing at 40 DAS), The maximum gross returns, net returns and B:C was found in treatment T 2 (Oxyfluorfen @ 150 g/ha (PE) + Quizalafop-p-Ethyl @ 50 g/ha (PoE) at 25 DAS). While the minimum cost of cultivation, gross returns, net returns and B:C was recorded in treatment T 10 (weedy check plot).

ENTREPRENEURIAL IMPACT IN SOCIAL CONDITION OF TRIBAL FARMERS IN KOLLI HILLS

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Purpose

Scheduled Tribes (STs) locally called Malayalis are indigenous people of Kolli hills, have their own distinctive culture, geographically isolated and are low in socio-economic conditions. The study examines the extent of social improvement of tribal farmers as the result of their entrepreneurial activities in and around the hill areas where as the products of tribals are unique and now a days, these forest produce find a specific place in the attraction of tourists.

Methods

Ex-post facto research design was used in the research. The study was conducted in Kolli hills of Namakkal district in Tamil Nadu. Out of the fifteen blocks in Namakkal district, Kolli hills block was selected based on the maximum number of tribal populations. A sample size of 120 tribal farmers was selected by using proportionate random sampling technique. The required data were collected by personal interview utilizing a well-structured and pre-tested interview schedule.

Results

The social condition of tribal farmers was measured under nine dimensions for the study. The finding reveals that majority of the tribal farmers fell under the medium (51.67%) level of improvement in their social condition as a result of tribal entrepreneurship.

Conclusion

The medium level improvement in their social condition was due lower literacy levels, land holdings and less social interaction. Education facilitates them to interact within and outside their social system and makes them more receptive to new innovations.

Keywords: Entrepreneurship, Social condition and Tribes.

EVIDENCE-BASED POLICY FOR BAMBOO DEVELOPMENT IN INDIA: BRIDGING THE DEMAND AND SUPPLY

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Bamboo is the fastest growing, perennial plant and provides food, renewable raw material and regenerative energy (Liese and Kohl 2015). It has the potential to provide alternatives to timber products, sequester carbon and restore degraded lands (Buckingham et al. 2011). In real sense, bamboo is neither a tree nor a crop. Due to this confusing identity, it is institutionally marginalized and neither fully owned either by the agriculture or forest ministries (Buckingham et al. 2011). Under the Indian Forest Act 1927, bamboo was categorized as a non-timber forest produce. Felling and transit of bamboo grown on forest as well as non-forest land attracted the provisions of this Act. In order to accelerate bamboo development in India, the National Bamboo Mission was launched by the environment ministry in 2006. It aimed to develop bamboo plantations in forest and non-forest lands and nursery development to ensure supply of quality planting material. The main weakness of this scheme was weak linkages between

farmers and the industry due to limited efforts on processing, product development and value addition (National Bamboo Mission Guidelines 2019). In 2014-15, the national bamboo mission was shifted to the agriculture ministry and subsequently restructured. The restructured mission aims to support the entire value chain of bamboo sector starting from planting material, plantations, creation of facilities for collection, aggregation, processing marketing, micro, small and medium enterprises, skill development and brand building initiative in a cluster approach mode. In 2018, to facilitate the benefit flow to the farmers, bamboo outside forest areas was excluded from the definition of tree by amending Section 2 (7) of the Indian Forest Act 1927. The rationale for these policy changes was to boost the production of farm bamboo, develop its value chain and free its commercialization in order to meet the vast and diverse needs of the domestic sector.

Methodology

The question for our research study was; Is removing supply side constraints, shifting the focus from “forest to farm” and value chain development sufficient for unlocking the potential of bamboo in the country? While the production aspect of bamboo has received a lot of attention in India, there is paucity of information on the market demand and consumption trends. The purpose of this study was to bridge this knowledge gap by assessing the demand side of bamboo trade and synthesize policy inputs for bamboo development in the country.

This study was taken up during 2018 and 2019, and we collected data from both primary and secondary sources. Bamboo studies scattered over space and time, were collated to develop a coherent national picture. Intensive study covering the bamboo trade in central India had been carried out in the two states of Madhya Pradesh and Maharashtra. In Maharashtra state, large tracts of forests have been handed over to the local communities under the Forest Rights Act, 2006 and the village councils manage the bamboo crop. We built on the network of the paper industry and the forest department to identify and interact with bamboo traders. The primary data was collected from forest department officials, traders, paper mill officials, farmers, artisans and the communities through the process of personal interviews, field study, focused group discussions and telephonic interactions.

Results

The study found that the main markets having bulk demand for bamboo is the paper industry, housing and horticulture. We found that over the years the demand for bamboo in the paper industry has diminished and the aspiration of people for *pucca* (brick masonry) houses has also reduced the demand in housing. The only sub-sector where the demand for bamboo has grown is in horticulture where it is used as support poles and sticks. Consequently, the share of bulk, low value industrial processing (paper industry) has fallen from 50% to 18%, while supply of raw culms (largely in horticulture) has increased from 40% to 63%.

Based on the value of processing involved and the grade of material used, the various value chains of bamboos can be categorized as unprocessed raw culms (horticulture, construction etc.), low value bulk processing (paper, charcoal, energy etc.), medium value processing (handicrafts, incense sticks, toothpicks, blinds etc.) and premium processing (flooring, tiles, ply board etc.). In the absence of technology, premium processing industries are yet to develop at scale unlike China. We found that broadly three supply chains are present for the bamboo resource namely social, industrial and commercial. The commercial supply chain consumes a bulk (80%) of the bamboo.

The findings of the field study mirror the national trend of the industry mix, having changed from low value bulk processing in the paper industry to a supplier of raw culms in horticulture and construction. While the farmers are getting a better price in this new value chain, job creation has not picked up. We assessed the bamboo trade in 417 villages that had management rights over forest bamboo. Following a three-year felling cycle, while ideally one third of the total villages (i.e. 139 villages) should have harvested bamboo, only 18 villages (or 13%) took

up harvesting. Even in these harvested sites, only one-third of the potential area was harvested. Hence, effectively less than 10% of the available bamboo potential was realized.

Conclusion

The recent policy initiatives for bamboo development in the country focus on promoting the cultivation and value addition of farm bamboo and freeing its harvest and trade. The implicit assumption is that the vast unmet domestic demand will soak up this additional supply. We argue that the key challenge confronting bamboo development in India is in the demand side, as the market for bamboo in traditional sectors has shrunk due to substitution by other materials. We contend that the imperative to drive bamboo development forward will need new demand creation by developing medium and premium processing industries (such as incense sticks, mats, blinds, flooring, tiles, ply board etc.) so as to create jobs as well as farmer incomes. The study recommends that the policy for bamboo development in India needs to shift from supply-side focus to opening up new markets by incentivizing medium and premium processing industries.

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GENETIC VARIABILITY AND CHARACTER ASSOCIATION STUDIES IN FENNEL GENOTYPES

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Purpose

The yield attributing characters are quantitatively inherited and highly affected by environment, hence shows lower heritability leading to ineffective phenotypic selection. Hence, the genetic variability, parameters viz., genotypic and phenotypic variances, genetic advance, genetic gain and heritability are useful in understanding the nature of inheritance of different characters. Therefore, the present study was undertaken to know the nature and magnitude of variability present in 41 fennel cultivars screened for yield and its attributing traits.

Methods

Fennel (*Foeniculum vulgare*) belonging to the family Apiaceae is a well-known aromatic and medicinal herb. In the present investigation, 41 fennel varieties were evaluated at the Department of Plantation, Spices, Medicinal and Aromatic Crops at the College of Horticulture, Bagalkot, Karnataka during Rabi season, 2020-21 in randomized complete block design with three replications for genetic variability, heritability and genetic advancement for eighteen morphological traits.

Results

Analysis of variation revealed significant amount of variability in the genetic material. Phenotypic coefficients of variation is greater than those of the genotypic coefficient of

variation for all the traits. Higher PCV and GCV (>30 %) were observed for all the traits except number of primary branches per plant, days to 50% flowering and days to maturity. The heritability was recorded maximum for number of umbels per plant (97.61%) followed by test weight (96.85%) indicating their higher selection efficiency and reliability for crop improvement. Higher genetic advance as percentage of mean was observed for traits like plant height (51.9%), days to first flowering (29.9%), number of umbels/plants (26.35%), fresh umbel weight (22.69%), biomass yield per plant (132.83%), seed yield/plant (28.61%) and seed yield per hectare (40.75%). Plant height, days to first flowering, days to 50 % flowering, fresh umbel weight, dry umbel weight, test weight, biomass yield/plant, harvest index, oil yield and aphid incidence exhibited positive and significant correlation with the seed yield revealing their indirect selection for increased yield in fennel.

Conclusion

The selection of traits having high heritability coupled with genetic advance as percentage of mean indicates that, improving these characters in varietal development program will be more effective as these characters are governed by additive gene action. Positively correlated traits with seed yield should be given greater priority while selecting for higher yield and related characters. The fennel cultivars utilized in the present study have greater variability and could be explored in fennel improvement program either as parents for hybridization or can be directly released for various target traits.

Keywords: Fennel, Genetic variability, PCV, GCV, heritability, GA, Correlation

INFLUENCE OF INORGANIC AND ORGANIC FERTILIZERS ON GROWTH, YIELD AND QUALITY OF PINEAPPLE (*Ananas comosus* L.) cv. AMRITHA

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Purpose

Pineapple (*Ananas comosus* L.) is a wonderful tropical fruit having exceptional juiciness, vibrant tropical flavour and immense health benefits. Amritha, a new hybrid variety of Pineapple is released from the Pineapple Research Centre, Vellanikkara, under KAU. Amritha when grown under the existing POP recommendations of KAU results in yield, less than 1.5 kg per plant. The observations and trials conducted at Pineapple Research Centre, Vellanikkara showed better response to higher levels of N, P and K with respect to yield. Therefore, there is a need to develop optimum nutrient doses for ensuring high productivity of pineapple cv. Amritha.

Methods

Amritha, is the pineapple hybrid which is cross between Kew and Ripley Queen. The study was conducted at Fruits Crop Research Station, Vellanikkara during 2018-2019. The experiment was laid out in RBD with six treatments and four replications. (T₁-POP recommendation of KAU (8:4:8 N, P₂O₅, K₂O g plant⁻¹), T₂-Modified based on soil test results (9.39:11.45:11.36 N, P₂O₅, K₂O g plant⁻¹), T₃-25 percent higher than the modified POP based on soil test results (11.7:14.31:14.31 N, P₂O₅, K₂O g plant⁻¹), T₄-50 percent higher than the modified POP based on soil test results (14.08: 17.17: 17.03 N, P₂O₅, K₂O g plant⁻¹), T₅-75 percent higher than the modified POP based on soil test results (16.4:20.03:19.13 N, P₂O₅, K₂O g plant⁻¹) and T₆-ad hoc organic POP. Observations were recorded monthly for vegetative parameters, yield parameters and quality parameters.

Results

The studies revealed significant difference of growth characters such as length of ‘D’ leaf and ‘D’ leaf area. Whereas, no significant difference was observed among others growth characters

like plant height, number of leaves and breadth of ‘D’ leaf. In case of yield and quality parameters significant difference was observed in characters like mean fruit weight, length, breadth and girth of fruit, yield per hectare, pulp weight and TSS respectively.

Conclusion: It was concluded that among the different treatments evaluated, treatment T₅ - 75 per cent higher than the modified POP based on soil test results (16.4:20.03:19.13 N, P₂O₅, K₂O g plant⁻¹) can be recommended for ensuring high productivity of pineapple cv. Amritha.

Keywords: Pineapple, Amritha, Nutrients, Adhoc organic POP, ‘D’ leaf area, Fruit weight, Length of the fruit, TSS.

PRECEDENCE OF KINNOW SALEABLE PLANTS WITH FORCING METHODS UNDER ARID-SUBMONTANE OF PUNJAB INDIA

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Purpose

The methods and period of forcing play’s important role on the vegetative growth and earliness production of Kinnow nursery under arid Submontane of Punjab. The data on the scion growth revealed that forcing three and more weeks increases the number of leaves, while four and five weeks of forcing improved scion length of Kinnow plants. Bending method of forcing had better growth attributes in number of leaves, scion length and diameter than the rest forcing methods.

Methods

There 8 periods (time) of forcing and three forcing treatment methods were employed in factorial arrangement in randomized complete block design and replicated three times. The eight periods (time) of forcing were 1. No forcing, 2, Forcing immediately, 3. One week forcing, 4. Two weeks forcing, 5. Three weeks forcing, 6. Four weeks, 7. Five weeks after budding and 8. Six weeks forcing after budding. The three forcing methods were: complete cutting back/topping (CCB), Looping/partial cutting back $\frac{1}{2}$ - $\frac{2}{3}$ of the stem and bending and tying (B/T). Data were collected on percent scion survival, scion growth number of leaves and earliness production of saleable plants.

Results

Bending and tying method of forcing was found superior in percent bud survival than the looping method of forcing. Five weeks of bending and tying produces highest percent of bud survival than that of complete cut back and looping methods of forcing. There were interactions between forcing periods and method of forcing especially for five weeks forcing period, and bending and tying method to produce significant effect on bud survival over many of the treatment’s combinations

Conclusions

The bud survival significantly affected by the time of forcing. Five and six weeks forcing periods were significantly superior to forcing immediately after budding. The data on the scion growth revealed that forcing three and more weeks increases the number of leaves, while four and five weeks of forcing improved scion length of Kinnow plants.

Keywords: Bending, forcing, looping, survival

STATUS OF COCCINELLIDS IN BRINJAL ECOSYSTEM OF ASSAM WITH SPECIAL EMPHASIS ON PREY CONSUMPTION

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ABSTRACT

The goal of the current experiment was to determine status of coccinellid predators and their prey consumption in eggplant ecosystem. Studies were conducted in the Experimental Farm of Department of Horticulture and in Laboratory of Department of Entomology, Assam Agricultural University, Jorhat during 2015-16 and 2016-17. Two species of aphid viz., *Aphis gossypii* and *Myzus persicae* and six coccinellid predator species viz., *C. transversalis*, *Cheilomenes sexmaculata*, *Harmonia dimidiata*, *C. septempunctata*, *Micraspis discolor* and *Brumoides suturalis* were identified and collected from brinjal crop. The relative abundance of *A. gossypii* (36.04%) was comparatively more on eggplant than *M. persicae* (17.04%) at field and *A. gossypii* was found throughout the cropping season. Among the coccinellid predators, *C. transversalis* (1.12%) and *C. septempunctata* (0.99%) had highest relative abundance. During 2015-2017, five other insect pests were found viz., *Bemisia tabaci*, *Amrasca biguttula biguttula*, *Leucinodes orbonalis*, *Henosepilachna vigintioctopunctata* and *Monolepta signata* were found to infest eggplant, besides aphids. Among the aphids, *A. gossypii* (2.30 ± 0.05 mm) was longer than *M. persicae* (1.85 ± 0.06 mm). Similarly among the coccinellid predators the largest size was seen with *H. dimidiata* (7.09 ± 0.04 mm) followed by *C. septempunctata* (6.57 ± 0.23 mm). The coccinellid predators plays a major role in control of aphid population. It was found that the mean consumption of *A. gossypii* by a *C. transversalis* 3rd instar and 4th instar grub individually were 48.10 ± 1.83 and 77.75 ± 2.43 respectively while, the mean consumption of *A. gossypii* by a *C. septempunctata*, 3rd instar and 4th instar grub individually were 47.80 ± 1.60 and 69.95 ± 1.63 respectively. Therefore *C. transversalis* is more preferable than *C. septempunctata* in control of aphids in brinjal crop.

Keywords: Aphids, *Coccinella transversalis*, Prey consumption, *Solanum melongena*

A COMPARATIVE STUDY AMONG MODE OF CHEMICAL APPLICATION FOR THE MANAGEMENT OF FALL ARMYWORM

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ABSTARCT

Maize (*Zea mays* L.) is the one of the most versatile and important crop grown under different agro-climatic conditions throughout the world. Now a days the plant is liable to attack by a more than dozen of insect pests such as striped stem borer (*Chilo partellus*), pink stem borer (*Sesamia inferens*), cob worm (*Helicoverpa zea*), aphid (*Raphalosiphum maidis*) and several others which is considered as the most restraining factor in its successful cultivation. Recently an invasive pest identified as Fall Armyworm (*Spodoptera frugiperda*) which made its first intercontinental migration from America to Africa has also been reported from India. The pest causes severe damage to maize field if not properly manages. Chemicals are serving as a quick

and effective methods for suppressing the population of above pest, thus save the yield. Since it a pest that attacks the crop from seedling to harvesting stages, spraying schedule is most important for its management. In this experiment we aimed to compare the effectiveness of mode of application of chemicals for the management of fall armyworm. For this a number of chemicals and their combinations were evaluate as seed treatment, foliar application as well as combination of both for the management of the pest. We found that, seed treatment alone with chemicals such as Cyantraniliprole 19.8%+Thiamethoxam 19.8%, Cyantraniliprole 600 FS, Chlorantraniliprole (Lumivia 50 FS) provide protection up to period of 30-35 days where as foliar application with chemicals such as Emamectin benzoate 5 % SG, Chlorantraniliprole 18.5% SC, Chlorantraniliprole 9.3% + Lambdacyhalothrin 4.6% ZC, Novaluron 5.25% + Emamectin benzoate 0.9% w/w SC provide protection after spraying but failed to provide protection at early growth stage. Seed treatment alone again leads to infestation of cob at later growth stages. However, a combination of seed treatment and foliar application at a particular interval was found to be most effective and provide protection to the crop from seedling to harvesting stage. Among number of chemicals and their combinations, seed treatment with Cyantraniliprole19.8% + Thiomethoxam19.8% @ 6ml/kg seed followed by foliar application of Chlorantraniliprole 18.5% SC 0.4 ml/ litre spray at 4 weeks after germination proved most effective for the management of fall armyworm.

EFFECT OF AMBIENT AIR QUALITY ON WHEAT CROP PROXIMATE TO PRISM CEMENT PLANT SATNA (M.P.)

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ABSTRACT

Cement manufacturing units are major air pollutent relessing industries. These industries release mainly PM_{2.5}, PM₁₀, NO_x, SO_x. Increased amount of these pollutants affects not only human beings but also trees and crops as well as all biological systems. Present study was done to find out effect of air pollution caused by prism cement Satna on nearby cultivated wheat crop. It was observed that crop growth and yield of wheat was less in those area where pollution level was high. Area which was are far away from industry exhibited better wheat crop plant growth and yield

Keywords: Cement Industries, wheat pant, biological systems

IMPACT OF CLIMATE CHANGE IN BENGALURU– THE GARDEN CITY CONVERTING INTO OVEN CITY

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ABSTRACT

Climate change one of the most complex and important global issues facing us today and crises of recent times is that of global warming or warming of the Earth, both at national & international level. It involves many dimensions – science, economics, society, political and moral and ethical questions. An Anthropogenic climate change is the topmost contemporary

global issue. Climate change can potentially upset the rhythm of nature threatening the very existence of life on earth. Expected that climate change disasters and extreme weather events will increase in future. Significant escalation of risk and damage to infrastructure, resources, networks and human lives. While one set of people consider this a big danger, there are others who feel that it is a natural phenomenon and its effects are being over exaggerated. When one hears this argument, it is only a matter of increase in temperature and does not entail the end of the universe, one is not surprised. Over the last several million years, there have been warmer and colder periods on Earth, and the climate fluctuates for a variety of natural reasons as data from tree rings, pollen, and ice cores samples have shown. However, human activities on Earth have reached an extent that they impact the globe in potentially catastrophic ways. In comparison to other major cities in India, Bengaluru city is known most for two reasons. One, the city’s massive IT industry that has grown to become its economic lifeline and two, its year-round moderate weather. While the IT industry has grown tenfold over the last decade, the weather in not as mild, predictable or pleasant as it used to be. Anthropogenic stresses such as human and livestock population pressures, land use changes, infrastructural factors and air pollution will all affect the Bengaluru environment responses to changing climate parameters. As these changes are likely to continue in the decades ahead, some of the valuable goods and services provided by city may be compromise. Protecting the Garden city or Silicon Valley city, then, meant preserving part of the culture and identity. By reducing and controlling the Anthropogenic activities, we can reduce the city loss and fight climate changed. This article discusses the current knowledge and opinions of Bengaluru urban that it is recognized with greater vulnerability climate change and variability in Bengaluru including sector-wise climatic projections, impacts, adaptation and mitigation measures, and the status of State.

Keywords: Climate change, global issues, anthropogenic activities, Culture, identity

INFLUENCE OF PHOSPHORUS LEVELS AND BIOFERTILIZERS ON CHICKPEA (*Cicer arietinum* L.) Under Guava (*Psidium guajava* L.) BASED AGRI-HORTI SYSTEM

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ABSTRACT

An experiment was conducted during the *Rabi* season of 2020-21 at the RGSC, BHU, Mirzapur (Uttar Pradesh), India in a thirteen-year-old guava (*Psidium guajava* L.) orchard with sandy loam soil with moderate fertility, (pH 5.9) to assess the growth, productivity and economics of chickpea (cv. Pusa-362) under agri-horti system and growth of guava tree. The experiment was laid in Factorial Randomised Block Design with ten treatments (30 kg P₂O₅ ha⁻¹ alone, 45 kg P₂O₅ ha⁻¹ alone, 60 kg P₂O₅ ha⁻¹ alone, 30 kg P₂O₅ ha⁻¹ with *Rhizobium*, 45 kg P₂O₅ ha⁻¹ with *Rhizobium*, 60 kg P₂O₅ ha⁻¹ with *Rhizobium*, 30 kg P₂O₅ ha⁻¹ with *Rhizobium* and PSB, 45 kg P₂O₅ ha⁻¹ with *Rhizobium* and PSB, 60 kg P₂O₅ ha⁻¹ with *Rhizobium* and PSB, the control (no phosphorus and biofertilizers). In chickpea, the highest growth parameters and yield attributes of chickpea were recorded with progressive increase in phosphorus level up to 60 kg P₂O₅ ha⁻¹ with dual inoculation of seeds with *Rhizobium* and PSB proved to be profitable boosting grain yield (1568 kg ha⁻¹) and gave the maximum net return (Rs. 65460 ha⁻¹). Under agri-horti system, guava + chickpea (application of 60 kg P₂O₅ ha⁻¹ with dual inoculation of seeds of chickpea with *Rhizobium* and PSB) gave highest net returns (Rs.153070 ha⁻¹) and B-C ratio (2:69) as compared to other treatments integrated with guava fruit tree. The highest tree height, canopy diameter, stem girth and fruit size of guava was recorded in association with chickpea.

Keywords: Agri-horti system, Biofertilizers, *Cicer arietinum* (L.), Economics, Yield

SCIENCE TECHNOLOGY AND INNOVATION (STI) APPROACH IN MODERN EXTENSION SYSTEM FOR EMPOWERING THE FARMERS

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ABSTRACT

Food security is usually framed in four dimensions: food availability, access to food, food utilization and use, and food stability. The FAO acknowledges a number of issues STI must be addressed in order to attain higher productivity and sustainability, such as enhancing yield and productivity, bridging yield gaps, protecting yield gains, exploiting biotechnology, managing natural resources, addressing environmental concerns, managing climate change, minimizing adverse impacts of natural disasters, and utilizing information communication technologies (ICTs) to promote knowledge-based development. The potential of IT can be explored for direct contribution to agricultural productivity by empowering farmers to take relevant information and timely quality decision which will have positive impact on the agriculture and allied activities. Precision farming extensively uses IT to make direct contribution to agricultural productivity. The Artificial Intelligence and machine learning had made their footprints stronger in agriculture sector. Now India had moved a step forward and ready to compete with other nations since we were updating the knowledge in Artificial intelligence and Machine learning. Technologies used in achieving food security should ensure high quality food products. Low food quality exposes the population to poor nutrition and food safety issues, which in turn create a burden on the society, affecting overall socio-economic well-being.

Keywords: Food Security, m-Agriculture, Agricultural mobile apps, and Innovation in food sector.

PERCEPTION OF FARMERS TOWARDS CLIMATE CHANGE

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Purpose

Climate change is predicted by scientists to have the main impact on agriculture, economy and livelihood of the populations of developing countries and India is one of them, where large parts of the population depend on climate sensitive sectors like agriculture and forestry for livelihood. Climate change is intrinsically linked to other environmental issues and to the challenge of sustainable development. Perception about climate change plays an important role to support farm-level decisions in the cropping cycle. The people and their livelihoods are inextricably entwined with their climate and a very small change can affect them in diseases, on water needs, on nutrient requirements and also harvesting and marketing time of the produce. Considering this factual information the study on a ‘Perception of farmers towards climate change’ was planned and conducted.

Methods

The present investigation was carried out in Vidarbha region of Maharashtra State of India. Out of 11 districts Vidarbha region namely Yavatmal was selected for the study. For the purpose of study 6 villages from Yavatmal district were selected randomly. In this way, a total of 120 farmers were considered as respondents for a study. Ex-post facto research design was used for study. Data were collected through personal interview method with the help of structural schedule. Then the data was subjected to statistical analysis for interpretation.

Results

It is observed that a majority of farmers (85.83%) agreed (SA+A) that there was an “Increase in temperature as compared to previous years” whereas 5.83 percent (SDA+DA) disagreed with this and (8.34%) farmers were ‘undecided’ about increase in temperature as compared to previous years. In response to a statement “intensity of heat during summer has Increased” majority of farmers (80.84%) agreed (SA+A) with this statement. Where as (71.66%) percent of farmers agreed (SA+A) that changes of high temperature and heat wave occurrence have increased. Further, 84.18 percent (SA+A) farmers observed changes in rainfall as compared to last few year. while, 83.32 percent (SA+A) farmers reported that “there was the changes in timing of rainfall.

Conclusions

It is concluded that majority of farmers (50.83%) have Medium level of perceptions towards climate change followed by 43.34 percent high and 5.83 percent low perception towards climate change.

Keywords: Perception, Climate change

AVIAN COMMUNITY STRUCTURE ALONG A GRADIENT OF URBANIZATION IN BILASPUR, CHHATTISGARH, INDIA

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ABSTRACT

Urbanisation is considered an important driver of current biodiversity loss, but the underlying causes are not fully understood. It is generally assumed that this loss reflects the fact that most organisms do not tolerate well the environmental alterations associated with urbanisation. Urbanization will generate intensively constructed urban centres and moderately renovated urban fringes, but urbanization is a major threat to global biodiversity often accompanied by irreversible damage to natural ecosystems. As some of the top organisms in the food chain, birds have long been used to monitor environmental change and its related effects. As important indicators of biodiversity conservation and human environments, avian species richness and individual abundance are representative of the value of not only urban green spaces but also urban ecosystem functions and services. Avian distribution patterns along an urbanization gradient most likely depend on the development type and surrounding environmental matrix of the urban region being studied. Under the background of consistent increasing of urbanization pressure within our study area, the effort to find out the efficient methods to control its damage on avian communities becomes highly important.

The objectives of present study were to document bird species in the Bilaspur city of Chhattisgarh along a vegetation gradient ranging from highly urbanized to entirely wooded (i.e. forest) areas and evaluate the avian community organization in relation to different degrees of urbanization. It was observed that avian community structure is highly influenced by the vegetation habitat variables, food availability and human-related disturbance variables. Such

data may be useful in identification of most vulnerable species of the studied area as well as useful to conservation planners, urban planners, and land managers.

Keywords: Avian community, urbanization gradient, environmental variables.

HYDROLOGIC RESPONSE OF KOSI RIVER BASIN DUE TO CHANGING CLIMATE

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Purpose

The changing climate and hydrologist extreme events have a negative impact on agriculture, water resource development and can cause natural hazard. Production of crop is vulnerable in changing climate and alike with increasing temperature; increasing CO₂, change in rainfall which leads to decline in production of crop also extreme weather like drought heat, heavy rainfall lead to flood. Therefore it requires more attention to adaptation and mitigation research, through the sustainable intensification of crop production capacity building, change in policies, and in support of national/global adaptation funds and other resources to minimize adverse impacts.

Methods

In this study, characteristics of watershed are carried out for a Kosi River basin in of Bihar. Watershed Morphometric parameters are number of channels, order no., drainage density, Bifurcation Ratio, stream Length, Stream frequency, circulatory ratio etc. Intensifying crop production and addressing climate change are done in an integrated and sustainable way.

Results: At present scenario, the aggregate impacts of climate change on global-scale agricultural productivity cannot be reliably quantified. Kosi River (Ganga River tributaries) evaluated the linear, relief and aerial morphometric of river with reference for future development landslides incidences and planning of the watershed. The study describes that the number of the landslide's incidence are more in the upward side then the downward sides of KosiRiver.

Some global-scale assessments have been carried off, and it is limited in their ability to capture the uncertainty in climate projections, and excluded the potentially important aspects like extreme events and changes in pests and diseases.

Conclusion

Since climate change is an inevitable phenomenon, policy making should be introduced adaptation measures to sustain the economic growth.

IMPACT OF ANTHROPOGENIC INTERFERENCES ON VERTICAL DISTRIBUTION OF SOIL ORGANIC CARBON IN SAL DOMINATED FOREST OF ACHANAKMAR AMARKANTAK BIOSPHERE RESERVE, CHHATTISGARH

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ABSTRACT

Removal and loss of primary forests due to human need and greed are prevalent throughout the country, which brings a significant change in soil organic carbon (SOC) and generates carbon dioxide (CO₂) emissions. Changes in SOC concentration in soil may alter the soil health because carbon content in soil is a major factor in its overall fertility and its function. Moreover, it facilitates the scientific basis of forest soil management and land-use. Depletion of forest

reduce the carbon content in soil and leads to desertification that are the greatest concern in today's world. It is therefore, necessary to quantify the SOC concentration in soil in response to changing forest cover. Achanakmar-Amarkantak Biosphere Reserve (AABR) is the 1st Biosphere Reserve of Chhattisgarh State of Central India and 14th biosphere reserve of the country, declared by Government of India during the year 2005. In forest fringes of AABR, Sal Forest is becoming more and more degraded every day because of increasing anthropogenic interferences including excessive grazing, deliberate forest fire, and overexploitation of forest resources. However, distribution of SOC in the different soil profile and its response to forest degradation received little attention in this region. We assessed these impacts based on the analysis of soil sample collected from disturbed and undisturbed site of dominated Sal Forest in five vertical layers at 20cm interval. The changes in SOC were evaluated up to 100cm soil depth. The SOC were recorded higher in topmost layer, which was approximately 70% higher in first layer compare to last one of both forest sites. The distribution of SOC in soil profile, rapidly decline in first two layer after that there was less difference occurred in last three layers. It was found that soil organic carbon was decreased by 24% in the disturbed forests site compare to undisturbed site. The concentration of SOC decreased with increasing soil depth in both sites. It revealed that forest canopy degradation due to anthropogenic interference caused loss of SOC in almost every layers.

EFFECT OF NEEMA STRA, AGNIA STRA AND BRAHMA STRA ON ROOT-KNOT NEMATODES, *Meloidogyne* spp. INFECTING TOMATO

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ABSTRACT

A preliminary field study on the effect of three different natural farming inputs viz., *Neemastra*, *Agniastra* and *Brahmastra* was done on root-knot nematodes, *Meloidogyne* spp. infecting tomato. All three natural farming inputs were prepared by using fresh indigenous cow urine and dung. A total of three different concentrations of each input, *Neemastra* (200, 300 & 400 l /acre), *Agniastra* (400, 600 & 800ml/10 l water) and *Brahmastra* (400, 600 & 800ml/10 l water) were used and applied 500 ml water solution as drenching per plant near the root zone area at the time of transplanting and repeated after 15, 30 & 45 days after transplanting. All the recommended agronomical practices were followed to raise the tomato crop [*var.* Gujarat Anand Tomato 3(GAT-3)] at Nematology Farm, Department of Nematology, B. A. College of Agriculture, Anand Agricultural University, Anand (GS), India during *kharif* 2020. The experimental field was infested with root-knot nematodes with a population density of more than one nematode per gram of soil *i.e.* 256 infective juveniles per 200cc soil. The experiments were carried out in completely randomized block design (RBD). Based on the results of the root-knot index (RKI 0-5), the minimum RKI of 2.38 was found in *Agniastra* @ 800ml/10 l water followed by 2.56 in *Neemastra* @ 400 l /acre and 2.63 in *Brahmastra* @ 800ml/10 l water as compared with rest of the treatments. The data on fruit yield indicated that the maximum of 30117 kg/ha was observed in *Neemastra* @ 400 l /acre followed by 29598 and 29250 kg/ha in *Brahmastra* @ 800ml/10 l water and *Agniastra* @ 800ml/10 l water, respectively. Statistically result on fruit yield was non-significant and as per DNMRT all treatments were at par. Among all organic input treatments, *Agniastra* @ 800ml/10 l water gave a maximum reduction of RKI and was superior over all the treatments. These organic inputs were found effective to manage root-knot nematodes and reduce RKI significantly.

Whereas, the data on fruit yield showed that these organic inputs were not found effective and the result was found non-significant.

ARSENIC IN CEREALS, VEGETABLES, AND FRUITS: A PRELIMINARY STUDY

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ABSTARCT

Groundwater is the major source of drinking water across the world. The arsenic contamination of groundwater either geogenic or anthropogenic alters the natural composition which is harmful to living organisms. The contamination of arsenic affects more than 300 million people across 108 countries. The irrigation of crops, vegetables, and fruits with contaminated groundwater leads to the accumulation of arsenic in them, which is further transferred to humans through the food chain and get bioaccumulated. Prolonged consumption of arsenic-contaminated agro-products may cause serious health-related problems such as skin pigmentation, gastrointestinal problems, diabetes, and cardiovascular diseases and ultimately leads to cancer. A study has been designed to estimate the level of arsenic in various agro-products and human tissues like hair, nail, and urine as well as to estimate its health risk. In this study, firstly we estimated the level of arsenic in the study area in which a total of 138 samples were estimated through a highly sensitive arsenic testing kit. Estimation shows more than 65 percent of samples of groundwater are contaminated far above the permissible limit of WHO (10µg/l) and Indian standards (50µg/l). We also examined the level of arsenic in various cereals, vegetables, and fruits and concluded that these agro-products continuously affect human health. These agro-products are exported in the market across Bihar. We are also planning to extend this study throughout Bihar. Awareness programs and the installation of water purification system is highly desirable in these areas.

Keywords: *arsenic, agro-products, cancer, health risk*

CHANGE IN TRADITIONAL AGRICULTURE IN ARUNACHAL PRADESH, NORTHEAST INDIA

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Purpose

The study primarily concentrated on the necessity of agroforestry practises in terms of socio-economic development, means of subsistence, and food security, as well as the current barriers impeding the growth of the studied farming system.

Methods

For the present study, we carried out a thorough survey in three districts of Arunachal Pradesh, India, *viz.*, the Kra Daadi, the Lower Subansiri, and the Papum Pare using structured questionnaires.

Results

Due to its socio-economic and ecological benefits, it has been observed in the recent past that the majority of indigenous farmers in northeast India are now focusing on traditional agroforestry systems. The practise of jhumming, which has become almost outdated saw a fall of at least 70 to 80 percent in the last 10 to 15 years and has been replaced by traditional agroforestry practices.

Conclusions

The traditional agroforestry has been used in these areas for various social, environmental, and economic reasons encouraging its adoption as a means of sustainable development.

Keywords: Jhum, Traditional Agroforestry, Sustainable development, Arunachal Pradesh, India

IMPACT OF COVER CROPS ON MICROCLIMATE OF CUSTARD APPLE (*Annona squamosa* L.) cv. BALANAGAR

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Purpose

Custard apple, botanically known as *Annona squamosa* L. belongs to the family annonaceae and it is a deciduous tree of annonaceae family that grows well in subtropics. Its flowering takes place over a lengthy period of time, beginning in March-April and continuing until July-August and flowering is maximum in the months of April and May. Fruit set does not occur throughout the spring and summer months and it only begins during the rainy season. Low productivity in sugar apple is the major hurdle in expanding their commercial cultivation because plant produces enough blossoms to provide a good harvest but the poor fruit set results in a reduced yield. Under natural circumstances, just 1- 8 per cent of fruit set has been documented. Poor pollination causes low fruit set in custard apples, which has been linked to both external and internal factors such as high and low humidity at flowering, soil moisture stress and competition between vegetative and floral growth, hypogyny, dichogamy, poor pollen germination and a lack of insect pollinators. Productivity of custard apple in the field may be improved by cultural practices like overhead misting, windbreaks and efficient irrigation scheduling. Similarly, growing of cover crops in the custard apple orchard before flowering helps in creating a micro climate during flowering by conserving soil moisture, reducing canopy temperature and increasing canopy relative humidity causes better fruit set and increases the yield.

Methods

A field experiment was conducted at Horticulture Research Extension Center, Vijayapura. UHS, Bagalkot during 2021-22. Experiment consist of 7 treatments and 3 replication. Treatment likes T₁ (Macuna), T₂ (Dhiancha), T₃ (Sunhemp), T₄ (cowpea), T₅ (Lucerne), T₆ (water spray) and T₇ (control). Recommended dose of fertilizer is common for all the treatments and cover crops were sown one month before flowering and water spray was done at evening hours during flowering period.

Results

Among the different cover crops and water spray and control treatment, T₃ (Sunhemp) has recorded the minimum number of days required for flowering to fruit set and maturity and also in the same treatment highest fruit set (%), more number of fruits per plant and yield (kg/plant and t/ha) has been recorded and it is followed by T₂ (Dhaincha) and T₄ (cowpea).

Conclusions

From the investigation it was concluded that growing of cover crops one month before flowering advances the early fruit set and maturity. This might be due to cover crops creates a micro climate under plant canopy by reducing the temperature (0.9 – 2 °C), increasing canopy relative humidity (1-3 %), conservation of soil moisture for longer period maintains high stigmatic receptivity for a longer period in summer and improves the soil organic carbon and helps in fixation nitrogen in the soil.

Keywords – Custard apple, Cover crops, Sunhemp, Temperature, Humidity, Micro climate

EXPLOITATION OF ALTERNATE PRODUCTION TECHNOLOGIES FOR HORTICULTURAL CROPS

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ABSTRACT

Growing population and climate change coupled with diminishing land and water resources can be a threat for horticultural crop production by means of conventional methods. The exploitation of alternative production technologies can contribute towards the real solutions for these challenges. The adverse effects of using inorganic inputs and low efficiency of inputs insist to adopt the alternate technologies. For ensuring optimum production of horticultural crops, environment independent cultivation, precise resources application, horizontal space utilization, soil less cultivation, introduction of new crops and tolerant varieties, organic resources utilization, use of new and renewable energy source, artificial light usage for increasing production efficiency, minimum budget farming, automation in plant monitoring, exploitation of horticulture in urban and peri-urban areas and use of drone and sensors for disease identification and management. All the developed alternate production technologies should be carefully studied and need to be standardized in different horticultural crops. The technological gap between scientists and farmers need to be reduced and there is need to increase the number of research to standardize these technologies in different horticultural crops.

Keywords: Alternative approaches, input use efficiency and productivity.

PRODUCTION, CONSUMPTION AND IMPORT OF NPK FERTILIZER IN INDIA – AN ECONOMIC ANALYSIS.

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ABSTRACT

Fertilizer is one of the strategic inputs for enhancing productivity which enables to meet the growing demand for food in the country. The present study was conducted to know the growth and determinants of fertilizers in India. The secondary data on production of major chemical fertilizer, consumption of (NPK) fertilizers, etc. from 1988-89 to 2017-18 were collected.

There was a substantial growth in production and consumption of chemical fertilizers in India over the years. The production of chemical fertilizer showed an increasing trend. The country witnessed an increase in the consumption of NPK. The consumption of fertilizer during overall period showed a positive and significant growth. Among the period I recorded the highest consumption of NPK. The average consumption of nitrogenous fertilizers was more compared to phosphorous and potash. Compound growth rate for consumption of fertilizers (NPK) was recorded high during period I in all india. During period III the consumption of fertilizers registered mostly negative growth rates in all india.

Compound growth rate for import of NPK fertilizers was recorded high in period II in overall period. In period III the import of NPK fertilizers was found negative growth rate.

Keywords: Production, consumption, and Import of NPK fertilizer.

SPECIES COMPOSITION AND DIVERSITY OF INSECT POLLINATORS OF TEMPERATE FRUITS ORCHARDS IN NAINITAL DISTRICT OF KUMAON HIMALAYA, UTTARAKHAND, INDIA

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ABSTRACT

Kumaon Himalayan region harbors a number of temperate fruits orchards of apple, peach, apricot, plum, pear and kiwi that increase the economy of the fruit growers of the Uttarakhand state. The present study was conducted in temperate fruit orchards located in hills of Nainital district of Kumaon Himalayan region of Uttarakhand state of India. The proposed study with appropriate methodology was therefore conducted in this region to provide information on evaluating the community structure and distribution of insect pollinators in different temperate fruit orchards of Kumaun region. A total of 92 species insect pollinators belonging to 59 genera under 25 families and four orders were recorded. The order Lepidoptera was represented by 53 species followed by Hymenoptera with 19 species, Diptera with 14 species and Coleoptera having six species. The findings of the present study revealed that *Apis cerana* Fabricius was the most abundant species followed by *Pieris brassicae*, *Aglis caschmirensis*, *Pieris canidia*, *Vanessa cardui*, *Apis mellifera*, *Vanessa indica*, *Issoria lathonia* and *Syrphus fulvifacies*. On the other hand, *Philoliche longirostris*, *Componotus compressus*, *Hybomitra* species and *Mylabris pustulata* were found to be the least abundant species of the total insect pollinators surveyed during the entire study period. Richness of insect pollinators across different temperate fruit orchards were calculated by using Margalef's index where the maximum value was recorded in apple (7.309), followed by peach (6.193), plum (5.153), pear (4.723), apricot (4.316) and kiwi (3.513) respectively.

Keywords: Insects, Orchards, Pollinators, species and temperate fruits.

COMMUNITY STRUCTURE OF ANTHOPHILOUS INSECTS IN THE WESTERN HIMALAYA, UTTARAKHAND, INDIA

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ABSTRACT

The Himalaya is the largest mountain chain in the world and is considered as the repository of biological and cultural diversity. Western Himalaya includes three states of India namely, Jammu and Kashmir, Himachal Pradesh and Uttarakhand (Garhwal and Kumaon Himalaya). Anthophilous insects visit flowers to collect pollen, nectar, oil, or floral tissues and thus during foraging several species serve as crucial pollinators of angiospermic plants. The common anthophilous insects include groups like bees, wasps, ants, true flies, moths, butterflies, thrips and several beetles. The present study was conducted in around the district Nainital of Kumaon Himalayan region of Uttarakhand state from March 2018 to February 2020. The anthophilous insects were sampled through appropriate methodologies. A total of 128 species under 101 genera of anthophilous insects belonging to five orders (Lepidoptera, Hymenoptera, Diptera, Coleoptera, Hemiptera) and 37 families were recorded over the entire study period. Out of which the maximum species belong to the order Lepidoptera whereas the minimum

belonged to the order Hemiptera. In terms of the number of individuals, Hymenoptera was the most dominant order, whereas Hemiptera was the least dominant order. The relative abundance of *Apis cerana* was recorded the maximum (4.95%), in contrast, *Belenois aurota* was recorded with the minimum relative abundance (0.05%). The Shannon diversity of anthophilous insects was recorded maximum in the rainy season (4.304) and minimum was in the winter season (3.405). Similarly, Simpson's dominance was calculated maximum in the rainy season (0.982) and the minimum in the winter season (0.954). However, Margalef's richness was calculated maximum in the spring season (14.03) and minimum was in the winter season (7.68). The density of anthophilous insects was observed abundantly in the month of May whereas minimum in January month in both observational years.

Keywords: Anthophilous, diversity, flower visitors, insects, species

AIR POLLUTION LEVEL DECLINES THE BIRD SPECIES DIVERSITY IN URBAN AREA: A CASE STUDY OF BILASPUR, CHHATTISGARH DURING SUMMER SEASON

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ABSTRACT

With rapid growth and changes in daily life, air pollution is also increasing with a high rate. Air pollution threats are not only restricted to urban areas but have adverse effect in rural areas also. Apart from being harmful for the human beings; air pollution possesses negative impact on bird species also. This study was carried out with the aim to find out the adverse impact of air pollution on diversity of avian community. The study was executed at five different locations of Bilaspur city during the summer season (2022). Vehicular emissions, burning of fossil fuels, constructions etc. being the major source of pollution in the city. Point count and checklist method was adopted for the observation of bird species. The air quality and pollution monitoring had been carried out through ‘Smiledrive Air Quality Monitor Pollution Meter’ which detects the concentration and level of PM 2.5, PM 10, TVOC and HCHO in the air. The diversity of bird species was calculated through total species richness and Shannon-Wiener diversity index. It was observed that the site having minimum pollution level have large number of bird population with maximum diversity and the sites having high pollution level have least diversity of birds. It is due to the reason that many bird species avoid the areas with high pollution concentration. The study also revealed the remarkable high population of birds of ‘Sturnidae’ and ‘Columbidae’ family in polluted sites which validates that the birds of these families have adapted themselves well in the sites with high pollution level.

Keywords: Air pollution, birds, diversity, urban area.

SYSTEMATIC STUDY ON ROADSIDE MORTALITY OF INSECT FAUNA IN AND AROUND NAINITAL CITY, UTTARAKHAND, INDIA

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ABSTRACT: A high rate of mortality due to road traffic is affecting the biodiversity. The effects of road networks on insect mortality were studied in and around the Nainital city, Uttarakhand, India to assess the species composition and abundance of insects suffering a high mortality due to road networks. A total of 154 individuals belonging to 37 species of insects under 16 families and six orders affected with vehicle-insect collisions were observed during the study period. Order Lepidoptera was the most dominant order with maximum mortality of 20 species and accounting 54.1% of the total number of species of insects during the entire study period, followed by Coleoptera and Hymenoptera (5 species; 13.5% each), Hemiptera (4 species; 10.8%), Orthoptera (2 species; 5.4%) and Odonata with single species accounting 2.7% of total insects. The maximum numbers of road killed insect species were recorded from Transect-I followed by Transect-II and Transect-III respectively due to variation in the vehicular traffic along the different study sites. As the road networks and traffic volumes are increasing across the globe, estimation of road mortality is an essential issue for the conservation of insects living on road verges.

Keywords: Conservation, Insects, Roadside mortality, Road killed, Traffic

GREEN TECHNOLOGY INNOVATION ON URBANIZATION FOR SUSTAINABILITY IN INDIA

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ABSTRACT

Urbanization is the process of people moving from rural to urban regions. India, the world's second-most populous nation after China, is becoming more urbanized. Because of excessive resource use, rapid urbanization, a sharp rise in population, and a corresponding rise in the number of cities, the world is currently experiencing numerous economic and environmental issues. The idea of research come with the urge to change the basic concept of urban planning techniques. we should include environment friendly techniques. This study goes under the number of papers review. Green technology, commonly referred to as sustainable technology, considers both an item's immediate and long-term effects on the environment. By definition, green products are those that protect the environment. A green product or technology takes into account a variety of factors, including energy efficiency, recycling, health and safety considerations, renewable resources, and more. A simple example of green tech is LED lighting, Solar Panels, Wind Energy, Composting, Electric Vehicles, Programmable Thermostats, Vertical Farming. The term "green technology" was developed as a method to address the issues of rapid urbanization, excessive resource use, sharply rising population, and a commensurate rise in the number of cities, among other factors with a focus on sustainable development at all scales. It appears to be a very efficient instrument for contemporary urban planning, taking into account all planning factors, including infrastructure, industry, energy, telecommunications, and other key sectors in cities.

Keywords: green technology, urbanization, sustainable development, environment.

ASSESSMENT OF SCLEROTINIA STEM AND LEAF ROT RESISTANCE AND ITS ASSOCIATION WITH STEM PHYSICAL STRENGTH ATTRIBUTES IN BRASSICACEAE WITH SPECIAL EMPHASIS ON *Brassica Juncea*

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Introduction

The *Brassicaceae* family includes many economically important species that are grown worldwide and used mainly for vegetable oils. Sclerotinia stem and leaf rot, caused by *Sclerotinia sclerotiorum*, is a devastating disease that affects many *Brassicaceae* species and threatens their long-term productivity and profitability. Against this pathogen, no genetic sources with a high level of resistance have yet been discovered.

Materials and Methods

In this study, 338 accessions from 13 cultivated and wild *Brassicaceae* species, including 266 accessions of *B. juncea*, were evaluated for leaf and stem resistance to *S. sclerotiorum* as well as for various stem physical strength attributing traits viz., stem diameter, stem breaking force, stem breaking strength and stem specific density.

Results

Large variation of resistance was found in *Brassicaceae*, with maximum differences of 23.08- and 8.25-folds in stem and leaf resistance respectively. *B. juncea* IC 589660, *D. tenuisiliqua* and *S. alba* SA 1 showed high level of resistance to stem rot while *B. carinata* HC 0214, *B. juncea* IC 589660, *B. juncea* IC 491160, *B. juncea* IC 73231, and *B. juncea* IC 491463 exhibited high level of resistance to leaf rot. These accessions showed significantly lower disease scores than the resistant control. Among all the evaluated accession, *B. juncea* IC 589660 is the only genotype exhibited high resistance to both stem and leaf rot and could prove useful for *S. sclerotiorum* resistance breeding programs. The lack of association between leaf lesion size and stem lesion length revealed separate genetic regulation for stem vs leaf resistance. While, significant negative correlation detected between stem lesion length, and stem physical strength attributing traits indicated that stem physical strength-mediated resistance (SPSMR) factors were responsible for Sclerotinia stem rot resistance in Brassicaceae. A key resistance component against stem rot is the hard and woody stem, which could be targeted in long-term resistance breeding strategies.

Conclusion

These findings pave the door for further research into the molecular basis of SPSMR's response to Sclerotinia stem rot in Brassica oilseeds and other hosts. Sclerotinia stem and leaf rot resistant accessions identified in this study will be of considerable benefit not only in increasing our understanding of resistance mechanisms across different Brassicaceae species, but also in generating resistant cultivars against *Sclerotinia sclerotiorum*.

Keywords: Brassicaceae, *Sclerotinia sclerotiorum*, genetic resistance, stem physical strength, stem and leaf rot

PATTERNS OF CROP RAIDING BY WILD ANIMALS IN BHABHUA FOREST RANGE OF KAIMUR WILDLIFE SANCTUARY, BIHAR

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ABSTRACT

In terms of agriculture, Bihar is one of the nation's strongest states. About 80 percent of the population engages in agriculture, which is significantly higher than the national average. It also contributes significantly to India's production of fruits and vegetables. In Bihar's Kaimur district, there are around 1,13,403 ha of forested land, of which 98,644 ha covers the Kaimur Wildlife Sanctuary. There is substantial agriculture in the alluvial plain that reaches up to the Bhabhua range foothills. The main crops of the area are rice, wheat, pulses, oilseeds, maize, etc. and the landscape is interspersed with bamboo clumps and mango orchards. Some of the area is covered with Dry Deciduous Forest. Animals including Panther, Sloth bear, Black buck, Nilgai, Wild boar, and Porcupine in numbers are frequently seen in these areas. The possibility of crop raiding by wild animals has increased as a result of coexisting human and wildlife in an ecotone area. Crop raiding and small-scale farmers ability to secure enough food has not been thoroughly researched.

In the Bhabhua Forest Range of the Kaimur Wildlife Sanctuary, we've undertaken a study to show the extent, frequency, and types of animals responsible for agricultural loss. Data were gathered from farming communities living on the edges of the forest using a questionnaire and informal interviews.

Four wild animals were recognized as the top raiders in the region such as Nilgai, Black buck, Wild boar, and Porcupine. Black buck and Nilgai were the top raiders in both the fields closest to and the fields farthest from the forest zone, while wild boar and porcupines were the main raiders in the areas adjacent to the forest boundaries. Peak crop raiding was strongly linked with periods of heavy rainfall. The frequency of occurrence of crop raiding decreased with increase in distance from forest area. According to farmers the majority of agricultural raids took place close to the forest edges, and the local guarding methods used were ineffective. Wild animals are seen as a threat to the survival of the farming population living close to the forest. The results of our study highlight that crop raiding is a threat to the food security of the farmers, and it is important to discover measures to minimize their socioeconomic impact, particularly in areas close to the forest boundaries. At the same time, farmer antagonism toward wildlife, particularly of threatened species, this needs to be combined with enhanced mitigation of human-wildlife conflict.

Keywords: Agricultural crops, farming communities, socio-economic, crop raiding

LAND USE AND LAND COVER CHANGE DETECTION OF ERNAKULUM, KERALA USING REMOTE SENSING AND GIS

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ABSTRACT

The present study was conducted to assess the Land Degradation (LD) status under different land use in Ernakulum district of Kerala, India that is dynamically regulated by marine and terrestrial processes and often controlled by natural and anthropogenic activities. In this study, Land use land cover changes (LULC) was investigated using Remote Sensing (RS) and

Geographic Information Systems (GIS) technology. The primary objective of this study is to estimate the change detection using satellite images i.e. Landsat TM, ETM and implemented algorithm such as Maximum Likelihood Classifier (MLC) for the period from 2014– 2020 with an equal time interval. The resulted classified LULC classes indicates a substantial change in patterns; i.e. the area covered under the Waterbody and build-up shows a declining trend from 2014 to 2020, with change in classes of about 17.40 km² and 59.38 km² respectively. While, the status for Vegetation, Forest, and Barren land displayed a general increasing order; from 2014 to 2020 with a spatial distribution of 27.14 km², 41.14 km², and 8.49 km² respectively. The observed LULC changes mostly are the result of flood and anthropoid activities, with a large variety of negative impacts on the socioeconomic environment. Therefore, the available data on LULC changes can be helpful in decision-making, environmental management and planning in future for the Ernakulum district of Kerala.

Keywords: RS & GIS, LULC, Change Detection

IMPACT OF COMMUNITY ANIMAL HEALTH CENTRE IN TRIBAL VILLAGES ON THE DELIVERY OF ANIMAL HEALTH SERVICES AND PRODUCTIVITY OF ANIMAL.

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Purpose

The service delivery in India is facing acute shortage of veterinarians and infrastructure resulting in poor accessibility to animal health services, especially among the farmers living in remote locations. It is estimated that the available human resource to meet the animal health service requirements during the year 2020 will be around 28.5 per cent lesser than actual requirement. To address this issue, Krishi Vigyan Kendra, Banka developed and implemented novel model of *Community Animal Health Centre* (CACH). This model consists of (i) developing capacity of local human resource and engaging local institutions (ii) cost sharing for minimization of public investment (iii) handholding support for service providers to develop entrepreneurship and (iv) continuous monitoring for quality assurance.

Methods

The CAHC model was implemented in five scheduled tribe (ST) dominated villages – Khirkitari, Pokhariya, Dharhawadi of Banka, Budhavabaithan and Logain of Katoriya block of Banka district in Bihar under the Tribal Sub Plan Scheme. From each of the selected villages, three youths were trained for developing skills to impart paravet services including vaccination, deworming, artificial insemination, diagnosis of common diseases and providing advisories regarding pre and post-natal care of ruminants. The infrastructure of village Panchayat in these villages was utilized to establish Community Animal Health Centres wherein the basic veterinary facilities like travis were established and products including veterinary medicines, feed supplements, etc. were stored. Initially, free vaccination drives, animal health camps and awareness programmes were organized to make livestock owners realize the importance of animal health care and to create congenial environment for sustainable functioning and utilization of the CAHC. Later on with mutual agreement, the livestock owners and paravet service provider of the village agreed up on to pay service charges to the trained paravet ranging between rupees 10 to 100 on the basis of type of service provided. However, initially, all the veterinary medicines and vaccinations were provided freely to the needy ones. The paravets were provided with appropriate registers to maintain the record of details of animal, diagnostics and treatment provided along with veterinary supplies utilized.

Results

The major services provided under CAHC intervention were deworming, vaccination, treatment of minor diseases. The most frequently availed service was vaccination of animal (f=1181, 41.58%) followed by deworming of animals (f=1154, 40.63%) and treatment of diseases (f=483, 17.01%). Only 22 times livestock owners sought for other services including advisories related to animal feed and fodder related issues. Across five AHACs, average 358 livestock owners availed deworming services, whereas average of 394 and 161 livestock owner availed vaccination and disease treatment services, respectively.

The average distance covered by livestock owners to seek animal health services before establishment of community animal health centre was 22.83 kilometers. After establishment of community animal health center, this distance is reduced to 6.40 kilometers (71.97%). further it was observed that ease of access to animal health services has increased by 43.96 per cent. The average cost for each visit of the veterinary service provider has also drastically reduced from Rs. 320 to Rs. 64.92. Milk production in cow, marketing age of goat, productivity of goat meat was increased by 121%, 35% and 35% but total meat produce increased by 73%. Poultry meat production and consumption was increased by 3 and 6 times. Hence, Animal health advisory centre is an effective way for improving veterinary services in tribal village.

Conclusions

Findings of the study revealed that, these community animal health centers have significantly reduced the cost associated with availing animal health services and have also significantly increased the timeliness of the services. On the qualitative front, it was observed that, CAHC were successful at increasing ease of access to animal health services as well. However, the effectiveness of animal health services provided by trained paravets was slightly lesser than that of services provided by full-fledged veterinary doctors. However, this difference was found to be statistically non-significant.

All over, Animal health advisory centre is an effective way for improving veterinary services in tribal village.

Keywords: *Veterinary service, Animal health, Livestock, vaccination*

EFFECT OF TWO DISTINCT SOIL MOISTURE SCENARIOS ON THE WHEAT (*Triticum aestivum*) ROOT ATTRIBUTES AND SOIL BIOLOGICAL PROPERTIES FOLLOWING DIFFERENT COMPOST AMENDMENT PRACTICE

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Purpose:

Municipal solid waste compost is a cheaper alternative source of compost as compared to largely used farmyard manure. Therefore, this experiment was conducted to determine the competence of this compost against farmyard manure based on wheat root growth and enzymatic attributes, root enzymes, soil enzymes, microbial biomass carbon, and bacterial community structure under two different soil moisture scenarios.

Methods:

A two-year-long field experiment was initiated in the winter season of 2018 and laid out in a Randomized Block design with five treatments which were; 1: Control, 2: 100% RDF, 3: 5-ton FYM (Farmyard Manure) + 100% RDF, 4: 5-ton MSWC (Municipal Solid Waste Compost) + 100% RDF 5: 10-ton MSWC+ 100% RDF along with two consecutive dynamic moisture scenarios (field capacity to 50% available soil moisture (ASM) and 50% ASM to 25% ASM.). The root rhizosphere soil was collected from five spots from each plot and analyzed following

the standard procedure described by Dick et al. (1997) and Jensen et al. (1996), while root parameters were analyzed as described by Luo et al. (2016) and Yannarelli et al. (2007). Relative abundance of bacterial genera was estimated using 16sRNA seq using illumine sequencing machine and following standard procedure.

Results:

The pooled data of two consecutive years (2019-20 and 2020-21) indicates significantly higher and better root attributes such as root activity, root growth rate, glutathione reductase activity, and root antioxidant level have been recorded with the treatment where 10-ton municipal solid waste compost was applied along with 100% of the recommended dose of fertilizer although while the dose was 50% lower; the farmyard manure recorded better result than the municipal solid waste compost. The result also shows that compost amendment has significantly lowered the glutathione reductase activity and increased antioxidant activity, which indicates better stress tolerance. The correlogram indicates enhanced soil microbial and enzymatic activity due to compost amendment strongly positively correlated with root growth and antioxidant activity and negatively correlated with glutathione reductase (plant stress indicator) under both moisture regimes (FC-50% ASM & 50-25% ASM). The abundance of bacterial genera was also different among control, RDF, 5t FYM+ 100%RDF and 5t MSWC+ 100%RDF

Conclusion:

The application of municipal solid waste compost at a rate of 10 tons along with 100% RDF has resulted in higher wheat root attributes and enhanced soil enzyme activities compared to control and FYM under both moistures sufficient and scarce scenarios. The relative abundance of bacterial genera was also different.

Keywords: wheat, root antioxidant activity, soil microbial biomass carbon, soil enzyme, municipal solid waste compost

EFFECTS OF LONG-TERM EXPERIMENTS ON CHEMICAL PROPERTIES OF SOIL

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ABSTRACT

Long-term experiments have been conducted to quantify changes in physicochemical properties of the soils. Long-term experiments having different management practices can provide critical observations regarding the changes in soil quality and can help in prediction of future soil productivity and soil-environment interactions. The soil pH decreased with application of FYM, SS and NPK. The highest soil pH decrease was observed in the treatment with NPK and N + straw was observed at Hněvčeves site. By the treatments FYM and SS the highest decrease was registered at Červený Újezd. Organic manures substituted plots registered lower pH than sole chemically fertilized plots which may be assigned to release of more organic acids on decomposition of FYM. Continuous cropping of rice–wheat system led to decrease in EC value as compared to initial value. Electrical conductivity was slightly lower in organic treated plots as compared to chemically fertilized plots but differences were very meagre. Irrespective of modes of FYM application the increasing level of FYM significantly increased the mean EC of surface and subsurface soil. Soil organic carbon significantly enhances with increase with C input treatment (FYM +N). Integrated application of inorganic fertilizers and organic manure (100% NPK+FYM) resulted in greater SOC accumulation and higher potentially mineralizable C in soil. Among different cropping systems (CS) maize-based CSs

had the maximum SOC pool, followed by that in groundnut and cotton. Retention of residue did not significantly affect total C and N concentration in the plough layer of the soil. Addition of organic amendments for 10 years significantly increased SOC stocks compared with solitary application of NPK. The C accumulation in separated pools was influenced by the chemical composition of the organic source. Long-term application of fertilizer has a positive effect on soil TN (total nitrogen) and TOC (total organic carbon) compared to control treatment. Significantly higher N availability was observed in Sc4 at sowing of wheat over all other scenarios. In sub-surface depth, available N was higher in Sc2 than other scenarios at all growth stages. Lower availability of N was observed in sub-surface as compared to surface soil in all scenarios. Long-term studies in high Olsen-P soils showed increased P build-up with present recommended fertilizer P application rates. Integrated use of manure with fertilizers increased K availability in soils than the use of inorganic K alone.

Keywords: Chemical properties, pH, EC, Organic Carbon, FYM

EFFECTS OF LONG-TERM EXPERIMENTS ON PHYSICAL PROPERTIES OF SOIL

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ABSTRACT

Long-term experiments have been conducted to quantify changes in physicochemical properties of the soils. Long-term experiments having different management practices can provide critical observations regarding the changes in soil quality and can help in prediction of future soil productivity and soil-environment interactions. The research on forest and tea garden soils showed that organic matter content, hydraulic conductivity, field capacity moisture content and mean weight diameter of the soil aggregates were significantly lower for the tea garden than for the forest, while bulk density was higher. There was also a significant change in soil bulk density (BD) among cultivation, pasture, and Forest soils at depth of 0–20 cm. Depending upon the increases in BD and disruption of pores by cultivation, total porosity decreased accordingly. The mean weight diameter (MWD) and water-stable aggregation (WSA) were greater in the pasture and forest soils compared to the cultivated soils, and didn't change with the depth for each land-use type. Aggregates of >4.0 mm size were dominant in the pasture and forest soils, whereas the cultivated soils comprised aggregates of the size 0.5 mm. With straw incorporation soil aggregation, total porosity and bulk density were improved. Water retention was found to be less with straw burning than straw removed. Cumulative infiltration and its rate were greater with straw incorporation than burning or removal. Significant variability in water-stable aggregates and mean weighted diameter with SOC indicated better soil stability in horticulture plantations. The increase in OC significantly increased the infiltration rate (IR), hydraulic conductivity (HC), soil water retention at all suctions, water stable aggregates (WSA) and mean weight diameter of the soil aggregates, while decreased the bulk density (BD) and penetration resistance (PR) both at surface and subsurface soil layers. The MWD, total porosity and WHC improved with balanced application of fertilizers. It has been observed that the N and landscape position significantly influenced soil hydrological properties. Higher N rate decreased bulk density (ρ_b) and soil penetration resistance (SPR) and increased hydraulic conductivity (K_s) and soil water retention. Furthermore, footslope position significantly decreased ρ_b , SPR, and increased the K_s , and soil water retention. The data show positive effects of mulch rate on soil physical attributes under

NT. Significant variations in bulk density and penetration resistance (PR) along with their interactions were observed among tillage and mulch treatments. With increase in mulch rate from 0 to 16 Mg/ha, saturated hydraulic conductivity (Ks) under NT, RT and PT treatments. Similarly, the mean weight diameter (MWD, mm) increased under NT, RT and PT treatments with increase in mulch rate from 0 to 16 Mg/ha. Adoption of ZT leads to higher macroporosity and connectivity of pores which is likely to have positive implications for nutrient cycling, root growth, soil gas fluxes and water dynamics.

Keywords: Physicochemical, Bulk density, Porosity, Hydraulic conductivity, Penetration resistance

EFFECT ON MORPHOMETRIC AND BIOCHEMICAL PARAMETERS OF DIFFERENT VARIETIES OF SESAME ON MAJOR INSECT PESTS

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ABSTRACT

The morphological characters of plant showed that the variety RT-346 which had more number of leaves per plant, number of branches per plant, number of capsules per plant and number of trichomes per mm² was found least susceptible for the leaf roller and capsule borer, leafhopper and whitefly population. Whereas, the variety RT-46 was found to be most susceptible which had less trichomes to the variety RT-346. The total phenols had negative significant effect with leaf roller and capsule borer, leafhopper and whitefly population, while free amino acids, total soluble sugars, protein content and chlorophyll had positive significant effect with leaf roller and capsule borer, leafhopper and whitefly population.

Keywords: Sesame, morphological characters, leaf roller and capsule borer, leafhopper and whitefly.

PERFORMANCE OF CLUSTERBEAN (*Cyamopsis tetragonoloba*) UNDER LONG-TERM PRESCRIPTION-BASED FERTILIZER RECOMMENDATION IN WESTERN RAJASTHAN

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ABSTRACT

To understand the impact of prescription-based fertilizer application on the performance of clusterbean [*Cyamopsis tetragonoloba* (L.) Taub.] crop in loamy sandy soil, we started an experiment in 2018 which consisted of 5 treatments; general recommended dose, prescription-based fertilizer recommendation for 1.5 and 2.0 t/ha without compost, prescription-based fertilizer recommendation for 1.5 and 2.0 t/ha with compost. The results revealed that, prescription-based fertilizer recommendation with compost for target yield 2.0 t/ha produced significantly 28.5 and 10.8% higher seed yield than general recommended dose and prescription-based fertilizer recommendation for target yield 2.0 t/ha without compost respectively. Similarly, growth and yield attributes parameters such as plant height, leaf area/plant, pod length, clusters/plant, pods/cluster, pods/plant, seeds/pod and test weights were also found significantly higher under prescription-based fertilizer recommendation for target

yield 2.0 t/ha with compost than the other treatments. The prescription-based fertilizer recommendation with compost for target yield 2.0 t/ha enhanced significantly macronutrients (N, P and K) content uptake, protein and chlorophyll content.

CD – ROM AN EFFECTIVE TOOL TO PROMOTE MEDICINAL PLANTS IN RURAL AREAS.

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Introduction

Traditional systems of medicine based on medicinal plants are playing an important role in providing health care to a large segment of the population, particularly in developing countries. This is because; these are very cheap in comparison to the synthetic industrial forms of medication. The use of these plants is increasing worldwide. Hence in the present study efforts were made to assess the gain in knowledge about the use of medicinal plants through prepared CD – ROM. Besides that, this study also determined the impact of media in terms of adoption of medicinal plants.

Methodology

Initially a CD-ROM of 25 minutes duration was prepared on the benefits and use of medicinal plants and later it was standardized by three different groups. First group comprised of 12 experts from medicinal section and District Extension Specialists placed at different KVKs (Jhajjar, Kurukshetra and Mandkola), second group comprised of 12 middle level extension workers and third group comprised of 30 rural women. Later the media was assessed in terms of gain in knowledge about the benefits and use of medicinal plants at domestic level by exposing the prepared CD-ROM to 30 rural women of village Gawar of Hisar district of Haryana.

Results

The media was standardization on 10 parameters viz. Accuracy, Coverage of information, Content of presentation, Audio quality, Visual quality, Appropriateness of language, Usefulness of information, Understandability, Effectiveness and the Overall presentation of CD-ROM. The results highlighted the facts that 1st rank was given to three parameters viz. accuracy, usefulness of information and overall presentation of CD-ROM by the experts however middle level functionaries and rural women gave 1st rank to overall presentation of CD-ROM.

The results regarding the gain in knowledge about the benefits and use of medicinal plants highlighted the facts that maximum gain in knowledge was observed in *stevia* i.e 76.6 percentage followed by *Giloy*, *Staver* and *Marwa* (73.3%). 70.0 percent knowledge gain was observed in *Sadabahar* and *Mint* followed by *Aleo-vera*, Least gain in knowledge was observed in *Cumin seeds* and *Cardamom* i.e 53.3 percent. The low gain in knowledge was observed in plants with which the respondents were familiar earlier and some of them were being used by the respondents like *black pepper*, *cumin seed*, *turmeric*, *ginger*, etc in their kitchen as basic ingredients for cooking. However they were not much aware about their medicinal properties. Symbolic adoption on medicinal plants was observed on eighteen parameters and accordingly scores were assigned, The results highlighted the facts that majority of the respondents had high symbolic adoption level i.e 60.0 percent. However, 33.33 percent had medium level of symbolic adoption followed by low level i.e 6.67 percent.

In the end impact assessment index of respondents was calculated on knowledge and adoption parameters. It was turned 70.0 percent which speaks of moderate to high impact in changing knowledge and adoption regarding medicinal plants.

Conclusion

The overall presentation of CD-ROM prepared on the benefits and use of medicinal plants was ranked first by all the three different groups who judged the CD-ROM for its standardization, The maximum gain in knowledge was observed in stevia i.e 76.6 percentage followed by *Giloy*, *Staver* and *Marwa* (73.3%) each. 70.0 percent of the respondents were willing to adopt the medicinal plants without any difficulty. Majority of the respondents (60.0%) had high adoption level, 33.33 percent had medium level of adoption followed by low level i.e 6.67 percent. Impact assessment index of respondents was observed 70.0 percent which speaks of moderate to high impact in changing knowledge and adoption regarding medicinal plants.

Keywords: Medicinal plants, Standardization, CD-ROM, Adoption, Respondents

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IMPACT OF CLIMATE CHANGE ON AGRICULTURAL PRODUCTION AND ITS SUSTAINABLE SOLUTION

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ABSTRACT

The study entitled was conducted in Solan district of Himachal Pradesh. It was analyzed that agriculture was the main occupation as 68.60 per cent of work force practice farming in the study area. On an average 13.83 per cent people per family were engaged in off farm (job/business) activities. Thus, the households engaged in off-farm income resources were less vulnerable to climate change. The average size of land holding was found 1.77 hectare. Cultivation is mainly (77.47%) rain dependent therefore; rainfall is a crucial factor for the success of crop production. Rainfall showed positive effect on the major cereal crops i.e. with increase in rainfall crops yield were also increasing. Among production, quality, insect-pest attack and disease incidence, majority of the households' perception were that the production (65.00%) and quality (68.33%) of agriculture products have decreased whereas insect pest attack (70.00%) and disease incidences (73.33%) have increased over the year. About 82 per cent of the overall sampled farmers reported that the decrease in the rainfall was the major reason for reduction in the yields levels over the period followed by pest and disease (53.33%), changes in temperature and seasonal patterns (65%). The farming activities were constrained by the wildlife related shocks (76.66%) followed by lack of irrigation facilities (56.67%) and low market price for crops (56.67%). The chi square test showed that wild life related shocks and pest/disease incidence is common in all the categories. Households' observations on the

availability of water revealed that there is a decreasing trend in the availability of portable and irrigation water. Whereas, source of water showed an increasing trend (like lift irrigation schemes, tube wells and gravitational schemes) during the last 10 years. Most of the households has opted for coping strategies like use of organic manure (90.59%), changing crop variety (80.97%), and mixed cropping (87.38%). Out of the 16 adaptive strategies, 7 were highly adopted by the farmers as remaining 9 strategies were adequately adopted by the households. Lack of the labour, high cost of adaptation and lack of access to irrigation facilities were the major hindrances to adaptation strategies to climate change. Therefore, to mitigate the hindrances, adaptation strategies like shift to agricultural mechanization, development of water harvest structures and water use efficiency through micro irrigation system should be adopted.

IMPACT OF SOCIAL MEDIA AGRICULTURAL INFORMATION ON FARMERS KNOWLEDGE

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ABSTARCT

The agriculture research and extension institutes are a major source of agricultural information and they are making full use of all information dissemination methods to bridge the information gap among farmers. Social media platforms are dominating agricultural information dissemination platforms in field level. The present study was conducted to assess the effect of agricultural information disseminated through social media on farmer’s knowledge level. The Ex-post facto research design was adopted for the study with a sample of 120 respondents, covering all three erstwhile districts form the Southern Telangana Zone of Telangana state. majority of the respondents had low (75.20%) level of knowledge on agricultural technologies followed by medium (26.67%) and high (0.83%) before intervention to social media. After intervention to social media the respondents had low (51.70%) level of knowledge on agriculture technologies followed medium (42.50%) and high (5.80%). It was found that significant difference existed between the extent of knowledge of respondents before and after use of social media (Z value 8.76). Further data revealed that before intervention, (50.84%) of the respondents had medium level knowledge on production technologies and practices followed by low level (48.33%) and high (0.83%). Knowledge percentage attained was 35.21, hence this category was accorded first position in order. The results further indicates that (65.00%) of the respondents had low level knowledge on post-harvest, schemes and modern concepts followed by medium (34.17%) and high (0.83%). The knowledge percentage attained was 25.83, hence this category was accorded second position. Regarding the protection technologies and practices, it was observed that (80.00%) of respondents have low level of extent of knowledge followed by medium (20.00%). Knowledge percentage obtained was 13.10 and hence this category was ranked third position in order. Regarding the extent of knowledge on climate resilient agriculture technologies and practices, it was observed that majority (85.84%) of respondents had low level of knowledge followed by medium (13.33%) and high (0.83%) The obtained knowledge percentage was 12.92, hence this category was

accorded with fourth position. The study further indicated that (84.20%) of the respondents had low knowledge on agriculture market followed by medium (15.80%). The knowledge percentage obtained was 10.24, hence this category was accorded fifth position in order. The data of knowledge after interventions to social media shown that 72.50 per cent of the respondents had medium level knowledge on post-harvest, schemes and modern concepts followed by low (25.00%) and high (2.50%). The knowledge percentage attained was 43.69, hence this category was accorded first position. The study further revealed that, 85.00 per cent of the respondents has medium level knowledge on production technologies and practices followed by low level (11.70%) and high (3.30%). Knowledge percentage attained was 42.50, hence this category was accorded second position in order. Regarding the protection technologies and practices, it was observed that 58.40 per cent of respondents have low level of extent of knowledge followed by medium (35.80%) and high (5.80%). Knowledge percentage obtained was (35.24%) and hence this category was ranked third position in order. Regarding the extent of knowledge on climate resilient agriculture technologies and practices, it was observed that majority (67.50%) of respondents had low level of knowledge followed by medium (29.20%) and high (3.30%). The obtained knowledge percentage was 26.98, hence this category was accorded with fourth position. The study further indicated that 70.00 per cent of the respondents had low knowledge on agriculture market followed by medium (28.30%) and high (1.70%). The knowledge percentage obtained was 26.31, hence this category was accorded fifth position in order. The variables digital literacy (0.408), social media usage (0.300), information processing (0.367), mode of access and preference (0.345), and social media participation (0.315) found to be positive and significant relation with knowledge levels on agriculture technologies at one per cent level of significance. Further variables farm size (0.211), social media network (0.187) and readiness to accept information (0.210) found to positive and significant at five per cent level of significance.

BIOEFFICACY OF INORGANIC PESTICIDES ON FLEA BEETLE IN GRAPES (VAR. THOMPSON SEEDLESS)

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Purpose: Intensive and extensive cultivation of grapes (*Vitis vinifera* L.) leads to serious pest problem in vineyards in major grape-growing areas of the world. Climatic conditions in India are favourable for high production of table and wine grapes, and also for incidence of a variety of pests. Among these pest, Grape Flea Beetle (*Scelodonta strigicollis* Mots. Coleoptera: Chrysomelidae) is a regular and serious pest in major grape-growing areas causing loss upto to 50%. Therefore, the present study was undertaken to minimise or mitigate this pest, through different insecticides at different concentrations.

Methods: The experiment was carried out at Horticulture Research and Extension Center, Vijayapura (Tidagundi), Karnataka, during 2020 - 2021 with Thompson Seedless variety in randomized completely block design (RCBD) with 3 replications and 10 treatments given with 2 sprays per season. First spray was taken after 15 days after fruit pruning in October month and second spray after 10 days interval of 1st spray. The flea beetle population was counted on three vines in each treatment and five shoots per vine were selected and the flea beetle population was counted separately to know the population of flea beetles. Further, mean population of flea beetles per shoot had calculated. The observations were recorded at day before, 1, 3 and 5 days after first and second spray on randomly selected grape vines. Similarly, per cent bud damage and yield per hectare has recorded.

Results: Among the insecticides evaluated, significantly lower number of flea beetles per shoot and % bud damage per shoot was recorded in the treatment Lambda cyhalothrin 5% EC at the concentration of 0.50 ml followed by Alphamethrin 10% EC at 0.50 ml, Lambda cyhalothrin 4.9% CS at 0.50 ml and Spinosad 45% SC at 0.25ml. The next best treatments which has been recorded lower number of flea beetles per shoot and % bud damage per shoot are Thiamethoxam 25% WG at the dose of 0.25g followed by Flonicamid 50% WG at 0.30g, Fipronil 80% WG at 0.06g and Cyantraniliprole 10.26% OD at 0.70 ml. Significantly highest number of flea beetles recorded in Azadirachtin 1% EC at the concentration of 2.00ml and in untreated control.

Conclusion: Two foliar spray of Lambda cyhalothrin 5% EC at the concentration of 0.50 ml followed by Alphamethrin 10% EC at 0.50 ml, Lambda cyhalothrin 4.9% CS at 0.50 ml and Spinosad 45% SC at 0.25ml were superior and effective in reducing the flea beetles damage on buds of grapevine which contribute to higher fruit yield. The present studies confirm that newer molecules are highly effective against grapevine flea beetle, these insecticides could provide a better alternative for the insecticides to which it has developed resistance.

Keywords: Grape, Thompson seedless, Grape flea beetle, Insecticides, Karnataka

STABILITY ANALYSIS IN CAULIFLOWER (*Brassica oleraceae* var. *botrytis* L.) FOR YIELD AND YIELD ATTRIBUTING TRAITS.

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The current study was undertaken to estimate stability analysis for marketable curd yield and its contributing horticultural characteristics of cauliflower in the Vellore region of Tamil Nadu. A stability study was conducted in cauliflower with sixty genotypes grown over four environments viz., E₁ (60 x 45 cm without boron), E₂ (60 x 30 cm with boron), E₃ (45 x 45 cm without boron) and E₄ (45 x 30 cm with boron) for twelve characters viz., plant height (cm), plant diameter (cm), plant weight (g), leaf length (cm), leaf breadth (cm), curd weight (g), curd length (cm), curd diameter (cm), number of leaves per plant, petiole length (cm), days to first curd formation and days to 50% maturity. The analysis of variance revealed significant differences among all the traits. The linear component mainly regulated the genotypes x environment interaction for curd yield, curd breadth, days to curd initiation and days to 50% curd formation. The genotypes PCF201, PCF202, PCF203, PCF205, PCF206, PCF218, PCF235, PCF240, PCF248, PCF251 and PCF255 were found stable for curd yield and were identified for wider adaptability under Vellore region of Tamil Nadu, mainly because of their stability and predictable performance for four traits thus found promising.

Keywords: Cauliflower, Environments, Genotypes, Stability and Yield.

METHODS

The investigation was conducted at Palar Agricultural College (PAC), Affiliated to Tamil Nadu Agricultural University (TNAU, Coimbatore), Kothamarikuppam, Mailpatti, Vellore for two seasons. The data for two seasons were pooled and analyzed. The experimental material consisted of sixty genotypes of cauliflower. The genotypes were selected from G.B.P.U.A & T, Pantnagar, Uttarakhand. The genotypes were grown in two different micronutrients and two different spacing viz., normal and high densities. Hence four different environments viz., E₁ (60

x 45 cm without boron), E₂ (60 x 45 cm with boron), E₃ (45 x 30 cm without boron) and E₄ (45 x 30 cm with boron) present. There are more than a hundred plants in each plot in an Augmented Block Design (ABD), here every ten genotypes three checks are repeated. The genotype x environment interaction was calculated by the pooled analysis of variance. Data analysis of stability parameters was estimated by the model suggested by Eberhart and Russel (1966) and Perkins and Jinks (1968).

RESULTS

The analysis of variance over four environments showed that the mean sum of squares due to genotypes were significant when tested against G x E interaction for all the characters indicating the strong influence of environments on the expression of genotypes. The values of genotypes x environments interaction were significant for plant weight (g), leaf length (cm), leaf breath (cm), curd weight (g), curd length (cm), curd diameter (cm), plant height (cm), plant diameter (cm), number of leaves per plant, petiole length (cm), days to first curd formation and days to 50% maturity revealed that the genotypes interacted differently with environmental variations for these characters.

The G x E interaction was regulated by linear component for curd weight, curd length, curd diameter, days to curd initiation, and days to 50% curd formation further indicating that prediction of performance can be made across the environment.

The stability parameters for days to first curd formation exhibited that out of 60 genotypes, PCF202, PCF205, PCF206, PCF207, PCF208, PCF224 and PCF233 ($X_i > 101.55$, $b_i = 1$ and $s^2 d_i = 0$) were highly stable and desirable over different environment's as they had high mean value over population mean, closer to one regression coefficient (b_i) and low and non-significant deviation from regression (S_d^2 around zero). Days to first curd formation ranged from 88.83 to 117.50 with an overall mean of 101.55. The genotypes PCF204, PCF209, PCF211, PCF212, PCF215, PCF218, PCF225, PCF230, PCF232, PCF250 and PCF254 ($X_i < 101.55$, $b_i > 1$, high $s^2 d_i$) were found to be suitable for rich environments. The mean performance of genotypes for days to 50% maturity along with the regression (b_i) and deviation from regression ($s^2 d_i$) are presented. Days to 50% maturity ranged from 117.63 to 147.2 with an overall mean of 132.87. All the genotypes except PCF205, PCF207, PCF211, PCF213, PCF226, PCF228 and PCF 238 showed non-significant for all the genotypes with checks PG-3, PG-5 and PG-6. The most desirable and stable genotypes were PCF203, PCF205, PCF236 and PCF255 ($X_i > 132.87$, $b_i = 1$, $s^2 d_i = 0$). Similar results were also reported By Siva, (2020) in brinjal.

Conclusions

It could be concluded that genotypes PCF201, PCF202, PCF203, PCF205, PCF206, PCF218, PCF235, PCF240, PCF248, PCF251 and PCF255 had higher mean value over population mean, closer to one regression coefficient (b_i) and low and significant deviation from regression and was highly stable for curd yield per plant. These genotypes are likely to perform well in all four selected environments. The information about the stability and contribution of different characters of interest will be useful in selecting parents for hybridization. Hybridization may be initiated to generate a wide spectrum of variability so that breeder can manipulate the material. At the same time, the promising genotype can be evaluated in larger plots and recommended for release.

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STUDY ON EXTREME RAINFALL EVENTS IN DIFFERENT DISTRICTS OF MAHANADI BASIN AREA OF CHHATTISGARH STATE

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ABSTRACT

The present study entitled “Study on extreme weather events in different districts of Mahanadi basin region of Chhattisgarh” was carried out in department of Agrometeorology during 2021-22. RClimDex 1.0 software was used to find out extreme rainfall events in different districts of Mahanadi basin area of Chhattisgarh State. Mahanadi is one of major peninsular river of India, originates from Pharsiya village in Dhamtari district of Chhattisgarh and travels a distance of 851 km, consider as a lifeline of major part of Chhattisgarh and Odisha. The Mahanadi basin extends over an area of 141,589 km². The annual rainfall of Mahanadi Basin area was 1158 mm. In the years 2003, 2008, 2011 and in 2014 the basin has experienced major floods due to heavy rainfall. The outcome of rainfall extremes indicates that, the 1- and 5-day monthly maximum rainfalls status exhibit significantly decreasing trends, while SDII shows significantly decreasing trend in major districts. Concurrent decrease in dry spells and increase in wet spells were also observed over the basin. The increase in frequency and magnitude of extreme rainfall in the basin has been attributed to the increasing trend in warm days and decreasing in cool nights. Higher value of consecutive wet day has a high chance of flooding. Numbers of heavy precipitation days had been increasing in slow pace in most of the districts.

Keywords- Mahanadi basin, extreme rainfall, RClimDex1.0 software

EFFECT OF STORAGE TEMPERATURE AND DURATION ON FERTILITY OF KUROILER BREED OF CHICKEN

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ABSTRACT

The present investigation was carried out to investigate the fertility of eggs of Kuroiler breed of chicken at poultry farm SKN College of Agriculture, Jobner (Rajasthan). For study total 180 fresh eggs of Kuroiler chicken of 25–38-week age was collected and stored for 0, 5 and 7 days at two different temperatures i.e. 30 ± 2 °C and 20 ± 2 °C as per treatment i.e. T₁(30 °C+0d), T₂(30 °C+5d), T₃(30 °C+7d), T₄(20 °C+0d), T₅(20 °C+5d) and T₆(20 °C+7d). For determine fertility treated eggs are placed in automated incubator. Result shows that fertility was found maximum (95.56%) in T₅ at storage temperature 20 °C and minimum (84.44%) in T₃ under temperature of 30 °C. It is concluded that under 30 °C storage temperature fertility was start decline after 5 days storage as compared at 20 °C storage temperature it is well maintained up to 7 days. In present investigation percentage embryonic mortality was found maximum

(23.08%) in eggs of T₁ group and lower (09.30%) in T₅ group, which was stored for 5 days under cold temperature (20 °C) with fumigation. Result shows that fertility declines when storage duration is beyond 5 days and also decline in eggs stored at 30 °C temperature. Fertility of eggs significantly (P≤0.05) affected by duration of storage and temperature. It concluded that for best fertility results eggs are not stored for more than 5 days at both temperatures. In present investigation fertility was found higher at 20 °C storage temperature as compared to 30 °C storage temperature it indicates that 20 °C storage temperature is optimum for best fertility results.

Keywords: Fertility, kuroiler breed, embryonic mortality, storage duration, storage temperature.

RESPONSE OF WEED MANAGEMENT PRACTICES ON WEED DYNAMICS, GROWTH, YIELD AND ECONOMICS OF ELEPHANT FOOT YAM [*Amorphophallus paeoniifolius* (Dennst.) Nicolson]

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Weed is one of the most important determinants in crop production particularly in under-developed and developing countries because of unnoticed harmful effects on crop unlike pests and diseases by the majority of unaware farmers who are mainly doing hand weeding at the crop stage when the harm on crop has already been done, but now a days a number of herbicides, mulching materials, weeding tools etc. are also being used alone or in combinations, These weed management practices have profound impact on weed dynamics, crop growth, yield and economics. Research works are very limited on this aspect in tuber crops especially on elephant foot yam which is one of the most important tuber crops of India and tropical countries being used mainly as cooked vegetables and other medicinal purposes. Keeping these facts in view, this experiment was undertaken.

METHODOLOGY: This experiment was conducted at Agricultural Research Farm, Dholi of Tirhut College of Agriculture under Dr. Rajendra Prasad Central Agricultural University, Pusa (Bihar) during the period of 2019-21. The soil of the experimental plot was sandy loam with pH value of 8.1. Initial soil analysis values of experimental field was : organic carbon (0.38%), available nitrogen (162.4 kg/ha), phosphorus (18.72 kg/ha), and potassium (141.2 kg/ha). There were nine treatments i.e., T₁-Pre-emergence application of pendimethalin @ 1000g a.i./ha + Post emergence application of glyphosate @1000g a.i./ha at 45 and 90 DAP, T₂-Pre-emergence application of pendimethalin @ 1000g a.i./ha + Hand weedings at 45 and 90 DAP, T₃-Raising cowpea for green manuring in inter spaces immediately after planting and incorporation of cowpea at 50 DAP + Post emergence application of glyphosate @1000g a.i./ha at 90 DAP, T₄-Hand weeding at 30 DAP + Post emergence application of glyphosate @1000g a.i./ha at 60 and 90 DAP, T₅-Post emergence application of glyphosate @1000g a.i./ha at 30, 60 and 90 DAP, T₆-Pre-emergence application of pendimethalin @1000g a.i./ha + Post emergence application of Quizalofop ethyl @ 50g a.i./ha at 45 and 90 DAP, T₇-Weed control by ground cover/mulching @10t/ha, T₈-Hand weedings at 30, 60 and 90 DAP and T₉-Control (Weedy check) replicated thrice in randomized block design. ‘Gajendra’ was taken as test variety. Tubers of about 1.0 kg size was planted at a spacing of 90 cm x 90 cm.

Recommended dose of manures and fertilizers i.e., 15.0 t/ha of compost with 60: 80: 60 kg N: P₂O₅: K₂O /ha were applied uniformly in all the treatments.

RESULTS: It was found that plant height (71.4 cm), pseudo stem girth (18.6 cm) and canopy spread (102.3 cm) after five months planting was significantly higher in T₇ than T₈, T₅, T₁ and T₄ but was found at par with T₆, T₃ and T₂. The extent of increase was to the tune of 1.56 to 25.24 in plant height, 1.64 to 26.53 in pseudo stem girth and 3.86 to 20.64 per cent in canopy spread. Reduction in weed density at 40, 70 and 100 days after planting ranged from 3.71 to 86.20, 82.33 to 90.13 and 79.34 to 90.73 per cent, respectively and to that of weed dry weights/weed control efficiencies varied between 5.33 to 91.79, 86.18 to 98.03 and 79.96 to 98.77 per cent, respectively. Although excellent weed control was seen by the application of post emergence of glyphosate but it had some toxic effect on crop plant also which ultimately reflected in less growth of crop plants and less yield and less net income to the farmers.

Increase in corm yield, net return and B : C ratio as compared to weedy check was to the tune of 8.83 to 146.24, 11.27 to 906.95 and 3.28 to 115.38 per cent, respectively. Significant lowest weed population and weed dry weight at 40, 70 and 100 days after planting were recorded under T₇ may be due to weed control right from early stage up to the maximum canopy spread stage that could kept the competition for growth resources to the minimum by weeds and ultimately resulted in realization of significant higher corm yield (41.54 t/ha), net return (Rs. 450521/ha) and B : C ratio (2.52) than T₈, T₁, T₄ and T₅ but T₆ (weed control by ground cover) was found equally good to T₇ in terms of growth parameters, corm yield, net return and B : C ratio which may be due to moisture conservation for the plants during the hot months, keeping the temperature congenial for early sprout of seed corm, adding nutrients after decomposition, enhancing microbial activities in the rhizosphere, keeping weeds in control from the starting stage up to stage of maximum canopy spread. Similar results were also reported by J.S.Kumar *et al.*, 2020.

CONCLUSION: Weed management by ground cover was worked out to be economically viable technology for weed control in elephant foot yam. Although, hand weeding thrice produced highest tuber yield but was found uneconomical because of significantly lower net return and B:C ratio as compared to weed management by ground cover practice.

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Table 1: Effect of weed management practices on weed count, weed dry weight, plant height, pseudostem girth, canopy spread, net return and B:C ratio.

Treatments	Weed count (no./m ²) at Harvest	Weed dry wt. (g/m ²) at harvest	Plant height (cm) at 150 DAP	Pseudo-stem girth (cm) 150 DAP	Canopy spread (cm) at 150 DAP	Tuber yield (t/ha)	Net return (Rs./ha)	B : C Ratio
T ₁	7.39 (53.59)	6.07 (35.90)	74.5	21.12	103.9	37.04	309283	1.87
T ₂	7.76 (59.23)	6.92 (46.89)	76.6	21.91	105.6	41.29	367033	1.98

T ₃	7.91 (61.49)	6.45 (40.59)	77.9	22.06	109.1	42.98	402078	2.08
T ₄	7.38 (53.52)	5.98 (34.79)	74.5	21.27	103.8	37.54	310658	1.85
T ₅	7.13 (49.83)	5.73 (31.89)	73.3	20.85	102.3	36.34	299183	1.84
T ₆	9.97 (98.34)	8.83 (76.92)	76.2	21.77	105.7	35.61	281623	1.78
T ₇	8.94 (78.98)	7.35 (53.06)	87.8	23.78	119.6	44.96	442718	2.21
T ₈	7.61 (56.93)	6.82 (45.49)	81.3	22.63	114.5	42.92	387248	2.01
T ₉	19.71 (387.65)	20.27 (409.70)	59.9	16.94	61.2	19.43	5678	1.02
SEm±	0.72	0.43	3.01	0.91	4.49	3.73	13688	0.04
CD p=0.05	2.17	1.28	9.02	2.73	13.46	1.24	41064	0.12

BIOCHARS FROM DIFFERENT PLANT RESIDUES : CHARACTERIZATION AND EVALUATION

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ABSTRACT

Biochar is a type of charcoal produced during pyrolysis, a process where organic material is heated under low oxygen conditions. Pyrolysis is the most common and widely used method to produce biochar. The longevity of biochar, a carbon-based porous material has proven to provide higher crop yields, improve soil health and retain nutrients in the soil and prevents their leaching into the groundwater. There are a number of benefits of biochar that will provide a positive effect in preventing leaching of nitrogen and phosphorous components of fertilizer. Many raw materials and their conversion processes can lay claim to produce biochar, and the resulting biochars will have different characteristics. The purpose of this discussion is to formulate a simple scheme for characterizing biochars before addition to soils. Seven types of biochar were produced from Putus leaves (*Lantana camara*), Mango leaves (*Mangifera Indica*), Jamun leaves (*Syzygium cumini*), Litchi leaves (*Litchi chinensis*), Eucalyptus/Neelgiri (*Eucalyptus globulus*), Karanj leaves (*Millettia pinata*) and Maize stone (*Zea mays*) at pyrolysis temperatures of 450°C for one hour with the help of Muffle Furnace and sampling was done 3 times for each biochar. Physical and chemical characteristics of biochar such as pH, Total N,P,K, CEC and Carbon % in biochar, conversion efficiency of biochar were determined using a variety of methods. It was indicated that pH of Biochar is neutral to alkaline in nature. It's conversion efficiency ranges from 29.51% to 43.93%. Biochars from Eucalyptus bark has highest conversion efficiency (43.93%) than others (Maize Stone, Eucalyptus Bark, Litchi, Mango, Jamun, Neem, Lantana & Karanj Leaves). Biochar contains carbon, ranges from 58.8% to 94.0%. Out of all Biochars (Maize Stone, Eucalyptus Bark, Litchi, Mango, Jamun, Neem, Lantana & Karanj Leaves). Maize Stone contains highest carbon% (94.0%) than others.

Biochars have very high CEC than soil (8-9). High CEC value indicates ability to retain cationic fertilizers (K^+ & NH_4^+) in the root zone and prevent nutrient leaching. Eucalyptus Bark biochar has highest CEC (318.30 cmol (P^+) kg^{-1}) among the evaluated biochars..

Keyword-biochar, soil, plant residue etc

MAJOR INSECT-PESTS OF MAIZE AND THEIR MANAGEMENT

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ABSTRACT

Maize (*Zea mays L.*), belongs to family Poaceae. It is one of the most important cereal crops in the world and called as “Queen of cereals”. Among the maize growing countries, India rank 4th in area and 7th in production and cover 4% of the world total area and 2% of total production. In India, maize is emerging as the third most important crop after rice and wheat. Maize crop is attacked by as many as 24 insect-pests in the world. There are five major pests of maize prevalent in India. These are fall armyworm (*Spodoptera frugiperda* J. E. Smith), spotted stem borer (*Chilo partellus* Swinhoe), pink stem borer (*Sesamia inferens* Walker) cob borer (*Stenochroia elongella* Hamp) and shoot fly (*Atherigona soccata* Rond). Spotted stem borer (*C. partellus* Swinhoe) considered as the most important insect-pest during *Kharif* season and causing yield losses in the range of 26-80 per cent. While, pink stem borer caused 25-78 per cent losses during *Rabi* season. When the rolled leaves of whorl unfurl series of pin holes and papery windows are visible than we can say our maize crop is attacked by spotted stem borer. The larvae of pink bollworm bore into the central shoot resulting in drying up of growing point and formation of dead heart in younger plants. The young larvae of fall army worm feed in and around the whorl leaves by causing scraping and skeletonizing the upper epidermis. According to different research crop damaged by major pests were 8.5 and 21.75 % by shoot fly 15.67 and 13.45 % by stem borer Insect-pests infesting in this crop at various crop growth stages from sowing to maturity of crop. Aims of Integrated pest management of pests through a combination of techniques such as physical, mechanical, chemical, biological and use of resistant cultivars. For the management of major insect-pests of maize, we are advised for Deep summer ploughing, collection and destruction of the stubbles, Intercropping of maize with cowpea in 2:1 ratio and install *Tricogramma chilonis* 8 cards/ha at first and second week after germination. Chlorantraniliprole 18.5 SC@150 ml/ha also considered as eco-friendly management.

Keywords: Chlorantraniliprole, Insect-pests, Eco-friendly, IPM, Loss, Maize and *Tricogramma chilonis*

AIR POLLUTION AND IT'S IMPACTS ON AGRICULTURE

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ABSTARCT

Air pollution has become an extremely serious problem. Air pollutants (Inorganic pollutants-sulfur dioxide, fluoride, chlorine, and ozone-and the organic pollutants-peroxyacetyl nitrate (PAN) and ethylene) affect both plants and animals. Under polluted conditions, plants develop different physiological, morphological and anatomical changes. Pollutants cause damage to cuticular waxes by which then they enter the leaves through stomata. This further leads to

injury to plants which can be either acute or chronic. Changes in stomata due to air pollutants which seem to be small can be of great consequence with respect to survival of the plant during stress. These effects can further lead to disturbing the water balance of leaf or whole plant. Respiration also gets affected because of the exposure of plants to air pollutants (Gupta, A., 2016).

Agricultural crops can be injured when exposed to high concentrations of various air pollutants. Injury ranges from visible markings on the foliage, to reduced growth and yield, to premature death of the plant. The development and severity of the injury depends not only on the concentration of the particular pollutant, but also on a number of other factors. These include the length of exposure to the pollutant, the plant species and its stage of development as well as the environmental factors conducive to a build-up of the pollutant and to the preconditioning of the plant, which make it either susceptible or resistant to injury.

Reductions in biomass accumulation and seed yields were highest at the site experiencing highest concentrations of all three gaseous (SO₂, NO₂ and O₃) pollutants. The magnitude of response indicated that at peri-urban sites SO₂, NO₂ and O₃ were all contributing to these effects, whereas at rural sites NO₂ and O₃ combinations appeared to have more influence. The quality of seed was also found to be negatively influenced by the ambient levels of pollutants (Heather, G., 2021).

Keywords: Air Pollution, Agricultural crops, Environment, Human Health

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SOIL AND WATER CONSERVATION IN AGRICULTURE

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ABSTRACT

Conservation of soil and water resources is important for sustainability of agriculture and environment. Soil and water resources are under immense pressure due to ever increasing population thereby ensuing growing demand for food, fiber and shelter. Soil and water resources are being deteriorated due to different anthropogenic and natural factors.

Soil erosion is one of the several major deteriorative processes which results in deterioration of the soil. Soil erosion is removal of soil due to movement of water or air. Soil erosion may lead to the significant loss of soil productivity and thus may lead to the desertification under sever conditions. Water and wind are the major agencies which are responsible of soil erosion. Deforestation, over-grazing, mismanagement of cultivated soils, intensive cultivation and intensive urbanization are major factors triggering the soil erosion.

For sustainable agriculture and environment, it is pertinent for the protection of soil resources against erosion. Different control measures should be adopted to protect the soil resources against erosion. The concept of soil conservation cannot be materialized without conserving and efficient use of water resources. It is therefore pre-requisite that soil conservation practices should be adopted. Soil conservation practice include soil management, crop management, engineering, range management and forestry operation. The proper use of soil and water resources is necessary to ensure the future well-being of humans and of the environment.

Keywords: Soil, Water, Erosion, Conservation, Management

SYNERGIES BETWEEN RENEWABLE ENERGY AND ENERGY EFFICIENCY

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ABSTARCT

Global energy-related carbon dioxide (CO₂) emissions can be reduced by 70% by 2050 with a net positive economic outlook, according to the report “Perspectives for the Energy Transition: Investment Needs for a Low-Carbon Energy Transition”, jointly prepared by the International Renewable Energy Agency (IRENA) and the International Energy Agency (IEA) (IRENA and IEA, 2017). The report, which was prepared to inform the energy and climate agenda of the 2017 German Presidency of the Group of Twenty (G20), shows that increased deployment of renewable energy and energy efficiency (RE/EE) in G20 countries and globally can achieve the emission reductions needed to limit global temperature rise to no more than 2°C. This would avoid the most severe impacts of climate change.

In realising the decarbonisation of the global energy system, renewables would account for about half of total emission reductions in 2050, with another 45% coming from increased energy efficiency and electrification. When pursued together, they result in higher shares of renewable energy, a faster reduction in energy intensity, and a lower cost for the energy system. This synergy also has important environmental and societal benefits, such as lower levels of air pollution.

Keywords- renewable, synergy, electrification

A REVIEW ON HUMAN ELEPHANT CONFLICT IN NORTH CHHATTISGARH: MANAGEMENT STRATEGIES AND MITIGATION MEASURES

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ABSTARCT

Chhattisgarh is home to many elephants because the 44.21% of forest cover. For conserving this umbrella species special management and mitigation measures should be taken in the part of north Chhattisgarh, which is highly affected by human elephant conflict. This complex negative interaction between man and abnormal & daily causes the accidents, like: Elephant death, death of mans, crop loss, etc. Number of conservation strategies, Gajraj scheme (Govt. scheme to mitigate conflict) and ample of management plans are there but the current situation wants more frequent data on elephant corridors & its movement plan for their conservation. Reviewed many research papers, research journals, books and local news papers to collect data of conflict, management plan & strategies.

This study results that Biotelemetry, Radio-collaring study is needed here for scientific conservation, because the behavioural change in elephants, makes the study more complex, so updated scientific tools are preferable. Loss of human life as well as elephant death shows failure of the conservation plans, this time we must opt information technology for making the ranging route map of elephant, habitat analysis, proper awareness programmes/community training programme, etc should be organized in nearby villages to overcome & mitigate conflict scientifically, along with this natural resource conservation is became need for their survival, good food and water management in forest is a key mitigation measure.

Keywords: Wildlife conflict, Elephant, Management plan, Bio-telemetry.

FOOD PROCESSING & PRESERVATIONS

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ABSTRACT

Food processing is any deliberate change in a food that occurs before it's available for us to eat. Food can be processed and preserved in many ways, including canning, freezing, dehydration, pickling, and irradiation. The most common method of food processing is probably cooking, which prepares food for consumption in various ways. Food processing and preservation can be defined as all the activities and operations required for converting raw agricultural produce into safe and nutritious food products. Food processing and preservation are necessary to ensure access to safe, wholesome and palatable foods at reasonable costs. Food processing enhance the shelf life of food through various ways such as microorganism control, low-temperature storage, dehydration and removal of oxygen. It also alters the texture flavor and nutritional value of food products to appeal to consumers. The food processing industry is a important part of the Indian economy. It accounts for about 10% of India's GDP and employs around 15 million people. The food processing industry in India is facing several challenges such as lack of adequate infrastructure, shortage of skilled workforce, inadequate access to finance and raw materials, high cost of energy, lack of proper storage facilities, and poor market exposure. The government should also provide incentives for developing the food processing industry and create awareness about the importance of processed food. We can only hope to see the sector multiply and contribute to India's economic development.

Keywords : *Infrastructure, Palatable foods, Irradiation, Incentive, Consumption*

GREEN SYNTHESIS AND ASSESSMENT OF BIOLOGICAL ACTIVITIES OF ZNO AND CUO NANOPARTICLES FROM *Chrysanthemum indicum* LEAF EXTRACT

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ABSTRACT

The current study discusses the synthesis of ZnO and CuO nanoparticles by green synthesis method and its antibacterial and antioxidant and anti-hyperglycemic activity. Nanoparticles are those particles which having a size of 1-100 nm in one dimension. The present study focused on the green synthesis of ZnO and CuO nanoparticles. In which ZnO nanoparticle is synthesized by zinc acetate and leaf extract of *Chrysanthemum indicum*. Copper nanoparticle is synthesized by copper sulphate and leaf extract of *Chrysanthemum indicum*. Another part, the characterization of ZnO and CuO nanoparticle was examined by UV-VIS, Zeta potential, Zeta Sizer, FTIR, XRD and SEM.

In this study, antibacterial study was carried out on gram positive and gram-negative bacterial strain by agar well diffusion method, to calculate the antibacterial assey of zinc oxide nanoparticle and Copper oxide nanoparticles. Results indicate that ZnO and CuO had strong antibacterial activity against these bacterial strains. Antioxidant activity was evaluated by DPPH method result show that prepared ZnO and CuO NPs has excellent antioxidant activity. Antihyperglycemic activity was done by ZnO, CuO and Leaf extract of *Chrysanthemum*

indicum on rats. After 21 days of experiment, results indicate that ZnO and CuO NPs shows excellent antidiabetic activity as compared to leaf extract of *Chrysanthemum indicum*.

Keywords: -Green synthesis, antibacterial activity, Antioxidant activity, Zinc oxide nanoparticle, Copper oxide nanoparticle, *Chrysanthemum indicum*, UV-VIS, FTIR, XRD, SEM, anti hyperglycemic activity.

GREEN SYNTHESIS OF SILVER AND ZNO NANOPARTICLES PREPARED BY ROOT EXTRACTS OF PSIDIUM GUAJAVE AND LEAFS EXTRACTS OF ROSA INDICA AND ITS ANTIBACTERIAL AND ANTIDIBETIC ACTIVITY

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ABSTRACT

Nanotechnology is a developing interdisciplinary field of research interspersing material science, bionanoscience, and technology. Nanoparticles are studied extensively for their specific catalytic, magnetic, electronic, optical, antimicrobial, wound healing, antidiabetic activity and anti-inflammatory properties. The main aim of the present study was to synthesize Silver and ZnO nanoparticles using the leaf extract of *Rosa indica* and root of *Psidium guajava* and to evaluate their antimicrobial efficacy against some selected microbes and antidiabetic activity on albino rats. The synthesis Silver and ZnO nanoparticles were characterized by UV-VIS spectroscopy, particle size analyzer and Scanning Electron Microscopy, FTIR, XRD. The synthesized Silver and ZnO nanoparticles showed significant antimicrobial activity against Gram positive and Gram-negative bacteria as well as Antidiabetic activity. The maximum zone of inhibition had been found against *Pseudomonas aeruginosa* whereas the minimum is found against *Staphylococcus aureus* (25 ± 0.100). The use of nanoparticles in medicine is an attractive proposition. In the present study, zinc oxide and silver nanoparticles were evaluated for their antidiabetic activity. Fifty male albino rats with weight 120 ± 20 and age 6 months were used. This study also suggests that green synthesized Silver and ZnO nanoparticles can be used as an alternative to existing antimicrobial agents and also antidiabetic activity.

Keywords- *UV-VIS, FTIR, XRD, SEM, anti hyperglycemic activity*

RELATIONSHIP OF PHYSIOLOGICAL CHARACTERS TO SEED YIELD IN MUNGBEAN GENOTYPES USING INFRA-RED GAS ANALYZER

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Mungbean is one of the widely adapted and high potential pulse crop largely cultivated in arid and semi-arid areas. However, the current environmental changes, many biochemical and physiological impacts may affect the productivity of this crop. The productivity of mungbean is very low and is often related to that of morpho-physiological constraints, besides its genetic makeup. This work aimed to evaluate the impacts of physiological traits like net photosynthetic rate, transpiration rate and photosynthetic water use efficiency on seed yield. A field experiment was conducted with 35 mungbean genotypes over four environments created by four different dates of sowing in RBD with three replications at SKRAU, Bikaner during summer-2019 and *Kharif*-2019. Net Photosynthetic rate and transpiration rate were recorded on the abaxial surface of the 3rd fully expanded leaf from the top at 45 DAS, between 9.00 AM and 11.00 AM with a portable Photosynthesis System (Model CI-340) assembled with an Infra-Red Gas Analyzer (IRGA). High net photosynthetic rate coupled with high photosynthetic water use efficiency resulted into higher seed yield in mungbean. Therefore, seed yield estimation in mungbean may also be done through physiological parameters like net photosynthetic rate and water use efficiency besides agro-morphological traits.

Keywords: Environment, Mungbean, Net photosynthetic rate, Seed yield and Water use efficiency.

RESPONSE OF DIFFERENT LIQUID ORGANIC MANURES ON GROWTH, YIELD AND QUALITY OF PEA (*Pisum sativum* L.)

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ABSTRACT

The present experimentation entitled “Response of different liquid organic manures on growth, yield and quality of pea (*Pisum sativum* L.)” was conducted at Horticulture farm, Department of Horticulture, Rajasthan College of Agriculture, Udaipur during *Rabi* season of the year 2020-2021. Eight treatment combinations comprising different liquid organic manures in different concentrations were tried in Random Block Design (RBD) with four replications.

The results of the experiment showed that the application of T₈ treatment (*i.e.*, Jeevamruth @ 500 liters/ha at the time of sowing and 30 DAS + Panchagavya @ 4% sprays at 30 and 45 DAS + Vermiwash @ 10% sprays at 35 and 50 DAS) were recorded significantly highest values of different characters of pea such as plant height, number of leaves, leaf length (cm), leaf width (cm), leaf area (cm²), number of pickings, pod length (cm), pod diameter (cm), number of pods per plant, pod weight (g), pod yield per plant (g), pod yield per plot (kg), pod yield per hectare (t), net returns (Rs/ha), TSS (°Brix), chlorophyll content (mg/g) and also enhances soil properties (*i.e.*, organic carbon (%)) and available NPK (kg/ha) and microbial population (*i.e.*, bacteria, fungi and actinomycetes (cfu per g) as compared to other treatments.

MICRONUTRIENT MANAGEMENT IN SOILS FOR HIGHER CROP PRODUCTION

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ABSTRACT

The essential micronutrients for field crops are B, Cu, Fe, Mn, Mo, and Zn. Other mineral nutrients at low concentrations considered essential to growth of some plants are Ni and Co. The incidence of micronutrient deficiencies in crops has increased markedly in recent years Waqeel, & Khan, (2022) due to intensive cropping, loss of top soil by erosion, losses of micronutrients through leaching, liming of acid soils, decreased proportions of farmyard manure compared to chemical fertilizers, increased purity of chemical fertilizers, and use of marginal lands for crop production. Micronutrient deficiency problems are also aggravated by the high demand of modern crop cultivars. Increases in crop yields from application of micronutrients have been reported in many parts of the world. Factors such as pH, redox potential, biological activity, SOM, cation-exchange capacity, and clay contents are important in determining the availability of micronutrients in soils. Yield and quality of agricultural products increased with micronutrients application, therefore human and animal health is protected with feed of enrichment plant materials. Each essential element only when can perform its role in plant nutrition properly that other necessary elements are available in balanced ratios for plant.

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***Spirulina platensis*, *Manihot esculenta* and *Stevia rubidiana* IN FOOD FORTIFICATION**

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ABSTRACT

Food fortification is a part of integrated food system to combat malnutrition. In the developing countries, infection and infestation are important factors involved in the causation of severe malnutrition among preschool children consuming inadequate and ill-balance diets. The major deficiencies in their diets are low quality proteins, starchy carbohydrates and micronutrients. The right food to be fortified, the right amount and the combination of nutrients and bioavailable form of nutrient should be selected for successful fortification. Keeping these factors in mind, various types of cakes and cookies have been prepared incorporating the commercially available protein rich powders of blue green algae *Spirulina platensis*, carbohydrate rich powder of *Manihot esculenta* and sweetening agent i.e. crude leaf powder of *Stevia rubidiana* in their recipe. *Spirulina platensis* is a non-toxic blue green algae that is a filamentous cyanobacteria that is consumed as a food by humans. Cassava is primarily used as human food in almost all countries where it is cultivated because it is a concentrated source of energy. *Stevia rebaudiana* is a good alternative to natural and artificial sweeteners. In the preparations of noodle and pasta, maida has been replaced partially with crude powder of *Cassava esculenta* whereas, powder of *Spirulina platensis* has been replaced partially with egg powder in the preparation of various types of cakes i.e. plain cake, fruit cake, chocolate cake and nan-khatai. The prepared products were assessed on hedonic scale of 9 and their nutritive value determined.

Keywords: *fortification, malnutrition, micronutrients, alternative*

QUALITY AND ECONOMICS OF FENUGREEK AS INFLUENCED BY EFFECT OF FOLIAR APPLICATION OF PANCHAGAVYA AND BANANA PSEUDOSTEM SAP

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ABSTRACT

A field experiment on “Effect of foliar application of panchagavya and banana pseudostem sap on growth and seed yield of fenugreek” was carried out at Agronomy Instructional Farm, Chimanbhai Patel College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar during rabi 2020-21. The results revealed that significant improvement in seed yield, straw yield, protein content, highest gross realization (₹64,746/ha) and net realization (₹34,259/ha) was noted with an application of treatment T₄ (Panchagavya @ 4% spray at pre flowering + pod setting stage) over other treatments but which remained at par with treatment T₁₀ with respect to seed yield, straw yield, protein content and gross realization (₹62,748/ha) and T₃ (Panchagavya @ 4% spray at pod setting) for net realization (₹32,863/ha). The highest value of benefit: cost ratio (2.14) was accrued with treatment T₃ closely followed by treatment T₄ with BCR of 2.12.

Keywords: Panchagavya, Banana pseudostem sap, quality, economics, Fenugreek

ASSESSMENT OF SUITABILITY OF BER (*Ziziphus mauritiana* L.) CULTIVARS FOR VALUE ADDITION THROUGH DEHYDRATION TECHNOLOGY

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ABSTRACT

This novel experiment was conducted to assess the suitability of twelve Indian jujubes (*Ziziphus mauritiana* L.) cultivar for value addition through dehydration technology. The fresh fruit samples were collected randomly from ber tree and subjected to dehydration. A sum of five qualitative characters viz., total soluble solids (TSS), pH of fruit pulp, moisture content, ascorbic acid content and phenol content were explored along with organoleptic evaluation of fresh and dehydrated ber cultivars. Significantly higher TSS among fresh ber was found in Chhuhara (23.96 °Brix) and in dehydrated ber was in Sanaur-2 (29.91 °Brix). The highest pH was found among the fresh and dehydrated cultivars in Illaichi (4.73) followed by Dandan (4.70). The ascorbic acid content was recorded the highest in fresh Seb (108.73 mg/ 100g of fresh fruit) and dehydrated Kadaka (58.55 mg/ 100g dry fruit pulp). Significantly highest phenol content among fresh and dehydrated ber was in Seb 219.40 mg/ 100g fresh fruit pulp and 236.24 mg/100g dry fruit pulp respectively. In organoleptic evaluation, Kadaka ranked first as it retained high ascorbic acid content even after dehydration. From the present study, Kadaka seems to be the best cultivar for dehydration, followed by Seb and Gola.

Keywords: *Ziziphus mauritiana* L.; dehydration, qualitative characters

TO STUDY VARIOUS FACTORS AFFECTING PERSONALITY DEVELOPMENT OF AN ADOLESCENTS – A REVIEW

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ABSTRACT

Adolescence is a phase of transition from a largely dependent childhood to adulthood's psychological, social and economic independence. The period of adolescence starts from 11-21 years which are sub categorized into 3 stages. (i) Early adolescence (11- 14 years) (ii) Middle adolescence (15-18 years) and (iii) Late adolescence (19-21 years). There are five dimensions of personality which includes openness to experience, conscientiousness, extroversion, agreeableness and neuroticism. Personality of adolescents becomes more differentiated with age, gender, ordinal position and socio-economic status along with the growth of mental capacities. Regarding personality traits, conscientiousness and agreeableness are the best predictors of student's academic achievement while other personality traits such as extraversion, neuroticism and openness to experience were non-significant. Results revealed from various studies indicated that, urban and rural adolescents differed significantly in terms of agreeableness, conscientiousness and emotional stability, while, they were similar in two personality traits i.e., extroversion and openness to experience. Early and late adolescents differed significantly in terms of emotional stability. Boys were better in extraversion, conscientiousness and emotional stability trait, whereas, girls were better in agreeableness and openness to experience traits from their counter parts. Adolescent's personality development

was influenced by parenting styles. Mothers were more likely to be authoritative with boys as compared to girls. Whereas, the fathers were more likely to be authoritarian with the girls as compared to boys. Few research studies shown that, girls were found to be high in neuroticism and conscientiousness dimensions of personality than boys. Ordinal position also plays an important role in personality development, both first and last born children were found to have better performance than middle born, the difference was found to be more significant between last and middle born as compared to the first and middle born. No significant differences were observed between single female children and female children with siblings on personality development. Full-time maternal employment had negative impact on the propensity of adolescents to smoke which, means maternal employment had negative impact on adolescents behaviour. Few studies stated that financial status of parents had impact on adolescent’s academic achievement.

Keywords: Personality development, Adolescents, parenting styles, emotional stability, personality traits.

EFFECT OF FEEDING PREPARTUM CONCENTRATE FEED ON PERFORMANCE OF DOES AND KID.

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ABSTARCT

Purpose

The potential to enhance the productivity of Black Bengal goat breeds through better nutrition and cross breeding and improved management is immense. Cross breeding has increased the yield potential of crossbred goat to some extent, but most of cross bred Black Bengal kid are unable to express their full potential due to inadequate nutrition during their early phase of growth. This could be achieved through better feeding and management of Black Bengal goat breeds during advanced pregnancy and kid during their early life. So, this work have planned with objective to providing essential nutrients during advanced stage of pregnancy, to ensure kid born are healthy and rearing kid to reduce mortality rate.

Methods

60 pregnant Does were selected and after proper vaccination and deworming divided into two equal groups of 30 each group and compare with farmers practice (Straw+maize-200g+grazing), TO1 (FP+ 200 g concentrate/day) for last 60 days of pregnancy. Up to 60 days age treatment group kids were fed Multi-nutrient block @ 100g/day/kid with suckling and compare with farmers practice kids were rear on suckling + maize. Since 61 days age kids were fed Straw +grazing+ 150g kid meal for 150 days and compare with farmers practice kids fed Straw+maize-200g+grazing. The Pregnant goat concentrate having CP-18% , TDN -70%, Ca-1% and P-0.8%. and Multi nutrient block for kid having CP-17.53%, TDN 70%, EE -0.73%, Ca 1%, P-0.8% chelated minerals and quality protein meals.

Results

Body weight of Pregnant Does at 21st week of pregnancy was significantly ($P<0.05$) higher in treatment (26.57 Kg) than control (24.81Kgk. The no. of Kids born was similar but bitrth weight of kid and survivability was significantly ($P<0.05$) higher in treatment (2.14 Kg, 98.9%) than control group (1.64 Kg,92.2%). The weight of kids at birth, at 60 days of age and average daily gain (g/d) was 1.64, 2.14; 3.9, 5.0 and 2.2 and 2.9, respectively in control and treatment group were significantly ($P<0.05$) higher in treatment than control group. The feeding cost (Rs) /Kg gain was statistically similar in both groups (63.7 and 61.8).

Conclusions

Feeding pre-partum concentrate feed improve the birth weight and survivability of cross bred black Bengal kid as well as performance of kid after feeding multi-nutrient block for kid.

Keywords: Multi-nutrient block, Pre-partum feeding, Goat Kid, Survivability

INFLUENCE OF SHOOT TIP PRUNING AND PACLOBUTRAZOL SOIL APPLICATION ON THE YIELD OF MANGO HYBRID RATNA UNDER HDP SYSTEM

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Purpose: Mango (*Mangifera indica* L.), the king of fruits is known for its nutritional quality, appearance, taste and flavour. Low productivity of mango in Kerala is attributed to the complex flowering phenomenon that is greatly affected by the weather parameters, pest and disease incidence, inherent factors and the unscientific canopy management techniques. The productivity of mango orchards can be improved by adopting the high-density planting system which could accommodate a greater number of plants per unit area along with pruning and growth regulator application. The canopy management techniques standardised elsewhere cannot be blindly adopted in the humid tropical condition of Kerala due to the variation in the climatic conditions and the unpredictable weather parameters prevailing during the flowering and fruiting period of mango. In this context, an experiment was undertaken with the objective to study the effect of different levels of pruning and time of pruning with and without paclobutrazol application on the yield parameters of seven-year-old trees of mango hybrid Ratna.

Methods: The study was conducted in the Mango orchard attached to the Department of Fruit Science, College of Horticulture, Vellanikkara during 2018-2019. The HDP mango trees were planted in the Mango orchard in 2011. The mango hybrid selected for the study was seven-year-old trees of Ratna, planted at a spacing of 3 m x 3 m. The experiment was laid out in CRD with each treatment replicated twice. The pruning operations were carried out before the 5th of every month from June to September. Tip pruning of all the shoots was carried out at two levels viz. 10 cm and 20 cm length from the shoot tip with and without paclobutrazol soil drench. T₁-Pruning @ 10 cm length (June), T₂-Pruning @ 20 cm length (June), T₃-Pruning @ 10 cm length (July), T₄-Pruning @ 20 cm length (July), T₅-Pruning @ 10 cm length (August), T₆-Pruning @ 20 cm length (August), T₇-Pruning @ 10 cm length (September), T₈-Pruning @ 20 cm length (September), T₉-Pruning @ 10 cm length + PBZ (June), T₁₀-Pruning @ 20 cm length + PBZ (June), T₁₁-Pruning @ 10 cm length + PBZ (July), T₁₂-Pruning @ 20 cm length + PBZ (July), T₁₃-Pruning @ 10 cm length + PBZ (August), T₁₄-Pruning @ 20 cm length + PBZ (August), T₁₅-Pruning @ 10 cm length + PBZ (September), T₁₆-Pruning @ 20 cm length + PBZ (September), T₁₇-control. The observations on vegetative, flowering and yield parameters were recorded at weekly intervals.

Result: The yield characters of Ratna showed significant variation among the treatments. The highest number of fruits per tree (34.50) was recorded for T₁₀ (pruning of shoots at 20 cm length during June and drenched with PBZ) and was on par with T₁₆ (pruning of shoots at 20 cm length during September and drenched with PBZ). Maximum fruit weight (468.98 g) was recorded by the treatment T₁₆ which was on par with treatment T₁₀ (465.48 g). The control trees (T₁₇) which received no pruning and PBZ treatment produced the fruits with minimum weight (298.43 g). The treatment T₁₀ (pruning of shoots at 20 cm length during June and drenched with PBZ) recorded the highest fruit yield of about 16.06 kg per tree and was found to be on par with the treatment T₁₆ (15.95 kg per tree).

Conclusion: Pruning all the shoots of the tree to a length of 20 cm from the shoot tip along with paclobutrazol soil drench during June month was observed to produce maximum number of fruits per tree and maximum fruit yield (kg/tree) in Ratna. The individual fruit weight was maximum in the trees pruned at 20 cm length during September month drenched with paclobutrazol.

Keywords: Mango, Ratna, Pruning, Paclobutrazol, Number of fruits per tree, Yield, Fruit weight, June, September

INFLUENCE OF CLIMATE BASED LITTER DECOMPOSITION ON REGENERATION OF TROPICAL MIXED FOREST ECOSYSTEM

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PURPOSE

Tropical forests are a major ecosystem function that controls nutrient cycling and soil organic matter. The status of organic matter production depends upon the litter decomposition dynamics and climate attributes such as temperature, rainfall, humidity, and seasonal variations. In addition, the litter-fall contributes in seedling recruitments as it acts as soil seed bank. The positive and negative impact of litter dynamics can help understanding seed germination and seedling emergence process of different species of tropical forests. Furthermore, the quantity, quality, and availability of nutrients of litter components and its nutrient release pattern interlinked with the forest litters and seasons. The present study deals the litter fall and nutrient component is forest litters and its influence on forest regeneration in different seasons and climatic factors.

METHODS

Leaf litter fall, litter decomposition and nutrient return pattern in tropical mixed forests were studied monthly and seasonal interval to assess. Forest of Central India is considered as most ecological and rich in biodiversity and source of tribal livelihood and country economy. Quadrates of 1m² X 1m² were laid out in study. Litter quantity, decomposition and nutrient release patterns were studied in relation to the forest regeneration status.

RESULTS

Based on study the total litter estimated was 4738.6 kg/ha in the studied forest area. The amount of litter found to decrease the seedling regeneration and establishment due to high litter load and hindrances for nutrient uptake. There was positive correlation between decomposition and nutrient releases are highly influenced by the magnitude of litter production, litter quality and nutrients release which were affected by forest floor temperature, moisture and other factors. Ecological impact of carbon and nutrient dynamics in the litter layer is considerable in a forest ecosystem.

CONCLUSIONS

Litter dynamics is an important for forest regeneration and seedling establishment which influence positively for some species and negative for others. As this is a topic of greater and wider interest, further experimentation needs for its validation in different forests.

Keywords: Litter-fall, Litter decomposition, Regeneration, Tropical forest

AGROFORESTRY FOR LIVELIHOOD SECURITY: A STUDY FROM BARAMULLA DISTRICT IN NORTH KASHMIR

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Purpose: Agroforestry in temperate Himalayas presents a significant outcome in terms of livelihood and employment generation. The present abstract is a part of our study which highlights the importance of “Livelihood Security through Agroforestry Systems in District Baramulla of Kashmir”.

Methods: The study was carried out in 4 Blocks of Baramulla district through multi-stage randomized selection. The data were collected by personal interviews of the respondents through a structured interview schedule.

Results: The results of the study revealed that majority of the respondents in the study area were of middle age (44.44%) and illiterate (37.78%). Cultivation was the main occupation for all households. The majority of the farmers were either small (72.22%) or medium (15.55%) category. Income of households from the sale of agroforestry produce (agriculture, horticulture and forest resources) contributed the maximum income share in the livelihood dependency. Poplars and Willow were the most preferred forest tree species whereas, Apple, Pear and Walnut were the most preferred fruit tree species. Significant percentage (87.22%) of respondents are in the high-income category, with 2.22% respondents in the low-income category and very low-income category respondents weren't found. The average gross annual income in the study area was ₹ 439747. Families were predominant with a high gross annual income of more than ₹ 90000 per year in the surveyed population.

Conclusion: The findings of the present study suggest considering socio-economic factors while scheming agroforestry models for the study area. Further, farmers should practice fruit tree-based agroforestry systems such as Agri-Horti-silviculture system, integrated mixed farming (production of food, feed, fodder, fibre, fuel on a small piece of land), agri-Horti-silvopasture system, etc. The current agroforestry practices also need improvement by incorporating fruit, fodder and timber trees as per farmer's choice.

Keywords: Agroforestry, livelihood, Silvopastoral, Kashmir

IMPACT OF FRONTLINE DEMONSTRATIONS ON PIGEON PEA CROP IN WEST CHAMPARAN, BIHAR

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Purpose

Pigeon pea is an important pulse crop widely consumed in India. It also plays an important role in sustainable agriculture enriching the soil through biological nitrogen fixation. The productivity of pulses in Bihar and in district West Champaran is quite low as compared to potential yield and other states. Cluster front line demonstration is an appropriate means for demonstration as well as transfer of improved agricultural innovations to the farming community. National food security mission, a centrally sponsored scheme on pulses, enabled

Krishi Vigyan Kendra, Madhopur has conducted cluster front line demonstrations on pulse crops regarding establishment of production potential of pigeon pea crops.

Methods

To increase the production and productivity of pigeon pea crop in the district, Krishi Vigyan Kendra, Madhopur conducted 103 demonstrations on pigeon pea crop during 2020–21 and 2021-22. An extensive survey was made before conducting the cluster frontline demonstrations to find out the need-based farmers. The receptive and innovative farmers were selected through group meeting in each year and taking in to consideration mainly the approachable site and adaptive attitude of the farmers. All critical inputs viz. improved varieties of pigeon pea that was Rajendra Arhar-1 and demonstrated with full package of practices i.e. proper tillage, proper seed rate, time of sowing and sowing method, balanced dose of fertilizer (18 kg Nitrogen 46 kg P₂O₅/ha), *Trichoderma* and *Rhizobium* culture @ 5 gm/kg of seed as seed treatment, proper irrigation, weed management and improved plant protection measure were applied at farmers’ fields.

Results

The findings in respect of pigeon pea crop, the minimum and maximum average yield trend of demonstrations ranged from 12.90 to 20.35 q/ha and the overall average yield 16.63 q/ha was obtained from all demonstration plots during both the crop season. It was 38.19 percent more over the farmers practice. Average net profitability of worth Rs. 71850.00/ha as compared with farmers practices (Rs. 45825.00/ha) were obtained and average benefit cost ratio i.e. 3.30 and 2.39 were recorded in demonstrated plot and farmers practice respectively.

Conclusions

Cluster frontline demonstrations (CFLDs) organized by the KVK, Madhopur had enhanced the yield of pigeon pea crop. The CFLDs made a great impact on the use of improved varieties, weed management, fertilizer application plant protection measure, seed rate, seed treatment and sowing methodology and adoption of other recommended practices of pulse crops under study.

Keywords: Cluster Frontline Demonstrations, Pigeon pea crop, Net returns, BCR

ENHANCEMENT OF RAPESEED-MUSTARD PRODUCTION THROUGH CLUSTER FRONTLINE DEMONSTRATIONS IN WEST CHAMPARAN DISTRICT OF BIHAR

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Purpose

Mustard is one of the most important oilseeds crop in India, which plays a major role in supplementing the income for small and marginal farmers of West Champaran district in North West Alluvial Plain Zone of Bihar. The development of the agriculture is primarily depending on the application of the scientific technologies by making the best use of available resources. To increase the production, productivity and quality of agricultural produce, cluster front line demonstrations are being conducted at various farmers’ field. Cluster front line demonstrations on farmer’s field also help to identify the constraints and establish production potential of the rapeseed-mustard in specific area as well as it helps in improving the economic and social status of the farmers. The aim of the cluster front line demonstration is to convey the technical

message to farmers that if they use recommended package and practices then the yield of this crop can be easily doubled than their present level.

Methods

Cluster Front line Demonstrations conducted on Rapeseed-Mustard during *Rabi* season of 2020-21 & 2021-22 in selected cluster villages of West Champaran district of Bihar. Krishi Vigyan Kendra, Madhopur conducted 694 demonstrations on rapeseed-mustard crop during two consecutive years. The high yielding varieties Giriraj NRCYS-05-02, B-9 and Rajendra Sufalam were demonstrated on farmers’ fields with full package of practices viz. proper tillage, proper seed rate and sowing method (45 x 10 cm R x P), balanced dose of fertilizer (120:40:40:30:N:P:K:S kg/ha), *Trichoderma* @ 5 g/kg of seed as seed treatment, proper irrigation, weed management and improved plant protection measures. In this demonstration control plot was also kept where farmers practices was carried out. The data output were collected from both C-FLDs plots as well as control plots and finally yield and economical parameters were computed and analyzed.

Results

The yield of rapeseed-mustard fluctuated successively over the years in demonstration plots and the average yield registered 31.74 percent higher with use of technological interventions over farmers’ practice. Average net profitability of worth Rs. 38664.50/ha as compared with farmers practices (Rs. 23254.50/ha) were obtained and average benefit cost ratio i.e. 2.55 and 2.15 were recorded in demonstrated plot and farmers practice respectively.

Conclusions

The use of scientific methods of rapeseed-mustard cultivation can reduce the technology gap to a considerable extent thus leading to increased productivity in the district. It requires collaborative extension efforts to enhance adoption level of location and crop specific technologies among of the farmers for bridging these gaps. By conducting cluster front line demonstrations of proven technologies, yield potential of rapeseed-mustard cultivation can be enhanced to a great extent with increase in the income level of the farming community.

Keywords: Cluster Frontline Demonstrations, Mustard, C-FLD, Net Returns and BCR

DEVELOPMENT OF MACHINE LEARNING BASED REFERENCE EVAPOTRANSPIRATION MODEL FOR SEMI-ARID REGION OF PUNJAB, INDIA

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Purpose

Evapotranspiration (ET) is a critical element of the hydrological cycle, and its proper assessment is essential for irrigation scheduling, agricultural and hydro-meteorological studies, and water budget estimation. It is computed for most applications as a product of reference crop evapotranspiration (ET₀) and crop coefficient, notably using the well-known two-step

method. Accurate predictions of reference evapotranspiration (ET_0) using limited meteorological inputs are critical in data-constrained circumstances and the preferred FAO-56 Penman-Monteith (PM) equation cannot be used. To overcome the complexity of calculation, the present study is focused to develop a Random Forest-based ET_0 model to estimate the crop ET for the semiarid region of northwest India.

Methods

The RF based model was developed by focusing on the easily available data (temperature and relative humidity) at the farm level. For comparative study Hargreaves–Samani model was also modified and used to estimate the ET_0 . Further, ET_0 was also estimated using existing models like Hargreaves–Samani model, and Modified Panman model. The calibration and validation of the models were done by using meteorological data collected from the weather station of Punjab Agricultural University for 21 years (2090-2010) and 9 years (2011-2019) respectively and the PM FAO-56 model was taken as a standard model.

Results

The developed RF-based model's mean absolute error and root-mean-square deviation were found to be better than the other models, and it was obtained as 0.95 mm/d and 1.32, respectively, with a r^2 value of 0.92. The developed RF based model was used to predict the ET_0 and further, predicted ET_0 values were used for irrigation scheduling of two growing seasons (2020-2021) of maize and wheat crops. The result of the field experiment also shows that there was no significant yield reduction in the crop.

Conclusions

Hence, the developed model can be used for the estimation of ET_0 and irrigation scheduling of the semiarid region of northwest India, also it can be as a replacement FAO-56 model. This model can easily adopt by farmers and researchers for scheduling and designing irrigation systems.

Keywords: Reference evapotranspiration, Random-Forest algorithm, PM FAO-56, Hargreaves–Samani model, modified Hargreaves–Samani model, Irrigation Scheduling.

INTEGRATED PLANT DISEASE MANAGEMENT

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ABSTRACT

Worldwide, large crop losses are caused by plant diseases, which are regarded as a serious biotic constraint. In contrast to adopting a single component method, integrated disease management (IDM), which integrates biological, cultural, physical, and chemical control strategies, has been shown to be more successful and long-lasting. In actuality, and in the majority of cropping systems today, a single technique is still the focus. Although the adoption of the IDM strategy is expanding, developing nations frequently lack the supportive environment necessary for its effective implementation. A wide range of topics, including plant protection, private sector investment, trade and export, food safety, land use, education and awareness, and agriculture extension, must be addressed by the policies that must be in place for success. IDM practices must be widely used in order to have an impact at the national level. Experience over the past few decades has amply demonstrated the value of adopting and encouraging the use of participatory approaches in helping farmers manage their fields more effectively overall, especially in terms of disease control, cost containment, and production efficiency. This essay will highlight all the factors that must be taken into consideration for developing nations to successfully embrace IDM at the national level.

Keywords- *Biological practices, cultural practices, chemical practices, disease management, IDM,*

BIOLOGICAL MANAGEMENT OF PLANT DISEASES

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ABSTRACT

Disease management is essential to modern agriculture. A crop's potential output levels typically decline based on the timing and severity of the disease. The disease management strategies need to be put into practice during the growth of the specific crop. How the pathogen is controlled depends on a variety of factors, including the crop, the kind of pathogen, the source of inoculums, the season of cultivation, the stage of infection, the affected plant part, and the number of pathogen generations in a crop cycle, and many more. As a result, there are numerous solutions and suggestions for managing diseases. Over the past century, numerous fungicides and other chemical-based insecticides have been created to manage various plant infections. The unjustified use of chemical pesticides to eradicate countless naturally existing, potent antagonistic microorganisms have occurred over time to control numerous insect pests and diseases. Pesticide-resistant strains' progressive reversal of the pathogens' gains in agricultural contexts was shown by their emergence. It has been found that employing natural plant components instead of synthetic fungicides is a secure and effective way to control plant diseases. A pathogen's survival or activity is reduced by the agency of any other living species except man, and as a result, the incidence of the disease brought on by the pathogen decreases. This is what is meant by "biological control." Numerous diseases affect various plant components due to pathogens.

Keywords- *Biological agents, biological control, disease management, fungicides, pesticides.*

IMPACT OF PRESERVATIVES AND COMMERCIAL PASTEURIZATION ON NUTRITIONAL, PHYTOCHEMICAL, MICROBIAL AND SENSORY QUALITY OF BANANA RTS

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ABSTARCT

Purpose

The demand of fruit-based beverages is increasing worldwide in contrast with carbonated beverages. Stability and degradation of nutrients are the major problem for storability of fruit-based beverages. Banana fruit is highly nutritious and one of the most important sources of energy in the diet of people living in tropical humid regions. The current research was aimed to formulating novel and healthy drink from banana and to study the influence of preservatives (nisin, vanillin, lemongrass and cinnamon essential oil) and commercial pasteurization on banana RTS.

Methods

Banana RTS prepared using 20 percent banana pulp, 0.28 percent acidity and 15 percent TSS. Preservatives and pasteurization treatment was given to banana RTS and stored at room and refrigerated temperature for 90 days to study the nutritional, phytochemical, sensory and microbiological quality.

Results

The total soluble solids, total sugar, reducing sugar and acidity were increased whereas total phenolic components, ascorbic acid, antioxidant and FRAP activity decreased during 90 days of storage. It was found that nutritional, phytochemical and sensory quality was better retained in nisin and sodium benzoate preserved RTS while pasteurization results in loss of quality attributes. However, vanillin, cinnamaldehyde and lemongrass essential oil influenced the aroma of banana RTS and not accepted by consumers. Total bacterial and yeast and mold count during storage of banana RTS with nisin and sodium benzoate was below the detection level while other samples spoiled and discarded before the completion of storage study.

Conclusions

The nisin and sodium benzoate showed extended shelf-life and better-quality attributes as compared to commercial pasteurization treatment.

Keywords: Banana RTS, Preservatives, pasteurization, nutritional quality, Sensory quality

WEED DYNAMICS AND YIELD OF DIRECT-SEEDED RICE AS INFLUENCED BY HERBICIDES UNDER DIFFERENT AGRO-ECOSYSTEMS

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Purpose

Rice (*Oryza sativa* L.) is an important staple food for more than 60 % of the world population. It supplies 20 percent of the total calories required by the world and 31 percent needed for the Indian people. Direct seeded rice is an emerging production technology in India due to insufficient water, labour, and capital input requirements. But direct seeded rice has the problem of severe weed infestation. The success of DSR depends largely on weed control, especially with chemical methods, as mechanical weed control is labour intensive and not cost-effective. Therefore, applying several herbicides in combination or sequence can be more helpful.

Methods

The study was conducted during the *kharif* 2019 at Research Farm, College of Agriculture, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (M.P.) with 2 mainplot treatments (rainfed and irrigated agroecosystems) and 8 subplot treatments (bispyribac sodium @ 25 g *a.i./ha*, fenoxaprop-p-ethyl @ 60 g *a.i./ha*, fenoxaprop-p-ethyl + penoxsulam @ (60 + 26.7) g *a.i./ha*, cyhalofop + penoxsulam @ (135 + 26.7) g *a.i./ha*, bispyribac sodium + (metsulfuron methyl + chlorimuron ethyl) @ (25+4) g *a.i./ha*, triafamone + ethoxysulfuron @ (40+20) g *a.i./ha* as post-emergence herbicides, hand weeding twice and weedy check) replicated thrice. Rice variety MTU 1010 was seeded on 12th June 2019 in rows 20 cm apart using seed drill. Weed density (no./m²) were recorded species wise in each plot using quadrat from the area selected randomly for observations.

Results

The results indicated that weed flora of the experimental field was mainly dominated by *Echinochloa colona* with a mean relative density of (30% and 28.6%) followed by *Alternanthera sessilis* (26% and 25%), *Cyperus rotundus* (18.9% and 18%) and *Cynodon dactylon* (18.4% and 17.9%) under rainfed and irrigated agroecosystems. The highest weed control efficiency of (97% and 97.4%) at 90 DAS was recorded with hand weeding under rainfed and irrigated agroecosystems respectively which was closely followed by bispyribac sodium @ 25 g *a.i./ha* (89.5% and 89.6%) and fenoxaprop-p-ethyl + penoxsulam @ (60 + 26.7) g *a.i./ha*. Growth parameters and yield attributing characters of rice were higher in plots

receiving bispyribac sodium @ 25 g *a.i./ha*, which registered the maximum values of these parameters. Similarly, the highest grain yield was recorded with bispyribac sodium @ 25 g *a.i./ha*.

Conclusions

It was concluded that effective management of weeds and higher grain yield of direct seeded rice was registered with bispyribac sodium at 25 g *a.i./ha* under rainfed and irrigated agroecosystem.

Keywords: Agroecosystem, Bispyribac sodium, Rice, Weeds

STUDY OF GENETIC DIVERSITY IN RICE (*Oryza sativa* L.) GENOTYPES FOR GRAIN YIELD UNDER HUMID SOUTH EASTERN PLAIN OF RAJASTHAN INDIA

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ABSTRACT

Rice (*Oryza sativa* L.) is the most important food source for more than half of the world's population, so determining the best genotypes for proper crossing is important to produce high yielding varieties with good cooking quality. Genetic diversity is the base for survival of plants in nature and for crop improvement. Diversity in plant genetic resources provides opportunity for plant breeders to develop new and improved cultivars with desirable characteristics, which include both farmer-preferred traits (high yield potential, large seed, etc. Diversity helps the plant breeder in choosing the right parents for breeding programmes. In the study the 25 rice genotypes were grouped into six clusters based on Mahalanobis's D^2 statistics. Cluster II consisted with the highest number of (8) genotypes from different origin, whereas cluster VI consisted with the lowest number of (1) genotypes. Cluster I consisted of 7 cultivars showed maximum mean grain yield. Maximum inter cluster distance was recorded between cluster III and VI. Cluster I had the highest mean values for grain yield and Number of productive tillers per plant and Cluster VI had the highest mean values for 1000-grain weight. The cultivars from these clusters with desirable characters may be used as potential donor for future hybridization program to develop high yielders.

Keywords- Genetic diversity, Mahalanobis's D^2 , *Oryza sativa*, Rice

EVALUATION OF THE ANTIMICROBIAL ACTIVITY OF METHANOLIC AND N-HEXANE EXTRACTS OF *Curcuma zedoaria* ROSCOE RHIZOMES

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ABSTRACT

Curcuma zedoaria, a perennial herb is also known as “white turmeric” and is indigenous to China, Indonesia, Sri Lanka and Taiwan and India. The rhizomes of this plant have aromatic, stimulant, and carminative properties. Besides its use as spices, the plant has anti-inflammatory, anticancer, antimicrobial and neuroprotective effects. The study was carried out to evaluate the antimicrobial potential in *Curcuma zedoaria* rhizomes collected from North-east and North-west India. Methanolic and n-hexane extracts of the collected rhizomes from North-east and North-west were prepared. The results for antibacterial potential revealed that *Escherichia coli* showed the highest sensitivity at 10mg/ml in methanolic extract from North-

west location, and the inhibition zone recorded was 15.3 ± 0.19 mm at 150 μ l extract concentration. However, the size of inhibition zone was small (6.4 ± 0.02 mm) with *Alcaligenes denitrificans* when treated with 150 μ l n-Hexane extract. Similarly, on comparing the two extracts from North-east location highest zone of inhibition was recorded in both methanolic and n-Hexane extracts (150 μ l) against *Alcaligenes denitrificans* and *Escherichia coli* which were 15.0 ± 0.03 mm and 15.0 ± 0.43 mm respectively. In case of antifungal activity, highest percentage inhibition was observed against *Fusarium oxysporum* (38.26 ± 0.54 , 36.10 ± 0.82) at 900 μ l concentration while lowest percentage inhibition was observed with n-Hexane extract against *Aspergillus niger* (25.82 ± 0.91) in extracts from North-west location. Similarly for the rhizomes collected from North-east location, the highest percentage inhibition was observed with methanolic extract (40.54 ± 0.33) against *Fusarium oxysporum* while with n-Hexane extract against *Aspergillus niger* it was only 22.24 ± 0.32 . Hence ability of rhizome extracts of *C. zedoaria* to inhibit the growth of wide range of test pathogen is an indication of its broad-spectrum antimicrobial potential which could be employed in the management of microbial infections.

Keywords: Curcuma zedoaria, rhizomes, antibacterial, antifungal, antimicrobial activity

STUDY OF GENETIC DIVERSITY FOR YIELD AND ITS COMPONENT CHARACTERS IN LENTIL UNDER LATE SOWN CONDITION

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ABSTRACT

The current investigation was carried out on thirty-six lentil genotypes at Bihar Agricultural University farm, Sabour, Bhagalpur. The genetic diversity study was done under late sown condition using Mahalanobis D^2 statistics. The presence of variation among genotypes was revealed by ANOVA for considerable characters which were significant for all the traits under study except number of primary branches per plant and number of pods per cluster. The study on genotypic diversity unveiled the grouping of total genotypes into five clusters under late sown conditions viz. Cluster II with maximum number of genotypes (18) offering 50.00 percent diversity followed by cluster I (11) accounting 30.56 percent diversity, cluster III (5) accounting 13.89 percent diversity and lastly, cluster IV and V were mono-genotypic accounting 2.78 percent diversity. Owing to maximum value of intra cluster distance (cluster II, 94.81) and inter cluster distance was noted between cluster IV and V (9500.62) indicating enough genetic diversity among the genotypes. Under late sown condition. Cluster V showed highest mean value for number of secondary branches per plant, 100 seed weight, grain yield per plant, biological yield per plant and harvest index which influences higher yield under heat stress. Thus examining the above data, Pusa Vaibhav and IPL 406 under late sown scenario are expected to trigger the desirable segregants for utmost potential yield.

Keywords: *Lens culinaris*; Genetic divergence; D^2 statistics.

CLIMATE SMART AGRICULTURE FOR ECOLOGICAL SUSTAINABILITY

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ABSTRACT

Climate-Smart Agriculture (CSA) is a method for assisting those in charge of managing agricultural systems in efficiently responding to climate change. The CSA strategy aims to achieve three goals: increasing production and earnings sustainably, adapting to climate change, and lowering greenhouse gas emissions wherever possible. This doesn't necessarily mean that every strategy used in every region should result in “triple wins”. Rather, the CSA approach aims to decrease trade-offs and enhance synergies by incorporating these goals into decisions at all sizes, from local to global and overlong and short time horizons, in order to arrive at locally acceptable solutions. Climate-smart agriculture is neither a new system nor a collection of methods. It's an innovative approach of mapping out development paths that can make agriculture more productive and sustainable, as well as better suited to serve climate change mitigation and adaptation. The bulk of the world's poor resides in rural areas, with agriculture serving as their primary source of income. Over the next two decades, increasing the productivity and incomes of smallholder crop, livestock, fish, and forest production systems will be critical to ensuring global food security. Climate change is projected to have the greatest impact on emerging countries. Warmer temperatures, variations in precipitation patterns, increasing sea levels, and more recurrent extreme weather events are some consequences. All of these factors put agriculture, food, and water supplies in danger. As a result, resilience is a major concern. Agriculture is a significant contributor to greenhouse gas emissions. Mitigation is often a large co-benefit of measures to boost adaptation and improve food security, therefore mitigation that is congruent with national agricultural development targets is an essential part of CSA. Focus and implementation of climate-smart agricultural practices will help deal with climate change in India.

EFFECT OF ACTIVE MODIFIED ATMOSPHERE PACKAGING ON QUALITY AND SHELF LIFE OF KINNOW FRUIT

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Purpose

Kinnow comes in the “Mandarin” group of citrus fruits, which are produced prominently in India and Pakistan and are perishable in nature. It has the shortest shelf life among all other citrus fruits. The aim of present study was to enhance the shelf life of kinnow fruit by active modified atmosphere packaging.

Methods

Response Surface Methodology with Box-Behnken Design for 3 independent variables at 3 levels viz. dose of scavenger (3-5grams), fungicide concentration (3-7%), and polythene thickness (100-200guage) was used to optimize the process parameters to maintain the quality of fruit with respect to selected responses i.e., the composition of O₂ and CO₂ gas, physiological loss in weight, total soluble solids, ascorbic acid, microbial load, and shelf-life. The samples treated with fungicide were packed in LDPE wrapped carton box with O₂ and CO₂ scavenger and stored in the cold chamber (5-7°C, 90-95% RH) and monitored at regular intervals.

Results

Physiochemical properties of kinnow fruit were significantly affected by active packaging ($p < 0.05$). The optimized conditions for active packaging of kinnow fruit were 5 grams dose of scavenger, 6.83% fungicide concentration, and 192.12 gauge of polythene thickness. Corresponding to these variables, the values of O₂, CO₂, physiological loss in weight, total soluble solids, ascorbic acid, microbial load, and shelf life were 12.84%, 3.75%, 7.34%, 9.2°Brix, 35.28 mg/100ml, 4.87×10^3 cfu/ml and 69 days respectively. The overall desirability was 0.812. The value of percentage deviation for validation was less than 5% for all the responses which indicate the precision and reliability of the study.

Conclusions

The fruit was stored at optimized storage conditions at cold storage i.e., samples were packed in a 200-gauge LDPE bag with a 5gram scavenger dose after being treated with 7% neem leaf powder solution as natural fungicide exhibited a better shelf life of 66 days.

Keywords: Kinnow, natural fungicide, scavengers, LDPE, carton box, shelf life, quality

EFFECT OF GROWING ON GROWTH AND FLOWERING OF CHRYSANTHEMUM (*Chrysanthemum morifolium*) cv. Pusa Shawait

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ABSTRACT

The present investigation entitled, “Standardization of growing media for quality growth and flowering of chrysanthemum (*Chrysanthemum morifolium*) cv. Pusa Shawait” were conducted in Mata Gujri College, Fatehgarh Sahib during the academic year 2021-2022 in the experimental farm of Mata Gujri College, Fatehgarh Sahib. The experimental details comprised of seven growing media viz., Soil: Coco peat: Farmyard manure (1:1:1, v/v), Soil: Sand: FYM (1:1:1, v/v), Soil: Perlite: Mushroom compost waste (1:1:1, v/v), Soil: Coco peat: Mushroom compost waste (1:1:1, v/v), Soil: Perlite: FYM (1:1:1, v/v), Soil: Vermiculite: FYM (1:1:1, v/v) and Soil: Vermiculite: Mushroom compost waste (1:1:1, v/v). The rooted cutting of chrysanthemum cv. ‘Pusa Shawait’ was transplanted in to earthen pots of 10 inch size. The study concluded that the M₂ performed best in plant height and stem length. Number of stem per plant was performed best in M₃. Number of leaves per plant, number of leaves per stem, leaf size and stem diameter (mm) was performed best in M₄. Whereas number of nodes per stem was performed best in M₅. Internodel distance per stem was found best in M₆. In floral parameters days taken to bud formation, days taken to flower opening, number of flower per stem, number of flower per plant, flower diameter and duration of flower. The pot presentability was also found best in M₅. In this finding it may be concluded that the media M₅ i.e. Soil: Perlite: Mushroom compost waste (1:1:1, v/v) is best for growing chrysanthemum variety Pusa Shawait in 10 inch pot size.

FUTURE OF FARMING: THE HYDROPONICS

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ABSTRACT

There is a big gap between the food we produced these days and the food required to feed each person in 2050. There will be almost 10 billion persons in the world by 2050—approximately and 3 billion additional mouths to feed than there were in 2010. In order to overcome the scarcity of quality and quantitative food in the future, we should adopt vertical farming that is helpful in increasing productivity in fewer area. Hydroponics is a good example of vertical farming. Thus, Hydroponic farming might be called the future of agriculture due to increasing population, shrinking land and water resources. The hydroponic word was derived from the two Greek words, first is Hydro which means water, and the second is Ponos which means labor, which literally says that “water working”. Hydroponic farming means raising plants in a water solution rich in nutrients instead of soil. This technique is also called aquaculture, soilless culture, nutria-culture, or tank farming. Nowadays it’s become popular in metropolitan cities due to its effective resource management and high-quality food output. Numerous benefits of this technique such as round-the-year production; less time required for the growing of crops than conventional growing; nominal disease and pest incidence; 70 to 90 % savings of water; Higher yields achieved in a smaller space; Nutrients are precisely controlled and Soil-borne pests and diseases are eliminated.

Conclusively we can say; that hydroponics is a technique that will help to feed the future population. In hydroponics, it is possible to cultivate short-duration crops, and vegetables throughout the year in very small spaces with less labour, so hydroponics can play a countless contribution in areas with shortage of soil, water and in adverse climatic conditions in future.

Keywords: Hydroponic, agriculture, yield, aquaculture and soilless culture.

E-NAM: ONE NATION, ONE MARKET

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ABSTRACT

National Agriculture Market (e-NAM), a pan-India electronic trading portal, was launched on 14th April 2016, by the Central Government of India to network the existing Mandis on a typical online market platform as “One Nation One Market” for agricultural commodities in India. The vision of e-NAM is to promote uniformity in agriculture marketing by facilitating processes across the combined markets, removing information asymmetry between buyers and sellers and boosting real-time price finding based on actual demand and supply and leading to more reasonable price realization for sellers- farmers due better assurance on the product quality and providing better price discovery through transparent auction procedure based on the quality of products along with timely online payment. The government’s “ONE NATION ONE MARKET” ambition is aided by e-NAM. In India, there are 1260 APMC mandis, markets across 22 states and 3 UTs have been integrated with e-NAM in a full-fledged way. Rajasthan

has the first-highest number of 145 APMC mandis integrated with e-NAM in a full-fledged way. E-NAM is a website that links domestic markets, i.e., APMC from different states, to build a pan-India e-market online platform to help achieve the ONE NATION ONE MARKET motto. In the COVID-19 pandemic, demand for agricultural produce has skyrocketed, but governments in several countries have enforced lockdowns to prevent the COVID-19 virus, limiting the supply of farm products. The coronavirus pandemic has sparked a health problem and an economic crisis that poses a severe threat to food security. In that scenario, e-NAM (spotlight of agriculture marketing) is a pan-India market platform built on a virtual network that allows farmers to vend their farm products anywhere in the country by eliminating state boundaries, thus unlocking new avenues for agriculture marketing.

CHARACTERIZATION OF GROUNDWATER HYDROCHEMISTRY AND GEOCHEMICAL PROCESSES IN AFZALPUR TALUK, KARNATAKA, INDIA.

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ABSTRACT

The present study focused on assessing the characterization of groundwater chemistry and evaluate the hydro geo-chemical processes of Afzalpur taluk. The groundwater chemistry is mainly controlled by water-rock interaction, but also influenced by other processes such as evaporation, dissolution, carbonate weathering, silicate weathering and ion exchange. Total 20 groundwater samples were collected during two different seasons (Post-monsoon 2020 and pre-monsoon 2021) from the study area and analyzed for cations and anions. The analyzed parameters formed the attribute database for statistical analysis. The study approach Gibbs plot and other statistical analysis of hydro chemical data were used to identify hydrogeo-chemical processes occurring in the study area and its relation to groundwater quality, the result shows that the dominancy cations and anions were observed as $\text{Na}^+ > \text{Ca}^{2+}$ and $\text{HCO}_3^- > \text{Cl}^-$. It was found that the general hydro geochemistry of groundwater in the study area dominated is by the processes such as rock, evaporation and weathering due to sluggish drainage conditions, greater water-rock interaction and anthropogenic activities.

Keywords: Afzalpur taluk, Groundwater quality, Gibbs plot, Hydrogeo-chemistry, hydro chemical processes.

HEAVY METAL CONTAMINATION IN SOILS

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ABSTRACT

Arsenic is a trace toxic element which is of great environmental concern due to its presence in soil, water, plant, animal and human continuum. It is a widely occurring toxic metal in natural ecosystems, the symptoms of arsenic poisoning include skin disorders, weakness, languor, anorexia, nausea and vomiting with diarrhoea or constipation. As the toxicity increases the symptoms attain more characteristics features, which include acute diarrhoea, edema, skin pigmentation, arsenical melanosis and hyperkeratosis, enlargement of liver, respiratory diseases and skin cancer.

Drinking water is considered as the most important source for Arsenic exposure, there are other sources also that leads to arsenic toxicity like soil-crop-food transfer. Bioavailability of Arsenic in soils is governed by mainly pH, redox potential, organic matter content, clay content and presence of other ions in soil solution.

Keywords- trace, human continuum, edema, bioavailability, redox potential

REVIEW ON TINOSPORA CORDIFOLIA UNVEILING ITS HEALTH BENEFITS AND BIOLOGICAL POTENTIAL

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ABSTRACT

Tinospra cordifolia is a deciduous climbing shrub. It is also known as Gulvel or Guduchi and has a substantial usage because of varied properties. In Ayurvedic regime this plant is designated as Rasayana drug because of its significant therapeutic importance. The plant *Tinospora cordifolia* in the world of medicine helps in healing of many diseases. This climber plant grows in warm climate and with support of fast growing breed i.e. Moringa (*Moringa oleifera*), Neem (*Azadirachta indica*) and Jatropha (*Jatropha curcas*). Neem Giloy shows more therapeutic properties. This plant *Tinospora cordifolia* has such active compounds i.e. alkaloids, diterpenes, steroids, Diterpenoid lactones, glycosides, aliphatic compounds that plays an important role in curing many diseases. The present review focuses on health benefits of the plant as it has been used traditionally by tribal and ayurvedic regime as it has various properties for curing many diseases.

Keywords: *Tinospora cordifolia*, stems, leaves, medicinal plant, health benefits, Rasayana

FODDER CROP BASED CROPPING SYSTEMS FOR SUSTAINABLE FODDER PRODUCTION

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KVK Shadhol (M.P.)

ABSTRACT

As per 20th livestock census of 2018-19, the total livestock population is 536.76 million in India showing an increase of 4.8% over 19th livestock census 2012. The total livestock population in rural and urban area is 514.11 and 22.65 million respectively. India has emerged as largest producer of milk (187.7 million tonnes) in the world during 2018-19, but livestock productivity is very low as compared to the developed countries. The area under fodder crops in the country is 8.47 million ha but the country faces a net deficit of 62.7% green fodder, 21.9% dry crop residues and 64% feeds. Therefore, there is need to increase forage production, within the existing farming systems, by developing intensive fodder production system to get year round forage and economize livestock feeding. A field experiment was conducted at the Sorghum Agronomy Block of Instructional Dairy Farm, Nagla of the Govind Ballabh Pant University of Agriculture and Technology, Pantnagar (U. S. Nagar), Uttarakhand, India, during 2015-16 and 2016-17. The treatments consisted of 12 fodder crop rotations (single cut sorghum+cowpea-oat+berseem-single cut sorghum+cowpea (control), sweet sorghum+rice bean-oat+berseem-sweet sorghum+cowpea, sweet sorghum+phillipesara- 6 row barley+berseem-sweet sorghum+cowpea, sweet sorghum+phillipesara- 2 row

barley+berseem-sweet sorghum+ cowpea, sweet sorghum+cowpea-rye grass+berseem-sweet sorghum+cowpea, pearl millet+rice bean-oat+berseem-sweet sorghum+cowpea, pearl millet+ phillipesara-6 row barley+berseem-maize+cowpea, pearl millet+cowpea-rye grass+berseem-maize+cowpea, maize+rice bean-oat+berseem-maize+cowpea, -maize+phillipesara-6 row barley+berseem-maize+cowpea, maize+cowpea-rye grass+berseem-maize+cowpea, hybrid napier-hybrid-napier+berseem-hybrid napier) were tested in randomized block design with three replication. On the basis of the present investigation, it is concluded that among crop rotations, total yield of rotation (green fodder, dry fodder, crude protein and digestible dry matter mineral) was higher in hybrid napier based crop rotation followed by sweet sorghum+cowpea-rye grass+berseem-sweet sorghum+cowpea crop rotation compared to remaining fodder-based rotation systems during both the years.

GROWTH AND YIELD OF COWPEA AS INFLUENCED BY INTEGRATED NUTRIENT MANAGEMENT PRACTICES IN MAIZE-COWPEA CROPPING SYSTEM

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ABSTRACT

A field experiment was carried out in the Regional Research Station (Hill Zone), UBKV, Kalimpong during the year 2020 and 2021 to evaluate the effect of integrated nutrient management on maize-cowpea cropping system. The experiment design Split Plot with three replications was adopted, the main plot treatments comprised of four cropping system *viz.* C₁: Sole maize, C₂: Sole cowpea, C₃: maize + cowpea (2:2), C₄: maize + cowpea (2:4). The sub-plot treatment comprised of four nutrient levels, N₁: 100% RDF 80:40:40 Kg ha⁻¹ of N: P₂O₅: K₂O; N₂:100% RDF + Phosphate Solubilizing Bacteria (PSB) + *Azotobacter*; N₃: 75% RDF + PSB + *Azotobacter* + vermicompost (VC) @ 5.0 t ha⁻¹; N₄: 50 % RDF + PSB + *Azotobacter* + 50 % vermicompost @ 2.5 t ha⁻¹. The results showed that the Sole cowpea (C₂) significantly recorded the maximum growth attributes *viz.* plant height, number of branches per plant, LAI, yield attributes *viz.* number of pods plant⁻¹, number of seeds pods⁻¹, 1000-test weight and seeds yield kg ha⁻¹ (933.81 kg ha⁻¹) which were statistically at par with the treatment 2:4 row ratio combination of maize + cowpea intercropping system (C₄) during both years of experimentation. Application of 75% RDF + PSB + *Azotobacter* + vermicompost (VC) @ 5.0 t ha⁻¹ (N₃) significantly influenced growth and yield of cowpea.

Keywords: Integrated nutrient management, maize, cowpea, growth and yield attributes, yield

YIELD AND QUALITATIVE EVALUATION OF FODDER PEARL MILLET (*Pennisetum glaucum*) VARIETIES UNDER DIFFERENT FERTILITY LEVELS

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ABSTRACT

Animal nutrition including green fodder plays an important role in livestock productivity but the productivity of livestock is low under arid conditions due to green fodder deficiency. Therefore, an experiment was conducted on fodder pearl millet crop during *kharif* season of 2018 at College of Agriculture, Swami Keshwannd and Rajasthan Agricultural University, Rajasthan, India. The treatments consisted of four fertility levels (0, 40, 80 and 120 kg N/ha) and three varieties (Raj bajra -1, Raj- 171 and Local). The experiment was laid out in factorial randomized block design with three replications. The productivity of crops was evaluated in terms of green and dry fodder yield and quality in the form of dry matter, ash, crude protein, ether extract, crude fibre, total digestible nutrients, dry matter intake and dry matter digestibility values. Results revealed that total green fodder and dry matter yield was higher in variety Raj bajra-1 as compared to Raj 171 and Local variety. Among nutrient management, treatment 80 kg N + 40 kg P₂O₅/ha recorded higher fodder production as well as fodder quality as compared with control and 40 kg N + 20 kg P₂O₅/ha being statistically at par with 120 kg N + 60 kg P₂O₅/ha.

Keywords: Greenfodder yield, dry fodder yield, ether extract, ash content and crude fibre

A REVIEW ON GLADIOLUS WITH PLANT GROWTH SUBSTANCE

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ABSTRACT

Gladiolus, a majestic bulbous ornamental crop grown throughout the world and native from South Africa. It is called the “Queen of bulbous flowers”. It comprises of about 300 species in which 250 are wild and 50 of garden origin. Gladiolus name derived from latin word mean sword commonly known as sword lily due to sword shape foliage name and botanical name is *Gladiolus hybrida* and belongs to the family Iridaceae and subfamily is crocoidae. Gladiolus have chromosome number $2n = 30$ and diploid in nature but grandiflora is tetraploid in nature and having chromosome number 60. Gibberellins was discovered by kurosava in 1926. It was extracted from the fungus *Giberellafujikori (Fusarium moniliforme)*. Yabuta, Hayashi and Kannbe first isolated gibberellin. West and Phinney (1956) discovered GA₃ as a natural product of higher plants. Functions of GA₃ seed germination, dormancy breaking, cell division, flowering, extending shelf life and fruit setting. Cytokinin is also called as phytoakinin. Haberlandt (1913) provided evidence that the substance from the phloem induces cell division. Miller and Skoog (1955) isolated a substance from heiring sperm DNA and named it kinetin. In 1964, Skoog isolated zeatin from maize and thereafter other cytokinins were isolated. The functions of the cytokinin cell division, cell and organ enlargement, seed germination, root initiation and growth, retention of chlorophyll and delayed senescence in leaves, breaking dormancy. Benzyl Adenine (BA) is the type of cytokinin and mostly used for organ genesis. The

existence of auxin was proposed by Charles Darwin (1880) while working on canary grass. Went (1928) performed “Avena-curvature test” that substance was known as IAA. Cycocel (CCC) is the type of auxin its growth retardant and stop the vegetative growth and induce the reproductive growth. Functions of auxin hormone cell division and cell enlargement, shoot and root growth.

Keywords:- Gladiolus, seed germination, hormone etc.

A QUICK, EASY, AND RELIABLE TEST FOR DETECTION OF PALM OIL ADULTERATION IN MILK

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Purpose

Adulteration of milk is a big problem in India especially in lean season. Fraud milk traders, for earning more money, use to adulterate vegetable oil in milk, especially those oil has same fatty acid profile like milk fat. Palm oil has very similar fatty acid profile with milk fat, so incidents of adulteration of palm oil is increasing day by day. we have developed a quick, easy, and reliable chromogenic test for detection of palm oil adulteration in milk.

Methods

For estimation of fat in milk the Gerber method was applied according to FSSAI. Take 2 ml of fat from the butyrometer was kept in a test tube. There after 1 ml of DPPH solution were added in that test tube and kept it for 30 seconds; thereafter observe the colour.

Results

Milk containing palm oil; the violet colour was turned to yellow colour. Palm oil is a very good source phytonutrient like vitamin E, carotene, Phytosterol, phenolic compound and phospholipid and those phytonutrients are very good source of antioxidants. Therefore, these antioxidants are able to scavenge free radicals actively, hence colour of adulterated fat samples turned violet to pale yellow colour with reaction to DPPH.

Conclusions

Detection of foreign oil or fat, in milk fat is that like detection of tap water in river water. Here a simple rapid DPPH based chromogenic method was developed for detection of palm oil in milk. This said protocol is rapid sensitive and even able to detect 5% level of palm oil adulteration in milk. Hence, this simple test could be recommended for regular quality control lab for detection of palm oil in milk.

Keywords: Milk fat, palm oil, adulteration DPPH and antioxidant.

COMPARISON OF POST HARVESTING MECHANIZED TECHNIQUES OF PEPPERMINT PLANT USED FOR EXTRACTION PROCESS

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ABSTRACT

Peppermint plant is worldwide cultivated because of its wide range of applications in medicines, cosmetics, soaps, mouth fresheners, chewing gums etc. However, in south Asian continent, the traditional way of processing peppermint leaves for extraction of peppermint oil is laborious, slow and tedious. It is hazardous, and naked use of leaves, as practiced in the subcontinents, may cause skin problem as well.

This paper compares the post harvesting techniques of the traditional method with the modernized and mechanized proposed models, and aims to build a farmer friendly and economical model. For this purpose slight modification are carried on in the current system being used in villages. The mechanised system for movement and compaction of the compact/hay is mechanically done and is made easier compared to the manual method that is even adopted now.

The comparison helps to reduce the time wasted in putting the leaves/ hay manually, in the boiler vessel, in single operation per day and sccurate involvement of labour in the same. The outcomes of the study will be helpful for farmer to escalate the profit of small scale industries with small capital investment for the setup

Keywords: Peppermint leaves, post harvesting techniques, mechanization.

AN ECONOMIC ANALYSIS OF DIFFERENT FARMING SYSTEMS PREVAILING IN JAIPUR DISTRICT OF RAJASTHAN

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ABSTRACT

The research study entitled “An economic analysis of different farming systems prevailing in Jaipur district of Rajasthan” was aimed to identify the prevailing different farming systems, workout the costs and returns and income and employment generated through different farming systems and also to identify major constraints faced by farmers in different farming systems. In this study two tehsils namely; Chomu and Phulera were purposively selected for the study. The random sampling technique was used for the selection of farmers. A sample of 60 households consisting of 30 each from rainfed and irrigated situations was selected for the study. Four farming systems were existed in both rainfed and irrigated situations of Jaipur district *viz*: FS-I: Crop + Dairy (C+D), FS-II: Crop + Dairy + Vegetable (C+D+V), FS-III: Crop + Dairy + Goat (C+D+G) and FS-IV Crop + Poultry (C+P). Under rainfed situation, FS-III (Crop + Dairy + Goat) was being adopted by maximum no. of farmers and minimum number of farmers adopted FS-II (Crop + Dairy + Vegetable) and FS-IV (Crop + Poultry). While, in irrigated situation, FS-II was being adopted by maximum number of farmers and FS-IV was adopted by minimum number of farmers. The total costs per households under rainfed situation were the highest under FS-IV and it were lowest under FS-II. While, in case of irrigated situation, it was highest in FS-II and lowest in FS-III. Under rainfed situation, FS-IV was the most profitable farming system on net return basis (₹ 158942.26) and return per rupee investment *i.e.* ₹ 1.61. While, on the basis of net return per household, the most profitable farming system adopted under the irrigated situation was FS-II (₹ 489534.25) and on the basis of returns per rupee investment most profitable farming systems were same as FS-I and FS-II *i.e.* ₹ 1.89. On per household basis, employment generated under rainfed situation was maximum (661 man- days) under FS-IV and it was minimum (416 man-days) in FS-II. In irrigated situation, highest (696 man-days) per household employment was generated under FS-II and it was lowest (489 man-days) in FS-I. The employment generation was more under irrigated situation as compared with the rainfed situation because in irrigated situation, more irrigation water facilities were available and growing more proportion of crops and vegetables. The major constraints reported by household in rainfed situation for crops and dairy enterprises were inadequate irrigation facilities (61.24 mean score) and high cost of concentrates feed (64.41 mean score), respectively. While, under irrigated situation, major constraint observed in crop enterprise was lower price of farm produce (59.41 mean score) and low milk

productivity of cattles (59.47 mean score) in dairy enterprise. Under poultry enterprise, high cost of feed (75.48 mean score) was observed as prime constraint under both the situations.

Keywords: Farming systems, Rainfed Situation, Irrigated Situation etc.

ROLE OF NANO PARTICLES IN PROLONGING THE LIFE OF CUT FLOWERS

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ABSTRACT

Floriculture or flower gardening has emerged as versatile, unique and dynamic field in Horticulture. It is an extensively expanding industry with the growth rate of more than 15 % annum in the last 2 decades. Leading edge of about 120 countries are actively involved in the floriculture industry as global manufactures with the Netherlands as an epicentre of world flower production and distribution. Flowers are highly perishable and the highly sensitive from the stage of its harvest. 20 to 30 % of losses in the production and supply chain of flowers are due to inefficient pre and post-harvest management. The most common factor for deterioration of cut flower is trapping of air bubble and rapid growth of microorganisms in the xylem leading to blockage in the xylem vessels and hence no water supply to twig. To subdue this complication, a few new methods and technology have been developed for the global flower industry, many of which involve the use of chemicals to inhibit the synthesis of hormones in the petals or microbial growth in the vessels of the xylem. Treating the cut end portions to the pulsing and holding solutions are an effective way of prolonging the shelf life and vase life of the flowers, but in advancing in floriculture field, Nanoparticles are emerging as a new method to improve the quality of flowers. NPs have novel and size related specific physio-chemical properties that are significantly different from larger matter (Tran and Le, 2013), therefore, nanotechnology is widely used in various industries such as energy, electronics, biomedicine and mechanics (He et al., 2018b) and now in agriculture field as Nano fertilizers, agrochemicals and maintaining the shelf life of fresh products. Nanotechnology also helps in the extension of postharvest life of many horticultural products in different ways to minimize horticultural product waste (20-30%), such as production of new innovative packaging materials (nanocomposites), controlling postharvest diseases, protecting stored products from the influence of harmful rays and gases, use of multiple chips (biosensors) for labelling of fresh produce and improving strength and appearance of packaging (Yadollahi et al., 2010; Ruffo et al., 2019). Nanosilver regulate many physiological processes in plants that include enhanced germination, growth invigoration, they improve shoot induction, increase pigment content, increase solar radiation absorption and increase plant biomass and other NPs like, ZNPs, SiNPs, MgO NPs and Carbon Nanotubes have an important role in improving the postharvest characteristics of many cut flowers.

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ROOFTOP VEGETABLE GARDEN- A BOON FOR URBAN AGRICULTURE

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ABSTRACT

As population of Indian cities are growing higher and higher, demand for food and expenditure on food are also increasing. But the resource is scarce as agricultural land is converting to residential, commercial or industrial land uses. Thus it reduces the possibility to grow more and different agricultural food products. Again food contamination such as harmful chemical and inorganic fertilizer and pesticide usage to increase production etc. is increasing at an alarming rate. In this circumstance, to solve these problems and find a way out, initiation of growing vegetable on roof top can be a possible and potential solution. Rooftop vegetable farming can help to meet food demand by supplying fresh and hygienic vegetables, reducing household expenditure for buying vegetable and creating healthy atmosphere by improving air quality and absorbing carbon from air and lessening the impact of climate change.

Keywords: Vegetables, fruits, rooftop, urban agriculture, vegetable garden

ORGANIC FARMING FOR SUSTAINABLE AGRICULTURE

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ABSTARCT

Organic farming is a contemporary and ecological way of producing fresh, natural agricultural product for consumer. Crop rotation, crop residues, animal manures, green manures, off-farm organic wastes, mechanical cultivation, mineral-bearing rocks, and elements of biological control are major components of the production management system used in organic farming to maintain soil productivity, supply plant nutrients, and control insects, pathogens, and weeds. By improving nutritional intake, encouraging healthier rural lives, and, most critically, boosting biodiversity while reducing environmental sensitivity to the extreme climatic shifts the globe is presently experiencing, organic farming can assist to secure long-term food security. A tried-and-true substitute for a society controlled by chemicals is to live by natural means. Organic farming is not the same as going back to the old ways. Many of the traditional farming methods are still useful today. The best of them are combined with the most recent scientific knowledge in organic farming. Since the beginning of time, organic farming has been practised extensively in India. It's a farming technique that focuses on cultivating the land and growing crops in a way that keeps the soil alive and healthy by using organic wastes (crop, animal, and farm wastes, as well as aquatic wastes), microorganisms (biofertilizers), and other biological materials to provide nutrients to crops for higher long-term productivity in an environmentally friendly way. In order to prevent environmental damage, organic farming techniques are concentrated on having as harmonious a contact with nature as possible. In addition to the apparent immediate benefits to the environment, organic or natural farming also helps a farmer become self-sufficient in terms of food quality and quantity by reducing the amount of agro-input he needs and the expense of doing so. The issue of land becoming infertile, pests becoming resistant, and humans becoming more susceptible to infectious and non-infectious illnesses caused by manmade pollution have already demonstrated the long-term effects of chemical farming. In India, consumers and farmers are progressively returning

to organic farming and organic goods. While the health benefits of organic food have yet to be proved beyond doubt, consumers are willing to pay even a premium price for such products. Organic farming is not a novel idea among Indian farmers who have engaged in traditional farming from time immemorial. For obvious reasons, organic farming is attracting increased interest in several Indian states, including Tamil Nadu. Locals are encouraged to grow organic farming by rising health consciousness among consumers and the potential market, both in India and overseas.

CONTINGENT PLAN FOR SUSTAINABLE CROP PRODUCTION UNDER CHANGING/ ABERRANT WEATHER CONDITIONS

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ABSTRACT

Sustainability of the agricultural productivity is under serious threat due to weather aberrations. The weather aberrations like monsoonal anomalies characterized by late onset, early withdrawal, long dry spells, continuous and excess rainfall; uncertain and reduced winter rainfall; rise in winter temperature particularly at grain filling stage; cold wave and frost; etc. have not only become widespread and uncertain but also recurrent in recent years due to climate change. The changing climate is a major concern for agricultural productivity in general and food security in particular (Brahmanand *et al.*, 2013). The weather aberration affects the normal cropping systems and cause negative impact on sowing, growth, development, logging and productivity of crop.

Contingency crop planning are needs to mitigate any unexpected, unusual, unfavorable and hence unwanted accidental weather situations, occurring at any time without prior knowledge at any time before the crops are sown or even after the crops are sown. To develop a contingency plan for an area, a detailed study of the rainfall data should be done first. The choice of appropriate crop and varieties, cropping systems or other necessary relevant farm practices like to overcome the contingency is called contingency crop planning.

Keywords: Climate change, Contingency planning, Weather aberrations

DEVELOPMENT OF A BATTERY-OPERATED ANIMAL DRAWN PNEUMATIC COTTON PLANTER

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ABSTRACT

Cotton is a crop of high economic importance and cultivated worldwide in 32.5 million hectares of lands. In order for each plant to utilise the resources available in a consistent manner and eventually to produce more cotton, precision cotton planting is essential. Numerous developing nations still rely on animal energy for agriculture. According to estimates, animal energy accounts for 60% of available farm power worldwide. Air suction is used in pneumatic suction type planters to smoothly singulate and deliver seed at a specific location. A battery-assisted DC motor aspirator was used for a two-row animal-drawn pneumatic planter. A 12 volt 120 A. h lithium ion battery was used to supply power. Optimized seed metering plates of orifice size 3 mm were used. Shoe type furrow opener with 45° rake angle, base of seed hoppers with 45° angle to horizontal plane were used. A quality feed index of 92 % was achieved in field operation with miss index of 5%, multiple index of 3% and precision index of 15%.

Keywords: Cotton, pneumatic plante, animal drawn and battery operated

AN INTEGRATED SYSTEM FOR URBAN BIO-WASTE MANAGEMENT

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ABSTRACT

The rapid urbanization has led to a huge increase in waste generation in cities. On other hand, a double rate of waste is being generated from urban areas as urbanization advances. Urban bio-waste includes solid waste, plastic waste, liquid waste, paper waste, organic waste and recyclable waste. Substantially, these wastes can be produced from residential, municipal solid waste, agricultural waste, industrial waste etc. Globally, urban waste is generated at a rate of 2.01 billion tonnes per year from the 3.4 billion of whole bio-waste. Critically, it is estimated that more than half of the waste openly disposed of and the trajectories of waste growth will have profound implications for health, the economy and environment. Hence, proper biomass management system can provide renewable energy and high value fertilizer instead of causing number of modern city problems. Superficially, this study highlighted the integrated planning to utilize urban bio-waste to produce beneficial outcomes from it. Apart from that, it also focusses on collection, biodigestion, biogas and slurry generation, supply of biogas as urban household fuel, composting of slurry, production of vermicomposting and utilization in urban green corridor development. Hence, this article potential elucidates the different methods to collect the urban waste and production biogas and vermicompost from the same.

Keywords: Urbanization, bio-waste, vermicompost, biogas and waste management

EFFECT OF LONG-TERM NUTRIENT MANAGEMENT PRACTICES ON POTASSIUM FRACTION IN CALCAREOUS SOIL UNDER GROUNDNUT-WHEAT CROPPING SYSTEM

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ABSTRACT

Crops grown on highly weathered upland soil in tropical monsoonal climates frequently suffer from potassium (K) deficiencies in the soil. For efficient K management in crop production, it is crucial to critically evaluate the forms of K in soils and their capacity to release K for plant absorption. Our study focused on how potassium dynamics in the soil of the long-term fertilizer experiment were affected by soil managements with sole or mixed applications of mineral and organic fertilizers. Twelve fertilization treatments were included in the long-term fertilizer experiment, and each treatment comprised four replicates that were organized in a randomized block pattern. The available-K status in LTFE soils was nearly the same during the first year, but it was significantly altered and revealed significant differences as a result of various treatments after the 16th year, and it showed significantly higher at treatments T₈ (50 % NPK + FYM @ 10 t ha⁻¹ to Groundnut and 100 % NPK to wheat) and T₉ treatment, which received FYM. With the exception of T₈, there was a slight overall decline in the availability of K status after 16 years. After 16 years of experimentation, the application of FYM @ 25 t ha⁻¹ and combined use of FYM with NPK significantly increased the other fraction of potassium, namely water soluble-K, HNO₃ soluble-K, total K, exchangeable K, and reserved K, while the rest of all treatments show depletion. There was also overall decrease status of different fraction of potassium in LTFE soil after a span of 16 years. In long term fertilizer experiment soils, the per cent depletion of different forms of potassium were interesting that in

all treatments. All the forms of potassium showed positive per cent depletion in all the treatments except treatments which received FYM *i. e.* T₈ & T₉, which showed negative per cent depletion. After 16 years in LTFE soil, the distribution of potassium in its various forms was found to be in the following order: HNO₃ soluble-K > Available-K > Exchangeable-K > Reserve-K > Water soluble-K.

Keywords: LTFE soil, Potassium fraction, Percent distribution, percent depletion

IDENTIFICATION AND CHARACTERIZATION OF STRESS RESPONSIVE PROTEINS: DEHYDRINS IN WHEAT

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Purpose

Drought stress have become a global issue for the crops which is affecting crops growth as well as their productivity. Wheat is one of the most consumable rabi crop all over the world and have been affected by the various abiotic stress conditions, including drought. In the present study stress responsive genes known as dehydrins have been identified which helps in improving the crop productivity as well their growth under stress conditions. Dehydrins are well known for stress tolerant genes in plants but their structure, function and multitasking roles in plants are still unknown. This study aims towards genome wide analysis of dehydrins proteins in wheat.

Methods

In silico analysis of dehydrin genes was done using various bioinformatics techniques and software. Physio-biochemical properties (pI and molecular weight) was analyzed using compute_pi (http://web.expasy.org/compute_pi/). Conserved domains regions analysis was performed using PFAM (<http://pfam.xfam.org>) and Prosite (<https://prosite.expasy.org/>) databases. Subcellular localization of specific genes was analysed using LOCTREE3(<https://roslab.org/services/loctree3/>), online web server. Gene structure analysis was done using GSDS2.0 we server (<http://gsds.cbi.pku.edu.cn/>).

Results

In this study we have identified 48 dehydrin genes which encode for 48 different dehydrin proteins by analyzing recently available wheat genome sequence from IWGSC. Identified proteins range from 9.65 kDa to 101.60 kDa. Nomenclature of proteins is done as TaDHN, Ta indicates Triticum aestivum while DHN indicated dehydrin following the molecular weight and chromosome number. Genome wide analysis has been done including domain analysis, phylogeny studies and gene structure analysis. While 35 TaDHNs are single domain proteins consist of single dehydrin domain, 13 other proteins have multiple domains which indicates towards constant diversity and multifunctionality of dehydrin genes. Subcellular localization of proteins was predicted, cytoplasm (35), secretory system (8) and nucleus (5). Gene structure analysis indicate that beside ORF, introns are also present in both 5' and 3' UTRs in almost all proteins.

Conclusions

This study is first to characterize WZYb dehydrin family in wheat. *In silico* analysis imply functional versatility of dehydrin proteins and this tends towards the function analysis of identified dehydrin proteins and future scopes tends towards their structural analysis and link between function and structure of specified proteins

Keywords: dehydrins, wheat, boiling soluble proteins, dehydrin proteins, stress

COOKING QUALITY OF *BASMATI* RICE GRAIN (*Oryza sativa*) AS INFLUENCED BY COMBINED APPLICATION OF DIVERSIFIED NUTRIENT SOURCES IN ORGANIC *BASMATI* RICE–WHEAT (*Triticum aestivum*) SYSTEM

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ABSTRACT

Rice (*Oryza sativa* L.) is life of half of the global population. It is an indispensable ingredient in rituals and festivals celebrated in India. *Basmati* rice is endowed with unique quality features-pleasant aroma, long slender grains makes it gourmet delight. Organic *Basmati* rice has high demand in the global market. A field experiment was carried out during the *Kharif* season of 2016 at ICAR–Indian Agricultural Research Institute research farm, New Delhi to evaluate the efficacy of different combination of diversified nutrient sources on cooking quality of *Basmati* rice in organic *Basmati* rice–wheat system. The experiment was carried out with 16 treatments, replicated thrice in a randomized complete block design. The treatments were divided into 3 sets containing five treatments in each set with one absolute control. One set of treatment was applied to rice only, second to wheat only and the final to both rice and wheat crop. Each set consisted of FYM @ 10 t/ha, Sesbania green manuring (SGM) in rice and Leucaena green leaves manuring for wheat (LGLM), GM + biofertiliser as Blue green algae in rice and Azotobacter in wheat, GM + FYM and GM + FYM + biofertilizers. Kernels were cooked in water bath (Thermotech temperature controller TH-013) at boiling temperature for 6-7 minutes. Application of GM + FYM + biofertilizers to both the crops in the system exhibited highest hulling %, milling % and head rice recovery as 80.50%, 71.80% and 62.10% respectively. Physical quality parameters of grain such as Kernel length before cooking (7.45 mm) and after cooking (12.82 mm), kernel breadth before cooking (1.65 mm) and after cooking (2.54 mm) was also recorded highest with application of GM + FYM + biofertilizers to both the crops in the system. The performance of GM + FYM + biofertilizers treatment was also best in terms cooking quality parameters such as Kernel length elongation ratio after cooking (1.72), Kernel breadth expansion ratio after cooking (1.54), however control resulted in Kernel length breadth ratio after cooking (6.48). It can be concluded that Physical and cooking quality of *Basmati* rice grain can be increased by application of diverse organic nutrients sources.

Keywords: *Basmati* rice, grain, Organic sources, FYM, Nutrient

OPTIONS FOR SOIL CARBON SEQUESTRATION IN RICE–WHEAT CROPPING SYSTEM

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ABSTRACT

Decline in soil organic carbon content is considered a key constraint for sustenance of rice–wheat system productivity in the Indo-Gangetic Plain region. Rice-Wheat rotation is the most important production system in the Indo-Gangetic plains of South Asia, in general and India in particular. However, sustainability of this system is at high risk due to the deterioration of soil health, mounting pressure on natural resources has brought fatigue to this system in recent years. The rice-wheat cropping system is highly nutrient exhaustive and annually remove more than 650 kg/ ha of N, P, and K, and 0.5-1.0 kg/ ha Zn, 2-3 kg/ ha Fe and 3.0-3.5 kg/ ha Mn (Shah *et al.*, 2011). The rice-wheat cropping systems therefore cause a considerable depletion of soil health and their effect on long-term productivity is threatening. Carbon Sequestration/CO₂ storage is the placement of CO₂ into a depository in such a way that it remains safely stored and not released back to the atmosphere. The primary way that carbon is stored in the soil is as soil organic matter. So there is a need to manage soils because soil contains more inorganic carbon than the atmosphere and more organic carbon than the biosphere. Soil organic carbon is the fraction of organic matter; the decomposed plant and animal materials including microbial population. It is directly associated with nutrient availability, soil physical properties, and biological soil health and buffer actions over various toxic substances. The major cause of yield decline in this system is nutrient imbalance, which is associated with soil organic matter, declining over time where intensive cropping has been experienced. Maintenance of soil organic C in cropland is important, not only for improvement of agricultural productivity but also for reduction in C emission. Sequestration of soil organic carbon is an important strategy to improve soil quality and to mitigate climate change effect in rice wheat cropping system. The long-term sustainability of RW cropping system depends on its carbon inputs, outputs, and carbon-use efficiency.

Keywords: Carbon Sequestration, climate change, organic matter, productivity, sustainability

EFFECT OF DIETARY SUPPLEMENTATION OF SILYMARIN AND NANO-ZINC ON PROTEIN METABOLISM OF SAHIWAL CALVES

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ABSTRACT

This study was carried out to assess the dietary effect of supplementation of silymarin and nano-zinc on protein metabolism of Sahiwal Calves. In this 120 days research trial 28 sahiwal calves (6-15 months) select out from the sahiwal herd which is reared at Livestock Research Complex (LRC), SVPUA&T, Meerut (Uttar Pradesh) India. All 28 calves, according to his body weight and age basis categorised into four groups (n=7) by control, T1, T2, and T3.

Control groups calves offer only basal diet without silymarin or nano zinc feed supplement. T1 Group calves’ diet was supplied with silymarin @ 500mg/kg DM/calves/day. Group 3rd or T2 Group diet was supplemented with nano-zinc @ 40mg/kg DM/calves/day and T3 or last Group diet was combined supplemented with silymarin and nano-zinc supplementation @ 500 mg/kg DM/calves/day+40 mg/kg DM/calves/day for whole trial duration. In the trial period the mean protein and protein concentration on 30, 60, 90 and 120 days of the trial found out significantly ($P < 0.05$) higher in T3 treatment which is fed on combined feed supplement, silymarin and nano-zinc as compared to the control group. In the plasma albumin concentration on 0, 30, 60, 90, and 120 days during the albumin concentration was statistically similar in each group. The mean plasma concentration of globulin was statistically ($P < 0.05$) enhanced in the T3 group which is supplemented by silymarin and nano-zinc as compared to all other groups. The mean of creatinine showed the significant difference among the groups and gives the result 1.97, 1.87, 1.69, and 1.49 in the respectively control, T₁, T₂, and T₃ groups. The mean plasma urea nitrogen was significantly ($P < 0.05$) declines in that groups which is supplemented with silymarin, nano-zinc, or both feed supplementation group comparison against the non-supplemented group. Finally my conclusions, we find out that supplementation of silymarin and nano-zinc improved the kidney function and immune status of sahiwal calves in comparison against the control group.

Keywords: Silymarin, nano-zinc, sahiwal calves, protein metabolites

SEASONAL ABUNDANCE, DISTRIBUTION AND DIVERSITY OF BEETLES (INSECTA: COLEOPTERA) IN AND AROUND NAINITAL, UTTARAKHAND, INDIA

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ABSTRACT

The beetles are among the dominant group of insects occurring almost on all the fragmented and natural habitats. Seasonal abundance, distribution, status and diversity of beetles’ population were studied in and around Nainital, Uttarakhand, India. A total of 733 individuals of beetles (Order: Coleoptera) belonging to 29 species represented by 26 genera and 10 families were recorded during the study period February, 2019 to March, 2020. Scarabaeidae was the most dominant family with 11 species followed by Coccinellidae (five species), Meloidae (three species), whereas families Chrysomelidae, Cicindelidae and Carabidae were represented by two species each. Similarly, families Lucanidae, Hydrophilidae, Cerambycidae and Tenebrionidae were represented by single species, respectively. The most abundant species were *Zygogramma bicolorata* Pallister, *Coccinella septempunctata* Linnaeus and *Mylabris cichorii* Linnaeus, whereas *Cicindela flexuosa* (Fabricius), *Lepidiota albistigma* Burmeister, *Gonocephalum* sp., and *Melolontha cuprescens* Blanchard were recorded the least abundant species during the entire study period. Based on observations, a highest number of 10 species of beetles were characterized as uncommon, followed by nine common, six very common and four species were recorded rare in and around the study sites. Species richness was analyzed by using Margalef’s index where the maximum value was recorded in the rainy season (4.393), followed by summer season (4.213) and the least value were recorded in the winter season (2.621). The value of Shannon Wiener Diversity index (H') was calculated as 2.80 for overall samplings of beetle assemblages depicting a rich diversity of beetle’s population in and around Nainital.

Keywords: Abundance, Beetles, Diversity, Family, Species.

GENETIC DIVERSITY STUDIES IN CLUSTER BEAN (*Cyamopsis tetragonoloba* (L.) Taub.)

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ABSTRACT

The investigation on “Genetic diversity studies in cluster bean” was conducted in the field of Vegetable Science of KRC College of Horticulture, Arabhavi in randomized block design with two replications. Forty-three cluster bean genotypes were evaluated for 23 characters to study the divergence and the data obtained was subjected to D² analysis. As many as thirteen divergent clusters were grouped by using Trocher’s method.

Cluster IV is the largest cluster having 13 genotypes followed by clusters VI with seven genotypes, cluster VIII with four genotypes and cluster XI with three genotypes (CBG - 25, CBG - 39, CBG – 42). Cluster I (CBG-18, CBG -28), cluster II (CBG - 21, CBG – 41), cluster III (CBG - 6, CBG – 35), cluster V (CBG - 30, CBG – 32), cluster VI (CBG - 15, CBG – 20), cluster IX (CBG - 33, CBG – 40) and cluster X (CBG - 31, CBG – 37) had two genotypes each. Cluster XII (CBG – 38) and cluster XIII (Pusa Navbahar) had one genotype each.

Intra and inter-cluster average D² values are presented in Table-12. Among the thirteen clusters, cluster XI with three genotypes showed maximum intra-cluster distance (D² = 2450.455) followed by cluster VII (D² = 2392.701), cluster IV (D² = 1987.573) with maximum number of genotypes (13), cluster VIII (D² = 751.835), cluster X (D² = 567.128), cluster IX (D² = 538.542), cluster VI (D² = 254.677), cluster V (235.835), cluster III (218.029), cluster II (178.980) and cluster I (154.427). The cluster XII and cluster XIII had no intra-cluster distance (D² = 0.000) as they possessed single genotype in each.

Based on distance between clusters i.e. inter-cluster distances (Table-12), the maximum distance was observed between cluster XII and XIII (D² = 20513.842) followed by cluster XI and XII (17634.514), cluster II and XII (D² = 15843.412), cluster III and XII (D² = 13585.321), cluster VII and XII (13198.409), cluster X and XIII (12598.564), cluster X and XI (10259.579), cluster IX and XII (9200.085), cluster II and X (8772.010) and cluster VII and X (7364.097). The least inter cluster distance was observed between cluster I and VI (233.280) followed by cluster II and III (280.272).

CORRELATION AND PATH ANALYSIS STUDIES IN CLUSTER BEAN (*Cyamopsis tetragonoloba* (L.)Taub.)

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ABSTRACT

The correlation and path analysis studies was conducted in 43 genotypes of cluster bean (*Cyamopsis tetragonoloba* (L.)Taub.) in the field of Dept. of Vegetable Science, KRC College of Horticulture, Arabhavi.

Among 23 different characters studied, vegetable pod yield per plant is highly significant (both at p = 0.01 and p = 0.05) and positively correlated with stem girth (rG = 0.690), weight per ten pods (rG = 0.609), pod length (rG = 0.493), pod breadth (rG = 0.453), plant spread (E-W)

($rG = 0.380$), plant height at 45 DAS ($rG = 0.372$), plant spread (N-S) ($rG = 0.332$), hundred seed weight ($rG = 0.320$), plant height at 90 DAS ($rG = 0.311$), number of branches at 45 DAS ($rG = 0.304$) and number clusters per plant ($rG = 0.293$) and it was also positively and significantly correlated with number of branches at 90 DAS ($rG = 0.237$) only at $p = 0.05$ but negatively and significantly (at $p = 0.05$) correlated with number of seeds per pod ($rG = -0.217$). The path coefficient analysis for vegetable pod yield per plant was performed with a set of 16 independent characters. Stem girth had high direct and positive effect (1.777) on vegetable pod yield per plant and it also had high indirect effect via plant spread (E-W) (0.674), plant spread (N-S) (0.568), cluster length (0.568) and days to vegetable pod harvesting (0.334). Plant spread (E-W) had high direct and positive effect (1.375) on vegetable pod yield per plant and it also had high indirect effect via plant spread (N-S) (1.011), stem girth (0.871), days to first flowering (0.458) and number branches at 45 DAS (0.303). Plant spread (N-S) had high direct and positive effect (1.081) on vegetable pod yield per plant and it also had high indirect effect via Plant spread (E-W) (1.286), stem girth (0.934), days to first flowering (0.559) and number branches at 45 DAS (0.300).

Days to first flowering had high direct and positive effect (3.332) on vegetable pod yield per plant and it also had high indirect effect via plant height at 90 DAS (0.851). Days to vegetable pod harvesting had no positive direct effect (-3.914) on vegetable pod yield per plant and it had high indirect and positive effect through days to first flowering, plant height at 90 DAS (0.968), plant spread (E-W) (0.376) and plant spread (N-S) (0.300).

Weight per ten pods had high direct and positive effect (0.630) on vegetable pod yield per plant and it also had high positive indirect effect through number of clusters per plant (0.317) and stem girth (0.302). Number of seeds per pod had high direct and positive effect (0.781) on vegetable pod yield per plant.

ASSESSMENT OF GENETIC DIVERSITY IN GROUNDNUT (*Arachis hypogaea* L.)

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ABSTRACT

Divergence analysis among 36 groundnut genotypes using Mahalanobis's D^2 statistic grouped into 13 clusters. The maximum inter-cluster distance (D) was observed between cluster II and cluster XIII (315.56) followed by cluster III and cluster IX (289.56), cluster III and cluster XII (289.21) and cluster XII and cluster XIII (297.11) indicating that the genotypes of these groups may be more divergent from each other. The genotypes in above clusters revealed substantial difference in the means for important yield contributing characters suggesting that the genotypes belonging to these clusters form ideal parents in hybridization programme for getting transgressive segregants and improvement in groundnut.

Keywords: Clusters, genetic divergence and groundnut

GENETIC DIVERGENCE STUDIES IN MUNGBEAN

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ABSTRACT

A field experiment with 38 genotypes was conducted to study the genetic divergence in mungbean genotypes at Agricultural University, Jodhpur during *Kharif*-2019. Significant differences were observed among genotypes for all 11 characters studied. These genotypes were grouped into nine clusters which is indicating the existence of ample amount of genetic diversity in the genotypes and therefore signifying the scope of selection for genetic improvement of mungbean. The maximum intra cluster was observed in cluster I, followed by cluster II, respectively; while maximum inter cluster distance was exhibited between cluster II and XI, followed by cluster II and VII, cluster II and V, cluster II and III, cluster II and VIII, cluster II and VI, cluster II and IV. The greater distance between two clusters indicates the presence of wider genetic diversity among the genotypes of those clusters. Therefore, genotypes belonging to diversified clusters may be used in hybridization programme for developing the high yielding varieties in mungbean.

Keywords: Cluster analysis, divergence, genetic diversity, mungbean

FERTILITY, ITS ASSOCIATED RISK FACTOR ON WOMEN AND CONSEQUENCES TO SOCIETY IN TANSEN MUNICIPALITY, PALPA NEPAL.

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ABSTRACT

Fertility refers to the process of giving birth to child and linked to the environment of various societies. Economic, social, cultural and other factors all have an impact on fertility. This study determines the socioeconomic and demographic factors that influence fertility of women and its consequence in society in Tansen Municipality Palpa. This study is completely based on primary data gathered by questionnaire using convenience sampling procedure which involves 144 married women. The information was examined by cross sectional study using descriptive and inferential statistics. The mean number Children Ever Born (CEB) of women was 1.55 with standard deviation 0.611. The factors Age of the women ($p=0.003$), Age of husband ($p=0.003$), knowledge of family planning ($p=0.041$) was significant role on reducing fertility in women.

The longer duration of marriage age contributes significantly to the rise in CEB. Women with a higher level of education appear to have a key role in reducing the number of CEB. The result of the study shows that the women having high level of knowledge about family planning and contraception use is seen to have very significant impact for explaining the children ever born (CEB) to the women of Tansen Municipality of Palpa district of Nepal.

Keywords: Children Ever Born, Factors, Fertility, Prevalence, Women

QUANTITATIVE ANALYSIS OF CARBON: A CASE STUDY OF SOUTHERN ACHANAKMAR TIGER RESERVE, INDIA

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Protected areas play a major role in carbon sequestration, which regulates the climate while conserving a diverse range of flora and fauna. The study was conducted on one of the protected areas, the Southern Achanakmar Tiger Reserve in India's Chhattisgarh State, to assess the regulating service in the form of carbon sequestration. The forest consists of tropical dry deciduous types of vegetation.

Method

The stratified random sampling method was adopted as the area was classified into three strata, dense, moderately dense and open forest. The carbon content estimation was done in the three levels of each strata, where the first level consists of trees, the second level consists of soil, and in the third level, litter was considered. For the analysis of soil organic carbon, the Walkey and Black method (1934) was adopted. The carbon content in litter was analysed by the percentage of carbon content in the weight of a sample of litter.

Result

The forest area has a diversity of flora, some of which are major species like *Shorea robusta*, *Terminalia tomentosa*, *Madhuca indica*, *Tectona grandis*, *Pterocarpus marsupium*, and *Diospyros melanoxylon*. In the dense forest, *Shorea robusta* was found abundantly. In this cross-sectional study, it was found that the soil organic carbon ranges between 0.47 – 0.56%, which comes in the category of low to medium carbon content. The trees of more than 30 cm girth of the dense forest area sequester approximately 4.62 m ton/ m².

Discussion

The study reveals the importance of the forest as a reservoir of carbon by quantifying carbon content in the three tiers. Although the forest has lots of human pressure around and inside the forest area for daily requirements like fuelwood, agriculture practices, etc., the forest still captures a huge amount of carbon. The adoption of a sustainable management plan by the local stakeholders can improve the quality of the forest and increase the sink of carbon in the area.

Keywords Carbon, Forest, Climate Change, Soil, Litter

ASSOCIATION ANALYSIS OF CLEC16A VARIANTS WITH TYPE 1 DIABETES IN POPULATION OF JAMMU & KASHMIR

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ABSTRACT

Type 1 diabetes (T1D) results from autoimmune destruction of pancreatic beta cells and leads to insufficient production of insulin. There are multiple factors including genetics, environment and immunology involved in pathophysiology of T1D. A number of genetic determinants of T1D are already been established through candidate gene studies, primarily within the major histocompatibility complex but also within other loci. Among these other loci, *CLEC16A* gene turned out to be an important determinant. It is found out that *Clec16a* via *Nrdp1* regulates autophagosomal trafficking during late mitophagy and regulates pancreatic β cell function

through control of mitophagy. Variation within intron 19 of the *CLEC16A* (*KIAA0350*) gene region has been seen to be unequivocally associated with type 1 diabetes (T1D) in the founder, autoimmunity-prone Sardinian population of Northern Europe. Similar study done in American population gave the same results and showed significant association with T1D. To identify whether these newly found genetic variants which increase the risk of T1D are consistent in other populations, we need to replicate these studies in other populations. So, this study aimed to find out the association of important linked intronic variants of *CLEC16 A* (rs725613, rs2903692, and rs17673553) with T1D patients in northern region of India.

SCREENING OF ENTOMOPATHOGENIC NEMATODES AGAINST *Helicoverpa armigera* (Hubner) Infesting Chickpea

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ABSTRACT

Chickpea farming is hampered by several biotic limitations, one of the most serious of which being gram pod borer, *Helicoverpa armigera* (Hubner) infestation and damage. Insecticides are routinely employed to control this insect pest, although biopesticides are also in demand due to soil residual issues and other environmental dangers. Another safe technique for managing this vital pest is entomopathogenic nematodes (EPNs). This study evaluated the infectivity of 10 native EPNs against *H. armigera* by assessing their penetration and production in *H. armigera*. The efficiency of the promising EPNs against the second, third, and fourth instars larvae and pupa of *H. armigera* was further examined. Among the tested EPNs, *Steinernema* sp. (IARI-EPN RP 05 and 09) and *Heterorhabditis* sp. (IARI-EPN RP 06) were the most harmful to *H. armigera*, producing 100 percent mortality within 72 hours. *Heterorhabditis* sp. (IARI-EPN RP 06) had the most penetrations, followed by *Steinernema* sp. (IARI-EPN RP 05 and 09), with *Oscheius* sp. (IARI-EPN RP 04) having the least penetration. *Steinernema* sp. (IARI-EPN 05) produced the most, followed by *Oscheius* sp. (IARI-EPN RP 07) *Steinernema* sp. (IARI-EPN 05), while *Heterorhabditis* sp. (IARI-EPN RP 06) producing the least. The second instar larvae of *H. armigera* were the most susceptible to EPNs, followed by the third and fourth instar larvae. *Heterorhabditis* sp. (IARI-EPN RP 06) was found more promising against pre-pupa and pupa of *H. armigera*, followed by *Steinernema* sp. (IARI-EPN RP 05 and 09). According to the findings, *Steinernema* sp. (IARI-EPN RP 05), *Heterorhabditis* sp. (IARI-EPN RP 06) and *Steinernema* sp. (IARI-EPN RP 09) were the most virulent against *H. armigera*. As a result, these EPNs can potentially be effective biological control agents for *H. armigera*. Furthermore, the fifth instar *H. armigera* larva was more suited for multiplication, indicating that this insect is suitable for EPN production. Further field testing of these promising EPNs will reveal their efficacy in sustainably managing *H. armigera*.

Keywords *Cicer arietinum*, Biopesticides, Insects, *Heterorhabditis*, *Steinernema*, *Oscheius*

DESCRIPTION OF A NEW PREDATORY NEMATODE *Discolaimus pusai* SP. N. (NEMATODA: DORYLAIMIDA) FROM DISTRICT SAHARANPUR (UTTAR PRADESH) INDIA

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ABSTRACT

A study was undertaken to explore the diversity of soil and plant nematodes associated with district Saharanpur (Uttar Pradesh). During the survey, forty-eight soil samples were collected from different localities of district Saharanpur. Among the various plant and soil nematodes extracted, one population of *Discolaimus* was also encountered. A thorough investigation revealed that this was an undescribed species, and is described herein as *Discolaimus pusai* sp. n. This species was identified using morphological, morphometrical, and molecular techniques, and its phylogenetic relationships were also discussed. In the present study, the molecular approach using DNA markers like ITS rDNA viz., ITS-F: 5'-TTGATTACGTCCCTGCCCTTT 3' and ITS-R: 5'-TTTCACTCGCCGTTACTAAGG 3' were used for identification. Predation ability assay proved that this new species have the potential for biocontrol of plant nematodes. Hence this new species can play a significant role in the management of plant parasitic nematodes in field conditions and develop as biopesticides in the future.

Keywords: Morphology, Morphometrics, Ribosomal DNA, Taxonomy, Saharanpur

FIELD PERFORMANCE OF FOXTAIL MILLET (*Setaria italica*) AS AFFECTED BY APPLICATION OF ZINC AND IRON IN NORTHERN TRANSITIONAL ZONE OF KARNATAKA UNDER RAINFED CONDITION

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ABSTRACT

The study of field performance of Foxtail millet (*Setaria italica*) as affected by application of Zinc and Iron in Northern Transitional Zone of Karnataka under rainfed condition was conducted at College Farm, College of Agriculture, Hanumanamatti, Ranebennur taluk, Haveri district (UAS, Dharwad) Karnataka state during *khari* 2019 and 2020. The experiment was laid in RCBD with eight treatments each replicated thrice. RPP was common to all treatments (30:15:15 kg NPK ha⁻¹ + 6 t FYM ha⁻¹ + 500 g of *Azospirillum* ha⁻¹) except control. The treatments comprised of T₁ : Farmers' practice (30 kg DAP ha⁻¹ & No FYM), T₂ : RPP (30:15:15 kg NPK ha⁻¹ + 6 t FYM ha⁻¹ + 500 g of *Azospirillum* ha⁻¹), T₃: T₂ + ZnSO₄ @ 10 kg ha⁻¹, T₄: T₂ + ZnSO₄ @ 15 kg ha⁻¹, T₅: T₂ + FeSO₄ @ 10 kg ha⁻¹, T₆: T₂ + FeSO₄ @ 15 kg ha⁻¹, T₇: T₂ + ZnSO₄ @ 10 kg ha⁻¹ + FeSO₄ @ 10 kg ha⁻¹ and T₈: T₂ + ZnSO₄ @ 15 kg ha⁻¹ + FeSO₄ @ 15 kg ha⁻¹. In the present investigation there was no significant difference among the treatments with respect to plant height. However, with respect to number of tillers per hill, T₈ has recorded significantly higher number of tillers per hill during both the years of study (12.23 & 12.10 during 2019 & 2020, respectively) as well as in pooled data (12.17). Same trend was noticed with respect to total dry matter production per plant (g.). Significantly a greater number of leaves per hill was observed in T₈ during both the years of study (32.23 & 31.33 during 2019

& 2020, respectively) as well as in pooled data (31.78). Significantly maximum panicle length (20.10 & 19.37 cm during 2019 & 2020, respectively) and higher panicle weight was recorded in T₈ during both the years of study (6.27 & 6.47 g. during 2019 & 2020, respectively) as well as in pooled data (6.37 g.). Almost similar trend was noticed with respect to test weight. The grain yield was significantly higher in T₈ during both the years of study (17.73 & 19.17 q ha⁻¹ during 2019 & 2020, respectively) as well as in pooled data (18.45 q ha⁻¹) as compared to rest of the treatments under study. However, it was on par with T₇. Significantly lower grain yield was recorded in farmers’ practice. Almost similar trend was noticed with respect to stover yield.

FIELD PERFORMANCE OF MAIZE (*Zea mays* L.) AS AFFECTED BY APPLICATION OF COMPLEX CNS FERTILIZER GRADE – 8:21:21 IN NORTHERN TRANSITIONAL ZONE OF KARNATAKA

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ABSTRACT

The study of field performance of maize (*Zea mays* L.) as affected by application of complex CNS fertilizer grade – 8:21:21 in Northern Transitional Zone of Karnataka was conducted at College Farm, College of Agriculture, Hanumanamatti, Ranebennur taluk, Haveri district (University of Agricultural Sciences, Dharwad) Karnataka state during *Rabi* 2019. The experiment was laid out in Randomized Block Design with three replications comprising of eight nutrient management treatments including farmers’ practice. The results revealed that there is no significant difference among the treatments with respect to germination per centage, plant population, plant height, length of leaf, leaf area and LAI at 30 DAS. However, at 60 DAS, application of 180:80:80:30 of NPK and S through Complex fertilizer grade 8:21:21, Urea and Bensulf (1st dose at sowing through 8:21:21 grade @ 381 kg + Bensulf @ 24 kg, 2nd dose at four leaf stage @ 130 kg urea, 3rd dose at eight leaf stage @ 97 kg urea, 4th dose at tasselling stage @ 65 kg urea and 5th dose at grain filling stage @ 33 kg urea) (T₈) recorded significantly higher plant height (198.43 cm), length of leaf (102.33 cm), breadth of leaf (8.70 cm), leaf area (8971.54 cm² plant⁻¹) and LAI (7.48). In addition, number of cobs per plant and test weight of maize did not differ significantly due to different sources of fertilizers and levels. However, rest of the yield parameters and yield differed significantly due to different sources of fertilizers and levels. At harvest, T₈ recorded significantly higher cob length (20.83 cm), cob girth (17.00 cm), extent of cob filling (100.00%), kernel yield (72.59 q ha⁻¹) and stover yield (104.92q ha⁻¹). The cost of cultivation of different treatments ranged from ₹ 50230 ha⁻¹ to ₹ 71251 ha⁻¹. The treatments receiving nutrients through 8.21.21 grade (T₅ to T₈) recorded higher cost of cultivation as compared to rest of the treatments (T₁ to T₄). Among T₅ to T₈, T₈ recorded higher cost of cultivation (₹ 71251 ha⁻¹) as compared to rest of the treatments under study. In contrast, T₇ (application of 150:60:40 of NPK through 8:21:21 grade, DAP and urea (1st dose at sowing through 8:21:21 grade @ 190 kg + DAP @ 44 kg, 2nd dose at four leaf stage @ 110 kg urea, 3rd dose at eight leaf stage @ 82 kg urea, 4th dose at tasselling stage @ 55 kg urea and 5th dose at grain filling stage @ 29 kg urea) recorded higher net returns (₹ 66331 ha⁻¹), benefit cost ratio (2.10) and incremental cost benefit ratio (2.19) as compared to rest of the treatments.

DEVELOPMENT OF VALUE-ADDED PRODUCTS FROM DEHYDRATED CURRY LEAVES FOR PREVENTING MALNUTRITION

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ABSTRACT

Curry Leaf (*Murraya koenigii*) is an important leafy vegetable, that belongs to the family Rutaceae, are very popular spice used for aroma and flavouring of food products and due to presence of volatile oil and their ability to improve digestion have several medicinal properties such as anti-diabetic, antioxidant, antimicrobial, anti-fungal, anti-inflammatory, anticarcinogenic and hepato-protective properties. The various notable pharmacological activities of the plant include activity on heart, anti-diabetic and cholesterol reducing property, antimicrobial activity, antiulcer activity, antioxidative property, cytotoxic activity, antidiarrheal activity, phagocytic activity. The curry leaves are rich in fibers, minerals and vitamins such as calcium, carotene, nicotinic acid and vitamin A and phosphorous, calcium, iron, vitamin B2, niacin and vitamin C. The abundance of **health benefits** is due to the presence of powerful plant **compounds**. The compounds function as **antioxidants** in your body. Antioxidants play an essential role in keeping your body healthy and free from disease. Present study was planned with the objective of developing value-added food products with incorporating dehydrated curry leaves powder, their sensory evaluation and nutritional assessment (carbohydrate, fat, protein, fibre, iron). Various products were formulated with the incorporation level at different percentages. The prepared products were assessed on 9-point Hedonic scale, and their nutritive value were determined by AOAC (2020) methods. Developed products shows significant result on sensory evaluation and almost significant improvement was assessed in nutrient content of the product.

Keywords: *Value added food products, Antioxidative property, Dehydrated curry leaves*

EFFECT OF BOTANICALS AND BIOAGENTS ON GROWTH PARAMETERS OF SPONGE GOURD

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ABSTRACT

The sponge gourd, *Luffa cylindrica* (L.) Roem., is a member of the Cucurbitaceae family. Towel gourd, smooth loofah, vegetable sponge, and dishcloth gourd are further names for sponge gourd. The principal locations for *Luffa* commercial cultivation are China, India, Korea, Japan, and Central America. The young, delicate fruits are eaten as steamed vegetables. The mature, fibrous endocarp, which may be used to scrub with a loofah, is well-liked by customers in the United States, Japan, and Asia. Insect pests and illness cause the sponge gourd to produce at a low rate. Sponge gourds are susceptible to a number of diseases, including *Alternaria* leaf blight, *Cercospora* leaf spot, powdery mildew, downy mildew, and anthracnose, the latter of which is shown to be particularly destructive across the states. In this experiment, *Trichoderma viride* and botanicals were employed, which not only helped to manage the condition but also helped to maintain healthy soil and were not hazardous to the environment. The result of the present experiment revealed that treatment T₅ (neem oil + *Trichoderma viride* @ 2.5 +2.5%) was found effective in growth parameters like plant height, number of leaves, and number of branches.

Keywords: *Growth parameters, Luffa cylindrica, Neem oil, Trichoderma viride,.*

ASSESSMENT OF EFFECT OF SEASONAL VARIATION ON PHYSICOCHEMICAL CHARACTERISTICS OF SOIL BAMBOO PLOTS

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ABSTRACT

The aim of study was to investigate the effect of seasonal variations on physicochemical parameters in the soil of selected 10 spots of the Bamboo plot. Samples were collected in three different seasonal intervals: summer, monsoon and winter. The parameters that were calculated is soil pH, electrical conductivity, moisture, organic carbon, available N, P and K, calcium and magnesium during experimental-work. It was observed that the texture of soil was alluvial to sandy loam. Soil temperature is an important edaphic factor which effects on the entire physicochemical properties of soil and its abiotic potentiality. It controls the rate of decomposition, which is the source minerals returns to the soil. The pH and organic carbon are low at summer. The total amount of electrical conductivity, available N, P, K, soil moisture is maximum in monsoon and minimum in summer.

Keywords: Bamboo, soil pH, electrical conductivity, soil moisture, seasonal variation

CONSERVATION AGRICULTURE: A SUSTAINABLE APPROACH OF FARMING

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ABSTRACT

A method to managing an agro-ecosystem for greater productivity and profitability while protecting the environment and natural resources is called conservation agriculture. The sustainable use of soil and land resources includes a concern for food security. Crop rotation employing zero tillage, minimal tillage, and integrated crop management practices is the foundation of conservation farming. Conservation agriculture, which refers to the preservation of energy in many forms for cultivation, has grown in importance as a way to increase farming's profitability by reducing variable costs, improving resource use effectiveness, and improving soil qualities. Agriculture that is resource-efficient is another name for it. The fundamental tenets of conservation agriculture include: a) minimal soil disturbance enabled by no till/reduced tillage; b) maximum soil cover enabled by mulch, residues, or live mulch; and c) appropriate crop sequence or crop rotation (spatial and temporal) for enabling the agriculture system to improve soil conditions and production gets better and better year after year with lower cost. Conservation agriculture is defined as minimal soil disturbance (no-till) and permanent soil cover (mulch) combined with rotations, is a recent agricultural management system that is gaining popularity in many parts of the world (FAO). Long-term, these techniques aid in reducing soil erosion and enhancing soil fertility, quality, and water infiltration. Additionally, it lowers labour requirements, boosts output, enables earlier planting, and offers improved drought tolerance due to improvements in the physical qualities of the soil. Adoption of conservation agriculture by Indian farmers has a great potential to convert the whole production system productive, profitable and sustainable in long-run.

Keywords: Conservation agriculture, Farming, Profitability, Sustainability,

IMPACT OF SILYMARIN AND NANO-ZINC OXIDES IN LIVER FUNCTIONS OF MURRAH BUFFALO CALVES

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ABSTRACT

This study aimed to explore the impact of silymarin and nano-zinc oxides on liver functions of Murrah buffalo calves. Twenty-eight Murrah buffalo calves were used in this experiment and randomly assigned into four groups (n = 7) according to body weight (136±5.16 kg) and age (10.52±0.50 months). Group 1st acted as a control offered basal diet without any supplementation, however, group 2nd, 3rd, and 4th given basal diet with silymarin (600mg/kg DM/calves/day, T₁), nano-zinc (50mg/kg DM/calves/day, T₂), and both silymarin + nano-zinc (600mg/kg DM/calves/day + 50mg/kg DM/calves/day, T₃), respectively, for 120 days of the experimental period. The jugular blood was collected at 7.00 am in EDTA containing test-tube before feeding and watering for the analysis of alanine aminotransferase (ALT), aspartate aminotransferase (AST), and alkaline phosphatase (ALP). A statistical (P<0.05) reduction in ALT activity of the treatments was observed with respect to control, but reduction was greater in T₃ groups, however, no statistical difference was noticed between T₁ and T₂ groups. The AST activity was varied statistically (P<0.05) in the groups, and reported greater significant (P<0.05) reduction in the activity of AST in buffalo calves who received both silymarin and nano-zinc compared to all other groups. A statistical (P<0.05) reduction was observed in the activity of mean ALP in groups supplemented either with silymarin and nano-zinc or both than control but the reduction was highest in the T₃ group of Murrah buffalo calves. In conclusion, we find that the supplementation of silymarin and nano-zinc improved the function of liver of Murrah buffalo calves by reducing ALT, AST, and ALP.

Keywords: Silymarin, Nano-zinc, Murrah buffalo calves, liver functions.

PERFORMANCE EVALUATION OF FIRST LACTATION PRODUCTION AND REPRODUCTION TRAITS OF HARIANA CATTLE

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ABSTRACT

The data of 655 Haryana cattle on first lactation records of production and reproduction reared during 1965-2020 at State Livestock and Agriculture Farm, Babugarh, Hapur, India was used for least square analysis. The overall least square means for first lactation traits viz. Age at First Calving, First Total Lactation Milk Yield in Pail, First Standard Lactation Milk Yield in Pail, First Calving Interval, First Dry Period, First Lactation Length and First Service Period were found to be 1580.16 ± 12.20 days, 954.66 ± 19.79 kg, 857.92 ± 14.73 kg, 523.42 ± 6.86 days,

181.09 ± 5.16 days, 343.18 ± 4.81 days and 240.79 ± 7.22 days respectively. Various fixed factors used in the model were found to be significantly affecting first lactation traits except for few. The estimated least square means for first lactation traits will act as a baseline for animal breeders. The identified fixed factors significantly affecting first lactation traits in Haryana cattle will be useful for standardization of data beforehand genetic analysis.

Keywords: First Lactation, Haryana Cattle, Production traits and Reproduction traits

NEAR ZERO SURVIVAL THROUGH CELPHOS POISONING

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ABSTRACT

Aluminum Phosphide is an extremely toxic pesticide that is often used to preserve stored grain, most commonly wheat and rice. It is sold under various brand names such as Quickphos, Celphos and Salphos. Celphos is the most commonly used solid fumigant pesticide widely used in the Indian subcontinent. It is the most common tablet used for the suicidal deaths in Northern India. Each tablet is of 3 grams which are grey in colour and release 1 grams of Phosphine gas (PH₃) and has high diffusion rate. The lethal dose is 500 mg for an adult of 30 kilograms and above Phosphine gas causes inhibition of Cytochrome oxidase and also electron transport chain. Phosphine gas released by Celphos tablets effect Heart, lungs, and kidneys and can also cause electric abnormalities in the heart. The toxicity of celphos tablets results from the release of phosphine gas when it comes into contact with moisture. There is no antidote available till now. If anyone consumes Celphos tablet by mistake, death is rapid and survival is very difficult Prevention is another option in this case, and the most effective way is either ban of impose very strict regulations on the retail and sale of Celphos tablets Ingestion of this agrochemical compound is the principal mode of suicide and about 1.87 lakh people in 2010 who committed suicide, consumed some type of Poison in which mainly, it was pesticides. The first case of celphos poisoning in India was reported in 1981 after that these cases have been increasing year by year. So in order to reduce these type of poisoning cases especially Aluminum Phosphide, little strict legislation and regulations are to be enacted and imposed and the awareness among the people is necessary. Till now nearby zero or no person has been survived who intaked celphos tablet accidentally or as for suicide, as antidote till now is not available Restricted use and awareness programs to farmers an the people of the urban areas, might be beneficial in prevention of toxicity.

ENVIROMENTAL CHANGE AND ITS IMPACT ON WATER QUALITY

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ABSTRACT

Environmental change is a change or disturbance of the environment most often caused by human influences and natural ecological processes. Environmental changes include various

factors such as natural disaster, human interference, or animal interaction. Environmental change occurs as a result of both natural and human processes. There are basically three types of environmental changes: Global warming and climate change, water pollution and ocean acidification and loss of biodiversity. Unfortunately, climate change jeopardizes the quality and safety of our water. In many areas increased water temperatures will cause eutrofication and excess algal growth, which will reduce drinking water quality. The quality of drinking water sources may also be compromised by increased sediments or nutrients inputs due to extreme storm events. Water quality is influenced by many environmental factors like precipitation, climate, soil type, vegetation, geology, flow conditions, ground water and human activities. Changes in environmental conditions can also significantly influence water supply and demand. Increased precipitation or decreased evapotranspiration are likely to augment water supplies and reduce the water demanded by irrigated agriculture. By far, we have come in terms that the environment majorly affect water. We know that warmer air can hold more moisture than cool air. As a result, in a warmer world, the air will suck up more water from oceans, lakes, soil and plants. The drier conditions this air leaves behind could negatively affect drinking water supplies and agriculture. Our water resources face a host of series threats, all of which are caused primarily by human activity. They include sedimentation, pollution, climate change, deforestation, land scape changes etc.

Keywords: Climate change, human activities, environmental condition, pollution, health risks.

CAPSICUM DIVERSITY ASSESSMENT THROUGH SHANNON-WEAVER DIVERSITY INDEX AND CHARACTERIZATION

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ABSTRACT

Biodiversity is the paramount concern globally and under this vegetable more specifically chilli has its noteworthy significance due to both agricultural importance as well as contribution in economic value. The continual transposition of the current global climatic condition, which cause emergence of novel abiotic and biotic stresses demanding for chilli having higher resilience ability. The diverse genome of the wild relative and farmer’s collection observed as good assert for resolving these problems. Thus, the experiment was performed at Maharajpur Farm under the Department of Horticulture, College of Agriculture, J.N.K.V.V., Jabalpur (M.P.) during the Kharif season 2019-2022 and planted in Randomized Complete Block Design (RCBD) with three replications. Shannon-Weaver diversity index assessment and the characterization of thirty capsicum lines collected from farmer’s field and Indian Institute of Varanasi Research (IIVR) were evaluated for thirty-five qualitative traits articulated no variability for trait i.e., the monomorphic trait was non-enveloping fruit calyx cover, two descriptors were found to be moderately diverse, which were with medium fruit intensity of the red colour (at the mature unripe stage) and the narrow triangular shape of fruit with the Shannon-Weaver diversity index $H' = 0.46$ & $H' = 0.50$, both of these traits are fruit related. The descriptor intensity of pubescence (hairiness) of the stem had the highest diversity index of 1.82. The studies highlighted some of the collections with the distinctness, MPKC-1 (Katni collection) addressed unique features with green with purple tinge leaf colour, purple petal colour, upright fruit orientation, absence of fruit curvature, purple fruit colour at ripening maturity, ovate leaf and erect plant habit, depicting it like a wild relative of capsicum, which

could be utilized as the morphological descriptor in QTL mapping and as a genetic source for future resilience breeding programme.

Keywords: Biodiversity, Resilience, Shannon-Weaver diversity index, Genetic resource, Morphological descriptor,

TO STUDY THE EFFECT OF ORGANIC AND INORGANIC SOURCE OF NUTRIENTS ON PRODUCTIVITY Of Fenugreek (*Trigonella foenum-graecum* L.)”

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ABSTRACT

A field experiment entitled “Nutrient Management in Fenugreek (*Trigonella foenum-graecum* L.)” was conducted at Instructional Farm of soil science, Rajasthan College of Agriculture, Udaipur during rabi season of 2021-22 to find out suitable fertility levels for higher productivity of fenugreek, suitable source of organic manure with fertilizer and foliar Spray economic viability of treatments. The experiment was conducted on clay loam soil which was slightly alkaline in reaction, low in available nitrogen (273.0 kg ha^{-1}) and medium in available phosphorus (19.80 kg ha^{-1}). The treatment comprising four levels of inorganic sources viz. ION₀: Control, ION₁: 50%RDF+Foliar spray of Zn@0.75%, ION₂: 75%RDF+Foliar spray of Zn@0.5% , ION₃: 100%RDF+Foliar spray of Zn@0.25% and four levels of organic sources viz. ON₀: control, O₁: Vermicompost 2 t ha⁻¹ + Foliar spray @ 10% Vermiwash, ON₂: Vermicompost 4 t ha⁻¹ + Foliar spray @ 7.5% Vermiwash, ON₃: Vermicompost 6 t ha⁻¹ + Foliar spray @ 5% Vermiwash were evaluated in factorial randomized block design with three replications on fenugreek variety “RMT- 1”. The results of the experiment indicated the superiority of 100 % RDF, which brought about significant improvements in various growth parameters viz., plant height, number of branches plant⁻¹, dry matter accumulation, CGR and RGR of fenugreek crop at successive growth stages as well as at harvest. Number and weight of nodules plant⁻¹ were significantly higher under 75% RDF. However, inorganic sources failed to record any significant variation in days to 50 per cent flowering and maturity. These enhancements manifested in improvement in yield attributing characters (viz. number of pods plant⁻¹, pod length, seeds pod⁻¹, seed weight plant⁻¹ and test weight) and consequently increased seed yield ($2218.7 \text{ kg ha}^{-1}$) and haulm yield ($8932.5 \text{ kg ha}^{-1}$) by 595.1 and 3075.7 kg ha⁻¹ over that produced with fertility level of 50% RDF, respectively. The corresponding increase in seed and haulm yields were 222.6 and 1839.4 kg ha⁻¹ over 75% RDF (1996.1 and $7093.1 \text{ kg ha}^{-1}$, respectively). This fertility level enhanced uptake of N and P by the crop, improved chlorophyll content in fresh leaves at 50 per cent flowering and crude protein content (21.1%) of the seed, however, failed to record a significant variation in N and P content in seed and haulm. Nitrogen and phosphorus retained in soil under application of 100% RDF was significantly

Keywords: Nitrogen, phosphorus, Zinc, Vermicompost, vermiwash etc.

***TRIOZA OBSOLETA* INDUCED LEAF GALLS OF *DIOSPYROS MELANOXYLON*
ROXB. (TENDU)**

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ABSTRACT

Diospyros melanoxylon Roxb.(Family: Ebenaceae), commonly known as “Tendu” or “Kendu” tree, is endemic to Indian subcontinent. It is locally known as temburini. It is native to India and Sri Lanka and that has hard and dry bark. It is drought and frost hardy but sensitive to water logging. Tendu leaf is the second largest forest product in India after timber and is exclusively used in making local cigarette called Bidi. Its leaves make excellent wrappers and the success of the beedi is due, in part, to this leaf. Many people are involved in the business of making beedis thus tendu leaf as a non-timber product of forest also provide small income to the local communities for their livelihood support. Tendu leaves are wrapped with tobacco to make Indian beedi which has out sold conventional cigarettes in India. Most of the tendu leaves in India are obtained from natural vegetation. Its fruits are highly nutritive and rich source of phenols and fiber and consumed by tribal people residing in this region. It is also one of the important lesser-known fruit which is available during summer in the local market of Madhya Pradesh, Rajasthan, Chattisgarh, Jharkhand and Orissa state.

The Psyllid, *Trioza obsoleta* (Homoptera: Psyllidae) is one of the key insect pests of *Diospyros melanoxylon* which effects the quality of leaves yielding heavy losses in economic terms. It causes leaves galls which render leaf unsuitable for bidi wrapper. Recently in a visit to Sitamata santauri, Pratapgarh (Rajasthan) an infestation of leaf gall of tenu was observed. To study the casual organism and level of infestation on leaf, samples of leaves bearing galls were collected from infested plants and data pertaining to number of galls per leaf were recorded. The galls on the leaves were observed under dissecting microscope for nymphs and adults. The causal organism was identified as *T. obsoleta*. Its adults and nymphs’ feeds on plant sap with their piercing and sucking mouthparts and in consequence induces gall on leaf. It was observed that the epiphyllous leaf galls were greenish in colour, unilocular and distributed throughout the surface of leaf. The average number of galls was found to be 25-30 per leaf. As *D. melanoxylon* (tendu) leaves are a source of income of tribal people residing in and near the forests, leaf galls of tenu can impact the marketability of its leaf thus affecting the livelihood of tribal people.

Keywords: *Trioza obsoleta*, *Diospyros melanoxylon*

**MAHUA: STUDY OF NATURAL REGENERATION FROM VINDHYAN REGION OF
UTTAR PRADESH**

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ABSTRACT

Madhuca longifolia, often known as Mahua, is a multipurpose tree species that is used in the daily activities of indigenous and tribal livelihood. It is a member of a Sapotaceae family and is an economically significant tree distributed in northern, central and southern part of peninsular India, Sri Lanka, Burma and Nepal. Mahua is one of those forest tree species that provides the three major F’s i.e., Food, Fodder and Fuel that are associated with the forest products. Natural regeneration is the natural process by which plants replenish themselves, that

helps to conserve genetic variability and its uniqueness. The present study was conducted in the natural forest population of Mahua, situated in Vindhyan region (Mirzapur) of U.P., two stages were carried out in studying the natural regeneration *i.e.*, CPT's (Candidate Plus Tree) and sampling. Germplasm exploration surveys were conducted in order to identify phenotypically superior mahua trees in Vindhyan region, U.P., Quadrats of 30 X 30 m were laid down; growth parameter (height and diameter) of all individuals (seedlings, saplings and adults) of the said species falling in quadrats have been recorded. The data was quantitatively analyzed for abundance, the present study on the natural regeneration of Mahua in Vindhyan region of Mirzapur district was comparatively very less due to the adjoining anthropogenic activities *i.e.*, forest fires, over exploitation of mahua seed and overgrazing, etc.

Keywords: *Madhuca longifolia*, CPT's, Natural Regeneration, Biodiversity, Anthropogenic activities.

EFFECT OF DIFFERENT COLOUR SHADE NETS ON GERMINATION AND SEEDLING GROWTH OF PAPAYA (*Carica papaya*) var. GJP-1

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Purpose: Major difficulty of raising papaya seedling is mortality of seedling, among abiotic factors of environment like unfavourable microclimate; especially temperature restricts raising off-season fruit nursery under open field condition. Papaya (*Carica papaya* L.) is widely grown fruit crop in tropics and India is the largest producer in the world. We aim to produce papaya seedlings during off-season for fetching very high price.

Methods

The present investigation was carried out at College Nursery, Department of Horticulture, N. M. College of Agriculture, Navsari Agricultural University, Navsari during 2021. In this study, different colour 50% shade nets *viz.*, Red colour (T₁), White colour (T₂), Green colour (T₃), Blue colour (T₄), Yellow colour (T₅) and Control (T₆) were used as treatment for growing of papaya seedlings. The variety for papaya seedlings was GJP-1 and growing media (cocopeat: red soil: vermicompost, 4:1:1 v/v) was taken in plug tray (6 cm depth x 5 cm diameter) for this study. Sowing time was March (summer season). The experiment was laid out in a Completely Randomized Design with six treatments and repeated thrice. For the experiment purpose hundred seed were used in each treatment after sowing in plug tray, it was kept under different color shade net for further study. Survival and growth of seedlings were monitored for 30-45 days. The environmental and morphological data were recorded and computed and response of papaya seedling growth was evaluated in terms of days taken for germination, survival (%), seedling height, seedling diameter and number of leaves.

Result

The results of this study revealed that the environmental factor had significant impact during the entire study period in white colour shade net compared to other treatments. The lowest light intensity (320.1 $\mu\text{mol m}^{-2}\text{s}^{-1}$) compare to open condition (697.3 $\mu\text{mol m}^{-2}\text{s}^{-1}$), temperature was about 3°C less as compared to open condition and higher relative humidity was observed with white color shade net (T₂). The minimum time taken for days of germination (16.43 days), survival (61 %), seedling height (6.12 cm and 11.77 cm) at 30 and 45 days, respectively, seedling diameter (1.19 mm and 2.43 mm) at 30 and 45 days, respectively and number of leaves (6.27 and 8.93) at 30 and 45 days, respectively was found highest in white colour shade net (T₂) with variety GJP-1 and growing media (cocopeat: red soil: vermicompost, 4:1:1 v/v).

Conclusion

From foregoing discussion, it can be concluded that early germination and higher seedling growth were obtained when papaya seeds sown in plug tray (media cocopeat: red soil: vermicompost, 4:1:1 v/v) under 50% white shade net during first week of March.

Keywords: papaya, seedling growth, germination, Gujarat Junagadh Papaya-1

EFFECT OF TIME AND GROWING CONDITION ON SUCCESS OF SOFTWOOD GRAFTING IN MANGO

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Purpose

Mostly, mangoes are vegetative propagated. Among different vegetative propagation methods softwood grafting has distinct advantages over other methods of propagation which is an efficient, economics; rapid method and grafts can be ready within a year. So, softwood grafting gives an excellence response in initial success with least possibility of mortality, better and uniform orchard establishment. National Horticulture Board (NHB) who give accreditation and rating to horticulture nurseries, they mostly emphasis to prepare softwood grafting particularly for mango. Keeping in view these facts, an investigation entitled Effect of time and growing condition on success of softwood grafting in mango was undertaken.

Methods

The present investigation was carried out at Regional Horticulture Research Station, Department of Fruit Science, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari during June 2017 to February 2020. The treatments comprised of six grafting times viz., T₁- April, T₂- June, T₃- August, T₄- October, T₅- December, and T₆- February, while two growing conditions were open and polyhouse condition. The experiment was laid out in a Completely Randomized Design (factorial concept) with twelve treatment combinations and repeated thrice. For experiment purpose twenty grafts were prepared in each treatment. During experiment total 720 softwood grafts were prepared at different time interval and kept in different conditions for this experiment. Survival and growth of softwood mango grafts were monitored for 30-120 days. The morphological data were recorded and computed and response of softwood grafts were prepared at different time interval and kept in different conditions was evaluated in terms of day require to leaf emergence, success (%) of graft at 30 days, survival (%) of mango graft at 120 days, incremental length (cm) of mango graft, girth (mm) of mango grafts and no. of leaves of mango graft.

Result

The results of this study revealed that the different grafting time and growing condition had significant impact of success of softwood grafting in mango. The softwood grafting done in June month recorded minimum days required to leaf emergence (15 days), higher success of graft at 30 days (55.43%), survival of graft at 120 days (47.01%), maximum incremental length(3.02 cm , 4.07 cm, 5.17 cm and 7.43 cm) 30, 60, 90 and 120 DAG, respectively, maximum incremental girth (6.75 mm, 7.39 mm, 8.05 mm and 8.82 mm) 30, 60, 90 and 120 DAG, respectively, highest no of leaves per graft (10.75, 15.09, 18.20 and 22.74) 30, 60, 90 and 120 DAG, respectively. August month was found at par with June month. While the grafts prepared under poly house condition took minimum days (15.74) for leaf emergence, gave highest success of graft at 30 days (45.09 %) and highest survival of graft at 120 days (31.85 %), highest incremental length of graft (2.37 cm, 3.75 cm, 4.65 cm and 6.89 cm), maximum girth (6.55 mm, 7.22 mm, 7.90 mm and 8.56 mm) at 30,60, 90 and 120 days after grafting,

respectively, maximum number of leaf per graft (12.95, 16.53 and 20.92) at 60, 90 and 120 days after grafting, respectively. In case of combination effect, the grafting done during June and kept under poly house conditions (M₂C₂) gave significantly maximum percentage success of graft at 30 DAG (74.44 %), percentage survival of graft (64.44 %) at 120 DAG, maximum incremental length (4.21 cm, 5.55 cm and 8.07 cm) at 60, 90 and 120 days after grafting, respectively.

Conclusion

In the light of the results obtained it can be concluded that softwood grafting done in June month performed well in all parameters like success of graft at 30 days, survival of graft at 120 days, incremental length, incremental girth, no of leaves per graft. In general August month was found at par with June month. While the grafts prepared under poly house condition performed better as compared to open condition in all parameters. In case of combination effect, when plants are grafted in June month under poly house condition gave best result as compared to other combinations.

Keywords: mango, grafting time, growing conditions, growth parameter, softwood grafting

ASSESSMENT OF *Acorus Calamus* Linn. ACCESSIONS FOR MORPHOLOGICAL TRAITS AND YIELD PARAMETERS

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Purpose

Acorus calamus Linn. usually known as sweet flag belongs to the family Acoraceae. The Acoraceae family comprises of 115 genera and 2,000 species, of which about 25 genera and over 140 species has been reported from India. The genus *Acorus* is named from Dioscorides' Greek word *Acoron*, which was derived from *Coreon*, which meant pupil, because it was used in herbal medicine to cure eye inflammation, while the species *Calamus* is named after Dioscorides' Greek word *Calamus* (a reed). Among different species of *Acorus*, *calamus* has been an item of trades in many cultures for thousands of years and has been used medicinally for a wide variety of ailments. This herb is usually found on the banks of streams and in swampy areas. A perusal of literature revealed that there is a great variability in the populations with respect to morphological and chemical characters of *Acorus calamus* collected from different parts of the world and from India also therefore the present attempt has been made to study the variability present in the *Acorus calamus* germplasm of North eastern region of India.

Methods

This experiment consisting of 40 accessions of *Acorus calamus* was carried out at the experimental field of Department of Forest Products and Utilization, College of Horticulture and Forestry, Central Agricultural University, Pasighat, Arunachal Pradesh located at located at 28.07°N, 95.33°E and 155 m above msl during 2021-2022. With the objective referred 14 traits viz., plant height, number of leaves, leaf length, leaf width, leaf colour, leaf area index, number of prominent veins, number of lets, number of scales, rhizome length, rhizome width, rhizome weight, rhizome yield and oil content were studied. The data obtained were subjected to appropriate statistical analysis however among the 14 traits study 2 traits viz., number of

leaf and number of prominent veins was not subjected to statistical analysis as there were no variation in these traits among the accessions.

Results

On the basis of the mean performance of the accessions studied, plant height ranged from 56.64 cm to 110.80 cm, fresh rhizome weight ranged from 17g to 159.80g, rhizome yield ranged from 761.60 kg/ha to 7159.04 kg/ha. The accessions IC-0632808 (2.80%), IC-0632810 (2.30%), IC-0632792 (2.00%) showed high oil content among all the accession studied. Variation in other morphological characters under study is also found. Rhizome yield showed strong significant positive correlation with rhizome length (0.940) followed by rhizome weight (0.926), leaf width (0.729), number of leaves (0.647), leafarea index (0.558), leaf length (0.414), plant height (0.406), number of lets (0.338). In rhizome associated traits rhizome weight showed maximum positive direct effect on oil content followed by rhizome length and rhizome width. The accessions were divided into major seven clusters where maximum accessions were group in cluster 1 which consists of 16 accessions and check (Swarna swara). Cluster 5, cluster 6 and cluster 7 consist of 1 accession each. Cluster 6 showed maximum mean value for economically important below ground traits including rhizome length (74.2 cm), rhizome weight (159.80 g), rhizome yield (7159.04 kg/ha) and oil content (1.86%). The inter cluster D² value was shown maximum between cluster 6 and cluster 3. Intra cluster distance was found highest in cluster 4.

Conclusions

In the present study, accession IC-0362796 (7159.04 kg/ha) gives maximum rhizome yield. Accession IC-0632808 yielded maximum oil content followed by IC-0632810 and IC-0632792. The accession IC-0632808, IC-0632810 and IC-0632792 might be used for further breeding programme to develop a variety for obtaining high oil content in future research work.

Keywords: *Acorus calamus*, cluster, correlation, oil content, rhizome yield

ISOLATION AND IDENTIFICATION OF VEROCYTOTOXIN ESCHERICHIA COLI FROM ENVIRONMENTAL SOURCES IN DAIRIES OF JAIPUR, RAJASTHAN

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ABSTRACT

India ranks first in milk production with total milk production was around 187.7 million metric tonnes in the year 2018-19 according to NDDB (data.gov.in). In 2019-20 it is 198.0 million metric tons. Among the pathogenic organism E. coli is most important which causes intestinal disease. Out of six recognized diarrhegenic categories of E. coli, verocytotoxic E. coli (VTEC) is the most important food born pathogenic microorganism for humans. During the present study A total of 130 environmental samples (milkers hand swab-40, utensil swabs-30, udder swab-30 water sample-30) were collected aseptically for screening of samples for detection of E. coli. The overall percent of E. coli and VTEC from environmental sample was found to be 24.17% (29 out of 120) and 2.5% (3 out of 120) respectively. Presence of E. coli in environmental samples like hand swabs of milkers and handlers, utensil swabs and udder swabs due to unwashed or improperly washed hands, improper cleaning and sanitization of

utensils, improper washing of udder before milking in different levels. So milk producers and vendors should be educated on good and safe food preparations accompanied with good hygienic practices so as to safeguard the public from eating contaminated food.

Keywords: E. coli, Environmental source, VTEC

***Grewia optiva* (Bhimal) FIBER TREE IN AGROFORESTRY SYSTEM FOR LIVELIHOOD TO THE LOCAL INHABITANTS**

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Purpose

According to the FSI report, in India, the total numbers of stems of *Grewia optiva* (Bhimal) trees in agroforestry are 42391 (1.41%). The trees used for fuelwood, fodder, fiber, timber by the local communities for sustaining livelihood. The study conducted in the Garhwal Himalaya to understand that *Grewia optiva* fiber can be important sources of income generations through fiber products.

Methods

Few families of local inhabitant were selected and all possible necessary facilities provided (such as awareness meeting, exposure visit and various levels of trainings) to trained them to develop fiber products for income generation. In this programme, the assessment of the villagers was done during fiber product manufacturing. The trained villagers in fiber product manufacturing were also made linkage with market for successful running of the villager enterprise for livelihood.

Results

The villagers after successful completion of the various training programme are developing Bhimal fiber products i.e., basket, sleeper, purse, mat and curtain and many other attractive designs for their livelihood.

Conclusions

Now the villagers have established their small enterprise and market linkages for fiber products for their livelihood and sustainability.

Keywords: Agroforestry, handicraft, fiber product, communities, livelihood

SUSTAINABLE DEVELOPMENT, HUNGER AND FOOD SECURITY IN INDIA: AN EMPIRICAL ANALYSIS

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Today the country is celebrating the ‘Amrit Mahotsav of Independence’. We look forward to making the 75th anniversary of independence. But the only question is, “Did we assess what we left behind, what we found and where we succeeded and failed in these 75 years”? Today we are ready to move forward with the concept of building a new India. But on the other hand the irony is that even today 17% of the malnourished population of the world lives in India. In this concern after studying the report on global food security and nutritional status, it is found that India is becoming the country with the largest food insecure population whose pace has intensified after the Covid-19 epidemic. Even in the Contemporary era, rapidly increasing population, rising food prices and Climate change are such challenges which raise question marks on the direction of India’s renewal and development. The growing malnourished

population and increasing nutritional loss in India is a matter of concern as it is the inter-generational effect that is extremely harmful. If we remember that many years ago Swami Vivekananda had said in the ‘Parliament of Religions’ that India needs bread, not religion. At the same time he explained that “**Philosophy cannot be explained to a person who is struggling to fill his stomach**”. In the present study, the three dimensions that come under the general principle of food security i.e. Accessibility, Availability and Use of resources were extensively discussed. Along with this, important facts related to Sustainable Development Goal-2.0, Hunger and Food Security have been included in the present paper and along with the meaning of food insecurity, its types, historical details of food crisis in India, causes of food insecurity, Government efforts, other problems have been not only identified but also an attempt has been also made to give solutions by logical analysis of those identified questions. In this present paper, both primary and secondary data have been used for the analysis of facts. **Keywords:** Food security, Hunger, Malnutrition, Sustainable Development, Policy Formulation.

CLIMATE CHANGE AND GREEN CHEMISTRY IN CONTEXT OF HUMAN HEALTH

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ABSTRACT

The change in water quality or degradation due to climate change can directly or indirectly effect the quality of water bodies is due to climate change and some other anthropogenic activities which can affect green chemistry. Since most of the diseases are water born and climate change can also add a helping hand to make some disease endemic or epidemic. However, the use of concept of green chemistry in some industries that generate chemical is of less toxic order. However, climate change is already impacting health in a myriad of ways including by leading to death and illness from increasingly frequent extreme weather events such as heavy rain, hurricanes, effect of El-nino, drought rise of sea level water etc. By practicing concept of green chemistry, the discharge of waste like domestic waste, industrial waste including e- waste. The toxicity of natural resources like soil, water and air can be minimized to protect human health for sustenance of good health. Hence green chemistry can play a role in between climate change and human health therefore in industrial production concept of green chemistry in order to minimize the toxicity of discarded waste.

Keywords: Climate change, green chemistry, human health, environment, toxicity

PHYSIOLOGY AND MEDICINE IN ANCIENT INDIA – AN OVERVIEW

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ABSTRACT

Since the earliest times India achieved high excellence in art, warfare and medical sphere. Indians’ association with medicine can be traced to the Harrapan Civilization of which definite

proofs are not available. However, in Vedic period both physicians and medicines are mentioned. In Rigveda ninth mandal 112 Sukta there is mention of "Bhisaj" a word which later became more or less synonymous with 'Vaidya', which is still standard Indian term for a doctor of traditional type. The early hymns of Rigveda mentioned medicinal plants and herbs and the purifying properties of water & air. The juice of "Soma" plant was a medicine, a relaxant and 'Amrit' taken after the completion of Yajanas. In Vedic period the disease was believed to be largely due to wrath of Gods or the evil work of demons. The God 'Varuna' who maintains ethical order, punished those who transgressed his commands with disease. We find gradual shift of emphasis on scientific thinking from the supernatural in Mahajanpada period 600 B.C. – 200 B.C. This was the period of great scholars of Ayurveda – Sushruta, Atreya. Two schools – Atery school of medicine and Dhanvantari school of surgery flourished during this period, Kashi and Taxila two great centres of learning included the study of Ayurveda. The Vaidya's profession was considered valuable as is evidenced by the frequent appreciative mentioned of 'Jivaka' a physician of Magadh Mahajanpada.

Keyword: Bhisaj , Supernatural , Ayurveda , Dhanvantari , Sushruta.

SEASONAL ABUNDANCE OF SUCKING INSECT PESTS IN BT COTTON AGRO-ECOSYSTEM OF YADAGIRI DISTRICT, KARNATAKA, INDIA.

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ABSTRACT

In the present study the field investigations were undertaken at Bt cotton fields in selected study area of Yadagiri to study the seasonal abundance of sucking pests. Ajit-BG II is most commonly practiced Bt cotton hybrid in the selected area and sowing process will be carried out from June. Sucking arthropod pests recorded during study includes Aphids (*Aphis gossypii*), Leafhopper (*Amarasca biguttula biguttula*), Whitefly (*Bemisia tabaci*), Thrips (*Thrips tabaci*), Melaybug (*Phenacoccus solenopsis*). Among these sucking arthropod pests, the incidence of leafhopper and whitefly prevailed more active throughout the cropping season and cause damage crop at different stages of growth. Peak abundance of whitefly and aphids was observed at end of October 2021 up to early November 2021. Leafhoppers are invaded from July and peak abundance was noticed in the month of early October 2021 whereas, thrips were most abundant in the month of October 2021. Melay bugs were noticed at the end of September and infestation of this pest continues up to completion of cotton harvesting.

Keywords: Abundance, Sucking Pests, Ecosystem, Bt cotton.

SNOW COVER AND ITS RESPONSE TOWARDS CLIMATE VARIABILITY IN ANNAPURNA CONSERVATION AREA

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ABSTRACT

Snow cover is a vital indicator of climate change. Increased climatic variability influences change in snow cover area and ground ice reserve. Moreover, rapid increment in snowmelt and decreasing number of glaciers have been reported recently. This study analyses trend in

climatic indicators temperature & precipitation and snow-covered area for past decades to develop understanding of increasing climatic variability. Landsat images were used for mapping temporal change in snow cover. Mann-Kendall and Sen Slope were used to test the trend in temperature and precipitation and correlation was used to analyse the response of snow cover towards these variables. The average maximum temperature was increasing at the rate of 0.057⁰C/yr with no significant trend in minimum temperature and precipitation despite of slightly observed positive along with negative trend in some stations within the data. Perennial snow-covered area had decreased by 15% in the past three decades. Researches focusing on long term monitoring and observations of meteorological pattern and possible impacts should be carried out further at local level. Lack of studies, understanding might increase the risk and vulnerability in the area. Apart from that, regular assessment and monitoring of climatic indicators are required to formulate policies and strategies to minimize the risk.

Keywords: Snow, climatic variability, trend, vulnerability

PINEAPPLE PLANT AS A FIBER CROP: A NATURAL RESOURCE FOR UTILIZING IN SUSTAINABLE TEXTILE

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Purpose

Pineapple is one of the main commercial products of Manipur in India. The fruits are being exported to other parts of the country. The pineapple plant, *Ananas cosmosus* belonging to the Bromiliaceae family is widely cultivated for the fruits. This is the most important commercial crops of the state. The state stood 2nd in area wise and 5th in production wise of pineapple fruit in India according to the National Horticulture Board, 2017-18.

After harvesting of Pineapple fruits leaves are being wasted. Utilizing this wasted natural resource will help in socioeconomic growth as well as contribute in eco-friendly materials for sustainable textiles product. Its production, processing and export will be major source of the livelihoods of small-scale farmers, daily-wage workers and weavers.

Methods

The methodology of the study involved 1) collection of the raw material from the local farm in Phayeng, Manipur, 2) extraction of the fiber from the collected raw material was done by means of hand and machine, the extraction on machine was conducted at CSIR-NEIST branch laboratory in Lamphel, Manipur. 3) Testing of the extracted fiber & 4) its application in handloom weaving of Manipur.

Results

As pineapple is abundantly cultivated in Manipur, this became a great way for the raw material to end products in the sustainable domain. From the study, it was found that pineapple leaf fiber has fulfilled the properties to make traditional textiles of Manipur. Hence the fiber is compatible for using as an alternative fiber in traditional textile weaving of Manipur. The study showed that the waste leaves produced white, lustrous and fine silky fiber with good strength. Awareness regarding the extraction was spread through a newspaper press.

Conclusions

Managing the utilization of this natural resource in a greater extend in producing fiber will help the local people of Manipur. Pineapple is a main alternative plant to replace poppy plant in the state. So, encouraging to cultivate this plant will shape a better society by giving extra income to daily wage workers & farmers as well as by retaining the skill and tradition of weaving. Therefore, pineapple cultivation is a great natural land resource of fiber and fruit crop.

Keywords: Sustainable, socio-economic, textile, handloom, weaving, traditional

SEED MORPHOLOGY AND GERMINATION BEHAVIOUR OF *BAUHINIA PURPUREA* L. IN NURSERY

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ABSTRACT

The study aims to describe the morphological and germination characteristics of *Bauhinia purpurea* L., a promising fodder species, in nursery settings. In year 2021, an experiment was conducted at the nursery of the Forest Research Center for Eco-Rehabilitation (FRCER), Prayagraj, Uttar Pradesh, and different germination parameters viz, germination percent, survival percent, germination capacity, germination energy, vigour index, mean daily germination and mean germination time along with seed morphological parameters were studied. Early germination from the selected medium-sized seeds of *Bauhinia purpurea* L. proved out to be significant under nursery conditions. A good germination percent (66.14%), Seedling Vigour Index (643.29), Germination Capacity (74.00%), Germination Energy (52.02 %) and low Mean Germination Time (19.43 days) indicates an early and rapid germination of *Bauhinia purpurea* L. under nursery conditions. Such research could aid in creating conservation plans for nursery environments and lean times when feed is scarce. This study will also aid in drawing conclusions to address the issue of natural regeneration that the fodder species has been dealing with over time.

Keywords: *Germination behaviour, Nursery, Mean Germination Time, Germination Capacity Germination Energy.*

EFFECT OF WHEAT BRAN AND GRAM FLOUR ON YIELD AND BIOLOGICAL EFFICIENCY OF WHITE OYSTER MUSHROOM [*Pleurotus florida* (Mont.) Singer]

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ABSTRACT

Mushrooms are magic living organisms that need very few things to grow. They are low in calories but rich in protein and are nutritionally placed between meat and vegetables and hence may be called vegetable meat. The addition of supplements with substrate has been a common practice for enhancing mushroom yield and nutritional value. The present experiment was carried out to find a suitable supplement combination for the cultivation of *Pleurotus florida*. Two supplements, namely wheat bran and gram flour, were mixed with wheat straw in different concentrations to enhance mushroom growth. The result of the present experiment revealed that supplementation with 20% wheat bran+5% gram flour (T₁) enhanced yield significantly in all three flushes (176.27g) and biological efficiency (188.24 %) as compared to control and other treatments. The cost-benefit ratio was also superior in the case of 20% wheat bran + 5% gram flour (T₁) (6.86:1).

Keywords: *Biological efficiency, Cost-benefit ratio, Pleurotus florida, Supplementation, yield.*

A STUDY ON SEASONAL VARIATION AND ASSESSMENT OF HEAVY METAL CONCENTRATION IN GOGI LAKE, YADGIR DISTRICT, KARNATAKA, INDIA.

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Purpose

The lakes are the source of people's livelihood for surrounding communities, due to urbanization, and industrialization, these lakes are threatened with emerging environmental pollution as well as heavy metal pollution is a thoughtful major problem for lakes and wetlands. Heavy metal containment was toxic to human health, and the natural environment. Our study aims to find out the concentration of heavy metals in the aquatic ecosystem.

Methods

The study was conducted in one year period of three seasonal variations of ten different sites during the period of June-2020 to May-2021 of Gogi Lake. The analysis of the concentration of heavy metals is Zn, Cu, Mn, Cr, Fe, Mg, Cd, and Pb. The collection of samples, sampling preparation, pre-treatment processing, and analysis by using the instrument atomic absorption spectrophotometer (AAS) was done and data was subject to descriptive statistical.

Results

The study period, Zn concentration was found 0.01564 mg/L to 2.05866 mg/L, The Cu concentration ranged from 0.06794 mg/L to 0.01243 mg/L. Fe was found at 0.285 mg/L to 0.0256 mg/L, Mn concentration between 0.03272 mg/L to 0.00626 mg/L, The Cr was found at high concentration in monsoon season 0.0174 mg/L at site 2 and low concentration was found in post-monsoon 0.0015 mg/L at site 1., the study were reveals. Heavy metals have been shown within the permissible limits, except Pb, as per recommendations of WHO and BIS 10500 2012 standard of water criteria.

Conclusions

The present study recommended that continuous monitoring and assessment investigation will be beneficial for the management and protection of this Lake.

Keywords: Gogi Lake, Heavy metals, Seasonal variation, Water quality, Instrumental analysis.

CHLORPYRIFOS: ITS TOXIC EFFECTS ON AQUATIC ORGANISMS

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ABSTRACT

Pesticides are stable compounds and they enter the aquatic ecosystem through the agriculture run off. The evaluation of nature and degree of harmful effects produced by the toxic substance in the aquatic organisms are evaluated by toxic tests. The pesticide enters the body tissues of the fish that affects physiological activities. Chlorpyrifos (CPF) is a commonly used organophosphate insecticide that causes toxicological effects in aquatic organisms especially

in fish. CPF is activated to its oxon metabolite by cytochrome P450 to become toxic and also inhibits the AChE activity. Half-life of CPF is 25.6 days (water pH 7.0), 30 days (soil), 60 days (less alkaline soils) and weeks or months (indoors). CPF passes via air drift of surface run-off into the surrounding waters and gets accumulated in different aquatic organisms. Environmental Protection Agency (EPA) estimated that average CPF level of surface waters in America is around 0.026–0.4 $\mu\text{g L}^{-1}$. The impact of the CPF on the fish as follows: decrease in fertility, altered sex ratio, reducing hatching rate, produce neurotoxic effects and inhibits the AChE activity. Also, different types of alteration are occurred in haematological, biochemical and histopathological parameters. Due the bioaccumulation properties the human beings are dangerously affected by the Chlorpyrifos.

TOXICITY EFFECT OF PROFENOFOS ON PHYSIOLOGICAL PARAMETERS OF *Pangasianodon hypophthalmus* FINGERLINGS

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ABSTRACT

Profenofos is a widely used organophosphate pesticide and toxic to aquatic organisms including fish. The present study was conducted to determine the toxicity effect of Profenofos on physiological parameters of fingerling of *Pangasianodon hypophthalmus*. The static lethal toxicity test of profenofos was carried out on fingerlings exposed for 96 h was found to be 0.022 ppm. The effect of two sublethal concentrations of profenofos i.e 0.0022 and 0.0044 ppm (1/10th and 1/5th of LC₅₀) respectively were studied on physiology of striped catfish fingerlings for a period of 30 days. Physiological parameters such as Oxygen consumption rate, Oxygen: Nitrogen ratio and food consumption rate decreased significantly ($P < 0.05$) whereas, Ammonia-N excretion rate increased significantly ($P > 0.05$) in both sublethal group of profenofos as compared to control group. The present study suggested that sublethal exposure of profenofos alters the physiological parameter of fingerling of striped catfish, *Pangasianodon hypophthalmus* which exerts stress on.

STATUS OF TRADITIONAL AGROFORESTRY PRACTICES AND ITS ROLE IN FOOD SECURITY IN REMOTE LANDSCAPES OF ARUNACHAL PRADESH, INDIA

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ABSTRACT

Arunachal Pradesh, the largest state of North-eastern region of India, is inhabited by diverse tribal communities with rich indigenous knowledge, tradition and culture. The tribal communities are associated with both TAFs (traditional agroforestry systems) and *jhum* cultivation for many generations. Indigenous knowledge on farming practices by the thriving tribal communities in the remote and hilly terrains are believed to have been evolved by trial-and-error methods since ages and passed to younger generations orally. Agroforestry systems

in the state are largely characterized by the diverse plant species grown in different regions across the state. The present form of traditional agroforestry practices in the state are believed to have transformed from *jhum* practices which have lost its popularity in recent times in many regions across the state due to various social and environmental constraints. Adoption of agroforestry by the tribal communities had led to the upliftment of livelihood and socio-economy and its role in local food security is imminent. An extensive study involving 300 farmers practicing *jhum* and TAFs was carried out in 3 districts, viz. Tirap, Namsai and Lower Dibang Valley districts of Arunachal Pradesh to assess the floral diversity structure and imperatives of traditional agroforestry practices towards local food security and constraints. About 150 tree-crop species grown in traditional farming systems were recorded including economically important and medicinal plants. The study sites were largely inhabited by the people of the Adi, the Deori, the Sonoawal-Kachari, the Tai-Khampti, the Mishmis, the Nocte and Tutsa communities. The major constraints hampering the adoption of agroforestry systems were documented along with the status of food security in the study sites. Major components of traditional agroforestry systems and tree-crop combination for different climatic zones in the study area were also studied.

Keywords: *Traditional agroforestry, jhum, food security, species diversity, Arunachal Pradesh, indigenous tribe.* fish.

AGRONOMIC APPROACHES TO MITIGATE THE CLIMATE CHANGE AND FOOD SECURITY

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ABSTRACT

Climate change as a change in the state of the climate that can be identified by changes in the mean and or the variability of its properties, and that persists for an extended period, typically decades or longer. Anthropogenic causes like burning of fossil fuel emits CO₂, methane emission from agricultural land, burning of crop residues, nitrous oxide emission from agriculture and industrial sector, release of CO₂ due to forest fire, ultimately leads to the climate change. The agricultural sector is facing a significant challenge to provide food security for 9 billion people by the year 2050, while also protecting the environment and enhancing function of global ecosystems. For every 1°C rise in temperature the decline in rice yield would be about 6%. Therefore, different agronomic approaches must be taken are into practice to mitigate the effect of climate change.

Direct seeded rice (DSR) is one of the agronomic approaches to reduce the emissions of CH₄ because it uses less water during initial cropping. Drip irrigation (DI) along with Transparent mulch (TM) excelled at yield, water use efficiency as well as water requirement. There is a continual drive to conserve water and improve irrigation efficiency in agriculture, especially in regions where water resources are limited and regulated. Mulching is one cultural practice which can be used to reduce water needs. To optimize the efficiency of C sequestration in agriculture, crop rotation, intercropping, cover cropping, etc., play a critical role by influencing optimal yield, total increased C sequestered with biomass, and that remained in the soil. Agroforestry products can also make a major contribution to the economic development of the millions of poor farmers by enhancing food security. Lastly, Climate smart agriculture, using climate resilient crop varieties, micro irrigation system, agroforestry, integrated farming system etc., will help in food security as well as mitigation of climate change.

Keywords: Agroforestry, agronomic approaches, climate change, carbon sequestration, direct seeded rice (DSR), food security.

WASTE TO WEALTH: A SOLUTION FOR ARECA WASTE MANAGEMENT THROUGH AGRI-STARTUP

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ABSTRACT

Areca nut is extensively being cultivated in the state of Karnataka, India in an area of 2.61 lakh hectares with annual production of 3.82 lakh tonnes. It has provided enormous employment in primary, secondary and tertiary sectors of the economy. About three million farmers are reliant on areca nut enterprise for their livelihood. Areca nut cultivation in the state was restricted to traditional belts covering Dakshina Kannada, Uttara Kannada, Udupi, Chickmagalur and Shivamogga districts. After 2000, Areca nut has expanded even in the non-traditional belts like Chitradurga, Davangere, Tumkuru at an exponential rate replacing annual crops like paddy, maize, chilli, cotton etc. Areca nut has emerged as a lucrative enterprise among farming community. It has replaced quite a large area under paddy in Karnataka is a cause of concern from the view point of food and fodder security. The reason for the transition is profitability and lesser management required for areca nut crop. Dried and processed areca nut is the marketable produce from areca nut garden while various by-products such as areca leaf sheath, areca husk, trunk of areca palm etc. could also be utilized for economic purposes. Areca leaf sheath could be used for manufacturing of bowls, plates, spoons etc. The sheath which was wasted by farmers in the field has found utility in agro based Industries. Umpteen number of areca leaf plates and bowl manufacturing units of varies scale have mushroomed in the hinter land. Their emergence has escalated demand for leaf sheaths which was otherwise wasted by farmers. Enormous supply of raw material in the state could be observed due to exponential rate of growth in area under areca nut. The existing areca leaf plates and bowls industries alone will not absorb the available raw materials. Hence, entrepreneurs have room to think over other alternative usage of such raw materials. The flagship programme / scheme of Prime Minister of Government of India viz., Start-up India has provoked entrepreneurs / innovators in that direction. The present study aims at economic evaluation/assessment of a start-up named Bhoomi Agri Venture involved in utilization of areca leaf sheaths in manufacturing of palm leather. The obtained palm leather will be further processed into diary covers, vanity bags, indoor slippers etc. The innovation lies in manufacturing of palm leather in a sustainable manner without use of chemicals and without causing environmental pollution in an organic way. Thus, the present study is a modest attempt to evaluate the economics of form utility involved in conversion of areca leaf sheath which is actually a waste material lying in the areca nut garden to wealth in the form of palm leather which serves as raw material in production of varieties of first order goods vegan products like slippers, vanity bags, diary wrappers etc. The capital investment made on such venture was elicited from the entrepreneur, input use pattern in manufacturing of above-mentioned products, costs incurred towards human labour, raw material, electricity, biodegradable gum, biological solution etc was also elicited using an interview schedule. The economics of manufacturing above mentioned products was estimated following enterprise budgeting technique. The economic viability of the investment on the venture was examined estimating discounted cash flow techniques like Benefit cost ratio (BCR), Net present worth (NPW) and modified internal rate of returns (MIRR). Capital budgeting technique was performed considering the discount rate of 12 percent and length of cash flow streams as ten years. SWOT analysis was performed using Analytical Hierarchical Procedure (AHP). The SWOT analysis enables entrepreneur in identifying crucial component within SWOT and crucial factor within each component of SWOT. The economics of indoor

slippers, vanity bags and diary covers were worked out considering 12000 pairs, 3600 bags and 120000 diary covers. Arecanut growers realized total returns and net returns Rs. 40000 and Rs. 38000 respectively from the sale of areca leaf sheaths @ Rs. 2.50 per sheath. The average cost incurred in manufacturing of slipper worked out to Rs. 83.78 while profit accrued per pair came to Rs. 116.22. The average cost of production of diary covers inclusive of diary came to Rs. 223.02 while the net returns realised from use of areca leaf sheath for manufacturing of diary covers came to Rs. 76.98. From vanity bags, owner of the startup realised net returns of Rs. 253.52 per bag incurring an average cost of Rs. 346.48 per bag. The capital budgeting analysis indicated positive and substantial Net present worth (NPW) of Rs. 7.2 crores, Benefit cost ratio (BCR) of more than unity and modified internal rate of returns of 134 percent. All the indicators clearly reflect the economic viability of the venture. SWOT analysis performed using Analytical hierarchial process clearly indicated that Strength occupies first rank with importance degree of 0.495 followed by opportunities at 0.35, threats at 0.10 and weakness at 0.05.

Keywords: Enterprise Budgeting, Arecanut, Palm leather, Startup, Leaf sheath

DESIGN AND FABRICATION OF APPARATUS FOR LOTUS FIBER EXTRACTION – A WAY TO QUALITY AND PRODUCTIVITY

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Purpose

India stands second largest in the horticultural crop production. Lotus (*Nelumbo Nucifera Gaertn.*) is an aquatic perennial plant that is grown abundantly across the India. Every part of the plant like seeds, rhizomes, flowers, stamens has a variety of applications. Lotus crop generates huge amount of waste. After plucking the flowers, it was found that petiole which is part between flower and underground stem are left in the wetland as a “waste”. This waste petiole contains precious fibrous material which has a excellent properties to be used in textiles. Lotus fiber is extracted manually by some peoples in Myanmar and recently in Manipur. But manual extraction process sounds time consuming and it is very difficult to take it forward for mass production. As the fiber is very soft and fragile so developing some mechanical process for extraction is challenging. The main aim of the research paper is to design and fabricate the machine in which the extraction and spinning can be done together simultaneously.

1. Objectives

1. To fabricate the machine for lotus fiber extraction.
2. To develop different counts of yarn and test its properties

Materials and Methods

a). Design and Fabrication of machine – A machine contains two sections - one is input roller and another is the output roller. The input roller is the feeding mechanism in which the petioles are inserted. In the output roller bobbin is attached which collects all the extracted fiber. The machine has a speed regulator. In the different speed, it can produce various kinds of yarns. The machine was designed by the researcher and it was developed in collaboration with Mechanical Engineer – Er. Dhaval Raval Vadodara, Gujarat. For the machine, Researchers has got an Indian Patent IN 201921032058.

b). Development of yarns in different RPM :- By synchronizing the speed of both the rollers that is input roller and output roller, three different RPM that is low, medium and high were

optimized and different counts of yarns were developed for various end uses. Speed of both the rollers were evaluated by tachometer.

c). Testing of yarns:- All the three category of yarns that were produced in three different RPM were subjected for the following test: Fineness test was done by the researcher itself in Textile Testing laboratory, Department of Clothing and Textiles, Faculty of Family and Community Sciences, The Maharaja Sayajirao University of Baroda. Yarn strength test was done in Textile testing laboratory, Department of Textile engineering, Faculty of Technology and Engineering, Kalabhavan, The Maharaja Sayajirao University of Baroda. Both the test was done as per ASTM D 885.

Results and Discussions

It was observed that machine is successful in extracting the precious fibers from lotus petiole without compromising the quality. In the manual extraction process the fibers are extracted and again for improving its quality its is further spinned in the Charkha. The fabricated machine is designed in such a way that it can extract the fibers and simultaneously the twist can be provided for strength. The machine has a provision of obtaining different counts of yarns in three different optimized RPM that is low, medium and high. For operating the machine one person is required. Optimized speeds of rollers and different counts of yarns obtained in the respective RPM along with the strength are are mentioned in Table 1.

Table 1. Different types of yarns produced in varying speeds of input and output roller of fabricated machine

Sr.No	RPM of Input Roller	of	RPM of Output Roller	of	Count of Yarns (Count)	of	Yarn strength Load (gf)	Elongation (mm)
1	517		92		74		78.028	5.88
2	315		80		158		194.46	3.326
3	270		75		189		223.41	2.697

It was observed from Table 1. that fine count yarn obtained in highest RPM consist of good elongation of 5.88 mm which can be used for weaving fine fabrics and also due to the more fineness it can also be used for making knitting fabrics. In the lowest RPM the strength is excellent of 223.41 gf but it has less elongation of 2.697 because of imparting less twist by input roller. Yarn extracted from the fabricated machine was more uniform and even as compare to hand extracted yarn.

Conclusions

Fabricated machine will be a great help globally in tedious lotus fiber extraction process. Both the operation – extraction and spinning can be done simultaneously in one apparatus. Finest count yarn that is 70’s used in the apparels can be easily produced from this fabricated machine.

Keywords: Lotus, Petiole, Machine, Fibers, Yarns, RPM (Runs per minute), Strength, Fineness.

CONSERVATION AGRICULTURE: A SUSTAINABLE APPROACH OF FARMING

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ABSTRACT

A method to managing an agro-ecosystem for greater productivity and profitability while protecting the environment and natural resources is called conservation agriculture. The sustainable use of soil and land resources includes a concern for food security. Crop rotation employing zero tillage, minimal tillage, and integrated crop management practices is the foundation of conservation farming. Conservation agriculture, which refers to the preservation of energy in many forms for cultivation, has grown in importance as a way to increase farming's profitability by reducing variable costs, improving resource use effectiveness, and improving soil qualities. Agriculture that is resource-efficient is another name for it. The fundamental tenets of conservation agriculture include: a) minimal soil disturbance enabled by no till/reduced tillage; b) maximum soil cover enabled by mulch, residues, or live mulch; and c) appropriate crop sequence or crop rotation (spatial and temporal) for enabling the agriculture system to improve soil conditions and production gets better and better year after year with lower cost. Conservation agriculture is defined as minimal soil disturbance (no-till) and permanent soil cover (mulch) combined with rotations, is a recent agricultural management system that is gaining popularity in many parts of the world (FAO). Long-term, these techniques aid in reducing soil erosion and enhancing soil fertility, quality, and water infiltration. Additionally, it lowers labour requirements, boosts output, enables earlier planting, and offers improved drought tolerance due to improvements in the physical qualities of the soil. Adoption of conservation agriculture by Indian farmers has a great potential to convert the whole production system productive, profitable and sustainable in long-run.

Keywords: Conservation agriculture, Farming, Profitability, Sustainability,

CANNIBALISM IN INSECTS

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ABSTRACT

Cannibalism refers to killing and consuming an individual of the same species as food. It is generally known as intraspecific predation, which is best known in predatory species, but it occurs in some detritivores and herbivores as well. Cannibalism is common in carnivorous insects; however, it has also been reported in around 130 non-carnivorous insect species (Richardson et al., 2010). Mainly four types of cannibalism are found in insects viz., i) Infanticide and Ovicide ii) Regulated self-cannibalism (Autophagy) iii) Sexual cannibalism iv) Parental cannibalism. Among this sexual cannibalism is the most common and prevalent wherein a female organism kills and consumes a conspecific male before, during or after copulation (Santana et al., 2012). Polyandry may provide females with benefits that directly affect their condition and fecundity and/or enhance the quality of their offspring. In polyandrous species exhibiting sexual cannibalism, females gain considerable nutritional benefits through consuming a mating partner (Welke and Schneider, 2012). Food, density, physiological stress, behaviour and availability of victim may increase the rate of cannibalism in insects. In general, larger individuals are seem to be more cannibalistic (Richardson et al., 2010). Barry et al. (2008) studied on a moderate size dimorphic species such as praying mantid

Pseudomantis albofimbriata with relatively larger males benefit the cannibalistic females to gain nutritional benefits to translate into increased fecundity. Here, cannibalistic females substantially improve their body condition and subsequently produce heavier egg cases than their non-cannibalistic counterparts. Cannibalism can be adaptive by improving growth rate, survivorship, vigour and fecundity. It also plays an important role in regulating population density and suppressing population outbreaks, stabilizing host plant-insect relationships and reducing parasitism rate. Though cannibalism could bring enormous benefits to insects in terms of quality food, reduction of competition and surviving from food shortage, it is still not very common. Cannibalism could be widespread, but not universal.

Keywords: Cannibalism, carnivorous, Insects

ASSESSMENT & MONITORING OF RECLAIMED COAL MINE-DEGRADED LAND: A TOOL FOR ENSURING ENVIRONMENTAL SUSTAINABILITY

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Mining of mineral resources particularly coal disrupts the ecosystem functioning and alters the land use pattern of the area by removing the surface soil and piling it over unmined areas which creates overburden dumps. Due to unfavourable Physico-Chemical conditions for plant growth, restoration and reclamation of this degraded area are highly challenging. A successful restoration programme can help in maintaining environmental sustainability by rehabilitating the ecosystem and mitigating climate change. The present study was focused on the evaluation method to obtain the overall reclamation effect of coal mines on the environment and can be used as a monitoring tool for maintaining sustainability.

METHODOLOGY

A field study was conducted on the consequence of reclaimed overburden dumps (1, 3, 5, 7 and 9 years) of the Kusmunda open-cast project of Korba coalfield, Chhattisgarh, India. A phytosociological survey has been accompanied and a random quadrat sampling method was adopted for vegetation analysis in different reclaim sites and the change in vegetation cover was observed using the Normalized Difference Vegetation Index (NDVI).

RESULT

Reclamation of land is the process of enhancing land so that it is used as a tool for mitigating climate change and environmental rehabilitation. Presently, the total lease-out area of the open cast project is 16.72 km² in which area under biological reclamation (plantation on backfill and overburden dumps) is 4.86 km² (29.07%). The study area consists of a total of 41 tree species belonging to 36 genera and 19 families. The most dominant native tree species present in the area were *Dalbergia sissoo*, *Bauhinia spp.*, *Phyllanthus emblica*, *Tectona grandis*, and *Terminalia arjuna* while exotic tree species were *Peltophorum spp.* and *Leucaena leucocephala*. The result shows that the Shannon diversity index was more in the 1-year reclaimed area (2.56) as compared to other years. NDVI value helps in monitoring the vegetation cover over a period which indicates that the vegetation health was improved over the year.

CONCLUSION

The biological reclamation of the damaged coal mine area using tree species was found to be more promising because it has the potential to induce soil formation, improve biodiversity, reduce erosion, enhance organic matter, start nutrient cycling, reduce pollution, and improve

the overall aesthetics of the forest. This study performed a preliminary assessment of the vegetation used in mine restoration, offering a method for continuous monitoring and assessment of reclamation.

Keywords: Reclamation, Sustainability, Overburden dump, NDVI and Pollution

EXTERNAL TRAITS OF CHICKEN EGG FROM DIFFERENT BREEDS REARED UNDER BACKYARD PRODUCTION

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ABSTARCT

The present study was conducted at the Poultry Research and Training Centre, Sardar Vallabhbhai Patel University of Agriculture & Technology, Modipuram, Meerut- Uttar Pradesh, India. 50 eggs were collected for each breed from the Farmers door rearing these chickens under backyard Production System. The same (n=20) was also collected from the university farm at PRTC, SVPUAT to compare the egg quality traits under both farm conditions as well as field conditions. The eggs of CARI Hitkari, CARI-Upkari and CARI-Devendra were predominantly dark brown in colour. However, there were variations in colour from dark to light brown in these breeds both in farm as well as field conditions. The eggs of CARI Sonali and CARI Priya were white in colour in all eggs. Similar variation in egg colour was also observed in eggs collected from non-descript layer birds reared by local farmers under village conditions. The eggs were mostly clean in all varieties of chicken reared under backyard production system. The highest percentages of un-clean eggs were found in CARI-Priya birds both in farm as well as field conditions. but the major issues are hen health and nutrition; The specific gravity of eggs from different varieties was found to be similar in all birds. Haunshiet *al.*,(2006) compared certain egg quality traits of Vanaraja and White Leghorn chicken and found higher values of specific gravity (1.098 and 1.086, respectively) in these eggs. Similarly Singh *et al.* (2000) reported higher values in white leghorn chicken. There was no effect of management on specific gravity of egg, all eggs either from field or from farm having similar values of specific gravity. Similarly, the interaction effect was also non-significant (P<0.05).The egg specific gravity could be correlated to quality of the shell which determines important traits such as breaking strength, thickness, pore density, and elasticity. Hence, egg specific gravity may serve as an indicator of egg shell quality. The specific gravity of eggs is also related to porosity and hatchability of egg. At the same time, measurement of specific gravity is one of the cheapest, quickest and non-destructive methods of assessing shell strength. Due to its relation to shell strength, egg specific gravity defines the shell internal structure and microstructure, which affect the hatchability success. Eggs of proper specific gravity, ranging from 1.07 to 1.10 g/cm³, are usually properly shaped, which is particularly important in the case of hatching eggs. The results of present study indicate that the specific gravity of egg lye within the range and will hatch well.

Keywords: Egg quality traits

CLINICAL AND BIO-CHEMICAL PROFILE OF BREAST CANCER PATIENTS

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ABSTRACT

The carcinoma of breast represents the most severe and fatal malignancy in women all over the world. The incidence and mortality rate is increasing in developing countries as compared to developed countries. The aim of this study was to know clinical and biochemical profile of breast cancer patients. In the present study 240 breast cancer patients were selected for the study. All the patients complained presence of lump while majority of the overall patients (83.3%) felt weakness; followed by feeling of anorexia (55.8%); nausea and vomiting (44.6%); and pain (41.3%). In addition, discharge from nipple (17.1%); swelling in and around the breast (9.2%) were also present in the breast cancer patients. The mean value of haemoglobin, TLC, blood urea and serum creatinine were 11.32 ± 1.57 , 7705.21 ± 2179.93 , 23.33 ± 4.42 and 0.97 ± 0.40 respectively. In conclusion, these results suggest that clinical and biochemical parameters were important diagnosis tool for disease monitoring.

Keywords: carcinoma of breast, clinical and biochemical.

LIVESTOCK AND FODDER STATUS IN UTTAR PRADESH, INDIA

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ABSTRACT

Livestock and Fodder Status in Uttar Pradesh were reviewed livestock census 2019, shows about 67784.8 thousand livestock population of which 18789.3 thousand were cattle, 33016.8 thousand buffaloes, 14480.0 thousand goats, 984.7 thousand sheep and 408.7 thousand pigs in Uttar Pradesh state. As compared to previous livestock census of 2012, the latest census 2019 showed an increase in exotic/crossbred population by 64.6 percent and decrease in indigenous cattle by 19.3 percent whereas buffalo population increased by 7.8 per cent and goat population decreased by 7.1 per cent. 19463 thousand tonnes milk produced from buffaloes followed 9691 thousand tonnes by cows. Uttar Pradesh produced 30519 thousand tones of milk in 2018-19 but the productivity is a major concern (7.4 and 3.1 kg/day from cross breed/exotic and non-descriptive/indigenous breeds, respectively). The milk yield of an animal depends upon its breed and management practices. The poor quality of feed and fodder is also an important reason for the low yield of milk. In various agro-climatic zones of the state the feed available to the animals is of poor quality and lesser quantity. The state has a shortage of green fodder and compounded feed to the extent of about 38 percent and 47 percent respectively. Fodder crops are the cheapest source of feed for livestock but the area under fodder cultivation. The declining area and deteriorating quality of natural grassland has further compounded the problem. Current requirement of green fodder in state is 1499.6 lakh tones, while the availability is only 1145.0 lakh tones. Thus the availability of green fodder is hovering around 76.4 percent in this decade. If this supply is increased, the milk production in the state will also increase and the income of the farmers will also increase. The annual dry fodder requirement of Uttar Pradesh state is estimated around 735.1 million tonnes of which, only about 511.4 million tonnes is available which is about 69.6 % of the actual requirement. Occurrence of

drought and flood are regular feature in many districts of the state which is further aggravating the deficit of feed and fodder. Despite this feed constraint, milk production in the state has exhibited increasing trend because of more dependence on concentrates which is much more costly than green fodder. Looking at the vast gap between the demand and supply, it becomes necessary to put adequate efforts to transfer the potential technologies developed by various research organizations of the state and country to farmer's field in order to increase the production and productivity of good quality fodder. Therefore, there is an urgent need of development fodder security plan for round the year fodder supply in different agro-climatic zones of the state.

Keywords: Livestock and fodder UP

SPEED BREEDING: A TOOL TO ACCELERATE CROP IMPROVEMENT PROGRAMME

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ABSTRACT

It is anticipated that the global human population reach nearly 9.9 billion by 2050. The dynamic climatic fluctuation leads to rise in temperatures, frequency of floods and drought which causes the resurgence of novel diseases and more frequent pest outbreaks. Hence, there is an urgent need for increasing the current rate of genetic gain of critical food crops to safeguard global food security. Breeding crops in a traditional way requires a lot of time, space, resources for selection, and the subsequent crossing of selected plants. One of the major barriers to the advancement of plant breeding and research is the length of the seed-to-seed cycle. In this background, speed breeding, relying mainly on photoperiod extension, temperature control, and early seed harvest, has the potential to accelerate the rate of plant improvement. The Speed Breeding is the technique which allow breeders to advance the crop generation in a shorter period of time. Flexibility in Speed Breeding methodology allows them to bring into line and integrate with various research purposes including population development, genomic selection, phenotyping, and genomic editing. Even while Speed Breeding has been used widely in plant phenotyping and the pyramiding of many features to create new crop varieties, there are some obstacles and restrictions that prevent its widespread usage in a variety of crops. But by improving the Speed Breeding methodology for vital food crops and effectively integrating them into plant breeding pipelines, the current limits can be overcome.

Keywords: Genomic selection, genome editing, phenotyping, and speed breeding.

A COMPARATIVE STUDY OF COLLECTED WATER SAMPLES FROM KUSHESHWARSTHAN CHAUR WITH EFFECT OF SEASONAL VARIATIONS

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ABSTRACT

An experiment was conducted to a comparative study of physical and chemical characteristics of collected samples of water from two different sites. The water reservoirs and surrounding area with flora and fauna are directly and indirectly related with climatic changes. There are

variations in physicochemical characteristics of collected soil and water samples on the basis of seasonal alterations. Collection of samples were done from 15 spots of water reservoirs of Kusheshwarsthan Chaur. The parameters that were calculated is Temp. (OC), pH, Conductivity (mhos/cm), Dissolved O₂ (mg/l), Free CO₂ (mg/l), Carbonate alkalinity (mg/l), Bicarbonate alkalinity (mg/l), Chloride (mg/l), Total hardness (mg/l), Calcium hardness (mg/l), Calcium (mg/l), Magnesium (mg/l), Sodium (mg/l), Potassium (mg/l), Silicate (mg/l), Phosphate (mg/l) Nitrate (mg/l) during experimental-work. The high value of dissolved oxygen coupled with low biochemical oxygen demand and other nutrient levels indicate that the water body is moderately oligotrophic in nature. The diversity of present flora and fauna is directly affected with seasonal alterations. To save this diversity and to develop a sustainable aquatic ecosystem practices and proper documentation leading to diversity information system is an urgent need. **Keywords:** Seasonal alterations, Physicochemical characteristics, pH, Conductivity, Dissolved O₂, Biochemical Oxygen

CRITICAL ANALYSIS OF NON-TIMBER FOREST PRODUCTS (NTFPS) OF NEPAL AFTER 2000.

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ABSTRACT

Nepal Himalayas have been known as a rich source for valuable medicinal plants since Vedic periods. Traditional plant use in Nepal has been documented for millennia. The importance of plants as medicine has not diminished in any way in recent times, and traditional medicines are still the most important health care sources for the vast majority of the population. The Non-timber forest products (NTFPs) are important for sustaining rural livelihoods and facilitating rural economic growth, fostering rural poverty alleviation and enhancing biodiversity conservation are well known in Nepal. There are numerous NTFPs in Nepal from low land Terai to the snowcapped Himalayas, but their assessment and proper utilization have not been conducted scientifically. The Master Plan for the Forestry Sector (1989) has accorded high priority for NTFPs, but recognizing potential NTFPs is a major challenge. This is a desk top research which focuses on those NTFPs which are being utilized in Nepal for the last 20 years. The study is being conducted by using the most popular electronic databases, including Web of Science, Science Direct, Google Scholar, Scopus, Research gate and Springer Link. We have used different **Keywords** such as NTFPs, Nepal, uses of NTFPs, Himalayas, Hindu-kush, Terai. Besides these, the policy documents of NTFPs of Nepal and other unpublished documents related to NTFPs were being studied for our research. The collected information was then systematically reviewed for logical discussion and draw valuable conclusions as well as recommendations. Many different categories of NTFPs were identified in the Nepal including a range of provisioning services (fuelwood, vegetables, fruits, fodder, bamboo products, fiber, agricultural tools, and medicinal plants) and cultural services (ornaments, and ritual products). Also, NTFPs provide regulating services such as controlling soil erosion and moisture content in the soil. The most important is the need for inventory and research on NTFP species in widespread use. There are some issues regarding species banned under various other National Acts; the lack of marketing information and capacity building; administrative barriers; royalty rates; and illegal harvesting. Only blue print won't work well. Thus, clear policy on NTFPs should be the government priority.

Keywords: NTFPs, rural income, desktop review, multiple uses, vegetables, administrative barriers.

STUDIES ON VARIABILITY AND EFFICACY OF DORMANCY BREAKING METHODS IN RICE (*Oryza sativa* L.)

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ABSTRACT

In the present investigation, 32 genotypes of rice germplasm collections, including three checks, namely, Sarjoo-52, NDR-2065 and NDR-359 showing wide spectrum of variation for various characters, were evaluated in under timely sown and irrigated conditions during *Kharif*, 2019. The field experiment was conducted in Randomized Block Design (RBD) at the Crop Research Station (CRS) Masodha, Ayodhya, farm and obtained freshly harvested 7 rice varieties namely (NDR-359, BPT-5204, Sambha Sub-1, NDR-2065, NDR- 3112-1, Sarjoo-52, Narerndra Lalmati) to estimation of dormancy duration and effective method of dormancy breaking were tested in Seed Testing Laboratory of the Seed Technology Section, Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya (U.P.). The experiment was conducted in randomized block design along with three replications in normal soil under irrigated condition during *Kharif* 2019. Each entry was grown in 5 meter long single row plots with spacing 20 cm and 15 cm with in row to row and plant to plant, respectively.

The high magnitude of genotypic and phenotypic coefficients of variation were observed for L/B ratio, plant height, days to 50% flowering, days to maturity, seed yield per plant and 1000-seed weight, indicating thereby, substantial scope for improving in this character after hybridization and subsequent selection the high estimate of heritability with high genetic advance in per cent of means were observed for L/B ratio, days to 50% flowering, days to maturity, seed yield per plant and 1000-seed weight. The highest seed yield per plant was observed by Dilavra (40.64 g), while the lowest seed yield per plant was given by Mangla (23.06 g). The general mean calculated for this character (31.41g). Ten genotypes, namely Dilavra, Jaya, Pasharih, Bansfool, Ladeshwar, Ratna, Vijeta, Hazardana, Singra Rambhog-1 and Naina were significantly produced seed yield per plant.

The variety Sambha sub-1 recorded a very strong seed dormancy of 28 days followed by Sarjoo-52, Narerndra Lalmati with a dormancy of 14-21 days and a few more varieties viz., NDR-359 and BPT-5204 had dormancy more than 14 days. Most of the other varieties recorded dormancy from 7 days NDR-3112-1 (Prakhar) and NDR-2065 after harvest. It was observed that the longer duration varieties exhibited a longer dormancy period when compared to early and medium duration varieties. The seven varieties were observed for efficacy of chemical against breaking the dormancy in paddy varieties. The most effective variety was observed NDR-3112-1 (Prakhar) and NDR-2065. Its variety superior than the other five varieties. The most effective treatments were found in HNO₃ @ 1.5% followed by GA₃ @ 100 ppm is all over six treatments. It gets good result in the seed germination (%), speed of germination (%), shoot length (cm), root length (cm), seedling length (cm), seedling dry weight (gm), seed vigor index (I) and seed vigor index (II). Considering the overall result, it is apparent that certain information obtained here will help in future for improving development of new varieties.

IPR UTILIZATION IN AGRICULTURE ISSUES AND CURRENT CHALLENGES

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ABSTRACT

IPR means Intellectual Property Rights, which make sure that everybody has their own rights for their creativity that means for own ideas no one can steal from them, in a single term of course we can describe as biopiracy. As we all know that bio piracy has been going on increasing in all the sectors, like agriculture, animal, plant breeding rights, etc., In case of IPR all the copyrights, trademark, patents, trade secret all these comes under the rights, each of the term are having many defines that means to say something the one who had their own idea and they will implement that will their own copyright which cannot be steeled by others like for suppose if we consider agriculture a plenty of plant varieties were released all comes under plant breeder rights because the one who will introduce the variety and distribute to the farmer that is his or her rights and all the patent activity belongs to person and the symbol that is provided through the trade mark which is not copied from other sources, also for everything we need to protect and this can protected by trade secret because of biopiracy where mostly people are thinking to copy the ideas of other people. In agriculture if we consider a part called biotechnology which is playing lead role in introducing transgenic plants which majorly consumed by other countries instead of India, because of some reasons India has not accepted the transgenic crops because of some reasons and some IP issues accept cotton but not consumable crops. But IPR is applied in all the countries without a right nobody can go through that particular variety whether it through traditional breeding or molecular breeding. Even for raising a crop also every farmer needs some permission from government, if anyhow any misconception was their then legal action are taken by the government. If a farmer wants to do some investment to his crop, then definitely, he will seek government all these comes under IP issues and in return he has to clear the interest that will comes under challenge, whatever we do also there will be idea, creativity, own rights all of these comes under these IP rights. All these developments, creation and ideas of one who will invent all will comes these IPR rights in all the sectors.

Keywords: Intellectual Property Rights, Components of IPR, Agriculture Issue, Challenges,

EFFECT OF SULPHUR AND PHOSPHORUS ON GROUNDNUT- A REVIEW

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Abstract

The Fabaceae family includes groundnut (*Arachis hypogaea* L.), popularly known as peanut or the "king" of oilseeds. The term Groundnut is sometimes referred to as "earthnuts," "peanuts," "goober peas," "pindas," "jacknuts," "pinders," "g-nuts," and "monkey nuts." Due to its economic and nutritional benefits, millions of small farmers cultivate it as a valued cash crop. Its kernels are a good source of protein (43.55%) and edible oil (25.28%). India produces 6.73 million tonnes of groundnuts on 4.73 million hacters, with a yield of 1422 kg ha⁻¹ (2018-2019). Since it enhances nodulation, Biological Nitrogen Fixation, increases the residual nitrogen content of the soil and greatly contributes to healthy and effective root growth, phosphorus nutrition is also crucial for groundnut crops. Phosphorus is a key component for increasing

yields and other biochemical characteristics, such as the protein and oil content of groundnuts. Higher amounts of phosphorus rate can boost phosphorus utilisation efficiency. Sulphur is essential for the growth of seeds and enhancing oil quality. Since groundnuts are abundant in protein and lipids, they have a substantial need for sulphur as a crop. Groundnut was exposed to sulphur levels ranging from 20 to 70 kg/ha and the level at 60 kg/ha resulted in taller plants, higher leaf area index production, pod yield, and better oil quality. The goal of the study was to determine how phosphorus fertilisation affected groundnut yield, nutrient uptake, usage efficiency, and biochemical composition.

Keywords: Groundnut, Nutritional benefits, Economic, Phosphorus, Sulphur

STUDY ON CREDIT UTILIZATION PATTERN AND REPAYMENT BEHAVIOUR OF AGRICULTURAL LOAN BORROWERS THROUGH COMMERCIAL BANKS

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ABSTRACT

Though agriculture provides employment to about three-fourths of the working population and contributes the major share of the national income, yet, in India, it is more a way of life than a pure business. As Cultivation becomes uneconomic, the cultivator is forced into a hand-to-mouth existence, which, in turn, presses him to borrow either for consumption or for investment in agriculture. Individual tend to use different credit utilization pattern for obtaining the technology which ultimately affects his repayment behaviour. For accepting any innovation by the farmers in varying socio-personal and farm situation, different types of credit utilization pattern are required. Thus by keeping this view the study was conducted in purposively selected Bundi district of Rajasthan. Total of 500 agricultural loan borrowers were formed the sample for the study. The primary data were collected through personal interview method with the help of pre-tested interview schedule, which was prepared on the basis of objectives of investigation and variables. The statistical tests and procedures were used for analyzing the data with the help of statistical tools like- mean, S.D., percentage, and Karl Pearson’s coefficient of correlation, multiple correlation and regression analysis. We found that that 47.20 per cent of borrowers had used their credit only for Agricultural productive purpose. It was observed that correlation coefficients in respect of social participation, sources of information, Cosmopoliteness, scientific orientation and risk preference were found positive and highly significant with credit utilization pattern of farmers. Co-efficient of determination value of 0.6112 with highly significant ‘F’ value revealed the significance of regression equation in the prediction of credit utilization of farmers. Out of sixteen traits viz., annual income, scientific orientation and risk preference were found positive and highly significant relationship with credit utilization pattern of farmers. In case of Repayment Behaviour, we found that 67.60 per cent borrowers paid their dues on time and to be called as “Regular” or standard borrowers It was observed that correlation coefficients in respect of sources of information, Cosmopoliteness, scientific orientation and risk preference were found positive and highly significant with repayment behaviour of farmers. Co-efficient of determination value of 0.5514 with highly significant ‘F’ value revealed the significance of regression equation in the prediction of repayment behaviour of farmers. Out of sixteen traits viz., caste, annual income, cosmopoliteness, scientific orientation and Risk preference were found positive and highly significant relationship with repayment behaviour of farmers.

STUDY ON CREDIT UTILIZATION PATTERN AND REPAYMENT BEHAVIOUR OF AGRICULTURAL LOAN BORROWERS THROUGH COMMERCIAL BANKS

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Introduction

Though agriculture provides employment to about three-fourths of the working population and contributes the major share of the national income, yet, in India, it is more a way of life than a pure business. As Cultivation becomes uneconomic, the cultivator is forced into a hand-to-mouth existence, which, in turn, presses him to borrow either for consumption or for investment in agriculture. Individual tend to use different credit utilization pattern for obtaining the technology which ultimately affects his repayment behaviour. For accepting any innovation by the farmers in varying socio-personal and farm situation, different types of credit utilization pattern are required.

Materials and Methods

Thus by keeping this view the study was conducted in purposively selected Bundi district of Rajasthan. Total of 500 agricultural loan borrowers were formed the sample for the study. The primary data were collected through personal interview method with the help of pre-tested interview schedule, which was prepared on the basis of objectives of investigation and variables. The statistical tests and procedures were used for analyzing the data with the help of statistical tools like- mean, S.D., percentage, and Karl Pearson’s coefficient of correlation, multiple correlation and regression analysis.

Results and Conclusion

We found that that 47.20 per cent of borrowers had used their credit only for Agricultural productive purpose. It was observed that correlation coefficients in respect of social participation, sources of information, Cosmo-politeness, scientific orientation and risk preference were found positive and highly significant with credit utilization pattern of farmers. Co-efficient of determination value of 0.6112 with highly significant ‘F’ value revealed the significance of regression equation in the prediction of credit utilization of farmers. Out of sixteen traits viz., annual income, scientific orientation and risk preference were found positive and highly significant relationship with credit utilization pattern of farmers. In case of Repayment Behaviour, we found that 67.60 per cent borrowers paid their dues on time and to be called as “Regular” or standard borrowers It was observed that correlation coefficients in respect of sources of information, Cosmo-politeness, scientific orientation and risk preference were found positive and highly significant with repayment behaviour of farmers. Co-efficient of determination value of 0.5514 with highly significant ‘F’ value revealed the significance of regression equation in the prediction of repayment behaviour of farmers. Out of sixteen traits viz., caste, annual income, cosmopoliteness, scientific orientation and Risk preference were found positive and highly significant relationship with repayment behaviour of farmers.

IN VITRO ANTIMICROBIAL ACTIVITY AND PHYTOCHEMICAL SCREENING OF LEAF EXTRACTS *Murraya koenigii* L

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Purpose

Plants have been one of the important sources of medicines since the beginning of human civilization. There is a growing demand for plant-based medicines, health products, pharmaceuticals, food supplements and cosmetics. *Murraya koenigii* commonly called curry leaf tree is a multipurpose tree and is a source one of the medicinal products.

Methods

The fully matured fresh leaves of *M. koenigii* were collected from college campus at Dr. L.K.V.D College, Tajpur, Samastipur, India. The leaves were washed thoroughly, shade dried and finely powdered. The dried powdered leaves were extracted with three different solvents such as water, acetone and chloroform. For aqueous extraction, ten grams of the powdered leaves were mixed with 100 ml distilled water, boiled for about two hours and filtered. Whereas acetone and chloroform extracts were prepared by mixing ten grams of powdered leaf samples with 100 ml of each solvent separately in mechanical shaker for 48 hours at room temperature. Extracts were then filtered, concentrated, dried and were stored in the refrigerator at 4°C for future use.

Results

Different parts of *M. koenigii* are used in folkloric medicine for the treatment of various diseases. It is proved to possess significant wound healing capacity and shows antioxidant activity with high degree of radical-scavenging properties. This article intends to provide an overview of the chemical constituents present in the crude leaf extracts of *M. koenigii* with special emphasis on their pharmacological actions. Qualitative phytochemical screening was carried out using the crude leaf extracts in three different solvents such as water, alcohol and chloroform. Phytochemical analysis of the extracts revealed the presence of glycosides, alkaloids, oils, saponins and flavanoids.

Conclusions

The present work highlights the possible use of *M. koenigii* leaf extracts as a source of antioxidants and as antibacterial agents that can be used to prevent enteric diseases. The study reveals that the results of extraction yield, total phenol and flavonoid compounds and bioactivity tests varied depending upon the type of solvent being used. The leaves of *M. koenigii* contain a considerable quantity of phenol - flavonoid compounds which were considered to be the major contributor for their antioxidant and antibacterial activities. Hence it can be concluded that the leaves of *M. koenigii* would direct to the establishment of some compounds that could be used to invent new and more potent antimicrobial drugs of natural origin. Therefore, future research should be addressed on the application of using *M. koenigii* leaves as natural remedied and to protect against infectious diseases

Keywords: *Murraya koenigii*, phytochemical analysis, antimicrobial

EFFECT OF GLOBAL WARMING AND CLIMATE CHANGE ON INSECT PESTS AND VECTORS

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Purpose

Although the estimates vary considerably, global warming stemming from man-made emissions, primarily from fossil fuel combustion could increase the surface temperatures by 2°C to 11°C in this century. The detailed study based on the computer model suggests that such warming maybe twice as catastrophic as previously thought. Global climate change, perhaps the single most pressing environmental problem putting a serious challenge to human security and survival.

Methods

Alarming and continuing increases in human populations precipitate the vicious cycle of environmental degradation, diseases, and poverty. Global warming will in the future, and is in all likelihood already triggering expansion in the range and incidence of insect pests and vectors. The hot climate makes insect pests, vectors and pathogens spread over a wider range and increase their survival rate.

Results

An increase of 1°C in surface temperature is estimated to correspond to a 10% increase in the incidence of new insect pests and vectors. Deforestation is one of the common factors in all developmental activities and it has been observed that deforestation has led to change in the feeding behavior of various insect pests. Re-emergence/Resurgence of many insect pest species due to microclimate changes is amazing. Insects are ectothermic and sensitive to precipitation.

Conclusions

The impact of global warming and climate change can be direct, through the influence of climatic factors on the insect's physiology and behavior, or indirectly mediated by host plants, competitors or natural enemies. Populations of insect pests like beetles and insect vectors in general and in particular mosquitoes are growing much faster because of the warmer wetter weather. If climate change continues at the pace it's going now, these species could take over certain ecological reasons and will affect our food security.

Keywords: Global warming, Climate change, Deforestation

BIOREMEDIATION OF AGRICULTURAL SOILS POLLUTED WITH PESTICIDES

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Purpose

Pesticides are chemical compounds used to eliminate pests; among them, herbicides are compounds particularly toxic to weeds, and this property is exploited to protect the crops from unwanted plants. Pesticides are used to protect and maximize the yield and quality of crops. The excessive use of these chemicals and their persistence in the environment have generated serious problems, namely pollution of soil, water, and, to a lower extent, air, causing harmful effects to the ecosystem and along the food chain.

Methods

About soil pollution, the residual concentration of pesticides is often over the limits allowed by the regulations. Where this occurs, the challenge is to reduce the amount of these chemicals and obtain agricultural soils suitable for growing ecofriendly crops.

Results

The microbial metabolism of indigenous microorganisms can be exploited for degradation since bioremediation is an ecofriendly, cost-effective, rather efficient method compared to the physical and chemical ones. Several biodegradation techniques are available, based on bacterial, fungal, or enzymatic degradation. The removal efficiencies of these processes depend on the type of pollutant and the chemical and physical conditions of the soil. The regulation on the use of pesticides is strictly connected to their environmental impacts. Nowadays, every country can adopt regulations to restrict the consumption of pesticides, prohibit the most harmful ones, and define the admissible concentrations in the soil. However, this variability implies that each country has a different perception of the toxicology of these compounds, inducing different market values of the grown crops.

Conclusions

The present study gives a picture of the bioremediation of soils polluted with commercial pesticides, considering the features that characterize the main and most used ones, namely their classification and their toxicity, together with some elements of legislation into force around the world.

Keywords: Pesticides, bioremediation, agricultural soil, environmental pollution, health effects

VALUE ADDITION OF FINGER MILLET (*Eleusine coracana* L.)

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ABSTRACT

Finger Millet (*Eleusine coracana* L.) could be a coarse cereal and a hardy crop, one in every of those crops which may stay unaffected in many conditions. The millet has high supermolecule, minerals and iron compared to different cereals. The regular consumption of millet could scale back the prospect of diabetic mellitus. millet contains organic compound essential amino acid that is lacking within the diets of voluminous the poor World Health Organization carry on starchy staples like cassava, plantain, rice, or maize meal. organic compound emulsifier essential amino acid facilitate to chop down the cholesterol levels by eliminating additional fat from liver and theonine helps to dam fat disposals in liver. millet is crop moderately property for poor phase of the world's population. However, existence of anti-nutrients (Tannins, phytat & polyphenols) may scale back the accessibility of nutrients that limit the appliance of millet in food preparations. Antinutritional factors are often reduced to permissible limits with the appliance of bound pre-treatments like cookery, soaking, boiling, parboiling, fermentation, milling, germination, decortications, and extrusion cookery. Pretreatments improves millet quality that may be useful in formulation of varied worth accessorial nutrient like food, vermicilli, noodles, papads, soups, Indian sweets (Halwa) and workplace things. Therefore, this review focuses on health advantages, worth addition through process technologies and its impact on properties of millet.

STUDY ON CHANGES IN FISH ASSEMBLAGE FISHERY AND HABITAT PARAMETERS OF GANGA RIVER

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Purpose

The Ganga is the fifth largest river in the world which drains about 1,060,000 km² geographical area in India (80 %) and neighboring countries. The river passes through 2525 km distance from its origin at Gangotri to the confluence with the sea covering vast and varied geographical regions.

Methods

The river Ganga is facing serious consequences from massive anthropogenic activities along the catchments since the last few decades. The river along with its tributaries is dammed or proposed for damming at about 12 sites in Patna, Bihar. Due to multiple obstructions, abstractions and addition of pollutants from industrial, domestic sources and agricultural run-off, the river is rapidly degrading at many stretches

Results

The altered habitat conditions and water flow in the river Ganga and tributaries resulted in depletion of sensitive native species and invasion of exotic fishes. The exotic fishes were not recorded in the river at any stretch before the year 2021, but registered considerable population later on and contributed 19.31 to 43.0 % in the total catches at Patna, comprised by common carp (*Cyprinus carpio*) and tilapia (*Oreochromis niloticus*). Besides, 5 other exotic species have reportedly made inadvertent access in the river at different stretches.

Conclusions

The Ganga River system is known as original abode of the valuable Indian major carps. But the river system registered discernible depletion in valuable fishery during the last few decades. In a study, the river Sone witnessed the loss of 15 fish species due to the release of insufficient flow downstream to Indrapuri barrage. Loss of fish habitats, native species; rapid invasion and establishment of resilient exotic fishes is a matter of great concern and warrant serious efforts for the conservation of valuable fisheries. Maintaining river continuum and environmental flows are the key issues for the sustenance of the aquatic biodiversity and fisheries particularly in hilly rivers. Therefore, its need of hour to protect the valuable native species by all possible measures.

Keywords: Fish diversity, Fisheries, Ganga river

SNOW COVER AND ITS RESPONSE TOWARDS CLIMATE VARIABILITY IN ANNAPURNA CONSERVATION AREA

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ABSTRACT

Snow cover is a vital indicator of climate change. Increased climatic variability influences change in snow cover area and ground ice reserve. Moreover, rapid increment in snowmelt and decreasing number of glaciers have been reported recently. This study analyses trend in climatic indicators temperature & precipitation and snow-covered area for past decades to

develop understanding of increasing climatic variability. Landsat images were used for mapping temporal change in snow cover. Mann-Kendall and Sen Slope were used to test the trend in temperature and precipitation and correlation was used to analyse the response of snow cover towards these variables. The average maximum temperature was increasing at the rate of 0.057⁰C/yr with no significant trend in minimum temperature and precipitation despite of slightly observed positive along with negative trend in some stations within the data. Perennial snow-covered area had decreased by 15% in the past three decades. Researches focusing on long term monitoring and observations of meteorological pattern and possible impacts should be carried out further at local level. Lack of studies, understanding might increase the risk and vulnerability in the area. Apart from that, regular assessment and monitoring of climatic indicators are required to formulate policies and strategies to minimize the risk.

Keywords: Snow, climatic variability, trend, vulnerability

ASSESSING FOREST BASED MICRO-ENTERPRISE IN LIVELIHOOD UPLIFTMENT OF LOCAL PEOPLE IN BUFFER ZONE OF CHITWAN NATIONAL PARK, NEPAL

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ABSTRACT

The natural forest resources have huge potential to contribute the employment and services which is the burning issues around our country. Demand of product increases day by day and the rising demand of plastic product had occupied the market stability, which is against the environmental sound health. The alternative product for reduction of consumption of plastic product and unemployment problems can be solved by the forest based micro enterprises.

The research entitled “**Assessing Forest-Based Micro-enterprise in Livelihood Upliftment of Local People in Buffer Zone of Chitwan National Park, Nepal**” was carried out to assess the forest-based enterprises in Amaltari, Meghauli, Nirmal Thori, and Rewa Buffer zone of CNP to assess the potential of enterprise in the area. Direct observation, key informants interview (n=4), households survey (n=110), and group discussion (n=4) were conducted for primary data collection. Different relevant articles, journals and published and unpublished reports were reviewed for secondary data collection. Perception of users toward impact of enterprises on socio-economic condition was measured in Likert scale. The qualitative data were analyzed using descriptive statistics such as pie charts, bar graphs and tables.

The result showed **positive** changes in socio-economic condition of users from forest enterprises. The Buffer zones have high potential to conduct the number of enterprises and can engaged a large number of people in IGAs. Inadequate trained manpower, irrigation facility, marketing, low crop productivity, low price of products was some of the barriers to FBMEs in the study area. In addition, concerned agencies need to explore, design and promote forest and NTFPs based micro enterprise especially targeting poor and marginalized communities.

Keywords: Enterprises, Livelihoods, Buffer Zone, Livelihood, Socio-economic.

**IMPACTS OF CLIMATE CHANGE AND LOCAL ADAPTATION MEASURES
(A CASE STUDY OF TILA RURAL MUNICIPALITY, JUMLA)
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The report entitled “Impacts of climate change and local adaptation measures” was conducted in the remote Jumla (Tila Rural municipality ward number 2) district of Nepal which is vulnerable to climate change according to NAPA report 2010. The report was intended to address the perception of the local people on climate change, its variability and analyze the pattern of temperature and precipitation in the study area through meteorological data. Similarly, it identifies the impact on three major sectors i.e. agriculture, forest and water resource, the ongoing adaptation practices of local people to address the issues.

Both qualitative and quantitative data were collected. In this study, questionnaire survey taking 10% sample intensity using simple random method, ward level consultation, key informant interview were means of primary data collection whereas secondary data were collected from the published and unpublished report, articles, journals and other related literature. The qualitative and quantitative data were logically interpreted. The long-term pattern (1989-2019) of precipitation and temperature was analyzed taking the meteorological data of the nearby station i.e. Jumla airport.

The interpretation of metrological data disclosed that maximum temperature was increasing at rate of 0.0816°C/year and that of minimum temperature at rate of 0.0269°C/year. Annual rainfall and monsoon rainfall was increasing by the rate of 3.9814 mm/year and 4.225 mm/year while that of pre – monsoon and post – monsoon was decreasing at the rate of 0.507 mm/year and 0.5408 mm/year respectively. This consequently induced major climate threats like drought, outbreak of diseases in the study area as a result of which notable impacts were clearly seen in the sectors like agriculture, forest and water resources. But the way of perception is different and all have their own way and level of adaptation. Clearly, the adaptation seems to be more in the agricultural sector than that of the other two sectors (forest and water resources).

Keywords: climate change, impact, perception, adaptation, agriculture, forestry

IN VITRO SCREENING FOR ACETYLCHOLINESTERASE INHIBITION AND ANTIOXIDANT ACTIVITY OF SELECTED MEDICINAL PLANTS

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Purpose

In the present study five plant extracts (*Allium sativum* L., *Desmodium gangeticum* L., *Eclipta alba* L., *Ocimum sanctum* L. and *Piper longum* L.) were considered and checked for their acetylcholinesterase inhibitory activity which is the main true enzyme which hydrolyses acetylcholine in the body, due to utilization of acetylcholine by enzymes causes dementia or other neurodegenerative disorders which indicates the messages are not delivered properly from one neuron to another neuron. Hence inhibitors of these enzymes may prevent the hydrolysis of acetylcholine substrate preferably natural herbal plant extracts. There is research

where oxidative stress leading to AD and other neurological disorders therefore antioxidant is the other key component to find a cure or inhibition of this disease. Acetylcholinesterase (AChE), the predominant cholinesterase in the brain, hydrolyzes ACh to choline and acetate, thereby terminating the effect of this neurotransmitter at cholinergic synapses. Therefore, AChE is the target of cholinesterase inhibitors used for addressing the cholinergic deficit in Alzheimer’s disease (AD) patients. Despite decades of research and advances in our understanding of its aetiology and pathogenesis, current pharmacotherapeutic options for AD are still very limited and represent an area of need that is currently unmet. The leading AD therapeutics involves AChE inhibitors, resulting in increased acetylcholine concentrations in the synaptic cleft and enhanced cholinergic transmission. Compounds showing an AChE inhibitory effect are also used for the treatment of senile dementia, myasthenia gravis, Parkinson’s disease and ataxia. Taking into account that the inhibition of AChE has been one of the most used strategies for treating AD and that existing drugs are effective only against mild to moderate type of disease while presenting considerable side effects, the search for new sources of effective and selective anti acetylcholinesterase agents with fewer side effects is imperative. Various plants and phytochemical substances have demonstrated AChE inhibitory activity and thus could be beneficial in the treatment of neurodegenerative disorders such as AD. Antioxidant compounds in food are found to have a health-protecting factor. Primary sources of naturally occurring antioxidants are whole grains, fruits and vegetables. Plants are potent sources of biochemical constituents and have been components of phytomedicine since very long times. Among the numerous naturally occurring antioxidants, ascorbic acid, carotenoids and phenolic compounds are more effective. They are known to inhibit lipid peroxidation (by inactivating lipoxygenase), to scavenge free radicals and active oxygen species by propagating a reaction cycle and to chelate heavy metal ions.

Methods

The dried coarse powder of plants was extracted with methanol by cold extraction method. The resultant was assessed for acetylcholinesterase (AChE) inhibitory activity by the Ellman’s method with few modifications. The antioxidant activity was determined by DPPH (1, 1-diphenyl-2-picrylhydrazyl) and FRAP (Ferrous reducing Antioxidant power) assays. Quantitative phytochemical (phenolic and flavonoid contents) analysis of endogenous substances was performed by standard spectrophotometric methods and mass determination and compound prediction by LC-MS, facilitated by SAIF, CDRI-CSIR, Lucknow.

Results

Plants extract significantly inhibited AChE activity. Additionally, the plant extracts exhibited strong radical scavenging activity against DPPH and reduced the Ferric ion (FRAP) significantly when compared to that of standards. Plant extracts was found to be rich in phenolic (gallic acid equivalent/g of dry extract) and flavonoid (quercetin equivalent/g of dry extract) content. Furthermore, a positive correlation was observed between the total phenolics and antioxidant as well as the anticholinesterase potential.

Conclusion

The above floras have been shown to be a rich source for new and promising agents (AChEIs) for the treatment of AD. Ethnopharmacological approach and bioassay guided isolation have provided a lead in identifying potential AChE inhibitors from plant sources. This study was therefore aimed at investigating *in vitro* possible acetylcholinesterase inhibitors (AChEIs) in herbal medicines traditionally used for the treatment of memory loss and to point out the role of these plants as potential sources for development of newly potent and safe natural therapeutic agents of AD. Further studies are needed to isolate and identify the active compounds responsible for AChEI activities.

Keywords: Alzheimer’s disease (AD), Acetylcholine (ACh), Acetylcholinesterase (AChE), DPPH, Antioxidant activity, FRAP, Ascorbic acid, Free radical.

PHYSIOLOGICAL CHARACTERIZATION AND MOLECULAR MAPPING FOR γ -ORYZANOL AND ITS Components In Rice (*Oryza sativa* L.)

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Purpose

γ -oryzanol, a mixture of several ferulic acid and caffeic acid steryl esters, is one of the major antioxidants in the rice grain. In this study, we aimed at evaluating Indian rice germplasm accessions for \square -oryzanol content and identifying the genomic regions associated with it. Additionally, we aimed at unravelling the variation of concentration and composition of \square -oryzanol across the developmental stages and the effect of milling and cooking on its retention.

Methods

In the present study, a set of 192 Indian rice accessions were evaluated for \square -oryzanol and its components. \square -oryzanol was extracted following a protocol given by Bollinedi et al. (2021) and quantified using a reverse phase HPLC method. A genome-wide association study (GWAS) was carried out using BLINK and FarmCPU model to identify the significant QTNs. Further, spatio-temporal variation of γ -oryzanol was analyzed in 6 rice cultivars (Pusa Basmati 1, Pusa Basmati 1121, Pusa Basmati 6, Taraori Basmati, Swarna and BPT5204) at three stages (booting, milking and dough) from four different tissues (leaf blade, leaf sheath, peduncle and spikelet). Additionally, localization of these compounds in different parts of the grains was estimated. \square -oryzanol and its components were also extracted from milled and cooked rice to check its retention.

Results

A significant genetic variation in the range of 7.9-76.54 mg/100g was observed. 24-methylenecycloartanyl ferulate was recorded as a major constituent of \square -oryzanol (2.4-31.78 mg/100g) in brown rice, followed by campesteryl ferulate (1.39-11.78 mg/100g) and cycloartenyl ferulate (0.72-20.75 mg/100g). The GWAS resulted in identification of 19 significant marker-trait associations (MTAs) explaining phenotypic variance ranging from 0.001-48.88%. Four MTAs each for 24-methylenecycloartanyl ferulate (chromosomes 5, 7 and 12) and campesteryl ferulate (chromosomes 4, 5 and 12) and one for total \square -oryzanol (chromosome-5) were identified. Additionally, spatio-temporal analysis revealed existence of significant compositional variation between seed and non-seed tissues. In grains, bran showed maximum accumulation (107.53-129.67 mg/100g) followed by embryo (46.97-59.29 mg/100g), husk (5.23-37.79 mg/100g) and endosperm (9.78-14.33 mg/100g). Further, milling (58.44%) and cooking (47.18%) caused significant reduction of \square -oryzanol.

Conclusions

The composition of \square -oryzanol varied in seed and non-seed tissues during the developmental stages. The significant MTAs identified in the present study hold significant scope in the marker assisted breeding programs aiming at the development of nutrient-dense rice varieties.

Keywords: antioxidants, brown rice, GWAS, \square -oryzanol, MTA, rice quality

MOLECULAR PHYLOGENETIC ANALYSIS OF *Labeo Gonius* (HAMILTON, 1822)

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ABSTRACT

The present research was conducted on molecular characterization of *Labeo gonius* collected from Bijnor district (U.P.), India. On the basis of morphometry, identification keys and standard literature fish were identified. DNA isolation and gel electrophoresis were carried out. The region of taxonomic importance like Cytochrome Oxidase subunit I gene was amplified and sequenced. The Phylogenetic analyses of all the sequences were performed using MEGA 7.0. software. The cryptic samples and other fish were identified and characterized based on molecular studies viz. COI, showed maximum similitude to available gene sequence of *Labeo gonius* on NCBI, hence considered as the same and exact identification on the basic of Morphometry and Molecular studies.

Keywords: Morphometry, Molecular Characterization, DNA extraction, *Labeo gonius*, COI gene.

TRENDS IN AREA, PRODUCTION AND EXPORT DYNAMICS OF SELECTED MILLETS IN INDIA

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Purpose

Milletts are a group of highly variable small seeded grains, widely grown around the world as cereal crops for nutritious human food and fodder for animals. The current study intended to know the trends in area and production and direction of trade of selected millets in India from 1990-91 to 2021-22. Among the millet crops, sorghum, bajra, ragi and small millets were selected for the study based on the major area under cultivation among millets.

Methods

The study was based on secondary data. Secondary data regarding area and production was collected from indiastat.com from 1990-91 to 2021-22. Data on exports was obtained from APEDA from 2012-13 to 2021-22. Trend in area and production is estimated using Compound Annual Growth Rate model. The instability index of area and production was estimated using Cuddy & Della Valle instability index. The dynamic nature of trade pattern of the millets was analysed by employing first order Markov Chain process.

Results

From the study it was revealed that the area under all the millets was reducing over the years in all the decades whereas from the production point of view only bajra (1.55%) was registered positive growth rate. The instability index was observed that, in the overall period area under small millets was more stable with the value of 0.05 per cent followed by sorghum, bajra and ragi. Similarly, instability index of production of selected millets recorded sorghum was high stable with 0.12 per cent followed by small millets, ragi and bajra. Absolute and relative change in area and production of selected millets have been calculated and noticed that, bajra shown less change with -33.28 per cent and 22.22 per cent relative change in area and production respectively. By TPM it was noticed that most loyal country which imports sorghum was UAE, UK for bajra and Nepal is major importer of ragi.

Conclusions

There was negative growth in area and production of selected millets in India. Hence, farmers need to be educated by imparting training for gain of knowledge on good agricultural practices in cultivation of millets. The value addition of millets is an important area to save the millets from depletion in area and production. Efforts should be taken to promote export of selected products from India to explore and exploit potential of other markets and to avoid overdependency on few countries.

Keywords: Millets, Area, Production, Growth rate, Instability Index, Exports, Direction of trade, Markov chain analysis.

LIQUID FERMENTED ORGANIC MANURES (HERBAL KUNAPAJALA): A WAY FOR SUSTAINABILITY

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ABSTRACT

In present scenario, Indian agriculture was mainly focused on organic agriculture due to loss of soil organic matter from top soil, soil erosion and water pollution through imbalance application of fertilizers. Liquid fermented organic manures are prepared based on locally available resources they are not relied on external inputs. With this theme, an experiment was designed with set of herbal kunapajala concoctions and their doses at Norman E Borlaug CRC, GBPUAT, Pantnagar, during *rabi* 2021-2022 in mustard crop. The factorial RBD with additional treatment design was followed with set of 3 herbal kunapajala concoctions as factor A *viz.*, Herbal Kunapajala prepared from nettle grass (KJ₁), Herbal Kunapajala prepared from common weeds (KJ₂), Herbal Kunapajala prepared from 50% nettle grass + 50% common weeds (KJ₃), factor B with 4 levels *viz.*, 500 l/ha (D₁), 1000 l/ha (D₂), 1500 l/ha (D₃), 2000 l/ha (D₄) spray dose, 100% Recommended Dose of Nutrient as control treatment (N₁) and replicated thrice. The grain yield was significantly more with KJ₁ (1556.5 kg/ha) as compared to other treatments. Similarly, D₄ (1582.3 kg/ha) recorded significantly more grain yield as compared to other doses. The stalk yield was significantly superior with KJ₁ (4454.2 kg/ha) and D₄ (4620.3 kg/ha) treatment as compared to other treatments. The growth and yield attributing characters were recorded maximum with KJ₁ and D₄ treatment. Non-significant difference was noticed among control and rest treatment. Whereas, higher values were observed with control treatment.

EFFECTS OF ASPECT ON FOREST STAND CHARACTERISTICS IN FAR-WESTERN NEPAL HIMALAYA

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ABSTRACT

Nepal is a mountainous country with microclimatic variation in small stretches. The differences in the vegetation and above ground biomass between the aspects in Far western Himalaya was studied. Understanding the differences in vegetation and sequestered carbon between aspects of slope elevation is fundamental to effective management of these natural systems; however, very few studies have quantified these differences. Here, we analyzed the stand characteristics and carbon stocks of north and south facing slopes in a Himalayas of Karnali. The study area includes three forests of Kalikot district of Karnali province, one National Forest and two community forests. Random Sampling with quadrat was conducted to measure vegetation parameters. Individuals in each quadrat were counted and their height, DBH were measured in each site. Litter cover was also measured in each plot. Structural parameter of vegetation such as density, frequency, abundance, basal area, and Importance Value Index (IVI) were calculated. The above ground tree biomass was estimated and Shannon-Weiner Index (H') was computed for determining diversity. 19 species were recorded from three different forest. *Quercus semecarpifolia* was dominant in first and second study area whereas, *Quercus leucotrichophora* was dominant in third area. *Betula utilis*, *Myrica esculenta*, *Pinus wallichiana* were recorded in the northern aspect only. Mean DBH, height, abundance, basal area and density was higher in the southern aspect than in the northern aspect. Species diversity, richness and litter cover was found higher in the northern aspect than in the southern aspect. The above ground tree biomass was found higher in southern aspect. The difference in the southern and northern aspect forest stand characteristics is due to the intensity of solar radiation. These results suggest that topographical factors affect mountain forests through their direct influence on radiation and humidity, but anthropogenic disturbance also plays an important role in influencing vegetation and soil characteristics in highland environments. Afforestation and ecological restoration could be carried to enhance the regeneration of tree species along both the aspect.

Keywords: Above ground biomass, Ecological restoration, Slope aspect, Vegetation parameter

ROLE OF SOIL CARBON SEQUESTRATION IN SUSTAINABLE AGRICULTURE

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ABSTRACT

Soil carbon sequestration is a strategy to achieve food security through improvement in soil quality. The carbon sink capacity of the world's agricultural and degraded soils is 50 to 66% of the historic carbon loss of 42 to 78 Gt of carbon. The rate of soil organic carbon sequestration with adoption of recommended advanced technologies depends on soil texture and structure, rainfall, temperature, farming system, and soil management. Strategies to increase the soil carbon pool involve soil restoration and woodland regeneration, no-till farming, cover crops, nutrient management, manuring and sludge application, improved grazing, water conservation

and harvesting, efficient irrigation, agroforestry practices, and growing energy crops on spare lands. Various study showed that an increase of 1 ton of soil carbon pool of degraded cropland soils may increase crop yield by 20 to 40 kilograms per hectare (kg/ha) for wheat, 10 to 20 kg/ha for maize, and 0.5 to 1 kg/ha for cowpeas, as well as enhancing food security, carbon sequestration has the potential to offset fossil fuel emissions by 0.4 to 1.2 gigatons of carbon per year, or 5 to 15% of the global fossil-fuel emissions. The global soil carbon (C) pool of 2500 gigatons (Gt) includes about 1550 Gt of soil organic carbon (SOC) and 950 Gt of soil inorganic carbon (SIC). The soil C pool is 3.3 times the size of the atmospheric pool (760 Gt) and 4.5 times the size of the biotic pool (560 Gt). The SOC pool to 1^m depth ranges from 30 tons/ha in arid climates to 800 tons/ha in organic soils in cold regions, and a predominant range of 50 to 150 tons/ha. The SOC pool represents a dynamic equilibrium of gains and losses. Soil carbon sequestration is a strategy to achieve food security through improvement in soil quality. It is a by-product of the inevitable necessity of adopting recommended management practices for enhancing crop yields on a global scale. While reducing the rate of enrichment of atmospheric concentration of CO₂, soil carbon sequestration improves and sustains biomass/agronomic productivity. It has the potential to offset fossil-fuel emissions by 0.4 to 1.2 Gt C/year, or 5 to 15% of the global emissions. Soil organic carbon is an extremely valuable natural resource. Irrespective of the climate debate, the Soil organic carbon stock must be restored, enhanced, and improved. A carbon management policy that includes regulation-based trading soil carbon must be developed. Likewise, a widespread adoption of recommended management practices by resource poor farmers of the tropics is urgently warranted.

Keywords: Carbon sequestration, Organic, Nutrients, Food security, Soil restoration.

ASSESSMENT OF WEED MANAGEMENT METHODS ON PRODUCTIVITY AND PROFITABILITY OF LENTIL

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ABSTRACT

The On-farm trial was conducted during *Rabi* season 2019-20 and 2020-21 for Assessment of weed management methods on productivity and profitability of Lentil at farmers' fields of Munger district. The On-farm trial was conducted in randomized block design with three technical options *viz.* one hand weeding at 30 days after sowing, pendimethalin 1.0 kg a.i./ha at pre-emergence and Imazethapyr 30 g a.i./ha post-emergence (30 days after sowing), pendimethalin 1.0 kg a.i./ha at pre-emergence+ Imazethapyr 20 g a.i./ha post-emergence (25 days after sowing), and farmers practice and keeping with 06 farmers (replications). Application of pendimethalin 1.0 kg a.i./ha at pre-emergence+ Imazethapyr 20 g a.i./ha post-emergence (25 days after sowing) was recorded significantly lower population of total weeds (6 and 7 m⁻²) in lentil followed by Imazethapyr 30 g a.i./ha post-emergence (13 and 18 m⁻²) and pendimethalin 1.0 kg a.i./ha at pre-emergence (26 and 35 m⁻²) and over farmers practice (57 and 71 m⁻²) in both seasons of trials. Application of pendimethalin 1.0 kg a.i./ha at pre-emergence+ Imazethapyr 20 g a.i./ha post-emergence (25 days after sowing) was gave significantly higher grain yield (13.1 q/ha and 15.6 q ha⁻¹) and straw yield (25.3 and 27.9 q ha⁻¹) of lentil, followed by Imazethapyr 40 g a.i./ha post-emergence (30 days after sowing) and pendimethalin 1.0 kg a.i./ha at pre-emergence by over farmers practice (8.1 q/ha and 8.4 q/ha) during both years. However, highest gross returns (Rs.72050 and 96617 ha⁻¹), net return (Rs.55587 and 74357 ha⁻¹), and B:C ratio (3.87 and 4.34) was obtained with application of pendimethalin 1.0 kg a.i./ha at pre-emergence+ Imazethapyr 20 g a.i./ha post-emergence (25 days after sowing) followed by Imazethapyr 30 g a.i./ha post-emergence (30 days after sowing) and pendimethalin 1.0 kg a.i./ha at pre-emergence over farmers practice during both years.

INDIGENOUS KNOWLEDGE FOR CLIMATE CHANGE ADAPTATION: INSIGHTS FROM NEPALESE MOUNTAIN REGION

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Purpose

Indigenous communities relying on natural resources for their survival are vulnerable to climate change. Although indigenous people have been adopting their knowledge to adjust to changing environment, their knowledge is widely untapped or misinterpreted. The study aims to know about the sets of available indigenous knowledge practiced by indigenous communities and pave a way to establish and strengthen them to enhance climate change adaptation locally.

Methods

A mixed method approach was adopted to collect the data. We collected both quantitative and qualitative data as a primary data using different participatory rural appraisal tools such as household surveys, key informant interview, focus group discussions, and participants' observation along with 30-year meteorological data were employed for data collection.

Results

The statistical records and perception of indigenous communities revealed an increase in mean annual temperature and a decrease in average precipitation. People perceived different impacts in different sectors like agriculture, forestry, water resources and infrastructure. Use of plants with healing power, observation of weather phenomenon, traditional pest control measures, seed storage techniques etc. were major indigenous adaptation measures.

Conclusions

Although the communities have been utilizing their indigenous knowledge as an adaptation measure to cope with the effects of changing climate, the knowledge base is still untapped. The reluctance of youths in the study site to adopt the indigenous knowledge, the shift in livelihood incomes, and the advancements of scientific knowledge and technologies are some prominent reasons why this crucial knowledge system is declining. For better adaptation, this rich body of knowledge should be revitalized and mainstreamed into climate change policies that will lead to the development of effective adaptation strategies which are cost effective, participatory, and sustainable.

Keywords: Vulnerability, crop decline, knowledge transfer, climate change impacts, and strategies

PATH ANALYSIS IN LINSEED (*Linum usitatissimum*) GENOTYPES

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ABSTRACT

Linseed (*Linum usitatissimum* L.) is one of the most important Rabi oilseed crops after rapeseed and mustard. The ultimate objective of most of the plant breeding programmes is to develop

high yielding superior genotypes/lines better than existing ones through the manipulation of genetic constellation. Thirty-six genotypes of linseed (*Linum usitatissimum* L.) were analyzed to assess interrelationship among yield components and their direct and indirect effect on yield. In this experiment out of thirty-six including checks, each genotype was grown in 3 m long plot with plant-to-plant distance was maintained at 10 cm in Randomized Complete Block Design (RBD) with three replications during Rabi season, 2019-20. Path coefficient analysis revealed that number of capsules per plant has strong positive direct effect on seed yield per plant. Number of capsules per plant, number of primary branches per plant, 1000 seed weight and plant height were identified as important traits for selection in linseed breeding program.

Keywords: Linseed, randomized block design, path coefficient, breeding program and genetic constellation

EMPHASIS OF DRIP IRRIGATION FOR VEGETABLE CROPS PRODUCTION

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ABSTRACT

The impact of drip irrigation on vegetable crops A sort of Micro irrigation system called drip irrigation or trickling irrigation allows water to flow gently to plant roots from above the soil's surface, potentially conserving water and nutrients. Water should be applied directly to the root zone in order to reduce evaporation. A system of valves, pipes, emitters, and tubing is used in drip irrigation systems to deliver water. Drip irrigation systems have the potential to be more effective than other kinds of irrigation systems. Distribution lines, Hand operated/electronic or hydraulic control valves and safety valves, smaller diameter polyethylene tubing, Poly fittings and accessories, and Emitting devices at plants are some of the components utilized in drip irrigation. Pumps and valves in drip irrigation systems can be operated manually or automatically by a controller. Benefits of drip irrigation include-Localized application reduce fertilizer and nutrient loss. If properly managed, water application efficiency is good. There is no need for field leveling. It is possible to maintain field capacity for moisture with the root zone. Soil erosion and weed development are reduced. Labor costs are lower than with other irrigation techniques. Fertigation may be simply integrated with little fertilizer waste. Typically uses less pressure than other methods of pressured irrigation, which saves on energy. Use of the drip irrigation method: - Drip irrigation is utilized in gardens in homes and businesses, as well as on farms. In locations with severe water shortages, drip irrigation is widely used, particularly for crops and trees including cotton, grapes, bananas, eggplants, citrus, tomatoes, and containerized landscaping trees. Homeowners are increasingly using drip irrigation systems, which include a timer, hose, and emitter, for their plants. Irrigating flower pots requires the use of 4 mm diameter hoses.

Keywords- Drip irrigation, Emitters, Fertigation, Hydraulic control etc.

A PRELIMINARY SURVEY OF AVIFAUNA DIVERSITY IN SHARNBASVA UNIVERSITY CAMPUS, KALABURAGI, (KARNATAKA) INDIA

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ABSTRACT

Avifaunal diversity plays a very important role in determining the health of an ecosystem. The study on bird diversity in the campus of Sharnbasva University campus, Kalaburagi was done, over a period of six months from September 2021 to February 2021. The study area was divided into different regions that are: Sharanabasaveshwar College of Science and arts campus Garden, Engineering College campus, SBR PU College campus. The bird species were recorded using point counts and line transects method where ever possible for studying avian diversity. A total number of 39 bird species belonging to 11 orders and 23 families were recorded during the study period. The University campus has wide variety of trees, which may be one of the major contributing factors for the richness of bird species. This study provides baseline data for monitoring the avifauna diversity in the university campus and demonstrates the importance of university campus in bird conservation

Keywords: Avifauna, diversity, Richness, Sharnbasva University.

GENOMICS-ASSISTED BREEDING OF POMEGRANATE FOR BACTERIAL BLIGHT RESISTANCE

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Purpose

The bacterial blight of pomegranate caused by *Xanthomonas citri* pv. *punicae* (*Xcp*) is a significant menace in pomegranate cultivation. All the elite pomegranate cultivars are highly susceptible to bacterial blight. Current management through frequent chemical sprays causes environmental and health hazards. The development of host resistance, a sustainable and environment-friendly approach, is limited by a lack of resistance sources. Although few Himalayan genotypes have exhibited tolerance, they are associated with undesirable agronomic traits, which make them unsuitable for the breeding program. Molecular dissection of host-pathogen interaction and identification of candidate genes for the resistance or susceptibility hasten the resistance breeding using advanced biotechnological tools.

Methods

Bacterial pathogenicity factors were identified by long-read whole genome sequencing of *Xcp* using PacBio sequel. Dual transcriptomics of *Xcp* infected pomegranate leaf samples at 3- and 9-days post-inoculation in bacterial blight susceptible and tolerant pomegranate genotypes for simultaneous capture of both host and pathogen responses during their compatible interaction. Candidate genes were validated through *in silico* protein-DNA interactions and gene expression analysis using qRT-PCR.

Results

5.4 Mb of *Xcp* genome was assembled from the 368,980 CCS reads with an average read length of 2,460.8 bp and the longest read of 77471 bp. A total of 4652 genes were predicted, including 4451 protein-coding genes, 105 RNA coding genes, 61 tRNA genes and 35 non-coding RNA genes. Two transcription activator-like effectors (TALEs) were identified as potential pathogenicity genes. Dual transcriptomics identified 696 differentially expressed genes between bacterial blight susceptible and tolerant pomegranate genotypes. Most differentially expressed transcripts were related to biotic stress-responsive genes localised at the cell membrane.

Conclusions

The candidate genes identified in this study are being evaluated *in-vivo* are potential candidates for resistance breeding through CRISPR-Cas9 gene editing in the elite cultivar ‘Bhagwa’ to enhance resistance.

Keywords: Pomegranate, bacterial blight, bacterial genome sequencing, dual transcriptomics

FISH OIL CONCENTRATION AND FREE FATTY ACID VALUE DETERMINATION IN SOME FRESH WATER AND MARINE FISH SPECIES COLLECTED FROM A LOCAL MARKET

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ABSTRACT

Fish is a source of aquatic food which can both be farmed and caught wild. Presently there is high demand for different species of fishes due to their valuable benefits for a healthy lifestyle. Consumption of fish or fish oil provides various health benefits due to the presence of proteins, unsaturated essential fatty acids, minerals, and vitamins. Fish oil is unique from other oils because of the presence of good amount of unsaturated fatty acid (Omega 3-FFA and Omega 6-FFA) which are essential to the body. Fish oil has been shown to help in maintaining health especially heart health and it also has anti-inflammatory, hypertensive and anti carcinogenic properties.

Fish oil production is important for both human and animal consumption. Eight different types of fishes were used for the present study of which 7 are fresh water fishes and one is marine water fish. As compare to marine fish, the fresh water fish has higher oil concentration. From the obtained results, it is suggested that wet pressing method is the finest extraction process. FFA (free fatty acid) value was determined according to the method described in AOCS method (Aocs, 1992). (Laila *et al*, 2014). The analysis on the oil extracted from each sample of the fish species and the results indicated that the oil content of fish species, 1. *Notopterus notopterus*, - 2ml, 2. *Pangasius pangasius* - 5ml, 3. *Labeo rohita* - 35ml, 4. *Channa striata*, - 0.5ml, 5. *Oreochromis niloticus*, - 1ml, 6. *Rastrelliger kanagurta*, - 5ml, 7. *Piaractus brachypomus*, - 20ml, 8. *Alburnus arborella*, - 30ml, signifying that species 3 has a higher amount of oil while species 4 has the least amount oil extracted. The FFA (free fatty acid) percentage value of the species 1 to 8 has varied from 1.4. % to 2.8%. The significance of the result is that, the species free fatty acid value less than 3.5%, may be suitable for edible purpose. The lipid or free fatty acid content varies among the fresh water and marine fishes because of the attributed factors such as difference in geographical area where the fish was caught and also due to the biological factors such as age, sex and size.

IMPACT ANALYSIS OF MANAGEMENT APPROACHES ON TARO LEAF BLIGHT DISEASE CAUSED BY *P. colocasiae*

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Purpose

Taro is the fourteenth most consumed vegetable worldwide and is a staple crop both in the diet and economy of the tropics. Many tropical nations rely on taro as a main export. Taro Leaf Blight (*Phytophthora colocasiae*) is a highly infectious plant disease that is characterized by the formation of large brown lesions on the leaves of infected taro plants. Losses of 25-35% of corm yield. have been recorded. If preventative measures are not used to control spread and symptoms, extreme devastation this plant pathogen can cause. We aim to analyse the impact of chemical as well as eco-friendly treatments on the management of Taro Leaf Blight.

Methods

The experiment was laid out in field with plot size 3x2 m with 07 treatments including 01 control. The treatments were as follows:

1. Mancozeb + Metalaxyl M - 0.1% (1g/l) 2. Mancozeb 0.2% (2g/l) 3. Potassium phosphonate 0.3% (3ml/l) 4. Copper hydroxide 53.8% - 0.2% 5. Dipping of cormels in *Trichoderma* amended (@5g/kg of corm) cow dung slurry + soil application of *Trichoderma* amended vermicompost @100g/ plant at the time of planting and later at the time of intercultural operations 6. Dipping of cormels in 10% vermiwash + soil application of vermicompost @100g/plant + spraying and drenching with 10% vermiwash (before monsoon and later monthly interval) 7. Untreated Control

Results

As per the analyzed data, T1 (Mancozeb + Metalaxyl M - 0.1%) was found to be most effective among all 6 treatments with 34.89 percent reduction over control and 21.13 t/ha total yield followed by T2 and T4 with 30.08 and 24.78 percent reduction over control and respective total yield in case of T2 (20.84 t/ha) is superseded by T4 (20.01 t/ha). Among 6 treatments, least effective was T6 with only 14.89 percent reduction over control and 16.22 t/ha total.

Conclusions

The chemical treatments performed well in comparison to the *Trichoderma* and vermi-compost based treatments with a B:C ratio ranging from 0.70-2.34.

Keywords: *Phytophthora*, cormel, biological agent, vermiwash

STUDIES ON VARIABILITY AND MANAGEMENT OF *Alternaria porri* (Ellis) Cif. CAUSING PURPLE BLOTCH OF ONION (*Allium cepa* L.)

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ABSTRACT

The investigation was carried out on “Studies on Variability and Management of *Alternaria porri* (Ellis) Cif. Causing Purple Blotch of Onion (*Allium cepa* L.)”. The studies were aimed to work out isolations, pathogenicity, cultural and morphological characters of pathogen, screening of onion varieties and the management of disease by use of fungicides, botanicals and organic formulations. The symptoms of purple blotch disease were small, whitish, sunken, oval shaped lesions on infected leaves which later became elliptical or oblong and turned brown

to purple at the Centre surrounded by a light brown area later they turned necrotic giving a blighted appearance and affected leaves show drying from tip to downwards.

The pathogen was isolated from diseased leaves by following standard tissue isolation technique and purified by hyphal tip culture method. The pathogenicity of culture was proved by following Koch’s postulates and casual organism was identified as *A. porri*. During cultural and morphological variability of the *A. porri* the average variable size of conidia ranged from 59.2-72.2×10.00-13.25µm with maximum size of conidia 72.2µm (71-75)×13.25µm (12-15) in the isolate of AP-5 and smallest size of conidia 59.2µm (57-61)×12.75µm (11-15) was in AP-2 isolate. The growth diameter ranged from 54.50-80.00 mm. Pathogenic variability was studied for five isolates of the *A. porri* separately where degrees of severity ranged from 20.25 to 43.75 per cent. Isolate AP-1 exhibited the maximum disease severity (43.75 per cent) followed by isolates AP-2 (36.50 per cent), AP-4 (36.00 per cent) and AP-3 (25.00 per cent) while isolate AP-5 showed minimum disease index (20.25 per cent).

During screening of ten popular onion varieties for resistance against *A. porri*, Arka nikan, Arka kirtiman and Arka lalima were found moderately resistant (13.00, 14.67, 17.00 PDI) however varieties Bhima dark red and Bhima raj were moderate susceptible (34.00, 36.00), Bhima red, Bhima super, Bhima kiran, Arka kalyan, and N-53 were susceptible (PDI 44.00, 42.00, 46.33, 55.00 and 51.67, respectively).

DNA BARCODING: AN IMPORTANT TOOL FOR IDENTIFICATION OF INSECT BORERS OF TIMBER SPECIES

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ABSTRACT

Valuable timbers are threatened by borers (bark and wood borers). Tree infestations and outbreaks in plantations can inflict serious damage on the timber industry. Management and prevention techniques to combat borer infestations are severely limited due to poor beetle identification tools and classification systems, unknown ecological causes of infestation, and incomplete bio-geographic knowledge. The value of infested wood is often reduced due to staining and structural defects caused due to tunneling of the timber by insect larvae that pose adverse effects on tree vigour and timber quality. Therefore identification of bark & wood-boring larval insects is important for pest risk analysis and management of timber species. Identifying insects morphologically generally depends on adult stage but is difficult beyond family level due to highly conserved morphology. Also, species identification is the fundamental part in describing biodiversity. India has varied agro climatic conditions and is considered as one among the mega biodiversity countries favouring the hotspots for numerous species of insects and supporting nearly 7% of the world insect fauna. But due to change in climatic condition, global biodiversity is bound to change and as an upshot some species will get extinct and new will come up, also species abundances, species distributions and genetic diversity will change. At the same time increased wood trade and rapid transportation facilities between the countries invite many invasive pests into the country which causes havoc and alarming bio security concern which calls for the prompt identification of alien invasive insect species infesting economically important timber sp. Also, with the existence of vast number of insect species and significant variations in their life-stage, the correct identification becomes a challenging task for taxonomy. Identifications using molecular data by generating DNA Barcodes will help to elucidate the relationships of morphologically variable individuals of the same species, such as individuals in different developmental stages and sexually dimorphic

individuals. DNA barcodes representing insect species generated from adult insects will allow for identification of their immature stages in the future without requiring a prolonged rearing process. Thus Identification based on both taxonomy and DNA Barcoding as modern tools will definitely help to move systematically to the forefront of conservation of timber.

Keywords: timber, borers, DNA Barcodes

EFFICIENT UTILIZATION OF RICE FALLOWS IN SANDY LOAM SOILS OF ASSAM

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ABSTRACT

A field experiment was conducted during the *rabi* season of 2019-20 to find out the effect of varieties and integrated nutrient management (INM) practices on the efficiencies and economics of rapeseed and mustard in rice fallows. The experiment was laid out in a split-plot design with four rapeseed and mustard varieties in the main plot and five INM practices in the sub-plots and replicated thrice. The results revealed that the variety PM 27 (V₂) produced the highest seed yield (11.72 q/ha) which was *at par* with NRCHB 101 (V₃) (11.25 q/ha). The treatment of recommended NPK @ 40-35-15 kg/ha (F₅) was found to have a superior seed yield (12.01 q/ha) which was *at par* with application of 50% RD of NPK + VC @ 1t/ha (incubated with Azotobacter and PSB) in equal splits as basal and at 30 DAS (F₂) (11.82 q/ha). The highest agronomic efficiency (AE) (kg/kg), nutrient use efficiency (NUE) (kg/kg), physiological efficiency (PE) (kg/kg) and apparent recovery efficiency (ARE) (%) was obtained in INM treatment of FYM @ 2t/ha (incubated with Azotobacter and PSB @ 0.2% w/w for 15 days) + quick lime @ 20 kg/ha + ash @ 2kg/ha at basal and 30 DAS (1000:10:1) (F₄). PM 27 (V₂) produced the highest net returns of ₹40,965.11/ha with a B:C ratio of 2.34 followed by NRCHB 101(V₃) which produced a net returns of ₹38644.91/ha and B:C ratio of 2.22. In INM practice, the highest B:C ratio of 2.74 could be recorded in F₅ with a net returns of ₹45,325.00/ha followed by F₄ treatment producing a B:C ratio of 2.59 with net returns of ₹39,629.63/ha.

Keywords: Agronomic efficiency, Nutrient use efficiency, Physiological efficiency, Apparent recovery efficiency, Rapeseed, Mustard, Economics

FORMULATION AND QUALITY EVALUATION OF QUINOA AND MORINGA BASED VERSATILE FOOD MIX FOR GERIATRICS

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ABSTRACT

Ageing is an inevitable process of life which involves gradual degeneration of the structure and function of the organism. The cornerstone of geriatric nutrition is a well-balanced diet. However, there is a need to development of new and innovative versatile geriatric food mix. The supplementations of the quinoa, amaranth and moringa parts are very nutritious and fulfill the basic diet requirements of the old age people. The geriatric food mix was prepared using various combinations of quinoa, moringa pods powder and amaranth powder. Among all

formulations of versatile geriatric food mix the formulations T8 (55% quinoa, 20% moringa pod powder and 15% amaranth) were found best in the sensory evaluation.

In this study an attempt have been made to formulate a geriatric food gruel mix with higher nutritive value. The results showed that acceptable geriatric food mix could be produced from quinoa, amaranth, moringa pods and green gram powder. The optimized quinoa and moringa based geriatric food mix showed good sensory acceptability revealing their potential for consumption by elder population. Thus in the light of the scientific data it may be said that quinoa and moringa are good source of macro and micro nutrients hence open the way of introducing these materials to daily food items to prevent health problems. The incorporation of these ingredients in the geriatric food could help to alleviate the deficit in protein, fibre, minerals in the elder population.

Keywords – Geriatric nutrition, supplementation, quinoa, moringa, geriatric food.

INTEGRATED NUTRIENT MANAGEMENT IN CHINA ASTER

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ABSTRACT

This investigation was conducted in College of Horticulture, OUAT, Chiplima in winter season of 2021-22. 17 combinations of Azatobactor, azospirillum and FYM has made with 50% RDF and 100% RDF (as control) were used as treatments for this experiment. All vegetative and floral parameters of china aster were studied in this experiment. Azospirillum+ 50% RDF showed highest growth rate but Azatobacter + PMB+ 50% RDF showed tallest plant at 60days and at 90 days after transplanting with highest spreading in N-S and E-W direction. Azatobacter + PMB+ 50% RDF shows highest flower weight and highest vase life. Azatobacter + Azospirillum+ 50% RDF showed highest flower number as well as size. Azatobacter + PSB+ 50% RDF showed highest diameter of flower. Azatobacter + PMB+ 50% RDF shows highest BC ratio i.e. 2.06.

Keywords: China aster, Azatobacter, Azospirillum

SWITCHABLE SOLVENTS METHOD FOR PHOSPHOLIPIDS EXTRACTION IN MILK: A REVIEW

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Purpose

Phospholipids (PLs) found in milk are of great interest due to their health and nutritional benefits associated with their consumption. The utilization of milk phospholipids (MPLs) as functional ingredients has been a topic of industrial interest over the past decades. The primary drivers for such interest have been the health benefits of MPLs beyond their basic nutrition. A number of byproduct streams are industrially available to recover MPLs, including buttermilk, dried buttermilk, beta-serum, and whey protein phospholipid concentrate. The existing methods to recover MPLs from byproduct streams include enzymatic hydrolysis of protein followed by filtration, microfiltration, ultrafiltration, supercritical fluid extraction or a combination of these technologies.

Methods

1 g of sample was mixed with 12 mL of CyNMe₂, and kept for 18 hr. at room temperature under constant agitation using a magnetic stirring (1500 rpm). Then, 12 mL of water were added into the mixture followed by bubbling CO₂ at room temperature for 4 hr. Water was added to maintain the stoichiometry of the reaction, amine to salt. At the end of the bubbling, a lipid layer was formed at the top of the vial, while the bottom layer corresponded to the CyNMe₂ salt dissolved in water. The lipid layer was dissolved in 3 mL hexane and transferred to a test tube for evaporation at 30°C under nitrogen flow.

Results

The SHS extracted up to 99.96% of the PLs directly from (Butter milk) BM, while only between 2% and 11% of the PLs were extracted with conventional methods. The high efficiency was attributed to a rupture of the protein membranes through ion pair formation, followed by a release of the MPLs from the solid matrix.

Conclusions

Extraction of MPLs from dairy byproducts via CyNMe₂ resulted in high yields (up to 98%). Compared with Folch extraction, CyNMe₂ resulted not only in higher concentration of MPLs (up to 9-fold increment) but also a different relative distribution, where PI and PC were the predominant MPLs. This work will help to design novel extraction strategies for the recovery and isolation of MPLs.

Keywords: Phospholipids (PLs), Milk phospholipids (MPLs), Extraction, CyNMe₂

Reference:

Rathnakumar, K., Ortega-Anaya, J., Jimenez-Flores, R., & Martínez-Monteagudo, S. I. (2021). Understanding the switchable solvent extraction of phospholipids from dairy byproducts. *Food and Bioproducts Processing*, 126, 175-183.

ASSESSMENT & MONITORING OF RECLAIMED COAL MINE-DEGRADED LAND: A TOOL FOR ENSURING ENVIRONMENTAL SUSTAINABILITY

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ABSTRACT

Mining of mineral resources particularly coal disrupts the ecosystem functioning and alters the land use pattern of the area by removing the surface soil and piling it over unmined areas which creates overburden dumps. Due to unfavourable Physico-Chemical conditions for plant growth, restoration and reclamation of this degraded area are highly challenging. A successful restoration programme can help in maintaining environmental sustainability by rehabilitating the ecosystem and mitigating climate change. The present study was focused on the evaluation method to obtain the overall reclamation effect of coal mines on the environment and can be used as a monitoring tool for maintaining sustainability.

Methodology

A field study was conducted on the consequence of reclaimed overburden dumps (1, 3, 5, 7 and 9 years) of the Kusmunda open-cast project of Korba coalfield, Chhattisgarh, India. A phytosociological survey has been accompanied and a random quadrat sampling method was adopted for vegetation analysis in different reclaim sites and the change in vegetation cover was observed using the Normalized Difference Vegetation Index (NDVI).

Result

Reclamation of land is the process of enhancing land so that it is used as a tool for mitigating climate change and environmental rehabilitation. Presently, the total lease-out area of the open caste project is 16.72 km² in which area under biological reclamation (plantation on backfill and overburden dumps) is 4.86 km² (29.07%). The study area consists of a total of 41 tree species belonging to 36 genera and 19 families. The most dominant native tree species present in the area were *Dalbergia sissoo*, *Bauhinia spp.*, *Phyllanthus emblica*, *Tectona grandis*, and *Terminalia arjuna* while exotic tree species were *Peltophorum spp.* and *Leucaena leucocephala*. The result shows that the Shannon diversity index was more in the 1-year reclaimed area (2.56) as compared to other years. NDVI value helps in monitoring the vegetation cover over a period which indicates that the vegetation health was improved over the year.

Conclusion

The biological reclamation of the damaged coal mine area using tree species was found to be more promising because it has the potential to induce soil formation, improve biodiversity, reduce erosion, enhance organic matter, start nutrient cycling, reduce pollution, and improve the overall aesthetics of the forest. This study performed a preliminary assessment of the vegetation used in mine restoration, offering a method for continuous monitoring and assessment of reclamation.

Keywords: Reclamation, Sustainability, Overburden dump, NDVI and Pollution

EFFECT OF TEMPERATURE ON INFECTIVITY OF ENTOMOPATHOGENIC NEMATODES AGAINST RICE MOTH *Corcyra cephalonica*

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ABSTRACT

Entomopathogenic nematodes are arthropod parasitic nematodes with potential for use as bio-control agents. Although the use of EPNs against several insect pests is common, their efficacy depends on soil characteristics, agricultural management, and competition with native EPNs (Glazer, 2002). In addition, temporal fluctuations of EPN populations indicate the importance of temperature changes due to seasonal changes. An attempt has therefore, been made to find out the effect temperature on infectivity of *S. carpocapsae* against rice moth *Corcyra cephalonica*. Five last instar larvae of *Corcyra cephalonica* was placed in each petriplate and different inoculums level of IJs 100, 200, 300, 400 and 500 of *S. carpocapsae* were released in each petriplate and each treatment were replicated four times. Treatment without IJs EPNs was considered as control. Each treatment was kept at different level of temperature 15° C, 25° C and 35° C under BOD conditions. The observations were taken on the mortality of insect larvae after every 24 hrs up to 96 hrs from the times of inoculation of IJs. The dead larvae were examined for presence of nematodes Results on revealed that maximum (100) percent mortality was observed at 35°C and with 500 IJs after 48 hours of inoculation while at 25° C temperature (100) percent insect mortality was recorded after 72 hrs with 500 IJs. Likewise, at 35°C with inoculums level of 400 IJs, 80 percent insect mortality was achieved after 48 hrs and 100 percent mortality was observed after 72 hrs. Minimum 10 per cent mortality was recorded at 15° C with 100 IJs after 24 hours of inoculation. The results indicate that absolute mortality of *C. cephalonica* larvae was achieved within 48 hrs at 35°C, with inoculums level of 500 IJs per petriplate.

Keywords: Entomopathogenic nematodes, *Steinernema carpocapsae*, infectivity, abiotic factors, *Corcyra cephalonica*, temperature.

BIOFORTIFICATION IN MILLETS FOR NUTRITIONAL SECURITY

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ABSTRACT

The major threat to the world's population is nutritional insecurity that is highly dependent on cereals-based diet which is deficient in micronutrients. Millets are nutritionally superior as their grains contain high number of proteins, essential amino acids, minerals, and vitamins. Biofortification of staple crops is proved to be an economically feasible approach to combat micronutrient malnutrition. Conservation of plant genetic resources (PGRs) provides a continuous supply of raw material for crop improvement. Success of biofortification program lies in the sustainable utilization of PGRs for nutritional enhancement. International Crop Research Institute for Semi- Arid Tropics (ICRISAT) contains the largest collection of millet germplasm representing 27.4% of total crop accessions in the genebank. Biofortification is an upcoming, promising, cost-effective, and sustainable technique of delivering micronutrients to a population that has limited access to diverse diets and other micronutrient interventions. Biofortification of crops generally refers to their production with enhanced nutritional value. Biofortification of essential micronutrients into crop plants can be achieved through three main approaches, namely transgenic, conventional, and agronomic, involving the use of biotechnology, crop breeding, and fertilization strategies, respectively. Biofortification is a food-based approach, which is a relatively new and attractive intervention that involves breeding food crops, using conventional or transgenic methods for enhancing their micronutrient content. High iron pearl millet in India has been developed to tackle iron deficiency. Molecular basis of waxy starch has been identified in foxtail millet, proso millet, and barnyard millet to facilitate their use in infant foods. Biofortification in millets is still limited by the presence of antinutrients like phytic acid, polyphenols, and tannins. RNA interference and genome editing tools [zinc finger nucleases (ZFNs), transcription activator-like effector nucleases (TALENs), and clustered regularly interspaced short palindromic repeats (CRISPR)] needs to be employed to reduce these antinutrients

BIODECOMPOSITION OF PADDY STRAW USING MICROBIAL CONSORTIUM

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ABSTRACT

Rice cultivation is widespread worldwide due to its indispensable role in food security and high economic value. Unfortunately, rice cultivation is associated with the unwanted organic substance called rice straw (Paddy Straw) which occupies a large area in the field. Paddy straw is an undesirable by-product due to its poor digestibility, wealth of lignin and silica, slow degradation rate, weak proteinaceous content and also the cause of Diseases. Although paddy straw is now widely used in production of compost in many countries, the biological decomposition of paddy straw is urgently needed to avoid environmental pollution. The

biological decomposition of paddy straw depends on different kinds of microbes such as actinobacteria, which feed on paddy straw and produce useful metabolites such as biofuel, pharmaceutical products and sugar. Biodecomposition of paddy straw can be done in *ex situ* or *in-situ* conditions. The *in-situ* biodegradation of paddy straw increases the soil fertility due to liberation of carbon sources such as sugars and oligosaccharides without any harmful effect. Thermophilic bacteria produce unique hydrolytic enzymes with, by which they effectively hydrolyze the polysaccharides of paddy straw and release soluble carbohydrates. The mesophilic phase of straw utilization is managed by eubacteria and fungi, while the thermophilic phase is usually occupied with actinobacteria due to decomposition of complex substances to available forms, such as lignin, containing wastes. Therefore, pre-inoculation of bacteria in paddy straw leads to efficient and fast composting. The sustainability of the crop production system in future largely depends on the soil fertility, balanced and adequate supply of nutrients. Paddy straw is one of the most potential sources of organic substance available in the field itself. Paddy straw contains a good amount of plant nutrients and one ton of paddy straw is reported to contain 0.5-0.8% N, 0.16-0.27% P₂O₅, 1.4-2.0% K₂O, 0.05-0.10% S on dry matter basis. In addition to the above, it consists of digestible organic matter (51.5%), cellulose (47.2%), soluble phenolic compounds (4.3%) and lignin (3.0%). In recent years, paddy is being harvested using a combined mechanical harvester and large quantities of straw is being unutilized and left in the field. Paddy straw is one of the important sources of nutrients in the soil, in natural decomposition a slow process owing to the presence of lignocelluloses in the straw. The microbes play an important role in the breakdown of the complex substances into simple and in available form. Soil is an abode of microbes which are capable of degrading Lignocellulose material of agricultural waste. The recent interest in rice straw decomposition is a global focus on reducing air pollutants emissions, efficiently using renewable energy sources and increase in natural farming practices. Paddy straw has not been a good substrate for energy production because of its complex, lignocellulosic structure. But several emerging factors, including the abundance of rice straw, pre-treatment strategies and discoveries of appropriate inocula and the depleted wasted biomass contributing harmful gas emissions, support the perspective that rice straw can be decomposed and increase the soil health. Over the last decade, several methods have been developed and applied for the identities of straw decomposers with their activities and functions. Both Gram-positive and -negative bacteria are the key microbial members in the paddy straw degradation process. The members of the *Clostridium* cluster are actively involved in paddy straw decomposition in soil. The importance of the Clostridia classes, followed by Acidobacteria, Bacteroidetes and Proteobacteria. Actinomycetes are also known for their ability to decompose complex molecules, particularly lignocellulose components, which make them important in paddy straw decomposition processes. Fungal species are predominately degrading cellulose and lignin compounds and converted into simple sugars and acids, which further supports other host microbes in the soil. Some of the economically employed soil fungi are species of Pleurotus and Trichoderma. Although a small amount of GHG emitted during the process of decomposition, substrate with low C:N ratio releases higher CH₄ and NH₃ emission. Biodecomposition is a microbial degradation process, C:N ratio is the most important factor to initiate the decomposition process. At the initial state of decomposition, the C:N ratio must be around 50:1 which helps the fast decomposition of straw. As the C:N ratio (90:1), it is essential to bring down the C:N ratio by supplying an exogenous nitrogen source. Poultry waste is a good supplement to down the C:N ratio due to its high nitrogen content. In nature, the decomposition rate of paddy straw is slow and natural microflora participates in decomposition of the agricultural waste. Therefore, bioaugmentation of efficient microbes may improve and accelerate the decomposition process.

Paddy straw is a lignocellulosic biomass which is a complex structure comprising highly organized cellulose microfibrils linked to the network of hemicelluloses and shielded by lignin. This complex structure makes it recalcitrant to external physical, biological and chemical attacks. The bulk of straw in the field is generally decomposed slowly by indigenous microbes. Attempts to increase decomposition rate of straw have been done by augmenting cellulolytic microorganisms into the field. Fungal genera such as *Chaetomium*, *Aspergillus* and *Trichoderma* have been shown to increase decomposition of paddy straw in the field. However, the decomposition efficiency in open conditions is limited due to unstable environmental conditions and incompatibility of the effective cellulolytic microbes with indigenous microbes. Compatibility action of microbes producing a wide range of cellulolytic, hemicellulolytic, and lignolytic enzymes provides the basis for efficient lignocellulose decomposition of the complex structure of paddy biomass in nature. A highly active enriched microbial consortia comprising a variety of cellulolytic bacteria and fungi has been reported with high capability of degradation of rice straw in paddy fields. Direct application of exogenous cellulase in soil to promote paddy straw decomposition. Co-cultivation of biomass degrading microbes has been reported as a potent approach to increase decomposition efficiency of various agricultural residues. These included coffee pulp waste, paddy straw, forest waste, and wheat straw. Biodecomposition involves a microbial process where the complex substrate is broken down into a more stable product. Different microorganisms may have different roles in the decomposition process. Microbes have the ability to produce metabolites and enzymes which enhance the decomposition process of paddy straw and increase humus, nutrients quality in soil. This process is useful in managing paddy straw waste. Besides, technology using microorganisms for managing agricultural waste is one of the alternatives in use of available biomass and it is much more eco-friendly.

ENRICHMENT OF BIOCONTROL AGENTS IN FIELDS DURING NATURAL FARMING PRACTICES

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ABSTRACT

Natural Farming is a system integrating trees, crops, livestock and allowing the optimal use of functional biodiversity. Natural Farming is also known as “livestock-based” farming”. Natural farming is trying to give solutions to various health problems, natural calamities, global warming and climate change. As the name suggests, natural farming is an art of achieving much more with less. By 2050, the world's population will be approximately 10 billion. The increasing population will boost the agricultural demand by about 50%. Biocontrol is an activity of one organism that reduces the adverse effects of another organism. It is simply defined as “the control or regulation of pest populations by natural enemies”. The eradication of different pathogens, weeds, insects and pests is done by use of living microbes in this practice. The agents used to control a plant from its natural enemies are known as biocontrol agents. Biocontrol agents prevent killing of useful organisms in soil as they are highly specific in nature. Microbes are well-known to be used as biocontrol agents. Predation and parasitism are the two major principles on which biocontrol works. Other different bacteria like *Azotobacter chroococcum*, *Erwinia herbicola* and *Pseudomonas cepacia* can control *Rhizoctonia solani*, *Erwinia amylovora* and *Fusarium* spp., respectively. Various fungi including *Verticillium laccani*, *Trichoderma haematum* and *Trichoderma viridae* can control *Uromyces dianthi*, *Phytium* sp. and *Macrophomina phaseolina*, respectively. Bacteria that are

colonizing the plant roots and help in promoting plant growth are known as plant growth promoting rhizobacteria (PGPR). PGPR are highly diverse and some of them work as biocontrol agents. *Pseudomonas* is a motile, aerobic, gram-negative proteobacteria genus and is able to survive a wide range of habitats. It works as a biocontrol agent. Fluorescent pseudomonads are the well known biocontrol agents including *Pseudomonas fluorescens* Pf-5, *Pseudomonas fluorescens* A506 and *Pseudomonas fluorescens* 30-84 control *Rhizoctonia solani*, *Erwinia amylovora* and *Gaeumannomyces graminis* var. *tritici*., respectively. They control by antibiosis, lysis, competition and parasitism. Antibiosis is a process of secreting antibiotic compounds to prevent the growth of various pathogens by biocontrol agents. For example, suppression of take-all disease of wheat can be seen by secretion of phenazine by *Pseudomonas fluorescens*. Various other secondary metabolites like viridian, gliotoxin and trichodermin are secreted by fungus *Trichoderma* sp. to prevent pathogens. Lysis is the process in which cell walls or hyphae are lysed by different enzymes. For example, hyphae of *Gaeumannomyces graminis* are lysed by *Bacillus* sp. and by producing β -1,3 glucanases and chitinases, the cell wall of *Rhizoctonia solani* is disrupted. In Competition, pathogens are being competed with biocontrol agents for food and as a result are suppressed or displaced. For example, *Pseudomonas fluorescens* produces pyoverdins and pseudobactins and chelates the Fe present in soil, thus making pathogen unavailable with iron. As a biocontrol agent coils around the hyphae of a pathogen results in parasitism. For example, the hyphae of a fungal host are first punctured and then killed to obtain nutrients by *Trichoderma viridae*. Their high effectiveness, no toxicity, high protection, eco-friendly nature of biocontrol agents makes them more advantageous. Jeevamrit is a combined mixture of soil and water with cow urine, cow dung, pulses flour and jaggery. Due to its richness in phosphorus, potassium and nitrogen, it helps in proper growth and development of a plant. Jeevamrit takes just a week to be prepared. It helps in improving aeration, beneficial bacteria and maintaining the pH of soil. A non-metallic barrel having capacity about 200 litres is being filled with water, cow urine, cow dung, pulses flour, jaggery and a handful of soil. The mixture is then stirred clockwise two times in a day mainly in the morning and evening using a wooden stick. Crop rotation is a process of growing different crops in different seasons to maintain the soil health and its microbiota. It helps in increasing soil organic matter, improving microbiota of soil, controlling erosion, increasing yield, managing plant nutrients, preventing growth of weeds, insect pests and soil diseases. An agro-climatic zone is a unit of land depicting the different climates of a crop which are suitable for their sustainable growth. Different types of vegetation are influenced by various agro-climatic conditions of soil type, water availability, temperature and rainfall. India is classified into about 15 different agro-climatic zones namely island region, Gujarat plains and hills, eastern coastal plains and hills, western plateau and hills, eastern plateau and hills, upper gangetic plain region, lower gangetic plain region, western Himalayan region, eastern Himalayan region, middle gangetic plain region, trans-ganga plain region, central plateau and hills, southern plateau and hills, western coastal plains and ghats, western dry regions.

PLANT BREEDING AND BIOTECHNOLOGICAL APPROACHES FOR THE CROP IMPROVEMENT TOWARDS FOOD AND NUTRITIONAL SECURITY

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ABSTRACT

In the India population has been increasing day by day, even food production is increasing. Though, more food is needed for rapid growing population in coming years, food quality also to be improved for increase in nutrient content. India is in serious hunger stage; it is somewhat back as compared to its neighbouring nations. Many people are suffering due to malnutrition. It is required to improve quality of crops for now and to the future generations. Researchers are going on to improve the quality and yield. Even till now many are following the conventional breeding practices. The crop plants are degraded due to genetic erosion and other genetic problems. So it is very important to improve the crop yield and quality in coming years. Many new techniques are there in order to improve the quality of crops, such as heterosis breeding lead to broaden genetic bases, marker based selection, gene pyramiding and back crossing etc., these methods are very crucial to improve the crop plants. Genetic engineering will also play major role in the crop improvement, by gene transformation, genome editing, introgression of new alleles in the gene and by developing the genetically modified crops. These biotechnological approaches will improve the quality of the crop and their yield. Crop improvement through breeding will change the value and offers the better approach in food security.

Keywords: Food production, Nutritional Security, Heterosis, Genome Editing

EFFECT OF ASHWAGANDHA SUPPLEMENT ON SURVIVAL AND GROWTH OF TROPICAL MULBERRY SILKWORM

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ABSTRACT

Ashwagandha is “very revered herb” and popular herb in Ayurveda an ancient system of medicine in India. Bioactive molecules present in ashwagandha comprise several major and minor secondary metabolites, especially steroidal lactones and alkaloids which have numerous pharmacological activities and this herb is widely studied for potential properties such as antiviral, antibacterial antifungal activity, anti-inflammatory, antitumour, macrophage activating and immunomodulatory activity, antioxidant activity, anti-ageing activity and nootropic effects. Since, silkworm an economically important insect and in tropical regions, the summer season feature high temperature, humidity and poor-quality mulberry leaves, whereas spring season is favorable to mulberry crop and also to produce desirable quality and yield and several studies acknowledge such circumstances leading to produce poor quality mulberry leaves and impact the silkworm rearing. Moreover, it is commonly known that wide occurrence of several disease and pest, improper mulberry cultivation (technology adaptation)

can also contribute to poor mulberry leaf quality and yield to certain extent and further can get worsen by droughts situation which leads to poor irrigation and produce undesirable leaf quality and yield. This constraint particularly recommends alternative methods for producing good quality mulberry leaf. A simple approach to enrich the nutritive value of mulberry leaves can be attained or established through augmenting mulberry foliage with extrinsic nutritional sources. In the present study ashwagandha as supplement to 5th instar silkworm larvae was evaluated for its effects on growth and survival. Several studies have attempted to elucidate the effect of nutritional supplements broadly through certain aspects of its physiological, metabolism and cocoon parameters. Methods used to deliver supplements in to mulberry leaf includes spraying, dipping or spreading on leaf, here we used hand spray to treat different concentration of ashwagandha. Earlier several studies showed nutritional supplements enhanced larval characters such growth, weight, survival, food intake, and food conversion. The larval stage of silkworms is an important period of growth and development, and the larval weight and survival rate can reflect the effect of ashwagandha dietary treatment. Ashwagandha (4%) supplement through mulberry diet was more efficient with reference to larval body weight and cocoon shell weight. Eventually, other ashwagandha supplement also found to increase these parameters in respect of control group. However, in ashwagandha supplement of 6% and 8% treated group increased mortality at negligible level and cocooning rate were also increased. Since larval weight quantitatively increased in all the dietary treated larval groups suggest that ashwagandha supplement could exhibited growth promoting effects on 5th instar larval diet and therefore able to turn positive values for larval weight.

Keywords: Silkworm, mulberry leaf, ashwagandha, supplement, larval weight, larvae survival

EFFECT OF BIO REGULATORS IN CONTROL OF FLOWER AND FRUIT DROP ON TOMATO (*Solanum lycopersicum* (L.) Mill.) IN CALCAREOUS SOIL OF NORTH BIHAR

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ABSTRACT

The present investigation was carried out at the Vegetable Research Farm of Dr.Rajendra Prasad Central Agricultural University, Pusa, Samastipur, Bihar, during 2019-20 to study the effect of plant bio regulators (NAA and GA₃) on morphological, physiological, biochemical and yield attributing parameters of tomato cultivar “Kashi Vishesh”. The experiment was laid out in Randomized Block Design (RBD) having seven treatments and three replications. Treatments consist of different levels of NAA (T₁- 10 ppm, T₂ – 20 ppm, and T₃ -30 ppm), GA₃ (T₄ -50 ppm, T₅ – 100 ppm, and T₆ -150 ppm) along with control (T₇ - sprayed only distilled water). These different concentrations of NAA and GA₃ were sprayed on the crop at 25, 50, and 75 days after transplanting to study the different parameters at all successive stages of crop growth. All morphological, physiological, biochemical and yield attributing characters was found to be significantly superior at T₃ (NAA at 30 ppm) and T₅ (GA₃ at 100 ppm) viz. maximum plant height at 90 DAT (120.66 cm) and (119.22 cm), maximum number of branches per plant at 75 DAT (15.33) and (15.66), maximum number of leaves per plant (221.22) and (223.22), maximum number of primary branches per plant (39.22) and (39.44), maximum number of flowering branches per plant (9.107) and (8.66), maximum number of flowers per plant (18.887) and (20.22), maximum number of fruits per plant (14.107) and (13.77), maximum polar diameter of the fruit (4.79 cm) and (4.71 cm), maximum equatorial diameter of the fruit (4.82 cm) and (4.77cm), minimum acidity of the fruit (0.47%) and (0.47%), maximum leaf area index (2.75) and (2.86), maximum relative water content (1.197%) and

(1.24%), dormant ABA(0%) and (0%), maximum TSS content of the fruit (4.20⁰ Brix) and (4.31⁰ Brix), maximum ascorbic acid content of the fruit (10.68 mg/100g) and (10.46 mg/100g), maximum average weight of the fruit (96.99g) and (97.22g), maximum average yield per plant (2.57kg) and (2.570kg), maximum days taken for 50% flowering (73.22) and (72.88), maximum shelf life of the fruit (19.33 days) and (19.33days), maximum number of fruit set per plant (54.55%) and (54.27%), minimum fruit drop percentage (5.44%) and (5.55%), and maximum yield per hectare (48.67 t/ha) and (48.77t/ha) respectively compared to control.

SURVEY AND INCIDENCE OF POKKAH BOENG DISEASE OF SUGARCANE IN BIHAR REGION

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ABSTRACT

Sugarcane is an important food cum cash crop grown in tropical and subtropical areas of the country and plays a major role in Indian economy. In spite of having tremendous production potential and suitable ecological adaptation, the average productivity of the crop in Bihar is very low. Among the factors responsible for subsequent decline in sugar production, diseases have been considered to play a significant role. The incidence of diseases are increasing at an alarming rate and the yield is declining every year. An extensive survey works for sugarcane Pokkah Boeng disease and incidence of the disease were made in different locations of Bihar. Recent survey showed increasing trend of disease incidence and most of the commercial cultivars affected by the disease ranged from 1 to 90 per cent. On the basis of observation made, more or less almost all sugarcane varieties grown in Bihar are suffered due to this disease. It was noticed that the varieties grown from different regions are more affected than the Bihar regions. The varieties Co 0238, Co 0118, CoH 167, Co 0233, Co 0235, CoSe 95422 and CoP 2061 are affected with pokkah boeng disease. The maximum incidence was noticed in variety Co 0238 and it varied from 5 to 20% in Riga sugar factory areas whereas, minimum 3% incidence was noticed in variety CoP 2061 under Kalyanpur Farm Pusa.

Keywords -Sugarcane, survey, incidence, pokkah boeng, disease

STANDARDIZATION OF IRRIGATION AND FERTIGATION SCHEDULE FOR TOMATO CULTIVATION UNDER SOIL LESS MEDIA

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ABSTRACT

A study on “**Standardization of Irrigation and Fertigation schedule for Tomato cultivation under Soil less Media**” was conducted with eighteen treatments. The treatments comprised with different soil less media like Cocopeat, Perlite, Vermiculite, Vermicompost and sand along with three levels of RDF and two levels of irrigation. The tomato plants planted in grow bags irrigation and fertigation applied with drip irrigation system. Tomato crop of variety Avinash-2 was selected for experiment. The field layout done by using CRD with three replications. The seasonal crop water requirement of tomato plants in soilless media in grow bages cultivation varies from 17.37 to 21.71 cm under irrigation level 80% and 100% Etc. The best

growing media was found Cocopeat + Perlite + Vermicompost (3:1:1). The composite effect of growing media, irrigation and fertigation on vegetative growth and yield parameters (fruit length, fruit diameter, numbers of fruit per plant, fruit weight, yield per plant) was found better in treatment M1I2F1 (Cocopeat + Perlite + Vermicompost + 0.80 ETc + 125 % RDF). The maximum average vegetative growth was recorded as 102.12 cm, fruit length 5.55 cm, maximum diameter 5.29 cm, average numbers of fruit per plant 63.73, average fruit weight 90.82 g, and maximum yield 5.23 kg per plant was recorded. However, the minimum yield was (2.88 Kg) under M1F3I2 treatment. The B: C ratio of 3.12 and maximum net income of Rs 211211/- per 1000 m² in treatment M1I2F1 and minimum B: C ratio of 1.46 in treatment M1F3I2 (control).

Keywords: Soilless media, Tomato, Crop Water requirement, Fertigation, B/C ratio.

RESPONSE OF ECOLOGICAL INTENSIFICATION ON RICE

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ABSTRACT

A field experiment entitled “Studies on ecological intensification in rice (*Oryza sativa* L.)” was conducted on sandy loam soil at experimental farm of TCA, Dholi (Dr. Rajendra Prasad Central Agricultural University, Pusa) (Samastipur), Bihar during kharif season, 2019.

The soil of the experiment field was calcareous in nature containing 32.3% free CaCO₃, sandy loam in texture and alkaline in reaction with a pH of 8.21. It was moderately fertile being low in organic carbon (0.41%) and available nitrogen (184 kg N/ha) and also low in available phosphorus (10.23 kg P/ha) potassium (103.21 kg K/ha). The experiment was conducted in randomised block design (factorial) which was replicated thrice taking the variety Rajendra Bhagavati as a test crop. The factors under study comprised of different ecological intensification practices and farmers practices: T1-Farmers practices, T2- Ecological intensification (E.I.), T3- E.I. minus tillage practices, T4-E.I. minus nutrient management, T5- E.I. minus planting density, T6-E.I. minus water management, T7-E.I. minus weed management and E.I. minus insect and disease management. Standard package and practices of crop management were followed. Phosphorus and potassium fertilizers were applied as basal whereas urea was applied as per treatment in three split doses as basal (50%), active tilling (25%) and panicle initiation (25%). The experimental findings revealed that ecological intensification had a profound influence on growth parameters, yield attributes, yield, nutrient uptake and economics of rice. Significantly higher values of growth parameters (tillers m⁻² and dry matter production) were observed in rice. As a result, treatment T2 produced taller plants at all the growth stages. However, T8 treatment found at par with the T2 treatment in all the growth stages. Most of the yield attributes (panicle length and grains panicle⁻¹), yield (grain and straw), NPK uptake (grain and straw) were higher with T2 treatments. It was also found to be the most profitable treatment in regards to gross returns, net returns and B: C ratio. Thus, it can be inferred that the ecological intensification practices is beneficial for realizing maximum economic benefits, higher productivity, reduced fertilizer use and improve soil fertility.

Keywords- Ecological intensification, tillage practices

RESOURCE USE EFFICIENCY AND TECHNICAL EFFICIENCY OF SOYBEAN PRODUCTION IN MADHYA PRADESH-DEA (DATA ENVELOPMENT ANALYSIS) APPROACH.

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ABSTRACT

The resource use-efficiency of soybean production has been computed using primary data collected from 120 soybean growers spread over two blocks each from two selected district Vidisha and Ujjain of Madhya Pradesh. The study revealed that the mean technical efficiency of soybean crop regarding most of the farmers were found to be 69 percent which indicated that production of crop may further be raised by 31% with available technology. The allocative efficiency of the mean estimated as 0.69, indicating that the farmers could be minimize cost by 31% through using optimum combination of inputs keeping in mind their prices while selecting their quantities. The cost efficiency asserted that farmers may be reduce their overall cost of soybean production up to 73% to harvesting the existing level of output at least cost. Undoubtedly, the export of soybean from the state has increased during the period of investigation. Therefore, efficiency measures highlight considerable scope to enhance resource uses by least cost processing through use of appropriate quality combination of inputs and output. The study has also suggested that some measures to increase productivity and income of the farmers in the study area.

Keywords- Soybean, Resource use-efficiency, Technical efficiency, Allocative efficiency, Cost efficiency, M.P.

CULTURAL AND MORPHOLOGICAL CHARACTERIZATION OF *Collectotrichum falcatum* FROM BIHAR REGION

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ABSTRACT

Sugarcane red rot disease caused by *Colletotrichum falcatum* is a serious ravage for sugarcane production in Bihar. In the last twelve decades, several popular varieties were eliminated from the cultivation as they succumbed to red rot infection. The emergence of new variants of the fungus resulted in loss of resistance in the varieties against red rot pathogen. Therefore, study of variability of the fungus is the prime requirement for varietal resistance testing against the pathogen. In the present investigation, the cultural and morphological variability of twenty seven isolates of the pathogen collected from five districts of Bihar along with 3 designated pathotypes (CF 01, CF 07 and CF 08) was carried out. The observations was taken with respect to their colony colour on front and back side of the plate, growth rate in mm per hour and mm per day, topography, extent of sporulation and conidial characteristics. The several colony colour i.e. white, whitish grey, greyish white, ashy grey, light brown and pinkish white and pigmentations viz., light yellow, dark yellow, light pink and black were observed. The colony margin was either smooth to irregular. The mycelia of the isolates were aerial to sub-aerial,

sparse, scanty to abundant with flat, slightly raised and fluffy texture. The sporulation varied from low, medium to high. The conidia of all the isolates were single celled, hyaline and falcate in shape. The average length of conidia varied from 19.87 to 31.47 µm and width from 3.74 to 4.72 µm. The isolates were categorized into ten groups on the basis of their cultural and morphological characteristics.

Keywords – *Colletotrichum*, cultural, morphological, Bihar

DETERIORATION IN CANE JUICE ATTRIBUTES DUE TO WILT DISEASE

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ABSTRACT

Sugarcane (*Saccharum officinarum* L.) of family Poaceae, is one of the important commercial and widely grown crop in the Indian sub-continent. It is the second largest agro-based industry-next only to the textiles. A significant contribution to national exchequer is borne by this crop, it also provides employment to over a million people directly or indirectly. In Bihar, about 10-15 diseases were observed in which red rot, wilt, smut, Pokkah boeng, sett rot and ratoon stunting are of major concern. Among these diseases wilt of sugarcane caused by *Fusarium sacchari* which was first reported by Butler from Bihar, has emerged as a major disease of sugarcane affecting all stages of crop and is observed from germination to maturity in tropical and subtropical India. The field experiment carried out at Sugarcane Research institute, RPCAU, PUSA, Bihar in which 30 genotypes/varieties of sugarcane were evaluated keeping CoSe 95422 as check. The cane juice of all 30 varieties was estimated to understand the variation caused by the wilt pathogen on the juice attributes. Variety CoSe 17452 showed lowest brix (14.24%), sucrose (10.06%) and purity (70.65%). The most resistant variety among the evaluated varieties was CoP 17437 with highest brix (20.03%), sucrose (17.53%) and purity (87.52%).

Keywords: Sugarcane, juice, attributes, deterioration, wilt.

CURTAILING EFFECTS OF BIOCONTROL AGENTS, FUNGICIDES AND BOTANICALS AGAINST *Rhizoctonia solani* INCITING BANDED SHEATH BLIGHT OF MAIZE IN MANIPUR

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ABSTRACT

Maize (*Zea Mays* L., 2n=20), is a significant grain crop that is grown all over the world. It is frequently referred to as Queen of Cereals. Maize was first introduced to India in the 17th century, and today it ranks third in production and fifth in area. It is afflicted by numerous bacterial, viral, and fungal diseases, the most significant of which is banded leaf and sheath blight (BLSB), which is caused by *Rhizoctonia solani* f.sp. *sasakii* Exner (telomorph: *Thanatephorus cucumeris*). *R. solani* is a pathogenic fungus that lives in soil, and a hot, humid atmosphere is conducive to the disease. Due to BLSB, reductions in grain yield leads to the extent of 11 to 40% have been documented under these circumstances. *In vitro* evaluation of different *Trichoderma* spp. on radial growth of *R. solani* was conducted by using dual culture method. Seven different strains of *Trichoderma* spp. showed positive impact by reducing the

growth of pathogen *R. solani*. Highest inhibition percentage was shown by *Trichoderma asperellum* with 78.09% followed by *Hypocrea lixii*, *T. ovalisporum*, *T. atroviridae*, *T. koningiopsis* and least inhibition percentage was showed by *T. harzianum* with 62.38%. *In vitro* evaluation of fungicides was conducted by using poisoned food technique in 0.1%, 0.25%, 0.50%, 0.75% concentrations. Seven different fungicides showed effective results in reducing the growth of *R. solani*. Highest inhibition percentage was showed by Propiconazole 25% EC and Tebuconazole 25% EC in all concentrations with 100% followed by Azoxystrobin 18.2 w/w +Difenoconazole 11.4% w/w, Azoxystrobin 11% +Tebuconazole 18.3% SC, Kresoxim methyl, Dithane and least inhibition percentage was showed by Zineb with 65.29% at 0.25%. *In vitro* evaluation of botanicals was conducted by using poisoned food technique in 5,10,15% concentrations. Seven different botanicals showed effective results in reducing the growth of *R. solani*. Highest inhibition percentage was showed by Garlic with 100% in all concentrations, followed by Turmeric, Jatropa, Onion, Neem, Tulsi and least inhibition was showed by Lantana with 47.84% at 5% concentration.

Keywords: *Zea mays*, Banded leaf and sheath blight, *Rhizoctonia solani* f.sp. *sasakii*, *Trichoderma*, antagonism

GENETIC VARIABILITY AND CORRELATION STUDIES IN MUNGBEAN (*Vigna radiata* L. WILCZEK)

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ABSTARCT

The current study was conducted in *Kharif* 2021 to evaluate the genetic diversity and correlation between mungbean yield and yield-related traits. In this study, 14 quantitative characteristics, including days to 50% flowering, days to maturity, plant height (cm), number of primary branches per plant, number of clusters per plant, number of pods per plant, number of seeds per pod, number of seeds per plant, biological weight (g), 100 seed weight (g), harvest index (percent), and seed yield per plant (g), were examined in 60 mungbean genotypes. All of the traits displayed significant heritability along with high genetic advance based on genetic variability studies, demonstrating the predominance of additive gene action. This feature will be useful for selection. Heritability was highest for seed yield (0.998) and number of seeds produced per plant (0.998), and lowest for pod length (0.734). For all the characters being studied, phenotypic correlation is greater than genotypic correlation. According to correlation studies, the parameters number of pods per plant, plant height, number of clusters per plant, number of seeds per cluster, harvest index, and biological yield all exhibited positive, significant correlations with seed yield per plant. Thus, it would be more fruitful to select for the aforementioned features together in order to improve the mungbean.

Keywords: Mungbean, quantitative characters, Heritability

INHIBITORY POTENTIALITIES OF BIO-CONTROL AGENTS, FUNGICIDES, BOTANICALS ON *Cochliobolus heterostrophus* INCITING MAYDIS LEAF BLIGHT IN MAIZE

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ABSTRACT

Maydis leaf blight is considered the most devastating disease of maize crop, which causes noticeable reduction in crop yield. It is caused by the fungus *Cochliobolus heterostrophus* (Drechsler). It is also known as Southern corn leaf blight. Damage is most critical if infection occurs prior to silking and if weather conditions are favourable for disease development during the reproductive growth stages. For the purpose of better understanding and finding out the detailed study of the fungal pathogen firstly the symptoms should be identified in the field and isolate the pathogen, and then fungus should grow on suitable culture media under laboratory condition. Potato Dextrose Agar (PDA) is used as the media for the growth of the fungal pathogen. *In vitro* evaluation was done on seven *Trichoderma spp.* seven Botanicals and seven Fungicides. By using *Trichoderma sp.* the fungal pathogen grown in the petri plate by dual culture method. Botanicals and Fungicides are grown by following the poisoned food technique. After the full growth of the pathogen in the control plate, observations should be taken. As *Bipolaris* is slow growing pathogen, it takes nearly 7 days for complete growth in the control plate. Per cent inhibition should be calculated. By the results obtained, the best bio-control agent against *Bipolaris* is *Trichoderma ovalisporum* (85.23%) showing maximum growth inhibition on the pathogen among seven different species followed by *T. harzianum*, *T. atroviride*, *T. asperellum*, *T. koningiopsis*, *T. harzianum* and least per cent inhibition of 80.4% was shown by *Hypocrea lixii*. The fungicides are evaluated at four different concentrations *i.e.*, 0.1%, 0.25%, 0.5% and 0.75%. Among all the seven fungicides best per cent growth inhibition (100%) was shown by Propiconazole 25% EC and Tebuconazole 25% EC at all the four concentrations followed by Azoxystrobin 11% + Tebuconazole 18.3% SC, Azoxystrobin 18.2 w/w + Difenoconazole 11.4 w/w SC, Dithane M-45, Kresoxim methyl 44.3% SC. The least per cent inhibition was found in the fungicide Zineb 75% WP at 0.5% concentration (42.35 per cent inhibition). Botanicals are evaluated at three different concentrations *i.e.*, 5%, 10% and 15%. Among all the seven botanicals best per cent growth inhibition (100%) was shown by Garlic extract at all the three concentrations followed by *Lantana camera*, *Ocimum sanctum* (Tulsi), *Jatropha curcas*, *Curcuma longa* (Turmeric), *Azadirachta sp.* (Neem). The least per cent inhibition was found in the botanical *i.e.*, Onion at 5% concentration (61.17 per cent inhibition). Four cereals crops *viz.*, Paddy, Wheat, Pearl millet and Sorghum were taken for host range study of the fungus and it is found that all of them may be the host plant of this fungal pathogen.

Keywords: Maydis leaf blight, *Bipolaris*, *Trichoderma*, Fungicides, Botanicals

CLIMATE CHANGE AND SUSTAINABLE WATER RESOURCE MANAGEMENT

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ABSTRACT

Almost all aspects of climatic patterns are affected by rising level of Greenhouse gases (GHGs) and increasing anthropogenic activities. Change in climate is observed and studied by various researchers. In this article, the present and future effects of climate change on precipitation, temperature, flood events and droughts are discussed in the form of case studies. Significant rising trends in observed temperature are found in some parts Ganga basin. Future trends of temperature and precipitation also shows rising trend in entire Ganga basin. Rajasthan, a semi-arid hot zone, receives lesser rainfall and more prone to droughts. Historical and future trends of Standard precipitation index (SPI), which is a drought index, are also discussed in this study. It is seen that, overall, there will be less severe droughts based on annual and monsoon months, but Northern and Western part of Rajasthan will be prone to more severe droughts. Rising level of CO₂ emission is major contributor to the global warming. To keep the global warming lesser than 2°C than pre-industrial time, carbon capture and storage (CCS) is only feasible solution. Maintaining the sustainability of the water resources is of prime importance because (i) due to the rising temperature, the available water resources will decline in the long term and (ii) water requirements will increase due to the growing population and economic advancements. This article also discusses the considerations and components of sustainable water resource management highlighting the approaches employed for managing agricultural water which is a major share-holder in the consumption of water resources.

Keywords: - Climate Change, Sustainable Water Resources, Global Warming.

INNOVATION OF SPOT APPLICATOR IN PINEAPPLE CROP FOR UNIFORM HARVESTING

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PURPOSE

Technology developed by KSNUAHS, Shivamogga and PRABHAT TEK NOVA had MOU with KSNUAHS for production and commercialization for this tool. This tool delivers the measured liquid flow through the nozzle at one trigger and controlled by micro controllers and fits inside a 12 V battery operated backpack sprayer. In automatic made tool provides time setting, delay setting and volume setting for uniform harvesting in pineapple crop. Intelligent tool to deliver volumetric dispatch at once to the point of application, easy to use, reduce drudgery, less labor requirements, eliminated Health related chemical handling problems.

METHODS

For uniform maturity of fruits & one stoke harvesting, 50ml ethrel is used on each plants crown @ 12-month days after planting. Otherwise harvesting period will extend up to 90 days in traditional method of cultivation. Volumetric dispatch at once to the point of application. Point the nozzle on the crown of the plant and press trigger exactly 50ml liquid will be delivered to the crown.

RESULT

Labor required for application in 1 ha with medium density planting in pineapple crop required 2 man-days in SPOT APPLICATOR whereas 10 man-days in manual method. After the application of ethrel with SPOT APPLICATOR harvesting period is within 10 days where as in traditional method of cultivation it takes 90 days after the 12 months days after planting. Precise delivery to the exact point. It reduces drudgery and injury to the labor. Eliminated health related chemical handling problems. Easy to use with safety compare to traditional method of application.

CONCLUSION

Creates safe working environment in agriculture, work effortless in the field, reduces drudgery of men and women labors in pineapple field, safety in handling chemicals, save time and money to the farmers, reduces unnecessary dumping of chemical to environment, reduces environment pollution.

Keywords: Spot applicator, uniform harvesting, volumetric dispatch, point of application.

A STUDY ON MIGRATION OF ADULT CHILDREN AND ITS CORELATION WITH QUALITY OF LIFE OF ELDERLY

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Purpose

Globally, the population is aging rapidly. Elderly persons are more at risk since most of them are no longer in the economically active phase of life and the social security schemes for elderly pay a very meagre amount which is almost negligible for their day to day living and health expenses. The collapse in family ties and structure also have negative effect on elders. Although migration has become a widespread social and demographic phenomenon in developing countries, the subjective consequences of migration are often overlooked. Thus, the study aims at finding the positive or negative effect of migration of adult children on the quality of life of elderly left behind.

Methods

The sample comprised of 150 elderly of whom 100 elderly were living with children and 50 elderly were living with children. The scale on quality of life developed by Bowling and Stenner was used for the study. It consists of 35 statements with 8 dimensions. The data was subjected to correlation test

Results

Results revealed that elderly living with children faced financial problems. A significant relationship was found between gender, occupation and migration with quality of life of elderly living all alone and a significant relationship between gender and type of family was observed with quality of life of elderly living with children.

Conclusions

Quality of life of elderly parents living with children and living alone from Bagalkot and Vijayapura districts. The results revealed that majority of elderly living all alone suffered from financial and health problems. The results also revealed that there was significant association between districts and quality of life. Among them Vijayapura district elderly had better quality of life.

Keywords: *Problems, Quality of life, Elderly parents, Migration, Adult children*

FOOD SECURITY IN THE FACE OF CLIMATE CHANGE: THE POTENTIAL OF UNDERUTILIZED CROPS

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ABSTRACT

In order to meet the needs of an expanding global population and the difficulties caused by global warming, food production must be increased. Agriculture will be put under more stress due to rising temperatures, erratic rainfall and weather patterns, shifting growing seasons, more frequent droughts, and catastrophic weather occurrences. Due to more unpredictable and unfavourable weather patterns, there may be changes in food production and yield loss due to climate change. The creation and promotion of underutilized agricultural species is a crucial component of an adaptation strategy for a changing climate. Today, a limited variety of crop species, primarily the major cereals (wheat, rice, and maize), provide most of the world's food, neglecting a wealth of genetic resources and potentially advantageous features. To address concerns about food and nutrition security in the face of climate change, a more varied agricultural system and food sources are required. These resources can be obtained by taking advantage of the vast reservoir of minor and underutilized crop species. Many resource-poor farmers and consumers, mainly in developing countries, depend on underutilized crops for food security, nutrition, and revenue production. These crops are often referred to as understudied, neglected, orphan, lost, or disadvantaged crops. Underutilized crops can minimize environmental damage, promote agricultural variety, and improve food and nutrition security. According to research, physiological responses and crop-specific features help underutilized crops maintain their resilience in the face of climate change. Evidence shows that in semi-arid situations, these characteristics and physiological reactions have a substantial effect on the ability of crops to withstand times of water stress. This led to the conclusion that research and development of underutilized crops with the capacity to endure the negative impacts of climate change must be a crucial adaptation strategy to minimize the effects of climate change on agricultural output.

Keywords: Underutilized crops, resilient climate crops, food security

LIQUID FERMENTED ORGANIC MANURES (HERBAL KUNAPAJALA) AND THEIR DOSES TO IMPROVE MUSTARD PRODUCTIVITY

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Purpose

In present scenario, Indian agriculture was mainly focused on organic agriculture due to loss of soil organic matter from top soil, soil erosion and water pollution through imbalance application of fertilizers. Liquid fermented organic manures are prepared based on locally available resources they are not relied on external inputs.

Methods

With this theme, an experiment was designed with set of herbal kunapajala concoctions and their doses at Norman E Borlaug CRC, GBPUAT, Pantnagar, during *rabi* 2021-2022 in mustard crop. The factorial RBD with additional treatment design was followed with set of 3 herbal kunapajala concoctions as factor A *viz.*, Herbal Kunapajala prepared from nettle grass (KJ₁), Herbal Kunapajala prepared from common weeds (KJ₂), Herbal Kunapajala prepared from 50% nettle grass + 50% common weeds (KJ₃), factor B with 4 levels *viz.*, 500 l/ha (D₁), 1000 l/ha (D₂), 1500 l/ha (D₃), 2000 l/ha (D₄) spray dose, 100% Recommended Dose of Nutrient as control treatment (N₁) and replicated thrice.

Results

The grain yield was significantly more with KJ₁ (1556.5 kg/ha) as compared to other treatments. Similarly, D₄ (1582.3 kg/ha) recorded significantly more grain yield as compared to other doses. The stalk yield was significantly superior with KJ₁ (4454.2 kg/ha) and D₄ (4620.3 kg/ha) treatment as compared to other treatments. The growth and yield attributing characters were recorded maximum with KJ₁ and D₄ treatment. Non-significant difference was noticed among control and rest treatment. Whereas, higher values were observed with control treatment.

Conclusion

Application of nettle based herbal kunapajala concoction with 2000 l/ha gives higher grain and stalk yield in mustard crop.

Keywords: Nettle based herbal kunapajala, grain yield, Liquid fermented organic manure, stalk yield

TERRACE KITCHEN GARDENS FOR HOUSEHOLD NUTRITIONAL SECURITY IN SEMI- URBAN AREAS OF WEST GODAVARI DISTRICT OF ANDHRA PRADESH

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ABSTRACT

Growing of plants and ornamentals on roof top or terrace is a regular practice in rural and semi urban areas as per the availability of space and interest. The concept of growing the protected food groups i.e. vegetables, greens, fruits etc. in containers on terrace is termed as Terrace Kitchen Gardening. This has attracted many households especially in semi-urban areas where the availability of fresh, organically grown vegetables and fruits are not available. The covid-19 pandemic lockdown was the other reason for most of the nature lovers and home makers to adopt this Terrace Gardening on their open top roof. Dr. YSRHU-KVK, Venkataramannagudem has demonstrated this method of growing vegetables in grow bags and containers as per the available space and resources in ten locations in Tadepalligudem and Tanuku towns during the year 2020-21. The critical inputs like vegetable seed kit, grow bags, cocopeat, vermin compost, neem powder, bio-fertilizers and bio-control agents along with simple gardening tools were provided these women to start the terrace gardening. Seven days skill training was given to impart the skills in growing vegetables and fruits in various

containers. Six types of leafy vegetables, tomato, brinjal, okra, guar, beans, cucumber, ridge gourd, bitter gourd, bottle gourd, drumstick, guava, star fruit, acidlime, water apple and dragon fruit were successfully grown in these demonstrated locations. Grow bags of 16 to 18 inches height and 12 inches diameter were best used for two seasons in a year with low cost for growing leafy vegetables and other vegetables. The vine vegetables and fruit crops performed well in big containers of about 30 inches height and 24 inches diameter. The home makers innovatively and uniquely used the waste materials such as left-over waster cans, tubs, package boxes, oil cans, cooler tubs etc. for growing theses terrace kitchen garden. It was recorded that about 14% to 100 % supplementation of daily household requirement of vegetables, greens and fruits were met in different models. A successful model adopted by Sri. M. Satti Raju from Tanuku in about 250 sq. Ft. terrace with permanent cemented structures, trellising and irrigation arrangement was well suited for growing year-round vegetables, greens and fruits for their family.

Keywords: Terrace Garden, Containers, Grow bags, daily dietary requirement.

ORGANIC CROP MANAGEMENT PRACTICES ON GROWTH AND YIELD OF SESAMUM UNDER CLUSTER FRONTLINE DEMONSTRATION (OILSEEDS) IN WEST GODAVARI DISTRICT OF ANDHRA PRADESH

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ABSTRACT

Importance of Organic farming has significantly increased in recent decades. Organic farming is an agricultural system which deliberately renounces the use of synthetic and dangerous inputs. Indiscriminate use of the chemical inputs usually includes high risks long term contamination of land and water resources and intoxication risks for farmers and farm families. In organic farming affords are taken to avoid use of such chemicals directly and potentially. KVK, venkataramannagudem has conducted cluster frontline demonstration (oilseeds) on sesamum crop from last 5 years. During the year 2021-22 improved sesamum seed YLM 66 and along with improved organic package of practices were demonstrated in 75 acres in West Godavari District by selecting the organic farmers. They belong to singarajupalem, pullalapadu and marellamudi villages in West Godavari district. Sesamum is one of the oldest oilseeds crops it is well adapted to harsh environment and constitutes an alternative cash crop for small farmers. Farmers were adopted organic crop management practices in sesamum, from sowing to harvesting. Sesamum seed was treated with raw cow milk this was helpful against the seed borne pathogens and also protect the crop up to 20 DAS from viral diseases. Green manuring with Navadanyalu seed and incorporated them into soils at 45 DAS. For the last ploughing farmers add nearly 5-6 tons of ghanajeevamrutham, 2kgs of bio fertilizers as basal fertilizer and 1kg of trichoderma & pseudomonas consortia was added to soils before sowing for controlling the soil borne pathogens. panchagavya along with jeevamrutham was sprayed at an interval of 10 days at every 20 DAS as plant growth promoting substance. Major pest and diseases like leaf Webber, leaf hopper, phlloidy, sucking pests, dry root rot and alternaria blight were effectively controlled by spraying of Agniastram along with neem cake at 40 & 65 DAS. By adoption of complete organic practices farmers got an average yield of 3 quintals/acre with a gross income Rs. 30,000/ac. and the average cost of cultivation was recorded as Rs. 4,850/ac. only.

Keywords : sesamum, Organic farming practices and substances, Yield, Income and BC ratio

AQUACULTURE BASED INTEGRATED FARMING SYSTEMS FOR AUGMENTING FARMERS INCOME IN WEST GODAVARI DISTRICT OF ANDHRA PRADESH

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ABSTRACT

India is an agricultural nation, and for the majority of Indian households, agriculture serves as their main source of income. More than 80% of small and marginal farmers practice monoculture. Even if they work extremely hard, they do not make much money because there is little left over after paying for all inputs. This may be due to the low yields, high cost of cultivation, a late monsoon, pest and disease incidence, and other risk factors. Farming needs to be both economically successful and environmentally responsible in order to be sustained. Hence, a holistic all-around strategy is essential to make farming commercially profitable and ecologically sound and sustainable. In this direction, KVK, Venkataramannagudem has observed the low income due to less profitable farming by the tribal farmers and introduced fisheries based integrated farming systems in about 30 farmers' fields across 13 villages in Buttaigudem and Polavaram mandal, West Godavari district, Andhra Pradesh. This has created the visible increase in the production of fish 0.2 - 3 t/ha, poultry 15 - 200 kg. of meat and 80 - 600 eggs, vegetables 50 - 900 kg, duck meat 0 - 200 kg. goat / sheep meat 0 - 200 kg. Adoption of improved technology and the prudent use of resources has improved the income generation and man-days. The income has increased from Rs. 28000/- to 1,80,000/- per unit by integrating diverse farm components like aquaculture combined with poultry/Duckery/Small ruminants, Horticultural crops and recycling agricultural leftovers and by-products inside the farm. Integrated Farming System (IFS) places a strong emphasis on increasing profitability through integration of farm resources, waste reuse, and a reduction of reliance on external inputs. Augmenting farmer's income, enhancing livelihood security and socio-economic status was achieved through crop diversification and integration of agricultural systems.

Keywords: Integrated farming system; IFS; Aquaculture; Backyard poultry; Duckery; goatery; horticulture crops ; income generation.

DEMONSTRATION OF AREA SPECIFIC MINERAL MIXTURE SUPPLEMENTATION ON MILK YIELD AND REPRODUCTIVE PERFORMANCE OF DAIRY ANIMALS

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ABSTRACT

A study was conducted in West Godavari district of Andhra Pradesh to find out the effect of area specific mineral mixture feeding on the productive and reproductive performance of dairy animals. Thirty dairy animals were selected randomly from 5 villages of West Godavari (Yerrayigudem, East rekulakunta, Ravigudem, Koyarajamandry and Kamaiahkunta) and divided into two groups of fifteen animals each. The animals in a treatment group were fed with 50 g. of area specific mineral mixture daily continuously for 120 days after calving along with regular green fodder and dry fodder feeding. Control group of 15 animals were given regular diet without any extra area specific mineral mixture supplementation which is farmer practice in that particular area. Analysis of data showed that supplementation of area specific mineral mixture has increased the milk yield by 1.08 l/day (24.05%) in treatment group when compared with control group. Onset of first post-partum estrus was earlier in treatment group animals than in control group animals. The study showed that economic parameters such as gross returns, net returns and B: C ratio was found to be high in treatment group. Based on this, it is recommended that continuous feeding of area specific mineral mixture has improved the productive and reproductive performance of dairy animals.

Keywords: Area specific mineral mixture; dairy farmers; milk yield

IDENTIFICATION OF PLR2 GENES IN FLAX

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Purpose

A large array of phytochemicals which are found in plants are polyphenols like flavonoids, phenolic compounds terpenoids, tocopherols, lignans etc. Among these phytochemicals, lignans have gained momentum in *Linum usitatissimum* in the past few years, which are known to protect plants against stress conditions. (-)-Yatein is a dibenzylbutyrolactone type lignan synthesized by pinoresinol-lariciresinol reductase-2 (PLR2) gene, is a precursor of deoxypodophyllotoxin and podophyllotoxin and plays a role in flax defense response. As genome wide analysis of LuPLR2 gene is lacking and therefore the present study has been designed to analyze the *in silico* studies of the specific gene.

Method

In silico studies have been carried out using various bioinformatics tools. Protein sequence was retrieved from Uniprot database (<http://www.uniprot.org>) and the sequence was BLAST searched against Phytozome database (phytozome-next.jgi.doe.gov). Molecular weights and Isoelectric points was extracted from Compute Expasy (web.expasy.org/compute_pi/). Using Hidden Markov Model (<https://hmmer.org>), domain analysis was carried out. Using LocTree3 (roslab.org/services/loctree3/) and WoLF PSORT (genscript.com/wolf-psort.html), subcellular localizations of identified genes were carried out.

Results:

30 genes which encode for 30 different proteins have been identified. The molecular weight of these genes ranges from 8.54kDa to 70.665kDa while pI (isoelectric point) values ranges from 4.08-9.02. Domain analysis was done which revealed presence of single domains as well as multiple domains which tends towards the multiple functionality and functional diversity of identified PLR genes. Localization of genes were predicted which revealed the genes are present in chloroplast, mitochondria and some of them are present in extracellular membrane.

Conclusions

PLR2 genes present in the aerial parts of flax reflect their roles against stress conditions, henceforth highlighting their functionality and would be valuable to gain a better introspective view of the molecular function of phytochemical gene at sequence- structure- function relationship through genome wide analysis.

Keywords: PLR2 genes, databases, proteins, Yatein, Lignans.

ETHANOL AND SUGAR TOLERANCE OF THERMOTOLERANT YEASTS ISOLATED FROM FRUIT WASTES

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ABSTRACT

Fermentation is a critical step for the production of industrially important fuels and chemicals where monomeric sugars released by hydrolysis of feedstock are converted into these products by microbial action. An ideal microorganism used for ethanol production must have rapid fermentative potential, improved flocculating ability, appreciable sugar tolerance, enhanced ethanol tolerance and good thermotolerance. The ethanol production potential of thermotolerant yeast strains isolated from different fruit waste was investigated. Simultaneously they were assessed for sugar tolerance and ethanol tolerance. A total of 110 yeasts were isolated from different fruit wastes and were screened to determine thermotolerance by growing at different temperatures *viz.* 35, 40 and 45°C by using Yeast extract dextrose peptone broth. Among these, 20 yeast isolates grew satisfactorily at all three temperatures *viz.* 35, 40 and 45°C. Further all the 20 thermotolerant isolates were screened for sugar tolerance and ethanol tolerance. The broth medium was supplemented with different glucose concentrations ranging from 10 to 25 per cent (w/v) and ethanol concentrations (5% to 20% v/v) and incubated at temperature (35°C, 40°C and 45°C), time (24 h, 48 h, 72 h and 96 h) and growth was measured by OD at 600 nm. Among 20 isolates, four (YP11, YM17, YPA48 and YPA64) were tolerant to glucose at 25.0 per cent (w/v) and ethanol 20.0 per cent (v/v).

Keywords: Thermotolerant yeast, sugar tolerant, ethanol tolerant and fruit wastes

EFFECT OF BIO-FERTILIZERS INOCULATED SEED ON YIELD AND RHIZOSPHERE SOIL CONDITIONS IN HAPPY SEEDER WHEAT CULTIVATED PLOTS IN ROHTAS DISTRICT OF BIHAR UNDER CLIMATE RESILIENT AGRICULTURE

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ABSTRACT

Most rice stubbles are burnt in the conventional mechanized rice-wheat cropping system of Rohtas district of Bihar as it's difficult to manage combine-harvested rice residues on farm. This practice leads to loss of organic matter and nutrients, widespread air pollution as well as add up to global warming. Happy seeder combines stubble mulching along with seed drilling. In order to enhance sustainability of wheat cultivation with reduction in chemical fertilization and maintaining yield and quality standards, this study investigated the effects of two bio-fertilizers (*Azospirillum spp.* and PSB) for seed-inoculation in happy seeder wheat cultivation. Comparisons were made with non-inoculated seeds and conventional sowing techniques. The following treatments were established for the assay: T₁: Non-inoculated seeds + conventional sowing, T₂: Non-inoculated seeds + happy seeder wheat sowing T₃: seed inoculation with *Azospirillum spp.* & PSB + happy seeder sowing and T₄: seed inoculation with *Azospirillum spp.* & PSB + conventional sowing. All the other agronomic practices and management was carried out similarly in each treatment. It is clear from the data, treatment T₃ yield increase and improvement the physico-chemical as well as biological properties of rhizospheric soil in comparison to other treatment. Happy seeder wheat cultivation with bio-fertilizers enables residue management, enhances climate resilience in crop, improves soil conditions and provides sustainable productivity.

Keywords: bio-fertilizers, seed inoculation, happy seeder, residue management, rhizosphere

EVALUATION OF PERSISTENT ORGANOCHLORINE POLLUTANTS IN MOTHER'S MILK FROM KALABURAGI DISTRICT, KARNATAKA, INDIA.

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ABSTRACT

In present study, traces of organochlorine pollutants and related compounds namely DDE p, p' and DDE o, p' were analysed in mother's breast milk living in rural areas of Kalaburagi district, traces of organochlorine pollutants were analysed in almost 80% of the samples analysed from rural areas. Demonstrating that residents in these areas have been exposed to the contaminants. Kalaburagi is having fertile land, a variety of seasonal crops are grown here, farmers use huge amounts of pesticides to increase the crop productivity and control the pests. Exposure of humans to these hazardous chemicals occurs directly in fields as women works as agricultural labour and indirectly due to consumption of contaminated diet. The organochlorine pollutants are reported to be lipophilic in nature and their presence in mother's milk has been documented in different parts of the world. Milk samples were collected from mothers who were willing to donate the samples after signing the informed consent form. The levels of total OCPs in milk ranged from 5 ng g⁻¹ to 9 ng g⁻¹. The results are within permissible limits provided and harmless.

SITE-SPECIFIC ASSESSMENT OF FRUIT AND SHOOT BORER MANAGEMENT IN BRINJAL

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Purpose

Brinjal or egg plants are one of the most common popular and principal annual vegetable crop grown in all the three season under irrigated conditions. Among the insect pest, shoot and fruit borer (*lucinodesorbonalis* Guenee) is one of the major constraints for low yield of crops. Injudicious use of fertilizers and pesticides for harvesting higher yield in brinjal are very common in farming communities. It increases the risk of environmental contamination, loss of biodiversity and development of insecticide resistance against insects. Among the numerous technologies, one of the most essential components that cane producers should adopt was integrated pest management (IPM) practices.

Methods

Site specific on farm trials in eight locations were conducted to evaluate efficacy of eco-friendly IPM strategies with emphasis on use of pheromone traps for management of brinjal shoot and fruit borer (*Leucinodes orbonalis* Guenee) and to create awareness among the farming community on brinjal fruit and shoot borer management during 2021-22 in the farmer's fields in West Champaran District of Bihar. The IPM component for Brinjal fruit and shoot borer management was also comprised of deep ploughing in summer, avoiding over dose of nitrogen, weekly collection and destruction of eggs, larvae, pupae and affected plant parts and fruits, installation of T-shaped sticks @ 50/ha, installation of pheromone trap @ 80/ha and spray of Lamdacyhalothrin 5% EC @ 0.6 ml/liter of water.

Results

Performance of IPM technologies were found most effective to control fruit and shoot borer as reported least number of affected plants/10m² as well as damaged fruits/plant. The fruit damage on an average was also reduced by 17.50 per cent compared to 30.00 per cent in farmers practice. The average yield registered 61.67 per cent higher with use of IPM components over farmers' practice. Average net profitability of worth Rs. 207500/ha as compared with farmer's practices (Rs. 118500/ha) were obtained and average benefit cost ratio i.e. 5.92 and 3.20 were recorded in demonstrated plot and farmers practice respectively.

Conclusions

The integrated pest management technologies were found safe to natural enemies and their efficacy have good impact over crop yield parameters. By this way, the adaptation of IPM technologies and obtaining production can be improved their livelihood insecurity and income of the farming communities as well as environmental protection also.

Keywords: Biological pest control, Cultural practices, Integrated pest management, Mechanical practices, Sugarcane

ASSESSMENT OF MOISTURE CONTENT IN HONEY BY KARL FISCHER TITRATION METHOD.

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ABSTRACT

Multifloral honey of indigenous honeybee species, giant honeybee *Apis dorsata*, little bee *Apis florea*, market natural honey were collected from different talukas of Kalaburagi district of Karnataka whereas Dabur honey, Patanjali honey and Lion honey were also collected from a grocery store of Kalaburagi district, Karnataka were determined during May 2017. Physical character in honey i.e moisture content in honey was identified by Karl Fischer titration method. Honey of *A.dorsata* display more moisture (15.06%), *A.florea* with moisture of 11.97%, market natural honey with moisture of 13.70%, whereas commercial honey Dabur displayed less moisture compared to all other honey i.e. 7.92%, Patanjali honey with moisture of 11.08% and Lion honey with moisture of 14.93%. The study confirms that the moisture in honey is because of different honeybee species from geographical regions of Kalaburagi district. Variations occur in honey within honeybee species from different areas of Kalaburagi district. Results of the study confirmed the quality of honey of both natural and commercial honey were equally good in the physical compositions i.e. moisture content in honey.

Keywords: Natural honey, Commercial honey, Karl Fischer, Moisture, Kalaburagi.

IMPACT OF LONG-TERM INTEGRATED NUTRIENT MANAGEMENT ON MICRONUTRIENT CONCENTRATION IN SOIL

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ABSTRACT

INM is the best approach for better utilization of organic resources and to produce crops with less expenditure. In soils of India, Zinc, Boron and Iron deficiencies are the principal yield-limiting factors in soil fertility and crop production. The present investigation studied the data from 34 years old long-term integrated nutrient management (INM) practices on micronutrient concentration in soil. The treatment included three organic sources viz. FYM, wheat straw (WS) and green manuring (GM) with *Sesbania aculeata* replacing 25% and 50% of the optimum N during *kharif* season, the treatment replacing 50% N through organic manure were given 100% RDF in wheat while those receiving 25% N replacement in rice received only 75% RDF in wheat. The significant changes were recorded in the status of DTPA-extractable Zn, Cu, Fe, and Mn content of soil over a period of 34 years due to various treatments involving integration of organic and inorganic fertilizer. The highest value of DTPA-extractable Zn, Cu, Fe, Mn of soil was obtained with 50 % NPK of RDF + 50 % N through FYM in rice crop and 100 % NPK of RDF in wheat crop which was significantly superior over all other treatments. Imbalanced application of inorganic fertilizer decreased DTPA-extractable Zn Cu, Fe, Mn contents in soil over control. Integrated soil nutrient management is an approach to balanced nutrition to improve crop production, while preserving long term soil fertility through judicious use of fertilizer, recycled organic resources, and improved agronomic practices, which minimize nutrient losses and improve the nutrient-use efficiency of crop.

Keywords: INM, DTPA- Extractable, Zinc, Copper, Iron, Manganese and Green Manuring

CLIMATE CHANGE AND WOMEN FARMERS: CHANGING ROLES AND RESPONSIBILITIES

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ABSTRACT

It is evident from the scientific studies and the continuous observations that now the global economy is facing the negative impacts of the climate changes, in both ways direct and indirect. If we see in the terms of agriculture, this occupation is going through a bouncy stage of transformation, negative consequences and reduction in production and productivity of agricultural commodities due to negative effects of climate change. As per the reports of FAO and various scientific studies, there is imperative contribution of women farmers in any agricultural dependent economy; they are the most vulnerable section of the population due to climate change. With the feminization of agriculture, participation and activities of women farmers has increased drastically in agriculture and allied sectors, so there is a need to cater the needs and priorities of the women farmers to face the challenges of climate change. Its high time to make the programmes, policies and other decisions to be women farmers centric so that they should be felt recognised and be supported at all fronts to work and update themselves as per the changing needs of agriculture and allied sciences with special reference to climate change. Not only the agriculture, other sectors like dairy, veterinary, livestock, horticulture, processing, marketing etc. all are impacted by the climate change and women’s involvement in these sectors cannot be neglected. Continuous training in terms of knowledge, skill and attitude of women farmers towards change is an utmost prerequisite of present time as their contribution is equally important in the development of the economy of the nation and the world.

Keywords: Women, agriculture, climate change

ASSESSMENT OF GRASS SPECIES COMPOSITION IN MANAGED GRASSLANDS AT KARNALI FLOODPLAIN OF BARDIYA NATIONAL PARK

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ABSTRACT

Grasslands are the most common biome on earth, a huge source of biodiversity, the most beneficial to human society, and yet they are also the most endangered. 14 percent of Nepal is made up of grasslands, which are significant for biodiversity and only exist in their natural form in protected areas. The main objective of this study was to find out the types, composition of grasses and their distribution in the Karnali Floodplain of Bardiya National Park i.e., Baghaura and Lamkauli phantas. The assessment of grass species diversity and IVI was carried out by counting species in the 1m² quadrant, which is 200 m apart and is located in the parallel transects, which are 100 m apart. Following an analysis of the raw data in Ms-Excel that took into account its nature, the T-test was used. It was found that *Imperata cylindrica*, *Hyparrhenia rufa*, *Cynodon dactylon*, *Saccharum spontaneum*, *Saccharum bengalensis* were the dominant grass species with an average IVI of 72.57, 40.12, 37.26, 29.6, and 27.67 respectively.

Baghaura has slightly higher species richness than Lamkauli, implying that Baghaura has lower species evenness. Distribution map of the major grass species i.e., Siru (*Imerata cylindrica*), Baruwa (*Saccharum bengalensis*), Dubo (*Cynodon dactylon*) and Khar (*Hyparrhenia rufa*) in Baghaura and Lamkauli was shown based on the maximum number of species found on the individual transect points. There is no significant difference in IVI between Baghaura and Lamkauli, showing that the status of both managed grasslands is the same. Because of the annual flood, the availability of water, the edge effect, and less human disturbance, Baghaura Phanta is found more functional than Lamkauli Phanta in terms of floral and faunal species. Even though they share a microclimate range, further study is needed to compare the factors that contribute to the diversity of the various species in this managed grassland. This study would be useful for making plans and policy for future action for the proper management of grass species preferred by herbivores.

Keywords: IVI, Species diversity, Species evenness, Species richness, Transect

EFFECT OF ORGANIC AND INORGANIC FERTILIZERS AND WEED CONTROL TREATMENTS ON GROWTH AND YIELD OF KHARIF SEASON BABY CORN (*Zea mays* L.) IN PUNJAB

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ABSTRACT

A field trial was conducted at the Research Farm Lovely Professional University in Punjab during the Kharif season of 2021 to determine the performance of baby corn as influenced by different sources of nutrition and weed control methods. The result of the study shows that application of poultry dropping 1.55 t/ha + 125 per cent RDN significantly increased baby corn height, shoot dry weight, cob per plant, cob weight (t/ha) and harvest index other the rest of the treatments. In weed control treatments, lower weed density and dry weight and higher yield attribute viz cob weight, length and cob yield were recorded in the post-emergence application of tembotrione at 100ml/ha in comparison with the rest of the treatments and weed check had the highest weed density and dry weight and lowest yield attributes. The study concludes that post-emergence application of tembotrione at 100ml/ha + poultry dropping 1.55 t/ha + 125 per cent RDN should be adopted for a higher yield of baby corn.

Keywords: Tembotrione Baby corn, Weed, Atrazine, Pendimethalin, Poultry manure

FUNCTION OF BIOACTIVE COMPOUND AND EFFECT ON THE BRAIN

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ABSTRACT

Green tea contains a number of bioactive chemicals like flavonoids and catechins, the epigallocatechin gallate (EGCG) is the most abundant. EGCG is polyphenolic catechins found abundantly in green tea with a vast array of health benefits. Catechins and their derivatives are thought to contribute to the beneficial effects. The bioactive compound in green tea reduce the formation of the free radicals in the body, protecting cells and molecules from damage, also protective effects on neurons and may reduce the risk of neurodegenerative disorder. It has also the amino acid L-theanine, which is able to cross the blood-brain barrier. L-theanine increases the activity of the inhibitory neurotransmitter GABA, which has anti-anxiety effects. It also

increases dopamine and the production of alpha waves in the brain and improving brain function. The bioactive compound in green tea contribute to the beneficial effects on the brain. Green tea is considered as a very healthy beverage. It is loaded with antioxidant and have powerful effects on the body.

Keywords: Green tea, Catechin, L-theanine, Brain.

STANDARDIZATION OF SUBSTRATE FOR LIQUID SPAWN PRODUCTION OF BUTTON MUSHROOM

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Purpose

Grain of cereal crops are frequently used as substrates for the vegetative growth of mycelium of mushrooms. Application of grain spawn in large-scale mushroom cultivation is limited because of high production costs and contamination rates. Liquid cultures of mushroom mycelium has potential as a liquid inoculum for the production a liquid spawn as well as grain spawn. Liquid culture of mushroom has several advantages like higher mycelial production in a compact space and shorter time with lesser chances of contamination.

Method

Six different types of substrates were used for production of liquid culture media at three different pH and temperature for the cultural studies of the strain of button mushroom. Dry weight of mycelial biomasses were quantified at 10 and 20 days after inoculation to observe the growth of mycelia in every liquid media.

Result

Among six different types of liquid media, wheat grain extract liquid media at 5 pH and 22 °C had shown best result followed by potato dextrose broth media and malt extract broth media.

Conclusion

Higher amount of mycelium with homogeneous growth was obtained within a very short period of time than traditional grain spawn. Benefit-cost ration was also recorded for liquid spawn production which was higher than the grain spawn production. Liquid spawn could be use as a replacement of the conventional master grain spawn.

EVALUATION OF DEVELOPED TRACTOR OPERATED PADDY TRANSPLANTER UNDER CONTROL CONDITIONS

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Purpose

Rice (*Oryza sativa*) is a widely grown crop and source of dietary for the large percentage of the world's population. Labor shortages have been a major issue in Punjab, particularly during paddy transplanting and crop harvesting/threshing. Transplanting was discovered to be the

most time-consuming operation for agricultural workers. Timeliness in transplanting operations is advised to be essential for optimizing yield, which can be achieved if dependence on agricultural worker is eliminated or reduced. The commercially available mechanical transplanters in India are too expensive, and they use mat type nursery, which raises the cost due to skilled labor is required for raising nursery. Farmers in the region are now willing to implement new agricultural technologies (Pawar et al 2017) whereas, abandon existing mechanical transplanting techniques in favor of searching for a mechanical transplanter capable of transplanting wash root type nurseries.

Methods

A field selected was having dimensions 5 m x 33.5 m (0.017 ha) and sandy clay loam (sand 55.2% and clay 24.6%) soil. The developed paddy transplanting mechanism was evaluated in the simulated laboratory conditions for planting wash root type nursery seedlings where the seedlings were kept in upright position in two successive seedling box. Transplanters were operated length wise in the field on the puddled land with approximately 10-20 mm water level in the field. Forward speed (F1=1.5, F2=2.2 and F3=3.3 km/h), age of nursery (A1=25, A2=35 and A3=45 Days) and mechanism Speed (M1=254 RPM and M2=200 RPM) were selected as independent variable for the study. Whereas hill to hill spacing, missing index, no. of plant per hill and damage percentage were selected as dependent variables.

Results

The maximum hill to hill spacing (240.4 mm) was observed for F3M2 and minimum hill to hill spacing (123.1 mm) was observed for F1M1 at 45 days of nursery. The hill spacing rises significantly ($p \leq 0.05$) with variation in forward speed and mechanism speed, although there was no significant ($p > 0.02$) influence on hill spacing at different nursery ages. The missing index was lowest (31.11 percent) in the F1M1 and F2M1 speed combinations at 25 days of nursery and highest (64.44 percent) in the F3M2 speed combination at 45 days of nursery. All independent factors, including forward speed, mechanism speed, and age of nursery, showed a significant ($p \leq 0.05$) influence on the missing index. The effect of 3.3 km/h forward speed and 254 RMP mechanism speed (F3M1) at 25 days of nursery has the highest (4.47) number of plants per hill, whereas the effect of same forward speed and 200 RPM mechanism speed (F3M2) has the lowest (2.20) number of plants per hill. The age of the nursery had a significant effect on the number of plants per hill ($p < 0.05$). Furthermore, no significant variation in the number of plants per hill due to forward and mechanism speed was noted ($p > 0.05$). The F1M1 combination had both the lowest damage percentage (2.22%) at 45 days of nursery and the highest damage percentage (6.67%) at 25 days of nursery. There is a significant ($p \leq 0.05$) influence on damage percentage due to mechanism speed and nursery age, but no significant effect ($p > 0.05$) of change in forward speed was noticed. This might be attributed to an increase in mechanism speed, which increases the impact force applied to the seedling by the planting mechanism.

Conclusions

The hill spacing, and missing index rises significantly with an increase in speed index whereas number of plants per hill and damage percentage decreases significantly with an increase in age of nursery. The optimum operational parameters for operation of developed paddy transplanter were 1.5 km/h forward speed, 254 RPM mechanism speed, and 35 days of nursery (desirability – 0.668), with estimated values of hill spacing, missing index, damage percentage, and number of plants per hill of 125.11 mm, 33.0 percent, 4.98 percent, and 3.7 plants, respectively.

Keywords: Paddy; Mechanical Transplanting; Tractor Operated; Wash Root Nursery

EFFECT OF DIFFERENT MUSIC ON GROWTH AND FLOWERING OF FRENCH MARIGOLD

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ABSTRACT

The present research “Effect of different Music on growth and flowering of French Marigold” was carried out at College campus, Mata Gujri College, Fatehgarh Sahib, Punjab during winter season of 2020-21. The experiment was laid out in Completely Randomized Design with seven treatments of music including control. The treatments were replicated thrice. It can be concluded from the experiment that the maximum plant height at 90 DFTS, maximum number of leaves per branch (on average) at 60 DFTS, maximum plant canopy at 60 DFTS and 90 DFTS, maximum numbers of flowers per plant and maximum numbers of flowers per branch at peak flowering, and most presentable pots of French marigold plants were observed in T₂. The minimum days taken to first flowering and maximum flower diameter were noted in T₄. At 105 DFTS, the maximum numbers of flowers per plant were counted in T₁. The different type of music shows significant effect in almost all the growth and flowering parameters as well as in pot presentability of marigold.

STUDIES ON DIVERSITY AND DISTRIBUTION OF PHYTOPLANKTON IN FISH PONDS AT HISAR

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ABSTRACT

Planktons are micro and macroscopic aquatic organism that manage the nutrient cycle in aquatic ecosystem. The present investigation was carried out at three sites - site 1 (Pond near Gandhi Bhawan), site 2 (Pond in DDU Organic farm) and site 3 (Pond near Nehru Library) at CCS HAU, Hisar for documentation of the diversity of phytoplankton and physico-chemical parameters of pond water and sediments. A total of 35 genera belonging to 8 phytoplankton groups *viz.* Bacillariophyceae (3), Chlorophyceae (10), Cyanophyceae (7), Conjugatophyceae (1), Diatoma (2), Dinophyceae (1), Trebouxiophyceae (6) and Zygenematophyceae (5) were recorded. Chlorophyceae was found most dominant group with 10 genera. *Actinotaenium*, *Ankistrodesmus*, *Coelastrum*, *Comasiella*, *Eudorina*, *Kirchneriella*, *Pediastrum*, *Scenedesmus*, *Selenastrum* and *Stauridium* were frequently found species from the group Chlorophyceae. Maximum species diversity was recorded in September followed by October, November and December. The value of Simpson (1-D) and Shannon Weiner indices (H') were recorded in the range between 0.95 to 0.96 and 3.18 to 3.49, respectively. Species evenness (J') and Margalef index (S) were found in the range 0.77 to 0.86 and 4.77 to 6.65, respectively. Physico-chemical parameters of water like temperature, pH, conductivity, DO, total alkalinity, total hardness, nitrate, nitrite and ammonia were found in the range of 11.06 to 31.90°C, 7.02 to 7.51, 187.5 to 231.8 µs/cm, 4.5 to 7.3 mg/L, 155 to 237 mg/L, 148 to 299.7mg/L, 2.2 to 4.4 mg/L, 0.194 to 0.375 mg/L and 0.056 to 0.306 mg/L respectively. Physico-chemical parameters of soil such as pH, electrical conductivity, alkalinity, total hardness, nitrate, nitrite, and ammonia were recorded in the range between 7.2 to 7.6, 163.66 to 228 µs/cm, 135 to 151.49 mg/L, 224.8 to 325.5 mg/L, 1.11 to 2.77 mg/L, 0.083 to 0.25 mg/L, and 0.056 to 0.25 mg/L respectively.

Keywords: Phytoplankton, diversity, fish pond, physico-chemical parameters

ECOLOGICAL STUDIES OF PLANKTON COMMUNITIES OF FISH PONDS AT HISAR

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ABSTRACT

The present work was aimed to study the plankton communities of CCS HAU ponds. Water samples were collected from pond near Nehru Library, CCS HAU, Hisar. Different physico-chemical parameters were analyzed fortnightly from October 2021 to February 2022. Samples were collected between 8 am to 10 am. The planktons were identified according to standard procedures. In the present study, the phytoplankton population comprises of eight major groups namely, Bacillariophyceae, Chlorophyceae, Cyanophyceae, Conjugatophyceae, Diatoma, Dinophyceae, Trebouxiophyceae and Zygnematophyceae. It was observed that maximum diversity was found among Chlorophyceae and minimum in Bacillariophyceae. The order of group diversity comes to be –

Chlorophyceae > Cyanophyceae > Trebouxiophyceae > Zygnematophyceae > Diatoma > Dinophyceae > Conjugatophyceae > Bacillariophyceae. In the present study, the zooplankton fauna of the pond comprised of five major groups, namely Cladocera, Copepoda, Rotifera, Protozoa and Ostracoda. They showed wide variations in occurrence. Cladocera formed the most dominant group followed by Rotifera, Copepoda, Protozoa and Ostracoda.

Keywords: *Phytoplankton, zooplankton, diversity, Chlorophyceae, Rotifera*

EFFECT OF DIFFERENT MUSIC ON GROWTH AND FLOWERING OF FRENCH ARIGOLD

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ABSTRACT

The present research “Effect of different Music on growth and flowering of French Marigold” was carried out at College campus, Mata Gujri College, Fatehgarh Sahib, Punjab during winter season of 2020-21. The experiment was laid out in Completely Randomized Design with seven treatments of music including control. The treatments were replicated thrice. It can be concluded from the experiment that the maximum plant height at 90 DFTS, maximum number of leaves per branch (on average) at 60 DFTS, maximum plant canopy at 60 DFTS and 90 DFTS, maximum numbers of flowers per plant and maximum numbers of flowers per branch at peak flowering, and most presentable pots of French marigold plants were observed in T₂. The minimum days taken to first flowering and maximum flower diameter were noted in T₄. At 105 DFTS, the maximum numbers of flowers per plant were counted in T₁. The different type of music shows significant effect in almost all the growth and flowering parameters as well as in pot presentability of marigold.

BIOFERTILIZERS AS A LOW-COST MONITORING INPUT IN SUSTAINABLE AGRICULTURE

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ABSTRACT

Biofertilizers are low cost, renewable sources of plant nutrients which supplement chemical fertilizers. These are nothing but selected or specific strains of beneficial soil microorganisms cultured in the laboratory and packed in a suitable carrier. They can be used either for seed treatment or soil application or liquid form. Biofertilizers generate plant nutrients like nitrogen and phosphorous through their activities in the soil or Rhizosphere and make available to plants in a gradual manner.

The side effects of indiscriminate use of chemical fertilizers in agriculture can be summarized as disturbances in the soil reaction, development of nutrient imbalances in plants, increased susceptibility to pests and diseases, reduction in legume root nodulation and plant mycorrhizal associations, decrease in soil life and environmental hazards such as water pollution and soil humus reduction. The realization of such detrimental effects of chemical fertilizers when used continuously in large quantities in the absence of organic components has triggered interest regarding the alternatives to supply the plant nutrients in an integrated manner giving rise to Integrated Plant Nutrient System [IPNS] in which, bio-fertilizers play a major role.

Keywords: Biofertilizers, Rhizosphere and Mycorrhizal

HYDROLYSIS OF SOYA PROTEIN ISOLATES AND WHEY PROTEIN ISOLATES BY FOOD GRADE ENZYME PAPAIN AND PANCREATIN IN SPECIFIC CONDITION AND COMPARATIVE ANALYSIS OF THEIR PHYSICOCHEMICAL PROPERTIES.

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Purpose

Defatted soy protein isolate (SPI) is the least expensive sources of dietary protein, can be used as an alternate of milk protein (mainly Whey Protein Isolate). Enzymatic modification has been used to improve protein functionalities. The present study was carried out to evaluate the effects of enzymatic hydrolysis on molecular characterization, particle size, zeta potential, solubility and sustainability of soya protein isolates and whey protein isolates.

Methods

Those protein isolates were produced from organic whole flour, defatted by using Soxhlet apparatus (by hexane) and hydrolysed by using food grade pancreatin, papain (from papaya latex) (both are endoenzymes) with limited hydrolysis (for 10-, 30-, 60-, 90- & 120-min incubation time @ 35^oC). SDS-PAGE was used to determine the hydrolysis profiles of the isolates by molecular characterization.

Result

The degree of hydrolysis by pancreatin (food grade) of soya protein is higher than degree of hydrolysis (DH) by papain (food grade). In case of Whey Protein Hydrolysate's, DH of pancreatin modified Protein isolate is higher that papain modified proteins. The study through SDS-PAGE is shown that soya protein provides many new bands after hydrolysis than whey protein. In all cases the size of the particles is reduced heavily at first, then according to

increasing degree of hydrolysis the particle size increases. Zeta Potential is gradually decreasing with increasing incubation time in all samples.

Conclusion

Soya protein shows new bands after hydrolysis. So, soya protein isolates produce greater number of smaller protein fractions than whey protein isolates. This Particle Size and Zeta Potential indicates its solubility and sustainability in disperse medium and its better in case of whey protein isolates. These improved functional properties are suitable for food fortification making of food supplements for vegan peoples and patients.

Keywords: Soya Protein Isolate, Whey Protein Isolate, Pancreatin, Papain, Degree of Hydrolysis, Zeta Potential, SDS-PAGE.

FORECASTING MONTHLY SUNFLOWER OIL PRICES IN INDIA USING SARIMA MODEL

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Purpose

Sunflower seeds of the oil type are used to make healthy, natural sunflower oil. Sunflower oil has a mild flavor and appearance and contains the highest amount of vitamin E of any vegetable oil. Low levels of saturated fat are combined with monounsaturated and polyunsaturated fats. Cooks around the world are aware of this healthy oil's versatility. Sunflower oil is prized for its mild flavor, effectiveness as a frying oil, and health advantages. NuSun, linoleic, and high oleic sunflower oil are the three varieties that are offered. All were created using conventional breeding methods. Three varieties of sunflower oil are available, and they satisfy consumer and food manufacturer demands for a transgenic-free, high-performing oil. Thus, it becomes important to study sunflower oil prices in India and to forecast sunflower oil prices in India. The main objective of this study is to develop a model for forecasting sunflower oil prices in India using Box-Jenkins approach.

Methods

In this study, the data on monthly sunflower oil prices in India were collected from the website of indexmundi for the period from June 2017 to June 2022 and were used to fit the SARIMA model and to predict future oil prices in India.

Results

Based on the analysis, SARIMA (0,1,0) (0,0,1) (12) with AIC = 1273.01 and BIC = 1277.19 is the best SARIMA model for forecasting monthly sunflower prices in India. Using the Dickey-Fuller unit root test and plotting time series of monthly sunflower oil prices, it may be theoretically and visually verified. According to the results of the Dickey-Fuller unit root test, the stationarity requirement is satisfied at the first order difference with the $\Pr(|t| > -5.864) < 0.01$, which strongly shows that there is no unit root at the first order difference of monthly sunflower oil prices at the 5% significance level. The fitted models accurately forecast 95.98 percent of monthly sunflower prices, according to the mean absolute percentage error (MAPE).

Conclusions

According to the best fitted SARIMA model i.e., SARIMA (0,1,0) (0,0,1) (12) monthly sunflower oil prices in India is expected to decrease slightly to 1,38,711.60 Indian rupees per metric ton in the month of November 2022. The outcomes are represented numerically and graphically.

Keywords: ACF - autocorrelation function, ARIMA - Autoregressive Integrated Moving Average, Box-Jenkins Approach, Sunflower Oil Prices, PACF - partial autocorrelation function, Residual Analysis.

THE SPOUSE OCCUPATION STATUS EFFECT ON FARM SCIENTISTS' RESEARCH PRODUCTIVITY

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ABSTRACT

The study on occupation of spouse is increasingly important in the Behavioural Science as it plays key role in the work-life balance of the Farm Scientists. On the other hand, research field or any other working fields than an unemployed household of spouse may affect the productivity of the Farm Scientists. Thus, the study of this relationship helps the research institutions to decide whether to consider it as a critical factor to be consider while planning programmes on Farm Scientists development or improvement. The present study was conducted on purposively selected Farm Scientists with 199 sample size in the six State Agricultural Universities (SAUs) of Karnataka. The index developed by Paul (2012) was used to measure the research productivity of Farm Scientists with modifications. Equally important, spouse occupation was measured by procedure followed by Singh (1989). Ordinal logistic regression was used to know the effect of Spouse occupation status or nominal variable on Research productivity as it helps to establish the relationship. The results showed that more than half of Farm Scientists spouse were household followed by Government service. Furthermore, it emphasized that spouse occupation significantly effecting the research productivity in which the level of effect differs with each profession. Therefore, Spouse occupation of Farm Scientists was considered before planning programmes by concerned authorities for the development of Farm Scientists.

Keywords: Ordinal logistic regression, Research Management, State Agricultural Universities, Work-life balance

EXTENT OF ADOPTION OF SCIENTIFIC LAC TECHNOLOGY AMONG TRIBAL DOMINATED GROWERS IN NUMBER ONE PRODUCING STATE OF INDIA: A POLYNOMIAL REGRESSION LOGISTIC ANALYSIS

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ABSTRACT

Tribal and forest have long been interdependent and people in tribal dominant areas are surrounded by forest which helps them in providing food, nutrition and livelihood option. Jharkhand holds the 1st position in national lac production and it is an important source of a subsidiary income for tribal families. Indian Institute of Natural Resins and Gums (IINRG), located in Namkum, Ranchi helps who are indulged in production of lac by giving them scientific production knowledge. Therefore, a study was conducted on Extent of Adoption of Lac technology among the growers of Ranchi District of Jharkhand to assess the knowledge as well as adoption rate of lac production technologies given by IINRG. Data was collected by direct observation method and personal interview method with the help of a structured interview schedule. Total 80 respondents were selected from 2 different blocks each block; 2 villages were selected for survey. Statistical analysis was done through mean, frequency,

standard deviation, CSRF was used. The study elucidated that out of 21 recommended practices highest adoption was of timely harvesting (35%) followed by timely removal of Phunki lac (31.25%) and materials used for inoculation of lac (28.75%). For the estimation of extent of adoption of lac production technology polychotomous regression logistic model was used: occupation (P=.054) and farm-size (P= 0.065) were positively correlated at 10% of significance level and annual income (P=0.023) and mass media (P=.044) were positively correlated at 5% of significance level having a high Wald value. One major indication is that there is lack knowledge and awareness about lac cultivation and this opportunity should be taken for employment and income throughout the year.

Keywords: Adoption, Jharkhand, Polynomial Logistic Regression, Scientific Lac Production Technology, Tribal.

NAKED SEEDED TYPE: A TRAIT IN COTTON AS A NEW MORPHOLOGICAL MARKER

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ABSTRACT

Cotton seed trichomes are very long single epidermal cells that differentiate and elongate to form two types of fibers *viz.*, lint fiber and fuzz fiber (linters). Lint fibers are the most economically important product harvested from the cotton plant. Fuzz fibers are very short with length varying from 0.5 to 1 mm, tightly attached to the seed coat and have a thick secondary cell wall. All the varieties developed in tetraploid cotton *G. hirsutum* contain fuzz and lint fiber. The nakedness or fuzzless trait is characterized by lack of fuzz fiber development on the seed coat. The ginning of fuzzless varieties will generate black seed and has been referred to as the naked-seed phenotype (Ware *et al.*, 1947). The fuzzless trait is an important trait being used to determine physiological factors controlling fiber development and fiber properties in *G. hirsutum* (Lee *et al.*, 2006).

The amount of fuzz fibers on seed is variable depending on genetic background of the cultivar. Most upland cottons have seed that is completely covered with fuzz, while other cultivars have very sparse fuzz fibers or completely naked seeds. In some varieties it was found that fuzz fibers seen only on the micropylar end of the seeds distal to the fununculus, these are sometimes referred to as tufted naked types (Herbert, 1988). The lack of fuzz fibers on naked seeds is largely due to the presence of natural or induced mutant alleles, like N₁ allele that has been reported to delay lint initiation (Turley *et al.*, 2002). Naked seededness of a genotype can act as easily identifiable morphological marker which help breeder to identify or purify a genotype because a genotype which is naked is easily distinguishable from that of fuzzy type.

The lack of fuzz fibers on seed coat *i.e.* naked seeded type has important advantages over normal fuzzy types. Varieties with nakedness may have reduced mechanical damage of seed coat during ginning. It completely eliminates acid delinting process. Cotton varieties without fuzz make process of oil extraction easy and may have increased oil recovery as absorption of oil by fuzz fibers is reduced due to their absence. Hence, development of varietal lines and hybrids based on naked seed types would be useful in cotton.

Keywords: Cotton, Naked seed types, Fuzz fiber and Morphological marker

PREVALENCE OF DISEASES AND ASSOCIATION OF SEED MYCOFLORA ON PEA IN CENTRAL INDIA

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ABSTRACT

Pea (*Pisum sativum* L.) is one of the most important legume crops in India. The present investigation was carried on prevalence and incidence of Pea diseases and the result revealed that diseases were prevalent in all the four districts of Madhya Pradesh under study, showing its widespread occurrence after sowing in Rabi seasons of 2018-19 and 2019-20. The pooled mean of seedling disease incidence was maximum at Jabalpur (34.69%) and minimum at Mandla district (12.36%). The disease incidence of wilt, powdery mildew and downy mildew was also studied. The maximum disease incidence of wilt was recorded in Jabalpur district (36.36%) and lowest in Mandla district (26.77%) while that of downy mildew was maximum in Jabalpur district (14.35%) and lowest in Katni district (2.27%), Maximum Powdery mildew disease incidence was at Narsinghpur district (53.24%) and lowest at Mandla district (44.14%) respectively.

Seed mycoflora were detected on pea seeds by standard blotter method as per the international rules for seed testing. In Jabalpur district, maximum seeds were infected by *F. oxysporum* (6%) and minimum by *A. niger* (2%). In Mandla district, maximum seeds were infected by *F. oxysporum* (12%) and minimum by *Mucor sp* (1%). In Katni district, maximum seeds were infected by *F. oxysporum* (8%) and minimum by *Mucor sp* (1%). In Narsinghpur district, Maximum seed infected by *F. oxysporum* (8%) and minimum *Mucor sp* (0%).

Keywords: Status, Disease incidence, Seed Mycoflora and ISTA Method, Madhya Pradesh.

EMPLOYMENT OF FUNGICIDES AND PLANT EXTRACTS FOR THE TREATMENT OF WHEAT FOLIAR BLIGHT (*Bipolaris sorokiniana* and *Alternaria triticina*)

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ABSTRACT

India's major grain crop, wheat (*T. aestivum* L.), makes a significant contribution to the nation's food security. One of the most prevalent diseases of wheat that causes a sizable crop loss is foliar blight. In the current investigation, in vivo settings are used to establish management techniques against the disease employing botanical and fungicides. Six fungicides, including Propiconazole, Pyraclostrobin, Azoxystrobin, Difenconazole, Propineb, and Thiophenate Methyl, as well as six combination fungicides, including Nativo (Tebuconazole + Trifloxystrobin + Tebuconazole), Sofia (Hexaconazole + Carbendazim), Azoxy super (Azoxystrobin+ Tebuconazole. Two applications of Propiconazole (1ml/L) a single fungicide and two applications of Nativo (Tebuconazole + Trifloxystrobin) (1g/L) a combination fungicide—proved to be the most effective treatments, respectively, with the lowest disease score (02) and (01) and the highest grain yield (6.57 t/ha) and (6.77 t/ha) measurements. Six distinct plants extract garlic, neem, ashwagandha, datura, ginger, and tulsi as well as their

mixtures (Table 3.2) were assessed for their effectiveness against the illness. The least illness score (13) and (11) and maximum grain production (6.62 t/ha) and (6.76 t/ha) were observed in the treatments using garlic extract (5 percent) and a combination of ginger + garlic extract (2.5 percent + 2.5 percent).

SCREENING OF SOYBEAN (*GLYCINE MAX L. (MERR)*) GERMPLASM AGAINST MAJOR DISEASES

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ABSTRACT

There is growing curiosity on how agriculture affects the diversity of crops species. More research into the management of the soybean (*Glycine max L. (Merr)*), one of the more significant crops, could help us better understand how it is produced. Regarding the significance of soybean production globally, its production needs to be assessed from a variety of angles, including its symbiosis with soil microbes. The world's and India's top oilseed crop is the soybean. The finest source for developing resistance lines through hybridization between several, fruitful parents is germplasm. Under field conditions, resistance to numerous diseases was screened. Of the 150 germplasm samples, 17 lines were discovered to be 100 percent resistant to all four diseases. Out of the total examined lines, twenty lines were shown to be extremely resistant to yellow vein mosaic, 35 lines to charcoal rot, 69 lines to *Rhizoctonia* aerial blight, and all to bacterial pustule. Therefore, evaluating these genotypes for morphological traits may aid in the future development of cultivars that are resistant.

CITRUS INDICA: A STUDY ON ITS IDENTITY

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Purpose

Citrus indica is called the Progenitor of oranges. But there is no proper classification to show its relationship with other related *Citrus* species. Various authors have tried different methods and came with different conclusions to show the relationship of *Citrus indica* with other species. Therefore, to reduce confusion, we tried to study the relationship of *Citrus indica* with other species of *Citrus* using bioinformatics tool.

Methods

We retrieved the sequences of *Citrus indica* from ncbi in the FASTA format. We searched for similar related sequences from BLASTn and created a phylogenetic tree using MEGA11 software.

Results

We shortlisted nine sequences that were close to *C.indica*. The sequences of *C.indica* had 99.36% similarity with *Citrus halimii*, 99.11% similarity with *C.swinglei* and *C. hindsii*, 98.98% with *C. myrtifolia*, and 99.11% with *C. japonica* etc. The phylogenetic tree showed how similar the other *Citrus* species are with *C.indica* and how they diverged from it .

Conclusions

This study clarified the confusion the relationship of *C.indica* with other related *Citrus* species. Though the study cannot trace the origin of *C.indica* but with this study, we can conclude that since most of the related species (with highest percentage of similarity) of *C.indica* belonged to the Papeda family, therefore we agree with Barkley *et al.* (2006) that *C.indica* should be included in the family of Papedas, which included the lemons and sour oranges. Our results also supports Swingle and Reece (1967) theory that it can be a hybrid of *C.latipes* with other cultivable species of *Citrus*.

Keywords: Citrus indica, relationship, phylogenetic tree, ncbi, blastn, MEGA11

INFLUENCE OF CYCOCEL LEVELS ON DIFFERENT VARIETIES OF AFRICAN MARIGOLD FOR YIELD AND QUALITY ATTRIBUTES

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ABSTRACT

Marigold occupies special importance due to its hardiness, easy culture including inexpensive packaging and low pest menace and wider adaptability to varied agro-climatic conditions. The farmers are already fetching lucrative returns by growing this crop in rainy season for dussehra, diwali and other ceremonies. However, the rainy season marigold crop owing to high rainfall and high humidity, tends to grow taller i.e. apical dominance is in preponderance and the plant spread is comparatively lesser resulting in only marginal profit to the farmers (Narayan-Gowda and Jayanti., 1986). Plant growth retardants are synthetic organic chemicals that cause the retardation of cell division in pathways of hormone biosynthesis without evoking substantial growth distortions. These chemicals have great significance in shortening stem internodes and reduce the plant height and hence prevent lodging. These are used to retard the shoot length of plants in a desired way without changing developmental patterns or evoke phytotoxic effects. A number of synthetic compound exist in border range are cycocel, trizoles, pachlobutrazol, triapenthenol and pyrimidinees etc.Cycocel (2-chloroethyl trimethyl ammonium chloride) chemical gives an anti-gibberelline dwarfing effect leads to blocking the conversion of geranyl pyrophosphate to capalyl pyrophosphate which is first step in gibberelline synthesis restrict the growth of the internodes and regulates the plant height physiologically. This reduces the cost of pinching and allows obtaining the best ratio between the vegetative growth and flower production, thereby improving the market quality of flowers (Marosz and Matisiak, 2005 and Bekheta *et al.* 2008).

African marigold is a hardy annual, about 80-100 cm tall and bears single to fully double flowers and large size globular heads. The flower size and weight are significantly higher compared to *Tagetes patula*. Flower colour of these species varies from lemon yellow to yellow or orange. Orange colour varieties are reportedly the best for extraction of carotene and xanthophylls for dyeing purpose.

Marigold cultivars with orange colour flower have higher xanthophylls as compared to yellow (Deineka *et al.*2007). Lutein (C₄₀H₅₆O₂) is a primary xanthophyll pigment that produces the orange colour in marigold flower, comprising 90% of petal identified pigments (Quackenbush and Miller, 1972).This lutein having antioxidant properties is also used in eye health protection (Vankar *et al.*, 2009). Marigold has been most commonly used by poultry industry to augments xanthophyll present in corn and alfalfa feed to standardize the feeds xanthophylls contents (Delgado-Vargas *et al.*1998).

Flowers due to perishable nature, deteriorates in quality and quantity up to 20-30%. African marigold flower petals are being used for xanthophyll production. The marigold plants in monsoon tend to grow tall with very low branching. The cycocel is a growth retardant which gives an anti-gibberelline dwarfing effect, restricts the growth of the internodes, regulates the

plant height physiologically and increase number of branches and flowers. As the flowers are perishable in nature, the value-added products can generate more income and avoid loss. Therefore, an experiment was conducted at Main Garden, Department of Horticulture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (Maharashtra), India for two years. The experiment was laid out in Factorial Randomized Block Design with two factors- Factor A and B with three replications. The Factor A consist of four treatments of African marigold varieties (V₁- Pusa Basanti Gainda, V₂- Pusa Narangi Gainda, V₃- African Double Orange and V₄ - African Marigold Local-1) and Factor B has four levels of cycocel (C₁- Control (water spray), C₂- Cycocel 1000 ppm, C₃ – Cycocel - 1500 ppm, C₄- Cycocel 2000 ppm). The results of experiments revealed that, treatment combination African Double Orange and cycocel 2000 ppm reported significantly maximum pooled petal meal yield from fresh flowers (1533.49 and 1172.85 kg ha⁻¹ respectively) followed by African Local-1 and cycocel 1500 ppm during both the years of experimentation. Significantly, maximum xanthophylls yield from petal meal (47.85 and 38.67 kg ha⁻¹) was recorded in var. African Double Orange and cycocel 2000 ppm respectively. From different stages of plant growth, it was found that significantly maximum essential oil content was found at 50% flowering and last harvesting stage (0.115%) in Pusa Narangi Gainda with cycocel spray 2000 ppm.

STUDIES ON PRE-DISPOSING FACTORS OF *Macrophomina phaseolina* CAUSING CHARCOAL ROT OF SOYBEAN

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²Department of Plant Pathology, R.A.K. College of Agriculture, RVSKVV, Sehore, MP, **ABSTRACT**

Soybean (*Glycine max* (L.) Merrill) is an important cash crop in India. It is considered as one of the main oil crops all over the world. In the world, soybean is cultivated over an area of 108.51 million ha with a production of 269.11 million tonnes and the productivity is 2330 kg/ha. Major areas of soybean production are in temperate and subtropical regions, and the major producers include the United States (47%), Brazil (19%), China (11%), and Argentina (10%). Maximum charcoal rot incidence caused *Macrophomina phaseolina* was recorded in JS-335 followed by TAMS-38, showing susceptible reaction to the disease. Pathogenicity was proved by following cut stem inoculation technique. This, method was proved effective among the other methods. The observation on growth characters was recorded at 30 days after sowing and pycnidial stage was found in hot and humid environmental conditions. The number of pycnidia per centimeter stems length of soybean were recorded on variety JS-335. Stem epidermis thickness in the present investigation significant differences in epidermis thickness were observed in susceptible and moderately resistant varieties. More or less stem girth and fresh and dry weight of shoot was more in moderately resistant varieties but these differences with susceptible were non-significant. The latest work has found considerably less chlorophyll in susceptible soybean cultivars compared with mildly resistant strains. The significant and negative correlation indicates that the disease increase with the decrease in maximum temperature and minimum temperature. On the other hand average relative humidity and Rainfall showed highly significant and positively correlation coefficient with the disease intensity which clearly indicate that the disease increases with the increased in average relative humidity and rainfall. Disease showed a progressive increase due to adverse weather conditions.

GROWTH, YIELD AND QUALITY OF INDIAN MUSTARD [*Brassica juncea* (L.) Czern & Coss.] AS INFLUENCED BY NITROGEN, PHOSPHORUS AND SULPHUR

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ABSTRACT

A field experiment was carried out at Agronomy Instructional Farm, Chimanbhai Patel College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, Gujarat during the winter 2018-19 to study the effect of different nutrient levels on growth, yield and quality of Indian mustard. Twelve treatment combinations viz., three levels of nitrogen (50, 75 and 100 kg N/ha), two levels of phosphorus (50 and 75 kg P₂O₅ /ha) and two levels of sulphur (40 and 60 kg S/ha) were evaluated as per randomized block design in three replications. Soil of the experimental field was loamy sand in texture, low in organic carbon (0.18 %) and available nitrogen (171 kg/ha), medium in available P₂O₅ (37.2 kg/ha) and low in available sulphur (6.8 kg/ha) with soil pH of 7.3. Application of 75 kg N/ha along with 50 kg P₂O₅ /ha and 40 kg S/ha resulted in higher seed yield, oil and protein content, as well as net returns.

Keywords: Economics, Growth, Indian mustard, Nitrogen, Phosphorus, Quality, Sulphur, Seed yield

COWPEA + BABYCORN INTENSIFICATION AND STRESS MITIGATION FOR HIGHER PRODUCTIVITY DURING SUMMER SEASON

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Cowpea (*Vigna unguiculata* L.) is a quick growing and high yielding crop belongs to the family *leguminosae*. It is a valuable multipurpose grain legume widely cultivated in arid and semiarid tropics. Cowpea is grown as intercrop, mixed crop, catch crop, mulch crop and green manure crop. The cowpea cultivation is gaining popularity among growers due to soil enriching habit, quick growing nature, short duration, higher yield and higher profitability per unit area that gradually replacing the other traditional summer legume crops. Baby corn is dehusked maize ear, harvested within 2-3 days of silk emergence but prior to fertilization and it is consumed as vegetable due to its sweet flavour. Great nutritional value, eco-friendly and crispy nature of baby corn has made it special choice for many traditional and continental dishes apart from canning in the elite society (Singh *et al.*, 2006). During summer season night temperature at the time of reproductive phase of crops in North-West India remains > 20°C which may adversely affect the flowering and seed setting in summer crops.

Methodology

Field experiments were conducted to study yield of summer cowpea + babycorn intercropping system as influenced by fertility levels and stress mitigating chemicals during summer seasons of 2019 and 2020 in Kota, Rajasthan, India at agriculture research station, Ummedganj, Kota. The mean daily maximum and minimum temperature during the growing season fluctuated between 32.1 to 47.3 °C and 17.1 to 33.6 °C, respectively in the year 2019. The corresponding values for the year 2020 were between 37.0 to 44.5 °C and 17.4 to 24.4 °C, respectively. The experiment was taken in split split plot design with five intercropping systems [sole cowpea, sole baby corn, cowpea + baby corn (2:1), cowpea + baby corn (3:1) and cowpea+ baby corn (4:1)] in main plot, three fertility levels (100, 125 and 150% RDF) in sub plot and two stress

mitigating chemicals (0.5% CaCl₂ and 1% KNO₃ at flowering and pod development stage of cowpea) in sub sub plot and replicated four time.

Results

Results from pooled data of two year revealed that 2:1 row ratio of cowpea and baby corn significantly increased the cowpea equivalent yield (963 kg/ha) and economics [Gross return (58667 Rs/ha), net return (31025 Rs/ha), B:C ratio (2.12)] of cowpea and baby corn intercropping system. The highest relative water content of cowpea (74.08 %) and baby corn at 50 DAS (77.32 %) and lowest canopy temperature of both crops at 50 DAS (27.90 °C in cowpea and 33.01°C in baby corn) was also observed in 2:1 row ratio of cowpea and baby corn intercropping system.

In the sub plot cowpea equivalent yield (942 kg/ha), gross return (54358 Rs/ha), net return (28050 Rs/ha) and B:C (2.07) ratio were higher with the fertility level of 150% over lower levels (100% & 125%).

Our results further suggest that foliar application of 0.5% of CaCl₂ at flowering and pod development stage were significantly increased the cowpea equivalent yield (872 kg/ha), economics [Gross return (52491 Rs/ha), net return (26819 Rs/ha) and B:C ratio (2.05)], relative water content in cowpea (72.35 %) and baby corn (78.28) and lowest canopy temperature of both crops (28.97°C in cowpea and 34.10 in baby corn °C) over 1% KNO₃.

Conclusion

Based on results of two year experimentation, it may be concluded that cowpea + baby corn should be intercropped in 2:1 row ratio to achieve significantly higher equivalent yield, economics of intercropping system, relative water content and lowest canopy temperature of cowpea and baby corn. Fertilizing the crop with 150% RDF also record the significantly higher productivity and profitability. Further the application of CaCl₂ at the rate of 0.5% at flowering at flowering and pod development stage of cowpea fetched significantly highest the above parameters.

WEATHER DEPENDENT POPULATION FLUCTUATION OF *Helicoverpa armigera* Hubn. INFESTING CHICKPEA AND ITS MANAGEMENT USING SOME NOVEL INSECTICIDES

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ABSTRACT

The present experiment was conducted partly at “A-B” Block Farm of Bidhan Chandra Krishi Viswavidyalaya located at Kalyani, Nadia during *rabi* season of two consecutive years (2019-20 and 2020-21). It was observed that gram pod borer reached its peak at second week of March (10/03/2020) during first year whereas during second year the pest reached the peak level during last week of February (23/02/2021). From the correlation studies between pest population and weather parameters it was found that maximum temperature exhibited significant positive correlation with larval population ($r = 0.654$ during 1st year and 0.732 during 2nd year), minimum temperature showed non-significant positive correlation ($r = 0.500$ and 0.376) in both years, maximum RH exhibited significant and non-significant negative correlations ($r = -0.661$ and -0.115), respectively during two years of study, minimum RH showed non-significant negative association ($r = -0.516$ and -0.475). However, wind speed ($r = 0.511$ and 0.527) and bright sunshine hour ($r = 0.477$ and 0.309) exhibited non-significant

positive correlation with larval population during both the years, though rainfall exhibited non-significant negative correlation ($r = -0.250$) with larval population in first year only. Multiple step wise linear regression study revealed that among the different weather factors, maximum RH was the most influencing factor of the pest the population intensity which could describe pest population up to 82% during first year and maximum temperature alone could describe pest population up to up to 53% during second year. Among the insecticides, spinosad 45 SC was proved to be most effective compared with other insecticides as it resulted highest reduction of pest population over control during both the years (97.89% and 98.57%) and highest yield also (14.83 q/ha and 14.01 q/ha) followed by lambda cyhalothrin, alpha cypermethrin and teflubenzuron. All the treatments were found significantly superior over untreated control.

Keywords: Chickpea, *Helicoverpa armigera*, Incidence, Management, Weather variables.

FOOD PROCESSING & PRESERVATIONS

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B.K.T., LucknowB.K.T., Lucknow**

ABSTRACT

Food processing is any deliberate change in a food that occurs before it's available for us to eat. Food can be processed and preserved in many ways, including canning, freezing, dehydration, pickling, and irradiation. The most common method of food processing is probably cooking, which prepares food for consumption in various ways. Food processing and preservation can be defined as all the activities and operations required for converting raw agricultural produce into safe and nutritious food products. Food processing and preservation are necessary to ensure access to safe, wholesome and palatable foods at reasonable costs. Food processing enhance the shelf life of food through various ways such as microorganism control, low-temperature storage, dehydration and removal of oxygen. It also alters the texture flavor and nutritional value of food products to appeal to consumers. The food processing industry is a important part of the Indian economy. It accounts for about 10% of India's GDP and employs around 15 million people. The food processing industry in India is facing several challenges such as lack of adequate infrastructure, shortage of skilled workforce, inadequate access to finance and raw materials, high cost of energy, lack of proper storage facilities, and poor market exposure. The government should also provide incentives for developing the food processing industry and create awareness about the importance of processed food. We can only hope to see the sector multiply and contribute to India's economic development.

Keywords: *Infrastructure, Palatable foods, Irradiation, Incentive, Consumption*

EXTRACTION, ISOLATION AND CHARACTERIZATION OF BIOACTIVE COMPOUNDS FROM APIACEAE FAMILY PLANTS

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ABSTRACT

Plants are potential source for development of new herbal drugs the medicinal value of plants lies in antifungal compounds that create an unequivocal physiological action on the human body. Numerous studies have pointed out that plants from Apiaceae family are used for food, beverages, fragrance and play an important role in preventing and treating of human diseases. Apiaceae member's extract represent a good source of bioactive compounds which can be important for pharmaceutical, nourishment and cosmetics uses. The investigation highlighted on the analysis of bioactive compound present in plant species through the different procedures including the extraction, isolation and characterization. In actual-global scenarios considering about the recent trends concerning the layout of strong formulations incorporating Apiaceae bioactive products. We expect that this evaluation will inspire researcher to consider undervalued Apiaceae species as alternative assets of bioactive compounds and will deliver a make contribution to the field with the aid of suggesting new research papers.

Keywords: Pharmaceutical; Apiaceae; Bioactive compound; Antiungal; formulations

GREEN SYNTHESIS AND ASSESSMENT OF BIOLOGICAL ACTIVITIES OF ZNO AND CUO NANOPARTICLES From *Chrysanthemum indicum* LEAF EXTRACT

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ABSTRACT

The current study discusses the synthesis of ZnO and CuO nanoparticles by green synthesis method and its antibacterial and antioxidant and anti-hyperglycemic activity. Nanoparticles are those particles which having a size of 1-100 nm in one dimension. The present study focused on the green synthesis of ZnO and CuO nanoparticles. In which ZnO nanoparticle is synthesized by zinc acetate and leaf extract of *Chrysanthemum indicum*. Copper nanoparticle is synthesized by copper sulphate and leaf extract of *Chrysanthemum indicum*. Another part, the characterization of ZnO and CuO nanoparticle was examined by UV-VIS, Zeta potential, Zeta Sizer, FTIR, XRD and SEM.

In this study, antibacterial study was carried out on gram positive and gram negative bacterial strain by agar well diffusion method, to calculate the antibacterial assey of zinc oxide nanoparticle and Copper oxide nanoparticles. Results indicate that ZnO and CuO had strong antibacterial activity against these bacterial strains. Antioxidant activity was evaluated by DPPH method result show that prepared ZnO and CuO NPs has excellent antioxidant activity. Antihyperglycemic activity was done by ZnO, CuO and Leaf extract of *Chrysanthemum indicum* on rats. After 21 days of experiment, results indicate that ZnO and CuO NPs shows excellent antidiabetic activity as compared to leaf extract of *Chrysanthemum indicum*.

Keyword:-Green synthesis, antibacterial activity, Antioxidant activity, Zinc oxide nanoparticle, Copper oxide nanoparticle, *Chrysanthemum indicum*, UV-VIS, FTIR, XRD, SEM, anti hyperglycemic activity.

GREEN SYNTHESIS OF SILVER AND ZNO NANOPARTICLES PREPARED BY ROOT EXTRACTS OF PSIDIUM GUAJAVE AND LEAFS EXTRACTS OF ROSA INDICA AND ITS ANTIBACTERIAL AND ANTIDIBETIC ACTIVITY

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ABSTRACT

Nanotechnology is a developing interdisciplinary field of research interspersing material science, bionanoscience, and technology. Nanoparticles are studied extensively for their specific catalytic, magnetic, electronic, optical, antimicrobial, wound healing, antidiabetic activity and anti-inflammatory properties. The main aim of the present study was to synthesize Silver and ZnO nanoparticles using the leaf extract of Rosa indica and root of psidium guajave and to evaluate their antimicrobial efficacy against some selected microbes and antidiabetic activity on albino rats. The synthesized Silver and ZnO nanoparticles were characterized by UV-VIS spectroscopy, particle size analyzer and Scanning Electron Microscopy, FTIR, XRD. The synthesized Silver and ZnO nanoparticles showed significant antimicrobial activity against Gram positive and Gram-negative bacteria as well as Antidiabetic activity. The maximum zone of inhibition had been found against Pseudomonas aeruginosa whereas the minimum is found against Staphylococcus aureus (25 ± 0.100). The use of nanoparticles in medicine is an attractive proposition. In the present study, zinc oxide and silver nanoparticles were evaluated for their antidiabetic activity. Fifty male albino rats with weight 120 ± 20 and age 6 months were used. This study also suggests that green synthesized Silver and ZnO nanoparticles can be used as an alternative to existing antimicrobial agents and also antidiabetic activity.

Keywords- UV-VIS, FTIR, XRD, SEM, anti hyperglycemic activity

PRODUCTION AND QUALITY EVALUATION, MICROBIOLOGICAL ANALYSIS OF SUGAR-FREE GULABJAMUN PREPARED FROM GULABJAMUN MIX BY USING SKIM MILK POWDER, SOY FLOUR AND LOW-CALORIE SWEETENERS

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ABSTRACT

In the present study, changes in compositional, sensory analysis (standard plate count (spc), yeast and mould count and coliform count) of sugar free gulabjamun, Prepared from Gulabjamun mix by using skim milk powder, Soy flour, maida, Vanaspati and baking powder to improve the qualities of gulabjamun mix. With packaging materials (LDPE and aluminium foil) 15-day interval (0-60 day) and low-calorie sweeteners i.e., stevia, sucralose and herbal sugar. These treatment combination (G₁, G₂, G₃, G₄, G₅, G₆, G₇, G₈, G₉, G₁₀, G₁₁, G₁₂, G₁₃, G₁₄, G₁₅, G₁₆, G₁₇, G₁₈, G₁₉, G₂₀, G₂₁, G₂₂, G₂₃, G₂₄) used in the study were replicated five times. Sugar free gulabjamun were tested for standard plate count (SPC), yeast and mould count and coliform count. Cost of the product was also worked out for different treatment combinations. The data obtained during investigation were statistically analyzed by using factorial design and critical difference between treatment combinations.

Keywords: sugar free gulabjamun, skim milk powder, maida, Vanaspati, Soya flour, LDPE, aluminium foil, Stevia, sucralose, herbal sugar.

EFFECT OF GROWING MEDIA ON GERMINATION AND SEEDLING VIGOUR OF CUSTARD APPLE

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ABSTRACT

The experiment comprised of 5 treatments {G₀-Soil + FYM (1:1), G₁-Soil + Cocopeat (1:1), G₂-Soil + Cocopeat + Sand (1:1:1), G₃-Soil + Cocopeat + FYM (1:1:1), G₄-soil + Cocopeat + Sand + FYM (1:1:1:1)} with 2 experimental unit (Poly bags and seed beds) was conducted to effect of growing media on germination and seedling vigour of custard apple. Among the various treatments, G₄ was superior in respect to seed viability, days taken for first germination, seed germination percent, germination duration, seed vigour, germination index and number of leaves per seedling as compare to other treatments.

Keyword: germination, vigour, growing media and custard apple.

EFFECT OF HUMIC AND BORIC ACID ON CHILLI (*Capsicum annum*L.) GROWTH, YIELD, AND QUALITY IN ARID ZONE OF RAJASTHAN

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ABSTRACT

The field experiment was carried out during 2017-18 at the Agricultural Research Station, Mandor, Agriculture University, Jodhpur. The main aim of this experiment was to research findings on the vegetative growth, yield and quality with treatment parameters of the chilli crop. The treatments included humic and boric acid, which were applied as foliar applications with different concentrations at 30 and 60 days after transplanting of the plant. The results obtained strongly indicated that all the treatments and their combinations had significantly influenced the growth, yield and quality of chilli. Among the various treatments, HA @ 40 mg L⁻¹ + BA @ 40 mg L⁻¹ was found to be significantly superior in terms of increasing plant height, number of leaves plant⁻¹, leaf area plant⁻¹ and the number of primary branches plant⁻¹. With regard to fruit yield and quality parameters, the chilli plants sprayed with HA @ 40 mg L⁻¹ + BA @ 40 mg L⁻¹ also recorded the highest fruit set per cent, number of fresh fruits per plant, length of fresh fruit, diameter of fresh fruit, yield per plant and yield per ha.

Keywords: Humic acid, Boric acid, quality, yield and Chilli.

RELATIVE ABUNDANCE OF PREDATORY SPIDERS FAUNA IN RICE ECOSYSTEM IN TERAJ REGION OF WEST BENGAL

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ABSTRACT

The field experiment was conducted at the agricultural research farm of Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar, West Bengal, India in the year 2019-2021 to study the relative abundance of predatory spider fauna in rice ecosystem (MTU-7029). The spider

specimens were collected from rice field during kharif and rabi seasons. Sampling was done at different rice growth stages i.e. nursery, vegetative, reproductive and maturity stages. Total 16 species of predatory spider fauna belonging to 6 families of order Araneida were found. In Lycosidae family 2 species i.e. *Lycosapseudoannulata* and *Arctosatanaki* were found. In Oxyopidae family 3 species i.e. *Oxyopeslineatipes*, *Oxyopesjavanus* and *Oxyopessalticus* were observed. In Tetragnathidae family 5 species i.e. *Tetragnathamaxillosa*, *Tetragnathamandibulata*, *Tetragnathajavana*, *Leucagecelesbesiana* and *Leucage decorate* were found. In Salticidae family 2 species i.e. *Bianorsp.* and *Hasariusadansonii* were noted. In Thomisidae family only 1 species i.e. *Thomisius sp.* was found. In Araneidae family 3 species i.e. *Neosconatheisi*, *Neosconamukerjei* and *Araneus sp.* were found from the rice fields. Spiders belonging to family Oxyopidae was found most prevalent followed by Lycosidae in both the seasons. The relative abundance of *Oxyopeslineatipes* was found to be maximum followed by *Lycosapseudoannulata*. The abundance of predatory spiders was found maximum at maturity stage followed by reproductive stage and vegetative stage.

Keywords: Rice, predatory spiders, population

SMART METERING MECHANISM IN PLANTER FOR SUSTAINABLE DEVELOPMENT

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ABSTRACT

Sustainable development in Precision agriculture is a farming technique that uses agricultural technology to increase farm production while minimizing environmental impact with enhanced crop performance. Precision agriculture's success is determined by how well it can be used to measure, manage, and evaluate crop production's space-time continuum. The precision planting of crops is progressing in the country, however there is no indigenous precision planting machines available in the country. Some imported substitutes are available but being too costly are beyond the reach of common farmers. There are various types of planters which have different types of seed metering mechanisms which are working by attached with ground wheel; these mechanisms are of mechanical type and they use drive through gears, chains or belts from the ground wheel and while transmitting power, there exists some transmission losses. Due to continuous friction between moving parts, these components are subjected to wear and tear. The sensor system in the machine helps in proper metering of seeds and thus further reduces the losses. Therefore, this review article aiming to provide knowledge about electronic metering of seeds that would be an indigenous and cost-effective substitute for imported planters. The metering unit would be synchronized with the D.C motor with the help of proximity sensor and micro controller. Thus, the precision farming can be achieved with the help of smart metering mechanism by avoiding multiple seed dropping and missing voids, keeping row to row and seed to seed distance constant. By keeping the above points in view, an effort is made to develop a battery-operated corn planter based on electronic sensor metering mechanism. This will share major workload of operator for providing ease in planting operation. The developed planter will ensure precise planting, less drudgery, timeliness, economic viability and eco-friendly machine with scope to be adopted by the small to marginal farmers of the country.

Keywords: Metering mechanism, Electronic unit, sensor, Precision agriculture, D.C motor.

MECHANIZATION OF GARLIC (*Allium sativum*) IN RAJASTHAN

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ABSTRACT

India is the second largest producer of garlic in the world after China. It is grown and used as a spice or condiment throughout India. The average global garlic productivity of nearly 16.71 tons/ha. The area, production and productivity of garlic in Rajasthan are 77.03 thousand ha, 415.48 thousand MT and 5.39 t/ha, respectively, (Anon, 2020). Kota zone, including Baran district is the leading zone which has highest area under cultivation. Baran, Chittorgarh and Bundi are the major garlic producing clusters in the state of Rajasthan. There are avenues of mechanized cultivation available with present agronomic practices and few would need changes in the current agronomic practices to facilitate mechanization in order to realize the goals of maximum productivity of garlic in India. The production and productivity of garlic in Rajasthan are very low as compared to other states. Lack of awareness of farmers about improved varieties, climate, soil and agro-techniques, diseases and pest damaging the crops and their control measures as well as post-harvest management are the main reasons, inadequate market support is also responsible for limiting the production and productivity indirectly.

Mechanization of garlic ensures timely farm operation that brings numerous benefits to garlic growers apart from increased crop yield. Among various farm operations performed in garlic cultivation only soil preparation and soil bed making have been successfully mechanized. Presently the planting of garlic is being done by traditional methods. Some large/ progressive farmers have been reported to adopt tractor-operated or animal drawn planter for planting. Manual planters are adopted by the small and marginal farmers for garlic planting. There is need to further refine these planters for more precision and accuracy and develop automatic planters to reduce the labour cost. Intercultural, fertilizer application and plant protection are some of the operations in garlic cultivation, which needs immediate attention for mechanization. Harvesters and diggers for garlic are still to be adopted by farmers at a large scale. In garlic cultivation, mechanization is mainly limited to the land preparation machines and to some extent planting machines. Other machines to mechanize the operations like planting, intercultural, harvesting/digging, which involve a lot of human drudgery when performed manually, need to be developed, demonstrated and popularized amongst the garlic growers.

Keywords: Mechanization, Garlic, Planter, Drill planter.

DEVELOPMENT AND PERFORMANCE EVALUATION OF SOLAR POWERED WEEDER

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ABSTRACT

Power weeders are most commonly used machines for removing weeds, to prevent them from competing with main crops. However, these power weeders are powered by either petrol or diesel engine. With the shortage of fossil fuel, its unavailability in rural areas and for reducing emission due to burning of fossil fuel, an alternative energy powered weeder is very much

required. As solar energy was very available and weeding usually carried out during daytime. Hence, an attempt had been made to develop a solar powered weeder. It comprised of a solar powering system and a rotary blade assembly. The power source included solar panel of 160 W, solar charge controller, two batteries of 12 V, 26 Ah, LCD battery level indicator and DC motor of 150 W, 24 V. The J type blade was used to perform the weeding operation, which was mounted on the rotary shaft with the help of flange and power was given to the rotary weeding shaft by 150 W, 24 V DC motor using a gearbox, chain and sprocket drive.

The performance of weeder was evaluated at three different widths of cutting blade 17.5 mm, 25 mm and 35 mm and no of blades per flange 2, 3 and 4. The developed weeder was tested in soybean crop having 300 mm row spacing. The optimized machine variables for the developed weeder obtained from the study are width of cutting blade 35 mm and no of blades per flange 4, respectively. Solar panel with a power of 160 W was used to charge the battery and it takes approximately 8 h to completely charge the battery, while weeder is in steady state. With simultaneous charging and discharging of batteries, the solar system could run the weeder for 6 to 7 h.

Keywords: Solar, weeder, weeding and weed etc.

BIOCHAR'S POTENTIAL ROLE IN AGRICULTURE WASTE MANAGEMENT AND ENVIRONMENTAL SUSTAINABILITY

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ABSTRACT

Crop waste management is still a significant problem in the agricultural sector. Since there is no practical way to manage crop residue, burning it is a significant source of greenhouse gases and air pollution. Burning crop residue in place deteriorates soil, raises the risk of erosion, and raises soil temperature, all of which lead to the destruction of soil microorganisms. Both the price of restoring soil fertility and the danger of increased pollution from increased fertilizer use are impacted by this. Crop residue marketability, the high cost of incorporating, transporting, and processing them, labour shortages, and the short time between harvest and the next cropping season affect crop residue burning decisions. Pyrolysis is one of the most promising low-cost and environmentally friendly processes for converting waste into valuable products such as biochar, syngas, and biochar in the absence of oxygen. Biochar application in agriculture may significantly decrease global warming through the sequestering of atmospheric carbon and mitigating greenhouse gas (GHG) emissions from soil. The environmental challenges caused by agricultural waste disposal can be reduced by recycling the crop waste into biochar using a thermochemical process. This manuscript presents a state-of-the-art review of biochar applications for the solution of agricultural waste and environmental sustenance. Furthermore, this paper identifies the key issues that need to be addressed for the sustainable utilization of biochar.

BIOTECHNOLOGICAL APPROACHES TO ACHIEVE FOOD AND NUTRITIONAL SECURITY

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ABSTRACT

India is second largest population country in the world after China. Food is essential commodity for increasing population day by day. Now, a days increasing population required food for their lively wood but so many factors are responsible for decay of food. A range of biotechnological approaches, including both traditional ones like selective breeding and fermentation techniques, and modern ones such as genomics, molecular breeding and genetic engineering, can contribute towards achieving food and nutrition security. Since the dawn of agriculture conventionally used genetic and breeding methods aided substantially to enhance the yield thresholds and defending various pests and diseases. However, many unsolved problems through the conventional methods can be witnessed even after many decades of continuous efforts by the breeders. In this regard, biotechnology is being played an immense role in agriculture by providing better feed and fuel to the growing world. In the present paper, in order to reiterate the significance of this essential technology to those who ridicule it, I reviewed the fruitful outcomes of the intervention of biotechnological tools in food and nutrition security besides offering plausible solutions to inheriting, as well as emerging constraints in a comprehensive and concise manner.

Keywords: Biotechnology, Food security and Nutrition.

OVERVIEW OF BIOCOSCOMPOSITES MATERIAL FOR A SUSTAINABLE TECHNOLOGY

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ABSTRACT

Carbon materials are becoming increasingly important in various industrial areas however, these materials have disadvantages of high cost and oil based essence. Traditional carbon compounds derived from coal and petrochemicals are typically energy intensive and involve extreme synthetic conditions. In recent years, renewable materials such as biochar have become a substitute of carbon with several advantages such as production of these substitute of carbon may help to reduce biomass waste and also contributes to CO₂ mitigation. Biochar is carbon produced from recyclable organic materials through pyrolysis process. Recent research has shown that biochar-based composite materials have considerable application in agricultural due to their porosity and easily tuned surface chemistry. Biochar are inexpensive and bio-composites produced using biochar could be a feasible solution to substitute the traditional carbon in various applications. This present papers reviewsthe production process of biochar based bio-composite materials, its potentials and new discoveries to advance the practical uses.

Keywords: Bio-composite, biochar, biomass, pyrolysis.

INTERNET OF THINGS (IOT) ASSISTED FOOD TECHNOLOGIES: A SYSTEMATIC OVERVIEW

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ABSTRACT

All industries, including food technologies, benefit greatly from information and communication technology. On the other side, the world is battling food waste, starvation, and innutritious food. There are many more technologies available now that boost productivity, quality, and profitability. Many nations use IoT technologies for food safety, shipping, packaging, temperature monitoring, nutrition analysis, and the real-time detection of faulty foods utilizing IoT devices and applications via smart phones and computers. The primary focus of this analysis was on IoT in food technology with regard to food production, security concerns, and potential solutions to those concerns. An organized analysis of the literature was done for that, and the results were qualitatively examined. Results showed that IoT and related technologies positively promote raising the demand for and improving the quality of food production. The main security concerns for those IoT devices and applications were data privacy concerns and the need for quick technological solutions. It was determined from the review of the literature that IoT offers valuable services to the food industries, including the creation of new types of food products with the expected level of nutrition, food packaging, real-time monitoring of the food's temperature and moisture, traceability of transportation, identifying faulty foods, lowering the incidence of diseases in farming, and lowering food waste.

RESPONSE OF SOWING DATE AND COVERING MATERIAL ON GROWTH, YIELD AND QUALITY OF WATERMELON UNDER LOW TUNNEL

POONAM

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ABSTRACT

The field experiment was conducted at research farm of ICAR- Rajasthan college of Agriculture, Udaipur, Rajasthan during 2020-21 to evaluate response of sowing date and covering material on growth, yield and quality under low tunnel. The treatment considered of three dates of sowing i.e. 15th December, 30th December and 15th January and four types of covering materials using no covering, polythene sheet, non-woven poly-propylene and insect net respectively. The farmer practices are taken as a control in open field. Result was found to be significant for growth, yield and quality parameters in 30th December with covering material using polythene sheet as compared to other treatment. Environment is the aggregate of all external conditions which influence growth and development of plants. Temperature can be controlled and regulated under polythene sheet better than other treatments. Polythene sheet increase the higher temperature under low tunnel during winter season and favor the growth and yield parameters.

Keywords: Watermelon, sowing date and Covering material.

ENERGY AND EXERGY ANALYSIS OF PASSIVE SOLAR DISTILLATION UNIT

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ABSTRACT

The present research involved the energy and exergy analysis of a passive solar distillation unit. The design of solar distillation was optimized for 40 litres of holding capacity and with the desired output of 5 litres of distilled water. The performance of the developed unit with a period between 8 AM to 5 PM. The solar still produced per day per m² 4.5 litres of freshwater in 0.01 m depth of the basin. According to the thermal evaluation of the solar still, the maximum daily energy efficiency was found at 23.6% and the exergy efficiency was found at 4%. Efficiency of the passive solar still is lower than the energy efficiency. It is mainly due to less available energy in the evaporative heat transfer as the system temperature in the form of saline water temperature varies in the lower range of 18–97⁰ C. The maximum instantaneous overall energy and exergy efficiency and hourly yield are 48.49%, 8.98% and 0.79 l/m², respectively. Daily average energy efficiency, Exergy efficiency and productivity was found to be 31.23%, 4.98% and 4.26 l/day, respectively.

Keywords: Solar energy, water, temperature.

DEVELOPMENT AND PERFORMANCE EVALUATION OF ANIMAL DRAWN FARMYARD MANURE SPREADER

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ABSTRACT

Agriculture remains the principal source of livelihood for majority of the population in India, which is the most important sector of Indian economy. Indian agriculture sector accounts for 18 per cent of India's gross domestic product (GDP) and provides employment to 50 per cent of the country's workforce. Over the past five decades synthetic fertilizers consumption has drastically increased several folds in order to increase the productivity but this resulted in adverse effects on human health and harmful effects on soil fertility due to the presence of higher pesticide residue, more nitrate and heavy metals. The urgency of using organic manure has been gaining in the wake of increasing cost of fertilizer with every passing year and certain other inherent limitations with the use of chemical fertilizers, farmyard manure is the oldest organic manure used by man ever since he involved in farming. The evenly spreading of manure on farm fields is extremely important to achieve better effect.

The application method for dry fertilizer, broadcasting and mixing into the soil after ploughing is popular in Indian farms. Use of manpower for application of organic materials is uneconomical due to high labour cost. Thus, mechanization in application method of FYM attracted wide attention to overcome this problem animal drawn farmyard manure spreader has been developed at the College of Technology and Engineering, Udaipur. The objective of this study was to development and evaluation of FYM spreader. To spread the farmyard manure in the field at required quantity with more uniformity. The developed animal drawn FYM spreader was evaluated in the field for the calculation of manure delivery rate, application rate, draft, power requirement, uniformity of distribution and field efficiency. The results were obtained as 13.5-21.08 kg/min, 5.6-8.7ton/ha, and 18.5-45.6 kg-f, 0.26-0.65 kW and 65.4-86.8 per cent respectively.

Keywords: FYM, Animal drawn, manure delivery rate, application rate, power requirement.

ROLE OF ARTIFICIAL INTELLIGENCE, INTERNET OF THINGS (IOT) AND BIG DATA ANALYSIS IN INDIAN AGRICULTURE

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ABSTRACT

Agriculture has been backbone of Indian economy from ancient times. Inadequacy of food for the burgeoning population need to be addressed by making sensible changes in the conventional agricultural practices. Artificial Intelligence, Machine Learning, Internet of Things (IoT), Big Data Analysis are the promising and viable solutions and have slowly marking their presence in the Indian agriculture. Technologies like AI could create optimal models for analysing the climate and forecasting weather. IoT based Bio-Sensors have made possible to check the moisture and fertility of soil. Meanwhile, neural networks compute and predict with non-linear dependencies of past weather trends so different crops can be sown at correct time and at correct soil moisture level using Artificial Intelligence. Similarly, AI based motion detection security systems uses Python and Open Computer Vision Library (Open CV) to segment the background and foreground and it could detect any change in frames by capturing individually on a single camera and AI will proceed with the necessary repercussions like electric fence activation, activating alarms. It not only protects the yield from animals but also from trespassers. Similarly big data analysis in agriculture could lead Indian agriculture to intelligent farm machines, drone-based crop imaging and food quality assessment using spectral method and sensor fusion. Finally, food safety using gene sequencing and blockchain based digital traceability etc.

Keywords: IoT, Artificial Intelligence, Bio-Sensors, sensor.

PURIFICATION PROCESS FOR SYNGAS PRODUCED FROM AGRICULTURAL CROP RESIDUE

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ABSTRACT

The planet Earth is experiencing rapid global warming as a result of human-caused greenhouse gas emissions. A hydrogen-based economy is now widely viewed as a viable answer for the future of energy security and sustainability since hydrogen is a clean and effective energy transporter. Three major industrial processes are now used around the globe to produce hydrogen: steam methane reforming (SMR), gasification of coal and biomass, and water electrolysis. According to a recent study funded by MNRE, India now has access to around 750 million metric tons of biomass annually. By using biomass gasification to create syngas, it is possible to both produce energy from biomass and reduce pollution from burning agricultural crop residue. The syngas produced includes a combination of several gases as well as tar and ash particles. In comparison to competing methods like distillation, adsorption, and absorption, gas separation using membranes requires less energy and financial commitment. According to their kinetic diameter, the gases are separated by a porous membrane. Permeance and selectivity are used to evaluate performance of membrane. It is necessary to purify the hydrogen to the ultra-high purity levels needed by fuel cells (99.97 %). Therefore, purified hydrogen is helpful in reducing the demand for fossil fuels and pollution.

EXERGEOECONOMIC OF 50 W SOLAR PV MODULE

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ABSTRACT

The objective of the present study is to determine the exergoeconomic performance of solar PV panel. The study was conducted in April (2021) under climatic conditions of Udaipur (24°35'7" °N; 73°42'45" °E). The Exergy output, Exergy input and Energy input, Energy output was calculated. The Energy loss and Exergy loss was determined. It was found out that exergy loss was higher as compared to energy losses. Exergy input is always higher than energy input. Due to the change in ambient temperature and module temperature exergoeconomic performance is greatly affected. Due to the inclusion of factor related to temperature difference and wind velocity, exergy output is always less than the energy output.

Keyword: Energy input-output, Exergy input-output, temperature and wind.

BIOTIC AND ABIOTIC STRESS RESISTANCE IN WHEAT – ROLE OF SECONDARY METABOLITES

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ABSTRACT

Secondary metabolites are natural substances that are used for plants and other lower organisms as defence mechanisms, survival and endure most of the natural biotic and abiotic stresses; these substances are lower in molecular weight and do not impact the primary metabolism of plants. The secondary metabolites can be classified in different classes according to their physical structures and properties, many of these are being synthesized in the wheat crop through many metabolic pathways. Apart from protecting the wheat crop from various biotic and abiotic stresses, the secondary metabolites also help in enhancing the physiological growth of wheat crop passively. Through this paper we have enlighten about secondary metabolites, their classification and the effect of secondary metabolites imparting biotic stresses such as rust, Fusarium wilt and loose smut, effect of secondary metabolites imparting abiotic stresses like salt stress and UV radiation, and effect on wheat crop growth.

Keywords: Secondary Metabolites, Wheat, Biotic and abiotic stress

TO ASSESS THE LIVELIHOOD OF STs IN SCHEDULED AREA OF MADHYA PRADESH BY KNOWLEDGE & ADOPTION OF SOLE FARMING AND DIVERSIFIED FARMING WITH ALLIED ACTIVITIES

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ABSTRACT

Agriculture has been key issues for majority of tribal population in developing countries. According to United Nations 2017 that world population will grow 8.6 billion by 2030 and 9.8 billion by 2050, creating a rural need for Innovation, entrepreneurship and leadership in food

and agribusiness industries. India lives in villages, where agriculture is main occupation. Livelihood dependency has been assessed in terms of knowledge for study from scheduled area in Madhya Pradesh. Two blocks i.e., Thikari and Rajpur were selected by snow ball random sampling technique. Total 160 respondents out of which 80 of ole farming and 80 of diversified farming with allied activities were selected. Majority of the respondents of both group (Sole farming & diversified farming with allied activities) are illiterate. 95 percent respondents of diversified farming with allied activities reported in annual income category of Rs. 1,50,000 & above with small size of land holding & 85 percent sole farming respondents in category of 25,000 to 1,50,000 with marginal size of land holding. Dual per cent of knowledge about sole farming, diversified farming and allied activities were possessed by respondents of diversified farming with allied activities rather than respondents of sole farming. The respondents of diversified farming with allied activities had more adoption of diversified farming along with allied activities whereas, respondents of sole farming were adopted merely sole farming and a negligible level of diversified farming and allied activities. The reported constraints were found more serious for respondents of sole farming rather than respondents of diversified farming with allied activities. Knowledge should be provided to tribal farmers about scientific agricultural technology through Field Level Demonstration (FLD) by ATMA, KVK, District Agriculture Department, District Horticulture Department and private agricultural companies at each panchayats level.

Keywords: livelihood, sole farming, diversified forming, allied activities, knowledge and adoption.

IMPORTANCE OF HYDROGEL USAGE ON SOIL MOISTURE CONSTANTS AND ITS EFFECT ON YIELD IN GROUNDNUT (*Arachis hypogaea* L.) UNDER CENTRAL DRY ZONE OF KARNATAKA

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Purpose

One of the biggest issues currently facing nations in arid and semi-arid environments is the conservation of soil moisture. In addition, the agricultural sector utilizes more than 70 per cent of freshwater in the majority of the world's areas, and by 2030, the worldwide water demand is likely to be 50 per cent more than it is today. This will cause water scarcity. Hydrogel polymers are the materials for improving water and nutrient use efficiency in dry and semiarid regions with limited soil-water availability. The hydrogel can store water and plant nutrients and release them to the plant when the plant's root zone dries out. In this approach we studied the importance of hydrogel usage in groundnut.

Methods

An experiment was conducted during *Kharif*-2018 at ZARS, Babbur Farm, Hiriyur, KSN UAHS, Shivamogga with ten treatments and three replications arranged in Randomized Completely Block Design to evaluate the effect of hydrogel usage on soil moisture constants and its status in various growth stages of groundnut groundnut (*Arachis hypogaea* L.) under Central Dry Zone of Karnataka.

Results

The Results revealed that the treatment (T₉) with combined application of RDF along with hydrogel @ 4 kg ha⁻¹ and FYM @ 10 t ha⁻¹ was recorded the significantly higher soil moisture at all the critical crop growth stages *viz.*, germination (13.28%), flowering (14.15%), pegging

(20.08%), pod formation (13.81%) and at harvest (9.92%). Similarly, the soil moisture constants like field capacity, permanent wilting point, available water content and maximum water holding capacity varied significantly with usage of different quantity of hydrogel, farm yard manure and mulching practices. Correlation studies also shows positive and significant association between soil moisture constants and crop yield of groundnut.

Conclusion

Due to the lack of moisture during crucial stages, especially in dry land areas, rainfall variability, both yearly and seasonal, had an impact on plant growth. Therefore, it is important to grow crops using advanced agricultural practices. The hydrogel is a moisture-retentive polymer that releases moisture only when under stress. By combining the application of RDF, FYM @ 10 t ha⁻¹ and hydrogel @ 4.0 kg ha⁻¹, the moisture stress that is limiting the pod yield (1470 kg ha⁻¹) in the production of groundnut may be addressed.

Keywords: Hydrogel, Field capacity, Permanent wilting point and Critical growth stages

PERFORMANCE ASSESSMENT OF WATER APPLE (*SYZYGIUM AQUEUM* L.) IN CAUVERY DELTA OF TAMIL NADU

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Purpose

Water apple (*Syzygium aqueum* L), one among the non-climacteric fruit crop of tropics. In Cauvery delta region, paddy is the predominant crop which is commercially cultivated over years under wetland ecosystem. Being a ‘Paddy hub of Tamil Nadu’, there is no crop diversification and farmers are facing issue in availing right remunerative price for their produce. Among horticultural crops, water apple found to be observed better the performance in some tracks with this clay soil region. Moreover, water apple being cauliflorous in nature, an attempt was made to have a primary study with the behavioural pattern of the crop with its existing canopy architecture.

Methods

An experimentation was formulated to study the performance of three fruit types of water apple in the Cauvery delta region of Tamil Nadu, India. Canopy directions were earmarked in all the three types of Water apple as per proposed experiment. Observations on bud emergence, flowering, fruiting and yield characters were documented and analysed.

Results

For observations, among canopy direction, maximum the ‘number of flower buds at initial stage’ registered with ‘D1’ East (293.22) and for fruit type, maximum the ‘number of flower buds at initial stage’ registered with ‘T2’ White (154.47). With regard to the interactions, maximum the ‘number of flower buds at initial stage’ registered with in ‘East direction of pink type’ (333.10). Similar trend observed to be viewed for all other flowering parameters. On ‘total number of fruits’, among canopy direction, maximum the value registered with ‘D1’ East (212.81) and for fruit type, maximum the ‘total number of fruits’ registered with ‘T3’ Red-Green (117.18). With regard to interactions, maximum the ‘total number of fruits’ registered with ‘East direction of Red-Green’ (233.27).

Conclusions

Overall investigation revealed that those fruits obtained from ‘East direction of Pink type’ impacted major flowering and yield related characters with Water apple in a profound manner.

Keywords: Water apple, Canopy directions, Cauvery delta, Pink type, Red-Green type.

GROWTH AND YIELD OF PATCHOULI [*Pogostemon patchouli* (Blanco) Benth.] AS INFLUENCED BY ZINC

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ABSTRACT

Research was conducted on influence of zinc (as soil and foliar application) on growth and yield of patchouli [*Pogostemon patchouli* (Blanco) Benth.] during *kharij* 2018-19 at the Medicinal and Aromatic Plants Unit, Saidapur Farm, Department of Horticulture, College of Agriculture, UAS, Dharwad. The Experiment was conducted in RBD (Randomized Block Design) with nine treatments and were replicated three times, in which different levels of zinc (10, 15, 20 and 25 kg ha⁻¹) as soil application and along with these different levels of zinc as soil application 0.5 percent of zinc as foliar application at 45 and 90 days after transplanting was taken.

Significant differences were found among different doses and methods of zinc application to crop on both growth and yield parameters. Among nine treatments, treatment with application of RDF + ZnSO₄ @ 25 kg ha⁻¹ + ZnSO₄ @ 0.5 per cent recorded higher values in growth parameters, which includes like plant height (93.93 cm), number of primary branches (15.20), number of secondary branches (43.47), number of leaves (528.13), leaf area (48.24 dm²/plant) and leaf area index (1.79) at the time of harvest. The same treatment also recorded the higher values with the yield parameters like fresh herbage yield (520.33 g/plant), dry herbage yield (144.00 g/plant), fresh herbage yield (10.12 t/ha), dry herbage yield (2.63 t/ha), oil content (1.53%) and oil yield (40.17 kg/ha).

Among the different methods of application, soil application along with foliar spray was found more advantageous over the soil application alone both in terms of growth and yield parameters.

For the higher production of patchouli, application of zinc as both soil (25 kg/ha) and foliar application (0.5% at 45 and 90 days after transplanting) along with recommended dose of fertilizer helps in realizing higher yield.

Keywords: Patchouli, Zinc, Soil and Foliar application

EFFECT OF VARIED CROP GEOMETRY AND PLANTING PERIODS ON GROWTH AND YIELD OF GARLIC (*Allium sativum* L.)

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ABSTRACT

The field experiment entitled “Effect of varied crop geometry and planting periods on growth and yield of garlic (*Allium sativum* L.)” was conducted with split plot design at Horticulture farm, MARS, University of Agricultural Sciences, Raichur during the year 2020-21. The crop was sown at different planting periods *viz.*, second fortnight of October (D₁), first fortnight of November (D₂), second fortnight of November (D₃) and first fortnight of December (D₄) with varied spacings of 10 x 7.5 cm (S₁), 15 x 7.5 cm (S₂) and 20 x 7.5 cm (S₃). The experiment was objectivated to know the response of garlic for varied crop geometry and planting periods, to

standardize the suitable crop density and planting period for garlic and to workout economics of garlic for varied crop geometry and planting periods.

The results emanated from the experiment revealed that, amongst the four different planting periods, early planted crop on second fortnight of October (D₁) resulted in vigorous growth and high yield through maximum per cent emergence, plant height, number of leaves, leaf area, leaf area index, plant girth, neck thickness, fresh weight of bulb, number of cloves per bulb, bulb girth, bulb length, bulb diameter, average clove weight, test weight of cloves and bulb yield. Amongst the crop geometries, lower plant density with wider spacing of 20 x 7.5 cm (S₃) (6,66,667 plants ha⁻¹) resulted in better performance of the all parameters except the bulb yield. Maximum bulb yield was harvested with higher plant density of 13,33,333 plants ha⁻¹ in a spacing of 10 x 7.5 cm (S₁).

It was evident that, garlic planted during second fortnight of October with the spacing of 20 x 7.5 cm resulted in better performance of all the parameters. Maximum bulb yield was recorded with planting on second fortnight of October by adopting the spacing of 10 x 7.5 cm for which B:C ratio was also found to be high (2.11).

Keywords: Planting periods, spacings.

A COMPARISON AMONG MANGO VARIETIES IN MALDA DISTRICT WITH REFERENCE TO PROFITABILITY AND TASTE

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ABSTRACT

The requirement of fruit in the country is rapidly increasing because of increasing population and higher living standard of the people. But the productivity and the production of the mango have decreased. The improved technology of mango cultivation has not been fully adopted by farmers. There is a need to fully adopt the improved production technology of mango so that the production of the mango can be increased. Among the different varieties of mango cultivated in Malda district, there is a need to identify the most profitable as well as most tasty variety which can generate more income for the mango growers by importing these varieties in other states and countries. It is also important to find out the differences in sell price of different mango varieties. Besides it is also important to identify the constraints in the cultivation of mango in the district. This would pave the way for Government and extension agencies in working out the future strategies for formulating projects on TOT program in the field of Horticulture. For this reason, the present study has been undertaken with the following specific research questions and objectives. After my study, it reveals that, according to profitability, Langra variety is ranked No.1 with the highest value of 1.248, then Himsagar variety ranked with 2nd position with a little smaller value, 1.031. Lastly Amrapali and Fazli ranked 3rd and 4th respectively. And again according to taste, Langra variety is ranked No.1 with the highest value of 1.101, then Amrapali variety ranked with 2nd position with a little smaller value, 1.032. Lastly Himsagar and Fazli ranked 3rd and 4th respectively.

Keywords: Mango, Malda, Profitable, Sell price, Varieties.

DIRECT SEEDED RICE (DSR) WITH JUDICIOUS WEED AND NUTRIENT MANAGEMENT UNDER AEROBIC CONDITIONS: A SUSTAINABLE TECHNIQUE OF RICE PRODUCTION SYSTEM

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ABSTRACT

Rice (*Oryza sativa* L.) is one of the most important food crops in the world after the wheat (*Triticum aestivum* L.). Rice contains 74.8% carbohydrate, 8.4% protein, 2.6% fat, minerals (phosphorus, calcium, iron etc.) amino acids (thiamine, riboflavin niacin) and dietary fibers. Total production of rice in India during 2020-21 is estimated of record 121.46 million tonnes. It is higher by 9.01 million tonnes than the last five years average production of 112.44 million tonnes (Ministry of Agriculture and farmer Welfare). In India rice commonly grown by transplanting of its seedling in puddle soil. The major advantage of transplanted rice is to reduce the weeds in crop field along with facilitating water stagnation over the surface of the soil to enhance the availability of cationic ions under essential nutrients for better growth and development of the crop and the very less chance to crop failure but apart from that transplanted rice have many disadvantages like labour intensive method, requires more water and less profitability. Other factors like low fertilizer use efficiency, rising fuel prices, low availability of labour at the peak demand time, late sowing of succeeding crop and emission of methane for puddled transplanted rice are again compelled to rethink and look into other options of rice seed establishing method. Currently, water scarcity is the major problem that may be major cause to decrease the crop yield. A flooded rice system consumes twice or thrice the amount of water needed for other cereals. The shortage of water and raising the input prices are forcing the farmers to adopt the water saving and cost-effective rice cultivation techniques. Aerobic rice is one of the approaches in the rice production system that sustains the rice production. The aerobic rice face high weed competition than transplanted rice. Weeds are major problem in aerobic rice production system. In aerobic rice, weed control through use of pre and post herbicides alone or jointly may be inevitable and useful. On the other hand, the iron (Fe) deficiency is one of the serious nutritional disorders in aerobically grown rice on upland alkaline and calcareous soil besides heavy infestation of weeds, which leads to decline in productivity. It means aerobic rice cultivation requires different nutrient management practices like two foliar spray of FeSO₄ @ 0.1% + ZnSO₄ @ 0.5% before and after the flowering stages has been found to be effective to address the issues in relation to Zn and Fe management. Aerobic rice have many advantages as compared to transplanted rice that it requires 60% less water compare to irrigated puddle rice, on the other hand aerobic rice is also helpful in reduction of emission of greenhouse gases, thus it is safe for our environment because in such field 80- 85% lesser methane emission has been recorded in the immediate environment. This technique of paddy cultivation also economically viable because it saves land preparation, transplanting as well as labour cost. It means aerobic rice produce more yield per unit area of field with less water along with production cost reduction.

Keywords: Direct Seeded Rice (DSR), Herbicides, Iron, Rice (*Oryza sativa* L.), Zinc.

SEED GERMINATION IN *PLANTAGO SPECIES*: TEMPERATURE AND PHOTOBLASTISM

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ABSTRACT

Plantago, a monogeneric to family Plantaginaceae consist of 200 species worldwide Seeds of these species are used for treatment of chronic constipation, dysentery, abdominal pain, piles and rheumatism. Now its potential to lowering cholesterol level also has also documented. The present work aimed to verify the effect of light and temperature on the seed germination of four *Plantago species* viz. *P. ovata*, *P. psyllium*, *P. arenaria* and *P. major*. Thus, 3 replications were used, each with 50 seeds put to germinate in filter paper humidified with distilled water, at 10 and 35°C, at intervals of 5°C, in the absence and presence of light. The seeds of all the varieties germinated both in the light and dark presenting a neutral photoblastic behavior, but germination percentage were higher side in the absence of light. Temperature range between 15 -25 °C was recorded best for first two species and 20 to 25°C for remaining species.

Keywords: Plantago, Seed germination, Temperature, Light.

ANTI-MICROBIAL ACTIVITIES OF METHANOLIC LEAF AND STEM EXTRACTS OF DIFFERENT GERMPLASMS OF *ZANTHOXYLUM ARMATUM* DC GROWING WILD IN VARIOUS PROVINCES OF HIMACHAL PRADESH: AN ENDANGERED VALUABLE MEDICINAL PLANT

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ABSTRACT

A number of chemical compounds such as flavonoids, glycosides, alkaloids, terpenoids, steroids, phenols, lignins, coumarins and benzoids reported from different parts of the plant, which are responsible for a number of biological activities including antimicrobial, antioxidant, antipyretic, larvicidal, and anti-inflammatory properties. Agar well diffusion method was used to measure the antibacterial activity of *Z. armatum* leaf and stem extracts. Methanolic: water extracts showed activity against all the gram positive and gram negative bacterial strains. A significant variation was found among the antibacterial activity of different leaf and stem extracts of *Z. armatum* collected from different regions of Himachal Pradesh. The diameter of zone of inhibition was measured in (mm) of for all the samples (leaf and stem) collected from Hamirpur, Mandi, Bilaspur and Sirmour districts of H.P. The antibacterial actions of the extracts were compared with dicrysticin as positive control. Out of these samples from Mandi, the leaf extract showed highest inhibition against *E.coli* i.e., (21mm in leaf) in diameter and stem extract showed highest inhibition against *Pseudomonas fluorescens* (24mm in stem) in diameter.

LAND USE/ LAND COVER CHANGES DETECTION USING GEOSPATIAL TECHNOLOGY OF YADGIR DISTRICT, KARNATAKA, INDIA.

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Purpose

The main aim of the study was to assess Land Use/ Land Cover Changes Detection using Geospatial Technology of Yadgir District, Karnataka, India From 2000 to 2020

Methods

The data were analyzed by using ERDAS Imagine 14 software and Arc Map 10.1 software used for the preparation of LU/LC layers and for composition and generation of Maps for monitoring the changes in LU/LC condition of the study area for different periods by using IRS LISS-III + Pan Image and LISS-IV image of years 2000, 2005, 2011, 2015 and 2020.

Results

The LU/LC changes detection results show that dramatic increase in the rate of increment and decrement within the Build-Up land (2.36%), Agricultural land (2.41%), Forest (0.74%), Wasteland (1.90%), Waterbodies (1.20%) has experienced a few modifications over the period 2000-2020.

Conclusions

The area of agricultural land will continue to grow, but the waterbodies will decrease compared to other classes. The historical information of land cover alternate clarified the charge of encroachment of urban regions on a few other land cover, with dispersed patches of urban growth classifying the urban sprawl in the metro city. The climatic parameters circuitously impact the changes such as temperature, rainfall, and humidity based on the sensitivity consideration, a buffer zone must be included to limit development in those fields.

Keywords: LU/LC Changes detection, Remote Sensing, GIS, Yadgir.

AN ECONOMIC ANALYSIS OF SUPPLY CHAIN MANAGEMENT AND MARKETING EFFICENCY OF LITCHI IN MUZAFFARPUR DISTRICT OF BIHAR

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ABSTRACT

The present study planned to analyze the “An economic analysis of Supply Chain Management and Marketing Efficiency of Litchi in Muzaffarpur District of Bihar”. The district was selected purposely because of the leading litchi producing district in the state. In the district 140 sample consisting 60 litchi growers and 80 market intermediaries under the study. In the district litchi crop extensively grown under the area of 33.4 thousand hectares and annual production of 258.3 thousand MT with 7.8 MT/hectares. The study finds that the trends of area, production and productivity in the district has showed increasing trend with 0.03, 0.36, and 0.38 respectively. In case of state the area, production and productivity is 1.01, 0.5, -0.4 respectively. The overall picture indicates that except in the state of Bihar at the district and national level trends was significantly positive. The main region behind growth in productivity showed negative trend due to uncertainty of rainfall in the Bihar state. The study

showed that the marketing of litchi is a very complex procedure in the sampled area and where four major type of marketing channel are identified. Channel I: Producer - Pre-harvest contractor - Commission agent cum Wholesaler – Retailer – Consumer. Channel II: Producer-Village Trader- Wholesaler (local) – Commission agent (distant) – Wholesaler (distant) – Retailer –Consumer. Channel III: Producer - Retailer – Consumer. Channel IV: producer – consumer.

The fourth channel Producer → Consumer, (local market) was found very much efficient for the producers as compared to other three identified marketing channel. In fourth channel producer take 70.23

% of consumer rupee while the left behind 29.77 % was incurred in cost of marketing incurred by producer /contractor &retailers as well as middle men's margin. The price spread found minimum for channel IV that is 493.38Rs /q due to absence of market middlemen. The marketing efficiency was highest in channel IV (2.02) & lowest in channel 2nd (0.16) due to in channel fourth producer directly sell their produce to consumer. The most important marketing constraints of litchi marketing was perish ability of fruits with 98.92 mean score (With 1st Rank) followed by others problems i.e. Labour shortage during harvest, Lack of market information, Lack of marketing infrastructure, Lack of ordered marketing, High transportation cost for distant markets, problem of credit facility, Unorganized production and Price fluctuation etc. The study suggested ways and means for improvement of marketing and supply chain for obtaining higher share of consumer to the producer.

Keyword: Litchi, Muzaffarpur, Marketing Channel, Growth, Consumer

EFFICACY OF ORGANIC AMENDMENTS EXTRACT AGAINST DAMPING-OFF (*Pythium aphanidermatum*) OF TOMATO

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Purpose

Damping off, a generic term for a group of deadly seedling diseases, is fatal for tomato seedlings. It can be caused by several different fungi *Pythium*, *Rhizoctonia* or *Phytophthora*) which attack tomato seeds, tender stems, and roots. Young seedlings or plants are most susceptible. Damping-off of tomato caused by *Pythium aphanidermatum* (Edson) in nurseries is a major constraint in tomato production causing 62 per cent mortality of seedlings (Ramamoorthy *et al.*, 2002).

Methods

To find out antifungal effects of organic amendments extract on the pathogen, different amendments extract *viz.*, Farm yard manure (FYM), vermi compost, poultry manure, mustard cake, castor cake and neem cake were evaluated as method suggested by Jha *et al.* (2007). Water extracts of above organic amendments were prepared by incorporating 25 g shade dried fine powder of each amendment into 250 ml of sterilized distilled water. The extracts were passed after 24 hrs through muslin cloth and filtered through filter paper. This was constituted 10 per cent standard extract. In amendments oat meal powder and agar powder was added @ 2.0 and 5.0 per cent (w/v) to this extract and were sterilized in autoclave for 15 minutes. Approximately, 20 ml sterilized oat meal agar medium was poured into sterilized petri plates separately. Plates without addition of any amendment served as control. Observations on colony diameter were recorded at 48 hrs after incubation.

Results

The results presented in Fig. 1 revealed Significantly minimum mycelial growth (44.17 mm) of pathogen and maximum inhibition (50.92%) was obtained in castor cake extract followed by poultry manure (53.67 mm & 40.37%) at 5 per cent concentration. Whereas, lowest inhibition of mycelial growth was recorded in neem cake (27.22%) at 5 per cent concentration. The higher concentration (5%) was more effective than lower concentration (2%) in each treatment.

Conclusion

Among six organic amendments, castor cake was found effective against *P. aphanidermatum* *in vitro* at both 2% and 5% concentration. Significantly minimum number of damped-off seedlings per pot and maximum per cent disease control was obtained with castor cake as compared to other organic amendments under pot conditions. This treatment can be further tested in the management of *P. aphanidermatum* under field conditions.

Keywords: *P. aphanidermatum*, organic amendments, *in vitro*

COMPARATIVE ECONOMIC STUDY OF KOPERGAON AND OTHER VARIETIES OF GREEN GRAM

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ABSTRACT

In the varietal front the Pulses Research Station, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola has made significant progress by releasing five excellent green gram Varieties for Maharashtra. green gram variety Kopergaon was realised 1983.

In green gram, Kopergaon variety seeds are generally bold and shiny in appearance with green colour. It is suitable for Kharif season. It is synchronous maturity easy for picking of pod. It gives 08 to 10 qtl/ha yield and crop duration is of 60-65 days. Koperagaon variety is mostly adopted in states like Maharashtra, Madhya Pradesh, Andhra Pradesh, Karnataka and Chhattisgarh.

The main objective of this study, to study the growth rates of area, production and productivity of selected green gram, and to assess the economic impact of University released selected green gram.

The data on area, production and productivity of Green gram for Maharashtra and India was collected from the Annual report, Ministry of Agriculture and Farmers welfare, Government of India for the year 1990-91 to 2019-20. The information on expenditure on research, extension, salary, contingency etc. was availed from the office record of Pulses Research Unit, Dr.PDKV, Akola. Data on seed sale of Koperagaon were collected from Pulses Research Unit, Dr.PDKV, Akola and Mahabheej, Akola.

The data on costs and returns of Green gram, Kopergaon, and other varieties data of respective crops for the year 2019-20 were compiled from the Green gram quick estimate reports of Agricultural Price Cost and Scheme, Department of Agril. Economics and Statistics, Dr.PDKV, Akola. In addition to this primary data has been collected from the survey of sample cultivator through personal interview with help of pre-tested and structured schedule for the year 2019-20.

The gross return were work out to Rs. 35884.85/- and Rs. 24872.59/- Kopergaon and other Green gram variety respectively, whereas Net return at cost A observed that Rs. 13178.08/-

and Rs. 3975.83/- respectively. The Benefit cost ratio at Cost ‘A’ was 1.58 and 1.19, at Cost ‘B’ was 1.20 and 0.95 and Cost ‘C’ was 1.07 and 0.83 for Kopergaon and other variety growers respectively.

It was concluded from the Benefit cost ratio that the production of Kopergaon growers was profitable at Cost ‘A’ & Cost ‘B’ than other variety of green gram growers. It indicates that as use of Kopergaon seeds for cultivation, increase the yield level of green gram.

STUDY OF INDIA’S ORGANIC AGRICULTURE

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ABSTRACT

The first scientific approach to organic farming dates back to the Vedas of the later Vedic period, the essence of which is to live in harmony with, rather than exploit, Mother Nature. There is brief mention of several organic inputs in our ancient literatures like Rigveda, Ramayana, Mahabharata, KautilyaArthashastra etc. In fact, organic agriculture has its roots in traditional agricultural practices that evolved in countless villages and farming communities over the millennium. India produced 1.70MT certified organic produce during 2017-18. In recent years, however limitations of agriculture based on chemical use and intensive irrigation have become apparent and there has been a resurgence of interest in organic agriculture. Currently, India ranks 9th in terms of World’s Organic Agricultural land and 1st in terms of total number of producers (FIBL and IFOAM year book), 2018).⁷

This research focuses on the present status and prospects of organic farming in India. Keeping in view of this study has been undertaken with following objectives.

1. To study the area, production of organic farming in India.
2. To study the growth production and exports of organic products in India.

The data was collected from the secondary sources i.e International federation of organic farming movements (IFOAM), International Trade Centre (ITC), National programme of organic production (NPOP), APEDA (Agricultural processed food products & export development, Reports, Journals, Periodicals and newspapers etc. for the period 2002-03 to 2018-19. The present study analyses variability of Area, production and Export of organic products through coefficient of variations. Compound growth rate (CGR) was estimated using the exponential regression model to examine the trends in production and exports of organic products in India.

The result was concluded that, the total area of both organic & wild collection in India has increased from 2.57 million hectares in 2005 to 3.43 million hectares in 2018-19. Among all the states, In percentage Madhya Pradesh (34.67 per cent) has covered largest area under organic

EFFECT OF FOLIAR APPLICATION OF NANO NPK (19:19:19) UNDER DIFFERENT LEVELS OF ORGANIC NITROGEN ON GROWTH AND YIELD OF DIRECT SEEDED RICE (*Oryza sativa* L.) AND ITS RESIDUAL EFFECT ON GREEN PEA (*Pisum sativum* L.) IN RICE - GREEN PEA CROPPING SYSTEM

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ABSTRACT

A field experiment was conducted during two consecutive *kharif-rabi* season of 2020-2021 and 2021-2022 at the experimental field of Hiyanglam Mayai Leikai, Dist.: Kakching to study the “Effect of foliar application of Nano NPK (19:19:19) under different levels of organic nitrogen on growth and yield of direct seeded rice (*Oryza sativa* L.) and its residual effect on green pea (*Pisum sativum* L.) in rice - green pea cropping system”. Treatments: a) levels of nitrogen (N₁ - 100% RDF, N₂-75% RDF and N₃- 50% RDF) and b) foliar application of nano NPK (19:19:19). There are twelve treatment combinations (N₁F₁, N₁F₂, N₁F₃, N₁F₄, N₂F₁, N₂F₂, N₂F₃, N₂F₄, N₃F₁, N₃F₂, N₃F₃ and N₃F₄). The experiment was laid out in a Factorial Randomized Block Design (FRBD) and replicated thrice. The results revealed that maximum plant height (cm), number of tillers and effective tillers / m² were observed under treatment N₁F₄ and it was followed by N₁F₃ and N₂F₄. Significantly highest grain yield kg/ha, straw yield kg/ha and test weight were obtained under treatment N₁F₄ which were found to be at par with N₂F₄, N₁F₃, N₂F₃ and N₃F₄ and lowest was observed under treatment N₃F₁. Similarly, in residual effect on green pea also highest plant height(cm) number of pods/plant and green pod yield kg/ha were observed maximum under treatment N₁F₄ which were found to be at par with N₂F₄, N₁F₃, N₂F₃ and N₃F₄ and lowest was observed under treatment N₃F₁.

STUDY OF FLORAL BIOLOGY ON CLARY SAGE (*Salvia sclarea* L.) UNDER MID HILL CONDITION OF HIMACHAL PRADESH

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ABSTRACT

Floral biology on clary sage was studied under mid hill condition of Himachal Pradesh was found to be herbaceous perennial, cross pollinated, aromatic herb with profusely flowering verticillasters. Roots were cymose tap root system. Stems were erect, thick, quadrangular and pubescent with its height ranging from 96.62 ± 2.39 cm with 3.25 ± 0.55 cm diameter. Leaves were upto 21.85 ± 1.90 cm long and 13.15 ± 1.54 cm across of basal part which were petiolate, broadly ovate shape, obtuse apex and cordate base, crenate margin, pubescent surface with dark green colour arranged in opposite and decussate manner. Inflorescence was comprised of verticillasters possessing six flowers arising from the axil of two opposite bracts and it was upto 62.35 ± 3.63 cm long paniculates having 26.56 ± 1.51 numbers of verticillasters and profusely branched spike with many bluish to purplish flowers. Flowers were hermaphrodite, zygomorphic, gamosepalous with the length of 10.05 ± 1.85 mm long, corolla with 25.14 ± 3.38 mm long bilipped, upper lip bilobed, lower lip trilobed, two stamens with length of 11.07 ± 1.37 mm, epipetalous, bicarpellary, syncarpous, superior, bifurcated stigma with length of 25.65 ± 9.27 mm; schizocarpic nutlet fruit size ranging from 2-3 mm (2.54 ± 0.41 mm) in length and 1.51 ± 0.27 mm in diameter with rounded to triangular in shape with smooth surface having axile placentation.

Keyword: Aromatic herb, inflorescence, verticillaster, pubescent, schizocarpic

MITIGATION STRATEGY TO REDUCE THE IMPACT OF CLIMATE CHANGE ON CROP PRODUCTION USING NOVEL CLIMATE RESILIENT TECHNOLOGIES

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ABSTRACT

Food security relies on both, sufficient food production and quality food access. Bihar's food security depends on sustainable agricultural production which is extremely dependent on climate change. The accelerating pace of climate change affects agricultural production, which is likely to challenge food security in the upcoming future. Conservation agriculture and eco-friendly technological interventions through improved crop establishment are the need of time to produce more with fewer resources vis a vis mitigating climatic vulnerabilities and protecting environmental quality. In this regard different interventions viz Zero tillage wheat and Direct Seeded Rice were implemented in the year 2021-22 on Farmer's field on mass level under Climate Resilient Agriculture Programme (CRA Programme) started in East Champaran district of Bihar state during the year 2020. In the demonstrations, paddy transplanting and sowing of wheat through conventional tillage was replaced by Direct seeded Rice (DSR) and Zero Tillage (ZT) wheat, respectively. The grain yield of ZT wheat (4.47 t ha⁻¹) was 16.86 % higher than conventional tillage (3.83 t ha⁻¹) in sequence with DSR the yield was 4.63 t ha⁻¹ which was 23.35 % higher than paddy transplanting (3.75 t ha⁻¹). There was also improvement in soil fertility under DSR and ZT-wheat compared to paddy transplanting and conventional tillage. Overall, the resource conservation and soil fertility improvement through these technological interventions leads to a model of sustainable production system in climate change scenario in East Champaran, Bihar.

Keywords: Climate Change, DSR, Zero tillage, Crop Production, Yield

SUSTAINABLE APPROACH FOR IMPROVING PRODUCTIVITY OF LENTIL (*Lens culinaris*)

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ABSTRACT

Pulse is one of the essential parts of food due to its higher source of protein and ever demanding crop which is a good source of income for farmers, and contributes to agricultural as well as environmental sustainability. In East Champaran district of Bihar state farmers majorly grow Lentil legume crop in Rabi season, which plays an important role in the food and nutritional security of people. It is also a soil building crop and being a leguminous crop, it fixes atmospheric nitrogen (N) through symbiotic nitrogen fixation in soil, thereby helps in N cycling within the ecosystem. Considering the present agro-climatic scenario, cluster front line

demonstrations on pulses (CFLDs) may play a crucial role in mitigation of the quality food supply problems, sufficient production and minimizing adoption gap. In view of maximizing the area of Lentil in East Champaran district, CFLDs on Lentil was conducted by Krishi Vigyan Kendra, Piprakothi, East Champaran during the Rabi season in the year 2020-21. In the reported year, altogether 28 demonstrations were conducted on Lentil (*var. HUL-57*) in 10 ha area using improved technologies viz. soil testing, seed treatment, zero tillage/line Sowing, integrated nutrient management and integrated pest management. After a comparative study with non-cluster farmers, it was observed that on an average 11.88 q/ha yield recorded over the farmers yield 9.12 q/ha and it could increase 26.48 % yield of the selected farmers. It was positively marked a good net return on the demonstrated plot with an average of Rs. 34244 per ha with B:C ratio of 2.59 when compared to other farmers which was Rs. 18951 per ha with a B:C ratio of 1.73. Results indicated that a higher yield might be achieved due to the cumulative effect of Improved variety along with all technological interventions. The result also showed that the Cluster front line demonstration has given a positive and significant impact on the farming community of the district as they were motivated by the new agricultural technologies applied in the demonstrations and also convincing the farming community for higher productivity and returns.

Keywords: Agricultural sustainability, CFLD, Farmer’s income, Pulse, Production

CLUSTER FRONT LINE DEMONSTRATION ON OILSEED AMONGST FARMERS: AN APPROACH FOR SELF-RELIANT INDIA

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ABSTRACT

The district East Champaran of Bihar state is popularly known for its meet quality, Rice-Wheat Cropping system, Sugarcane production and in some cases vegetable production, by the intervention of oilseed crops amongst farmers field through Cluster Front Line Demonstration on oilseed (CFLD-oilseed) especially Mustard crop (Rajendra Sufalam) it is now well observed that it may have done significant changes in the rural life. In the year 2021, Rabi season, Rapeseed (*var. Rajendra Sufalam*) having good potential yield and bold seed get sown in the cluster manner with all the inputs like sulphur added fertilizer, seed treatment, due care of insect and pest management and zero tillage/line sowing in the area of 40 ha on the farmers field through 100 demonstrations on farmer’s field. After comparative study with non-cluster farmers it was observed that on an average 11.86 q/ha yield recorded over the existing yield i.e. 8.6 q/ha and it could increase 26.90% yield of the selected farmers. It was positively marked a good net return on demonstrated plot with average of Rs.31599/- with B:C ratio of 2.34 when compared to other farmers field i.e. Rs. 18340/- with a B:C ratio of 1.84. Results showed that higher yield may achieved due to cumulative effect of Improved variety, seed treatment, Zero tillage/line sowing, application of micronutrients, Integrated Pest and Nutrient Management practices and soil testing before sowing of the crop. It was also proven that in Rabi season Mustard crop may also get spaced in sugarcane field as intercropping which could give maximum yield with minimum input cost and in some cases it could make help to the farmer’s family basic needs after sale of the seeds.

Keywords: CFLD, oilseed, IPM, extension, self-reliant

ASSESSMENT OF MARKETED AND MARKETABLE SURPLUS OF PADDY IN THANJAVUR DISTRICT

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ABSTRACT

The main objective of the present study is to estimate the marketed and marketable surplus and to determine the factors influencing marketable surplus of paddy growers in different blocks in Thanjavur district. The primary data was collected from the 80 paddy farmers through well-structured questionnaire. Simple subtraction and multiple linear regression analysis were employed. This study reveals that most of the paddy growers had faced the marketing problems like price fluctuation, late payment and insufficient storage facilities in the market. And also, our results highlighted that area of the high yielding varieties, price of the commodity and variability in consumption pattern are significant and positively related with marketable surplus. Development of infrastructure, including roads and efficient transport facilities and strengthening of the cooperative marketing institutions for the crop may help in improving the efficiency of marketing in the district as well as state.

Keywords: Marketable surplus, Marketed surplus, Efficiency and HYV

STATUS OF SMUT, WILT AND POKKAH BOENG DISEASES IN WEST CHAMPARAN DISTRICT OF BIHAR

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ABSTRACT

Sugarcane (*Saccharum officinarum* L.) is one of the most important cash crop which is cultivated in the tropical and subtropical regions globally and contributes 70% of world sugar production and provides raw material for many other by products. Among all districts of Bihar, West Champaran is the highest sugarcane growing districts of the state. Sugarcane is grown as a major field crop by majority of the farmers in the district but there are various factors which are responsible for lowering down the production and productivity of sugarcane diseases are one of them. About 55 diseases of sugarcane have been reported from India in which more than 20 diseases of sugarcane have been reported from Bihar which are caused by different pathogens. Among them wilt, pokkah boeng, smut are serious concern in Bihar during recent past. During the survey of different sugarcane localities in West Champaran district was observed that the incidence of smut, wilt and pokkah boeng diseases increased and affected the several popular commercial varieties. During the survey of different sugarcane growing areas in West Champaran district increasing trends of these diseases was observed ranging from 2 to 20 per cent depending upon the locality and varieties of sugarcane and it was also observed that the incidence of smut, wilt and pokkah boeng diseases increased and it has affected popular varieties like Co 0238, Co 0118, CoJ 64, CoLk 94184, Co 0235, Co 0233 and CoH 160 cultivated in different localities. The incidence of smut, wilt and pokkah boeng disease ranged from 2 to 8 per cent, 5 to 20 per cent and 4 to 12 per cent was observed respectively.

Keywords – Status, smut, wilt, pokkah boeng, West Champaran

PRODUCTION OF ACIDIC PECTINASE THROUGH FRUIT WASTE

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ABSTRACT

The use of Enzymes in biotechnological measures has extended significantly as of late. Inferable from the increment in the interest for natural fruits and organic product items like juices, it turned into a key requirement for the organic product preparing businesses to improve the nature of the organic product juices in an economical way. Proteins, being exceptionally productive biocatalysts, are utilized at various strides in the cycle of juice creation. In the current examination, altogether, forty (40) secludes were recognized from orange and banana strips squander tests. In view of portrayal on the particular development media, the disconnects were gathered as microscopic organisms Bacteria (70.26%), and Fungi (29.74%). Among these, 61.58% showed states encompassed by clear zones which demonstrate the presence of pectinase movement. After thorough screening steps, the strains with high potential acidic pectinase action were recognized microscopically by sequencing the 18S rDNA district from the growths of the confines. In light of the molecular identification, the strains were *Penicillium oxalate* and *Talaromyces aurantiacus*. This was further optimized for fungal growth with respect to Acidic Pectinase production at variables like pH, temperature and nutritional supplements. Glass fermentation at rotary shaker was performed and extract was treated with ammonium sulphate. Finally purified extract was dried and a replicate was tested for SDS PAGE considering the confirmation of enzyme. Impact was tested with few juices during final lag of this study.

Keywords: Pectinase, optimized, pH, temperature, sequencing, fermentation and SDS PAGE.

EFFECT OF VARIED CROP GEOMETRY AND PLANTING PERIODS ON GROWTH AND YIELD OF GARLIC (*Allium sativum* L.)

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ABSTRACT

The field experiment entitled “Effect of varied crop geometry and planting periods on growth and yield of garlic (*Allium sativum* L.)” was conducted with split plot design at Horticulture farm, MARS, University of Agricultural Sciences, Raichur during the year 2020-21. The crop was sown at different planting periods viz., second fortnight of October (D₁), first fortnight of November (D₂), second fortnight of November (D₃) and first fortnight of December (D₄) with varied spacings of 10 x 7.5 cm (S₁), 15 x 7.5 cm (S₂) and 20 x 7.5 cm (S₃). The experiment was objectivated to know the response of garlic for varied crop geometry and planting periods, to standardize the suitable crop density and planting period for garlic and to workout economics of garlic for varied crop geometry and planting periods.

The results emanated from the experiment revealed that, amongst the four different planting periods, early planted crop on second fortnight of October (D₁) resulted in vigorous growth and high yield through maximum per cent emergence, plant height, number of leaves, leaf area, leaf area index, plant girth, neck thickness, fresh weight of bulb, number of cloves per bulb, bulb girth, bulb length, bulb diameter, average clove weight, test weight of cloves and bulb yield. Amongst the crop geometries, lower plant density with wider spacing of 20 x 7.5 cm (S₃)

(6,66,667 plants ha⁻¹) resulted in better performance of the all parameters except the bulb yield. Maximum bulb yield was harvested with higher plant density of 13,33,333 plants ha⁻¹ in a spacing of 10 x 7.5 cm (S₁).

It was evident that, garlic planted during second fortnight of October with the spacing of 20 x 7.5 cm resulted in better performance of all the parameters. Maximum bulb yield was recorded with planting on second fortnight of October by adopting the spacing of 10 x 7.5 cm for which B:C ratio was also found to be high (2.11).

Keywords: Planting periods, spacings.

EFFECT OF BIO-FERTILIZERS INOCULATED SEED ON YIELD AND RHIZOSPHERE SOIL CONDITIONS IN HAPPY SEEDER WHEAT CULTIVATED PLOTS IN ROHTAS DISTRICT OF BIHAR UNDER CLIMATE RESILIENT AGRICULTURE

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ABSTRACT

Most rice stubbles are burnt in the conventional mechanized rice-wheat cropping system of Rohtas district of Bihar as it's difficult to manage combine-harvested rice residues on farm. This practice leads to loss of organic matter and nutrients, widespread air pollution as well as add up to global warming. Happy seeder combines stubble mulching along with seed drilling. In order to enhance sustainability of wheat cultivation with reduction in chemical fertilization and maintaining yield and quality standards, this study investigated the effects of two bio-fertilizers (*Azospirillum spp.* and PSB) for seed-inoculation in happy seeder wheat cultivation. Comparisons were made with non-inoculated seeds and conventional sowing techniques. The following treatments were established for the assay: T₁: Non-inoculated seeds + conventional sowing, T₂: Non-inoculated seeds + happy seeder wheat sowing T₃: seed inoculation with *Azospirillum spp.* & PSB + happy seeder sowing and T₄: seed inoculation with *Azospirillum spp.* & PSB + conventional sowing. All the other agronomic practices and management was carried out similarly in each treatment. It is clear from the data, treatment T₃ yield increase and improvement the physico-chemical as well as biological properties of rhizospheric soil in comparison to other treatment. Happy seeder wheat cultivation with bio-fertilizers enables residue management, enhances climate resilience in crop, improves soil conditions and provides sustainable productivity.

Keywords: bio-fertilizers, seed inoculation, happy seeder, residue management, rhizosphere

EFFECT OF NUTRI- PRIMING ON PRODUCTION AND QUALITY OF BLACK GRAM IN THE ALFISOL OF EASTERN INDIA

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ABSTRACT

Black gram (*Vigna mungo*) is an important *kharif* season pulse crop in eastern India. It is very nutritious and contains high quality protein (24 %), carbohydrates (60 %), fat (1– 5 %), amino acids, vitamins and minerals like potassium, calcium, iron. The productivity of black gram is low in India as compared to world productivity. There is immense scope for increase productivity of black gram with adoption of high yielding varieties and better nutrient management practices. The production potential of this crop can be enhanced by use of

organic manures, inorganic fertilizers and bio fertilizers. The study “ Integrated nutrient management on productivity and quality of black gram (*Vigna mungo L.*)” was under taken at the Instructional Farm, College of Agriculture of Siksha “O” Anusandhan deemed to be university, Bhubaneswar during *rabi* season of 2019-20 with the objectives: To study the effect of different nutrient management practices on growth and yield of black gram; nutrient uptake and economics of black gram under various nutrient management practices. The experimental site was located at Chatabara village which was 45 km from the station and 28 km from the college of agriculture Siksha “O” Anusandhan deemed to be university with 28.4' N latitude and 27.12' E longitude and at an altitude of 45.0 m above mean sea level. Soil was sandy loam in texture. The initial status of the soil was pH, 5.5, available N, P and K were 160, 12 and 181 kg/ha. And organic carbon was 0.45%. The study revealed that in *rabi* blackgram, the maximum seed yield, stover yield, growth parameters, yield attributes, residual soil fertility were better under the treatment T₄ with 100%RDF+ FYM (5t/ha) +Nutri priming with Mo and P (Ammonium molybdate 0.1% and 1%P solution of SSP)+ Nutrient spray (2% DAP). This was followed by 100% RDF + 5t/ FYM. The net returns due to different integrated nutrient management influenced significantly. The maximum net returns of Rs. 39.25 thousand/ha was obtained at T₄ and Rs 35.26 thousand/ha in RDF with 5.0 t/ha of FYM (T₂). Overall, integrated nutrient management with 100% RDF+ FYM (5 t/ha) + Nutri-priming with Mo and P (Ammonium molybdate 0.1% and 1%P solution of SSP) + Nutrient spray (2% DAP) can be the best practice for the cultivation of black gram under *rabi* season with an yield level of 741.2 kg/ha and net returns of Rs. 39.25 thousand/ha. However, for farmers convenience point of view, integrated nutrient management with RDF+ 5.0 t/ha of FYM can be a the 2nd best practice for the cultivation of black gram under *rabi* season with an yield level of 687 kg/ha and net returns of Rs 35.26 thousand/ha.

REVIEW ON TUBEROSE INTRODUCTION

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ABSTRACT

Tuberose (*Polianthes tuberosa L.*), popularly known as Rajanigandha or Nishigandha. a member of family Asparagaceae was originated from Mexico and grown on large scale in Asia. It is an important flower crop of tropical and sub-tropical areas (Tiwari and Singh, 2002). Basic chromosome number is n=30. Ploidy in the diploid (2n=60) It is an important cut flower crop from aesthetic as well as commercial point of view. Morocco, France, Hawaii, South Africa, India and China are the major producers of tuberose. The flower is very popular for its strong fragrance and its essential oil is important component of high-grade perfumes in southern France. It produces attractive, elegant and fragrant white flowers. It occupies a very selective and special position to flower loving people because of its prettiness, elegance and sweet pleasant fragrance. It has a great economic potential for cut flower trade and essential oil industry. The flowers remain fresh for quite a long time and stand distance transportation and fill a useful place in the flower market. Its spikes are used for cut flower, decorating tables, floral ornaments, bouquet and garland. The flowers emit a delightful fragrance which is the source of tuberose oil. The natural flower oil of tuberose is one of the most expensive perfumer's raw materials. The bulbs of tuberose are used as the major propagating / planting material of the crop though, developments of plant materials from the seed are rare but not uncommon.

Keywords- Tuberose, fragrance, ornaments, tuberose oil, etc.

FOOD AND ENVIRONMENTAL SECURITY IN CROPS AS INFLUENCED BY CLIMATE RESILIENT TECHNOLOGICAL PRACTICES IN BANKA DISTRICT OF BIHAR

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Agriculture is strongly influenced by weather and climate. Agriculture is particularly vulnerable to climate change. There is a different type of threats governed by climate change, among them temperature CO₂, rainfall affects directly the plant growth and indirectly by land availability, irrigation, weed growth, pest, disease outbreak, etc. The climatic potential yield, which depends mainly on the climatic condition, gets reduced due to the vagaries of the threats. Climate change can therefore be expected to impact agriculture, potentially threatening established aspects of farming systems but also providing opportunities for improvements. Climate-resilient agriculture (CRA) is an approach that includes sustainability with existing natural resources through crop production systems to achieve long-term higher productivity and farm incomes under climate variability. Climate resilient agriculture is an inbuilt mechanism of the system to recognize the threats that need to be responded to, with effectiveness. Climate-resilient agriculture (CRA) include adverse threats such as erratic rainfall, cyclone, drought, flood, heat or cold wave, long dry spell, frost, insect and pest outbreaks, and other threats caused by climate change. It is also known as initial phase of CRA. Resilience is the ability of a system and its component to anticipate, absorb, accommodate or recover from the effect of a hazardous event in a timely and efficient manner.

Methodology

A field experiment was conducted during the *Kharif*, *rabi* and *summer* seasons of 2020 and 2021 at the farmer's field of Uprama village (24030'N latitude and 86030'E latitude at an altitude of 79 m from the mean sea level) in Banka District of Bihar as a frontline demonstration to evaluate the Food and environmental Security in crops as influenced by Climate Resilient technological practices in Banka District of Bihar. The soil of the experimental site was sandy-clay-loam in texture with neutral pH (7.23), low in organic C (0.46%) and available N (193.5 kg/ha) and medium in available P (17.1 kg/ha) and K (213.3 kg/ha). The field experiment consisted of cropping patterns with different technological interventions *ie.* Paddy-Wheat-Greengram, Paddy-Lentil-Greengram, Paddy-Maize-Greengram and Paddy-Mustard-Greengram under climate resilient agriculture program. The sowing of paddy, wheat, chickpea, and lentil by zero tillage and the wheat sowing by happy seeder with the presence of crop residue after the harvesting of paddy by combine harvester at 22.5 cm apart. A uniform fertilizer dose of 120, 60, 40 kg N, P₂O₅, and K₂O/ha in the form of urea, di-ammonium phosphate, and muriate of potash (MOP) was applied to zero tillage and raised bed wheat and 120, 60, 60 kg N, P₂O₅, and K₂O/ha for rice. Soil test-based nutrients applied in green seeker-based nutrient management wheat and rice. A full dose of phosphorus, potassium, and half dose of nitrogen was applied at sowing, and the remaining half dose of nitrogen was top-dressed in two split doses after the first and third irrigation. A uniform fertilizer dose of 20, 40 kg N and P₂O₅ in the form of di-ammonium phosphate was applied to chickpea, lentil and green gram as a full dose at the time of sowing. A uniform fertilizer dose of 80, 50, 40 kg N, P₂O₅, and K₂O/ha in the form of urea, single super phosphate, and muriate of potash was applied to raised bed mustard. The full dose of phosphorus, potassium, and half of the nitrogen dose was applied basal at the time of sowing, and the remaining half was top-dressed after 35 days after sowing.

Results

Grain yield was recorded more (45.3+120.90+8.86 q/ha) in Paddy-Maize-Green gram with technological interventions followed by (45.3+120.9+8.86 q/ha) in Paddy-Chickpea-Green gram, (45.40+11.90+8.70 q/ha) in Paddy-Wheat-Green gram, (45.10+11.70+8.80 q/ha) in Paddy-Mustard-Green gram and (45.10+10.10+8.90 q/ha) in Paddy-Lentil-Green gram as compared to traditional practice (Rice-wheat). According to an FAO (2012) report, the climate adaptation benefits of no-tillage can be significant. The prominent result of nodulation by zero tillage might be conserved moisture; improved fertility associated with minimum disturbance of soil and makes more efficient use of natural resources as well as a nutrient (Bell *et al.*, 2019). Net return and B: C ratio of wheat was recorded more (248539 & 2.94:1) in Paddy-Maize-Green gram with technological interventions followed by Paddy-Chickpea-Green gram (177293 & 2.82:1), Paddy-Wheat-Green gram (166869 & 2.70:1), Paddy-Mustard-Green gram (160741 & 2.66:1), and Paddy-Lentil-Green gram (152406 & 2.61:1) as compared to traditional practice (Rice-wheat).

Conclusion

The study has revealed that it is possible to save machine labor and irrigation water under zero tillage and other technological interventions than the conventional method. Due to resource-saving, the net return has been significantly higher in zero tillage technology and happy seeder machine. Hence, these technologies are an important alternative to save scarce resources and enhance the net farm income and B: C ratio in the different cropping patterns. The decomposition analysis has shown that per hectare production with technological interventions in rice-wheat-green gram was 2.98 percent higher in the conventional tillage method. In this improved production systems, zero tillage technology contributed 0.84 percent and inputs contributed 1.04 percent. By adopting these cropping patterns with technological interventions, farmers could save scarce resources and reduce the cultivation cost.

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CURRENT FARM MECHANIZATION STATUS IN WEST CHAMPARAN DISTRICT OF BIHAR FOR LAND PREPARATION

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Purpose

Effective farm mechanization uses modern tools which generally increased the crop production in two important ways, first by timeliness in operation and second by good quality work. It had been observed in various cited literature that increase in level of farm mechanization had positive effect on crop productivity. Land preparation for crop sowing plays a key role in increasing farm mechanization level and crop yield.

Methods

A descriptive study was conducted during 2021-2022 to know the status of adoption of modern agricultural machines for land preparation by farmers in five villages i.e., Srirampurva, Badnihar, Gaunaha, Katsikari and Samhauta) of West Champaran district of Bihar. A total

sample size of 150 farmers, 30 farmers from each village were randomly based upon minimum 10 years' experience in agriculture. A door-to-door survey approach was adopted with a pre-designed schedule for data collection on commonly used power sources (human, animal or power operated machineries) and machines for land preparation (indigenous plow, mb plow, disc plow, rotavator, disc harrow etc.)

Results

The study revealed that majority of farmers use (72%) power operated machines (tractor and power tiller) as their main power source followed by bullock (25%) and (3%) human -based for land preparation. Most of the farmers (86 %) owned less than 2 ha land while (14%) owns above 2ha. Power operated machineries use (63%) of tractor and (9%) of power tiller. Tractor with cultivator was used by most of the farmers (32%), followed by rotavator (28 %) while tractor with cultivator and rotavator was owned by (22%). Only (8%) of farmers use mb plow/ disc plow along with disc harrow and 5% of farmers use disc harrow individually. Very few high-category farmers (<2ha), (5%), use rotavator, cultivator, mbplow /discplow, and disc harrow for land preparation. Bullock drawn plow locally manufactured were commonly used for land preparation below (0.5 ha) area.

Conclusions

Most of the respondents had moderate to high level of adoption of farm machineries for land preparation and only few respondents had very high level of adoption. Most of the respondents were well aware about farm machinery but because of low purchasing power and unavailability of nearby custom-hiring center, they preferred traditional bullock drawn and human drawn land preparation methods over mechanized method.

Keywords: Farm Mechanization, Farm machinery, custom hiring center, Farm Productivity

ACARICIDAL RESISTANCE AND ACTIVITY OF DETOXIFYING ENZYMES IN *Oligonychus coffeae* NIETNER ON TEA.

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ABSTRACT

Acarine pests inflict heavy losses to the tea plantation in Terai and Dooars region of West Bengal, India. Synthetic pesticides of different groups are routinely applied in various conventionally managed tea plantations to keep the pest under control. Despite such routine application of pesticides, there are still frequent reports of pest control failures even at recommended doses from different tea plantations. Repeated management failure of this pest has been reported from tea ecosystem of North east India. Therefore, susceptibility status of the pest to the old as well as new chemistries needs to be monitored regularly for effective and economic management of the pest under field condition. Considering these, experiments were conducted in the Department of Agricultural Entomology and in the Department of Biochemistry of Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar, West Bengal-734301, India during 2018-19 and 2019-20 to study the status of acaricidal resistance and estimation of detoxifying enzymes activities. Results of the two years study revealed that Naxalbari population of *O. coffeae* acquired the highest resistance to all the acaricides tested followed by Cooch Behar population. Samsing population of *O. coffeae* was comparatively less resistant. Population collected from Naxalbari showed higher activities of GEs, GSTs and Cytochrome P450 during both the years of study. The present field recommended doses of dicofol, ethion and fenprothrin are no more effective for management of red spider mite as the pest has developed low to high level of resistance against these acaricides.

Keywords: *Oligonychus coffeae*, tea, acaricidal resistance, detoxifying activities, LC₅₀.

DEVELOPMENT OF VALIDATED HPTLC METHODS FOR QUALITY EVALUATION OF SOME HIGH TRADED MEDICINAL PLANTS FROM CENTRAL INDIA

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ABSTRACT

Since ancient era, nature functions as a complete store house of remedies to cure all ailments of mankind and provides us drugs in form of herbs, plants and algae to cure diseases without any toxic effect. More than 80% of world population is still relying on traditional system of medicines for healthcare. Due to being safe and effective, the world market for herbal medicines is growing at the rate of 7-15% annually. India being one of the richest biodiversity countries may capture the opportunity as a leader in the trade and commerce of pharmaceuticals, phytochemicals, nutraceuticals, cosmetics and other herbal products. But, due to lack of scientific validation and quality standardization, Indian herbal drugs fetch typical bias in western countries. Hence, the standardization of the herbal raw materials is the need of the hour to make the Indian branded drugs most reliable. Modern methods describing the identification and quantification of active chemical markers in the plant material may be helpful for proper standardization of herbs and their formulations. WHO and modern herbal pharmacopoeia are also strongly emphasizing for standardization of the quality of medicinal plants with respect to their correct identification and active chemical markers.

Active chemical markers are crucial for the quality control of herbal medicines, including authentication of genuine species, identification of superior chemotypes, harvesting the best quality raw materials, post harvesting handling, assessment of intermediates and finished products. The quality and efficacy of medicinal plants/ raw materials also depend on their therapeutically active marker compounds.

The present study aimed the standardization, development, validation of simple, precise, specific, rapid and cost effective high-performance thin layer chromatographic (HPTLC) methods for quality evaluation of some commercially important high traded medicinal plant species from Central India. The developed methods can be applied for routine quality analysis and identification of target species.

Keywords: Chemical markers, medicinal plants, quality, chemical fingerprinting

MARKETING PRACTICES AND MARKETING EFFICIENCY OF MINOR MILLETS IN BASTAR DISTRICT OF CHHATTISGARH

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ABSTRACT

The study was conducted in Lohandiguda and Bastanar block of Bastar district of Chhattisgarh. Out of the total 7 blocks (Jagdarpur, Bastar, Bakawand, Lohandiguda, Tokapal, Bastanar & Darbha) of Bastar district only one third of the total blocks i.e., Lohandiguda & Bastanar blocks were selected purposively on the basis of maximum area. For marketing of minor millets there were two marketing channels are observed i) Channel-I: Producer – Consumer. ii) Channel-II: Producer – Retailer – Consumer. The overall marketable surplus of kodo millet was found 90.70 percent, little millet 88.60 percent and finger millet 91.80 percent quintal per farm. The

marketing cost of minor millets incurred by producer in channel-I was obtained Rs. 95 and in channel-II Rs. 145 the respective cost incurred by retailer was Rs. 225. The marketing efficiency ratio was obtained for channel-I was 8.94 and in channel-II was 3.31. The major constraints witnessed in production of minor millets were lack of technical knowledge (95.87 percent) and lack of availability of resources (90.72 percent). The crucial constraints in marketing of minor millets were less price of crop (92.78 percent), lack of co-operative and regulated market (90.72 percent) and non-availability of marketing news and market intelligence (84.53 percent).

Keywords- Marketing channel, Marketing Efficiency, Marketing surplus, Marketing Practices

HUMAN-ELEPHANT CONFLICT: A BURNING ISSUE FOR BIODIVERSITY CONSERVATION

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ABSTRACT

The human-elephant conflict (HEC) seems to be one of the major threats to the conservation of biodiversity especially elephants worldwide. As the conflict results in enormous crop loss and human casualties, the marginal farmer becomes annoyed that triggers retaliatory killing of elephants. Therefore, an attempt was undertaken to study the degree of HEC and the people's perception on this issue in Dharamjaigarh Forest Division of Chhattisgarh, India in order to find out the site-specific mitigation measure of HEC.

Extensive field survey method was adopted to measure the crop loss (%) and a questionnaire survey was conducted to record the people's perception on these issues. The area damaged was compared to the total area cultivated for each plot to find out the percentage loss with respect to crop, village and farmer. A GPS location of the damage site was also recorded during data collection. On the other hand, a set of questions both closed ended and broad/ open types adapted for this study.

The study found a highest of 11.19% crop depredation in terms of area was recorded during 2019-20 followed by 10.67% during 2020-21 and 10.05% during 2021-22. The village wise crop depredation revealed that Potia village had received maximum crop damage (15.4%) and least (3.6%) in Chaal area during 2019-20. Similar trend was also followed during 2020-21 and 2021-22. Farmer wise crop depredation showed that majority of the farmers (74.3%) had received crop damage of up to 10% and remaining 25.7% of the farmers faced more than 10% crop damage. It was found that the farmers suffered a low of 0.4% to a high of 60.6% crop damage. It indicates that the marginal farmers who received more than 50% of crop less and have no alternate livelihood option; crop depredation could have an adverse effect on some farmer's economy. During the study period, 44 cases of human deaths, about 406 house damage and another 4 cattle deaths were reported due to HEC. On the contrary, 8 elephants were killed in retaliation during the study period. Interestingly, majority of the people (42.9%; n=103) showed a tolerance to crop damage up to 5% while another 33.8% (n=81) up to 10% loss. Interestingly, 23.3% (n=56) people showed intolerance to damage at any level. People in the research region mostly requested physical barriers such as a rubble wall, an electric fence, and a trench to prevent HEC.

Since majority of the people had no alternate source of income except cultivation, crop damage must have an adverse effect on the economy of a majority of people of this area that has developed negativity toward elephants which may hamper the conservation of elephants in this landscape in near future. Hence, the forest department must draw up some policy to pay ex-gratia for all kinds of damage and death/ injury of human beings immediately after the incident. In addition to these, some community-level activities namely, the Watcher Scheme and the Grain for Grain Programme could be implemented along with the installation of physical barriers to resolve the issues of HEC for the conservation of biodiversity of the entire region with an immediate effect.

Keywords: Biodiversity conservation, human-elephant conflict, people's perception

QTL ANALYSIS OF NOVEL GENOMIC REGIONS ASSOCIATED WITH ZINC DEFICIENCY TOLERANT TRAITS IN A RECOMBINANT INBRED POPULATION OF RICE (*Oryza Sativa* L.)

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ABSTRACT

Deficiency of Zn is a major soil constraint in rice plant growth and yield. Study on edaphic factors like Zn deficiency in soil in relation to plant performance is still poorly understood. Here, we have presented promising QTLs conferring tolerance to Zn deficiency which were identified through biparental mapping. The experiment was conducted using 236 F₇ RIL mapping population derived from the cross of Kinandang Patong (Zn deficiency sensitive) and A69-1 (Zn deficiency tolerant). A total of six QTLs (*qLB-2B*, *qLB-4B*, *qPM-4B*, *qPM-6B*, *qRZC-4B*, *qSZC-4B*) on chromosome 2, 4 and 6 were identified at environment 1, while five QTLs (*qLB-2N*, *qLB-4N*, *qPM-4N*, *qRZC-4N*, *qSZC-4N*) on chromosome 2 and 4 were detected in environment 2. Among these, five major [$>10 R^2$] and one minor [$<10 R^2$] QTLs at environment 1 and four major and one minor QTLs at environment 2 for Zn deficiency tolerance with Logarithm of Odd (LOD) threshold value higher than 3 were identified. The QTLs (*qLB-4B*, *qPM-4B*, *qRZC-4B*, *qSZC-4B*, *qLB-4N*, *qPM-4N*, *qRZC-4N*, *qSZC-4N*) for leaf bronzing, plant mortality root zinc concentration and shoot zinc concentration identified on chromosome 4 were found most promising and highly reproducible across the locations which explained phenotypic variation from 48.00 % to 56.00 % with the same marker interval RM6748-RM303. The new QTLs and its linked markers identified in this study can be utilized for Zn deficiency tolerance in elite cultivars using marker-assisted backcrossing.

Keywords: QTL, Linkage map, Recombinant inbred lines, Zn Deficiency, Rice

STUDIES ON GENETIC VARIATION, CORRELATION, PATH COEFFICIENT AND DIVERGENCE IN INDIAN MUSTARD {*Brassica juncea* (L.) Czern and Coss}

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ABSTRACT

An experiment involving 65 genotypes of Indian Mustard (*Brassica juncea* L) was conducted in randomised block design with three replications, during Rabi 2020. Data were recorded and analysed for ten characters viz, plant height, number of primary branches, number of secondary branches, number of grains/siliqueae, number of siliqueae/plants, 1000-seed weight, biological yield/plant, days to 50% flowering, days to maturity, economical yield/plant. The analysis of variance revealed significant differences among all the characters. In general, Phenotypic coefficients of variation were more than the corresponding genotypic coefficients of variation for all the characters. High values of genetic advance in percentage of mean (GAM) were observed in number of siliqueae/plant, economic yield, number of grains /siliqua, 1000 seed weight, number of primary branches and biological yield/plant. Economic yield/plant had positive and highly significant association with biological yield, number of siliqueae/plant, plant height, days to 50% flowering and 1000 seed weight while, negative and highly significant association of economic yield plant was seen with number of grains/siliqua. Path coefficient analysis revealed that biological yield per plant, 1000 seed weight, day to 50% flowering and number of siliqueae per plant had positive direct effect on economic yield/plant. All the 65 genotypes were grouped into 9 clusters using D² statistics. Cluster 6 had maximum number of genotypes (12) followed by cluster 5 (10) and cluster 1, 2, 3 had 9 genotypes each. The minimum number of genotypes (2) was present in cluster 9. Maximum intra-cluster distance was found in cluster 8 while, minimum intra- cluster distance in cluster 9. The inter cluster distance was found maximum between cluster 3 and cluster 7 followed by cluster 4 and 7.

Keywords: Variability, Heritability, Genetic Advance, Correlation Coefficient, Path Coefficient Analysis, D² statistics and Indian Mustard.

LIFE SKILL INTERVENTION POSSIBILITIES FOR SMART PHONE USAGE/ADDICTION AMONG COLLEGE STUDENTS

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ABSTRACT

Life skills can be broadly classified into: Social Skills and negotiation skills which includes self-awareness, empathy, effective communication and interpersonal relationship; Thinking skills like critical and creative thinking, problem solving and decision making and coping skills like coping with stress and emotion. Addiction to a cell phone device contributed to the increased incident of some psychological health symptoms amongst the younger college going generations. Studies concluded that younger people report high involvement with their mobile phones, found to exhibit addiction symptoms, concluded that the smart phone adoption behaviour of college students is highly likely to be influenced by friends, financial status and family members. highlighted the prevalence of addictive behaviour to mobile phone. Also it is seen that concludes that, as the functionality of cell phone continues to expand, addiction to this becomes an increasingly realistic possibility. What research has shown so far is that life skills-based education programmes have positive impact on increasing young people’s knowledge and awareness of risky behaviours. Prevention education program can be effective for Smartphone addiction also. Thus there is a need for Life Skills Intervention training so that the youth can come out of the addiction to their cell phones and have healthy life.

SECONDARY METABOLITE PRODUCTION AND LOW COST IN-VITRO PROPAGATION OF PODOPHYLLUM HEXANDRUM.(AN ENDANGERED MEDICINAL PLANT).

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ABSTRACT

The western Himalaya is a rich repository of unique plants that are valued for their medicinal properties. Many of these plants are extensively utilized in pharmaceutical industries, and there is a huge global demand for them. Since most of these plants have become rare, threatened, or endangered, there is an urgent need to conserve them. Podophyllum hexandrum is among one of them which is an endangered medicinal plant. Hence for the regeneration and conservation of the Podophyllum hexandrum micro propagation is one of the major tools. The primary application of micro propagation has been to produce high quality planting material. However, micropropagation technology, being a capital-intensive industry is expensive. Low-cost tissue culture technology is the adoption of practices and use of equipment to reduce the unit cost of micro propagule and plant production. Low cost options should lower the cost of production without compromising the quality of the micro propagules and plants. In low cost technology cost reduction is achieved by improving process efficiency and better utilization of resources. Plants cell culture technologies were introduced at the end of 1960's as a possible tool for both studying and producing plant secondary metabolites. Plants secondary metabolites are unique sources for pharmaceuticals food additives, flavors and others industrial values. Commercial importance of these secondary metabolites has resulted in a great interest in its production and in exploring possibilities of enhancing its production by means of tissue culture technology.

Keywords:- medicinal property, Podophyllum hexandrum, micropropagation, secondary metabolites.

PHYTODIVERSITY AND VEGETATION ANALYSIS OF DISTRICT KUPWARA.

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ABSTRACT:

Phytosociology, a training of plant science, addresses the specifics of plant societies in the way that floristic arrangement, form, development and classification on account of interrelationships with the species (Tansley, 1920; Allaby, 2004). Kupwara is one of the districts in the Indian state of Jammu and Kashmir. In 1979, the district was separated from the district of Baramulla. The Kashmir Valleys backward border area of Kupwara is full with breathtaking natural scenery. Kupwara has an extremely diverse range of flora and fauna thanks to the kindness of nature. It is unique from a tourism and wildlife perspective because of its dense forests and abundance of species. In the Kupwara region of Jammu and Kashmir sits Bangus, a sizable gorgeous valley that is one of the most alluring and beautiful areas of the Kashmir Valley. It has remained untouched by humans thus far due to its inhospitable terrains, which are flanked on all sides by steep mountains. The only impact on the valley, aside from military operations, is grazing. Since the valley hasn't been thoroughly investigated, not much is known about its biodiversity. The state administration recently decided to turn the valley into a tourism destination, and construction on the road that will make the valley easily accessible to tourists has already begun. These mountain ranges are surrounded by numerous lovely pastures and meadows. This offers sheep and cow grazing areas, as well as health spas and

tourist attractions for the adventurous souls. Climate, rainfall, soil, and altitude are all factors that affect vegetation. It is only reasonable that the vegetation should differ from the Inner Himalayas to the intermediate mountains and the outer plains of Jammu region given that these characteristics vary as the altitude climbs from the outer plains of Jammu Province to the loftiest mountain ranges of the Inner Himalayas.

Keywords: Phytosociology, topography, community, altitude, diversity, vegetation, homoestatis.

STUDIES ON DISTRIBUTION OF FRUIT FLIES (DIPTERA : TEPHRITIDAE) IN MANGO ORCHARDS OF SAHARANPUR DISTRICT OF UTTAR PRADESH

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ABSTRACT

Mango (*Mangifera indica*) is the second major fruit crop cultivated in India, it is known as “King of fruits” owing to delicious quality of fruit with richness in vitamins and minerals and has socio economic significance in international markets. Among the Indian states, Uttar Pradesh tops with the maximum cultivation of Mango. Saharanpur district of U.P has already been declared as important fruit belts of the country due to dense mango orchards.

Fruit flies (Diptera : Tephritidae) are one of the most diverse group of insects, comprising over 4000 species in 481 genera. Knowledge of the Tephritid spectrum in any given area is a prerequisite for the development of an IPM program to alleviate the pest problem.

Samplings were carried out in different mango orchard of Saharanpur district according to their fruiting seasons (April to August) with 15 days interval. Samples of fruit flies were collected by using methyl Eugenol lure traps from the farmer’s orchards and stored in 80% ethanol before identification in the labotary. Fruit fly species were identified using stereo-microscope with binocular lens by observing the morphological characteristics. Eight species of fruit flies were recorded from *Bactrocera* genus. The fruit flies identified in the laboratory were *Bactrocera caudate* (Fabricius), *B. correcta* (Bezzi), *B. cucurbitae* (Coquillett), *B. diversa* (Cocquillett), *B. dorsalis* (Hendel), *B. invadens* (Drew, Tsuruta & White), *B. tau* (Walker) and *B. zonata* (Saunders).

Keywords :- Mangifera indica, stereo-microscope, morphological characteristics.

CHARACTERIZATION OF QUINCE (*Cydonia oblonga* Mill.) CULTIVARS USING SSR MARKERS DEVELOPED FOR APPLE

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ABSTRACT

Quince, also known as *Cydonia oblonga* Mill. is small-scale fruit crop, that is largely used to make marmalade, jam and sauce. Only a small number of quince cultivars are recognised worldwide, and frequently, identical names are used for ostensibly different cultivars. The current study’s objective was to assess and define, using SSR markers, the genetic diversity of 36 quince cultivars and selections. Seven of the eight SSR markers created from apple sequences were able to amplify quince cultivars with success. There were typically 2 to 3 alleles

per locus. Compared to apples, these allele counts are quite low. It is assumed that it is the result of a genetic bottleneck. Despite the low allele frequency per locus, the 36 quince cultivars of quince produced 30 distinct genotypes. The low homozygosity ratio may have been related to the quinces self-(in) compatibility trait. SSR markers failed to distinguish between cultivars that were ostensibly closely related to one another. Due to the low allele number found, the level of variability among the tested quince genotypes was often greatly constrained. It must be remembered, nonetheless, that there are not enough SSR sites that have been studied to determine the overall heterozygosity of the quince genome. The SSR markers have proven to be a trustworthy and practical tool for such assessments, necessitating more research.

Keywords: *Cydonia oblonga*, quince, genetic diversity, SSR

PHYSICO-BIOCHEMICAL PROPERTIES OF TOMATO (*Lycopersicon esculentum* Mill.) GROWN IN HEAVY METAL CONTAMINATED SOIL

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ABSTRACT

The aim of the current study was to determine how the physico-biochemical characteristics of tomato fruit were impacted by heavy metal pollution of the soil. It was discovered that soil pollution has a negative impact on the yield of tomatoes, both in terms of quality and quantity. In tomato fruits grown in soil contaminated with industrial effluents, measurements were made of the fruit's length, diameter, volume, fresh and dry weights, total soluble solids, titratable acidity, lycopene content, and carbs. A few secondary metabolites, including total phenols and flavonoids, as well as micro- and macronutrients, were also found. The fruits that had been picked were analyzed for residual heavy metals (Cd, Co, Ni, and Pb). The results obtained were contrasted with tomato fruits grown in uncontaminated soil. According to the findings, heavy metal pollution of the soil has a negative impact on the properties of tomato fruits, including their titratable acidity, total soluble solids, lycopene concentration, ascorbic acid content, and carbohydrate content. In addition, compared to control fruits, fruits from plants grown in contaminated soil had higher concentrations of phenols, flavonoids, and heavy metals. To prevent an excessive buildup of heavy metals in the body, it is advised against consuming significant quantities of fruits grown in that region.

Keywords: *Lycopersicon esculentum*, heavy metals, lycopene, total soluble solids

THE ROLE OF SALICYLIC ACID IN PLANTS EXPOSED TO HEAVY METALS

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ABSTRACT

Salicylic acid (SA) is a clear and simple phenolic compound (C₇H₆O₃ compound composed of an aromatic ring, one carboxylic and a hydroxyl group). SA is important in plant growth and development for important physiological functions such as increasing the plant's response to stress conditions (abiotic and biotic). Under stress, including HM stress, SA interacts with other plant hormones (e.g., auxins, abscisic acid, gibberellins) and promotes the activation of antioxidant compounds and enzymes, alerting HM-treated plants and assisting in HM stress resistance. Stress has a negative impact on plants, resulting in unfavorable results. This factor

can be either abiotic (like climate and soil) or biotic (like weeds, pathogens, insects, and so on). Plant survival, growth, and yield are all affected by stress, as is the primary assimilation process, which includes photosynthetic rate, nutrient accumulation, and growth rate. Elastic stress occurs when the plant recovers after the stress factor is removed, whereas plastic stress occurs when the plant is deformed and the change is irreversible after the stress factor is introduced. The purpose of this study is to describe the role of SA in abiotic stress and how SA act as tolerant inducer during abiotic stress in plants.

Keywords: Stress, salicylic acid, plant, tolerant inducer, plant hormone

BIODIVERSITY OF HYMENOPTERAN INSECT POLLINATORS IN DISTRICT BARAMULLA OF JAMMU AND KASHMIR.

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ABSTRACT

The present study was carried out in Baramulla district of North Kashmir during blooming season 2018/2019 to investigate the comparative pollination potential of various hymenopteran insects. For this purpose, some crops on the basis of their agricultural/ horticultural importance were selected. A total of 12 species of insects belonging to order Hymenoptera comprising of 06 families i.e. Apidae (*Apis Ceranaindica*, *Apis mellifera*, *Apis dorsata*, *Bombus haemorrhoidalis*, *Bombus sp.*), Vaspidae (*Vespa velutina*, *Vespa affinis*, *Polister sp.*); Formicidae (*Camponotus sp.*, *Holocomyrmex sp.*); Halictidae (*Halictus sp.*); Xylocopidae (*Xylocopa sp.*) and Ceretinae (*Caratina hieroglyphica*) are recorded. The most prevalent insect visitors were the members of family Apidae followed by Vaspide. The result showed that among the selected crops, almost 80% were found to be mainly pollinated by honey bees i.e. honey bees constitute their major pollinators.

Keywords: - hymenopteran insects, Apidae, Vaspide, honey bees.

CARBON SEQUESTRATION POTENTIAL OF KASHMIR FORESTS

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ABSTRACT

Estimation of carbon sequestration in forest ecosystem is necessary to mitigate impacts of climate change. Current research project was focused to assess the Carbon contents in standing trees and soil of different subtropical forest sites in Kashmir. Tree biomass was estimated by using allometric equations whereas Soil carbon was calculated by Walkey-Black titration method. Soil carbon (C) sequestration implies transferring of atmospheric CO₂ into soil of a land unit through its plants. Cobenefits of soil C sequestration include: advancing food and nutritional security, increasing renewability and quality of water, improving biodiversity, and strengthening elemental recycling. Threshold level of soil organic C (SOC) in the root zone is 1.5– 2.0%.

Keywords: Carbon sequestration, carbon pools, Forest biomass,

STRESS MANAGEMENT IN PLANTS A KEY ROLE OF "BRASSINOSTEROIDS"

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ABSTRACT

Brassinosteroids is plant steroidal hormone which can influence plants against abiotic stress through signal transduction pathways. BRs interact with a variety of transcription factors which regulate the expression of BRs target genes. BRs are a group of Phytohormones and its growth promoting in nature. BRs receptors (BZR1) Brassinazole-resistant 1, detect the BRs, at cell surface and it is receptor family of leucine-rich repeat receptor -kinases BRASSINOSTEROID INSENSITIVE 1 (BRI1), that interact with co-receptor BRI 1 ASSOCIATED RECEPTOR KINASE 1 (BAK1) and undergoes a series of Phosphorylation and dephosphorylation events to transduce information to the nucleus. Which resulted in the regulation of expression of several hundred genes involved in Physiological process. The result of this research is BRs activate signal transduction pathways which activate stress responsive genes thus generating the initial stress response.

Keywords:- BZR1, Leucine, BRs, kinase, stress.

IMPACT OF PESTICIDE APPLICATION ON SOIL AND WATER WITH SPECIAL REFERENCE TO NATIVE FAUNA

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ABSTRACT

Over the past era there has been an increase in the development of pesticides to target a broad spectrum of pests. The increased quantity and frequency of pesticide applications have posed a major challenge to the targeted water bodies and soil quality. Field margins and hedgerows have the potential to provide semi-natural habitat for feeding, shelter and breeding of a wide range of fauna, many of which are beneficial, either as crop pollinators or pest predators. Given their potential to support biodiversity and enhance crop yields. However, there are growing concerns about the possible contamination of marginal vegetation with pesticides used in the adjacent crops, leading to exposure of non-target organisms to potentially harmful agrochemicals. This research summarizes our understanding of how pesticide exposure affects the flora and fauna of field margins in agricultural landscapes. Specific conservation goals, regulatory risk assessment and mitigation measures directed towards the protection of these habitats from the potential impact of pesticide use are also addressed.

Keywords: - pesticides, harmful agrochemicals, water bodies, flora and fauna.

INDIGENOUS KNOWLEDGE OF MEDICINAL PLANTS: A CASE STUDY OF GULMARG AREA OF J&K

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ABSTRACT

Ethnobotany is the scientific study of the relationships that exist between people and the plants. Ethnobotany aims to document the valuable knowledge of the tribal regarding the use of plants. The tribal people use the plants in their unique ways for various purposes mostly for the treatment of various diseases. There is a need to document this valuable knowledge as it is draining off at a rapid speed. An initiative was taken to document the ethnic knowledge regarding the medicinal plants in the Gulmarg and its allied areas in Kashmir Division of Jammu and Kashmir. During the survey about 80 plants, used for treatment of various diseases and ailments were documented. These plants are used for the treatment of various diseases like headache, toothache, epilepsy, gastric problems, skin disorders, pneumonia jaundice, etc.

Keywords:- Ethnobotany, treatment of various diseases.

BENEFITS AND PROBLEMS FACED DURING THE COLLECTION AND COMMERCIALIZATION OF NWFP'S IN BANDIPORA DISTRICT OF JAMMU AND KASHMIR FOR LIVELIHOOD SECURITY.

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ABSTRACT

Many Non-Wood Forest Products (NWFPs) are collected and consumed in Jammu and Kashmir; but both national statistical and scientific data on this topic are reported only for a limited number of countries, products, and case-study areas. Without an adequate quantitative basis, their importance as source of food and income, their links to recreation and cultural heritage, are all under-valued in forest-focused and forest-related policies. In this study we aimed to address the Benefits and Problems faced by assessing the consumption and collection of NWFPs. The data were collected with the help of well-structured pre-tested interview schedule through personal interview. The findings of this study reveal that cent per cent respondents were involved in collection. With regard to problems faced by the respondents in collection and marketing of NTFPs, majority of the respondents (95.56%) pointed out that they were facing the problem of low and fluctuated market price primarily, while; 95.56 respondents suggested for development of existing market infrastructure primarily, to overcome the problems faced by them in the collection and marketing of NTFPs. Our results show that ninety percent of households consume NWFPs and about one quarter collects them.. The vast majority of collected products is consumed fresh. Households with higher income consume a more diverse range of NWFPs, especially in Western part of the study area.

Keywords :- NTFPs, collection of NTFPs, consumption and collection of NWFPs.

PIR PANJAL RANGE OF KASHMIR HIMALAYA; A TREASURE OF MEDICINAL PLANTS UNDER SIEGE WITH SPECIAL REFERENCE TO CLIMATE CHANGE

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ABSTRACT

Climate change has emerged as an important issue to humankind. In this study we see a clear and vivid indications of climate change in the Pir Panjal Range of Kashmir Himalaya. In this study long term and short-term changes in temperature and precipitation are analyzed for three meteorological stations viz Gulmarg, Kupwara, Qazigund from year 1980-2016. These were observed by Man kendall, Linear regression, Cumulative deviation, Students t test. The results obtained showed increase of 0.8⁰ in average annual temperature over 37 years (1980-2016). The overall pattern of precipitation showed significant decrease and pattern of temperature showed significant increase and this change in pattern of precipitation and temperature has created a threat to medicinal plant diversity. It has altered the distribution of medicinal plants of the area from periphery to deep inside of the forest. Medicinal plants are quickly shifting to the higher altitudes. Some species stay at the same place by adapting to new climatic conditions through selection and some species may become extinct.

Keywords :- distribution of medicinal plants, Linear regression, Cumulative deviation.

RIDGE-TO-VALLEY TREATMENT OF HILLY TERRAIN FOR EFFICIENT SOIL AND WATER CONSERVATION

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ABSTRACT

Population growth demands more food production. Hilly areas are potential to address this gap. The development of hilly areas contributes to economic development of small and marginal farmers, development of small holdings. Beside food security they also provide environmental benefits. The fertile soil has more capacity to hold and retain moisture content and preserve humus factor in soils. However, the steep slopes of hills are highly susceptible to accelerated soil erosion and landslides due to high intensity rainfall. Ridge-to-Valley treatment of hilly terrains control soil erosion, conserve soil and soil moisture. This approach seeks to detain, divert, store and use available rainwater. Treatment of upper catchments prevents the pressure on lower catchment and strengthens the capacity of NRM structures in downstream. The works proposed in this write-up includes arable area treatment (arable and non-arable area treatments) and drainage line treatment with all possible techniques/structures. The control measure taken up helps in slowing down the flow of rain water. This increases duration of water flow on the surface and thereby increases infiltration into the ground. The water harvesting structures harvest water and keep it available for crops, livestock and even birds. The crops can get life saving irrigation to secure the yields and income to the farmers. Development of hill slopes into productive lands increases availability of land for cultivation ensuring food, livelihood and environmental security.

Keywords: Hilly terrain; steep slopes; ridge-to-valley treatment; cultivable land, food, livelihood and environmental security.

PERFORMANCE OF LAKADONG TURMERIC (*Curcuma longa* L.) Under Integrated Application of Farmyard Manure, Vermicompost And Chemical Fertilizers

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ABSTRACT

The Lakadong, one of the finest varieties of turmeric (*Curcuma longa* L.), has its uniqueness with a very high curcumin content of about 6-7.5% and volatile essential oil (dry) of about 3.6-4.8%. Being a heavy feeder, it depletes abundant quantity of nutrients from the soil, however farmers of Meghalaya are cultivating it without any nutrient source, or applying household waste resulting continuous decline in yield with poor quality produce. Therefore, a field experiment was conducted at the School of Natural Resource Management, College of Post Graduate Studies in Agricultural Sciences, Umiam, Meghalaya during 2021-2022 to assess the growth and yield of Lakadong turmeric under integrated nutrient management involving farm yard manure (FYM) and vermicompost (VC). The eight treatments combination viz., T₁ (100% N through FYM), T₂ (100% N through VC), T₃ (75% RDN through urea + 25% N through FYM), T₄ (75% RDN through urea + 25% N through VC), T₅ (50% RDN through urea + 50% N through FYM), T₆ (50% RDN through urea + 50% N through VC), T₇ (50% RDN through urea + 25% N through VC + 25% FYM) and T₈ (100% RDN, 120 kg N ha⁻¹ through urea) were tested in randomized block design with three replications. The significant higher plant height, leaf length, leaf breadth, clump length and fresh rhizome yield were recorded with the application of 50% RDN through urea + 50% N through VC (T₆), whereas the lowest values for these parameters were recorded with the application of 100% RDN i.e., 120 kg N ha⁻¹ through urea (T₈). The findings reflected the supremacy of integrated nutrient management through 50% RDN through urea + 50% N through VC over chemical fertilization alone as well as other combinations with organic manures. Hence, farmers of Meghalaya may be advised to adopt this package for getting higher yield of Lakadong turmeric.

PERFORMANCE OF DIFFERENT ORGANIC NUTRIENTS ON GROWTH AND YIELD OF BRINJAL GENOTYPES (*Solanum melongena* L.)

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ABSTRACT

Brinjal (*Solanum melongena* L.,) known as egg plant has been reported to give good response to different organic nutrients like other vegetables. For exploiting the yield potential of a genotype balanced use of different nutrient elements is one of the most important factors. Among different source of nutrients, nitrogen play a vital role in physiology of brinjal resulting in higher yield. Keeping in view of the above facts, the present investigations were undertaken. The study was conducted at farmers field Lummyrri village by college of Agriculture, Kyrdemkulai, CAU-I, Ri bhoi district, Meghalaya during the kharif season of 2020-21. Five treatment with different source of nitrogen, T₁=Control 0 kg (N), T₂=100% N from FYM@25t/ha, T₃=100% N from Pig Manure@15t/ha, T₄=100% N from Vermicompost@6.5t/ha, T₅ =100% N from Neem cake@2.25t/ha were tried in all possible

combinations with five brinjal genotypes namely (V1) Arka Kusumkar, (V2) Arka Shirish, (V3) Arka Keshav, (V4) Arka Harsita, (V5) Muktakeshi. The experiment was laid out in a Factorial Randomized Block Design (FRBD) comprising of 25 treatment combinations with three replications. Therefore, in each replication there were twenty-five plots of 1.5 m x 1.5 m and planting was done on spacing of 60cm x 60cm. The seedlings were transplanted on 24th July 2020. Observations were recorded on different growth parameters revealed that different growth parameters were influenced by genotypes, different organic nutrient sources and their interactions. Parameters measured include: plant height (cm.), number of branches, days to first flowers, days to harvest, fruit length(cm.), fruit girth(cm.), fruit weight(g), total harvest and yield(q/ha). Different growth characters predominantly expressed the values as per the morphological characters of the genotypes. In case of plant height, the genotype (V4) Arka Harsita resulted in maximum plant height which was followed by genotype (V5) Muktakeshi at final stage of observation, i.e., at 60 DAS. Among the different organic source of nitrogen, application of T5 =100% N from Neem cake@2.25t/ha gave the maximum plant height and interaction effect between the genotype and different organic nutrient source showed superiority of the genotype (V4) Arka Harsita with (T5) =100% N from Neem cake@2.25t/ha over other treatment combinations. For other character like number of branches (V5), (T5) and (V5XT5), days to first flowers (V4), (T3) and (V4XT2), (V5XT5), (V3XT3), (V3XT4), (V3XT5) showed earliest, days to harvest(V3), (T2) and (V3XT2), fruit length(V2), (T5) and (V1XT5) and (V3XT4), fruit girth(V5), (T5) and (V1XT5), fruit weight(V5), (T2) and (V1XT5), total harvest numbers (V3) (V4), (T2) (T3) and (V4XT3) performed best then other combinations. For yield among all organic source of nutrient application (T4) 100% N from Vermicompost@6.5t/ha showed significantly increased the yield of the genotype (V5) Muktakeshi in individual and in interaction (V5T4).

Keywords: Eggplant, Number of branches, Fruit length, Fruit yield, plant height.

AN INNOVATIVE APPROACH FOR ESTIMATION OF PHOSPHORUS (P) IN ORGANICALLY MANAGED ACIDIC SOILS

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ABSTRACT

Phosphorus (P) is a vital element in the life of a plant. Most of the soils of North-Eastern part of India including Meghalaya are acidic in nature and the agricultural soils in the state are organic by default. Acidic soils render phosphorus mostly deficient due to fixation and precipitation of the phosphate ions in the iron and aluminium oxides and hydroxides dominant in such soils. Proper replenishment of the soil P is very much important to correct the deficiency for better yield and development of crops. Organic phosphorus (P) pool contributes 15 to 80% of the total P in soil. However, compared to conventional system, a different nature of nutrient pools is evident in organic farming system. Lack of knowledge of these pools results in an unbalanced manuring plan which hinders successful production system. Plant nutrition in an organic farming system is mainly dependent on the potentially available inorganic pools of phosphorus. In contrast, the dynamic fraction of P, which is considered in conventional soil testing, cannot explain the correct status of phosphorus in soils under organic production systems as the conventional soil testing protocols do not take into account the potentially available inorganic pools of phosphorus. Hence, a different extractant which can extract such

potentially available P in an acidic soil under organic production system is highly required. The extraction, mineralization and solubilization of the potentially available P pool by various organic acids as produced by the beneficial soil microorganisms can serve the purpose. Therefore, the present research work was carried out to identify the best suitable P extractant to extract such potentially available inorganic P pool. The experiment resulted that in comparison to the conventional Bray 1 extractant, 2% citric acid and double lactate extractants, among 6 different extractants considered were found to strongly define the variation of total P in organic soils. Hence, 2% citric acid and double lactate extractants may be claimed as the promising extractants which can best estimate the potentially available phosphorus pools in organic farms of Meghalaya and the soil must be tested with these extractants to march towards a successful organic cultivation.

Keywords: Phosphorus, pools, extractants, acidic soil, organic farming system, soil testing protocol.

BIOCHEMISTRY OF DECOMPOSITION OF ORGANIC MATTER

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ABSTRACT

Transformation of organic residues in soil has a vital importance in maintenance of soil organic matter. Many bacteria, actinomycetes, fungi are involved in the biochemical transformation of organic residues by secreting several enzymes. The type of enzymes and secretor microorganisms alters depending upon the constituents of the residue materials, soil properties and climatic conditions. Thus, changes the rate of decomposition and mineralization influencing the content of soil organic matter and nutrient availability. Cellulose, hemicellulose, starch, lignin, proteins, nucleic acids and soluble substances such as sugars are the major constituents of organic residues found in soil. Sugars, starch and proteins having simple structures are attacked by microbes at the early stage of decomposition whereas, complex structure of cellulose is subjected to degradation at the later stage. Hemicellulose, being short side-chain structure, are break down prior to cellulose by high concentrations and large varieties of hemicellulases produced especially by *Trichoderma* and *Aspergillus*. Series of enzymatic reaction occurs outside the microbial cell in which complex cellulose is decomposed into free glucose molecules by extracellular enzymes secreted by numbers of cellulolytic microorganisms such as *Bacillus*, *Cellulomonas*, *Clostridium*, *Aspergillus*, *Alternaria* and *Micromonospora*. Depolymerisation and mineralization of lignin materials occur at the advanced stage of decomposition and are mostly done by fungi belong to the group of *Ascomycetes*, *Deuteromycetes* or *Basidiomycetes*. The rate and extent of decomposition is affected by temperature, availability of nitrogen, aeration and constituents of residues undergoing decay. Decomposition study of organic residues highlights the immense significance of numerous groups of microbes and enzymes in soil system in breakdown of different constituents of organic materials and releasing essential plant nutrients.

Keywords: *Organic residue, Decomposition, Cellulose, Hemicellulose.*

TREE SPECIES AS A REMEDY FOR SOIL AMELIORATION

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ABSTRACT

Soil degradation and agriculture sustainability is an emerging concern now-a-day. Adoption of mono-cropping, injudicious use of irrigation water led to development of poor fertile soils particularly under arid and semi-arid conditions of Haryana. The crop production has also reduced due to poor cultivation practices. The cultivation of tree species on such soils is beneficial. An experiment was conducted to study the role of tree cover on restoration of soil fertility and amelioration of soil health at Regional Research Station, Bawal, Rewari (Haryana-123501). The block plantation of *Ailanthus excelsa* and *Prosopis Cineraria* were selected to carry out the experiment. The soil samples from 0-15, 15-30, 30-60, 60-90, 90-120 and 120-180 cm soil depth under tree species as well as from site under control have been collected to analyse the change in soil pH and electrical conductivity under different plant cover. The soil was found loamy sand. The soil pH varied from 7.92 (at 0-15 cm) to 8.35 (at 120-180 cm) soil depth. The soil pH significantly reduced from 8.7 (under control) to 7.75 under *Prosopis cineraria* followed by *Ailanthus excelsa* (8.09). Similarly, the electrical conductivity (dSm^{-1}) was also reduced under different tree species. The highest EC was observed under control (0.28 dSm^{-1}). Maximum reduction in electrical conductivity was recorded under *Prosopis Cineraria* (0.20 dSm^{-1}) followed by *Ailanthus excelsa* (0.31 dSm^{-1}). In general, the tree species helped in reduction of soil pH as well as played important role in salt reduction through their uptake by deep rooting system.

Keywords: Degradation, Amelioration, Sustainability, *Prosopis cineraria*, *Ailanthus excelsa*

EVALUATION OF NEWER MOLECULES AGAINST POD FLY (*Melanagromyza Obtusa*) IN PIGEON PEA

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ABSTRACT

In case of pigeon pea cultivation in Bihar, among the most incidental pests, pod fly (*Melanagromyza obtusa* (Malloch)) infestation gives devastating consequences after the borer complex. Constant use of the conventional insecticides is helping to grow main pest status of pod fly in pigeon pea. The pod fly which can cause damage of up to 80%, is a significant biotic limitation on production in subsistence crop protection. Field trials were conducted in the *Kharif* seasons of 2020-21 and 2021-22, in Tirhut College of Agriculture, Dholi, Muzaffarpur, Bihar, India to check the effect of different insecticides upon the podfly. The experiment was conducted under randomized block design (RBD). In both the seasons of this experiment, insecticides viz. Buprofezine 25 SC, Diafenthiuron 50 WP, Dinotofuron 20 SG, Flubendiamide 480 SC, Lufenuron 5.4 EC, Thiamethoxam 25 WG, Acetamiprid 20 SP, Thiacloprid 23.7 EC were sprayed twice in 15 days of interval. The maggot population and cocoon per 100 pods were counted before and 14 days of each spray. Results showed a significant reduction in the populations of pod fly maggot and cocoon in the Flubendiamide 480 SC sprayed plot followed

by Lufenuron 5.4 EC over control plot. All the treatments were found effective against the pod fly in both the season. The seed yield has also been found increased in plot treated with Flubendiamide 480 SC (1555.55 kg/ha) followed by Lufenuron 5.4 EC (1513.88 kg/ha) as compared to untreated plot (1166.66 kg/ha). Chemical control is becoming more and more popular as an efficient, useful substitute, making pigeon pea farming profitable. It also reduces pod damage, grain damage and higher yield with a high benefit: cost (B: C) ratio.

Keywords: Insecticides, *Melanagromyza obtusa* M., Pigeon pea, Podfly

NUTRIENT RELEASE PATTERN AND FACTORS AFFECTING LITTER DECOMPOSITION IN THE *Quercus leucotrichophora* FOREST, WESTERN HIMALAYAS

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ABSTRACT

Plant litter helps to regulate the nutrient especially carbon and nitrogen, improve soil structure and maintain moisture which is beneficial for forest flora and fauna. We analyzed the leaf litter (LL) and leaf litter stoichiometry (LS) of Carbon (C), Nitrogen (N), Phosphorus (P) and Potassium (K) of *Quercus leucotrichophora* forest at two elevations, Uttarakhand, India by litterbag method at regular intervals. Principal Component Analysis (PCA) was used to determine the association of major elements. Stepwise regression was used to develop model for predicting LL nutrients based on dry weight and duration. Decomposition rate was determined 70.40 - 71.65 percent, however, 16.60, 64.87, 50.00 and 86.82 percent LL C, N, P and K are released respectively. The PCA - 1 and PCA - 2 explain 51 and 33 percent variation respectively. PCA - 1 positively associated with LL C and N and negative with LS C/N and C/N/P. PCA - 2 positively associated with LS C/N and C/N/P and negative with LL P. Model predicts dry weight positively determine LL nutrient and duration negatively determines LL nutrient excepting LL C. Result highlight that LL C takes time for mineralization compared to other nutrients. Therefore, concluded that residual litter dry weight determines the decomposition rate and nutrient releasing pattern. Our finding provides insight into the scientific utilization of LL ultimately helps nutrient cycling.

Keywords: Forest functioning, Leaf C, Leaf N, Leaf P, litter stoichiometry

EXTENSION APPROACHES FOR CLIMATE CHANGE MITIGATION- A WAY TOWARDS CLIMATE SMART AGRICULTURE

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ABSTRACT

Agriculture is the foundation of most countries' economic structures. Agricultural production has been closely related with variations in weather and climate change. It is expected that climate change will have a major effect on conditions affecting agriculture including

temperature, carbon dioxide etc. Agriculture extension is an out of school education involves out stretching of skills, knowledge to farm people. It also includes transfer of information regarding Climate smart agriculture. In general aspect, CSA is one that increases the socio-economic background of farmers economically by adopting farming with suitable climatic conditions. By utilizing extension approaches such as FFS, ICT networks, F2F strategy etc., CSA is getting adopted by most of the people. Gender-specific consequences in the sense of climate smart farming vary by the degree to which women can equally access resources such as land or livestock, business opportunities etc. Institutions like NGOs, Research stations, other civil societies etc. Reforming Governance in supply, demand, administration, structure and legally are necessary for effective extension delivery. Some of the climate related financing agents worldwide and in national side were involved in sponsoring climate related services and also various schemes for sustainable livelihood for climate smart agriculture. Thus, Agriculture Extension is playing a crucial part in supporting and improving new innovative technologies introduced in agriculture. Future role of Agriculture Extension is vitally important for developing every farmer’s livelihood and their socio-economic conditions in the society. Farmers also need to initiate using new innovative ideas like CSA in order to lead a sustainable life.

Keywords: Agricultural Extension, Climate change, Climate Smart Agriculture, Information and Communication Technology.

PRADHAN MANTRI FASAL BIMA YOJANA: CHALLENGES AND WAY FORWARD

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ABSTRACT

Farmers in India have been the victim of systemic neglect and live a marginalized life. Crop failure due to natural calamities and unfavorable climatic conditions puts farmers in a challenging situation leading to extreme hopelessness and suicides. One new government policy, Pradhan Mantri Fasal Bima Yojana (PMFBY) could have wide-ranging effects. The study covered the opportunities and constraints for agricultural insurance in India, how PMFBY will be supported and governance will be maintained, and the best strategy for technology to increase farmer’s awareness and successful implementation. Under PMFBY, the government’s focus will be to bring in more farmers without loans (which comprise merely 5 per cent of total farmers at present) under the scheme. Premium rate for kharif crop i.e. 2 percent, rabi crop 1.5 percent and 5 percent for horticulture orchard. Crop insurance should be delinked from political affiliation. Velocity, variety and verifiability in PMFBY will make crop insurance scheme work better for farmers than insurers, administrators and politicians. Opportunities for agricultural insurance in India are numerous and insurance can be a risk transfer mechanism for Indian farmers that depend heavily on rains especially with the increasing influence of climate change. There is room for experiments and expansion of new insurance products since penetration is low and there also a favorable political environment for insurance and support of agricultural livelihoods.

Keywords: PMFBY, Government scheme, Challenged, opportunity

NON-NEWTONIAN FLOW OF SHEAR-THINNING PINEAPPLE JUICE OVER A MOVING PERMEABLE SHEET WITH SLIP AND HEAT GENERATION

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Purpose

The non-Newtonian flow of shear-thinning pineapple juice over a moving permeable sheet with slip-condition and heat generation is investigated. The shear-thinning nature of pineapple juice under certain prescribed condition is mathematically studied with the help of Power-Law fluid model. The impact of velocity slip parameter, heat generation parameter, non-Newtonian flow index and Eckert number are analyzed from graphs and conclusion are drawn from physical viewpoint. The obtained results help to design the transport system of fruit and vegetable juices in food processing industry.

Methods

The fluid motion of pineapple juice is governed by a set of partial differential equations along with relevant boundary conditions. The appropriate similarity variables are utilized to obtain the resulting governing equations. The graphical representation of velocity and temperature profiles are obtained by solving the governing equations by employing finite difference method-based MATLAB solver ‘bvp4c’.

Results

The influence of involved flow parameters like suction, slip, heat generation or absorption, Prandtl number and Eckert number on the dimensionless velocity profile and temperature profile of pineapple juice flow over a moving permeable sheet for two different values of flow index $n = 0.8$ and $n = 0.9$ exhibiting pseudo-plastic nature of fluid are presented graphically. It is noticed that the dimensionless velocity diminished as either the slip parameter or the suction parameter was increased. The rise of slip parameter, the dimensionless velocity reduces near the surface but increases at larger distances. Also, the dimensionless temperature was enhanced as either the injection parameter or the slip parameter or the heat generation parameter or the Eckert number was increased. The suction parameter or the heat absorption parameter or the Prandtl number has opposite effect.

Conclusions

The design of transport system of fluid fruit products mainly depends on the type and description of flow characteristics of the product and as such the obtained results will be beneficial for product development, design and evaluation of manufacturing processes in food industry.

Keywords: Shear thinning fluid, Power-Law fluid model, Slip velocity, Heat generation, Eckert number.

REVIEW ON MEDICINAL PROPERTIES OF *Tinospora cordifolia* (Neem Giloy)

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ABSTRACT

Tinospora cordifolia (*Guduchi*) is a large, glabrous, perennial, deciduous, climbing shrub of weak and fleshy stem found throughout India. It is a widely used plant in folk and Ayurvedic systems of medicine. *T. cordifolia* is known by different name in various different languages in India viz, Tippa-teega (Telugu), Shindilakodi (Tamil), Amruthu, Chittamruthu (Malayalam),

Amrutha balli (Kannada), Rasakinda (Sinhala), gurcha (Hindi), garo (Gujarati), Amritavalli (Sanskrit), Guduchi (Marathi), Guluchi (Oriya) and belong to the family of Menispermaceae. The plant is very rigid and it can be grown in almost all climates but prefer warm climate. Planting is usually done during rainy season (July-August). It can be successfully grown in all variety of soils. It is considered an essential herbal plant of Indian system of medicine (ISM) and has been used in the treatment of fever, urinary problem, dysentery, skin diseases leprosy, diabetes, and, the chemical constituents reported from this shrub belong to different classes, such as alkaloids, diterpenoid lactones, glycosides, steroids, sesquiterpenoid, phenolics, aliphatic compounds and polysaccharides. The World Health Organization (WHO) estimated that up to 80% of people still rely mainly on traditional remedies such as medicinal plants for their medicines. Since the beginning of human civilization, plants have been used as natural medicines. Recently, scientists are showing a great interest in the development of new drugs from traditional medicinal plants. India with its vast bio-diversity and huge knowledge of ancient traditional systems of medicine such as Ayurveda, Siddha, Unani, Amchiand provide a strong base for the utilization of a large number of plants in general healthcare and common ailments of the people The plant is designated as Rasayana in Ayurveda and is very well known for building up the immune system and body’s defence against definite infecting Micro-organisms.

Keywords- Tinospora, Phenolics, Glycosides, Medicinal Plants etc.

MANAGEMENT OF COLLAR ROT DISEASE OF ELEPHANT FOOT YAM THROUGH BIOCONTROL AGENT AND CHEMICAL FUNGICIDE

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ABSTRACT

Elephant foot yam [*Amorphophallus paeoniifolius* (Dennst)] is commonly known as ‘king of tuber crops’ due to its higher biological efficiency, cultivated commercially in the districts of Muzaffarpur, Samastipur, Vaishali, Bagusarai and East Champaran of Agro-climatic Zone-1 of Bihar and regarded as *money spinning crop*. Among various diseases affecting elephant foot yam, collar rot disease caused by *Sclerotium rolfsii* causes significant yield loss to the tune of 20 to cent per cent. Considering seriousness of this disease, present investigation on “Management of collar rot disease of elephant foot yam through biocontrol agent and chemical fungicide” was carried out in experimental plot Tirhut College of Agriculture, Dholi, Muzaffarpur (Dr. Rajendra Prasad Central Agricultural University, Pusa, Samastipur, Bihar) during 2019-2020. Seven treatments under the objective of management of collar rot diseases of elephant foot yam comprises of corm treatment and soil application with either fungicide or *Trichoderma* alone or in combination in different sequence including control. Field efficacy of biocontrol agent and chemical fungicide against collar rot disease was evaluated wherein corm treated with *Trichoderma* @5g/kg corm + soil application with *Trichoderma* grown in FYM @ 2.5 kg/pit + soil application twice with *Trichoderma* grown in FYM @250g/ plant resulted in minimum disease incidence at different fortnight interval *i.e.*, 5.55% (75 DAP), 7.84% (90 DAP), 6.38% (105 DAP) and 4.52% (120 DAP) with overall 22.22% disease incidence with maximum disease reduction over control (52.94%) and highest yield (34.85 t/ha). Feasibility

of treatment in economic terms was calculated by incremental cost benefit ratio (ICBR). The highest ICBR of 1: 2.57 with net profit over control was realized as Rs 134294/ha in treatment where corm were treated with *Trichoderma* @5g/kg corm + soil application twice with *Trichoderma* grown in FYM @250g/ plant.

Keywords: Elephant foot yam, collar rot , *Sclerotium rolfsii*, *Trichoderma*, fungicide.

MULTIPLE OVULATION EMBRYO TRANSFER TECHNOLOGY TO PROPAGATE ELITE SAHIWAL COWS IN BIHAR

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ABSTRACT

Although agriculture productivity has increased but would not remain the most credible to meet the feeding demands of massively increasing human population to about 10 billion in 2050. On the other hand animal husbandry alone is contributing above 25% to the agrarian economy in India. Furthermore, since ancient, milk is considered as the complete food and its consumption is increasing day-by-day globally and demand of indigenous cow milk has increased tremendously. Hence, there is urgent need to increase the number of indigenous cattle producing higher milk yield i.e above 2500-3000 kg per lactation length thereby enhancing national milk productivity and thus the farmer's income. Among indigenous cattle, Sahiwal is the best milk breed able to flourish under adverse climate changing conditions particularly in regions having limited feed resources and rain-fed area like Bihar and area adjoining to Nepal. Keeping in view, the study was planned for faster propagation of elite Sahiwal from herd by utilizing the innovative and applied reproductive biotechnology i.e. multiple ovulation embryo transfer technology.

Sahiwal (n=12) were selected and subjected for the superstimulatory protocol using Stimufol 5 ml (250 µg) in divided dose for 4-days. Estrumate-2ml (500 µg) was injected with fifth dose of Stimufol and artificial insemination (AI) was done 48 h later. Embryos were recovered non-surgically on 7th day of AI. Good quality embryos were transferred in estrus-synchronised surrogate cattle which were later observed for non-return to heat and confirmed for pregnancy. Result showed variable superovulatory response with corpus luteum and recovered embryos ranged from 0 to 32 and 0 to 7 in number, respectively. Upon transfer of embryos in 3-receptients, 2-surrogates were non-return to heat upto day-30 and one (33%) was found pregnant at 2 months of embryo transfer.

The study concluded that advance reproductive biotechnology in dairy science could be successfully implemented to augment the milk productivity of indigenous Sahiwal cow and thus increase the farmer's income in Bihar and adjoining areas.

Keywords: Indigenous Sahiwal Cow, Milk Productivity, Embryo Transfer Technology

CARBON MANAGEMENT IN AGRICULTURE SOIL

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ABSTRACT

World soils constitute the third largest carbon (C) pool after oceanic (38,000 petagram; Pg, 1 Pg = 10¹⁵ g C = 1 Gt = 1 billion tonnes) and geologic (5000 Pg) pools. The soil C (organic and inorganic) pool, estimated at 2500 Pg to 1-m depth i.e. about 3.3 times the atmospheric pool (760 Pg) and 4.5 times the biotic pool (560 Pg). There are numerous management strategies for drawing carbon out of the atmosphere and holding it in the soil. These strategies vary in effectiveness across different climates, soil types, and geographies. The depletion of soil organic carbon (SOC) pool is exacerbated by soil drainage, plowing, removal of crop residue, biomass burning, subsistence or low-input agriculture, and soil degradation by erosion and other processes. The magnitude of soil C depletion is high in coarse-textured soils (e.g., sandy texture, excessive internal drainage, low activity clays and poor aggregation), prone to soil erosion and other degradative processes. Thus, most agricultural soils contain soil C pool below their ecological potential. Adoption of recommend management practices (e.g., no-till farming with crop residue mulch, incorporation of forages in the rotation cycle, maintaining a positive SOC stock through the use of manure and other biosolids), conversion of agriculturally marginal soils to a perennial land use, and restoration of degraded soils and wetlands can enhance the SOC pool. The global potential of soil C sequestration is 0.6 to 1.2 Pg C/yr which can off-set about 15% of the fossil fuel emissions. Increasing SOC in agricultural systems has been considered as a possible solution to mitigate climate change, e.g., via removing atmospheric CO₂ into the long-lived C pool.

Keywords Carbon pool; Soil organic carbon (SOC); Carbon Sequestration; Biosolids; fossil fuel emissions; No-till farming.

MANAGEMENT OF CHARCOAL ROT *Macrophomina phaseolina* (Tassi.) GOID. OF SESAME (*Sesamum indicum* L.) In Field Condition.

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ABSTRACT

The study management of charcoal rot of sesame used through fungicides (Two fungicides tebuconazole 2DS, carbendazim 12%+ mancozeb 63% WP) and bio-agents (two bio-agents *Trichoderma harzianum*, *Pseudomonas fluorescens*) in field conditions. Most effective fungicides tebuconazole 2DS seed treatment and tebuconazole 25.9 EC as soil drenching was most effective in minimizing (9.52%) the charcoal rot incidence followed by carbendazim 12% + mancozeb 63% WP used as seed treatment plus soil drenching (13.50%). In case of bio-agent seed treatment and soil application with *T. harzianum* significantly reduced the disease incidence (23.50%) . Maximum per cent disease control Charcoal rot of sesame was found with tebuconazol 2DS seed treatment plus soil drenching (84.13%) followed by carbendazim 12% + mancozeb 63% WP (77.50%). while in case of bioagents as seed treatment and soil application *T. harzianum* was found effective (60.83%). The grain yield was highest (480.60 kg ha⁻¹) in tebuconazol 2DS and tebuconazol 25.9 EC followed by carbendazim 12% + mancozeb 63%

WP (450.00 kg ha⁻¹) used as seed treatment + soil drenching. Higher grain yield was also recorded in bio-agent *T. harzianum* (392.00 kg ha⁻¹) seed treatment and soil application increased yield under field conditions.

Keywords: - Sesame, charcoal rot, *Macrophomina phaseolina* (Tassi) Goid., *Trichoderma harzianum*, *Trichoderma viride*, *Pseudomonas fluorescens* and *Bacillus subtilis*

EFFECT OF DIFFERENT CONCENTRATIONS OF POTASSIUM NITRATE AS FOLIAR SPRAY ON GROWTH AND YIELD OF Wheat (*Triticum aestivum* L.)

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ABSTRACT

A field experiment entitled “Effect of different concentrations of potassium nitrate (KNO₃) as foliar spray on growth and yield of wheat (*Triticum aestivum* L.)” was conducted during rabi season, 2012-2013 at the Research Farm, College of Agriculture, Central Agricultural University, Imphal. The treatments comprised of different concentrations of potassium nitrate (0.5%, 1%, 1.5%, 2%, 2.5% and 3%). The experiment was laid out in randomized block design with three replications and seven treatment combinations.

Observations on plant height, number of leaves per plant, number of tillers per hill, fresh weight per plant, dry weight per plant, number of effective tillers per hill, length of ear, number of filled grains per ear, number of spikelets per ear, grain yield (kg/ha), straw yield (kg/ha) and nutrient uptake were recorded.

Among the treatments potassium nitrate @ 3% produced significantly tallest plants. Application of potassium nitrate @ 3% significantly recorded the maximum number of leaves per plant, number of tillers per hill, fresh weight per plant, dry weight per plant and number of effective tillers per hill.

With respect to yield attributes *viz.*, length of ear, number of filled grains per ear, number of spikelets per ear was recorded significantly higher in the treatment receiving potassium nitrate @ 3% compared to rest of the treatments. Test weight was not significantly affected by all the treatments under considerations.

The grain yield increased significantly with the increasing doses of potassium nitrate. However, the foliar spray of potassium nitrate @ 3% recorded significantly highest grain yield per hectare.

As regards to the economics of grain yield production, the calculated gross return was highest in foliar application of potassium nitrate @ 3% and net return and B:C ratio were more in foliar application of potassium nitrate @ 2% among the various treatments.

From the present investigation, it can be concluded that maximum profit can be obtained by foliar application of potassium nitrate @ 2% at 49 DAS (maximum tillering stage) and 69 DAS (late jointing stage).

CLIMATE CHANGES: WATER QUALITY AND ACCESSIBILITY

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ABSTRACT

Access to clean water is a fundamental right, yet climate change jeopardizes the quality and safe accessibility of drinking water or water of other uses such as domestic, agro etc. The climate changes and warming of weather can cause increase in evaporation and allowing air to hold high content of water vapour/moisture content. This sets the stage of heavy rainfall or rain storms. Moreover, change is disrupting weather patterns leading to extreme weather events, unpredictable water availability, exacerbating water scarcity and contaminating water quality. Such impacts can drastically affect quality and quantity of water that human being need to use in every sphere of life to sustain life. Contamination of water bodies due to heavy rain can pose a threat to human life as water and sanitation related to diseases are one of leading cause of death in children in particular of age below five years.

Keywords: Climate change, Water quality, Sanitation.

HORTICULTURAL PRACTICES AND SOIL RESOURCE MANAGEMENT IN KUMAUN HIMALAYAN, UTTARAKHAND, INDIA

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ABSTRACT

Kumaun Himalayas mostly have hilly and sloping regions and at some places there are many patches of plains in valley regions along rivers in Hilly area as well as in the Tarai and Bhabar regions. Whereas in the Tarai and Bhabar regions the soil is most fertile, in the valley regions in hills alluvial soil is also equally good for agro-horticultural cultivation. Hence horticultural practices in these regions may be developed remarkably. The common queries that we need to know in this regard are the types of treatments available for soil methods of sustaining soil fertility, techniques of maintaining moisture contents in the soil, use of decomposing organic matters, study of microorganisms (weight and number) and nutritive elements of the soil. Soil treatment should be applied immediately after monsoon season in the month of October and should be mixed proper with the soil, and thereafter any fertilizers including phosphorus should not be applied for at least 1 month. Acidic soils can be made favourable for horticultural cultivation generally by using fertilizers of calcium ammonium nitrate (CAN) and other forms to meet the demands of nitrogen in the soil. Once every five years the soil should be tested only then a mixture of calcium oxide should be applied according to the pH value of soils. Soil formations in the Kumaun Himalaya are still in an immature stage. Since soil is made up of the fracturing of rocks, therefore, it's their colour, structure and physical characteristics is similar and close to rocks or stone, which are also of the same formation. In the Kumaun Himalaya there are mainly two types of soils, (i) soil which has a significant content of limestone (calcium carbonate) while the (ii) soil which is without calcium carbonate. According to the geological formations the major soil types are alphisoil, insectisoil and altisoil. Some of the major soil types and compositions in nature as general descriptions not in Kumaun Himalaya. This paper suggest that how can management the soil resource with help of some to take initiatives like

advance technologies i.e. mulching, irrigation techniques, soil testing, using manure etc. applying these applications we can involve to the local farmers for getting more income, much practices in horticultural sectors and can shift from conventional agriculture into cash crop cultivation in Himalaya.

Keywords: Soil Resource Management, Kumaun Himalaya, Horticulture, Hilly Regions.

MOISTURE LOSS AS INFLUENCED BY VEGETATION IN BUNDELKHAND REGION OF UTTAR PRADESH

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ABSTRACT

Dynamics of water in the soil has similar importance as other physiological properties in agricultural crop production. We sampled the soil from the vegetative lands of Bundelkhand region upto the depth of 0 – 15cm and determined for moisture content (MC), bulk density (BD), rate differential equation, instantaneous loss of moisture and correlation among these parameters. The observation invokes that maximum loss of moisture occurred from the L₄ while minimum from the L₁ followed 4th and 1st ordered rate differential loss equation. The moisture content followed to vary from 5.39% (L₅) to 16.94% (L₂). However, the BD values ranged from 1.33 (L₄) to 1.14 gm/cc (L₃). Apart from this the moisture content was found to be highly significantly correlated with BD ($r = -0.359^{**}$) and rate loss ($r = 0.460^{**}$). Therefore, the proper use of land can be intimated by proper selection of plant species as per availability of moisture and its dynamics losses.

Keywords: *moisture, rate differential, Bundelkhand Region*

PISCICULTURE BASED AGROFORESTRY SYSTEM BOON FOR MEDIUM AND SMALL FARMERS LIVELIHOOD

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ABSTRACT

In large parts of globe, a lack of food is being caused by increasing urbanisation and population pressure, as well as land degradation, soil salinization, and climate change. This suggests that increased productivity for the food, fodder, and fibre per unit of land is necessary. According to the Socio-Economic and Caste Census (SECC) 2011, out of the 24.39 crore families in the nation, 17.91 crore resided in villages and were largely dependent on agriculture and its allied sectors. Traditional resource management adaptations, such as agroforestry systems, may offer choices for improving livelihoods through the simultaneous production of food, fodder, and firewood as well as mitigating the effects of climate change. Agroforestry systems (AFS) have been established as models and assessed for the region's diverse agro-climatic conditions such as home gardens and multistorey agroforestry systems (AFS) are the two most prevalent types of agroforestry in the country. Agroforestry systems include Agri-aquaculture based system (Paddy-fish system, Horticulture-fish system, aqua-silviculture, Agri-pisciculture-poultry farming system, agro-aquaculture, etc.) and Livestock based aquaculture system (Poultry cum

fish farming, Goat cum fish farming, Duck-fish farming system, etc.). Aquaculture presently produces 47% of the world's fish production, and it is expanding quickly, with an average annual growth rate of 5.8% between 2001 and 2016. Those agroforestry systems, which are enhanced with additional sources of income, provide chances for overall development and increased employment. Fish ponds on farms with trees play a significant role in the development of aquaculture-based agroforestry system. Integrated fish farming techniques produce fish using the organic waste obtained from animals, poultry, and agricultural by products. One kg of fish is produced from an organic waste amount of 40–50 kg. In the various parts of the country, farmers using homestead ponds to rear fish from 23 different species. Agri-horticulture-aquaculture might one day be included into urban planning for ecological, aesthetic, practical, and economic reasons.

Keywords: Pisciculture, Horticulture, Agroforestry, Aqua forestry, Livelihoods, Integrated farming system

THE HISTOLOGICAL AND HORMONAL CHANGES IN REPRODUCTIVE SYSTEM OF FEMALE ALBINO RATS AFTER TREATMENT WITH TRAMADOL

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ABSTRACT

Tramadol is used as a painkiller, which is a centrally active synthetic opioid analgesic used extensively now a days. The present experimental studies were carried out to outline the histological changes on the reproductive changes (ovaries and uterus). During the present study eighteen rats weighing approximately 120-130g. The animals were divided into control group (n=6), 1mg tramadol group (n=6) and 3mg tramadol group (n=6). Dose level of 1mg and 3mg/100g body weight were daily injected through intraperitoneally for the period of 20 days. At autopsy on 21st day significant reduction in the ovarian and uterine cavity was observed. Histological observations showed that decrease in the number and size of graafian follicles and corpora lutea. The uterus showed absence of endometrial glands, decrease in the height of myometrium, endometrium and its epithelial cells. The total protein and glycogen content of the ovary and uterus showed the decrease whereas, the cholesterol content is increased.

Keywords: Tramadol, Graafian follicles, Corpora lutea, Endometrium, Myometrium.

MICROBIAL POPULATION DYNAMICS IN RHIZOSPHERE OF WEEDS OF YADGIRI DISTRICT

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ABSTRACT

A laboratory experiment was conducted on microbial diversity dynamics in Rhizosphere soils of different weed from yadgiri district at College of Agriculture Bheemarayanagudi UAS Raichur, during 2021-22. In this rhizosphere soil samples were collected from *Parthenium hysterophorus*, *Calotropis gigantean* and *Lantana camara* weed from yadgiri district. Among collected soil samples the highest number of bacteria, Fungi and *Actinomycetes* population was recorded in *Parthenium hysterophorus* (55.33×10^{-6}), *Lantana camera* (25.60×10^{-3}) and *Parthenium hysterophorus* (39.66×10^{-4}). Respectively. In this the highest number of N₂ fixation, PSB and KSB was recorded by *Lantana camera* (21.33×10^{-6}), *Calotropis gigantean* (24×10^{-4}) and *Lantana camera* (11.66×10^{-4}) respectively

Keywords – Weeds, N Fixation, **PSB** - Phosphorus Solubilizing Bacteria, **KSB** - Potassium Solubilizing bacteria

STUDY OF CADMIUM COMPOUNDS ON MORPHOLOGICAL AND BEHAVIORAL ASPECTS IN AN AIR BREATHING FISH *Channa gachua*

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ABSTRACT

Cadmium compounds are serious pollutants of aquatic environment because of their environmental persistence and ability to be accumulated by aquatic organisms. In the present study, the acute toxicity of cadmium compounds (Chloride, Sulphate and Nitrate) and their toxicological effects on morphology and behavior of widely consumed Indian snake headed fish *Channa gachua* was observed for 24 hours. In this study percentage mortality was recorded in freshwater fish via treatment with various concentrations of cadmium compounds. Freshwater fish *Channa gachua* was exposed to various concentrations of cadmium chloride (600-650 ppm), cadmium sulphate (600-850 ppm) and cadmium nitrate (900-990 ppm) for 24 hour. The LC₁₀-LC₉₀ value for all the three compounds were calculated according to Probit analysis and CdCl₂ was shows low LC₅₀ value as compared to CdSO₄ and CdNO₃. Among morphological changes when fish exposed to various concentration of CdNO₃ a discoloration of skin, thin white layer sedimentation on the bottom of test aquaria was observed above 900 ppm and in CdCl₂ and CdSO₄ the similar changes occurred in the lower concentration as compared to CdNO₃ (800 ppm) respectively. Level of toxicity (lethality) was higher for CdCl₂ as compared to CdSO₄. In the present study the observations clearly shows that among three tested compounds of cadmium, CdCl₂ was highly toxic while CdNO₃ was comparatively less toxic to fresh water fish *Channa gachua*. The details will be discussed in this paper.

Keywords: Cadmium toxicity, Morphological changes, Behavioral changes, *Channa gachua*.

HISTOPATHOLOGICAL ANALYSIS OF THE RESPIRATORY ORGANS IN AN AIR BREATHING FISH *Channa gachua* EXPOSED TO AIR

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ABSTRACT

Channa gachua has a bimodal respiratory mechanism for exploitation of water (via gills and skin, an accessory respiratory organ) as well as air (through an air-breathing organ, ABO). It inhabits swamps and derelict waters and can subsist on aerial respiration when it faces acute drought, at which time it remains burrowed for days in the mud. When exposed to air the fish shows quick ventilatory movements of the operculum and inhales air from the atmosphere especially in the initial stages. Out of water, the fish can survive for about 31 hours. During this period, the respiratory organs become progressively damaged. The density and staining properties of mucous cells (MCs) of all three respiratory organs show periodic fluctuations. They exhibit a greater affinity for sulfate moieties that keep respiratory surfaces moist for longer periods in order to maintain respiration during air exposure. The large quantities of sulfated muco polysaccharides or lipids present in their sub epithelial loose connective tissues also help in prevention of desiccation. The blood capillaries (BLCs) of the ABO extensively bulge out into the surface to reduce the blood-air barrier distance. Later, hemorrhage causes decreased density of the RBCs. Subsequently the ladder-like (PLC) pillar cell (BLC) component of the respiratory secondary lamellae (SL) collapses. A thin layer of sulfated slime often covers the respiratory epithelia (RE). The skin of the exposed fish also shows severe wear and tear and sloughing leading to hemorrhage. A thin layer of sulfated slime covers the skin surface. Furthermore, the dermis shows severe damage with loosening of the connective tissue fibers, which give stronger reactions for sulfated mucin that retains additional quantities of water for continued skin respiration. Air exposure prevents normal branchial respiration and the (BLCs) in the (SL) of the gills show congestion. Wear and tear causes hemorrhage. Soon, the (PLC-BLC) components of the gills also lose their ladder-like arrangement with ultimate gill degeneration prior to death of the fish. The details will be discussed in this paper.

Keywords: Air exposure, Histopathology, Respiratory organs, *Channa gachua*.

ASSESSING THE IMPACT OF PESTICIDES AND VERMICOMPOST ON THE GROWTH OF *EISENIA FOETIDA*

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ABSTRACT

Earthworms are important soil invertebrates and play an important role in improving soil quality. They act as nature's best fertilizers and have beneficial role in the process of vermicomposting that is very useful in crop production. The Indiscrete use of chemical fertilizers and pesticides poses a threat to soil quality, crop production and also hampered the growth of earthworms. In our present study the impact of pesticides and vermicompost in potato crops field and on *Eisenia foetida* was noted. The study aimed to understand the effect of chemical and biological fertilizers on the life table attributes of earthworm, *Eisenia foetida*. Laboratory adapted *E. foetida* were reared on artificial soil supplemented with chemical fertilizers and vermicompost. Changes in number and biomass of *Eisenia foetida* were

monitored four times in various applications of pesticides and in vermicompost. Four pesticides that are commonly used in potato crops are Chlorpyrifos, Malathion, Carbofuran & Pyrethroids. Thus, the negative impact of these Pesticides on *Eisenia foetida* and Potato crops has been reported when compared to the control (Vermicompost). The effect of Pesticides was noted in following order:

Chlorpyrifos > Malathion > Cabofuran > Pyrethroid. Application of Chlorpyrifos to the potato crop field harbouring earthworms reduced the number of earthworms from 200 in the control group to 20 as soon as 60 days of the application. The effect was more pronounced on the total biomass of the culture owing to the high toxicity of Chlorpyrifos. The Pesticides treatment decreased the percent survival of the earthworms by 70% and 40%, respectively. The number and biomass of Earthworm decrease on increasing the application of pesticides thus, reduces crop production. On the other hand, the vermicompost had a positive effect on the earthworm's biology.

Keywords: Pesticides, Organic farming, Vermicompost, *Eisenia foetida*

IMPACT OF PADDY DRUM SEEDER TECHNIQUE OF PADDY CULTIVATION IN KUSHINAGAR DISTRICT OF UTTAR PRADESH, INDIA

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ABSTRACT

Farmers cultivating transplanted paddy in irrigated and rainfed areas are increasingly faced with water shortages due to deficit rainfall, receding groundwater due to insufficient recharge, injudicious use, late and limited release of irrigation water from canals or poor inflows into tanks. Land preparation for nursery and main field require copious amounts of water and involve extensive labour for nursery raising of seedlings and subsequent transplanting. Water shortage at the transplanting time leads to delay and use of over aged seedlings with limited tillering capacity. Drum seeding technique involves direct seeding of pre-germinated paddy seeds in drums made up of fibre material to dispense seeds evenly in lines spaced at 20 cm apart in puddled and levelled fields. About 35 to 40 kg paddy seed/ha is soaked overnight in water and allowed to sprout. Two labourers are required for completing the sowing operation *i.e.* one for pulling the seeder and the other for loading the pre-germinated seeds in the drum while consistently monitoring the even dispersal of seeds from drum holes during seeding. The field was kept moist without standing water in the field up to 20 days after sowing.

The present study was conducted by Krishi Vigyan Kendra, Kushinagar during 2019-21. Sixty five demonstrations on Paddy var. S-52 were conducted in adopted village Amwakhas under NICRA Project. A total of 40 ha. area was under demonstration of Drum Seeder technique for paddy cultivation with the ulterior objective of technology dissemination and onward propagation. Per hectare cost of cultivation was observed to be reduced by INR 8700. Average higher yield of 51.5q/ha was obtained under the technology demonstrated. Yield as obtained from the traditional method *i.e.* transplanted paddy was to 40.5 q/ha. Increase in grain yield was observed to be 29.62%. Four irrigations were done over the duration of crop (two less than transplanted paddy). Additional net income generated from the demonstrated technology was INR 28885/ha. The benefit cost ratio of 2.66 with drum seeding was significantly higher as compared to transplanted paddy *i.e.* 1.68. This technique demonstrated saving on resources such as water requirement, reduced labour apart from improving productivity because of line sowing, higher tillering and early maturity of crop.

Keywords: Impact, Direct sowing, Drum Seeder, Paddy cultivation

CLIMATE CHANGE AND ABIOTIC STRESS MANAGEMENT

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ABSTRACT

A climate-smart and sustainably productive agriculture is a must for assured livelihood security in an agriculturally important country like India where over 600 million people are directly dependent on agriculture. Enigmatically, good proportions of farmers are food-insecure and resource-poor, and are faced with increasing climate change volatilities and vulnerability. Thus, agriculture is needed that sustainably increases production, resilience, and removes greenhouse gases (mitigation). These three goals can be achieved through the synergistic integration of water-smart, soil and nitrogen-smart, energy-smart, gene-smart, carbon-smart, weather-smart and knowledge-smart development pathways. The climate-smart village programme should be judiciously piloted and up-scaled. Given the persisting high incidence of food and nutritional insecurity, and the intensifying abiotic stresses, emphasis should be placed on adaptation-led mitigation. Investment in science and research for development and the associated human resources should be suitably enhanced, and linked with an effective monitoring, evaluation, and impact mapping pathway. The science policy interface must be institutionalized to ensure that the rigor of science sensitizes policy makers, and guides the policy process, options, actions, and even implementation. Development of climate-smart agriculture should thus be mainstreamed in the national policy.

Keywords: Resilience, mitigation, climate-smart agriculture, abiotic stress, greenhouse gases, carbon-smart, water-smart, energy-smart and food and nutritional insecurity.

HURDLE PRESERVATION OF SUGARCANE STALKS AND JUICE

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ABSTRACT

Sugarcane (*Saccharum officinarum* L.) family Poaceae is a perennial long duration crop which widely cultivated as a major crop in tropical and subtropical regions of the world. A total of 116 sugarcane varieties have been identified under All India Coordinated Research Project on sugarcane, out of which 55 varieties have been registered and notified for cultivation in different parts of the country. Fresh sugarcane juice is popular beverage in Southeast Asia, South Asia, Latin America and also in other countries, where in India, sugarcane juice is available throughout the country but juice composition varies according to cane variety, geographical location, cultural practices, maturity at harvest and mechanical treatment during harvesting and transportation. Sugarcane juice is great for recharging energy because it contains appreciable amount of water, reducing sugar, non-reducing sugars along with minerals, organic acid, vitamin C, vitamin B₆ and phenolic compounds, mainly flavonoids. Being a nutritious product, sugarcane juice has many medicinal properties and keeps the body healthy due to low glycemic index. Sugarcane juice processing and marketing are limited due to its rapid deterioration as it is affected by several factors like physical (light, heat), chemical (oxygen), biochemical (enzymes) and biological (microorganisms) and further the time lag between the extraction and consumption of sugarcane juice has marked deteriorating effect on its quality characteristics. Thus, study conducted to enhance the shelf life of sugarcane stalks

and preservation of juice concluded that sugarcane stalks under refrigerated temperature can be stored successfully with minimum loss in weight (5.15%) and juice yield (12.12%) for four months as against one month under ambient conditions. Optimization of pH of sugarcane juice up to 4.00 was standardized by adding different acidulants where orthophosphoric acid was found highly acceptable on the basis of organoleptic characteristics followed by processing of juice at 90°C for 15 minutes on the basis of PPO activity and microbial growth. The preserved juice was microencapsulated with 170°C inlet temperature, 110°C outlet temperature and 14 ml/min feed rate and 10.0 per cent maltodextrin as a carrier agent. The powder was reconstituted at the rate of 16.60 per cent which was highly acceptable by panelist containing similar characteristics as that of sugarcane juice.

ALPHA DIVERSITY OF ANT ASSORTMENT TO AN AGRICULTURAL GRADIENT OF CROPPING FIELD AS HUMAN MODIFIED LANDSCAPE IN THE SEMI-ARID REGION, KALABURAGI

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ABSTRACT

We investigated the response of alpha diversity of ant assortment to an agriculture gradient in the Kusnoor region, the ants were sampled within 10 plots (40X60m) including different cropping field percentages. The present study had the detailed analysis on the taxonomic position and species diversity of ants in agricultural habitat. A total of 12301 ant workers belonging to 41 species, 22 genera and 06 subfamilies were recorded. The Simpson index of diversity (1-D) was 0.764 indicating greater diversity in the study habitat. Similarly, the Shannon index was 2.163 indicating assortment of ant species in the study site as the greater diversity in species composition. Areas with low levels of vegetation & food resources probably offer limited variations in habitat type and conditions thus leading to low number of ant species when compare to other fully vegetative land types. Human modified landscapes plays vital role as biodiversity reservoirs as of which there's a need for the introduction of it in the management of landscape studies and conservation practices.

Keywords: Agriculture fields, Ants, Kalaburagi, diversity indices

STUDY ON SEASONAL DIVERSITY OF ZOOPLANKTON OF CHICKERE WATER BODY IN RELATION TO WATER QUALITY

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ABSTRACT

The present study deals with the Zooplankton diversity on Chikkere water body of Sira town. Surface water samples were collected from four selected stations at monthly intervals from January 2021 to December 2021 in Chikkere water body. Analysis of physico – chemical parameters were done and the results revealed that most of the physico – chemical parameters were recorded within the permissible limits. Zooplankton belonging to four different groups were identified of which Rotifers formed the bulk with **47.82%** followed by Cladocera **26.1%** and Copepods **17.39%** A total of **23 species** of fishes under five genera belonging to five families.

Keywords: Physico-chemical, Water quality, Zooplankton, Diversity, Chikkere water body.

ASSESSMENT OF PRIMARY PRODUCTIVITY IN RELATION TO HYDROCHEMISTRY OF CHIKKLINGDALLI WATER BODY

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ABSTRACT

The present study is carried out for estimation of primary productivity in relation to water quality of Chikklingadalli water body of Chinchollitaluk, Kalaburagi district, every month water samples were collected from the four different sampling sites of the water body from Feb 2016 to January 2018. Various water quality parameters including Atmospheric and water temperature, DO, Free CO₂, Total alkalinity, Total hardness, Chloride, Nitrate, TDS etc. were estimated, whereas correlation and coefficient between parameters were analyzed. During the study period all the values of the physico-chemical parameters are within the permissible limit. Primary productivity values were recorded highest during summer season and northeast monsoon season and lowest values recorded during the southwest monsoon season from study area. Data subjected to statistical analysis.

Keywords: Chikklingadalli water body; water quality; gross primary productivity; net primary productivity and community respiration.

CLIMATE CHANGE AND ABIOTIC STRESS MANAGEMENT

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ABSTRACT

A climate-smart and sustainably productive agriculture is a must for assured livelihood security in an agriculturally important country like India where over 600 million people are directly dependent on agriculture. Enigmatically, good proportions of farmers are food-insecure and resource-poor, and are faced with increasing climate change volatilities and vulnerability. Thus, agriculture is needed that sustainably increases production, resilience, and removes greenhouse gases (mitigation). These three goals can be achieved through the synergistic integration of water-smart, soil and nitrogen-smart, energy-smart, gene-smart, carbon-smart, weather-smart and knowledge-smart development pathways. The climate-smart village programme should be judiciously piloted and up-scaled. Given the persisting high incidence of food and nutritional insecurity, and the intensifying abiotic stresses, emphasis should be placed on adaptation-led mitigation. Investment in science and research for development and the associated human resources should be suitably enhanced, and linked with an effective monitoring, evaluation, and impact mapping pathway. The science policy interface must be institutionalized to ensure that the rigor of science sensitizes policy makers, and guides the policy process, options, actions, and even implementation. Development of climate-smart agriculture should thus be mainstreamed in the national policy.

Keywords: Resilience, mitigation, climate-smart agriculture, abiotic stress, greenhouse gases, carbon-smart, water-smart, energy-smart and food and nutritional insecurity.

RESPONSE OF GREENGRAM TO CLIMATE CHANGE IN NORTHERN TRANSITION ZONE OF KARNATAKA

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ABSTRACT

Greengram is the major grain legume crop of Northern Transition Zone of Karnataka (NTZ) grown during *kharif* season both on black and red soils. Since the adverse effects of rising temperature and erratic rainfall patterns may vary from location to location and from crop to crop, it is better to assess their effect at zonal level. As a part of it, a field experiment conducted on greengram at Agricultural Research Station, Dharwad during *kharif* seasons from 2016 to 2018 using DSSAT-CROPGRO model with a combination of three temperature (control, +1⁰c and +2⁰c) and three rainfall (control, -10% and -20%) providing nine (9) scenarios has revealed that, the highest grain yield (592.13 kg ha⁻¹) was obtained under Scenario-1 (i.e., no change in rainfall and temperature). But, when rainfall was reduced by 10 and 20% i.e., Sce-2 and Sce-3, the grain yield was reduced by 2.36 and 9.50% respectively and the total biomass by 4.83 and 10.48% respectively. And when the temperature was increased by +1⁰C and +2⁰C than daily maximum and minimum temperatures i.e., Sce-4 and Sce-5, the simulated grain yield reduction was 1.71 and 3.56% respectively and that of total biomass was 4.86 and 9.36% respectively. The lowest grain yield (495.24 kg ha⁻¹) among all the scenarios was obtained under Sce-9 (RF -20% and Temp +2⁰C) with a reduction in simulated grain yield by 16.36% and total biomass by 21.16%. From this experiment it is concluded that, greengram was found to be more sensitive to changes in rainfall rather temperature change. Hence, in the upcoming years following the soil, moisture conservation practices and application of supplemental irrigation during dry spells helps to cope up with erratic rainfall to maintain high yields of greengram.

Keywords: Climate change, Greengram, DSSAT, CROPGRO, NTZ of Karnataka.

EVALUATION OF *Bacillus vallismortis* AS BIO-CONTROL OF *Ustilaginoidea virens* IN *Oryza sativa*

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ABSTRACT

Purpose

Paddy is one of the most important food crop in India in terms of both production and consumer preference. *Ustilaginoidea virens* is the causal agent of rice false smut, now becomes a destructive biotic factor throughout the major rice growing areas reducing both the quality and *yield* of rice. The purpose of our study is to use an environment-friendly approach to minimize the yield loss caused by rice false smut disease.

Methods

Rhizospheric soil was collected from the healthy rice during *kharif* season. Culture was isolated and maintained in a nutrient agar medium. The screening bio-control activities of various bacterial strains were checked using dual culture assay against rice false smut disease.

The bacterial strain was also tested for plant growth-promoting activities (PGPR). The molecular characterization of bacterial strain was done through 16S rDNA gene sequencing.

Results

A potential bacterial strain showed strong growth inhibition activity *in-vitro* conditions against the phytopathogen *Ustilaginoidea virens* about 46% inhibition in the dual culture test. Bacterial strain was identified as *Bacillus vallismortis* through the 16S rDNA sequence analysis. Sequence data were submitted to the NCBI GenBank and got an accession number (MZ359961). Then further standardization of seed bio-priming technique was done with this potential bacterium which was used as bio-control agent. Treatment with bio-control agents resulted 75% less infestation of false smut disease in crop which will mitigate the use of chemical fungicide for false smut disease and also enhanced approximately 25% seed emergence, seedling height, vigour index and about 20% increment of crop yield in comparison to control. Plant growth promoting activity (PGPR) was assessed and 8.5 mm of Zinc solubilizing zone was recorded.

Conclusion

In this study, we looked for the strong antifungal activity implied that the *B. vallismortis* might provide an alternative resource for the biocontrol of rice false smut. That will minimize the use of overpriced and harmful chemical fungicides.

Keywords: *Bacillus vallismortis*, Bio-control, *Ustilaginoidea virens*, Bio-priming, PGPR.

DEVELOPMENT AND EVALUATION OF ALOE VERA FORTIFIED LOW-CALORIE MUFFINS

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ABSTRACT

Purpose

The global upsurge in the health food industry has resulted in adoption of alternate food ingredients to replace traditional components having high risk. Consumption of high calorie foods, or a diet rich in fat and calories have been reported partially responsible for the occurrence of various chronic diseases. Besides this, the addition of health promoting functional ingredients from natural sources to food products has risen in popularity due to their ability to reduce the risk of chronic diseases beyond their basic nutritional attributes. Keeping in view the above facts, present study was aimed to develop *Aloe vera* fortified low-calorie muffins using fat replacers and alternative sweeteners.

Methods

All the raw materials for the development of *Aloe vera* fortified low calorie muffins were procured from the market. *Aloe vera* gel was extracted from fresh *Aloe vera* leaves and preserved until it was needed for quality testing and product development. First product development trial was carried out for the development of *Aloe vera* fortified muffins using different concentration of *Aloe vera* gel (@10 - 40 %). The best rated treatment was used in further experiments for optimizing concentration of fat replacer (@10-60 % xanthan gum or guar gum) and alternative sweetener (@25, 50, 75, 100 % jaggery or sweetos). The best selected treatments from each experiment along with the control sample were packed in polyethylene pouches, which were stored at ambient ($18 \pm 2^\circ\text{C}$) and refrigerated ($5 \pm 2^\circ\text{C}$) storage conditions. The optimized products were evaluated for various physico-chemical, nutritional and sensory attributes at periodic intervals of 0, 4, 8, 12 and 16 days of storage period.

Results

Aloe vera gel (AV; 20%) improved the nutritional profile and sensory characteristics of the developed muffins. While, 50% fat replacement with xanthan gum and 100 % sugar replacement with jaggery was optimized for the development of *Aloe vera* fortified low calorie muffins. The developed muffins demonstrated significant reduction in fat (19.24 % to 11.20 %) and energy value (406.3 Kcal/100 g to 333.9 Kcal/100 g). The aloin content (1.5 to 1.9 ppm) of the muffins was well within the permissible limits. FTIR analysis revealed significant improvement in the nutritional profile of the muffins. Further, storage studies indicated retention of sustainable shelf life with acceptable physico-chemical and sensory quality for 12 and 16 days under ambient and refrigerated storage conditions, respectively.

Conclusions

Conclusively, the low-calorie *Aloe vera* fortified muffins presents a healthy bakery snack choice for the consumers with ample potential for commercial application. The developed muffin gives a splendid way for utilization of *Aloe vera* gel in bakery snacks. Further, partial replacement of fat with xanthan gum and complete replacement of sugar with jaggery leads to development of more healthy and nutritious muffins and the availability of such products in the market will definitely benefit masses who are looking for healthier products in their day-to-day life.

Keywords: Fortified foods, fat replacers, alternative sweeteners, low-calorie, aloin, FTIR

EXTENT OF KNOWLEDGE LEVEL AND TRAINING NEEDS OF FARMERS IN RELATION TO SORGHUM PRODUCTION TECHNOLOGY IN KALABURAGI DISTRICT OF KARNATAKA

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ABSTRACT

The study was carried out over 80 sorghum growing farmers in Kalaburagi district of Karnataka to assess the knowledge and training needs of farmers in relation to sorghum production technology. The findings indicated that majority of respondents have good knowledge about recommended sorghum production technology in the area of showing time (2.79,) followed by soil selection and harvesting & threshing as their mean values obtained 2.78 and 2.72 respectively. The other areas like, intercultural operation (2.38), recommended varieties (2.34), irrigation management (2.05), disease management (2.05), fertilizer management (1.98), thinning operation (1.88), pest management (1.76), and seed treatment (1.55) about recommended sorghum production technology found knowledge in descending order. The extent of training needs of farmers in the main and sub area of training showed that highest training needs among sorghum growers in different components of sorghum production technology were observed in the area of doses of pesticide and fungicide (2.79) followed by pest and diseases (2.75) and recommended doses of fertilizers (2.73) The least preferred areas for training were time and method of harvesting, signs of maturity, time and frequency of intercultural, preparation and selection of land among the areas of sorghum production technology.

ENTREPRENEURIAL BEHAVIOUR OF JAGGERY PRODUCERS IN BELAGAVI DISTRICT OF KARNATAKA

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ABSTRACT

Sugarcane (*Saccharum officinarum* L.) is most important commercial crop and it provides raw material for several agro based industries for the development of the country after textiles. Entrepreneurship is necessary for sugarcane industry for socio economic development of rural areas by mobilizing rural resources, generating employment and enhancing income of the farmers. The Indian jaggery industry is the largest unorganized market, and it is one of the oldest and most prominent rural cottage industries. The majority of sugarcane growers are manufactures the jaggery with minimal capital expenditure, generating jobs for unemployed rural residents. The majority of jaggery producers are small and marginal farmers who depend on fast returns from their crops. It is therefore important to protect sugarcane growers' income from their jaggery manufacturing units by improving their output through value addition and modern technology packaging of jaggery-based goods. Keeping these considerations in mind, the present investigation was undertaken to assess the entrepreneurial behaviour of jaggery producers in Belagavi district of Karnataka. The study was carried out in two blocks of Belagavi district of Karnataka state during the year 2020-2021. A total of 90 respondents were randomly selected for the present study. The data were collected by personal interview method and with the help of a structured interview schedule. The findings indicated that the majority of jaggery producers had medium level of innovativeness (68.88%), decision making ability (62.22%), risk orientation (67.77%), knowledge on farming experience (50.00%), and information seeking behaviour (60.00%), achievement motivation (68.88%), economic motivation (56.66%), leadership ability (65.55%), scientific orientation (58.88%) and management orientation (65.55%). It was also found that majority (71.11%) of jaggery producers had medium level of entrepreneurial behaviour. The findings also evident that out of all the entrepreneurial behaviour of the jaggery producers, economic motivation is rank first and leadership ability is rank last on the basis of the highest and lowest mean value.

CLIMATE RESILIENT AGRICULTURE IS A TECHNIQUE: A WAY OF NATURAL RESOURCES MANAGEMENT

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ABSTRACT

One of the most important ideas in risk management for climate change is climate resilience agriculture (CRA). Resilience in this context refers to an agricultural system's capacity to

anticipate and prepare for changes in the climate and extreme weather, as well as adapt to take in, absorb, and recover from these changes' effects. In order to improve long-term productivity, sustainability, and farm income in the face of climate change, agricultural and livestock production systems can use the climate resilient technique to sustainably harness their current natural resources. Resilience can be increased by putting into practise both short- and long-term climate mitigation and adaptation strategies, as well as by encouraging transparent and inclusive participation of various actors and stakeholders in management and decision-making processes. Temperature and precipitation changes that have a long-term impact on temperature, rainfall patterns, and agricultural production

Keywords: climate resilience, productivity and sustainability

IMPACT OF IN-SITU RICE RESIDUE AND NUTRIENT MANAGEMENT ON PERFORMANCE OF WHEAT CROP

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ABSTRACT

Wheat (*Triticum aestivum* L.) a native of South West Asia, is one of the most important staple food crop that has been labelled as “king of cereals”. India is the second largest wheat producer country in the world. It is the second most important crop in India after rice, both in terms of area and production. Crop residue is a good source of plant nutrients and important component for the stability of the agricultural ecosystem. The N and K uptakes were 11.7% and 7.9% higher with the incorporation of residue than with residue removal and the various rice residue and nutrient management systems significantly affect the number of tillers per meter, number of effective tillers, length of ear head, number of spikelets per spike, grain, straw yield and nitrogen uptake by grain and straw were maximum with 30% additional NPK + recommended NPK over sowing of wheat without incorporation of rice residue and recommended NPK and rice residue incorporation + recommended NPK at wheat sowing. The retention of rice residue enhanced the wheat grain yield 21.3% at zero N, 8.3% at 150 N (whole basal) and 5.4% at 150 N (three split) applications. Thus, it can be concluded that adoption of rice residue incorporation with 25 - 30% additional recommended NPK or Nitrogen application improves wheat yield and improve soil health.

Keywords: Rice Residue, Nutrient Management, Wheat.

CLIMATE CHANGE ADAPTATION AND MITIGATION THROUGH CARBON SEQUESTRATION

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ABSTRACT

The greatest important environmental challenge to the struggle against hunger, malnutrition, disease, and poverty is probably climate change. Weather patterns can alter significantly over timescales of a few decades to millions of years due to climate change. Crop productivity, including quantity and quality, agricultural practices, including changes to irrigation and

agricultural inputs like herbicides, insecticides, and fertilizers, environmental effects, particularly in relation to frequency and intensity of soil drainage (leading to nitrogen leaching), soil erosion, and reduction of crop diversity, as well as rural space, through the loss and gain of cultivated lands, are all possible effects of climate change on agriculture. Due to its dependence on local climate variables like rainfall, temperature, soil health, etc., agriculture is the most fragile and sensitive sector affected by climate change. By jointly tackling the problems with food security and the effects of climate change, it incorporates the three facets of sustainable development (economic, social, and environmental). The adaptation of climate-related information, tools, and methods to local circumstances, encouraging collaboration between farmers, scientists, and extension agents, and extensively spreading climate-smart agriculture techniques. Greenhouse gases that trap heat are widely released by the food and agricultural industries. Carbon dioxide, methane, and nitrous oxide are the three main GHGs that agriculture releases into the atmosphere. Nitrous oxide emissions from soil (mostly due to fertilizer use and manure being converted by soil microbes) and methane emissions are the primary sources of agricultural GHGs. By storing carbon and lowering emissions, there is a chance to develop a climate-smart agriculture. Enriching soil carbon, supporting climate-smart animal production methods, reducing the use of inorganic fertilizers, repairing degraded lands, and limiting deforestation are the main initiatives that can play a significant role in CSA. Carbon can be captured and emissions reduced through agricultural practices like managing soil cover and residues, minimizing tillage, conservation agriculture technology, perennial plant farming, climate-friendly livestock systems, conserving and restoring forests and grasslands, and low emissions farming systems.

Keywords: *Climate change, Adaptation, Mitigation, Carbon sequestration*

TRAINING: AN EFFECTIVE TOOL FOR TRANSFER OF AGRICULTURAL TECHNOLOGIES

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ABSTRACT

Transfer of farm worth technologies to the farmers is the need of hour and vital for harnessing the fruit of Research. Training of farmers & farm women in a critical input for the rapid transfer of technologies. The study was carried out in adopted villages (Harda, Nimandar, Manjrod, Umarda, Sandas) of Krishi Vigyan Kendra, Burhanpur during 2014-15 to 2018-19 Total 100 different training programmes were organised on various topics i.e. pre sowing techniques, crop management practices, post-harvest management, goatery production and livestock management practices. 05 skill development training programmes, 10 rural youth training programmes, 20 Capacity Building training Programme and 65 one day farm and farm women training programmes were organised and total approx 2500 farmers were trained by KVK, Burhanpur during last five years but the sample size taken was of 500 adult members who were actively involved in the training programmes. The study revealed that the on campus training was most preferred by 60.60 % farmers, followed by off campus training programme (21.40%). The farmers rated one to three days duration training as “most preferred” (32.60%) and ranked it first, lean period (60.60%) and rainy season (40.60%) was perceived as most preferred time for arranging training programme for farmers.

Keywords: *Training, Preferences, Farmers and Farm women*

TECHNOLOGY-ASSISTED CLIMATE SMART AGRICULTURE

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ABSTRACT

Climate smart agriculture is a comprehensive strategy that uses technology to increase productivity, improve resilience, and reduce greenhouse gas emissions. The goals of climate smart agriculture can be achieved with careful planning and guiding. For instance, energy smart food systems must integrate unified sustainable resource technologies for farming such as biomass, biofuels, wind turbines, solar panels, pyrolysis units, geothermal, and bio-energy operated water pumps. In states like Punjab, Haryana, and Uttar Pradesh, Resource Conserving Technologies (RCTs) like decreased tillage methods allow farmers to plant wheat shortly after rice in order to prevent warm weather that is unsuitable for grain filling. Utilizing crop wastes like stalks, leaves, and seed pods aids in soil moisture conservation. Growing green manuring plants like alfalfa, dhaincha, and sun hemp contributes to improve soil fertility. The losses brought by climate change can be reduced to a minimum with the use of weather forecasting and warning systems. Information and communications technology (ICT) can be a useful tool for researchers and policymakers when preparing for upcoming initiatives. Computer-aided crop simulation models can help to develop climate wise agriculture, including its alleviation methods, by identifying potential risks of climatic implications on future crop production. The use of crop simulation models makes it possible to understand how different environmental elements such as light, temperature, and water stimulate crop response and increase agricultural output. Achieving food security, the effects of climate change on agriculture, and the influence of agriculture on climate change can all be addressed through the use of improved technologies. Climate Smart Agriculture assists stakeholders at all different levels in identifying agricultural approaches appropriate for the local circumstances. It helps the organization's objective to make agricultural and livestock systems, forests, fisheries, and aquaculture more productive and sustainable, and it is in line with the FAO's vision for sustainable food and agriculture.

Keywords: *Global Warming, Resource Conservation Technologies (RCT), Information and communication technology (ICT)*

STUDY OF IRRIGATION SCHEDULING IN DIFFERENT MUSTARD [*Brassica juncea* (L.)] VARIETIES

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ABSTRACT

An agronomic investigation to study the response of various mustard varieties to different irrigation scheduling treatments through critical growth stage approach was conducted during

Rabi season of year 2019-20 at IFS research Unit farm in Banda University of Agriculture and Technology, Banda (U.P.- 210 001). The experiment was laid out in strip plot design with three replications. Four irrigation scheduling treatments [*viz.* I₀: No Irrigation, I₁: One Irrigation at Rosette stage, I₂: One Irrigation at Pod formation and I₃: Two Irrigations (1st at Rosette + 2nd at Pod Formation)] were allocated to horizontal plots; whereas two mustard varieties (*viz.* NRCHB-101 and PM-28) were sown in vertical plots. Higher growth attributing characters at different crop stages and yield attributing characters at harvest *viz.* final plant stand, plant height, number of primary & secondary branches, leaf area index, plant dry matter, crop growth rate, relative growth rate, net assimilation rate, number of pods per plant, pod length, number of grains per pod and test weight were produced in mustard variety NRCHB-101 with irrigating the crop for two times during rosette and pod formation stage. Similarly, higher grain & straw yield along with highest harvest index & B: C ratio and water use efficiency was recorded in variety NRCHB-101 with two irrigations as compared to all the other treatments. All these plant growth and yield attributing characters and yield along with net monetary income & B: C ratio and lowest water use efficiency was observed in variety PM-28 under the condition of no irrigation applied.

Keywords: *Irrigation scheduling, varieties, growth attribute, mustard and yield.*

ENDOCRINE DISRUPTING CHEMICALS AND IMPACT ON NEURODEVELOPMENT AND BEHAVIOR

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ABSTRACT

Endocrine Disrupting Compounds are chemicals that interfere with any aspect of hormone action and widely persist in environment. These chemicals mimic or antagonize the action of endogenous hormones, thus modulating hormone synthesis, binding, and metabolism or by interacting with hormone receptors. Neurocristopathies are a class of congenital disorders resulting from the abnormal induction, specification, migration, differentiation or death of neural crest cells (NCCs) during embryonic development and have an important medical and societal impact. Some of these defects are caused by teratogens, which are agents that negatively impact the formation of tissues and organs during development. The use of BPA in the production of polycarbonate plastics and epoxy resin has been identified as an important contributor to BPA pollution of surface and ground waters. They are emitted into the atmosphere during anthropogenic activities and physicochemical reactions in nature. Inhalation of these EDCs as particulate and gaseous vapors triggers their interaction with endocrine glands and exerts agonist or antagonist actions at hormone receptors.

The endocrine disruption at nanogram levels of EDC's has gained concern in the last decade, due to infertility among men and women, early puberty, obesity, diabetes and cancer. Pesticides are used to kill unwanted organisms in crops, public areas, homes and gardens, and parasites in medicine. Human are exposed to chemicals due to their occupations or through dietary and environmental exposure. EDCs can bind to and activate various hormone receptors and then mimic the natural hormone's action (agonist action). EDCs may also bind to these receptors without activating them. This antagonist action blocks the receptors and inhibits their action. EDCs may also interfere with the synthesis, transport, metabolism and elimination of hormones, thereby decreasing the concentration of natural hormones. Human biological monitoring is a powerful method for monitoring exposure to endocrine disrupting compounds.

Keywords- Endocrine Disrupting Compounds (EDCs), Teratogens, Pesticides

COMPARISON STUDY OF SHIMLA MIRCH IN TRADITIONAL AND PROTECTED CULTIVATION UNDER POLY HOUSE

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ABSTRACT

Capsicum (Shimla Mirch) is Very Valuable Vegetable Crop of Narkhi Block in District Firozabad the area of Shimla March in District Firozabad about 7150 ha. KVK, Firozabad conducted on-farm trial to performance of traditional cultivation and protected cultivation of shimla mirch under poly house. In the poly house transplanting of seedlings on the ridge (T₂) the production is 585 q/ha (98.3 % increase in yield) with the net return of Rs. 1440000 as compared to farmer’s practice (T₁) the yield is 295 q/ha with the net return Rs. 697000. Benefit cost ratio is Very higher 5.57 in Transplanting of seedling on the ridge in the poly house in Comparison to farmers Practice (T₁) Direct transplanting of seedling in the flat filed(Farmers Practice)

Table Performance of traditional cultivation and protected cultivation of shimla mirch under poly house

<i>Technology Option</i>	<i>No. of trials</i>	<i>Yield (q/ha)</i>	<i>Yield increase %</i>	<i>Cost of cultivation (Rs/ha)</i>	<i>Gross Cost (Rs/ha)</i>	<i>Net Return (Rs/ha)</i>	<i>B:C ratio</i>
T ₁ - Direct transplanting of seedling in the flat filed (Farmers Practice)	3	295	-	88000	88500	697000	3.71
T ₂ - Transplanting of seedling on the ridge in the poly house		585	98.3	315000	1755000	1440000	5.57

Selling price Rs. 30/kg

OPTIMIZATION OF PH, TEMPERATURE AND SUGAR CONCENTRATION FOR THE GROWTH OF *Rhizoctonia solani* INCITANT OF SHEATH BLIGHT OF RICE

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ABSTRACT

Rice (*Oryza sativa* L.) is one of the primeval cultivated crops and belongs to the family Poaceae (Gramineae). It is the most principal staple cereal food crop of the world and over half of the world’s population relies on rice in their diet. The productivity of rice is affected by several pathogens among which, sheath blight, is one of the most fiscally significant rice disease worldwide and causes serious grain yield and quality losses. The pathogen associated with sheath blight (ShB) is *Rhizoctonia solani* Kuhn (Teleomorph: *Thanatephorus cucumeris* Frank Donk). Different parameters such as pH, temperature, and sugar concentrations play an important role among different factors affecting fungi growth and spread. In this research, pH, temperature, and sugar concentrations at different levels were maintained to study the isolates’

mycelial growth variation. The fungal pathogen was maintained as a pure culture on potato dextrose agar (PDA). *In vitro* evaluation was done for ten isolates of *Rhizoctonia solani*. For finding the optimum pH, temperature, and sugar concentrations, potato dextrose agar media was prepared at different pH (4,5,6,7,8), sugar concentrations (10g/L,15g/L,20g/L,25g/L, and 30g/L), and temperature (26°C,28°C,30°C,32°C,34°C). The maximum mycelial growth of the majority of isolates was observed between pH 4 to 5, higher temperatures (30°C to 34°C), and sugar concentrations of 20-25g/L. The optimum growth was found at pH 5, 30°C, and 20g/L of sugar concentration.

Keywords: Rice, Sheath blight, *Rhizoctonia solani*, pH, temperature, sugar concentration

FLORISTIC DIVERSITY AND CONSERVATION STATUS OF PLANTS IN HOMEGARDENS AT SOUTH GARO HILLS, MEGHALAYA, INDIA

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ABSTRACT

Homegardens are traditional farming systems, presumably the oldest land use system which allow its owner to produce a wide variety of products and ecosystem services. The present study was conducted to analyse the floristic diversity of homegardens in South Garo Hills Meghalaya. Purposive, multi-stage and random sampling procedures were followed in the present study. Total sampled area was 26.96 ha (average 0.27 ha) and 15528 individuals were counted from the homegarden (N = 100) that harboured a diverse layer of useful plants species. The present study documented 214 species belonging to 78 families and 174 genera (Confirm the family and genus after species change) and plant species richness ranged from 07-64 with average 16.6 (\pm .86). Trees were the dominating life form (87 species, 36 families, 71 genera) followed by herbs ((62 species, 32 families, 51 genera), shrub (38 species, 22 families, 34 genera), climbers (17 species, 11 families, 16 genera), palm (seven species, one family, six genera), bamboo (two species, one family, one genus and fern (one species, one family, one genus. Homegardens exhibit complex structure, both vertically and horizontally having five vertical stratum, in ground stratum 82 species comprising herb, vine and climbers; 29 species in 2nd stratum mainly shrub species; on third strata with 43 species mainly associated with small tree and large size shrub of fruits and ornamental species; on 4th strata 33 species were associated, predominantly fruit, timber, fuel wood and multipurpose species; 28 species recorded on 5th strata predominantly trees were represented. In sampled homegardens 78% homegarden were recorded with animal component. There were two species of plant categorized as Critical endangered, three species Endangered, one species Vulnerable. Frequency estimated was 1-75 %, density was 0.01-103.6, species abundance was 1.0-138.13% and IVI was 0.19-87.28. The species diversity index or Menhinick's index, Concentration of dominance or Simpson's index, Shannon-Wiener diversity index and Species evenness of the studied homegardens was 1.72, 0.45, 2.00 and 0.21 respectively. Homegarden age and size was significantly and directly correlated. Homegardens of South Garo Hills are a useful tool for preserving genetic resources and promoting economic well-being.

Keywords: Homegarden, Species diversity, Structure, Utilization

CLIMATE CHANGE AND ITS IMPACT: PERCEPTION OF FOREST DEPENDENT COMMUNITIES IN WEST GARO HILLS OF EASTERN HIMALAYAS

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ABSTRACT

The study documented perception of forest dependent community of West Garo Hills in Meghalaya, India from April 2021 to April 2022 through questionnaire based personal interviews involving 100 respondents. Majority of the respondents were female with a mean age of 53.94 years, literates and farmers with marginal land holding. The results show that forest dependent community of the study area have less awareness on climate change but having idea about its effects on the weather, ecosystems, biodiversity and agriculture. Majority (90%) of them perceived increase in temperature as increase in day and night temperature. Similarly they believed that monsoon is becoming unpredictable day by day with changed intensity and withdrawing early over the past few decades along with decrease in cloudy and rainy days. Majority of these people also perceived the impact of climate change on forest resources along with risk on their livelihood through increased misery, decreased NTFPs, and reduction of crop yields. There is significant difference between occupation, education and awareness on climate change. The study also revealed a need for scientists, government and non-government agents and other stakeholders to support efforts by farmers to adapt to effects of climate change through technological, policy and financial interventions with the aim of improving livelihoods and food security.

Keywords: Climate change, Global warming, Forest resources, Indigenous community

EFFECT OF SALICYLIC ACID, 2, 4- DICHLOROPHENOXYACETIC ACID AND GIBBERELIC ACID ON YIELD AND ECONOMICS OF CAPE GOOSEBERRY (*Physalis peruviana* L.)

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ABSTRACT

The present experiment was conducted at the field of Horticulture Research Farm, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, during the period from October 2020 to March 2021. The experiment was laid out in randomized block design and comprised Ten treatment viz; Salicylic acid (20, 40 and 60 ppm), 2,4-D (4, 8 and 12 ppm), GA₃ (20, 40 and 60 ppm) and control which were replicated thrice. From the result it was observed that GA₃ @ 60 ppm proved to be most effective treatment to enhance yield parameters like number of fruit per plant (108), average fruit weight with husk and without husk (11.8g and 10.9g) polar diameter with husk and without husk (4 mm and 2.7 mm), radial diameter with husk and without husk (3.53 mm and 2.67 mm), and yield (1274.9g and 123.65 q/ha). The maximum gross return, net return and benefit cost ratio (1: 6.13) also recorded in GA₃ @ 60 ppm under Prayagraj agro-climatic condition.

Keywords: Cape gooseberry, Salicylic acid, 2,4-D, Gibberellic acid

FACTORS AFFECTING ADOPTION OF WEATHER BASED INSURANCE UNDER CLIMATE CHANGE SCENARIO

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Purpose

Weather based insurance provides protection to farmers against climate risks. The research revealed that hilly regions are more vulnerable to climate risks. In India, fruit crops such as apple, mango etc. is covered under weather based crop insurance scheme. There was also a significant policy change occur in terms of modalities of the Restructured weather based crop insurance scheme. The crop insurance under PMFBY/WBCIS was earlier a voluntary scheme for non-loanee farmers and mandatory for those availing crop loans from banks. However, from kharif, 2020 onwards, the scheme has been declared voluntary for all the farmers, both loanee and non-loanee farmers. therefore, the study was conducted to assess factors affecting adoption of weather based insurance for apple crops.

Methods

The list of insured apple growers in Himachal Pradesh before the scheme was made voluntary for all the farmers i.e. in the year 2020. The growers were selected randomly to assess their understanding about the weather-based insurance and their willingness to adopt the scheme post policy change in the year 2021.

Results

The secondary data revealed that there is a drastic reduction in number of insured apple growers in the year 2021 as compared to the year 2020. Maximum likelihood estimates procedure was utilized to influence the adoption of weather based crop insurance by apple growers. Age, off-farm job, total land, number of trees and distance from weather are negatively affecting the willingness to adopt weather based crop insurance scheme, whereas education is positively and significantly affected the adoption of RWBCIS.

Conclusions

Apple growers faced several extreme climatic events in the past. However, there preference to adopt weather crop insurance scheme for mitigating the risk is limited. Creating awareness among farmers is essential for broader coverage of farmers under the scheme. Unawareness about the modalities of scheme is the major reason for poor response towards adoption of scheme

Keywords: Weather based crop insurance, adoption, apple, Himachal Pradesh, India

STANDARDIZATION OF HIBISCUS TEA FOR FLAVOR AND NUTRITION

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ABSTRACT

The present study on entitles “Standardization of Hibiscus Tea for Flavor and Nutrition” in the experimental farm, Mata Gujri College, Fatehgarh Sahib (Punjab), during 2020-2022. The experiment was laid out in completely Randomized Design with seven combinations, with Hibiscus, Sugar and Citric acid with different combinations. Each treatment was replicated three times for determination of Total soluble solids (TSS), pH, Titrable Acidity (%), Ascorbic acid (mg/100g), Antioxidant Activity (%) and Total phenolics content (GAE/g) ; determination of Mineral content and organoleptic properties of Hibiscus tea. was recommend best combination of Hibiscus tea for good nutrition and organoleptic properties. From experimental result it was concluded that the Sample B Hibiscus (15.15%), Sugar (75%), Citric acid (9.09%) gives best results for minerals as well as for organoleptic properties.

Keywords: Hibiscus, Ascorbic acidity, Total Soluble Solids, Titrable acidity.

PERFORMANCE OF SESAME (*Sesamum indicum* L.) VARIETIES UNDER DIFFERENT PLANT ESTABLISHMENT METHOD DURING SUMMER SEASON.

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ABSTRACT

A field experiment was conducted during the summer seasons of 2019 and 2020 at the District Seed Farm of Bidhan Chandra Krishi Viswavidyalaya, Nadia, West Bengal to evaluate the effect of line sowing and broadcasting method and ecological adaptation of different varieties in relation to good growth and yield of sesame (*Sesamum indicum* L.). The results revealed that line sowing did not have significant variation over broadcasting although line sowing enhanced growth and yield attributes viz., plant height, branches per plant, capsules per plant, seeds per capsule, and test weight, and ultimately gave higher seed yield (1.31 t/ha), a tune of 7-9 % and stalk yield (3.75 t/ha) over broadcasting but higher Net return and BCR was obtained with broadcasting owing to the cost of cultivation was comparatively lower in broadcasting. The results also showed that among the different varieties (GT₁, GT₂, GT₃, GT₄, GT₅, GT₆, GT₁₀, and Savitri), GT₂ (Gujrat Til-2) performed better in terms of growth and yield attributes such as plant height, branches per plant, capsules per plant, seeds per capsule, and test weight, resulting in higher seed yield (1.46 t/ha) and stalk yield (3.86 t/ha) along with highest Net return (Rs. 46660/ha) and BCR (2.04) was obtained with the treatment S₁V₂ although variety GT₄ (Gujrat Til-4) was statistically very close to GT₂ (Gujrat Til-2). Therefore, the adoption of line sowing over broadcasting and using of high-yielding improved varieties following suitable mechanized cultivation could be appropriate for maximizing yield and monetary returns from summer sesame in West Bengal.

Keywords: - Sesame, varieties, sowing methods, growth, and yield.

STUDIES ON PHYSICAL AND BIOCHEMICAL ATTRIBUTES OF INDIGENOUS COW URINE

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ABSTRACT

Indian cow urine is very powerful medicine in ayurvedic side. Cow urine is believed to have therapeutic value and used in many drugs formulation. Considering the present demand of products based on panchgavya there is a huge scope in livestock farming of indigenous cows and evaluation of indigenous cow byproducts for their beneficial effects.

In present investigation indigenous cows were selected from livestock unit of Department of Animal Husbandry and Dairy Science, College of Agriculture, Dapoli. Ten selected animals divided into two groups based on physiological phases viz., milking and dry with similar age (5-8 years) and similar body weight.

The minimum and maximum range of specific gravity, pH and EC was 1.028 to 1.033, 6.66 to 6.99 and 31.84 mS to 33.24 mS, respectively. There was a no significant ($P \leq 0.05$) difference in mean specific gravity, pH, EC, glucose, phosphorous and bilirubin content of urine collected from both dry phase and milking phase animals. Glucose and bilirubin constituent was negative in both dry phase and milking phase animals. The average protein of dry phase animals (8.25

mg/dL) urine was higher than average protein of milking phase animals (7.55 mg/dL) urine. Average calcium content of dry phase animals urine was (15.85 mg/dL) less than the average calcium content of milking phase animals urine (20.47).

The average nitrogen, creatine and creatinine content of urine collected from dry phase animals (10.81 g/L, 13.19 mg/dL and 24.36 mg/dL respectively) was higher than urine collected from milking phase animals (9.56 g/L, 11.42 mg/dL and 20.16 mg/dL respectively). There was significant ($P \leq 0.05$) difference between average nitrogen, creatine and creatinine content of dry phase and milking phase animals urine.

During shelf life period of indigenous cow urine, pH level of cow urine samples goes on increasing from slightly acidic to neutral, neutral to alkaline and then to strong alkaline as the shelf life period increases. EC level of cow urine samples also goes on increasing as shelf life period increases. The present investigation on indigenous cow shows that, the cow urine collected from dry animals was more useful than that of urine obtained from milking cows and freshly collected urine must be utilized as early as possible.

STATUS OF DEVELOPMENT AND COMMERCIALIZATION OF TRANSGENICS IN FRUIT CROPS

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ABSTRACT

Fruits are one the major sources of micronutrients (e.g., vitamins and minerals), phyto nutrients and dietary fibers that are essential for human health. To ensure nutritional security of increasing world population it is important to enhance fruit production on limited land availability. Fruit breeding is difficult with conventional methods because of long juvenile phase, self-incompatibility, high heterozygosity and linkage drag. To address these problems, we need an innovative and advanced breeding approach such as genetic engineering. Genetic engineering facilitates the development of fruits with useful agronomic or quality traits that are difficult or laborious to achieve by conventional breeding, either due to the lack of suitable germplasm or the long breeding cycles and need for multiple rounds of back-crossing. The same traits can be introduced by genetic engineering in one generation, often directly into elite varieties. Tremendous progress has been made during the last two decades in transgenic research in fruit crops, which have started bearing fruits in the form of approval by regulating agencies for either release or sale of transgenic fruit varieties. Some genetically engineered fruits have been on the market for more than 25 years, and have achieved a remarkable positive socioeconomic impact by reducing pests and diseases and increasing the quality of the end product, both of which help to increase income for farmers.

In 1992, the first PRSV-resistant papayas (SunUp and Rainbow) were developed through a collaboration involving Cornell University, University of Hawaii and the As grow company. ‘SunUp’ and ‘Rainbow’ papaya contain the coat protein gene from the mild PRSV HA 5-1 isolate. Similar to the ‘SunUp’ variety, transgenic Huanong No. 1 papaya was developed and is resistant to the four predominant PRSV strains found in South China. Most of the transgenic fruits were developed to improve agronomic productivity by conferring pest or disease resistance, or delayed ripening. However, more recent products have addressed quality traits by eliminating fruit browning or adding new visual traits such as flesh colour. Okanagan Specialty Fruits had developed non-browning transgenic Arctic[®] Apple using RNA interference (RNAi) technology by silencing PPO (Polyphenol oxidase) genes.

Currently, there are three commercial varieties of Arctic[®] apple: Arctic[®] Golden Delicious, Arctic[®] Granny Smith, and Arctic[®] Fuji. Commercial harvest of Arctic[®] Golden Delicious and Arctic[®] Granny Smith started in 2016, and Arctic[®] Fuji will be on the market in 2021. Similarly, Del Monte started to develop the Pinkglow[™] pineapple by suppressing lycopene β -cyclase (*bLyc*) and lycopene ϵ -cyclase (*eLyc*) leading to accumulation of lycopene pigment giving pink colour to the flesh of pineapple. The Pink glow pineapple received FDA approval in 2016.

PRSV-resistant papaya is the most widely cultivated genetically engineered fruit crop, followed by Arctic[®] apples, and Pinkglow[™] pineapple. In USA 77% area of papaya is occupied by transgenic cultivar ‘Rainbow’ and SunUp’. Whereas in China 86% area of papaya is under transgenic papaya cultivar Huanong No. 1. Further, the area under transgenic Arctic Apple and pink fleshed pineapple is slowly increasing. Despite, the tremendous achievements made in the development of transgenic fruit crops, the adoption of transgenic fruit crops is not much successful. Except few countries like USA, China and Canada where some of the transgenic fruit crops like transgenic papaya, non-browning apple and transgenic pineapple have been approved and adopted at commercial scale, the adoption rate of transgenic fruit crops is negligible worldwide particularly in the developing nations. The main concern limiting the expansion of transgenics is the bio safety issues, lack of consumer acceptance and strict regulatory approval (due to foreign gene) as well as lack of efficient regeneration and transformation protocols for many cultivars of the different fruit species. Removing these barriers will offer tremendous opportunity for the breeder in the near future and sustain the mankind in the era of exponentially increasing population and climate change.

Keywords: Transgenics, papaya, breeding, regulatory approval.

STUDIES ON DIFFERENT PH LEVELS ON QUALITY WINE PRODUCTION FROM NAGPUR MANDARIN USING YEAST *Saccharomyces cerevisiae*

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ABSTRACT

An experiment entitled “Studies on different pH levels on quality wine production from Nagpur mandarin using yeast *Saccharomyces cerevisiae*” was carried out at Vasantrao Naik College of Agricultural Biotechnology, Yavatmal. Mandarin fruit juice extracted from Nagpur Mandarin of mrig bahar was taken for the physicochemical analysis. The objective was to assess four different levels of pH for quality wine production. All the treatments were inoculated with 5% yeast inoculum of *Saccharomyces cerevisiae* adjusted at 25^oB and placed at 20 to 22^oC for fermentation. After 30 days of fermentation, it was observed that the pH, of wines were found gradually increased with the pH levels and found that, the must pH 4.5 gave the minimum pH i.e. less acidic wine. It was observed that there found reduction in TSS, titrable acidity, ascorbic acid, and reducing sugar at 30 days of fermentation with increased in alcohol content of wine. Wine prepared at higher level of pH 4.5 reported maximum total soluble solids, minimum reducing sugar, maximum total sugar and alcohol and vice versa. The organoleptic evaluation of wine, reported that Nagpur Mandarin wine prepared at 4.5 pH scores 8.03 points for overall acceptability categorized as like very much wine and found acceptable for winery. Wine prepared at pH levels 4 also reported acceptable as scored ‘like moderately’ for sensory evaluation and physicochemical parameters and stood next to wine prepared at pH 4.5.

Keywords: Nagpur mandarin, pH, yeast, fermentation, wine

STUDIES ON YIELD AND ECONOMICS OF LINSEED (*Linum usitatissimum* L) VARIETIES UNDER UTERA SYSTEM OF CULTIVATION IN MEDIUM LAND ECOLOGY OF JHARKHAND

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Introduction

Among the oilseed crops cultivated during rabi season linseed is next in importance to rapeseed – mustard in area as well in production. Today it is considered to be oldest oilseed in the world. India ranks second in area occupies 2.96 lakh ha yielding out 1.49 lakh tones having an average productivity of 502 Kg/ha (2012-13). India contributes about 14.89% and 6.56 % to world area and production, respectively. The major parts of linseed areas lies in the states of MP, Chhattisgarh, UP, Maharashtra, Bihar, Odisha, Jharkhand, Karnataka and Assam. Our state production of 05 thousand tones is realized from an area of 18 thousand ha with low productivity of 278 Kg/ha (2004). It's value addition has paved the way for it's diversified uses in nutraceutical and medicinal purposes and recently propounded that it is the best herbal source of Omega-3 & omega-6 fatty acids. Mono-cropping with paddy is the dominating system of Jharkhand comprises upland, medium and lowland ecology. The paddy dominated medium and lowland having an area of 6.29 & 4.81 lakh ha, respectively remain fallow after paddy harvesting. The area under utera / paira cropping of linseed is increasing with the decline in lathyrus cultivation. The medium land which remain fallow can be utilized for utera / paira cropping of linseed and other crops like lentil, chickpea & lathyrus by utilizing residual soil moisture for germination and subsequent growth of crop. The better yield of linseed can be obtained with the help of rain shower from January to April. But this system limits the scope of application of modern improved technologies along with use of inputs which results in lower productivity. The suitable variety is the most critical input by using which productivity of linseed can be increased. Thus, this objective taking in mind present study was undertaken to evaluate the suitable variety for increasing growth, yield and economics of linseed production under

utera / paira system of cultivation.

Methodology

The present study was conducted at research farm of Birsa Agricultural University, Kanke, Ranchi during rabi season for consecutive three years (2009-12). The experiment was conducted in Randomized Block Design replicated four times comprising five varieties (T-397, Sweta, Shekhar, R-552 & Padmini). The broadcasting of seed was done in the standing crop of rice 10-15 days before of harvesting with increased seed rate of about 40 Kg/ha to maintain optimum plant population. After paddy harvesting N was top dressed @ 30 Kg/ha to linseed in addition to 80:60:40::N:P:K Kg/ha to rice in kharif. The data on, yield attributes and yield were recorded. The crop was harvested in 2nd fortnight of April. Economic indices viz. gross monetary returns (GMR), net monetary returns (NMR) and benefit : cost ratio (B:C ratio) were computed on the basis of cost involved in the cultivation and value realized from the produce per unit area under various treatments.

Results & Discussion

05 varieties of linseed were evaluated for three years (2009 to 2012) to find out suitable variety of linseed for utera cultivation at Kanke.. On the basis of mean data of three (2009-2012) variety T-397 was showed it's superiority over rest of the varieties (Shekhar, R552 & Padmini) and recorded maximum mean seed yield (416Kg/ha) and it was followed by variety Sweta (373Kg/ha). On the basis of mean data higher NMR (Rs, 9497/ha) and B:C ratio (1.51) was obtained with T-397 and it was

followed by Sweta (NMR Rs. 8109/ha & B:C ratio (1.23). This is might be due to deep root system and higher yield potential of crop which resulted better growth of crop through better absorption of residual moisture and nutrients under resource constraints situation also and ultimately contributing to higher yield attributing characters and yield. These results are in conformity with the findings of Chopra and Badiyala (2015).

Conclusion

It is concluded that variety T-397 of linseed having high yield potential coupled with consistent performance is more productive and profitable under utera / paira system of cultivation.

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EFFECT OF INTEGRATED NUTRIENT MANAGEMENT ON PRODUCTIVITY AND PROFITABILITY OF NIGER (*Guizotia abyssinica.cass*) Under Rainfed Condition

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Introduction

Niger (*Guizotia abyssinica*(L.f.) cass.) is an important traditional oilseed crop. India is the largest producer of niger in the World which was grown over an area of 2.77 lakh hectare with a production of 0.89 lakh tones and productivity of 321Kg/ha (Anonymous, 2015). It is lifeline of tribal agriculture and economy in India. Niger although considered minor oilseed crop, is important in terms of it's 32 to 40 per cent of quality oil with 18 to 24 percent protein in seed. It is also used as an oilseed crop in India where it provides about 3 per cent of the edible oil requirement of the country. The niger oil is also used in cooking as a substitute of ghee and olive oil..Productivity of niger indicates a declining trends during 2012-13 & 2013-14. Farmers are generally getting lower seed yield due to low input application particularly fertilizers. The information regarding use and effect of bio-fertilizer and green manuring either alone or in combination with each other as well as inorganic fertilizers on niger cop in this region is very less. Thus, this objective taking in mind present study was undertaken to evaluate the integrated use of green manuring, bio-fertilizers and inorganic fertilizers on growth, yield and economics of niger production.

Methodology

A field experiment was conducted on niger with variety Birsa niger-1 at research farm of B.A'U Kanke,Ranchi during kharif season for four years (2008-12). The soil of the experimental field was clay loam in texture, acidic in reaction (P^H 5.5-6.0) with low in available N (185 Kg/ha) and P (16 kg/ha) wherever available K is medium (240 Kg/ha). Ten treatments of different nutrient management combinations were tested in Randomized Block Design replicated four. The seeding of niger was done on last week August to 1st week of September in the row of 30 cm. maintaining the intra-row spacing of 10 cm. by Thinning operation. The green manuring crops Sunhemp & Cowpea were sown before 45 days of sowing of main crop and they are incorporated in the soil at the time of last land preparation before flowering. Azotobacter and Phosphate Solubilizing Bacteria (PSB) were applied with seed as seed treatment. The recommended dose of fertilizers (20:20:20::N:P:K) was applied through urea, single super

phosphate & muriate of potash to the crop as per treatments. The data on growth parameters, yield attributes and yield were recorded. The crop was harvested in 2nd fortnight of December. Economic indices viz. gross monetary returns (GMR), net monetary returns (NMR) and benefit : cost ratio (B:C ratio) were computed on the basis of cost involved in the cultivation and value realized from the produce per unit area under various treatments

Results & Discussion

The application of 50 % of RDF (10:10:10::N:P:K Kg/ha) with green manuring of sunhemp resulted the highest mean seed yield 482 Kg/ha and NMR of Rs. 7063/ha and it was at par with integration of 50 % of RDF & incorporation of cowpea as green manure crop (451 Kg/ha) mean seed yield and NMR (Rs. 6340/ha) among other bio fertilizer treatments on the basis of pooled data of four years (2008-11). The percentage of oil content was highest (34.8%) when 50 % of RDF (10:10:10::N:P:K Kg/ha) was integrated with green manuring of sunhemp There is no significant difference were found between treatments regarding B:C ratio on the basis of pooled value of four years (2008 to 2011). But maximum B:C ratio (2.4) was recorded with the application of 75% RDF + Azotobacter + PSB. These results are in accordance with the findings of Dalei et al.(2014).

Conclusion

Thus, application of 50% recommended dose of fertilizer with green manuring of sunhemp to niger crop is more productive along with enhancement in seed quality through increasing oil content in seed.

TO STUDY THE SOCIO-ECONOMIC ATTRIBUTES AND TECHNOLOGY ADOPTION BY CHICKPEA CULTIVATORS IN UTTAR PRADESH

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ABSTRACT

Chickpea's area production, and productivity have fluctuated widely over the past four decades. The present study was conducted in the central plain zone of Uttar Pradesh to find out the socio-economic characteristics of chickpea production technology. There are nine agro-climate zones in the state. In this region there are sixteen districts, out of which Kanpur Dehat and Unnao was randomly selected for the present study. From each of the selected districts three blocks were randomly selected. From each of these selected blocks three villages were selected randomly and from each of the selected villages, 12 respondents were selected randomly so as a total of two hundred sixteen respondents were selected for present study. The finding revealed that the majority (20%) of the respondents were illiterate, 6 per cent of them were functional literate, 17 per cent of them had education upto high school, 8% had education up to primary school, 13% had education up to middle school, 13% had education up to intermediate school, 13 per cent were graduates, whereas only 13 per cent of them had post graduate qualification. Further majority (72.222%) of the respondents had marginal size of land holding followed by small size (13.888%), medium size (8.333%), and large size only (5.557 %) respectively and majority (60.648%) of the respondents had low annual income (Rs 83086) followed by the medium income category (29.166%) and

only (10.186%) of them had high annual income (Rs 380116). Most (55.557%) of the respondents had low extension contact which limited them to get the latest technical know how about the recommended practices of chickpea. Chickpea's area production, and productivity have fluctuated widely over the past four decades. Some of the states like Punjab, Haryana, Uttar Pradesh, and Bihar have lost significant chickpea ground, while other states like Andhra Pradesh, Maharashtra, and Karnataka have brought extra area. Chickpea is a significant and valuable source of protein in the diets of poor people. Chickpea is grown in the subcontinent of India.

Keyword: Socio-economic characteristics, chickpea, technology adoption, Uttar Pradesh

HYBRID SEED PRODUCTION IN PEARL MILLET USING LINE X TESTER BREEDING TOOL IN ARID AND SEMI-ARID CONDITION.

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ABSTRACT

Pearl millet [*Pennisetum glaucum* (L.) R. Br.] is a major warm-season cereal grown on 26 million ha in the arid and semi-arid tropical (SAT) regions of Asia (more than 10 million ha) and Africa (15-16 million ha). Pearl millet is a staple food for the majority of poor farmers and also an important fodder crop for livestock population in arid and semi-arid regions of India. Line × tester analysis is one of the most powerful tools for predicting the general combining ability (GCA) of parents and selecting of suitable parents and crosses with high specific combining ability (SCA). A tester is a genotype that is used to identify superior germplasm in accordance with breeding objectives in a hybrid-oriented program.

Keywords: Pearl millet, Germplasm, GCA, SCA, SAT regions.

DARJEELING MANDARIN HEALTH CLINIC: AN INNOVATIVE EXTENSION APPROACH FOR ITS REVIVAL IN EASTERN HIMALAYA

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ABSTRACT

Purpose

Darjeeling mandarin (*Citrus reticulata* L.) is one of the most important cash crops of Sikkim and Darjeeling hills. It's cultivation in the hills is since time immemorial. However, during recent years the productivity of this crop has decreased due to various biotic and abiotic stresses. Some of the major reason of low productivity is lack of quality planting material, many severe pest and disease attack and less technical know-how in the cultivation aspects. Keeping these in mind, Indian Agricultural Research Institute (IARI), Regional Station, Kalimpong has conceptualized and established a Darjeeling Mandarin Health Clinic at Mungpoo, Balason & Sitong of Darjeeling and Iche Gaon of Kalimpong with the financial help of NABARD. The Health Clinic on Darjeeling mandarin has taken few initiatives viz.

production of healthy grafted planting materials by farmers, raising rootstocks at farmers field for grafting, trained the farmers for production of nucellar seedling, providing diagnostic services, advisory services on nutrient management, arranging necessary inputs, low cost nursery for virus free planting materials, marketing arrangement and capacity building of farmers on pest and disease management of Darjeeling mandarin.

Methods

The study collected the sample from all the villages where Plant health Clinic on Darjeeling Mandarin was established. Total 100 sample from each locations were selected randomly. Thus 300 farmers constitute the total sample for present study. Data was collected using structured schedule and statistical analysis was done using SPSS 21.

Results

The study on satisfaction of farmers about the service from health clinic revealed that 40 per cent farmer were highly satisfied about the quality of grafted planting materials, 51 per cent were highly satisfied about the training and 45 per cent were highly stratified about the timely inputs delivery. The study revealed that almost 1500 farm families re-started Darjeeling mandarin cultivation under its guidance and supervision. The initiative has helped to revive mandarin cultivation in almost 250 ha. area of Darjeeling and Kalimpong hills.

Conclusion

The study proved that adoption of recommended practices enhanced when interventions were made through community led institutions like Darjeeling Mandarin Health Clinic. This type of strategies should be replicated all over the district for promoting mandarin cultivation.

Keywords: Darjeeling Mandarin, Revival, Extension Model

REVIEW ON EFFECT OF MANGO (*Mangifera indica*) LEAF MEAL AS SUPPLEMENTARY FEED ON GROWTH AND DIGESTIBILITY OF COMMON CARP FINGERLINGS

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ABSTRACT

The state of world fisheries and aquaculture play an important role in food, nutrition and employment to millions of people to maintain proper livelihoods. Globle fish production is reported to have hit 179 million tonnes, with a total first sale price of USD 401 billion out of which 82 million tonnes, approximately USD 250 billion, derived from aquaculture production .In totality , 156 million tonnes were consumed by humans and 20.5 kg per capita is reported to be the annual supply . The remaining 22 million tonnes were designated for uses other than food, mostly for the production of fishmeal and fish oil. Aquaculture produced 46% of total fish and 52% of fish utilised in human consumption.

Fisheries is an essential area of food production that ensures the nations nutritional security while also providing a source of income for a substantial portion of the population, particularly the country’s fisherman. India provides about 7.7 per cent of global fish production and is the fourth largest exporter of fish products about in the world. India is 3rd largest fish producing and 1st largest Aquaculture nation globally with 14.73 MMT. Contribution of fisheries sector in national GDP was 1.24%. The total fish production during 2019-20 was 141.64 lakh tonnes with a contribution of 37.27 lakh tonnes from marine sector and 104.37 lakh tonnes from inland sector.

Rajasthan has vast and singnificant water resources (4.23 lakh ha.) for fisheries.but largely underutilized and untapped potential for fish production and livelihood development. 4.23 lakh ha water resources are available but fish production was 1.16 lakh tons in 2019-20.

The common carp is native to Europe and Asia, and has been introduced to every part of the world except the poles. They are the third most frequently introduced (fish) species worldwide, and their history as a farmed fish dates back to Roman times. Carp are used as food in many areas, but are also regarded as a pest in several regions due to their ability to out-compete native fish stocks. The original common carp was found in the inland delta of the Danube River about 2000 years ago, and was torpedo-shaped and golden- yellow in colour. It had two pairs of barbels and a mesh-like scale pattern. Although this fish was initially kept as an exploited captive, it was later maintained in large, specially built ponds by the Romans in south- central Europe (verified by the discovery of common carp remains in excavated settlements in the Danube delta area).

Keywords- Aquaculture, fishmeal, fish stocks, etc.

ROLE OF REVERSE BREEDING IN THE ERA OF MODERN PLANT BREEDING

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ABSTRACT

Reverse breeding (RB) is a novel plant breeding technique which is designed to produce the parental lines for any heterozygous plant. Reverse Breeding generates perfectly complementing pair of the homozygous parental lines through bio-engineered meiosis. The method is based on reducing genetic recombination in the selected heterozygote by eliminating meiotic crossing over. Also, the male or female spores which are obtained from such plants contains the combinations of non-recombinant parental chromosomes which can be cultured *in vitro* to generate homozygous doubled haploid plants (DHs). From these DHs, complementary parents can be selected and used to reconstitute the heterozygote. Since the identification of unknown heterozygous genotypes is impossible, reverse breeding could fundamentally change future plant of breeding.

Keywords: Bio-engineered meiosis, Double Haploids, Genetic Recombination, Reverse Breeding

ASSESSMENT OF PHOTOPERIOD SENSITIVITY IN KATARNI RICE DERIVED LINES UNDER DIFFERENT PHOTOPERIODS

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ABSTRACT

Rice is one of the major staple foods for more than 60% of the world population in general and South-East Asian people, in particular. However, very few high yielding non-basmati aromatic semi-dwarf rice varieties are available for cultivation. Katarni rice is traditional rice which is

native of Bihar and extensively grown in few blocks of districts of Bhagalpur, Munger and Banka. This rice has a unique aroma with medium slender grain but it suffers from lodging problem due to weak culm and tall height (150-170 cm) which results in its low yielding (25-30 Q/ha) ability. Simultaneously, it is photosensitive with longer maturity period of 150-155 days. Hence in order to enhance its Farmers adoption a high yielding semi-dwarf and early maturing aromatic lines of Katarni is needed. To reduce the height and maturity period, a marker assisted backcrossing and forward breeding programme was initiated at Rice Section, BAU Sabour by crossing Katarni with two semi-dwarf and medium maturing rice varieties namely Rajendra Sweta and IR 64. Present study was undertaken to assess the genetic variability among the 54 selected advanced breeding lines of Katarni along with parental checks i.e. Katarni, R. Sweta, IR 64, MTU7029, Sabour Surbhit and Rajendra Suwasini at four different date of sowing in two years i.e. 2018 (DOS 1: 15-6-2018) and 2019 (DOS2: 29-5-2019, DOS3: 15-6-2019 and DOS4: 15-7-2019). In a trial conducted in Alpha Lattice (Incomplete Block Design), the analysis of variance (ANOVA) showed highly significant differences for all the traits among all the genotypes studied. Grain yield per plant had positive non-significant correlation with days of 50% flowering in all three trials except for the DOS-4. Trait (fragrance) linked SSR markers used had showed considerable polymorphism among the genotypes. The gene specific primers for heading date (*Hd3A*), semi-dwarf (*sdl*) and fragrance (*badh2*) also explained variation among the genotypes. Katarni derived lines KIR-48, KMTU-54, KIR-49 were found to be photo insensitive because they flowered earlier both at (DOS-2 and DOS-3) when compared with Katarni check, whereas lines KIR-46 recorded photo insensitive in all the date of sowings and KRS-3 in (DOS-2, DOS-3 & DOS-4) to next best checks for days to 50% flowering i.e., Sabour Surbhit (DOS-1, DOS-2, DOS-3) and MTU-7209 (DOS-4).

Keywords: *badh2*, Katarni rice, PCV, Perfect markers, *sdl* gene, SSR markers

GROWTH AND YIELD OF PATCHOULI [*Pogostemon patchouli* (Blanco) Benth.] AS INFLUENCED BY ZINC

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ABSTRACT

A research was conducted on influence of zinc (as soil and foliar application) on growth and yield of patchouli [*Pogostemon patchouli* (Blanco) Benth.] during *khari* 2018-19 at the Medicinal and Aromatic Plants Unit, Saidapur Farm, Department of Horticulture, College of Agriculture, UAS, Dharwad. The Experiment was conducted in RBD (Randomized Block Design) with nine treatments and were replicated three times, in which different levels of zinc (10, 15, 20 and 25 kg ha⁻¹) as soil application and along with these different levels of zinc as soil application 0.5 percent of zinc as foliar application at 45 and 90 days after transplanting was taken.

Significant differences were found among different doses and methods of zinc application to crop on both growth and yield parameters. Among nine treatments, treatment with application of RDF + ZnSO₄ @ 25 kg ha⁻¹ + ZnSO₄ @ 0.5 per cent recorded higher values in growth parameters, which includes like plant height (93.93 cm), number of primary branches (15.20), number of secondary branches (43.47), number of leaves (528.13), leaf area (48.24 dm² /plant) and leaf area index (1.79) at the time of harvest. The same treatment also recorded the higher values with the yield parameters like fresh herbage yield (520.33 g/plant), dry herbage yield

(144.00 g/plant), fresh herbage yield (10.12 t/ha), dry herbage yield (2.63 t/ha), oil content (1.53%) and oil yield (40.17 kg/ha). Among the different methods of application, soil application along with foliar spray was found more advantageous over the soil application alone both in terms of growth and yield parameters. For the higher production of patchouli, application of zinc as both soil (25 kg/ha) and foliar application (0.5% at 45 and 90 days after transplanting) along with recommended dose of fertilizer helps in realizing higher yield.

Keywords: Patchouli, Zinc, Soil and Foliar application

BIOLOGY OF BRINJAL SHOOT AND FRUIT BORER (*Leucinodes orbonalis*) AND DAMAGING STAGE: A REVIEW

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ABSTRACT

Brinjal (Eggplant) *Solanum melongena* Linnaeus is one of the important and remunerative vegetable crops of hot and wet climatic zones. Among solanaceous vegetables, brinjal is one of the important crops grown throughout India. It is commercially very accessible and profitable vegetable to farmers. Which is grown everywhere in the world belongs to the family Solanaceae. The brinjal consists of several of vital biochemicals and rich source of minerals, such as vitamins, proteins, calcium, and phosphorus. Insect pests infestation is one the major constraints for commercial production in all brinjal growing areas. It is cultivated throughout the year, even in the hot summer season. It is more vigorous during the hot weather conditions, mainly during the rainfall period than the cooler season (November to February) due to the influence of climatic conditions on the life cycle. It takes more time to complete its life period in winter than summer months. Shoot and fruit borer causes severe loss to the fruits in autumn and the entire crop can be devastated. Generally, brinjal crop attacks by many insects such as shoot and fruit borer, leafhopper, whitefly, thrips, aphid, spotted beetles, leaf roller, stem borer and blister beetle. About 27 insect pests were recorded in this area that infests the brinjal crop. Among insect pests, brinjal shoot and fruit borer (BSFB) is one of the most destructive pests on brinjal in South and Southeast Asia.

Keywords: shoot and fruit borer, *Leucinodes orbonalis*, life history, incubation period.

ENVIRONMENTAL CONSEQUENCES OF LANDSLIDE HAZARDS: A CASE STUDY OF RISHIKESH TO BYASI REGION, TEHRI GARHWAL, UTTARAKHAND, INDIA

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ABSTRACT

In the era of climate change the diminutive stint strategic developmental activities now ecological imbalance and hazards like Landslide, Earthquake, Floods (Flash Flood, Urban Flood), Cyclone, Tsunamis, Volcanic Eruption and Drought etc. became more catastrophic for the next generation and raised the upcoming challenges for environmental sustainability. Due to increasing human foot prints pressure many other substantive issues rapidly enhanced like pollution, exploitation of natural resources and depletion of natural reserves, deforestation,

unplanned urban sprawl, urban heat island, carbon footprints, water foot prints, imbalance in ecological foot prints, adverse impacts of scientific and technological revolutions on the environment etc. In this era of digital revolution lots of advance technological reform regarding identification, forecasts, mitigative measures warning systems in relation to environmental hazards support in disaster risk reduction, help in economic growth of the nation and reduce the fatalities in the hilly regions of the earth.

The major reasons for environmental degradation on landslide prone areas caused due to the rapid explosion of global population and increasing global networking demand of infrastructural expansion (like Road network / Railways/ Tunnel/ Valley/Tourism etc.). Due to the undulating topography, complex geology, geomorphology, lithology of the hilly regions the settlements around the rivers undergo continuous threats due to various types of natural (Earthquake, Rainfall, rapid cloudburst due to changing climate) as well as anthropogenic causes (road cutting, degradation of vegetal cover, soil erosion, toe cutting, drainage discharge, seepage, waste dumping, settlement at vulnerability, risk, hazard zones etc.).

The environmental hazards which affects differently with respect to monsoon, weather, seasons, geological variations and neotectonic activities in the fragile hilly regions of the Himalayas caused lots of environmental impacts like removal of vegetal cover, rapid fertile soil erosion, regular changing sediment load on the river channels, lateral erosion of river banks, sedimentation, sinuosity, drastic shifting of environmental flow, fluctuation in rainfall frequency and pattern of river, stream and other water bodies, reduction in drinking water quality, forest cover, changing pattern of landuse/ landcover, change in habitat of native aquatic and terrestrial flora and fauna, adverse impacts on biome, biodiversity, biogeographic zones, agro climatic zones, wildlife vegetation cover and bioindicators, reduction in agricultural and pastoral land, socioeconomic losses and casualties. Space science and technology i.e. Remote Sensing and GIS technology play a vital role in the mitigation.

Now science and technology became boon for the environmental protection and management in various real time data availability which helps in decision making at economic, social, environmental, political, legal, and administrative level and ultimately protect from the losses of landslides risk-prone zone. Many studies shows that the environmental consequences ramification are much higher in developing nations than the developed nations. In the recent times sustainable development with environmental sustainability are major concern for the global academicians, scientists and researchers which need more cooperation, coordination and collaborations.

Keywords: Landslide, Impacts, Environmental Sustainability, Management

RESPONSE OF LIQUID BIOFERTILIZER AND THEIR MODE OF APPLICATION ON GROWTH AND YIELD OF FINGER MILLET (*Eleusine coracana* L.)

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ABSTRACT

A field experiment entitled “Response of liquid biofertilizer and their mode of application on growth and yield of finger millet (*Eleusine coracana* L.)” was carried out during *Kharif* 2020 at Research Farm of Tirhut College of Agriculture, Dholi, RPCAU, Pusa, Bihar in randomized block design with 3 replications involving 11 treatments to find out the effect of liquid biofertilizer on growth and yield of finger millet. The factors under study comprised of different liquid biofertilizer practices. T₁ - 100% RDF+seed treatment with liquid biofertilizer (5 ml kg⁻¹ seed) followed by soil application of liquid biofertilizer (2.5 lit., mix with 500kg/ha

FYM and apply in furrow, T₂ -100%RDF + seed treatment with liquid biofertilizer. T₃ - 100%RDF + seed treatment with liquid biofertilizer, T₄ -85%RDF+seed treatment with liquid biofertilizer (5 ml kg⁻¹ seed) followed by soil application of liquid biofertilizer (2.5 lit., mix with 500kg/ha FYM and apply in furrow, T₅ -85%RDF + seed treatment with liquid biofertilizer, T₆ -85%RDF + soil application of liquid biofertilizer, T₇.70%RDF+seed treatment with liquid biofertilizer (5 ml kg⁻¹ seed) followed by soil application of liquid biofertilizer (2.5 lit., mix with 500kg/ha FYM and apply in furrow, T₈ -70%RDF + seed treatment with liquid biofertilizer, T₉ -70%RDF + soil application of liquid biofertilizer, T₁₀ -RDF (40:20:20,N:P₂O₅:K₂O Kg ha⁻¹), T₁₁ -Control. The variety of finger millet (RAU-8) was sown on 28th July 2020. A common recommended dose of fertilizer of 40N:20 P₂O₅:20 K₂O Kg ha⁻¹ was applied.

The maximum significant grain yield (23.58 qha⁻¹) was recorded with T₁ - 100%RDF+seed treatment with liquid biofertilizer (5 ml kg⁻¹seed) followed by soil application of liquid biofertilizer (2.5 lit., mix with 500kg/ha FYM and apply in-furrow which was statistically at par with treatment T₃-100%RDF + Soil application with liquid biofertilizer and (21.47 qha⁻¹) T₄-85%RDF+Seed treatment with liquid biofertilizer (5 ml kg⁻¹ seed) followed by Soil application of liquid biofertilizer (2.5 lit., mix with 500kg/ha FYM and apply in furrow, (20.92 qha⁻¹) T₆ -85%RDF + Soil application of liquid biofertilizer.

All the growth parameter like plant height (92.45 cm), the number of tillers per plant (4.39), dry matter accumulation (20.57g plant⁻¹), days to 50% flowering (81.25), crop growth rate (2.73 g day⁻¹m⁻²), and relative growth rate were significantly influenced the treatments and maximum recorded at T₁ - 100% RDF + seed treatment with liquid biofertilizer (5 ml kg⁻¹ seed) followed by soil application of liquid biofertilizer (2.5 lit. mix with 500kg/ha FYM applied in furrows.

The maximum available nitrogen (185.25kg ha⁻¹), phosphorus (19.21 kg ha⁻¹) and potassium (132.78 kg ha⁻¹) and in term of dehydrogenase activity (gTPFg⁻¹ dry soil 24h⁻¹ in soil were observed with T₁ - 100% RDF + seed treatment with liquid biofertilizer (5 ml kg⁻¹ seed) followed by soil application of liquid biofertilizer (2.5 lit. mix with 500kg/ha FYM applied in furrows), which was found to be at par with treatment T₁₀ - RDF (40:20:20, N: P₂O₅:K₂O Kg ha⁻¹) and lower available nitrogen (121.52 kg ha⁻¹ kg ha⁻¹), phosphorus (10.40 kg ha⁻¹) and potassium (84.78 kg ha⁻¹) in soil were estimated with T₁₁ -(control) has noted maximum post-harvest availability of total N, P₂O₅, K₂O and dehydrogenase activity (gTPFg⁻¹ dry soil 24h⁻¹) of finger millet has shown significantly higher availability of nutrient (Dutta *et.al*, 2019).

The maximum gross return (89824 ₹ ha⁻¹), net return (62859 ₹ ha⁻¹) and B:C ratio (2.33) were fetched under T₁ -100% RDF + seed treatment with liquid biofertilizer (5 ml kg⁻¹ seed) followed by soil application of liquid biofertilizer (2.5 lit. mix with 500kg/ha FYM applied in-furrow and which was statistically at par with treatment T₃-100%RDF + Soil application with liquid biofertilizer and T₄-85%RDF+Seed treatment with liquid biofertilizer (5 ml kg⁻¹seed) followed by soil application of liquid biofertilizer (2.5-3 lit., mix with 500kg/ha FYM and apply in furrow, under finger millet. The minimum gross return (36203 ₹ ha⁻¹), net return (14703 ₹ ha⁻¹) and B:C ratio (0.68) was obtained under T₁₁-(control) under finger millet crop.

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**EVALUATION OF SEXUAL DIMORPHISM IN HYPOTHALAMUS OF CHICKEN
(*Gallus domesticus*)**

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ABSTRACT

The present study was conducted to identify sexually dimorphic regions in the chicken hypothalamus. Brain samples of apparently healthy chicken of either sex of 6-7 weeks was processed and consecutively stained by Hematoxylin and Eosin, Cresyl Violet and Toluidine Blue. The length and breadth of selected nuclei (preoptic nucleus, periventricular preoptic nucleus, medial suprachiasmatic nucleus and lateral hypothalamic nucleus) was calculated by Leica Qwin Images Analyser software in Leica DM 2000 Microscope. The study suggested that preoptic and medial suprachiasmatic nuclei were significantly ($P < 0.01$) larger in males than females and also demonstrated that in Nissl-stained sections the Preoptic nucleus appeared longer and stained more intensely in males than in females.

Keywords: Chicken, Hypothalamus, Preoptic nucleus, Suprachiasmatic nucleus, Sexual Dimorphism

**EFFECT OF PHOSPHORUS LEVEL AND MICRO INOCULANTS ON
PERFORMANCE OF WHEAT (*Triticum aestivum* L.)**

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ABSTRACT

Plant height recorded at 30, 60, 90 days after sowing and at harvest stage. The plant height was significantly affected by different phosphorus levels and micro inoculants at all the stages of crop growth except at 30 days after sowing maximum plant height of wheat was recorded with P₃ (100% RDP) which was significantly superior over P₂ (50% RDP) and P₁ (0% RDP (control)). In case of micro inoculants, maximum plant height of wheat was recorded with M₄ (PSB+VAM) which was significantly superior over rest of the micro inoculants. Maximum number of tillers/m was recorded with P₃ (100% RDP) which was significantly superior over P₂ (50% RDP) and P₁ (0% RDP (control)). In case of micro inoculants, highest number of tillers/m of wheat was recorded with M₄ (PSB + VAM) which was significantly superior over rest of the micro inoculants. Maximum dry matter accumulation was recorded with P₃ (100% RDP) which was significantly superior over P₂ (50% RDP) and P₁ (0% RDP (control)). In case of micro inoculants, highest dry matter accumulation/m of wheat was recorded with M₄ (PSB + VAM) which was significantly superior over rest of the micro inoculants. Maximum leaf area index was recorded with P₃ (100% RDP) which was significantly superior over P₂ (50% RDP) and P₁ (0% RDP (control)). maximum leaf area index was recorded with M₄ (PSB + VAM) which was significantly superior over rest of the micro inoculant treatments at 60 and 90 DAS. Maximum number of effective tillers/m was recorded with P₃ (100% RDP) which was significantly superior over P₂ (50% RDP) and P₁ (0% RDP (control)). In case of micro inoculants, maximum number of effective tillers/m was recorded with M₄ (PSB + VAM) which was significantly superior over rest of the micro inoculant treatments. Number of grains spike-

1 increased significantly with increase in number of phosphorus levels. Maximum number of grains spike/plant was recorded with P₃ (100% RDP) which was significantly superior over P₂ (50% RDP) and P₁ (0% RDP (control)). In case of micro inoculants, maximum number of grains spike-1 was recorded with M₄ (PSB + VAM) which was significantly superior over rest of the micro inoculant treatments. All the observation of phosphorus has been recorded at all the stages of crop growth except 30 days after sowing similarly the microbial inoculants has also been observed at all stages of crop growth except 30 days after sowing.

Keywords: wheat, Phosphorus, micro inoculants, RDP, PSB, VAM, plant height, dry matter accumulation, leaf area index, tillers and grains spike.

EFFECT OF NITROGEN AND SPACING ON GROWTH AND FLOWER QUALITY OF SPIDER LILY(*Hymenocallis littoralis* L.)

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ABSTRACT

The current study entitled “Effect of nitrogen and spacing on growth and of spider lily (*Hymenocallis littoralis* L.)”, was conducted between the years 2019–20 and 2020–21 at the College of Horticulture, Dr. Balasaheb Sawant Konkan krushi Vidyapeeth, Dapoli, considering the commercial significance of spider lily in the Konkan agro-climatic region. The experiment was held using a split plot design with three replications, four levels of spacing, four levels of nitrogen and 150 kg ha⁻¹ of phosphorous and potassium as common dosages (100 kg ha⁻¹). Plant height (117.80 cm), number of leaves (83.64), plant spread (132.61 cm) and leaf width (6.68 cm) recorded the highest growth parameters with treatment N₁ (300 kg ha⁻¹). The treatment S₂ (60×60 cm) had the highest plant height (115.92 cm) and plant spread (124.25 cm), but spacing S₃ (30×60 cm) and S₁ (90×60 cm) had the highest number of leaves (81.55) and leaf width (6.40 cm), respectively. The interaction (N×S) effect was found to be non-significant across all growth parameters. And the quality parameters viz., highest flower bud diameter (7.67 mm) and bud length (17.19 cm) were recorded with N₁ (300 kg ha⁻¹) whereas, the flower diameter and individual flower bud weight varied non-significantly. With regards to spacing, the highest flower diameter (19.45 cm) was recorded in S₃ (30×60 cm) and the flower bud diameter, bud length and individual flower bud weight varied non-significantly. However, the interaction effect of N₁S₃ (300 kg ha⁻¹; 30×60 cm) registered the highest bud length (17.36 cm). From the results, it is concluded that the spacing of 30×60 cm with the application of 300 kg nitrogen per ha along with common dose of 150 kg phosphorus and 100 kg potassium per ha under Konkan agro-climatic conditions was found to be best.

RESPONSE OF COMPOSTS AND INDUSTRIAL BY-PRODUCTS OR YIELD AND QUALITY OF MAIZE

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ABSTRACT

Maize (*Zea mays* L.) is the third most important cereal crops in the world after wheat and rice and known as “King of grain crops”. The conventional, non-conventional organic sources, industrial by-products influence soil productivity through their effect on physical and chemical properties of soil. With this preview, the present investigation was undertaken to study the influence of organic sources industrial by-products with inorganic fertilizers on the yield and quality of maize. The incubation experiment was conducted with conventional organic resources like vermicompost, non-conventional organic source like municipal solid waste compost and industrial by products like rice husk ash, lignite flyash with chemical fertilizers are used to study the release pattern of nutrients. For this incubation experiment, the soil was collected from Varugupettai village having clay loam, pH 7.6, EC 0.31 dS m⁻¹ (Typic Haplusterts). Regarding the available nutrient status, it was low in alkaline KMnO₄-N, high in Olsen-P and medium in NH₄OAc-K. The treatments constituting nine following T₁ - Control 100 % RDF, T₂ - 100 % RDF + Municipal Solid Waste Compost @ 5 t ha⁻¹, T₃-100 % RDF + Municipal Solid Waste Compost @ 10 t ha⁻¹, T₄ -100 % RDF + Vermicompost @ 2.5 t ha⁻¹, T₅ -100 % RDF + Vermicompost @ 5 t ha⁻¹, T₆ -100 % RDF + Bagasse Ash @ 5 t ha⁻¹, T₇ - 100 % RDF + Bagasse Ash @ 10 t ha⁻¹, T₈ - 100 % RDF + Lignite Flyash @ 5 t ha⁻¹, T₉ - 100 % RDF + Lignite Flyash @ 10 t ha⁻¹. Periodic soil samples at 30, 60 and 90 days after incubation (DAI) were taken and analyzed for pH, EC, organic carbon, available NPK. The results of the incubation experiment showed that 100 % NPK + Vermicompost @ 5 t ha⁻¹ was most efficient in increasing NPK availability in soil. These treatments were repeated and studied in pot experiment to evaluate their efficiency in increasing the yield of maize and improvement in soil nutrient availability.

The pot experiment was conducted in Department of Soil Science and Agricultural Chemistry, Annamalai University to evaluate the response of maize (*Zea mays* L.) with conventional, non-conventional organic source, industrial by-products combined with inorganic fertilizers. The treatments imposed were T₁-Control (100 % RDF), T₂- 100 % RDF + Municipal Solid Waste Compost @ 5 t ha⁻¹, T₃- 100 % RDF + Municipal Solid Waste Compost @ 10 t ha⁻¹, T₄ - 100 % RDF + Vermicompost @ 2.5 t ha⁻¹, T₅ - 100 % RDF + Vermicompost @ 5 t ha⁻¹, T₆-100 % RDF + Bagasse Ash @ 5 t ha⁻¹, T₇- 100 % RDF + Bagasse Ash @ 10 t ha⁻¹, T₈- 100 % RDF + Lignite Flyash @ 5 t ha⁻¹, T₉- 100 % RDF + Lignite Flyash @ 10 t ha⁻¹. There were nine treatments combinations replicated thrice in CRD. The soil was clay loam in texture with available nitrogen, phosphorus and potassium of 235.2, 38, and 226.4 kg ha⁻¹ respectively which fell in fertility status of low, high and medium. The soil classified taxonomically as Typic Haplusterts. The results showed that application of 100 % RDF + Vermicompost @ 5 t ha⁻¹ (T₅) significantly increased the growth attributes like plant height (208 cm), no. of leaves plant⁻¹ (14.3) and yield attributes viz., cob length (26.4 cm), cob girth (26.3 cm), cob weight (379.6 g plant⁻¹), no. of cobs plant⁻¹ (2) and grain yield pot⁻¹ 416.8 g pot⁻¹ and stover yield (545.9 g pot⁻¹). This treatment registered maximum quality attributes like starch content (72.9), and crude protein (11.3%), dry matter yield of grain (333.4 g pot⁻¹) and dry matter yield of stover (300.3 g pot⁻¹). The combined application of 100 % RDF + Vermicompost @ 5 t ha⁻¹ (T₅) registered the highest NPK uptake in grain and

stover i.e N (6.09 g pot⁻¹), P (1.060 g pot⁻¹), K (1.157 g pot⁻¹) and N (2.268 g pot⁻¹), P (0.615 g pot⁻¹) and K (3.976 g pot⁻¹). The uptake of grain in Fe (5.495 mg pot⁻¹), Mn (0.592 mg pot⁻¹), Zn (0.746 mg pot⁻¹) and the uptake of grain in Cu (0.118 mg pot⁻¹) recorded higher in the treatment (T₃) which received 100 % RDF with Municipal Solid Waste Compost @ 10 t ha⁻¹. Stover uptake in Fe (44.0 mg pot⁻¹), Mn (3.25 mg pot⁻¹), Zn (0.85 mg pot⁻¹) and Cu (0.72 mg pot⁻¹) was recorded highest due to application of 100 % RDF with Vermicompost @ 5 t ha⁻¹ (T₅). The post harvest organic carbon (6.2 g kg⁻¹), soil available N (153.1 mg kg⁻¹) and soil available P (22.3 mg kg⁻¹) status was higher due to application of 100 % RDF with Vermicompost @ 5 t ha⁻¹ (T₅). The post harvest available K (121.7 mg kg⁻¹) recorded higher in the treatment T₃ which received 100 % RDF with Municipal solid waste compost @ 10 t ha⁻¹.

DEPTHWISE DISTRIBUTION OF MICRONUTRIENTS (Fe, Mn, Zn & Cu) IN THE ORANGE ORCHARD SOILS OF TAMENGLONG DISTRICT, MANIPUR

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ABSTRACT

Orange grows in Manipur, a state in North Eastern part of India, is famous for its unique flavour and nutritional value. As there is reduction in the yield of orange in recent past years reported by the farmers, the experiment was observed with the objective of evaluating the depthwise distribution of micronutrient cations of soils in the *orange orchard* of Tamenglong district, Manipur. In addition to this, importance of micronutrients fertilizer is unnoticed and less use by the farmers. A total forty-five samples were collected from fifteen different orange orchards. Those samples were collected depth-wise at an interval of 20 cm up to 60 cm depth viz. 0-20, 20-40 and 40-60 cm, respectively. The correlation among the micronutrients was studied for each depth separately.

The studied soil samples showed a narrow texture variation. 84.44% of the studied samples were found to be clay texture and remaining 15.56% were clay loam in texture. In the experiment, DTPA- extractable micronutrients (*Fe, Cu, Mn and Zn*) were found ranging from 18.62 to 45.12 mg kg⁻¹, 0.12 to 1.26 mg kg⁻¹, 3.42 to 44.33 mg kg⁻¹ and 0.16 to 1.36 mg kg⁻¹, respectively. Distribution of *DTPA-Fe* varied from 25.00 to 45.12, 23.21 to 41.13 and 18.62 to 33.86 mg kg⁻¹ soil at 0 - 20 cm, 20 - 40 cm and 40 - 60 cm depth respectively. *DTPA-Cu* availability varied from 0.25 to 1.26, 0.20 to 0.87, 0.12 to 0.52 mg kg⁻¹ soils at 0 - 20 cm, 20 - 40 cm, 40 - 60 cm depth soils, respectively. *DTPA-Mn* varied from 6.11 to 44.33, 4.14 to 32.01 and 3.42 to 21.16 mg kg⁻¹ soil at 0 - 20 cm, 20 - 40 cm and 40 - 60 cm depth soils, respectively. *DTPA-Zn* content varied from 0.38 to 136, 0.22 to 1.24 and 0.16 to 0.88 mg kg⁻¹ soil at 0 - 20 cm, 20 - 40 cm and 40 - 60 cm depth soils, respectively. *DTPA-extractable Fe* showed positive correlation with *Cu* and *Mn* at 0 - 20 cm and *Cu* and *Zn* at 20 - 40 cm and *Cu* at 40-60cm. *DTPA-extractable Mn* showed positive correlation with *Zn* at 0 - 20 cm. The surface layer soils were fairly high in organic carbon and adequate in all the micronutrient content except *Zn* which deficiency occurred in 55.56 per cent soils across different depths and required *Zn* fertilization for better yield of orange.

Keyword: Orange, Micronutrients, Depth-wise, Tamenglong, Manipur.

BIOLOGY OF TEAK SKELETONIZER (*Eutectona machaeralis* W.) REARED IN LABORATORY CONDITIONS ON TEAK (*Tectona grandis*, Linn.) LEAVES IN SEMI-ARID REGION OF CENTRAL INDIA

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ABSTRACT

Study on biology and life cycle of *Teak skeletonizer* W. (Lepidoptera: Pyralidae) was carried out during *kharif* season of 2021 in the laboratory of Department of Entomology, Institute of Agricultural Sciences, Bundelkhand University, Jhansi U. P. (India). The common laboratory conditions viz., 30° C temperature and 73% relative humidity (RH) were maintained for the investigation. Results reveal that there were fifth larval instars. Average larval duration was 15 days and that of pre pupa and pupa were 1.5 and 6.5 days respectively when reared in common laboratory condition fed with teak foliage. The longevity of male and female adult was found as 6.5 and 8.5 days, respectively the oviposition duration were found as 3.5 days, Average number of eggs laid by the female during its life cycle was found to be 307.3. The total life cycle of male and female were found as 31.5 and 34.6 days, serially. In the field studies were conducted on the management of *Eutectona machaeralis* was carried in different bio-pesticides viz: *Bacillus thuringiensis* var. *Kurstaki* (5% WP), *Metarrhizium anisoplae* (2x10⁸ cfu), *Verticillium lecanii* (2x10⁸ cfu), *Baveria bassiana* (2x10⁸ cfu), Neem Seed Kernal Extract (Crude extract), Neem oil (5% EC). Experimental results revealed that the trees treated with bio-pesticides registered significantly difference of *Teak skeletonizer* over the treatment of untreated control. Among them the treatment of *Beaveria bassiana* (24.74 damage leaves/ plant) were found in significantly more effective against the pest as compared to other bio-pesticides NSKE, Neem oil, *Bacillus thuringiensis* var. *Kurstaki* and *Verticillium lecanii* were found moderately effective and proved significantly superior over NSKE, Neem oil, *Bacillus thuringiensis* var. *Kurstaki* and *Verticillium lecanii* after, NSKE, Neem oil, *Bacillus thuringiensis* var. *Kurstaki* and *Verticillium lecanii* proved significantly less effective among the bio-pesticides evaluated against *Eutectona machaeralis*.

Keywords: Biology, life cycle, Teak, *Teak skeletonizer*

BIOLOGY AND MANAGEMENT OF PULSE BEETLE *Callosobruchus chinensis* (L.) Infesting Green Gram, *Vigna radiata* (L.)

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ABSTRACT

Laboratory studies on “Biology and management of pulse beetle, *Callosobruchus chinensis* (L.) infesting green gram, *Vigna radiata* (L.)” was carried out under laboratory conditions at Department of Entomology, Institute of Agricultural Sciences, Bundelkhand University, Jhansi (U.P.) during 2021-22. The study on biology of pulse beetle, *C. chinensis* revealed that mean total number of egg laid by single female 85.33 eggs. The incubation period of eggs mean of 4.66 days. The egg laying period was mean of 5.33 days. The number of egg hatched was mean of 76.33 eggs. The egg hatchability per cent was mean of 84.66 eggs. The larval period was

mean of 10.33 days. The pupal period was mean of 7.33 days, respectively. The mean male and female adult longevity were 12.33 and 8.0 days, respectively. Total life cycle of male pulse beetle was mean completed in 39 days, while female life cycle was mean completed in 42.33 days.

Among different bio-products, seed treatment with castor oil @ 5 ml/kg was showed maximum mortality % of pulse beetle at 1, 3, 6 and 9 days after release were 23.33, 45.00, 62.67 and 65.67 per cent, respectively. Lowest mortality % of pulse beetle at 1, 3, 6, and 9 days after release were Tulsi leaf powder @ 5 gm/kg caused 5.00, 10.00, 24.00 and 25.00. The lowest number of mean egg laid by pulse beetle on castor oil @ 5 ml/kg treated green gram seeds/grain, which were 21.67, 25.67 and 24.33 eggs at 3, 6 and 9 days after release, respectively. The mean egg laid at 3, 6 and 9 days after release of beetle. The highest mean egg laid by Tulsi leaf powder @ 5 gm/kg treated seed was 58.33, 61.33, 60.00 eggs at 3, 6 and 9 days after release of adult, respectively. Tulsi leaf powder @ 5 gm/kg was least effective treatment.

Keywords:- Green gram, *Vigna radiata*, Pulse beetle, *Callosobruchus chinensis* (L.)

DETERMINATION OF THE MECHANIZATION STATUS OF UTTAR PRADESH USING STATISTICAL TECHNIQUE*

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Purpose

In this present study, quantification of mechanization will be done for all 9-agro climatic zones of Uttar Pradesh and comparison will be made based on constructed index Keeping the above discussion in mind the following objectives were taken into consideration. To assess existing mechanization status in various agro-climatic zones of Uttar Pradesh and quantify and compare mechanization status using suitable statistical technique in different agro-climatic zones.

Methods

An appropriate sampling design for selection of sample for primary data collection with respect to agricultural mechanization status in all 9-agro-climatic zones of UP state, was stratified multistage sampling treating group of agro-climatic zone as strata, district as first stage, and block as second stage, village as third stage and farmers as ultimate stage units. All 75-districts of UP may be stratified into 9-agro climatic zones strata, each zone consisting of many districts. Agro-climatic zone districts criteria was based on neighborhood (geographical proximity) i.e. each agro-climatic zone at least one district was selected. From each district at least one block was selected by simple random sampling without replacement (SRSWOR). Within each selected district, block was sub-stratified into urban and rural. From each block i.e. urban/rural, few villages were selected by SRSWOR in proportion to the total no. of villages in the block. All the selected villages shall be completely enumerated for preparation of sampling frame i.e. listing of farmers involved in mechanization. The cost and time were the constraint then list of farmers involved in mechanization was prepared in consultation with deputy director agriculture (extension) of each district staff, those were fully engaged in particular block and have information of each block primary as well as secondary data along with headman knowledgeable person of the village. The total no. of farmers involved in mechanization in the villages shall be grouped into three categories i.e. (i) farmers having implements and supply the implements to other farmers on custom hiring, (ii) farmers having implements and do not supply the implements to other farmers on custom hiring and

(iii) farmers not having implements and use them on custom hiring. Five farmers out of total no. of farmers shall be selected from each of the three groups by simple random sampling without replacement. Finally primary data on agricultural mechanization status was collected from all 9-agro-climatic zones i.e. 600 farmers at least 30 farmers in each selected district in each agro-climatic zone as per the prepared proforma.

Results: The results of the study were done in the following points:

1. Mechanization Index (MI):The average values of mechanization index in Central Zone, Eastern Plain Zone, South Western Semi-Arid Zone, Bundelkhand Zone, Bhabhar and Tarai Zone, Mid-Western Plain Zone, North Eastern Plain Zone, Vindhyan Zone, Western Plain Zone of Uttar Pradesh were 0.9464, 0.953, 0.9541, 0.9201, 0.9587, 0.9547, 0.9502, 0.9481 and 0.9644 respectively.

2. Level of Mechanization (Farm Power):The average values of level of mechanization i.e. Farm Power in Central Zone, Eastern Plain Zone, South Western Semi-Arid Zone, Bundelkhand Zone, Bhabhar and Tarai Zone, Mid-Western Plain Zone, North Eastern Plain Zone, Vindhyan Zone, Western Plain Zone of Uttar Pradesh were 2.18, 2.93, 3.41, 1.61, 3.70, 3.47, 2.53, 2.37 and 5.38 kW respectively.

3. Cropping Intensity: The average values of cropping Intensity in Central Zone, Eastern Plain Zone, South Western Semi-Arid Zone, Bundelkhand Zone, Bhabhar and Tarai Zone, Mid-Western Plain Zone, North Eastern Plain Zone, Vindhyan Zone, Western Plain Zone of Uttar Pradesh were 212.04, 196.25, 196.00, 124.59, 150.00, 162.79, 107.50, 177.50 and 195.24% respectively.

4. Total Energy: The average values of total energy in Central Zone, Eastern Plain Zone, South Western Semi-Arid Zone, Bundelkhand Zone, Bhabhar and Tarai Zone, Mid-Western Plain Zone, North Eastern Plain Zone, Vindhyan Zone, Western Plain Zone of Uttar Pradesh were 540.76, 883.08, 987.63, 426.94, 1067.27, 1018.52, 620.38, 704.37, and 1738.3 kWh/ha respectively.

5. Mechanical Energy: The average values of mechanical energy in Central Zone, Eastern Plain Zone, South Western Semi-Arid Zone, Bundelkhand Zone, Bhabhar and Tarai Zone, Mid-Western Plain Zone, North Eastern Plain Zone, Vindhyan Zone, Western Plain Zone of Uttar Pradesh were 495.49, 748.45, 899.68, 400.31, 1020.46, 931.49, 541.95, 676.07, 1676.64 kWh/ha respectively.

6. Human Energy: The average values of human energy in Central Zone, Eastern Plain Zone, South Western Semi-Arid Zone, Bundelkhand Zone, Bhabhar and Tarai Zone, Mid-Western Plain Zone, North Eastern Plain Zone, Vindhyan Zone, Western Plain Zone of Uttar Pradesh were 45.27, 139.21, 59.43, 26.63, 46.81, 87.03, 78.43, 28.31 and 61.63 kWh/ha respectively.

7. Annual Farmers Income: The average values of annual farmer income in Central Zone, Eastern Plain Zone, South Western Semi-Arid Zone, Bundelkhand Zone, Bhabhar and Tarai Zone, Mid-Western Plain Zone, North Eastern Plain Zone, Vindhyan Zone, Western Plain Zone of Uttar Pradesh were 148892, 118300, 154000, 119852, 270000, 294651, 158500, 254575 and 335500 rupees respectively.

8. Annual Input Cost: The average values of annual farmer income in Central Zone, Eastern Plain Zone, South Western Semi-Arid Zone, Bundelkhand Zone, Bhabhar and Tarai Zone, Mid-Western Plain Zone, North Eastern Plain Zone, Vindhyan Zone, Western Plain Zone of Uttar Pradesh were 52425, 46035, 45568, 32463, 51344, 35974, 57138, 4558 and 49550 rupees respectively.

9. Irrigation Intensity: The average values of irrigation intensity income in Central Zone, Eastern Plain Zone, South Western Semi-Arid Zone, Bundelkhand Zone, Bhabhar and Tarai Zone, Mid-Western Plain Zone, North Eastern Plain Zone, Vindhyan Zone, Western Plain Zone of Uttar Pradesh were 212.04, 196.25, 196.00, 124.59, 150.00, 162.79, 107.50, 177.50 and 195.24 % respectively.

10. Degree of Mechanization (DM):The average values of degree of mechanization in all unit operations starting from sowing to threshing in Uttar Pradesh for different agricultural implements i.e. Cultivator, Power tiller, Disc plow, M B plow, Desi hal, Disc harrow, Leveller, Puddler, Bundmaker, Rotavator, Seed cum ferti drill, Diesel engine, Electric pump, Sprinkler, Dripper, Spray manual, Spray tractor, Harvesting worker, Harvesting harvester, Thresher were 0.636, 0.002, 0.057, 0.003, 0.004, 0.202, 0.040, 0.140, 0.038, 0.013, 0.126, 0.364, 0.205, 0.001, 0.00, 0.418, 0.004, 0.984, 0.016, and 0.398 respectively.

Conclusion

After analysis of data of all 9-agro-climatic zones of Uttar Pradesh in the year 2018-19, the average values of mechanization status indicators i.e. Mechanization Index, Farm Power (kW/ha), Cropping Intensity (%), Irrigation Intensity (%), Annual Farmers Income (Rs), Annual Input Cost (Rs), Human Energy (kWh/ha), Mechanical Energy (kWh/ha), Total Energy (kWh/ha) were 0.9501, 3.06, 169, 169, 196320, 55941, 63.64, 821.17 and 887.47 respectively.

Keywords: Mechanization Index, Farm Power, Degree of Mechanization, Net cultivated area, Cropping Intensity.

PREPARATION AND PRESERVATION OF FRUIT WINE WITH FACTORS AFFECTING FERMENTATION

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ABSTRACT

Fruit is an essential part of your diet contributing various health promoting bioactive constituents including vitamins and minerals. Fruit wines are fermented and undistilled alcoholic beverages made up of fruits other than grapes and might also have additional flavors taken from fruits, flowers, and herbs. Depending on the region and its specific agro-climatic situations, variety of fruits and berries possess the potential to produce wine that undergoes a period of fermentation and aging. They usually have an alcohol content ranging between 5 and 13%. Wines made from fruits are often named after the fruits. No other drinks, except water and milk, have earned such universal acceptance and esteem throughout the ages as has wine. Wine is a food with a flavour like fresh fruit which could be stored and transported under the existing conditions. Being fruit-based fermented and undistilled product, wine contains most of the nutrients present in the original fruit juice rather the nutritive value of wine is increased due to the release of amino acids and other nutrients from yeast during fermentation. Fruit wines contain 8–11% alcohol and 2–3% sugar with energy value ranging between 70 and 90 kcal per 100 ml. The production of quality wine is influenced by numerous factors of which fruit quality is one of the most important factors. The production of quality wine, however, is not possible without the selection of efficient fermenting yeast, good winemaking techniques, maintaining overall conditions for fermentation and effective quality control. The present paper explained about the factors affecting fruit wine fermentation and its preservation techniques.

Keywords: Fruit fermentation, sugars, pH, inoculums, fermenting yeast, wine flavour

REDUCING POSTHARVEST LOSSES DURING STORAGE FOOD SECURITY IN DEVELOPING COUNTRIES

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ABSTRACT

Poor storage and transportation infrastructure is the principal source of the Rs 92,651 crore postharvest losses that Indian farmers experience yearly. Unfortunately, the high-level Dalwai committee report states that all it takes to enhance the status of storage and transportation infrastructure for food crops is an investment of Rs 89,375 crore, which is just slightly less than the yearly postharvest losses. Lack of logistical connectivity to ensure that a farmer's crop arrives at markets promptly lowers their capacity to market their products as a market is a primary venue for farmers to trade their goods for money. This becomes even more crucial when it comes to perishable fruits and vegetables. 54.6 per cent of India's population depends on agriculture for a livelihood, with 82 per cent of farmers being small and the population below it, although agriculture contributes the least to GDP. Agriculture contributes 20.2 per cent to the national GDP. Food demand for a rapidly increasing global population is a big challenge to humanity. The population is expected to grow to 9.1 billion people by 2050, and about 70% extra food production will be required to feed them. While fulfilling the food demand of an increasing population, reducing the postharvest losses, especially in developing countries, could be a sustainable solution to increase food availability, reduce pressure on natural resources, eliminate hunger and improve farmers' livelihoods.

Keywords: Farmers livelihood, Food demand, Population, Postharvest losses

A REVIEW ON HUMAN HEALTH EFFECT OF HEAVY METALS

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ABSTRACT

These metals have been extensively studied and their effects on human health regularly reviewed by the international bodies such as the WHO. The heavy metals have been used by humans for thousands of years. Although several adverse health effects of the heavy metals have been known for a long time, exposure to heavy metals continues, and is even increasing in some parts of the world, in particular in less developed countries, though emission have declined in most developed countries over the last 100 years. The recent data indicate that adverse health effects of cadmium exposure may occur at lower exposure levels than previously anticipated, primarily in the form of kidney damage but possible also bone effects and fractures. The general population is exposed to lead from air and food in roughly equal proportions. Exposure to the arsenic is mainly via intake of the food, drinking water and food being the most important source in most populations.

Keywords: Heavy metals, Health effects, Human beings.

SURVEY OF SOME GRASS FLORA IN SIX TEHSIL OF DISTRICT RAMPUR, UTTAR PRADESH, INDIA WITH SPECIAL REFERENCE TO THEIR MEDICINAL VALUE.

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ABSTRACT

The present study deal with survey and identification of grass plants species in six tehsil of district Rampur viz. Swar, Shahabad, Milak, Sadar Rampur, Bilaspur, and Tanda. By this survey we investigated that grasses are the members of Poaceae (Gramineae) family which are the most vital part in our life as food, medicine, cattle-fodder and many different things. Rampur district is represented by six subfamily and fourteen tribes of family Poaceae. Subfamily Panicoidea (23 species) had the highest number of species followed by Chloridoideae (7 species), Pooideae (5 species) and Bambusoideae (1 species), Ehrhartoideae (1 species), Arundinoideae (1 species) each. Total 38 grass plants species found in different tehsil of district Rampur. These 38 plant species were identified and these species belong to 6 subfamilies. We recorded total 38 grass species out of which 21 grass species used in fungal infection, fever, haematuria, urinary diseases, intestinal worm, asthma, jaundice, cough, wounds, snakebite rheumatism etc. Some medicinal grass species such as *Bambusa arundinacea willd*, *Cymbopogon citrates Stapf*, *Desmostachya bipinnata Stapf*, *Heteropogon contortus L.*, *Panicum antidotale Retz*, *Setaria glauca L.* and so on.

Keywords: Grasses, Medicinal value, Food, Fodder, Subfamily, Tribes, Taxonomic study, Rampur district.

EFFECTS OF NATURAL AND ARTIFICIAL POLLINATION ON FRUIT AND OFFSPRING QUALITY

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ABSTRACT

Worldwide, many crops rely on insect pollination. Insufficient pollination can reduce fruit and seed set by directly reducing pollen deposition, and can also affect offspring quality, such as growth rate and resistance to herbivores, by limiting outcrossing opportunities. Both effects are important in fruit agroecosystems where fruit size and the quality of seeds for re-planting are dependent on sufficient pollination. We experimentally manipulated pollination of the cape gooseberry, *Physalis peruviana L.* (Solanaceae), to test the effects of honey and bumble bee pollination compared to manual outcrossing and autonomous self-pollination on fruit and offspring characteristics. Compared to manual and self-pollination, bee pollination increased fruit size, seed set and germination rates, supporting the hypothesis that sufficient pollination increases plant fitness. Interestingly, plant growth rate and herbivore resistance were significantly and marginally greater in manually outcrossed plants compared to self-pollinated offspring, suggesting that inbreeding reduces offspring quality. Herbivore resistance and plant growth did not differ between one honeybee visit and self-pollination suggesting that multiple pollinator visits are needed to prevent inbreeding events. Our data suggest that the quantity and quality of pollen deposited by bee visitation can significantly alter ecologically and economically relevant traits in this agroecosystem.

Keywords: self-pollination, outcrossing

ADDITIONAL RECORD OF COMMON BARON *Euthalia aconthea* (Cramer, 1777) (LEPIDOPTERA : NYMPHALIDAE) FROM WESTERN DOON VALLEY, DEHRA DUN (UTTARAKHAND, INDIA) WITH ITS DISTRIBUTION IN INDIA AS PER SUBSPECIES, HOST PLANTS AND CONTROL MEASURES

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ABSTRACT

Recently a good specimen of *Euthalia aconthea* (Cramer, 1777), the Common Baron, belonging to family Nymphalidae under order Lepidoptera, has been found in Western Doon Valley, Dehra Dun (Uttarakhand, India) and recorded here as additional record for the area. The distribution of the species as per its subspecies (*Euthalia aconthea garuda*, *E. a. acontius*, *E. a. anagama*, *E. a. meridionalis* and *E. a. suddhodhana*) found in Indian region, larval host plants and control measures are provided.

Keywords: *Euthalia aconthea*, Western Doon Valley, Dehra Dun.

REGENERATIVE FASHION AND ITS NECESSITY

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ABSTRACT

The fashion industry is the 3rd biggest water consumer and the 5th biggest greenhouse gas emitter in the world in India, more than 1 million tones of textiles are thrown away every year, with most of this coming from household sources, according to the Indian Textile Journal. Textiles make up about 3% by weight of a household bin. Textile waste is also the third-largest source of municipal solid waste in India. This needs to change. Indeed, cotton is the most water-intensive raw material, and manufacturing generates negative externalities — such as water, environmental, and biodiversity pollution.

In this paper, explained the Concept of Regenerative Agriculture. If we need to reduce our consumption and improve the recycling process, we can also act on the value chain, by changing all the activities leading to the creation of the piece of clothing. Regenerative fashion changes the usual approach, by conditioning the garment so that it becomes a resource and not a waste product.

Regenerative fashion goes beyond being organic — its ultimate goal is to enrich the earth. The piece of clothing is composed exclusively of natural organic fibers — which are themselves the result of enriching cultivation processes. No depletion of soil my monoculture, no use of pesticides nor fertilizers, and respect for local biodiversity. It is mainly a biodynamic method of cultivation, agriculture that considers the earth as a complex living being, and its inhabitants, whether living or inert, as energy resources for nourishment and regeneration. Regenerative agriculture mimics the cycles that occur naturally in nature, helping to increase biodiversity, enrich the soil and mitigate global warming. It sounds fictional but it’s already happening. Many brands from England and California are leading the way in this revolution.

Keywords: - Externalities, Biodiversity Pollution, Regenerative Agriculture, Regenerative Fashion, Organic.

INSIGHTS INTO THE BUFFALO HOUSING PRACTICES IN RELATION TO HERD SIZE ADOPTED BY FARMERS OF CHITTORGARH DISTRICT IN RAJASTHAN

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ABSTRACT

A study was designed to evaluate the existing housing practices followed by the farmers of Begun and Kapasan tehsils in Chittorgarh district of Rajasthan. In total, 160 respondents were randomly selected from four villages of each selected tehsil and interviewed regarding the various housing practices adopted by them. Regarding the housing management practices 61.25 per cent of the respondents kept their animals inside dwelling house. Most of respondents (90.00%) had *kutch* floor. Roof made by asbestos material was prevalent in the study area (52.50%). Wall of shed was prepared from stone in mud/cement material by 36.88 per cent of the respondents followed by that prepared from bricks in lime or cement (30.62%). The number of respondents having *pucca* manger were 44.19 per cent. About 37.50 per cent respondents followed grooming practice of their buffalo. About 35.00 per cent of the respondents had constructed water trough in animal shed. Bedding material was provided to their buffalo by 73.75 per cent of the buffalo keepers during winter season. Findings indicated that 56.87 per cent of the respondents segregate their buffalo before calving and 67.50 per cent provided bedding material to pregnant buffalo. No one had wallowing facility in their animal shed.

Keywords: Buffalo housing, Chittorgarh, Bedding material.

STANDARDIZATION OF FERTILITY LEVELS FOR SINGLE- CUT FODDER SORGHUM [*Sorghum bicolor* (L.) MOENCH] GENOTYPES

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ABSTRACT

A field experiment entitled “Standardization of Fertility Levels for Single- cut Fodder Sorghum [*Sorghum bicolor* (L.) Moench] Genotypes” was conducted at Instructional Farm, Rajasthan College of Agriculture, MPUAT, Udaipur during *Kharif*, 2018 with the objectives to select suitable single-cut fodder sorghum genotype, to work out optimum fertility levels and to arrive economically viable treatment. The experiment consisted of 15 treatment combinations comprising 5 genotypes (SPV 2296, SPV 2316, SPV 2445, CSV 21F and CSV 30F) with 3 fertility levels (75, 100 and 125 per cent RDF). The experiment was laid out in Factorial Randomized Block Design with three replications. The experimental soil was sandy clay loam in texture, moderate alkaline in reaction (pH 8.1), low in available nitrogen (247.2 kg ha⁻¹), medium phosphorus (20.8 kg ha⁻¹) and high in available potassium (375.9 kg ha⁻¹) while medium in organic carbon (0.69%). The crop was sown on 05th July 2018 with recommended seed rate of 25 kg ha⁻¹.

Single-cut fodder sorghum genotype SPV 2445 recorded significantly higher plant height, stem girth, leaf to stem ratio and number of leaves plant⁻¹ thus resulted highest dry matter accumulation at successive crop growth stages and at harvest as compared to genotypes SPV

2296, SPV 2316, CSV 21F and CSV 30F. These improvements manifested in the production of significantly higher green (57.34 t ha⁻¹) and dry fodder yield (14.22 t ha⁻¹), net return (58375 ha⁻¹) and B:C ratio (2.66).

The higher N, P, K content and its uptake was observed in genotype SPV 2445. Genotype SPV 2445 recorded significantly higher crude protein, crude fibre, ether extract and mineral ash content at harvest. The maximum nitrogen free extract and total digestible nutrient content were recorded in genotype SPV 2296 which was significantly higher over rest of the genotypes. The lowest HCN content at 30 DAS and at harvest was registered with genotype SPV 2445.

Keywords- Sorghum, Fertility levels, Organic carbon, Nitrogen Potassium, Phosphorus, etc.

DIGITAL APPLIQUE WORK: BEAUTIFUL IN ITS SIMPLICITY

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ABSTRACT

Applique work is one of the most famous art form around the world (Anonymous, 2018). The term appliqué is derived from French and Latin words appliquer and applicare, respectively, which both mean to join or attach (Upadhyay, 2017). Like embroidery, it has a humble beginning. The technique was used as a way to strengthen worn areas of items or to patch holes that had formed. An early applique was used to prolong the life of clothing and transferred to artistic techniques that can be seen in blankets and quilts from many cultures around the world (Mohapatra 2005). The applique work designs were documented for the study from secondary sources and the most preferred designs were selected for digitization as per preferences of experts. Digitization was done using embroidery softwares and products were developed. Developed products with digital technology were evaluated on various parameters. The study was found that applique works such a fabulous craft, developed products with digital technology were highly liked by consumers in terms of Motif (2.96), Design (2.94), placement of Design (2.78), colour ways (2.32) and overall appearance (2.68) Weighted Mean Score.

Keywords: Digital software's, Applique work, Consumer Opinion, Marketability, Textile Heritage.

EFFECT OF FERTIGATION (NPK) ON VEGETATIVE GROWTH AND MORPHOLOGY OF KINNOW MANDARIN FRUIT IN ZONE IIIA OF BIHAR

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ABSTRACT

This experiment was conducted in the Department of Horticulture (Fruit & Fruit Tech.) at Bihar Agricultural College, Sabour, Bhagalpur under BAU, Sabour on six years old Kinnow plants under high density planting. There were seven treatments of different levels of fertilizer viz. T₁- 120 % of RDF; T₂- 100% of RDF; T₃- 80% of RDF; T₄- 60% of RDF; T₅- 40% of RDF; T₆- Full dose in basal with drip irrigation and T₇- Full dose in basal without drip irrigation and each treatment were replicated thrice in randomized block design.

Research indicated that increase in current season shoot (8.68 cm) under T₁ which was at par with T₂ (7.93 cm) whereas lowest 6.25 cm in T₅ i.e 40% RDF. Data regarding to plant height, it was found highly significant among the treatments. Highest increase in plant height (88.54

cm) was recorded in T₁ which was at par with T₇ (82.74 cm) followed by T₂ (79.26 cm) whereas lowest in T₅ (68.43 cm). Similar trend was showed in LAI with the application of different doses of NPK through fertigation. Maximum LAI (7.88) was recorded under T₂ whereas minimum (6.90) in T₅.

Fruit weight was also height under higher dose of fertilizer. It was maximum (165.76 g) in T₁ which was at par with T₂ and minimum (133.66 g) under T₅. Significant differences of different doses of fertilizers were also observed in fruit length. Highest (64.16 mm, 62.15 mm and 60.00 mm) were observed in T₂, T₃ and T₇ respectively whereas lowest (55.00 mm) in T₅. There was no significant differences were observed in fruit width. . In most of the cases 120 % RDF was found the best which was at par with 100 % of RDF. In most of the observations, both treatments were showed at par reading; hence 100 % RDF may be more beneficial for the farmers.

EVALUTION OF NEW KALANAMAK SCENTED RICE GENOTYPES FOR YIELD & YIELD RELATED TRAITS OF TARAI REGION OF EASTERN UTTAR PRADESH.

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ABSTRACT

Crop genotypes play a dominant role in crop production systems. Uttar Pradesh has been the home of some of the finest quality scented rices. Kalanamak is an important & popular scented rice variety grown in some district of Eastern Uttar Pradesh as well as Balrampur. This variety is famous for its taste and aroma. In eastern India it is cooked in honour of guest are given as gift. It can be boon for farmers of tarai region of eastern Uttar Pradesh & Bihar. In present study 7+2 line/ genotypes of Kalanamak, collected from IRI, New Delhi were evaluated on the basis of vital to know the effect of various characters on yield for the selection criteria for high yielding & quality genotype. The experiment laid out at KVK farm during Kharif 2018 & 2019. Yield & yield related traits were studied. Statistical analysis exhibited that rice genotypes differed significantly for days to 50% flowering, plant height (cm) panicle m², number of spikelets per panicle, SRF % , grain yield (Kg/ha), grain type & incidence of insect pests & diseases. Moreover significantly positive genotypic correlation of grain yield with plant height & panicle/m² were observed. The result indicated that high yield was recorded in Pusa 1638-07-130-2-67-1-1-1 (3158kg/ha) followed by Pusa 1652-10-11-2-1-1-1 (3065kg/ha). Grain yield increase over check (Bauna Kalanamak & Kala Namak) have high stability. The investment on production by adopting improved Kalanamak genotypes with a value of Rs. 32190/ ha. cultivation under improved Kalanamak genotypes/ line, Pusa 1638-07-130-2-67-1-1-1 fetch higher net return of value Rs. 95975/ha as compared to check variety Bauna Kalanamak & Kalanamak respectively (Rs. 80385/ha, 78375/ha) followed by Pusa 1652-10-11-2-1-1-1, Pusa 1638-07-62-2-13, Pusa 1638-07-5-3, Pusa 1638-07-62-2-10 & Pusa 1652-07-69-2-29-1-2. The BC ratio of improved Kalanamak line was higher in Pusa 1638-07-130-2-67-1-1-1 (2.99) followed by Pusa 1652-10-11-2-1-1-1, Pusa 1638-07-62-2-13, Pusa 1638-07-5-3, Pusa 1638-07-62-2-10 & Pusa 1652-07-69-2-29-1-2. On the basis of result of this experiment it can be concluded that genotype Pusa 1638-07-130-2-67-1-1-1 & Pusa 1652-10-11-2-1-1-1 can be used as commercial cultivars in Balrampur & other Tarai district of eastern Uttar Pradesh area after multi locational trials.

IMPACT OF DROUGHT ON CROPS AND WAYS TO MITIGATE IT

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ABSTRACT

An extended period of deficient rainfall compared to normal rainfall of that region is called as drought. Drought stress is one of the most important abiotic stresses to crop plants. It can occur for a variety of reasons, including low precipitation, absence of water availability or decreased access to water supplies. There is a considerable loss of yield due to drought stress even though plants have developed mechanisms to cope up with it. Globally, about one-fifth of the damage caused by natural hazards can be ascribed to droughts (Dewgan et al. 2016). Some of the most common effects of drought seen in the crops are changes in water relations, reduction in photosynthesis and respiration, hormonal imbalances, protoplasmic dehydration, membrane breakdown, growth, development and finally yield. However, every plant has developed some or the other mechanism to overcome it such as drought escape, drought resistance, drought avoidance, and drought tolerance.

Several measures which can be practiced manually for mitigating drought are contingency cropping, mulching, tillage, use of anti-transpirants, use of shelter belts, supplemental irrigation as well as water harvesting. Nearly 73% of the cropland in the world and about 60% of the cultivated area in India is rain-fed and it contributes to 40% of total food production (Patil et al. 2016). Drought stress has been found to affect each crop in a different manner and hence ways to mitigate it must be carried out accordingly. A combination of ridges and furrow with tied ridging and the application of 50 per cent RDF + FYM @ 2.5 tons per hectare + biofertilizer as seed treatment was found to be beneficial for in situ moisture conservation and increasing productivity of pearl millet in semi-arid conditions (Wani et al. 2014).

Keywords: abiotic stresses, contingency cropping, drought resistance, drought avoidance, drought tolerance.

A STUDY ON ENTREPRENEURSHIP BEHAVIOUR AND READINESS AMONG AGRICULTURE STUDENTS UNDER STUDENT READY PROGRAMME (SRP)

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Introduction

Increase in the education level increases unemployment among the young age groups in India (Anonymous, 2014). Hence, economic development of a nation depends on its employment rate. Entrepreneurship development is one such pathway for overcoming unemployment among students in higher education. Taking into consideration of agriculture sector in India, agricultural graduates play a crucial role in agriculture development and holds greater responsibility in building the quality man-power. Now-a-days it is challenging to find job opportunities in public sector and private sector for all the agricultural graduates. Hence, there is a need to develop entrepreneurial behaviour and impart required skills and find the readiness of students towards entrepreneurship development. In path of this enforcement, the “Fifth Deans committee” of Indian Council of Agricultural Research (ICAR) has recommended a new course Student Rural Entrepreneurship Awareness Development Yojana (READY) during final year of undergraduate courses in all the disciplines of agriculture and allied sciences (Anonymous, 2019). It promotes the graduates to build confidence and prepare their mindset

to become entrepreneurs. Thus this programme helps to earn their livelihoods and strengthen rural economy. In spite of all these efforts, hardly few students show interest to become entrepreneurs. Hence, there is a need to understand the mindset and difficulties of the agriculture students to move towards the entrepreneurship and become self-sufficient (Sanketh *et al.*, 2022). With this background the study was conducted with the objective, “to assess the entrepreneurship behaviour and readiness among agriculture students under Student READY Programme in UAS Dharwad.

Methodology

An ex-post facto research design was used in the study to assess the entrepreneurship behaviour and readiness among agriculture students under Student READY Programme. The study was conducted at University of Agricultural Sciences (UAS), Dharwad, Karnataka State. A total sample size of 68 agriculture graduates who completed their graduation during 2022 and have undergone READY programme were randomly selected for the study. The study was conducted through online survey mode with the help of Google Forms in pattern of multiple choice questions. A scale developed by Sanketh (2020) was used to measure the entrepreneurship behaviour. The scale has 35 statements comprising of seven dimensions viz., innovativeness, risk taking ability, achievement motivation, decision making ability, leadership ability, management orientation and goal setting ability. The response for each statement was rated on a five point continuum Likert-scale which ranged from ‘strongly agree’ (5 point) to ‘strongly disagree’ (1 point) for positive statements and it was reversed for negative statements. To measure the readiness to start an enterprise among agriculture students, schedule was developed by Sanketh (2020) was used for this study. Based on total score, the respondents were categorized into three categories as low, medium and high using mean and standard deviation. The collected data was tabulated and analyzed with statistical tools as frequency, percentage, mean standard deviation, correlation and regression.

Results

The results of the study clearly indicated that more than one-third (36.76%) of the agriculture graduates had possessed medium level of entrepreneurship behaviour, followed by 33.82 per cent low level and 29.42 per cent of the respondents had high level of entrepreneurship behaviour. With respect to the findings of readiness among agriculture graduates towards entrepreneurship development, the results showed that more than one-third (35.29%) of the respondents had high level of readiness, followed by low level (33.82%) and medium level (30.89%) of readiness towards entrepreneurship development. The study also revealed that Overall Grade Point Average (OGPA) of the respondents had a positive significant relationship towards entrepreneurial behaviour whereas rural/urban background had a negative significant relationship towards readiness.

Conclusion

The results of this study revealed that the Student READY Programme has a positive impact in influencing the students to develop entrepreneurship behaviour and readiness among agriculture students to take up their own enterprises. This shows that the course introduced by ICAR increases the number of entrepreneurs among agriculture graduates in the countries.

Keywords: Entrepreneurship behaviour, Readiness, Student READY Programme, Youth empowerment.

EFFECT OF IRRIGATION, TILLAGE AND NITROGEN FERTILIZATION ON YIELD AND NUTRIENT UPTAKE OF SUMMER MUNGBEAN (*Vigna radiata* L.) UNDER VERTISOLS

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Green gram [*Vigna radiata* (L.) Wilczek] gives low seed yield and poor growth performance mainly due to poor management and low soil fertility. Very early sowing of summer mungbean can reduce the germination whereas delayed sown crop can be damaged by the monsoon rains during end of June. Water is limiting and costly input in summer season and it is judicious application need special attention for the maximizing yield per unit area and time hence, it is necessary to find out suitable approach for scheduling irrigation. Tillage and crop residue management play important role in maintaining soil physical properties as well as on chemical properties and ultimately affect the crop productivity. The reasons for low productivity may be poor management practices including irrigation. It needs to schedule irrigation as and when required to meet the full water needs of crops and realize maximum yields. Moisture stress during crop growth plays important role in productivity of mungbean. Hence, in the light of such complexities, the present investigation was carried out to study irrigation, tillage and nitrogen fertilization on yield and nutrient uptake of summer mungbean (*Vigna radiata* L.) under Vertisol

Methodology

A field experiment was conducted during *kharif* season of 2021 at Instructional Farm, Agricultural Research Station, Ummedganj, Kota (Rajasthan). The experiment was laid out according to strip plot design with three replications. The experiment consisting of 18 treatments combinations with irrigation schedule in main plot (0.8, 1.0 and 1.2 Etc), two types tillage practices (Zero tillage and conventional tillage) and three doses of Nitrogen in sub plot [75% RDN (15kg N), 100% RDN (20kg N), 125% RDN (25kg N)]. Different parameters e.g., yield attributes, nutrient content and uptake were estimated by standard procedures.

Results

The results revealed that yield attributes [pod length (7.70, 7.74 and 7.73 cm), seed per pod (11.19, 11.88 and 11.47), number of pod (39.9, 42.4 and 41 respectively)], yield parameters [seed yield (1226, 1389 and 1253 kg ha⁻¹), straw yield (2136, 2435 and 2176 kg ha⁻¹ respectively), biological yield (3362, 3824 and 3428 kg ha⁻¹ respectively) and nutrient uptake by seed (NPK) (44.7, 3.84 and 9.53 kg ha⁻¹ respectively)] have highest shown treatment response in I3 (1.2 Etc), ZT (zero tillage) and N3 (125% RDN).

Conclusion

Based on one year field experimentation, it is inferred that higher yield attributes, yield and nutrient content and uptake was observed under zero tillage practice, along with irrigation schedule Etc 1.2 and 25 kg N ha⁻¹, respectively. Therefore, growing of summer mungbean variety IPM-02-03 under zero tillage with irrigation schedule Etc 1.2 and 25 kg N ha⁻¹ was found more productive and profitable in vertisols soils of South-Eastern Rajasthan.

Keywords: Tillage, Irrigation schedule, Nitrogen, nutrient content, nutrient uptake, Vertisols

BIO-NANOTECHNOLOGY: THE WAY OF IMPROVING CROP PLANTS

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ABSTRACT

Nanotechnology (the Greek word nano means "dwarf") is the creation and utilization of materials, devices and systems through the control of matter at the nanometer-length scale, i.e., at the level of atoms, molecules, and supramolecular structures. It is the popular term for the construction and utilization of functional structures with at least one characteristic dimension measured at the nanometer scale- a nanometer (nm) is one – a billionth of a meter (10⁻⁹ m). Nano-food research focused mainly on nano-food packaging with 76.84% contributions, whereas in nano-agriculture research, the focus has been on nano-fertilizers with 90% contributions. Germany, France, Korea, Italy, the Czech Republic, Slovenia and the Slovak republic have more than 20% of dedicated nanotechnology firms. A growth of about 45% in nano-food patents has been observed for the USA during 2011–2015, and China is leading in the nano-agriculture patents with an increase of 60.7% during 2012–2015.

The database allows mapping research themes in nanotechnology to specific sectors in the agricultural value chain to enable a rational assessment of the potential applications of nanotechnology in the agri-food sector, identifying and prioritizing research needs across the agricultural value chain, and assessing the environmental and societal implications of this emerging technology.

Keywords: supramolecular structures, agri-food sector, nano-agriculture research, nano-fertilizers

QUANTIFICATION OF PUERARIN AND DAIDZEIN IN *Pueraria tuberosa* (Willd.) DC BY VALIDATED HIGH-PERFORMANCE THIN-LAYER CHROMATOGRAPHY (HPTLC) DENSITOMETRY METHOD AND *IN SILICO* INVESTIGATION FOR PHYTOESTROGENIC ACTIVITY OF THE CERTAIN COMPOUNDS

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Purpose

Pueraria tuberosa (Indian kudzu or Vidarikanda) is a medicinal plant that is frequently distributed throughout South-East Asia. The tuber is widely used in ethnomedicine as well as in traditional systems of medicine, particularly in Ayurveda. Numerous bioactive phytochemicals are present in the tuber and their individual or synergistic effects are may be responsible for the therapeutic potential against a wide range of ailments and about their activity as immune booster, aphrodisiac agent, anti-inflammatory, cardio tonic and brain tonic. This study was performed to investigate the presence of certain Phytochemicals and quantification of the certain bioactive compounds in the methanolic extract and to investigate their phytoestrogenic activity.

Methods

For HPTLC: As a test solution, 50 mg of powder root is extracted in 1 ml of methanol and used this solution for HPTLC analysis. For Standard solution extract of 1 mg of marker compound in 10 ml of methanol is used. 10, 15 & 20 μ L methanolic extract of *Pueraria tuberosa* samples and 2.0 – 12.0 μ L of standard solution applied on a precoated silica gel 60 F254 HPTLC plates by using Camag Linomat 5 applicator. Developed the plate in the solvent system Methanol : Chloroform:: 8:2 v/v to distance of 35ml, inside CAMAG automatic developing chamber (Model ADC2).

For In-silico investigation: Estradiol(used as a reference in this study) is a natural estrogen which binds to the α and β subunit of Estrogen Receptor. The compounds Puerarin and Daidzein are investigated for Phytoestrogenic activity as ligands for binding with the ER α and ER β .

Results

Here the methanol extract showed the TPC(total phenolic content) 0.016 \pm 0.00092%, TFC(total flavanoid content) 0.034 \pm 0%, TTC(total tannin content) 0.4 \pm 0%, TSC(total starch content)0.33 \pm 0%, Total Sugar content 0.22 \pm 0.01%.

An HPTLC method was developed and validated for linearity, accuracy, precision, limit of detection (LOD), limit of quantification (LOQ), etc. by ICH guidelines. The calibration range was 100–500 μ g /band for both the bioactive compounds. Puerarin was separated with the R_f value of 0.132 \pm 0.002 and Daidzein with 0.605 \pm 0.002. The LOD and LOQ were 0.001237 μ g and .0.003747 μ g for puerarin and 0.0012 μ g and 0.0037 μ g for daidzein respectively. The developed HPTLC method was simple, precise, robust, specific, rapid, and cost effective. The *In silico* investigation for phytoestrogenic activity of Puerarin and Daidzein was done against ER α (binding energy with Puerarin-5.21 and Daidzein -7.15) and ER β (Puerarin -3.43, Daidzein -6.98, (in kcal/mol)).

Conclusion

The results obtained suggest that Puerarin and Daidzein will serve as marker compound for the chemical identification of the plant and can be used to monitor the batch to batch consistency of the herbal product using this plant.

Keywords: *Pueraria tuberosa*, Isoflavones, puerarin, daidzein, HPTLC, LOD, LOQ.

EFFECT OF LONG-TERM NUTRIENT MANAGEMENT PRACTICES ON POTASSIUM FRACTION IN CALCAREOUS SOIL UNDER GROUNDNUT-WHEAT CROPPING SYSTEM

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ABSTRACT

Crops grown on highly weathered upland soil in tropical monsoonal climates frequently suffer from potassium (K) deficiencies in the soil. For efficient K management in crop production, it is crucial to critically evaluate the forms of K in soils and their capacity to release K for plant absorption. Our study focused on how potassium dynamics in the soil of the long-term fertilizer experiment were affected by soil managements with sole or mixed applications of mineral and organic fertilizers. Twelve fertilization treatments were included in the long-term fertilizer experiment, and each treatment comprised four replicates that were organized in a randomized block pattern. The available-K status in LTFE soils was nearly the same during the first year, but it was significantly altered and revealed significant differences as a result of various treatments after the 16th year, and it showed significantly higher at treatments T₈ (50 % NPK + FYM @ 10 t ha⁻¹ to Groundnut and 100 % NPK to wheat) and T₉ treatment, which

received FYM. With the exception of T₈, there was a slight overall decline in the availability of K status after 16 years. After 16 years of experimentation, the application of FYM @ 25 t ha⁻¹ and combined use of FYM with NPK significantly increased the other fraction of potassium, namely water soluble-K, HNO₃ soluble-K, total K, exchangeable K, and reserved K, while the rest of all treatments show depletion. There was also overall decrease status of different fraction of potassium in LTFE soil after a span of 16 years. In long term fertilizer experiment soils, the per cent depletion of different forms of potassium were interesting that in all treatments. All the forms of potassium showed positive per cent depletion in all the treatments except treatments which received FYM *i. e.* T₈ & T₉, which showed negative per cent depletion. After 16 years in LTFE soil, the distribution of potassium in its various forms was found to be in the following order: HNO₃ soluble-K > Available-K > Exchangeable-K > Reserve-K > Water soluble-K.

Keywords: LTFE soil, Potassium fraction, Percent distribution, percent depletion

TOXICITY OF HEAVY METALS ON HUMAN HEALTH AND ENVIRONMENT

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ABSTRACT

Almost each heavy metal is serious toxicants as carcinogens. Heavy metals are kept under environmental pollutant category due to their toxic effects in plants, human and food. These are heavy metals persistence, accumulate and not metabolized in other intermediate compounds and do not easily breakdown in environment. Heavy metals are naturally occurring elements, and are present in varying concentrations in all ecosystems. Some of the heavy metals *i.e.* Arsenic (As), Cadmium (Cd), Lead (Pb), Mercury (Hg) are accumulative poison. Arsenic (As), cadmium (Cd), chromium (Cr), and nickel (Ni) are category 1 heavy metals according to the International agency for Research on Cancer. There is the large of number of heavy metals. Total metals have caused major human health problems in various parts of the world. The term “heavy metal” is connected in many people’s minds to metals that are toxic. There is a relationship between the chronic diseases and geologic environment. Geochemical environment is indeed a significant factor in the serious health problems. These metals have been extensively studied and their effects on human health regularly reviewed by international bodies such as the WHO. This reviews paper definite heavy metals and their toxicity and effects on human health.

Keywords: Heavy Metals, Human exposure, Toxicity, Carcinogenicity.

EFFECT OF DIFFERENT LEVEL OF NPK AND BIOCHAR ON SOIL PHYSICO-CHEMICAL PROPERTIES AND YIELD ATTRIBUTE OF BLACK GRAM (*Vigna mungo* L.) Var. KPU 07-08

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ABSTRACT

An experiment was conducted on “Effect of different level of NPK and Biochar on Soil Physico-chemical properties and Yield Attribute of Black gram (*Vigna mungo* L.) Var. KPU 07-08” during Rabi season 2019-20 at the Research farm Department of Soil Science and Agricultural Chemistry, Naini Agriculture Institute, SHUATS, Prayagraj. The design applied was randomized block design having three factors with three levels of NPK @ 0, 50, and 100 % ha⁻¹, three levels of Biochar @ 0, 50 and 100 % ha⁻¹ respectively. The result obtained with treatment T₈ - [NPK @ 100 % + Biochar @ 100 %] that showed the highest yield regarding, gave the best results with respect to plant height 60.10 cm, number of leaves plant⁻¹ 34.00, No. of pod plant⁻¹ 38.77, it gave highest yield 13.05 q ha⁻¹ Biochar in combination resulted in a slight increase in soil pH 7.25, Electrical conductivity 0.28 dS m⁻¹. In post-harvest soil of N P K fertilizers observations were resulted in significant increase in Organic carbon 0.79 %, Particle density 2.64 Mg m⁻³, Bulk density 1.10 Mg m⁻³, Pore space 58.33 % and available N 340.23 kg ha⁻¹, P 35.85 kg ha⁻¹, K 206.64 kg ha⁻¹, significant increase in case of Nitrogen (kg ha⁻¹), Phosphorus (kg ha⁻¹), Potassium (kg ha⁻¹) was found to be significant among other treatments in Black gram cultivation and soil quality improvement. It was also revealed that the application of NPK with Biochar was excellent source for fertilization than fertilizers.

Keywords: Black gram, Soil, Urea, SSP and Biochar.

ISOLATION, CHARACTERIZATION AND ANTAGONISM OF INDIGENOUS TRICHODERMA SPP IN LATERITIC AND COARSE, SHALLOW SOILS OF KONKAN REGION OF MAHARAHTRA, INDIA.

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ABSTRACT

Trichoderma species are monarch anti-fungal bio-agents in the current era of eco-friendly plant protection because they have the power to recognize, infect and fight pathogenic fungi, insect pests, nematodes and other similar organisms. As a result, in the current investigation, sixty seven soil samples from the rhizosphere of different crops such as mango, rice, chilli, areca nut, coconut, brinjal, banana, sapota, guava, bottle gourd, elephant foot yam, groundnut, horse gram, cabbage, cauliflower, lablab bean and a flowering plant- champak from various places in Konkan Region of Maharashtra, India were collected. Out of these, 27 isolates were obtained on TSM (*Trichoderma* specific medium).

The *in vitro* studies (dual culture technique) revealed that all the 27 isolates were effective against *Fusarium* spp., *Rhizoctonia* spp., *Sclerotium* spp., *Colletotrichum* spp. and *Alternaria* spp. The most promising seven isolates were identified up to species level. Three out of these seven isolates were identified by molecular characterization techniques and four were identified on the basis of morphological features. The isolate T₁₁ (Areca nut rhizosphere)

identified by molecular methods as *T. asperellum* recorded the highest 82.22 per cent inhibition of *Fusarium* spp isolated from watermelon field. The isolate T₂₃ (brinjal rhizosphere) identified by molecular methods as *T. asperellum* recorded 86.11 per cent inhibition of *Sclerotium* spp isolated from finger millet field. The isolate obtained from mango rhizosphere was identified as *T. harzianum* recorded the best performance (80.55% inhibition) against *Sclerotium*; 79.22 per cent inhibition of *Fusarium* spp and *Colletotrichum* spp (80.22%) isolated from mango leaf.

The isolate *T. koningii* isolated from guava orchard recorded 81.11 per cent inhibition of *Rhizoctonia* spp isolated from cow pea rhizosphere while *T. longibrachiatum* isolated from cabbage field recorded 86.66 per cent inhibition of *Alternaria* spp on coriander.

All the isolates recorded above 50 per cent inhibition of all the pathogens except *Sclerotium* spp. In case of this pathogen, most of the isolates recorded growth inhibition within a range of 15- 42 per cent and only 5 isolates recorded more than 50 per cent inhibition.

The colony colour of the isolates varied from whitish, off white, yellowish or in different shades of green initially which gradually turned to green or dark green. Hyphal growth spread in the form of tree branching or penicillate pattern. Phialides were sigmoid/hooks, ampuliform or lageniform. Conidia were mostly globose or sub-globose and arranged on phialides in catenate manner.

TECHNICAL TEXTILE: NANOFIBRES AND THEIR POTENTIAL APPLICATIONS

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ABSTRACT

The term nano is derived from the Greek word *nanos* meaning dwarf and is a unit prefix representing a factor of 10^{-9} which means "one billionth". Nanotechnology is a common name used for different set of techniques and methods to create numerous structures of nanometer sizes *i.e.* at the level of individual particles. It is possible to produce ultra-thin fibres *i.e.* nanofibres using the recent technology. Nanofibres have appeared as exciting one-dimensional nanomaterials and are capable to form networks of highly porous mesh with remarkable interconnectivity between their pores, which makes them an attractive choice for a number of commercial and innovative applications. Infact, the significant impact of nanofibre technology can be traced from the wide range of fundamental materials that can be used for synthesis of nanofibres. These include natural polymers, synthetic polymers, carbon-based, semiconducting and composite materials. One of the most widespread applications of nanofibres is in the field of textiles which include protective, smart, sportswear, electronic textiles, *etc.* These fibres have various applications in other areas also such as cosmetics, wound dressing, biomedical, filtration, drug delivery, sound absorptive materials *etc.* The future success of nanofibres in textile applications lies in areas where new principles will be combined into durable, multifunctional textile systems without compromising the inherent properties of textile including processability, flexibility *etc.*

Keywords: Nanofibres, Polymers, Properties, Techniques, Textile Applications

GENETIC VARIABILITY, HERITABILITY, GENETIC ADVANCE AND CORRELATION STUDIES FOR YIELD ATTRIBUTING CHARACTERS IN COWPEA [*Vigna unguiculata* (L.) Walp.]

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Cowpea remains an essential component for sustainable production system in semi-arid and arid regions due to its ability to restore soil fertility and provide shade to conserve soil moisture. In India, cowpea has vast scope for creating considerable diversity by analysing potential genotypes that can be utilized in breeding programmes for amplifying the productivity of this minor pulse crop under various climatic conditions. Thus, this study was conducted to bridge the gap in cowpea breeding by studying the variability, heritability, genetic advance, correlation and path coefficient among thirty cowpea genotypes.

Material and Methods

To study different variability and correlation parameters for eleven morphological characters, thirty genotypes of cowpea were grown in randomized block design during *Kharif* 2019 at Agricultural Research Farm, S.K.R.A.U., Bikaner, Rajasthan. The coefficient of variation (Burton, 1952), correlation (Searle, 1961) and path coefficient analysis (Wright, 1921) were estimated according to the established statistical procedures.

Results

Based on the results from analysis of variance, a wide range of variation and significant differences among all genotypes was found for all the eleven traits indicating the presence of considerable genetic variability. Number of pods per plant, harvest index, seed yield per plant and plant height had high phenotypic and genotypic coefficients of variation (PCV and GCV, respectively). The characters like plant height, biological yield per plant, harvest index, number of pods per plant, seed yield per plant, 100-seed weight and pod length showed high estimates of heritability. High result values of genetic advance as per cent of mean was found for number of pods per plant followed by harvest index, seed yield per plant and plant height. Significant and positive phenotypic correlation of seed yield was observed with harvest index, number of pods per plant, number of seeds per pod, plant height and protein content. At phenotypic level, harvest index, biological yield per plant, number of pods per plant, plant height, 100-seed weight, number of branches per plant, number of seeds per pod, protein content and pod length had positive direct effect on seed yield per plant. Residual effect resulted in path analysis was found to be very low at genotypic level and at phenotypic level.

Conclusion

High values of PCV and GCV of certain characters indicated the scope of exploiting variability for further improvement of such characters. High heritability and high to moderate genetic advance expressed as per cent of mean were found in plant height, number of pods per plant, harvest index, seed yield per plant, biological yield per plant and 100-seed weight which showed presence of additive gene effect in regulation of their expression and phenotypic selection for their amelioration can be brought by simple selection for their genetic improvement over a short span of time. Characters with significant and positive correlation with seed yield per plant suggested that these attributes are the primary yield determinant in cowpea. Path analysis revealed that the characters *viz.*, harvest index, plant height, number of pods per plant and number of seeds per pod possessed high direct positive effect over seed yield with significant and positive relationship and were the major determinants of seed yield. Thus, more emphasis should be given to these characters during selection for yield improvement in cowpea. Low residual effect values represented that there was maximum and sufficient effect of the characters evaluated on seed yield in cowpea.

Keywords: Variability, heritability, genetic advance, PCV, GCV, correlation, path analysis

POPULATION DYNAMICS OF BRINJAL (*Solanum melongena* L.) INSECT PESTS WITH ABIOTIC FACTOR

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ABSTRACT

The field trial was conducted at the Organic research farm kargua ji, Department of Entomology, institute of Agricultural Science, Bundelkhand University Jhansi, (Utter Pradesh) during Rabi November to March 2021-2022 investigation entitled “Population dynamics of brinjal insect pests with abiotic factor” the population results showed that the *Aphis gossypii* was commenced from 45th standard week (November first week) with an average 0.33 aphids/plant and increased and gradually reached peak level of 83aphids/plant at 49th standard week (December first week). White fly, *Bemisia tabaci* (Genn.) was commenced from 46th standard week (November second week) with an average 0.67 no. of white fly per plant and increased and gradually reached peak level of 14 no. of white fly / plant at 51th standard week (December third week. Hadda beetle, *Epilachna spp.* was commenced from 49th standard week (December first week) with an average 0.67 larvae & Adult/ plant and reached peak level of 3.33 larvae/plant at 4th standard week (January fourth week). Shoot and fruit borer, *Leucinodes orbonalis* G. was commenced from 3rd standard week (January Third week) with an average 1.67 larvae per plant and reached peak level of 4.33 larvae per plant at 6th standard week (February second week). Lady Bird beetle *Harmonia conformis* was commenced from 50th standard week (December second week) with an average 1.67 larvae/plant and reached peak level of 8.33larvae/plant at 4th standard week (January fourth week). Grass hopper, *Melanoplus differentialis* was commenced from 47th standard week (August third week) with an average 0.33 larvae/plant and reached peak level of 5.67larvae/plant at 52th standard week (December last week).

Keywords: Brinjal, whitefly, aphid, shoot and fruit borer (*Leucinodes orbonalis* G.)

SCIENTISTS-FARMERS PARTICIPATORY MODE OF QUALITY SEED PRODUCTION IN HORTICULTURAL CROPS

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ABSTRACT

The ‘seed system’ in various ways but most often refer to the organized, formal mechanisms through which farmers obtain seed and through which seed quality can be guaranteed. This kind of seed systems consist of chains of interlinked activities, starting from genetic resource management, breeding research and crop improvement, through seed multiplication, marketing and distribution, to use of the seed by farmers. Due to advent of private seed companies with the liberalization of seed trade in 1988, the public sector seed corporations have started declining and becoming inept. With an objective of developing an alternative seed production system to compete private sectors, the University of Horticultural Sciences, Bagalkot in Karnataka implemented Scientists-Farmers Participatory Mode (SFPM) of vegetable seed production in selected villages. A group of farmers were selected at hobali level and were

supplied the foundation seeds of new promising public varieties to an extent of 0.4 ha. And two to three training programmes were conducted in targeted villages for quality seed production. The seeds produced by the target group was processed and packed scientifically in the university seed processing unit and arranged for distribution to the farmers at affordable price. By this new innovative and modified system of seed production the university could be able to replace old varieties and farmer saved seeds of onion, chilli and drumstick in this region. The University of Horticultural Sciences, Bagalkot produced 46.20 quintals, 13.40 quintals and 139.69 quintals of chilli, drumstick and onion seeds of new public varieties under Scientist’s-Farmer’s Participatory Mode Programmes respectively during 2017-18 to 2021-22. From this new alternate model of seed system, there should be large scale promotion of regional seed system involving farmers, NGO and voluntary organization for quick and effective replacement of old, low yielding and disease susceptible varieties with new high yielding, disease resistance for enhanced food production and food security.

Keywords: Public, Private, Corporations, Participatory, Hobali, Processing and Organization

CHARACTER ASSOCIATION AND PATH ANALYSIS STUDIES FOR YIELD AND YIELD ATTRIBUTES IN CHILLI (*Capsicum annuum* L.)

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ABSTRACT

The correlation and path co-efficient analysis for growth and yield traits in chilli (*Capsicum annuum* L.) was studied in 20 genotypes of chilli including 5 newly bred industrially valued elite genotypes for 13 different growth and yield characters at Horticultural Research and Extension Centre, Haveri (Devihosur) during *kharif* 2020-21. Correlation provides information on nature and extent of relationship among the characters. The computation of correlation coefficient at genotypic level revealed that significant and positive correlation between dry fruit yield per plant with all the characters except days to first flowering, days to red fruit harvest and fruit width. Path-coefficient analysis of different characters contributing towards dry yield per plant had significant positive direct effect *via* plant height, plant spread, plant branches, number of fruits per plant, fruit length and green fruit yield.

Keywords: *Capsicum annuum*, Stalk-less, Correlation, Path co-efficient analysis, yield

MICROSATELLITE MARKER FOR CHARACTERIZATION OF *Albugo candida* CAUSING WHITE RUST DISEASE IN RAPESEED-MUSTARD

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Purpose

White rust is an economically important disease of rapeseed-mustard caused by the oomycetes *A. candida*. The highly variable nature of the pathogen poses challenges for the management of the disease. As an obligate parasite there is very high variability in *A. candida* and the molecular diversity study particularly in India is very limited. Therefore, considering these

facts and as per our known studies, this is the first time we are using microsatellite markers for the diversity study of *A. candida*.

Methods

In the present study 12 Simple Sequence Repeat (SSR)-based markers used to identify and analyze genetic relatedness among 33 *A. candida* isolates. These 33 *A. candida* isolates collected from 12 different states of India and 9 different *Brassica* spp. All the 33 isolates were purified under the glasshouse condition and pure DNA extracted for the molecular diversity study using SSR markers.

Results

All the 12 SSRs were found to be 100 per cent polymorphic and highly robust; a total of 46 alleles with 1-10 alleles per marker with an average of 3.83 were amplified. To find the efficiency and informativeness of the markers different parameters used viz. Polymorphism Information Content (PIC), Marker index (MI), Resolving Power (RP) and Diversity Index (DI). PIC ranged from 0.216 to 0.488, MI from 0.555 to 9.019, RP from 0.606 to 4.605 and DI from 0.555 to 0.953. In Spearman rank correlation coefficient of different parameters of markers PIC was negatively correlated to other parameters, while, MI, RP and DI were positively correlated and very informative to provide genetic variability among *A. candida* isolates. The dendrogram constructed using UPGMA hierarchical clustering and formed 17 major clusters with genetic similarity in between 3 to 73 per cent.

Conclusions

We concluded that these highly polymorphic SSRs marker is able to differentiate *A. candida* isolates and this could be used for the study of pathotype variation of *A. candida*.

Keywords: *Albugo candida*, isolate, rapeseed-mustard, SSRs, variability

YIELD GAP ANALYSIS OF CLUSTER FRONTLINE DEMONSTRATIONS (CFLD) OIL SEEDS MUSTARD (*Brassica juncea*) IN TRIBAL DISTRICT OF MANDLA, MADHYA PRADESH.

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ABSTRACT

Mustard is an important rabi oilseed crop of rainfed season of Mandla district of Madhya Pradesh. The productivity 850 kg/ha of oilseed in the district is low as compared to National average mainly due to poor crop management practices ultimately and inadequate availability of quality seed of improved mustard varieties and other inputs. Mustard is the second most important and most prominent Rabi season oilseed crops of India. It belongs to the group of cruciferae with several cousin species cultivated.

Materials and methods

Cluster Frontline Demonstrations (CFLDs) on improved farm technology (Table 1) were conducted by Krishi Vigyan Kendra, Mandla, JNKVV Jabalpur (MP), India in mustard (Arpan) during Rabi 2018-2019 and Rabi 2019-2020 under rainfed conditions on 20 ha area of Mandla district covering 50 farmers. The soil of CFLDs was Sandy loam to Sandy clay loam and the pH of soil is near about 6.18 to 7.11. the scientific technology such as improved varieties seed (Arpan) method of line sowing with Nari plough seed treatment with thirum and bio control agents weed management and integrated pest management practices was maintained during period of study seed treatment was done with thirum 3 gm/kg seed trichoderma at @ 5 gm/kg and PSB @ 5 gm/kg of seed before sowing to protect the crop against fungal diseases up to 15 - 20 days after sowing the seed rate of mustard was kept 5 kg/ha in demonstrations plot the sowing of mustard was done during 1st November to 10th November during the study period

the spacing between row to row and plant to plant was kept 30x20 for the Cluster Frontline Demonstrations.

Results and Discussion

The findings of the study as well as relevant discussion have been conferred under following points

Grain Yield

Transfer of improved technology under Cluster Frontline Demonstrations in mustard resulted in higher yield as compared to farmer's practice. The maximum yield in demonstration plot was due to improved variety of seed, seed treatment with bio control agent, integrated pest management practices. The average seed yield of demonstration plots was 11.70 q/ha which was higher as compared to farmers practice 7.20 q/ha. The increased yield percentage over control was 62.50 % in Cluster Frontline Demonstration over local check. However the seed yield of 11.70 q/ha in CFLD's was low as compared to potential yield 16 quintal per hectare of mustard variety Arpan due to attack of aphids and mustard sawfly. The yield enhancement through adoption of improved technology has also been reported in earlier studies of FLD's (Kothyari et al; 2018 and Kumar et al; 2019 and Jamwal Anamika et al 2020). Yield of the Frontline Demonstration trials and potential yield of the crop was compared to estimate the yield gaps which were further classified into technology and extension gaps (Hiremath & Nagarju;2009 and Jamwal Anamika et al 2020)

Conclusion

This study indicated that the incorporation of scientific farm technology practices along with active participation of farmer's of the area has positive effect on increasing the yield and economic return of mustard in Mandla district the economic viability of suitable technology for increasing the productivity of mustard motivated the farmers towards adoption of technologies demonstrated at farmer's field. Benefit cost ratio recorded was also higher in demonstration plots (3.20)as compared to farmer's practice (2.70) increased monetary returns as well as Benefit cost (B:C) ratio through improved farm technology have also been reported by various scientists (Vedna et al 2007, Bairwa et al 2013 and Jamwal Anamika et al 2020)

Keywords: Mustard, front line demonstration, Yield gap, technology gap, yield

MICROBIOLOGICAL PROFILE & CHARACTERIZATION OF SPOILAGE CAUSING BACTERIA OF VACUUM-PACKED MARKET PANEER DURING REFRIGERATED STORAGE

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ABSTRACT

To analyse the microbiological profile of vacuum-packed market paneer stored under refrigerated condition and also characterization of predominating spoilage causing bacteria isolated from vacuum-packed market paneer samples have been done. 3 vacuum-packed market paneer samples (Paneer A, Paneer B and Paneer C) were collected from market and shipped to laboratory at low temperature using ice box. Paneer samples were stored at 7^oC for 28 days and drawn at 7 days interval for analysis. The Titratable Acidity of the vacuum-packed market Paneer samples was increased gradually (% of Lactic Acid). The Standard Plate Count, Psychotropic Count, Coliform Count, Yeast & Mold Count, Mesophilic & Psychotropic Spore Count, Mesophilic & Psychotropic Proteolytic Count, Mesophilic & Psychotropic Lipolytic Count of the vacuum-packed market Paneer samples were also observed in my study. Some of colonies picked up from Nutrient agar, Skim milk agar, Tributyrin agar and lactose containing

nutrient agar with BCP, all isolates were performed catalase test and also gram, negative and spore staining. Those isolates had some spoilage activities i.e., Proteolytic, Lipolytic, Acid producing and Lecithinase activity.

Keyword: Vacuum-packed market paneer, Proteolytic activity, Lipolytic activity, Acid producing activity, Lecithinase activity

TIMBER ECONOMICS IN NEPAL; A STARK DISJOINT BETWEEN POLICY VISION AND FIELD EVIDENCE??

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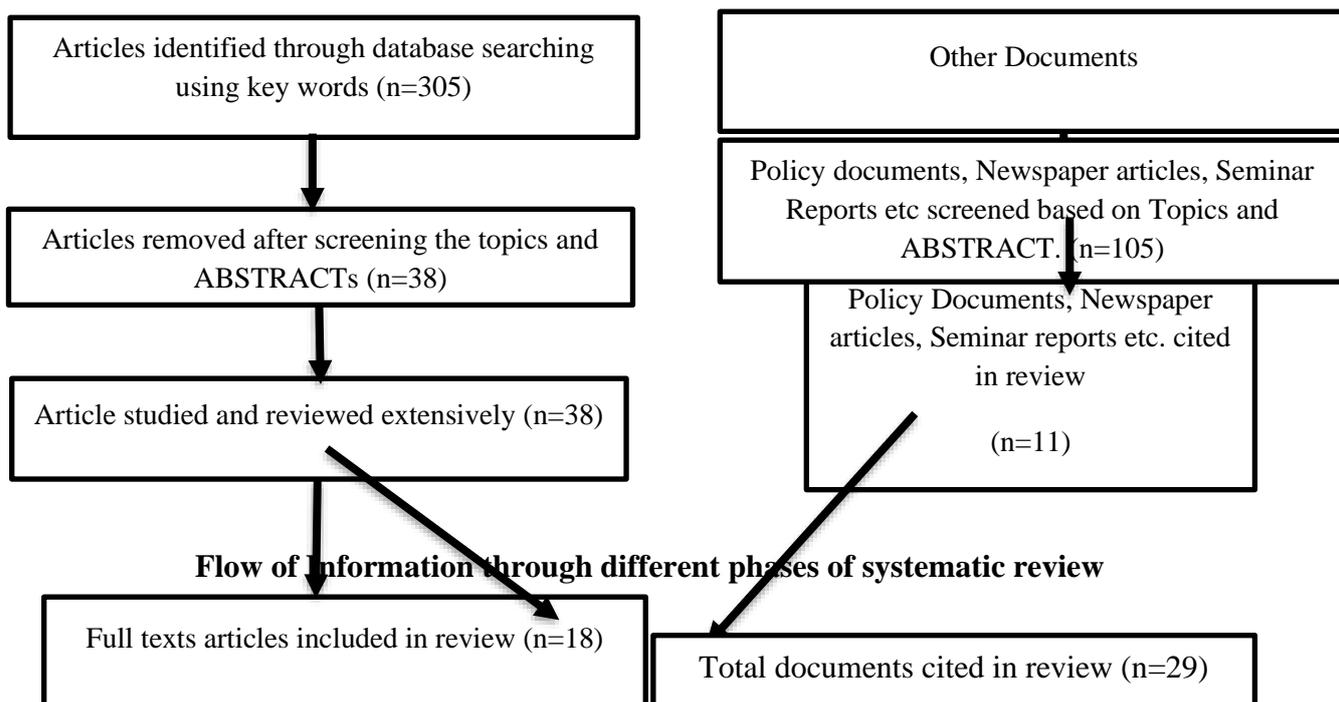
ABSTRACT

Introduction

More than 44% of total land area in Nepal is covered with forest and timber has biggest share economically in the forest sector. Despite this, full economic potential of timber is not being fulfilled and the country is mostly dependent on the timber import from the foreign countries. This situation directly leads to the demotivation of timber harvesting in the country. Various policies and guideline have been kept in place by government to promote/ regulate the timber harvesting in Nepal. However, in the recent years there has been shift in policies priorities from timber focused management to various other issues such as NTFPs, environmental services, biodiversity etc. Moreover, in field level severe under harvesting and under sale of harvested timber is prevalent. Because of this a large amount of timber is being wasted either standing in forests or as felled log in various depots. Bureaucratic incompetence, corruption, foul play, unethical market practices is also common in Nepali Timber market. This type of situation has made the Nepali Timber Market more of gamble rather than potential booming business despite its undeniable economic importance and potential. As there are more risks in Timber business than rewards, potential business entities and entrepreneurs are being hesitant to be involved in timber harvesting.

Methods

A systematic review of the literature was conducted.



Results

Forest policy 2075 which the main policy driving the forestry sector in as per sated in objective 6.2.2 aims to be self-dependent on forest product through value addition and to promote export. However, field evidences shows rather stark deviation. Few major problem factors were identified during study.

Paudel et al. (2014) based on the review of the Ops and extrapolation of those data has found that in six districts of Nepal AAH has been under calculated. Furthermore, harvest permits assigned by DFO are usually lower than AAH that has been mentioned in op which itself is under calculated and actual harvest is much lower than permitted amount. Similar findings were found in kankai CF of Chitwan district, where there too was large discrepancy between the AAH and actual harvest (Baral and Vacik 2018). Furthermore, Moreover, sales from the harvest is also very underwhelming. In fiscal year 2073/74 more than 55% of timber that went into sale through Timber Corporation of Nepal (TCN), District Forest Office (DFO) and District Forest Product Sales Board (DFPSB) has remained unsold and are left decaying in the depots see fig 4 (DOF 2018).

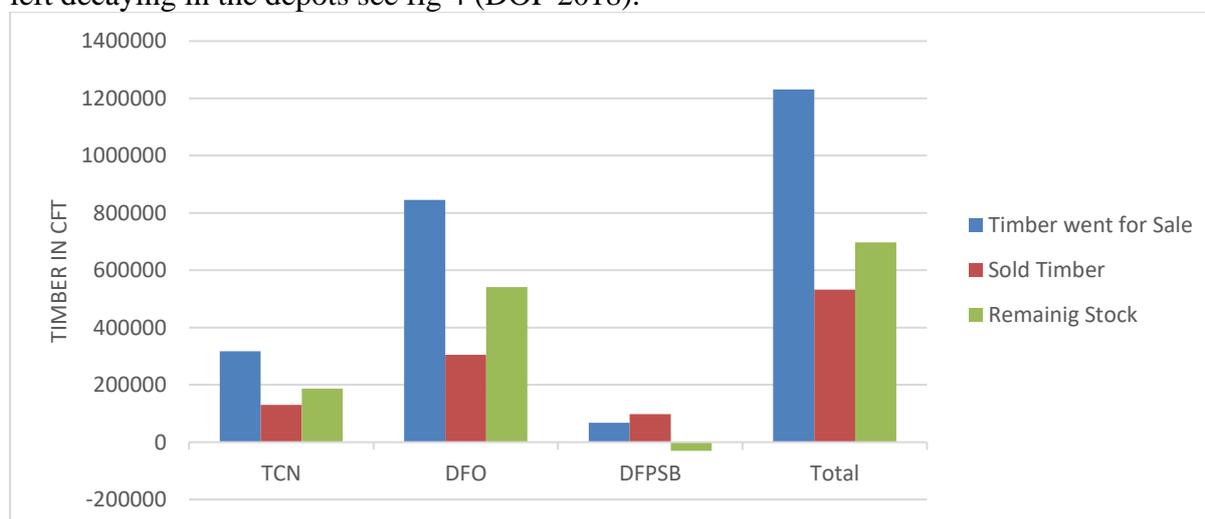


Figure 1: Timber sale in Fiscal year 2073/74

This high amount of stock being unsold however don't indicate that timber demand in country is very low as, it is reported that annual timber demand of Nepal is 30 million cuft of which more than 80% is being fulfilled from foreign import (Over 80 per cent of timber imported from foreign countries 2015) and Nepal has lost Rs 6.5 billion alone in 2018/19.(Country's dependency on wood increasing, timber import exceeds Rs 6 billion 2019). This under sale of the timber may be because of regressive and irrational decisions of government such as banning timber trade (Banjade et al. 2011), corruption and foul play in timber market (Banjade 2012; Aryal et al. 2016; Baral and Vacik 2018).

Another challenge is that exporting the unsold timber in the foreign market is not possible because of the 200% costume tax implemented (Ministry of Finance 2021). Furthermore, most of the foreign market demand the products exported to be certified which is very difficult for developing nations like Nepal as very few forests in Nepal are certified (Bhattarai et al. 2019) because of the various constraints such as high cost, inflexible policies etc. (Fischer et al. 2005). Share of the wood products dominates the revenue generated from the total forestry sector and overshadows the income generated from the NTFPs and other services. Despite this fact Nepal is quite far away from realizing its full economic potential from the timber. Since 1970s policy discourse in Nepal have shifted from the timber focused forest management to the non-timber

forest products (NTFPs), Biodiversity conservation and carbon (Banjade 2012) despite its significant contribution to the national treasury.

98 government policies, acts, guidelines and directives which are issued since 1993 were reviewed and it is found that most of the documents deals with issues around NTFPs, biodiversity, protected areas, environmental services, governance issues, gender mainstreaming etc. Similar results were obtained while reviewing the articles published in the three main Forest journals from Nepal; Banko Jankari, Journal of Forest and Livelihoods and Hamro Ban Sampada. A total of 273 articles published after 2012 from three journals were reviewed of which only 28 articles were related directly to timber and 84 articles had partial implication to timber.

Conclusions

The primary approach paper of the government (15th five-year plan 2019/24) has envisioned the prosperity and happiness through the sustainable forest management. It has also recognized potential of forest sector in national economy and timber has more than 90% share in the contribution from forest sector. However, in recent years, policy focus has shifted from the timber based forest management to the environmental services oriented one. Most of the recent policy has focused in the sectors like biodiversity, NTFPs, carbon trade, sociology in forestry etc. rather than timber based forest management despite obvious and clear importance of timber market in national economy. Field practices in ground level has also been hampering the timber market and timber harvesting practices. Because of the conservative approach taken by the government in the forest sector timber in many forests of Nepal are being under harvested. Furthermore, a significant amount of timber harvested remains unsold and left for decay in various depots and more than 80% of timber demand in the country is fulfilled through the foreign import. We concluded that reason behind it is corruption, bureaucratic malpractice, foul play and unethical market practices which has made timber business in Nepal more of a gamble.

Keywords: Forest Policy, Green Economics, Harvesting, Timber, Timber Harvesting, Timber Market

COMPARATIVE STUDY OF TWO PERENNIAL WETLANDS OF BHAGALPUR DISTRICT IN EASTERN INDIA WITH SPECIAL REFERENCE TO THEIR PHYSICO – CHEMICAL ENVIRONMENT AND PHYTOPLANKTON DIVERSITY

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ABSTRACT

Water is an important component for all the living beings. It performs unique and indispensable activities in the earth ecosystem and also serves as a habitat for several aquatic organism. Wetlands are one such productive habitat and are of immense socio- economic importance (De Groot *et al.*, 2012). Phytoplankton are integral part of wetlands biodiversity and play a vital role in functioning of wetlands. Phytoplankton could be used as the indicator of the physico – chemical status of any water body. The interplay of physical, chemical and biological properties of water most often leads to the production of phytoplankton. The purpose of the study was to investigate the change of phytoplankton population in closed freshwater ponds at different seasons. The effect of environmental factors and water quality parameters of two perennial wetlands of Bhagalpur district in eastern part of India, which potentially influence the growth of the phytoplankton, was evaluated by correlating these factors with each other.

Methods

For the assessment of water quality, water samples were collected from two perennial ponds of Bhagalpur district, (i) Jiccho pokhar in Pirpainti block (Pond-I: Latitude-N 25°18'56.25"/Longitude-E 087°25'53.94") and (ii) Purandaha pokhar in Shahkunda block (Pond-II: Latitude-N 25°09'35.46"/Longitude-E 086°48'22.62") in pre-cleaned and acid treated BOD bottles and 1.5-liter poly containers between 8:00 am to 11:00 am. Water samples were collected from the subsurface level i.e., 20-30 cm below upper water surface. Phytoplankton samples were collected in 125 ml of sample bottles using phytoplankton net of 65µmesh size. The filtrate was immediately preserved in 4% formaldehyde. Some of water parameters like ambient temperature, water temperature dissolved oxygen, free carbon dioxide, pH, electrical conductivity and total dissolved solids were estimated on the spot and for analysis of rest of the water parameters like bicarbonate, total hardness, chloride, phosphate-phosphorus, nitrate-nitrogen, COD and BOD, water samples were transported to the Environmental Biology Research Laboratory, University Department of Botany, T. M. Bhagalpur University. Water quality parameters were estimated following Standard Methods (APHA, 2005). Phytoplankton were identified with the help of available relevant literatures and monographs.

Results

In the present study, the water quality parameters in both the ponds under investigation varied widely among seasons. The overall surface water temperature varied from 17.9-28°C in pond-I and from 21.3-27°C in pond-II. The ambient temperature was found to be higher at both the sampling stations. The observations on pH indicated that both the ponds were in the alkaline range (7.3-8.5). The electrical conductivity ranged from 425-536µs and 171-276µs and TDS from 224-294mg/l and 92-189mg/l in Pond-I and Pond-II respectively. FCO₂ content (1-12mg/L) as well as HCO₃⁻ value (8-46mg/L) were found to be in lower range in both the pond waters. Total hardness values were relatively higher in Pond-I (100-390mg/L) compared to Pond-II (65-120mg/L). DO concentration varied in the range of 3.7-7.2mg/L in Pond-I and 1.8-6.2mg/L in Pond-II. Cl⁻ (187-204mg/L and 67.98-130mg/L), PO₄-P (0.033-0.059mg/L and 0.037-0.096mg/L) and NO₃-N (0.028-0.032mg/L and 0.028-0.045mg/L) contents were found to be in higher range in both the ponds. Both BOD (3.1-4.8mg/L) and COD (28.8-82.3mg/L) values were recorded in higher range crossing the permissible limits as prescribed by WHO (1998) and BIS: 10500 (2004-2005) in both the ponds; rest of the water parameters were found to be well within the permissible limit. The high levels of BOD and COD in pond waters in the present study suggested organic pollution of these waterbodies.

A total of 44 genera of phytoplankton have been identified in all the three seasons from the two ponds under investigation. Species like *Scenedesmus quadricauda*, *Scenedesmus obliquus*, *Scenedesmus dimorphus*, *Chlorella vulgaris*, *Pediastrum duplex*, *Coelastrum microporum*, *Synedra ulna*, *Synedra acus*, *Nitzschia sp.* *Cyclotella meneghiniana* and *Oscillatoria princeps* were recorded from both the ponds. The phytoplankton diversity in Pond-I was maximum during summer season with total density count of 5144.63 U/L, whereas the minimum density count recorded in monsoon season (1899.41 U/L). In the present investigation in Pond-I, the Chlorophyceae was found to be abundant (35.27%) followed by Bacillariophyceae (25.72%), Cyanophyceae (22.66%) and Euglenophyceae (16.41%) in the year 2020- 2021. Phytoplankton diversity was also maximum during summer season in Pond-II with total density count of 2607.26 U/L and minimum density count recorded during monsoon season (1948.72 U/L). The density of Chlorophyceae (39.66%) was found higher followed by Bacillariophyceae (34.41%), Cyanophyceae (16.56%) and Euglenophyceae (9.34%). In both the ponds, the different algal groups were found to be in the similar order in term of percentage abundance, Chlorophyceae being the most abundant group contributing 39.66 % for Pond- I and 35.27% for Pond- II to the total phytoplankton density. According to Palmer (1969) pollution index, presence of algal species like *Chlorella vulgaris*, *Oscillatoria princeps*, *Euglena gracilis*, *Nitzschia palea*, *Scenedesmus quadricauda* in both the ponds in all the seasons suggested that

both the ponds under investigation were organically polluted and are advancing towards eutrophic condition. Poor water quality and the potential for toxicity implies Cyanobacteria to cause environmental problems, disrupt drinking water supplies, recreational activities and pose a risk to livestock and human health

Conclusions

On the basis of above findings, we may conclude that both the wetlands are suffering from several types of deterioration processes like sedimentation, eutrophication, pollution and human exploitation. All these factors are also responsible for drastically disturbing the biotic communities and giving alarming call about poor water quality of both the wetlands.

Keywords: Wetlands, Phytoplankton, biodiversity.

CREATION OF NOVEL GENETIC VARIATION BY RECOMBINATION BREEDING AND ASSESSMENT OF VARIABILITY IN F₂ POPULATION OF BRINJAL (*Solanum melongena* L.) For Productivity Related Traits

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ABSTRACT

Brinjal (*Solanum melongena* L.) is one of the most common and significant commercial crops which is grown across the world with diploid chromosome number of $2n = 24$, belongs to the family *Solanaceae* and genus *Solanum*. Brinjal genotypes grown in India have low yield potential. Geographical variation for size, shape and skin colour have not been fully utilized. The development of cultivars with high fruit quality for better market value has gained moderately less attention in vegetables especially in eggplant. It is therefore necessary to progress the yield level of existing land races through hybridization. An investigation was carried out with a aim to crate novel genetic variation recombination breeding. Genetically diverse brinjal genotypes were crossed (COH BGK BC-3 x Tester-1) to produce the hybrid. Parents and hybrids were screened with 8 SSR markers for the confirmation of hybridity and to identify the polymorphic markers. After confirmation of hybridity, F₁ plants were selfed to obtain F₂ generation. More than 250 F₂ plants along with parents, F₁ and check were evaluated in unreplicated trails at the experimental block of Department of biotechnology and crop improvement, College of Horticulture, Bagalkot during *kharif* season 2020-21. Observations were recorded on various growth, earliness and yield parameters. Mean data was used for biometric analysis.

Among 8 SSR markers screened, SSR marker EM46 exhibited clear polymorphism between the parental line and F₁ hybrid. Analysis of variance indicated that, the prevalence of sufficient genetic variation among the genotypes for all the characters under the study. High heritability (> 60 %) coupled with high GAM (> 20 %) was observed for plant height, number of primary branches, fruit length, average fruit weight, number of fruits per plant and total fruit yield per plant indicating predominant effect of additive gene action for these traits. Thus there is a ample scope for improving these traits through direct selection. The superior segregants identified with respect to fruit yield per plant in F₂ population of the cross COH BGK BC-3 X Tester-1 were P-128 (4.56 kg), P-48 (4.23 kg) and P- 235 (3.96 kg). which can be further stabilized by selfing can be utilized in future crop improvement programme of brinjal

Keywords: Brinjal, Novel genetic variability, SSR marker, Productivity traits.

COMBATING THE ENVIRONMENTAL CRISIS BY ADVANCES IN SEED ENHANCEMENTS IN CHILLI (*Capsicum. annuum var. annum*)

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ABSTRACT

Chilli is an important vegetable crop grown in India throughout the year, native to South America (Mexico) region. Precision sowing in chilli is difficult because of small and irregular shaped seeds and germination of chilli seeds is less compared to other solanaceous vegetables. So seed pelleting is technique which converts such seeds into bold, spherical with smooth surface that helps in easy handling of seeds during sowing whereas in seed priming liquid solution is allowed to imbibe the seeds through the process of osmosis for better germination percentage. In addition, organic pelleting mixtures can also be incorporated effectively that will be useful for ensuring better field emergence and crop establishment. In view with the above stated points an experiment was conducted with 6 treatments including bio fertilizers, growth regulators and organic and inorganic chemicals. The treatments are T1- Butter milk*+Turmeric, T2- GA3* (5ppm) + Kavach + *Annona squamosa* leaf powder, T3- *Trichoderma**+ ZnSo4,+Prolepsis leaf powder, T4- Mepiquat chloride(10ppm)* + *Trichoderma*, T5- NAA*(10ppm)+ *Pseudomonas* + Neem Powder and T6- Control (Note- * were priming treatments).The results found that the treatment T5 showed highest percentage of germination i.e. (62%) followed by T2 treatment (55%) and T3 treatment showed (50%) germination whereas in control it showed germination of (42%). It can be concluded that the combination of bio fertilizers, growth regulators and plant based derived result in highest percent of germination and it can be used for better germination and field establishment of chilli seeds.

COMBINING ABILITY AND GENE ACTION STUDIES FOR YIELD, QUALITY AND DROUGHT RELATED TRAITS TO IMPROVE DROUGHT TOLERANCE IN TOMATO (*Solanum lycopersicum*)

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ABSTRACT

Combining ability effects and gene action for yield, quality and drought related traits in tomato were studied in Kittur Rani Channamma College of Horticulture, Arabhavi during 2020 – 21 by involving thirty cross combinations obtained from crossing ten high yielding lines with three drought tolerant testers in line x tester mating fashion. Combining ability analysis revealed that magnitude of sca variance was greater than gca variance suggesting the predominance of non-additive gene action for root length, total dry matter, leaf area, yield per plant, lycopene, ascorbic acid and proline. Based on results of gca and sca effects, parents EC-608271, Arka Meghali, Arka Saurabh and Hisar Arun were good general combiners whereas the crosses, EC-608269 × Kashi Anupama, Arka Saurabh × EC-638519, Arka Meghali × EC-638519, Hisar Arun × EC-634394 and RFT-S-1 × Kashi Anupama were superior specific combiners for yield, quality and drought related traits under both control and drought stress condition. So, these

parents could be considered as best for further use in development of drought tolerant varieties as these proved to be the best general combiners for most of the traits in both control and drought stress condition and these crosses could be recommended for multilocation trials and further may commercialized.

CAUSES, EFFECTS AND SOLUTION FOR ENVIRONMENTAL STRESS ON VIABILITY OF SEED DESIGNED OKRA

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ABSTRACT

The demand for seeds of okra (*Abelmoschus Esculentus* L.) is greater than the supply and it is necessary to improve productivity and quality of the crops. Seed pelleting facilitates plantability of small seeds in the field by increasing the seed size and provides improved water uptake, oxygen permeability, vigour and protection against diseases. Field experiments were conducted to determine the influence of seed priming and pelleting. Priming with Mepiquat chloride and pelleting with Turmeric powder, Kavach, ZnSO₄, *Metarhizium anisopliae*, *Pseudomonas fluorescens*, *Trichoderma harizianum* and leaves powder of selected trees like *Azadirachta indica*, *Prosopis juliflora* on seed attributes and identifying the best pelleting treatment to produce high quality seeds. Quick germination was observed in Mepiquat chloride + Kavach (87%) followed by Mepiquat chloride + Turmeric powder (82%) and Mepiquat chloride + *Pseudomonas fluorescens* + *Prosopis juliflora* (75.5%) compared to control (65%) . Seed priming induced synchronized germination, increased seed vigor, and growth of seedlings under stressful conditions i.e. increase in germination and emergence rate. Seed priming is generally adopted for better crop stand, germination and yield of various vegetable crops.

A REMEDY FOR ENVIRONMENTAL CRISIS BY SEED PRIMING AND PELLETING ON VIGOUR OF BRINJAL (*Solanum melongena* L.)

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ABSTRACT

Brinjal is an important vegetable crop grown in India throughout the year, native to Indo Burma region and having diploid chromosome number 24. Precision sowing in brinjal is difficult because of small and irregular shaped seeds. Seed pelleting is technique which converts such seeds into bold, spherical with smooth surface that helps in easy handling of seeds during sowing whereas in seed priming liquid solution is allowed to imbibe the seeds through the process of osmosis for better germination percentage. In addition, organic pelleting mixtures can also be incorporated effectively that will be useful for ensuring better field emergence and crop establishment. In view with the above stated points an experiment was conducted with 6 treatments including bio fertilizers, growth regulators and organic and inorganic chemicals.

The treatments are T1- *Trichoderma**+ Turmeric, T2-GA₃* (5ppm) + Kavach+ ZnSo₄, T3- Butter milk*+ *Metarhizium*+ Castor powder, T4- Mepiquat chloride(10ppm)* + *Trichoderma*, T5- NAA*(10ppm) + *Pseudomonas*+ Neem Powder and T6- Control (Note- * were priming treatments).The results found that the treatment T5 showed highest percentage of germination i.e. (96%) followed by T3 treatment (87 %) whereas in control it showed germination of 70 percent.it can be concluded that the combination of bio fertilizers ,growth regulators and plant based derived result in highest percent of germination can be used for better germination and field establishment of brinjal seeds.

VIABILITY AND VIGOUR STUDIES IN PASSION FRUIT (*Passiflora edulis* var. *flavicarpa*)

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ABSTRACT

The investigation on viability, vigour and storage studies in passion fruit (*Passiflora edulis* var. *flavicarpa*) seeds was carried out at Department of Fruit Science, K. R. C. College of Horticulture, Arabhavi. The germination of passion fruit seeds is less and uneven which may be due to physical (integument impermeability to water and gas), chemical (presence of inhibitory substances), physiological immaturity (mechanisms of germination inhibition), embryo immaturity (Favaris *et al.*, 2020). Pre-germination treatments may enhance the germination potential of passion fruit seeds. Hence, more emphasis has to be given to underutilized fruits due to their nutritional importance and medicinal properties. Among the seven pre-germination treatments studies, seeds treated with thiourea 1 per cent for 10 minutes recorded highest germination percentage (59.48 %) followed by GA₃ 250 ppm (49.33 %). Minimum number of days taken for initiation (18.33 days), 50 per cent (28.33 days) and maximum germination (38.00 days) were recorded in seeds treated with GA₃ at 250 ppm for 10 minutes. Vegetative parameters such as shoot length (26.54 cm), root length (15.91 cm), fresh weight of seedling (6.50 g), dry weight of seedling (1.38 g), seedling vigour index-I (1571) and seedling vigour index-II (82.38) were recorded highest in seeds treated with thiourea 1 per cent for 10 minutes and lowest for control.



DECADAL CHANGES OF FORESTS VEGETATION IN DARJEELING HIMALAYAS: A REMOTE SENSING APPROACH

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ABSTRACT

The Darjeeling Himalayan region is associated with diverse vegetation patterns and endemism covered in five forest types along an altitudinal gradient from tropical lowland to high mountains region ranges between 300-3500m amsl. This region is facing rapid loss in floral diversity and changing in vegetation pattern governed by various biotic and abiotic factors. For past three decades, change detection of forests vegetation was assessed by using satellite data of same month of each decade. Satellite data for the years 2000, 2010 and 2022 was LANDSAT 7 (30m resolution), LANDSAT 8 (30m resolution), and SENTINEL 2 (10m resolution), used respectively, acquired from USGS Earth Explorer. The work was performed in Google Earth Engine (GEE) platform and QGIS was used for mapping of forest densities. On the basis of Normalized Difference Vegetation Index (NDVI) values the concentration of forest vegetation was divided into open forest very dense forests (VDF), dense forests (DF), moderate dense forests (MDF), open forest (OF) and Scrubs (S). The significant change was seen in between three decades 2000-2022 governed by conversion of natural vegetation into built up land and other land uses. The dense forest is being converted into open forest due to anthropogenic activities. There is a need of management and conservation of small plant communities to maintain stability of ecosystem.

Keywords: Darjeeling Himalayas, Vegetation Change Detection, GEE and NDVI

EFFECT OF INTEGRATED NUTRIENT MANAGEMENT ON YIELD AND QUALITY OF *Kharif* SUNFLOWER (*Helianthus annuus* L.)

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Purpose

Sunflower (*Helianthus annuus* L.) is one of the most popular members of the family Compositae and its one of the world's most important source of vegetable oil. Sunflower ranks 3rd in the total oilseeds production in the world next to groundnut and soybean. Sunflower is considered as exhaustive crop. Adequate and balanced fertilizer is must for obtaining seed yield. Therefore, for wide spread adoption of the crop and exploitation of high yield potential, it is important to work out the integrated nutrient management under the different situation with considering this view the experiment conducted.

Method

The experiment was conducted during *kharif* season 2019 at Experimental Farm of Agronomy section. Oilseeds Research Station, Latur, to study the effect of integrated nutrient management on yield and quality of sunflower. The experiment was laid out in a factorial Randomized Block Design with 08 treatments 3 replication. The treatments were T₁-RDF only, T₂-RDF + Fly ash (2.5 t/ha), T₃-RDF + FYM (5 t/ha), T₄-RDF + ZnSO₄ (20 kg/ha), T₅-RDF + FeSO₄ (20 kg/ha), T₆-RDF + Azotobacter (250

gm/10 kg), T₇- RDF + Vermicompost (2.5 t/ha), T₈-RDF + Poultry manure (3 t/ha). Sowing was done by dibbling method on 5nd August 2019. The RDF 90:45:45 NPK kg ha⁻¹ was applied as per treatment half of nitrogen was applied at 30 DAS along with full dose of phosphorus and potassium as a basal dose and remaining half dose of nitrogen was applied as per treatments. The recommended cultural practices and plant protection measures were undertaken as per recommendation.

Result

The results of the field experiment indicated that the growth, yield and quality attributes of sunflower were significantly influenced by different treatments. The significantly higher plant height (175.34 cm), number of functional leaves plant⁻¹ (23.20), leaf area plant⁻¹ (73.20 dm²), stem girth plant⁻¹ (8.60 cm), head diameter plant⁻¹ (23.83 cm), dry matter plant⁻¹ (112.57 g) was found significantly superior with application of treatments (T₃) i.e RDF + FYM 5t/ha over the rest of treatments and number of filled seed plant⁻¹ (847.4), seed yield plant⁻¹ (36.30 g), seed yield ha⁻¹ (1833 kg), stalk yield ha⁻¹ (4227 kg), biological yield ha⁻¹ (6060 kg) was found significantly superior over rest of treatments. While higher oil content (19.92 %) was obtained due to application of treatments (T₃) i.e RDF + FYM @ 5t/ha and followed by application of RDF + Vermicompost 2.5 t/ha (T₇) and RDF + Poultry manure 3 t/ha (T₈).

Conclusion

Application of RDF + FYM 5 t/ha (T₃) was found most effective resulted in improvement of growth attributes as well as yield, yield attributes, oil content (33.78 %) of sunflower crop and gave higher GMR NMR, and benefit cost ratio for increasing productivity.

Keywords: Sunflower, Integrated, Nutrient, yield

HapMap – A NOVEL APPROACH TO DELINEATE SNPS FOR FAST- TRACK CROP IMPROVEMENT

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ABSTRACT

The use of DNA markers has revolutionized the pace and precision of crop genetics and breeding research and cultivar development. A haplotype can be defined as a set of DNA sequence variations (combination of alleles) or a set of SNPs found on the same chromosome. Haplotype blocks are sets of these polymorphic SNPs between which there is little or no evidence of historical recombination. Hence, the sets of these polymorphic SNPs within a haplotype tend to inherit together. The HapMap is a map of the haplotype blocks and specific SNPs called tagSNPs that identify the haplotypes. A set of such haplotype defining (tagSNPs) markers provides crop breeders with cost effective delineation of marker trait association and improved efficiency of marker assisted selection. The haplotype based breeding strategy will be very useful in crop breeding, mainly in the selection of parents based on the presence of superior and diverse haplotypes. The parental lines with a set of diverse haplotypes may be best suited for the development of the next generation superior haplotypes. To reap the maximum benefit of this tool, the cost of genotyping should be further reduced and the precision of phenotyping should still be improved where in all the laboratories could be able to afford the SNP-genotyping.

Keywords:- Haplotype, SNPs, Phenotyping, SNP-genotyping

EVALUATION OF ANTAGONISTIC POTENTIAL OF ENDOPHYTIC BACTERIA AGAINST *Phytophthora nicotianae*

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ABSTRACT

Citrus (*Citrus reticulata*) is an important fruit crop and is grown commercially in different agro-climatic zones of India for its fresh consumption and production of processed food products. Citrus is a long duration fruit plant and subjected to so many diseases. Out of which the *Phytophthora* diseases of citrus are the major constraints in the production of citrus. It causes losses up to 50% every year. A study was undertaken to evaluate the antagonistic effect of endophytic bacteria against *P. nicotianae*. Samples of rhizospheric roots from healthy citrus trees were collected from different citrus blocks situated at CCRI farm site. Total 52 isolates of bacteria were isolated and purified from root samples. Eight isolates were found promising in the dual culture assay. The inhibition ranged from 50.93 to 82.1 per cent. All the promising isolates were characterized morphologically, biochemically and molecularly. On the basis of 16s rDNA sequence analysis, the isolates were identified as *Bacillus subtilis*, *Bacillus pumilus*, *Burkholderia cepacia* and *Enterobacter kobei*. The sequences were submitted to GenBank under accession no- MT026939, MT026940, MT026941, MT026942, MT026943, MN988624, MN988627, MN988628.

Keywords: Citrus, *Phytophthora nicotianae*, Endophytic bacteria

POLLINATOR'S DIVERSITY ON SUNFLOWER (*Helianthus annuus* L.) IN GAJAPATI DISTRICT OF ODISHA

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Purpose

The oilseed crop, Sunflower, (*Helianthus annuus* L.) belonging to the family Asteraceae is an important crop for oil production. Sunflowers crops are primarily native to North and South America. Commonly sunflowers crops are grown for various purposes like for oil production, fodder, dyes, and ornamentation purposes. Different parts of the plants can be used for different purposes. The seeds can be used as a source of sweet yellow oil that can be obtained by milling of the seeds generally is used for cooking food in day to day life. Apart from its edible use of oil, it can also be used as a lubricant, ingredient for oil and paints. The residues (oil cake) obtained after milling of the seeds can be fed to the livestock. The leaves can be used as fodder and the flowers are used to make yellow dye. The seeds are not only used for oil production but also can be eaten dried or roasted. Sometimes the seeds are grounded into nut butter and are commonly used in the feeds of birdseed mixtures.

But the production is very less as compared to its requirement in our country for which India has to depend upon countries like Ukraine for import and it was devastating during the Russia-Ukraine attack, 2022. Therefore, there is high on demand on how to increase the production capacity of sunflower production through pollination. In the present study an investigation has been made on diversity of pollinators associated with sunflower for their future use.

Methods

Extensive data on composition and abundance of pollinators collected through visual observation at 3 days interval during the cropping seasons of 2021-22. The identification of

both immature and adult forms is done from a large number of samples by following fixed plot survey in selected experimental sites. The specimens were identified by following the dichotomous keys given in Borror and DeLong's Introduction to the study of insects. The specimens common name, scientific name, family, order, habitat were observed and recorded with their foraging behaviour.

Results

During the course of investigation 15 species of insects were identified belonging to three different orders namely Hymenoptera, Lepidoptera and Diptera. Among the orders, Lepidoptera order is the most dominant one (50%) followed by order Hymenoptera (43.75) and stray population of Syrphidae Dipterans (6.25%) were also observed. The Order Hymenoptera consisted of two families i.e. family Apidae and Vespidae, the order Lepidoptera consisted of two different families i.e. Nymphalidae, Pieridae and Crambidae. The order Diptera comprised of single family Syrphidae. Family wise Nymphalidae is the most dominant one (37.5%) followed by Apidae (31.25%), Vespidae (12.5%), Pieridae, Crambidae and Syrphidae each carrying one species contributing 6.25% each. The family Apidae of Order Hymenoptera was consisting of 5 different species i.e. Indian hive bee (*Apis cerana indica* Fabricius), Rock bee (*Apis drosata* Fabricius), Stingless bee (*Tetragonula iridipennis* Smith), Carpenter bee (*Xylocopa latipes* Drury) and Carpenter bee *Xylocopa aestuans* Linnaeus. The family Vespidae of order Hymenoptera was consisting of Oriental hornet (*Vespa orientalis* Linnaeus) and Wasp (*Vespa tropica* Linnaeus). The family Nymphalidae from Order Lepidoptera comprises of 6 different species of insects i.e. Tawny Coster (*Acraea terpsicore* Linnaeus), Common Crow (*Euploea core* Cramer), Grey pansy (*Junonia atlites* Linnaeus), Blue glassy tiger (*Idiopsis vulgaris* Butler), Plain tiger, African Queen and African Monarch (*Danaus chrysippus* Linnaeus) and Lemon pansy (*Junonia lemonias* Linnaeus). The family Pieridae of Lepidoptera consist of single insect i.e. Common/Lemon emigrant (*Catopsilia pomona* Fabricius). The family Crambidae of Lepidoptera consist of single insect Cucumber moth/Cotton caterpillar (*Diaphania indica* Saunders). From Order Diptera, *Syrphus* sp. From family Syrphidae though noticed but not included in the diversity study.

Conclusions

The entitle study concludes that though there were 3 orders of pollinators were identified but the Order Hymenoptera is regarded as the most effective as compared to other two. Lepidopterans are pollinators in their adult stage but they are harmful in their larval stage. Even among Hymenopterans, the honeybees are most abundant and most effective pollinators in increasing the sunflower seed yield.

Keywords: Pollinators diversity, Increase sunflower yield and Pollinators and their effect of pollination.

PHYSICOCHEMICAL PROPERTIES OF INSTANT DRINK FORMULATION PREPARED FROM RAW PLANTAIN (*Musa paradisca*) Powder And Moringa (*Moringa oleifera*) Leaf Powder

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Purpose

The *instant* drink powder formulation supplemented with banana and drumstick leaves can cater the protein, energy, vitamin and mineral requirement of the undernourished population. Protein quality of protein deficient population can be improved by the addition of whey protein

concentrate-80 whereas vitamins and minerals will be supplied by banana and drumstick leaf powder in instant drink formulation.

Methods

The addition of fortificant to foods may affect product composition and functionality; therefore, this study investigated the effect of *Moringa oleifera* leaf powder at varying concentrations on various properties of the fortified raw plantain powder. Instant drink powder was prepared by incorporating raw plantain powder, moringa powder, whey protein concentrate and sugar. Freeze drying was used for drying purpose for all powders incorporated.

Result

Some physical properties such as water Absorption Capacity (WAC), Water Solubility Index (WSI), Bulk density, tapped density, cohesiveness, flowability, colour values (L^* , a^* and b^*) and dispersibility were determined in instant drink formulation.

Conclusion

The use of *Moringa oleifera* leaf powder has the potential to combat protein-energy malnutrition and micronutrient deficiencies in developing countries.

Keywords: moringa powder, freeze drying, raw plantain powder, physical properties, whey protein concentrate

VERTICAL VARIABILITY OF CATIONIC MICRONUTRIENTS IN SOILS UNDER *JHUM* IN CHANDEL DISTRICT OF MANIPUR, INDIA.

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ABSTRACT

Micronutrients are essential nutrients that are required in small quantities for the normal growth and development of plants. They are equally important as macronutrients. Their deficiencies can cause severe crop failure while excess levels can be detrimental to plants and can also lead to health hazards. *Jhum* or shifting cultivation is one of the main forms of agriculture in North Eastern Region (NER) of India. It is widely practised in the region as a source of subsistence and income. Therefore, an investigation on micronutrient status of soil in soils under *jhum* is very important. Soil samples were collected at four depths at 20 cm interval *viz.* 0-20 cm, 20-40 cm, 40-60 cm and 60-80 cm from twenty different *jhum* sites of Chandel district of Manipur. DTPA- extractable micronutrients (Fe, Cu, Mn and Zn) content showed decreasing tendency with depth except for few samples. Surface layers accumulate higher content of the micronutrients than the lower layers of the soil profiles. DTPA-extractable Fe, Cu, Mn and Zn ranged from 10.27 to 159.00 mg kg⁻¹ soil, 0.04 to 3.21 mg kg⁻¹, 0.44 to 38.67 mg kg⁻¹ and 0.10 to 1.67 mg kg⁻¹, respectively. The contents of DTPA-extractable Fe and Mn were sufficient in all the soil profiles while Cu was adequate in majority of the soil samples with the exception of a few samples. However, 51.25 per cent soils were deficient in DTPA-Zn content. Correlations among micronutrients were significant for Fe *vs* Cu ($r=0.461^*$) and Fe *vs* Mn ($r=0.455^*$) at 0-20 cm. At 20-40 cm, Fe *vs* Cu ($r=0.537^*$), Mn *vs* Zn ($r=0.471^*$) were significant. At 40-60 cm, Fe *vs* Cu ($r=0.561^*$) and Cu *vs* Zn ($r=0.619^{**}$) were significant and at 60-80 cm, Fe *vs* Cu ($r=0.536^*$), Fe *vs* Zn ($r=0.481^*$) and Cu *vs* Zn ($r=0.626^{**}$) were significant.

Keywords: DTPA-micronutrient cations, *jhum*, soil profile, correlation

ISOLATION OF ENDOPHYTIC FUNGI FROM SORGHUM SPECIES

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Endophytes are fungi and bacteria living within a host plant in a symbiotic condition without causing any symptomatic or non-symptomatic diseases. This mutualism is effective for augmenting plant growth and yield as well as providing strength to plants to stand under biotic and abiotic stress conditions by regulating growth hormones and gaining nutrients. In the present study, the endophytic fungi were isolated from seeds of *Sorghum bicolor* L. Moench (CSV 27 genotype).

METHODOLOGY

The surface sterilization of seeds was done by following Parsa, 2016 methods, followed by sterilized seeds were placed on potato dextrose agar plates having streptomycin as an antibacterial drug by using Otero *et al.*, 2002 method. The identification of endophytic fungi was performed via morphological studies.

RESULTS

Four species of fungal endophytes namely *Fusarium* spp., *Alternaria* spp., *Trichoderma* spp. and *Aspergillus* spp. were characterized from *Sorghum bicolor* L. Moench seeds.

CONCLUSION

The results suggested that endophytes are symbiotically associated with plant and play several significant roles to enhance plant growth. This work engages further identification of endophytic fungi based on 18S rRNA sequencing and their plant growth-promoting traits.

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Keywords: Endophytes, *Sorghum bicolor*, *Fusarium*, *Alternaria*, *Trichoderma*, *Aspergillus*, 18S rRNA sequencing, Plant growth-promoting traits.

COMPARATIVE PROFILING OF NUTRITIVE AND MINERAL PROPERTIES OF OYSTER MUSHROOMS (*Pleurotus* spp.)

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ABSTRACT

Waste management is one of the most significant concerns being encountered by the globe, recently. Cultivation of edible mushrooms is one of the sustainable approach for recycling of various lignocellulosic wastes and that combines the production of protein rich food. *Pleurotus* species is one of the most economically viable edible mushrooms and has excellent source of nutrients including macronutrients and bioactive compounds. In the present study, biological efficiency (BE), nutritive properties (fat content, crude fiber, total carbohydrate and crude

protein), mineral contents, phenolic content, and antioxidant activity of various species of *Pleurotus* were investigated. Our results revealed that the highest yield was obtained from *P. ostreatus* D-66 (2417.53 g/kg dry substrate) with BE of 96.37 %. Total carbohydrate and protein content were found to be varied from 25.12 – 56.87 (g/100g) and 21.14 - 41.03 (%), respectively, among the species. *P. pulmonarius* D-151 showed maximum carbohydrate (56.87 g/100g) while highest protein content was observed in *P. ostreatus* D-66 (41.03 %). Total fat content was found to be maximum in *P. pulmonarius* D-93 (1.90 g/100g) while lowest in *P. ostreatus* D-66 (1.01 g/100g) and crude fiber was maximum in *P. ostreatus* D-66 (31.04 g/100g) as compared to others. *Pleurotus* spp. were studied for their mineral constituents by Inductive Coupled Plasma Atomic Emission spectroscopy (ICP-AES). The predominant macro-mineral elements observed were potassium (K) and phosphorus (P) with maximum quantity of 3609.76 mg/100g and 962.16 mg/100g, respectively in *P. ostreatus* D-66, followed by sodium (Na), 545.76 mg/100g in *P. florida* D-176. While, the least macro-element observed among *Pleurotus* spp. was magnesium (Mg) with 103.04 mg/100g in *P. pulmonarius* D-151. Among micro-elements, iron (Fe) was found to be more predominant and maximum concentration (183.88 mg/100g) was obtained from *P. ostreatus* D-66. The least micro-element was found to be copper (Cu) and was obtained in *P. pulmonarius* D-93 (9.0 mg/100g). High phenolic content (55.30 ± 9.39 mg of GA/ g) and flavonoid content (12.11 ± 0.83 μ g Quer. / g) were obtained in *P. ostreatus* D-66 from *P. florida* D-176, respectively. Also, strongest scavenging activity (85.83 %) was found in the methanolic extract of *P. ostreatus* D-66 in comparison to others *Pleurotus* species. This study shows that the oyster mushrooms (*Pleurotus* spp.), as rich source of nutrients, minerals with low fat content, could be significant food supplement for human diet to fight against malnutrition-related diseases besides being a promising substrate for human nutrition.

Keywords: Oyster Mushroom; *Pleurotus* spp.; nutritional value, mineral composition, antibiotics compounds.

EFFECT OF INCORPORATION OF CHIA SEEDS ON BIOCHEMICAL PARAMETERS OF THE POMEGRANATE SYRUP DURING STORAGE

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Purpose

The enrichment of product has become a pivotal tool in contemporary fruit beverage processing in the flourishing of trendy beverages of admirable calibre having sensorial and healthful properties. The alluring appearance, captivating flavour and nutrients retention and the enrichment are the main consideration which make the acquaintance of buyer predilection and upgrade the marketability of the new products. Despite the obvious advantages of pomegranate fruit and chia seeds, the present evaluation was delighted to investigate the development of pomegranate syrup by the incorporation of chia seeds and to access the biochemical parameter during storage.

Methods

The pomegranate extracted juice was taken according to the treatments and sucrose and fructose were used to maintain the TSS, chia seeds were added wherever needed to all the treatments with the different percentages (except T₁ and T₅). The prepared syrup was filled in the clean, sterile bottles and sealed with caps and stored in refrigerator (4°C)

Results

In this investigate, nutritious pomegranate juice and immersed chia seeds were exploit at various combinations (100 : 0, 90 :10, 85 : 15 and 80 : 20) using both sucrose and fructose for preparation of pomegranate syrup by incorporation of chia seeds. Among the treatments, highest antioxidant activity (100.42%) was recorded in T₇ (85% Pomegranate juice + Fructose 45° Brix + 15 % chia seeds) highest total phenol content was recorded in T₇ (85% Pomegranate juice + Fructose 45° Brix + 15 % chia seeds :629.55)

Conclusion

- Pomegranate syrup incorporated with 15 per cent chia seeds showed high amount of antioxidant and phenol content compared to control sample
- In storage studies, biochemical parameters decreased as the storage period advances. Chia based treatments retain good biochemical parameters and sensory qualities over a period of 90 days

Keywords: Pomegranate juice, chia seeds, fructose, sucrose, sensory characteristics

SULPHUR FRACTIONS AND THEIR RELATIONSHIP WITH RICE YIELD IN CALCAREOUS SOILS OF BIHAR

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ABSTRACT

The investigation entitled “studies on sulphur fractions and their relationship with rice yield in calcareous soils of Bihar” was carried out to study the various S fractions in soil and; to estimate S content and uptake by the rice crop during *kharif* 2019 at Dholi Kothi Farm of Tirhut College of Agriculture, Dholi. Ten surface soil samples from each upland, midland and lowland topography were collected before onset of monsoon and analyzed for sulphur fractions. The overall percentage of soil sample low and medium available sulphur were 90 and 10 per cent with a mean value of 9.28, 10.59, and 12.22 ppm in upland, midland and lowland, respectively. The proportion of water-soluble S, available S, heat soluble S, non-sulphate S and Organic S to total S were 1.37, 3.68, 9.38, 5.67 and 93.07 per cent, respectively whereas the proportion of water- soluble sulphur was 37.1% of available S. Grain and straw yields (q/ha) of rice crop irrespective of land topography varies from 31.98 to 47.21 and 50.26 to 67.45 q/ha, respectively. Highest Grain : straw ratio (0.70) and harvesting index (0.41) of rice crop were recorded in lowland. Total sulphur uptake was higher in lowland as compared to midland and upland and it varied from 8.02 to 11.94 kg/ha with a mean value of 10.37 kg/ha. Available Sulphur balance in soil was found negative in the tune of -6.48 to -5.24, -8.93 to -7.42 and -8.85 to -7.59 kg/ha with mean values of -5.77, -8.24 and -8.10 kg/ha in upland, midland and lowland, respectively. This study indicates that in low organic carbon calcareous soils of Bihar, rice crop with recommended dose of fertilizer (including zinc) yields with negative Sulphur balance in soil.

STUDIES ON SULPHUR FRACTIONS AND THEIR CORELATION WITH SOIL PROPERTIES IN CALCAREOUS SOILS OF Bihar

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ABSTRACT

With the introduction of high yielding varieties, more irrigation facilities and use of high analysis sulphur free fertilizers, depletion of sulphur in soil has been observed in various parts of the country. The studies are important to know the level of sulphur, their fraction and corelations with soil properties in calcareous soils of Bihar. Altogether, thirty surface soil samples, ten samples from each upland, midland and lowland topography were collected before onset of monsoon 2019 from Dholi Kothi Farm of Tirhut College of Agriculture, Dholi. The soil samples were analysed for important physico-chemical properties as well as different sulphur fractions using the standard procedure. The values of correlation coefficient between soil properties and forms of sulphur without considering topography shows that sand content was significantly and negatively correlated with all the forms of sulphur while it showed significance at only 5 percent level of significance with water soluble sulphur. Silt showed significantly positive correlation with all the forms of sulphur except non-sulphate sulphur. Clay was found positively correlated with all the forms of sulphur except non-sulphahte sulphur. pH and EC showed negative correlation with all the forms of sulphur except non-sulphate sulphur. Organic carbon, CaCO₃, CEC, total nitrogen, dehydrogenase and arylsulafatse showed positive correlation with all the forms of sulphur except non-sulphate sulphur. In the study, organic carbon of the surface soil exhibited positive and significant correlation with all forms of sulphur except water soluble and sulphate sulphur, indicates towards urgent changeover in management practices for organic carbon build up in calcareous soils of Bihar.

EFFECT OF SPACING ON YIELD AND PHYSIO-CHEMICAL CHARACTERISTICS OF DIFFERENT CULTIVARS OF APPLE UNDER MID HILL CONDITIONS OF UTTARAKHAND

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ABSTRACT

An experiment was carried out at ICAR-CITH RS, Mukteshwar to find out the effect of different planting densities *i.e.* 1.5×1.5 m, 1.5×2.5 m, 2.5×2.5 m and 6×6 m on yield and physico-chemical characteristics of three apple cultivars Starkrimson, Golden Delicious and Mollies Delicious. Observation revealed that highest mean number of fruits per tree, yield per tree, fruit weight, fruit volume, fruit length, fruit diameter maximum total sugar, reducing sugar and carotene content were recorded at 6×6 m spacing. While highest mean yield per hectare, fruit firmness and total anti-oxidant activity were recorded at 2.5×2.5 m spacing and lowest mean yield per hectare was registered at 6×6 m spacing. Cultivar Starkrimson exhibited highest

fruits per tree, yield per tree, yield per hectare, fruit firmness, TSS and ascorbic acid content. While maximum fruit weight, fruit volume, fruit length and diameter and total anti-oxidant activity were registered in cv. Mollies Delicious and maximum total sugar and reducing sugar were found highest in cv. Golden Delicious. Conclusively, Starkrimson cultivar was found superior in term of yield and physiochemical characteristic as compared to other cultivar and 2.5×2.5 m spacing was found best in terms of highest yield per unit area and better quality fruits as compared to other spacing.

Keywords: Spacing, Yield, Quality, Apple Cultivars, Uttarakhand

A REVIEW ON FOOD SECURITY THROUGH FINGER MILLET AND ITS ROLE IN FOOD PROCESSING

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ABSTRACT

In India, majority of people are deficient in nutrients like calcium, proteins and minerals. So, it is necessary to identify such type of food sources which have rich nutritional properties. Now days, consumers want processed or ready-to eat products to satisfy their appetite. Therefore, it's a great challenge to develop such foods that are nutritionally superior and also highly acceptable to the consumers. Present study is undertaken on nutritional security and processing of finger millet. According to the previous studies, finger millet is well recognized because of its higher dietary fibers, calcium and phenolic compound. It also has beneficial effect such as anti-diabetic and anti-microbial properties. Though it is nutrient-rich, but to keep pace with the consumer's choice, finger millet can be processed through popping, extrusion and malting and fermentation processes. The popular ready to eat products that can be prepared by blending finger millet flour with other cereals or legume flour are vermicelli, noodles, popped millet, *Ragi* soup, which have significant health benefits as well as fulfill the consumers demand of processed products.

Keywords: Finger millets, Nutrient-rich, Processing

FEMALES' PREFERENCE FOR READYMADE *KURTIES* AND THEIR FITTING PROBLEMS

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ABSTRACT

In Indian, many women residing at homes and/ or working in the offices, prefer to wear traditional salwar, kameez and sarees. However, most of young females have a great crush about *kurties*, as it is easy to wear, comfortable and create a traditional look. These young females worn these *kurties* with a variety of lower garments that include jeans, skirt, palazzo, lehnga and salwar etc. Beside this, a large variety of *kurties* with different colours, sizes, designs and styles are available in the market. But each consumer have some specific preference for their readymade *kurties* and facing some problem with it. Thus, this study was planned to know the females' preference for readymade *kurties* and their problems. The study was conducted in two universities i.e., Govind

Ballabh Pant University of Agriculture and Technology, Pantnagar and Thakur Dev Singh Bist (DSB), Nainital campus located in Udham Singh Nagar and Nainital districts respectively from Kumaon region of Uttarakhand state of India. In the present study, a survey method was used for data collection and a self-structured questionnaire cum interview schedule was used as a tool. A stratified random sampling method was used for sample selection. A total one hundred females between 21-31 years of age were selected as the sample size for study. Collected data analyzed by using frequency and percentage. It can be concluded from the study that maximum respondents from both place were preferred readymade *kurties* and gives reasons for preferring readymade *kurties* i.e., comfortable, time saving, available in wide variety and unique in design. Maximum numbers of respondents from GBPUA&T, Pantnagar opted to wear below knee length readymade *kurties* with jeans and salwar. On other hand study shows that more than 50 percent respondents from DSB Campus, Nainital were preferred to wear hip-length readymade *kurties* with jeans and between knee and hip length kurti with salwar. More than 65 percent respondents of 21-31 years of age from GBPUA&T, Pantnagar and DSB campus, Nainital were facing fitting problems with readymade *kurties* and these fitting problem were related to looseness and tightness of readymade *kurties* at various points such as neckline, shoulder, armhole, sleeve, bust, waist and hip.

Keywords: Readymade *kurties*, Cconstruction method, *Kurties* construction, *Kurties* fitting, Fitting problem.

INFLUENCE OF PRUNING INTENSITIES AND NUTRIENTS SPRAY ON GROWTH AND QUALITY PARAMETERS OF POMEGRANATE (*Punica granatum* L.) cv. Bhagwa

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ABSTRACT

A field experiment entitled **efficacy of pruning intensities and nutrients spray on growth and quality parameters of Pomegranate (*Punica granatum* L.) cv. Bhagwa** was conducted at Fruit Research Station, Imaliya, Department of Horticulture, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (M.P.) during 2020-21 Total of 20 treatments combinations of pruning intensity and foliar spray of nutrient were arrange in AFRBD. The pruning intensity and foliar spray of nutrients significantly influence the growth and chemical composition of fruits. However, the interaction effect of pruning intensities and foliar application of nutrients showed significant effect on the growth and quality parameters of the fruits and the maximum plant height (47.84 cm), shoot length (34.93 cm), shoot diameter (2.66 mm) were recorded at 90 days after pruning as well as minimum day to first flower (95 days), to first fruit set (112.33 days) and maximum number of flowers per shoot (7.80), were recorded with 20 cm pruning in combination with 2% Urea + 0.4% Zn + 0.4% B. As regard the chemical composition of fruit the superior quality fruit with maximum juice content (55.00 %), TSS (15.80 ⁰Brix), reducing sugar (12.91 %) and total sugars (13.96 %) while minimum acidity (0.30%) and non-reducing sugar (0.74 %), were recorded under treatment 60 cm pruning along with the foliar spray of Urea (2%) + Zn (0.4%) + B (0.4 %). The parameters viz. reducing sugar, total sugars, acidity and non-reducing sugars were did not differed significantly with interaction of the treatment 60 cm pruning along with the foliar spray of Urea (2%) + Zn (0.4%) + B (0.4 %).

Keywords: Growth, Pomegranate, Quality, Bahar

ASSESSMENT OF YIELD ATTRIBUTES AND YIELD OF PEARL MILLET UNDER DIFFERENT FERTILITY LEVELS AND ORGANIC MANURES

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Purpose

The mineral fertilizer application has reached such high levels that many ill side effects are appearing, such as adverse effects on soil properties, over-exploitation of natural resources, ground water pollution, etc. An injudicious use of chemical fertilizer spoils the structure and texture of the soil. Integration of inorganic, organic and bio-fertilizers play a vital role in enhancing crop productivity and sustaining soil fertility, this proves great promise for increasing farmer's income. A judicious use of inorganic fertilizers and organic manures can maintain long term soil fertility and sustain higher productivity of crops. Thus to maintain soil fertility, productivity and the soil health, use of inorganic fertilizers, vermicompost and FYM needs to be standardized.

Methods

A field experiment was conducted at Agronomy farm, S.K.N. College of Agriculture Jobner (Rajasthan) during *kharif* season 2018 on loamy sand soil to study effect of different fertility levels and organic manures on soil properties and yield of pearl millet. The experiment was laid out in factorial randomized block design with three replications. The experiment comprised of four treatments of fertility levels (Control, 50 per cent RDF, 75 per cent RDF and 100 per cent RDF) and five treatments of organic manures (Control, vermicompost @ 2.5 t ha⁻¹, vermicompost @ 5 t ha⁻¹, FYM @ 5 t ha⁻¹ and FYM @ 10 t ha⁻¹) were applied to the pearl millet var. RHB-173.

Results

Results showed that plant height, number of effective tillers, ear length, grains per ear head and test weight, grain and stover yield were observed significantly higher with application of 100 per cent RDF and vermicompost @ 5 t ha⁻¹.

Significantly higher yield and net returns of pearl millet crop can be obtained with combined application of 75 per cent RDF + vermicompost @ 5 t ha⁻¹, while, significantly higher net returns can also be obtained with application of 75 per cent RDF + FYM @ 10 t ha⁻¹ indicating saving of 25 per cent RDF by application of vermicompost @ 5 t ha⁻¹ and FYM @ 10 t ha⁻¹.

Conclusion

Integrated use of organic manure with chemical fertilizers resulted in build up of available nutrients in soil much more effectively than that of chemical fertilizer alone. Higher yield can be achieved by combined application of organic manures and chemical fertilizers.

Keywords: organic manures, yield, fertility levels.

STUDIES ON VARIABILITY AND EFFICACY OF DORMANCY BREAKING METHODS IN RICE (*Oryza sativa* L.)

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ABSTARCT

In the present investigation, 32 genotypes of rice germplasm collections, including three checks, namely, Sarjoo-52, NDR-2065 and NDR-359 showing wide spectrum of variation for various characters, were evaluated in under timely sown and irrigated conditions during *Kharif*, 2019. The field experiment was conducted in Randomized Block Design (RBD) at the Crop Research Station (CRS) Masodha, Ayodhya, farm and obtained freshly harvested 7 rice varieties namely (NDR-359, BPT-5204, Sambha Sub-1, NDR-2065, NDR- 3112-1, Sarjoo-52, Narendra Lalmati) to estimation of dormancy duration and effective method of dormancy breaking were tested in Seed Testing Laboratory of the Seed Technology Section, Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya (U.P.). The experiment was conducted in randomized block design along with three replications in normal soil under irrigated condition during *Kharif* 2019. Each entry was grown in 5 meter long single row plots with spacing 20 cm and 15 cm with in row to row and plant to plant, respectively.

The high magnitude of genotypic and phenotypic coefficients of variation were observed for L/B ratio, plant height, days to 50% flowering, days to maturity, seed yield per plant and 1000-seed weight, indicating thereby, substantial scope for improving in this character after hybridization and subsequent selection the high estimate of heritability with high genetic advance in per cent of means were observed for L/B ratio, days to 50% flowering, days to maturity, seed yield per plant and 1000-seed weight. The highest seed yield per plant was observed by Dilavra (40.64 g), while the lowest seed yield per plant was given by Mangla (23.06 g). The general mean calculated for this character (31.41g). Ten genotypes, namely Dilavra, Jaya, Pasharih, Bansfool, Ladeshwar, Ratna, Vijeta, Hazardana, Singra Rambhog-1 and Naina were significantly produced seed yield per plant.

The variety Sambha sub-1 recorded a very strong seed dormancy of 28 days followed by Sarjoo-52, Narendra Lalmati with a dormancy of 14-21 days and a few more varieties *viz.*, NDR-359 and BPT-5204 had dormancy more than 14 days. Most of the other varieties recorded dormancy from 7 days NDR-3112-1 (Prakhar) and NDR-2065 after harvest. It was observed that the longer duration varieties exhibited a longer dormancy period when compared to early and medium duration varieties. The seven varieties were observed for efficacy of chemical against breaking the dormancy in paddy varieties. The most effective variety was observed NDR-3112-1 (Prakhar) and NDR-2065. Its variety superior than the other five varieties. The most effective treatments was found in HNO₃ @ 1.5% followed by GA₃ @ 100 ppm is all over six treatment. It get good result in the seed germination (%), speed of germination (%), shoot length (cm), root length (cm), seedling length (cm), seedling dry weight (gm), seed vigor index (I) and seed vigor index (II). Considering the overall result, it is apparent that certain information obtained here will help in future for improving development of new varieties.

MANAGEMENT OF STEM GALL OF CORIANDER (*Protomyces macrospores* Unger)

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ABSTRACT

Coriander (*Coriandrum sativum* L.) is an important spice crop and grown throughout the world. The crop is attacked by several biotic and abiotic factors. Among the disease, stem gall of coriander, incited by the fungus *Protomyces macrosporus* Unger, is one of the most common, widespread and serious diseases throughout the world and causes 22 per cent yield losses and deteriorate quality of seeds. Different aspects of disease management were studied and salient finding of studies are summarized below- The efficacy of different soil amendment were evaluated against stem gall of Coriander in pot conditions. Maximum disease control (33.69%) found in neem cake followed by Mustard cake (29.24%), Parthenium compost (24.00%), Linseed cake (20.56%) and Sawdust has effective in reducing wilt control (12.65%) as compare to untreated check. One hundred thirty three coriander germplasm were screened for source of resistance against stem gall of coriander in field condition. Among them, 8 germplasm viz., ND Cor-19, ND Cor-45, ND Cor-48, ND Cor-49, ND Cor-60, ND Cor-70, ND Cor-73 and ND Cor-95 were found disease free and 90 germplasm were found resistance, 27 germplasm were found moderately resistance, 6 germplasm viz., Cor-180, 183, 184, 185, DH-202, Pant Haritima found moderately susceptible and 2 germplasm viz., Cor-182, 190 found susceptible to stem gall. The stem gall disease incidence range from 0.5 per cent to 59 per cent in screened coriander germplasm. The effectiveness of chemicals, bio-agent, Bio Enhancer (Bijamrit, Ghana Jeevamrit, Jeevamrit) and Neem leaf mulching, were evaluated to see their effect on disease management. The fungicide, bio-agent, Bio Enhancer was applied as seed treatment as well as foliar spray at 45, 60 and 75 DAS. All the treatment were more or less effective and exhibited reduction in disease and significantly increase the yield as compare to check. Minimum per cent disease severity (26.50%) and maximum disease control (54.88%) was noted in treatment T6 Seed treatment with Propiconazole @ 0.20% + three foliar sprays at 45, 60 and 75 DAS @ 0.20% followed by T2 Seed treatment with Carbendazim @ 0.20% + foliar spray at 45, 60 and 75 DAS @ 0.20% (29.43% & 46.84%), T4 Seed treatment with Blitox-50 @ 0.20% + foliar spray at 45, 60 and 75 DAS @ 0.20% (32.15% & 41.92%), T3 Seed treatment with Vitavax @ 0.20% + foliar spray at 45, 60 and 75 DAS @ 0.20% (33.20% & 40.03%), T1 Seed treatment with *Trichoderma* sp. @ 0.40% + foliar spray at 45, 60 and 75 DAS @ 0.40% (35.55% & 35.78%), T5 4.5 inch Neem leaf mulching + T7 (36.75% & 33.61%), T7 Seed treatment with Bijamrit + Basal application of Ghana Jeevamrit + Apply Jeevamrit with the first irrigation. Followed by 3 different concentrations of successive sprays at an interval of 21 days + Apply of sour mattha at 21 days since last spray of Jeevamrit. (No fertilizer recommended) (39.34% & 28.93%), T8 Soil mulching with Neem leaf (41.22% & 25.54%), respectively and maximum (55.36%) disease severity was found in T9 (control). Seed treatment with Propiconazole @ 0.20% + three foliar sprays was most effective with 26.50% disease severity as compare to all treatment. The maximum seed yield (19.06q/ha), plant height (116.86 cm.), fresh and dry weight (37.20 & 16.32 g), number of branches (8.45), seed per plant (678.30), and maximum germination per cent (90.00%) was obtained in T6 -Seed treatment with Propiconazole @ 0.20% + three foliar sprays at 45, 60 and 75 DAS @ 0.20% as compared to other treatments.

INTEGRATED DISEASE MANAGEMENT OF PHOMOPSISBLIGHT OF BRINJAL CAUSED BY *Phomopsis vexans*

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ABSTRACT

Brinjal (*Solanum melongena* L.), an important vegetable crop belonging to the family Solanaceae is grown for its fruits. Due to its versatility in use in Indian diet, brinjal is described as the ‘King of vegetables’. Among the factors responsible for lowering down the yield, the disease especially those caused by fungi are considered to be the major one. Phomopsis blight of brinjal caused by *Phomopsis vexans* causes heavy loss in crop.

Symptoms of the disease under natural conditions were studied. Under natural conditions symptoms first appeared as pale, sunken, circular to oval areas on the fruit surface. Affected fruits become soft and watery. First decay rapidly throughout the fruit, causing a light-brown discoloration of the flesh. Under dry conditions, fruits get shrivelled and become mummified. Black pycnidia arranged in a concentric pattern can be seen.

Cultural and morphological character of the pathogen was studied on PDA. Both types of conidia α and β conidia are produced by the pathogen. Among four culture media (PDA, Czapek’s Dox, oat meal agar and brinjal leaf extract dextrose medium) maximum radial growth of pathogen was recorded on PDA.

In-vitro screening of bio control agents, plant extract and fungicides were also tested against the pathogen. The best antagonist obtained under *in-vitro* screening by dual culture technique, was *Trichoderma harzianum*. At 20 percent concentrations leaf extract *Allium sativum* (58.82 %) was found the best in inhibiting the mycelial growth of *Phomopsis vexans* and *Allium cepa* (45.88 %), *Azadirachta indica* (56.47 %), *Lantana camara* (36.47 %) and *Parthenium* (23.52 %) also significantly superior.

Some fungicide was tested against *Phomopsis vexans* under *in-vitro* conditions by poisoned food technique. In the study of chemical management at (500 ppm and 1000 ppm) Carbendazim (100%), Tebuconazole (100%), Hexaconazole (100%) was found the best in inhibiting the mycelial growth of *Phomopsis vexans*. For the evaluation of fungicide, leaf extract and bio agent, was used as seed dressing and foliar spray in field experiment. The maximum inhibition of disease was recorded by foliar spray in standing crop with Carbendazim + Carbendazim + Tebuconazole (2g+0.2%+0.1%) and minimum disease intensity (11.69%) and highest yield (117.70 kg/field) was found. followed by T₂–*T. harzianum* + Tebuconazole + Neem (10g+0.1%+2%) and , T₃ - *T. viride* + Datura + Mancozeb (10g+5%+0.2%) was found effective for disease control.

ORGANIC FARMING FOR SUSTAINABLE AGRICULTURE

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ABSTRACT

Organic farming is a contemporary and ecological way of producing fresh, natural agricultural product for consumer. Crop rotation, crop residues, animal manures, green manures, off-farm organic wastes, mechanical cultivation, mineral-bearing rocks, and elements of biological control are major components of the production management system used in organic farming

to maintain soil productivity, supply plant nutrients, and control insects, pathogens, and weeds. By improving nutritional intake, encouraging healthier rural lives, and, most critically, boosting biodiversity while reducing environmental sensitivity to the extreme climatic shifts the globe is presently experiencing, organic farming can assist to secure long-term food security. A tried-and-true substitute for a society controlled by chemicals is to live by natural means. Organic farming is not the same as going back to the old ways. Many of the traditional farming methods are still useful today. The best of them are combined with the most recent scientific knowledge in organic farming. Since the beginning of time, organic farming has been practised extensively in India. It's a farming technique that focuses on cultivating the land and growing crops in a way that keeps the soil alive and healthy by using organic wastes (crop, animal, and farm wastes, as well as aquatic wastes), microorganisms (biofertilizers), and other biological materials to provide nutrients to crops for higher long-term productivity in an environmentally friendly way. In order to prevent environmental damage, organic farming techniques are concentrated on having as harmonious a contact with nature as possible. In addition to the apparent immediate benefits to the environment, organic or natural farming also helps a farmer become self-sufficient in terms of food quality and quantity by reducing the amount of agro-input he needs and the expense of doing so. The issue of land becoming infertile, pests becoming resistant, and humans becoming more susceptible to infectious and non-infectious illnesses caused by manmade pollution have already demonstrated the long-term effects of chemical farming. In India, consumers and farmers are progressively returning to organic farming and organic goods. While the health benefits of organic food have yet to be proved beyond doubt, consumers are willing to pay even a premium price for such products. Organic farming is not a novel idea among Indian farmers who have engaged in traditional farming from time immemorial. For obvious reasons, organic farming is attracting increased interest in several Indian states, including Tamil Nadu. Locals are encouraged to grow organic farming by rising health consciousness among consumers and the potential market, both in India and overseas.

NEAR ZERO SURVIVAL THROUGH CELPHOS POISONING

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ABSTRACT

Aluminum Phosphide is an extremely toxic pesticide that is often used to preserve stored grain, most commonly wheat and rice. It is sold under various brand names such as Quickphos, Celphos and Salphos. Celphos is the most commonly used solid fumigant pesticide widely used in the Indian subcontinent. It is the most common tablet used for the suicidal deaths in Northern India. Each tablet is of 3 grams which are grey in colour and release 1 grams of Phosphine gas (PH₃) and has high diffusion rate. The lethal dose is 500 mg for an adult of 30 kilograms and above Phosphine gas causes inhibition of Cytochrome oxidase and also electron transport chain. Phosphine gas released by Celphos tablets effect Heart, lungs, and kidneys and can also cause electric abnormalities in the heart. The toxicity of celphos tablets results from the release of phosphine gas when it comes into contact with moisture. There is no antidote available till now. If anyone consumes Celphos tablet by mistake, death is rapid and survival is very difficult Prevention is another option in this case, and the most effective way is either ban of impose very strict regulations on the retail and sale of Celphos tablets Ingestion of this agrochemical

compound is the principal mode of suicide and about 1.87 lakh people in 2010 who committed suicide, consumed some type of Poison in which mainly, it was pesticides. The first case of celphos poisoning in India was reported in 1981 after that these cases have been increasing year by year. So in order to reduce these type of poisoning cases especially Aluminum Phosphide, little strict legislation and regulations are to be enacted and imposed and the awareness among the people is necessary. Till now nearby zero or no person has been survived who intaked celphos tablet accidentally or as for suicide, as antidote till now is not available Restricted use and awareness programs to farmers an the people of the urban areas, might be beneficial in prevention of toxicity.

EFFECT OF SPACING AND VARIETIES ON GROWTH AND YIELD OF ONION (*Allium cepa* L.) CROPS

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ABSTRACT

Haphazard and inappropriate plant spacing and poor soil fertility management practices are among the major factors constraining onion production. Therefore, a field experiment was conducted in Baba sahib bhim rao University Lucknow from November 2019 to April 2020 to assess the influence of spacing (15×10cm, 15×10cm and 10×10cm) and different nitrogenous fertilizers (Urea, Calcium nitrate and N:P:K mixture) on growth, yield, and quality of onion. The experiment was laid out in a randomized complete block design (RCBD) of with three replications. Significant difference was observed among all the treatments. The tallest plants (63.67cm) were obtained from the treatment with N: P: K applications well as those spaced at 10 cm intra and inter row spacing. Nitrogen fertilizers and spacing interacted significantly to influence all parameters. Thus, nitrogen fertilizer across the increasing spacing significantly increased number of leaves (30 DAT) fresh bulb weight and bulb diameter. The highest value of plant height (30, 60, and 90 DAT) and number of leaves (60, 90 and 120 DAT) were observed from the application of calcium nitrate and plant spacing of 15×10 cm. whereas total bulb yield was highest in T1S2 (18.53T ha⁻¹). It can be concluded that the highest benefit with low cost of production was obtained in response to the application of nitrogen fertilizers (urea & calcium nitrate) and spacing (15x10cm & 10x10cm) was optimum for producing the crop in the limited area.

RECOGNITION OF SEED FILM COATING POLYMERS FOR EFFICIENT AND HEALTH FRIENDLY SEED TREATMENT OPERATION FOR CERTIFIED SEED OF PIGEON PEA

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ABSTRACT

An experiment conducted to study the “**Recognition of seed film coating polymers for efficient and health friendly seed treatment operation for certified seed of Pigeon pea**” variety Asha in the department of Seed Science and Technology during 2016-2017. The seed materials were treated with Polymer {(Disco AG SP REDL200)+Thiram+Carboxin}, Polymer{(Disco AG SP REDL 200)+Thiram+Genius coat} Polymer {(Disco AG SP REDL-200)+Thiram+quick roots/mycorrhiza}. From the results, it can

be concluded that seeds of Pigeon pea variety Asha treated with Thiram, Carboxin, Polymer coating and mycorrhiza seed can be stored safely for 10 months under ambient condition, and can be recommended for safe storage. Germination, Seedling length, Seedling dry weight, Seed Vigor Index-I&II, insect infestation and field observation were recorded. T₁ [Polymer (Disco AGSP Red L-200)+Thiram+Carboxin] treatment showed better quality performance in laboratory and T₃ [Polymer (Disco AGSP Red L-200)+ Thiram+Quick Root] treatment showed better performance in field observation.

EFFECT OF DIFFERENT INORGANIC, ORGANIC AND BIO-FERTILIZERS ON PLANT GROWTH OF SWEET ORANGE (*Citrus sinensis* Osbeck.)

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ABSTRACT

The present investigation entitled —Effect of different Inorganic, Organic and Biofertilizers on plant growth of Sweet Orange (*Citrus sinensis* Osbeck) were carried out at experimental field, Department of Horticulture, Allahabad School of Agriculture, Sam Higginbottom Institute of Agriculture, Technology and Sciences Allahabad (Uttar Pradesh) during the year (2015-2016). The experiment was laid out in Randomized Block Design (RBD) with thirteen treatments and each replicated thrice. The treatment T₆ (20 kg/plant Farm Yard Manure, 10 g/plant PSB, 10 g/plant Azosprillium, Nitrogen 337 g/plant, Phosphorus 112 g/plant and Potash 75g/ plant was found to be the most suitable in terms of maximum plant height (119.87 cm), maximum number of leaves (400.90), maximum number of branches (29.83), maximum stem diameter (2.40 cm), maximum spread of canopy (75.62 cm²), maximum Leaf area (32.46 cm²), maximum length of internodes (8.60 cm) and minimum incidence of disease percentage (1.10 %) followed by treatment T₁₂ (20 kg/plant Farm Yard Manure, 10 g/plant PSB, 10 g/plant Azosprillium, Nitrogen 225 g/plant, Phosphorus 75 g/plant and Potash 50 g/plant, whereas the minimum parameters were found associated with (T₀) control. The nutrient status of soil like EC, Nitrogen, Phosphorous and Potassium were also higher with treatment T₆ and the maximum pH was recorded with (T₀) control. The results of the present study suggested that combination of Inorganic, Organic and Bio-fertilizers are responsible for increased growth of sweet orange.

Keywords: Sweet orange, FYM, PSB, Azosprillium, Soil nutrients

NAKED SEEDED TYPE: A TRAIT IN COTTON AS A NEW MORPHOLOGICAL MARKER

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ABSTRACT

Lint fibre and fuzz fibre are produced by the differentiation and extension of a single, long epidermal cell found in cotton seeds called trichomes (linters). The most valuable commercially

viable byproduct of the cotton plant is lint fibres. Fuzz fibres are extremely short, ranging in length from 0.5 to 1 mm, closely bound to the seed coat, and equipped with a substantial secondary cell wall. Lint and fuzz fibre are present in every variety grown from the tetraploid cotton *G. hirsutum*. The absence of fuzz fibre growth on the seed coat is indicative of the nakedness or lack of fuzzless feature. It has been known as the "naked-seed phenotype" that fuzzless types produce black seed when they are ginned. In *G. hirsutum*, the fuzzless phenotype is a significant feature that is utilised to identify the physiological processes regulating fibre formation and fibre qualities.

Depending on the cultivar's genetic background, the number of fuzz fibres on the seed varies. While other few cultivars have extremely thin fuzz fibres or completely naked seeds, the majority of upland cottons have seeds that are entirely coated in fuzz. It was discovered that certain variations only have fuzz fibres on the micropylar end of the seeds, which is why these are frequently referred to as "tufted naked types". The absence of naturally occurring or artificially produced mutant alleles, such as the N₁ allele, which has been found to delay lint commencement, is primarily to blame for the lack of fuzz fibres on naked seeds. Since a genotype that is naked, it can be clearly distinguished from one that is fuzzy in type; it can serve as an immediately recognizable morphological marker to aid breeders in identifying or purifying a genotype.

The naked seeded variety offers significant benefits over the typical fuzzy variety due to the absence of fuzz fibres on the seed coat. A reduced risk of mechanical damage to the seed coat during ginning may exist in varieties that are bare. The process of acid delinting is entirely eliminated. Cotton cultivars without fuzz make oil extraction simple and may have higher oil recovery since fuzz fibres absorb less oil as a result of their absence. As a result, cotton would benefit from the establishment of varietal lines and hybrids based on naked seed types.

Keywords: Cotton, Naked seed types, Fuzz fiber and Morphological marker

FUNCTIONAL MARKERS: A NOVEL GENE BASED MARKERS TO EXPLOIT INDIVIDUAL TRAIT VARIATION

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ABSTRACT

Plant breeders use molecular markers as crucial genetic tools to identify the genetic diversity present in their germplasm collection. Molecular markers are useful tools to understand the dynamics of the genome and thus increasing breeding effectiveness. Numerous fields used markers extensively for various purposes. The majority of markers are either found in the transcribed or non-transcribed regions of the genome, but their biological roles are unknown. However, in recent years, it has been able to create markers from genes or the transcribed regions of the genome. Such indicators are sometimes referred to as genic molecular markers (GMMs) or functional markers (FMs). Therefore, functional markers are those that are found inside genes and are thus appropriate instruments to determine function of genes.

Genic markers have been divided into two types according on their origin (polymorphic or non-polymorphic location in the gene): (a) gene targeted markers (GTMs), which are derived from polymorphic sites within genes causally involved in phenotypic trait variation, such as candidate gene-based molecular markers; (b) functional markers (FMs), which are derived from polymorphic sites within genes not necessarily involved in phenotypic trait variation. The

FMs can be further divided into two subgroups based on their involvement in phenotypic trait variation: (a) direct functional markers (DFMs), for which the contribution to phenotypic trait variation is well established; and (b) indirect functional markers (IFMs), for which the contribution to phenotypic trait variation is only hinted at. These markers may be found utilising a variety of methods, including comparative genomics, candidate gene-based marker discovery, EST-based marker discovery and intron-targeted marker creation. Next-generation sequencing data may be analysed using bioinformatic tools like Atlas-SNP, NextGENe, PanGEA and SNPsniiffer to find markers and study gene expression.

Recent developments in nanotechnology, nucleic acid chemistry, computational biology, and automation suggest that the creation and implementation of gene-based markers employing high-throughput marker discovery and genotyping assay is still a relatively new field, and more interesting developments are anticipated in the future. The capacity to do thorough genomic studies quickly, cheaply, precisely and with high sensitivity is one of the major promises of genic markers. This should lead to the development of a new generation of regular genomic tools to aid crop breeding.

Keywords: Molecular markers, Functional markers, Candidate gene and SNPsniiffer

INITIATIVE FOR ENHANCEMENT OF FARMER’S AND RURAL YOUTH INCOMES IN CURRENT CHANGING CLIMATE BY PRACTICING FARMERS PARTICIPATORY HYBRID PADDY SEED PRODUCTION IN BIHAR

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ABSTRACT

In Bihar, during current climate changing condition, demand of hybrid paddy seed among farmers is enhancing day by day. As per Bihar Agricultural Road Map 2017-2022, for hybrid paddy seed distribution program, physical and financial target fixed was 60775 quintals and ₹ 6077.53 (in lakh) respectively during 2021-22 but in Bihar, no hybrid paddy seed production is undertaken at either public or private sector. Many private seed sector companies are encasings the opportunity by providing a wide range seed of hybrid varieties in paddy. These private companies usually produce these hybrids in different state and sell these produced varieties in Bihar Agri-sector markets. It results in hike in price by 30 to 40% due to transport and storage at locations other than Bihar along with poor adaptability of crop in Bihar condition. This causes manifold losses in terms of both face value and economical fronts to Bihar which may be broadly partitioned in three headings:

a. Losses to farming community: Lose of the opportunities to harvest economical benefits from Hybrid Paddy Seed Production venture.

b. Losses to working man forces or laborers of Bihar: As hybrid Paddy seed production is being taken at other states, there is total loss of Job Avenues in the hybrid paddy production sector, followed by loss of working opportunities of other allied activities such as Seed Processing, Seed Storing, etc.

c. Loss of face value: This is major loss occurs to both scientific and seed production scientific community of state due to non development of Hybrid Paddy Seed Production Techniques suitable in Bihar Agro-Climatic Conditions.

Taking above facts in mind, one project entitled “Standardization of Seed Production Practices and Participatory Seed Production Program of Hybrid Paddy” has been submitted and finally gets sanctioned during last month of 2019 for period of two years by RKVY *Raftar* with the theme to standardize hybrid paddy seed production techniques and to popularize hybrid seed

production under Farmers Participatory mode in Bihar. As per the objective of this research project, standardization of seed production techniques was undertaken for three hybrid paddy genotypes (two experimental hybrid genotypes developed in RPCAU, Pusa, namely, RRH-1 & RRH-2 and one commercial hybrid variety received from IIRR, Hyderabad, namely, DRRH-2) followed by farmer’s participatory Hybrid Paddy Seed Production, which was undertaken in both *boro-2020-21* and *Kharif-2021* seasons in two districts (Biraoul Darbangha and Samastipur) of Bihar. During summer-22, on-farm trainings for hybrid paddy seed production for coming Kharif-22 were organized in about ½ acre at 5 farmer’s field and in 1 acre at KVK Turki with hybrid genotypes of RRH-2, RRH-3 and DRRH-2. Out of five farmers, two farmers and at KVK Turki were successfully undertaken on farm hybrid paddy seed production training. During kharif-22, based on-farm training during kharif -21 and summer-22, parental line seed for more than total 17.00 acres were distributed among farmers of Samastipur and Nalanda. First Farmer’s Seed Producing Organization (FPO) was started at Samastipur with help of Morand Desh Foundation (NGO) on Farmers Participatory Hybrid Paddy Seed Production. Based on above results and to undertake this farmer’s participatory Hybrid Paddy Seed Production on large scale, Government of Bihar has recommended under RKVY new project entitled “Motivation and Training for Participatory Hybrid Paddy Seed Production in Bihar” during-2022 for sanction.

All the seeds of female parent (A line) and male parent (R line) were sown in the nursery by adopting staggered planting approach. Twenty days old seedlings were transplanted to hybrid seed production plot. During transplanting 5 female (A): 1 male (R) row ratios were adopted. Spacing for female (A) and male parental (R) lines was maintained as 15 X 10 cm and 15 x 15 cm, respectively. Foliar application of Giberellic acid (GA₃) was done during panicle initiation and at the time of 30 percent panicle emergence. Supplementary pollination was done by rope pulling during throughout flowering period.

Results of Hybrid Paddy Seed Production both at university and Farmers Participatory mode during *Kharif-21* were quite encouraging. Productivity of about 25 q/ha recorded at university farms whereas at farmers field productive recorded was more than 30 q/ha of for all three hybrid paddy genotypes seed production against national average of 15 q/ha. Economies of seed production was worked out for both pureline and hybrid paddy seed production. Bihar farmers have now opportunity to enhance their income more than two times in comparison to production of pureline seed of same duration. Area under Farmers participatory hybrid seed production will be further enhanced depending on availability of parental lines seed.

Keywords: Farmers participatory, Hybrid paddy, Seed production, A line, R line, GA₃, Bihar.

IMPACT EVALUATION OF COVID-19 LOCKDOWN ON AMBIENT AIR QUALITY OF MAJOR CITIES OF INDIA: A STATISTICAL APPROACH

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ABSTRACT

Over the last decade, air pollution has been a major threat in many regions of India, with significant consequences for human health and agriculture. SO₂, NO_x, O₃ and suspended particulate matter are some of the important air pollutants causing yield loss in crops. Air pollutants are also a driving force for climate change. In response to the present threat of the COVID-19 pandemic, India had imposed nationwide lockdown measures in four phases from 25th March to 31st May 2020. Because of the lockdown regulations, pollution concentration in major places across the country has significantly decreased, which has sparked a new

interesting research area. The COVID-19 outbreak and its measurement enable us to estimate the contribution of anthropogenic sources to India's air pollution. The current study intends to statistically examine the impact of COVID-19 lockdown on air quality in India's four megacities, namely Delhi, Mumbai, Kolkata, and Hyderabad. Data on key air quality indicators (PM₁₀, PM_{2.5}, CO, NO_x, O₃, SO₂, Benzene, and AQI) were collected, imputed, and compiled from respective meteorological stations (<https://aqicn.org/> and <https://www.cpcb.nic.in/>) for the period 1st August 2018 to 1st July 2020. To estimate the changes in pollutant concentrations during the lockdown, we compared air quality indicators of the lockdown phase 2020 with the same period of 2019. To statistically quantify the effect of lockdown, we introduced a modified ARIMA-X model with lockdown (dummy variable) as an exogenous variable. We also proposed machine learning models (ANN model without lockdown effect and ANN model with lockdown effect) and evaluated their efficiency for modelling air quality parameters. Different patterns of decreasing concentrations of air pollutants have been observed in different cities. Most pollutant concentrations (PM₁₀, PM_{2.5}, CO, NO_x, and AQI) have decreased dramatically across all cities, but O₃, SO₂, and Benzene concentrations have shown varied results. The most substantial decreases were assessed for NO₂, PM₁₀, and AQI, while SO₂ having the least reduction, followed by O₃ and Benzene. Delhi witnessed maximum fluctuation in the concentration of pollutants, whereas Hyderabad observed the least fluctuation over the lockdown time. The ARIMA-X model inferred that lockdown has a substantial impact on most of the major pollutants, and the Machine learning model demonstrated that the ANN model with lockdown effect obtained higher accuracy than the ANN model without lockdown effect. A decrease in SO₂ and NO_x concentrations is a favorable indication for agriculture, but an increase in O₃ concentrations is a cause for concern for agricultural productivity. This study emphasized the significance of optimizing anthropogenic activity in order to achieve better air quality as a means of combating climate change.

Keywords: Air Pollutants; ANN; ARIMA-X; Climate Change; COVID-19 Lockdown; Machine Learning

IN VITRO EXPLORATION OF FUNGICIDES AGAINST COLLETOTRICHUM CHRYSANTHEMI INCITING ANTHRACNOSE OF CHRYSANTHEMUM.

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ABSTRACT

The disease anthracnose of chrysanthemum caused by the fungus *Colletotrichum chrysanthemi* is one of the most serious and destructive disease of cultivated Chrysanthemum spp. It is commonly prevailed in almost all chrysanthemum growing areas and cause considerable quantitative losses and deteriorate the quality of flowers.

Different fungicides viz., Mancozeb 75% WP @ 0.2%, Carbendazim 12% + Mancozeb 63% WP @ 0.2%, Chlorothalonil 75% WP @ 0.1%, Propiconazole 25% EC @ 0.1%, Difenconazole 25% EC @ 0.1%,

Tebuconazole 50% + Trifloxystrobin 25% WG @ 0.05%, Azoxystrobin 25% SC @ 0.1%, Thiophanate methyl 70% WP @ 0.1% and Copper oxychloride 50% WP @ 0.25% were evaluated *in vitro* against *Colletotrichum chrysanthemi*.

Among the various fungicide evaluated against test pathogen, Difenconazole 50% EC @ 0.1% showed maximum (83.33%) inhibition as against control. The next best treatment was Tebuconazole 50% + Trifloxystrobin 25% WG @ 0.05% which recorded 82.70% inhibition and was followed by Copperoxychloride 50% WP @ 0.25%, Carbendazim 12% + Mancozeb 63%

WP @0.2%, Propiconazole 25% EC @ 0.1%, Chlorothalonil 75% WP @0.1% with 80.5%, 78.3%,76.6% and 75.5% inhibition of test fungus respectively. Thiophanate methyl 70% WP, Azoxystrobin 25% SC were also equally effective in inhibiting the mycelial growth of test fungus with 72.2% and 70% inhibition. Mancozeb 75% WP @ 0.2% was found least effective against test pathogen with 61.10% inhibition.

CULTURAL AND MORPHOLOGICAL STUDIES on GROWTH AND SPORULATION OF *Alternaria brassicicola* Schw.

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ABSTRACT

The fungus *Alternaria brassicicola* was capable of growing on all five different solid media tested but variation in radial growth was observed on the different media. The growth of the pathogen on Potato Dextrose Agar (PDA) was maximum i.e. 87.34 mm and significantly superior over Mustard leaf decoction, Richards media, Asthana and Hawker's and minimum growth i.e. 22.17 mm was recorded in Czepek's (Dox) agar media. On liquid media, the maximum dry mycelial weight of 831.67 mg was recorded in Potato dextrose broth whereas minimum weight was obtained in case of Czepek's solution (99.67 mg). Colony colour of *A. brassicicola* changed from white to grey on Potato dextrose broth during the later stage. *A. brassicicola* grew on all the temperatures evaluated. Significantly maximum mycelial growth and colony diameter was recorded at 25^oC which was at par with 20^oC. The present studies also indicate that the pathogen tolerate a wide range of pH. Maximum (823.34 mg) dry mycelial weight was obtained at pH 6.5 which was followed by pH 6.0 (723.34 mg) and pH 7.0 (700.00 mg). Among the seven pH levels tested, pH 6.5 was found to be the best in sporulation of pathogen *A. brassicicola*.

Keywords: *Alternaria brassicicola*, Cultural and Morphological Studies

HETEROTIC RESPONSES OF SINGLE CROSS HYBRIDS OF MAIZE (*Zea mays* L.) FOR GRAIN YIELD AND ITS COMPONENT TRAITS OVER THE ENVIRONMENTS

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ABSTRACT

The present investigation entitled “Heterotic Responses of Single Cross Hybrids of Maize (*Zea mays* L.) for Grain Yield and Its Components Traits Over the Environments” was carried out

with twenty-one single cross hybrids developed through diallel mating scheme along with their seven parental inbreds and three commercial varieties at six environments comprises three locations and two crop growing seasons i.e., Kharif 2019 and Rabi 2019-20. The results of pooled analysis of variance for design of experiment over six environments for fourteen quantitative traits revealed that the mean squares due to environments, genotypes and genotype x environments interactions were highly significant for all the traits studied. The hybrids, P1 x P4, P2 x P5, P3 x P6, P4 x P5 and P6 x P7 were found to be good specific combinations for early days to 50 per cent anthesis, early days to 50 per cent silk, shorter anthesis-silking interval, and early days to 50 per cent physiological maturity. The pooled estimates of mid parent, better parent and standard heterosis over the best check, DMRH-1308 (C1) for grain yield per plant revealed the hybrids, namely, P1 x P7, P2 x P5 and P3 x P6 exhibited significant to highly significant positive heterotic responses for this trait. Hence these hybrids can be exploited commercially after critical testing for their superiority and stability across environments.

Keywords: Heterotic responses, Maize, and Single cross hybrids.

BIOTECHNOLOGICAL INTERVENTIONS IN WOOD INDUSTRIES

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ABSTRACT

Wood is a natural, biodegradable and renewable raw material, mainly used in construction, furniture and fuel production. Besides solid wood, wood-based products such as paper products (various types of paper, cardboard) and board materials (particle & fibre boards) are of great industrial importance. Wood based industries are emerging tremendously to meet the demand of continuously increasing population. However, most of the industrial processes adversely affect the environment, due to direct release of harmful chemicals and wastewater. To cope up with this, biotechnological interventions plays an important role. Biotechnology is defined as the technical use of living organisms or parts thereof, in making new products or processes. Industrial application of biotechnology is mainly based on fungal cultures and fungal isolated enzymes. Biotechnological methods in the pulp and paper industry include bio-pulping, enzymatic bleaching, pitch control and purification of wastewater. Biotechnological approaches in the area of wood industries aim at enhancing the treatability of wood with enzymes extracted from different microbes, mostly fungi and replacing chemicals used for different processes with biological control agents. For instance, the substitution of conventional chemical glues in the manufacturing of board materials and pitch control is achieved through the application of isolated fungal enzymes. Moreover, biotechnology plays an important role in saving energy and reduction of environmental hazards. Besides the advantages, biotechnological applications in wood industries faces many challenges like complexity, unreliability, high cost of enzymes and inadequate knowledge of the methods, whereas; major problem lies in their commercialisation. Nevertheless, many applications are still not developed at the industrial level, but the use of biotechnology has great potential in wood industry, and need more research.

Keywords: Bio-pulping, Biotechnology, Enzymes, Fungal cultures.

EARLY SUMMER HITS WHEAT PRODUCTION IN U.P.

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ABSTRACT

The state alone contributes more than 25% of India’s total wheat production. A recent survey by the state’s agriculture department put the total wheat production in UP in 2022 at 359 lakh metric tonnes (LMT) which is 16 LMT less than the wheat production recorded in 2021. Wheat production as well as total food grain production had been on the rise for the last few years largely because of favourable monsoons. Compared to the previous year, the wheat production this year is estimated to have fallen by around 16 lakh MT given the fact that wheat production in 2021 was recorded to be 375 LMT against 359 LMT this year,” Rajesh Gupta, agriculture director, statistics, said. The early arrival of summer this year is the main reason for the decline in the wheat productivity and production in the state,” he added. Since the temperature started to be high right from March, the wheat grains germinated or ripened prematurely because of which both quality and quantity suffered heavily resulting in low production, he explained. The survey also found that unlike in 2021 when the average wheat production was found to be 38.04 quintal per hectare, this year the output shrank to 36.81 per quintal, sowing having been done on around 98 lakh hectares of area. According to Gupta, the wheat crop needs a longer cold spell for optimum output but the early onset of summer and heat waves adversely affected the wheat production in the state. UP, which is the highest wheat-producing state in the country, grows around 100 LMT as market surplus which is sold to government agencies at the minimum support price (MSP) and the private traders at the market price. Government data shows that UP produces 20% of the country’s total food grain feeding the country’s 16.9% population. This is despite the fact that the state’s share in the country’s cultivatable land is only 11.8%. Wheat alone accounts for more than 50% of the state’s total food production.

Keyword: Wheat Production, climatic variation in wheat cultivation

FLORISTIC DIVERSITY, CONSERVATION STATUS AND ECOSYSTEM SERVICES OF LARGE CARDAMOM BASED TRADITIONAL AGROFORESTRY SYSTEM ALONG AN ALTITUDINAL GRADIENT IN DARJEELING HIMALAYA, INDIA

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ABSTRACT

Purpose

This research work aims to study the variation in phytosociology and diversity of large cardamom based traditional agroforestry systems along an altitudinal gradient in the Darjeeling Himalayas.

Method

The study was conducted in Darjeeling Himalayas from January 2019 to April 2021 which was classified into three altitudinal i.e., low (700-1200 m asl), mid (1200-1700 m asl) and high (> 1700 m asl) for analysing the variation on phyto-sociology, diversity. A total of 25 traditional large cardamom based agroforestry holdings were found during the survey, which was distributed in the elevations between 700-2000 m, of which 17 were in Kalimpong district, and

only eight were in Darjeeling district. Ecosystem services provided by different species in the traditional large cardamom based agroforestry system was documented following Millennium Ecosystem Assessment guidelines (Anon., 2005).

Result

The agroforestry systems were vertically and horizontally heterogeneous in their plant diversity and arrangement, thus maintaining the original forest characteristics. The altitudinal location significantly influences the plant diversity. Overall, 130 plant species were documented, of which 37 were trees, 25 shrubs, 46 herbs, 8 ferns, 11 climbers and three orchids. Low- (700-1200 m asl), mid- (1200-1700 m asl) and high- (< 1700 m asl) altitude class was documented with 76 plant species represented by 63 genera and 43 families; 60 species represented by 57 genera and 40 families; and 52 species represented by 45 genera and 35 families.

Conclusion

Documentation of ICUN red-listed species indicates that the large cardamom-based agroforestry farming system plays a vital role in harbouring and conserving regional plant diversity. Moreover, the traditional agroforestry system offers various ecosystem services from provisional to cultural like NTFPs, biodiversity conservation, water regulation and purification, production, economic yield, carbon sequestration, nutrient cycling and socio-cultural service for the well-being of the society. Due to heterogeneous composition and structure along with the restrictions in biomass removal the systems were stable and thus viable for offsetting regional carbon emissions.

Keywords: Traditional agroforestry system, *Amomum subulatum*, Vegetational diversity, Altitude, Darjeeling Himalaya

EFFECT OF DIFFERENT LEVELS OF ZINC AND IRON ON PHYSICO-CHEMICAL PROPERTIES OF SOIL IN CLUSTER BEAN

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ABSTRACT

The research conducted at the Soil Science Research Farm of Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, U. P. during the *Kharif* season 2020-2021. The experiment was laid out in randomized block design with sixteen treatment and three replications with four levels of zinc and iron with RDF that leads to the non-significant findings *i. e.* bulk density and particle density and remaining macro – micro nutrients such as % pore space, WHC, pH, EC, OC, NPK, Zn and Fe were found significantly low to medium range, which comprises yellowish brown colour, sandy loam textured soil and neutral to alkaline soil that is non- saline in nature among all the sixteen treatments combination applied in treatment T₁₆ (RDF @ 100 % + Zinc @ 20 kg ha⁻¹ + Iron @ 7.5 kg ha⁻¹) has shown the best results in improving the soil nutritional status that leads to increased crop yield and also increased morphological parameters as compare with in treatment T₁ [Absolute control (RDF @ 0 % + Zinc @ 0 kg ha⁻¹ + Iron @ 0 kg ha⁻¹)].

Keywords: Zinc, Iron, RDF and Cluster bean.

IMPACT OF CLIMATE-SMART AGRICULTURE PRACTICES ON TERMINAL HEAT STRESS OF WHEAT YIELD IN NORTH-BIHAR INDIA

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Purpose

Wheat (*Triticum aestivum* L.) is one of the most cultivated cereal crops in India. Change in the temperature, precipitation and decrease water availability for irrigation negatively influence the wheat yield and rising major concern for national and international food security to overcome with climate change scenario. In this research we study, the major impact of increase temperature and adjustments in sowing date on wheat yield in north-Bihar India

Methods

The probability of adoption of climate-smart agricultural practices (CSAPs) to overcome the heat stress influence. A study was conducted for two years to observe the impact of terminal heat stress on wheat by using three sowing date, viz. D1 (1 November to 15 November), D2 (16 November to 30 November) and D3 (1 December to 15 December) at Krishi Vigyan Kendra Saraiya, Muzaffarpur, India.

Results

Results was revealed that timely sown crop (D1) was found to be effective by reducing the impact of heat stress in terms of gain in grain yield by 21.45 % and 14.15 % for crop sown on D2, as compared to crop sown on D3 experiencing the heat stress. The delay-sown crop resulted reduce yield, which faced enhance temperature in its terminal growth stages.

Conclusions

It was observed that rising temperature at terminal crop growth stages caused yield reduction. By using the heat-tolerant cultivars and agronomic strategy under terminal heat stress condition enhanced the wheat yield. Reduce the effect of terminal heat stress by adoption the CSAP and adjustment in sowing window could be the appropriate planning under changing climate especially the terminal heat stress.

Keywords: Climate change adaptation, Climate smart agricultural practices, Minimum tillage, Stress-tolerant seed varieties

CONSERVATION OF PLANT BIODIVERSITY AND PLANT GENETIC RESOURCES

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ABSTRACT

Plant biodiversity is the foundation of our present-day food supply (including functional food and medicine) and offers humankind multiple other benefits in terms of ecosystem functions and resilience to climate change, as well as other perturbations. Species that are on the brink of extinction because of the rapid loss of genetic diversity and habitat come mainly from resource-poor areas of the world and from global biodiversity hotspots and island countries. These species are unique because they are endemic, and only a few small populations or sometimes only a few individuals remain in the wild. Therefore, the challenges to supporting conservation by in vitro measures are many and varied.

The conservation of species has two main streams: *in situ*, i.e. within the confines of communities in their present and, hopefully, their future of existence; and *ex-situ*, i.e. subject to continuing active support and management by humans. Both methods are applied to preserving both wild and domesticated species, a choice, if available, depending on the breeding system, the life cycle, etc., and on the purpose and time scale of preservation.

In particular, the impacts of land use and climatic changes on plant biodiversity will have extensive ramifications on other taxa and human society given that plants are fundamental structural and nutrient-sequestering components of most ecosystems. *In vitro* techniques for conserving plant biodiversity include shoot apical or axillary-meristem-based micropropagation, somatic embryogenesis, cell culture technologies and embryo rescue techniques, as well as a range of *in vitro* cold storage and cryopreservation protocols, and they are discussed in depth in this issue.

Keywords: Plant biodiversity, *in vitro*, *ex-situ*, cryopreservation and embryo rescue techniques.

CLIMATE CHANGE: RISK TO BIODIVERSITY AND FOOD SECURITY

ANIRUDH

KVK, Jaisalmer, Rajasthan

ABSTRACT

Climate change has become a global concern over the last few decades. Rising global temperatures are fuelling environmental degradation, natural disasters, weather extremities, food and water insecurity and economic collapse. The Millennium Ecosystem Assessment ranks climate change among the main direct drivers affecting ecosystem. If current rates of warming continue the global temperature could increase by 1.5°C by 2030 compared to before the industrial revolution. The major impact of climate change on biodiversity is the increased extinction rates, changes in species distribution, reproduction timings and length of growing seasons for plants. Climate change affects plant growth and production by promoting the spread of new pests and diseases. Increasing heat stress, changes in rainfall patterns, greater leaching of nutrients from the soil due to intense rains, greater erosion due to stronger winds and more wildfires in drier regions are the impacts of climate change on agriculture which ultimately reduces the yield leading to food insecurity. The resilience of ecosystems can be enhanced and risk of food security can be reduced through the biodiversity based adaptive and mitigative strategies. Maintaining and restoring the native ecosystems, protecting and managing habitats for endangered species and establishing networks of terrestrial, freshwater and marine protected areas that take into account projected changes in climate. Bringing extra land into agriculture, mitigating food waste, better management of agricultural soils and restoring degraded agricultural lands can mitigate climate changes to achieve food security.

P SEQUESTRATION: A METHOD TO MITIGATE EUTROPHICATION OF LAKE ECOSYSTEM

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ABSTRACT

Global water sources are facing the problem of eutrophication as a consequence of excessive dissolved phosphorus (P) in freshwaters. Better understanding of the occurrence of water

phosphorus (P) at the water-sediment interface is vital to clarify P sources of origin in lake ecosystems. To counteract the occurrence of eutrophication, the successful reduction of dissolved P mainly as the form of phosphate in freshwater highly depends on both of controlling internal P release from sediments and limiting introduction of external P inputs. Despite the great progress in limiting P inputs from point contaminant sources of P particularly wastewater discharges, the control of non-point P sources such as agricultural runoffs is still problematic. As a result, the external P inputs into freshwaters from these sources still occur. In addition, the capacity of lake sediments to reduce the continuously introduced P is limited and can be affected by redox conditions. Several techniques such as sediment dredging, sediment oxygenation, sediment capping with metal salts [e.g., aluminum (Al) and calcium (Ca)] have been adopted to sequester/immobilize phosphate in sediment, of which the control of P release using chemical salts or materials receives increasing attention due to its high efficiency and energy. Although these materials can effectively reduce dissolved P from freshwater, the capped P in lake sediment may be re-released into overlying water phase due to the aging of materials and variations of environmental conditions such as pH and redox potential. Tackling the release of phosphorus (P) from sediments remains a challenge to mitigating the eutrophication of lakes.

CHARACTERIZATION OF BIO SURFACTANT PRODUCING BACTERIA FOR BIOREMEDIATION

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ABSTRACT

A variety of surface-active and low molecular weight surfactants are being produced by various micro-organism, which vary in their molecular size and biochemistry. The high molecular weight surfactants are typically either polyanionic heteropolysaccharides or complexes containing both polysaccharides and proteins, while the low molecular weight surfactants are frequently glycolipids. Bio surfactants are an intriguing class of materials with a wide range of applications in fields like agriculture, public health, food, medicine, waste management, and environmental pollution control, such as the breakdown of hydrocarbons found in soil and water. Amphiphilic substances known as bio surfactants (BS) are produced on living surfaces, primarily the surfaces of microbial cells, or excreted extracellularly. They contain hydrophobic and hydrophilic moieties that lower surface tension (ST) and interfacial tensions between individual molecules at the surface and interface, respectively, and increase the solubility of molecules in water. Hence, the presence of surfactants may increase microbial degradation of pollutants. Use of bio surfactants for degradation of pesticides in soil and water environment has gained importance only recently. Epiphytic bacteria and their bio surfactants which was relatively little examined of phyllosphere microbiology compared to other bacterial habitats. Therefore, the production of bio surfactants on the leaf surface, and the effect of a rich indigenous epiphytic population on the leaf's physical properties should be investigated thoroughly. This will further help to address the effects of indigenous bio surfactant producer plants on contaminated water and soil.

Keywords: Bio surfactant, Surface tension, Bioremediation, Epiphytic

IMPACT OF DIFFERENT GENOTYPES AND IRRIGATION REGIMES ON WATER USE EFFICIENCY OF SUGARCANE

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Purpose

Globally, sugarcane produce about 80 per cent of sugar. In India sugarcane holds prominent position as a cash crop. In today's era climate change is a burning issue. Due to climate change frequency of abiotic and biotic stresses has increased. However, biotic stress can be managed to some extent. But biggest problem is to maintain and manage abiotic stress that occurs in unpredictable manner. So, here purpose of research is to find out better genotypes and management practices to improve the sustainability as well as adaptability of sugarcane in worst climatic situation like drought.

Methods

A field experiment was carried out at Sugarcane Research Institute, Dr. Rajendra Prasad Central Agricultural University, Bihar, Pusa (Samastipur) during spring season of 2018-19. The soil of the experimental plot was sandy loam in texture with calcareous in nature. The experiment was laid out in strip plot design with three replications. The experiment comprised of six elite sugarcane genotypes, namely CoP 16437, CoP 112, BO 153, CoP 2061, BO 154 and CoP 9437 along with two different irrigation regimes (IW: CPE ratio 1.0 and 0.3) to evaluate water use efficiency of sugarcane varieties under drought condition.

Results

Results showed that significantly higher water use efficiency (1.13 t/ha-cm) was obtained with CoP 2061 as compared to BO 153 (0.90 t/ha-cm), BO 154 (0.89 t/ha-cm) and CoP 112 (0.84 t/ha-cm) and there was statistical parity with CoP 16437 (1.05 t/ha-cm) and CoP 9437 (1.01 t/ha-cm). While, irrigation regimes did not cause significant variation on water use efficiency. However, comparatively higher water use efficiency (1.03 t/ha-cm) was noticed with an IW: CPE ratio 1.0.

Conclusion

To adapt changing climatic conditions, there is need to identify suitable genotypes which tolerate and resist water stress condition which occurs frequently. Genotype has affect on water use efficiency of sugarcane. Among six genotypes, CoP 2061 performed well and showed significantly higher water use efficiency.

Keywords: Sugarcane, water use efficiency, Genotype, Irrigation regimes

MUTATION AND MUTAGENESIS – A POTENTIAL APPROACH IN PLANT BREEDING

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ABSTRACT

A mutation is a sudden heritable change in the DNA in a living cell, not caused by genetic segregation or genetic recombination. The deliberate use of mutations in plant breeding is known as mutation breeding. Phenotypic variety is produced by genetic variation, which also serves as a primary catalyst for evolutionary diversification. Heritable variation was noted and employed in the domestication of plants and animals thousands of years ago. Dissociative changes in the environment are currently in a stable state globally. Its detrimental effects were gradually applied to a variety of crops, which prevented crop improvement as well. Mutation breeding, as opposed to hybridization and selection, provides the benefit of repairing a defect in an otherwise superior cultivar without sacrificing its agronomic and qualitative traits. These benefits have led to mutation breeding finding a role in plant breeding ever since the initial release of mutant cultivars from basic mutation research in Europe. Techniques for inducing mutations with physical and chemical mutagens in major crops have been improved, and methods for selecting mutant populations have been described. A hitherto unreported wide spectrum of mutations has been seen, and new mutagenic factors like cosmic rays and ion beam radiation are being researched. The effectiveness of mutant breeding has been increased due to the availability of strong in vitro procedures for several crop species. In vitro methods are extremely effective because they can handle sizable mutagenized populations in a small area, have rapid progeny turnover in species that are propagated vegetatively, and can screen for a variety of biotic and abiotic stress factors in the culture environment. In the last ten years, reverse genetic methods have revolutionised the field of mutant screening. Due to the development and incorporation of large-scale selection techniques, micropropagation and other in vitro culture methods, molecular biology tools and techniques, and modern crop breeding performance, induced mutagenesis is now successful in application. In this regard, insertional mutagenesis and retrotransposons are taking more support for mutational tagging and novel mutation creation as distinct mutation approaches and their application processes change dramatically over time. In this field of inquiry, where just a few crop plants have been employed for mutational experiments on several key agronomic features thus far, functional genomics investigations provide the apex platform. This is a necessary procedure that is used on a variety of crops to develop them further. The main methods and resources in molecular mutation breeding are high throughput DNA technologies for mutant screening like TILLING (Targeting Induced Limited Lesions IN Genomes), High-Resolution Melt Analysis (HRM), ECOTILLING, etc. Molecular mutation breeding will considerably improve crop breeding techniques' effectiveness and efficiency. With the goal of using a number of globally significant crops to validate identified pertinent novel methodologies, such modern and traditional technologies are being used for the development of mutation induction. Therefore, integration of mutation techniques with molecular approaches is providing exciting opportunities for modern plant breeding.

Keywords: *Mutation, Mutagenesis, TILLING, HRM, ECOTILLING*

FIELD EFFICACY OF BIO-INTENSIVE PEST MANAGEMENT (BIPM) MODULES AGAINST A MAJOR INSECT PESTS OF BRINJAL, FRUIT AND SHOOT BORER, *Leucinodes arbonalis* (Guenee)

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ABSTRACT

The study was conducted during *kharif*, 2017 and 2018 at Entomological Research Farm, Department of Entomology, Odisha University of Agriculture and Technology (OUAT), Bhubaneswar to study the bio-efficacy of bio-intensive pest management (BIPM) package, against a major pest of brinjal, Shoot and fruit borer, *Leucinodes arbonalis* (Guenee). The field experiment was laid out in a Randomized Block Design (RBD). There were four packages of treatments and each treatment was replicated six times. Each plot measured 8m x 5m. Each plot was separated from each other by bunds. Evaluation studies of different treatments on *L. arbonalis* revealed that lowest shoot infestation (6.49%) was noted in rotation of bio-pesticides next to chemical control (2.52%) during the first season. But in second season lowest shoot infestation (10.37%) was observed rotation bio-pesticides followed by BIPM package (15.02%). Pooled mean of both seasons revealed that the lowest shoot infestation (8.43%) was noticed in rotation of bio-pesticides followed by chemical control (10.64%) and BIPM package (11.10%).

In first season the lowest fruit damage on number (44.92%) and weight (44.87%) basis was noticed in BIPM package followed by chemical control (50.43% and 52.72%). During the second season lowest fruit damage on number (53.07%) and weight (54.75%) basis was observed in rotation of bio-pesticides followed by BIPM package (60.06% and 60.77%). The pooled mean of both seasons revealed that the lowest fruit damage on number (52.49%) and weight (52.82%) basis was recorded in BIPM package closely followed by rotation of bio-pesticides (53.69% and 54.75%).

Keywords: Field efficacy, Bio-Intensive Pest Management (BIPM) Modules, Fruit and shoot borer, Randomised Block Design.

ASSESSING THE EFFICACY OF MUTAGENIC AGENTS ON THE GROWTH AND FLOWERING ATTRIBUTES OF TUBEROSE (*Polianthes tuberosa* Linn.)

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ABSTRACT

Adopting the technique of mutation breeding has had a profound effect in producing a range of novel traits in number of crops. Tuberose (*Polianthes tuberosa* Linn.), that plays a major role in the floriculture industry in India because of its elegant white flowers and captivating fragrance, is impaired by a limitation of having flowers in white colours only. Broadening the genetic diversity of the crop has been one of the objectives for the breeders. So, with an objective to study the efficacy of mutagens in bringing improvement to the vegetative and floral characteristics in tuberose, an experiment was taken up in Bidhan Chandra Krishi Viswavidyalaya, West Bengal during the year 2019-20. The experiment was conducted with two locally available tuberose varieties of Calcutta Single and Calcutta Double by employing Randomized Block Design (RBD) with twelve treatments of which each were replicated thrice.

It was evident from the findings that both the varieties were responsive to the treatments given and lower doses of mutagens have positive influence on the growth and flowering attributes in both the varieties over the untreated plants. Calcutta Double irradiated with 5 Gy showed better performance over all other treatments in terms of floral attributes except for the floral weight which was recorded to be the highest in Calcutta Double treated with 2.5 Gy. It was also observed that higher doses of the physical mutagens did not have positive effect on the various attributes observed when compared to the untreated plants in both the varieties. Both varieties treated with 10 Gy did not give satisfactory results.

Keywords: EMS, gamma irradiation, tuberosa, mutagens.

EFFICACY OF IPM MODULES AGAINST FALL ARMYWORM, *Spodoptera frugiperda* (J.E. Smith) (LEPIDOPTERA: NOCTUIDAE) ON MAIZE

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ABSTRACT

Efficacy of some treatment modules comprising with chemicals and cultural methods were evaluated against fall armyworm, *Spodoptera frugiperda* (J.E. Smith) on maize during Rabi, 2021 at University Research Farm, BCKV, Gayeshpur, West Bengal. The results of field efficacy revealed that significant reduction of larval population (60.75% and 59.38%) over control together with increased yield (57.33 q ha⁻¹ and 58.17 q ha⁻¹) was recorded in module comprising with hybrid Napier grass as border + (chlorantraniliprole 10% + lambda cyhalothrin 5% ZC) @ 45g a.i/ha at 3 weeks after sowing + indoxacarb 14.5% SC @ 50g a.i/ha 5 weeks after sowing + lambda cyhalothrin 5% EC @ 25g a.i/ha at 7 weeks after sowing and the module comprising with spinetoram 11.7% SC (30g a.i/ha) at 3 weeks after sowing and chlorantraniliprole 18.5SC (50g a.i/ha) at 5 weeks after sowing and emamectin benzoate 5% SG (10g a.i/ha) at 7 weeks after sowing, respectively. Two other modules, one with intercropping of coriander + spinosad 45 % SC @ 60g ai/ha at 3 weeks after sowing + azadirachtin 10,000ppm @ 5g a.i/ha at 5 weeks after sowing + chlorantraniliprole 18.5 % SC @ 50g a.i/ha at 7 weeks after sowing and the other comprising of chlorantraniliprole 18.5SC @ 50g a.i/ha three applications at 3, 5 and 7 WAS, were moderately effective in management of FAW.

Keywords: Fall armyworm, treatment modules, Maize, Napier grass, chlorantraniliprole, lambda cyhalothrin, spinetoram, emamectin benzoate.

INFLUENCE OF PREVAILING WEATHER PARAMETERS ON POPULATION DYNAMICS OF *Empoasca Kerri*, LEAFHOPPER IN PIGEONPEA

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Purpose

Pigeonpea [*Cajanus cajan* (L.) Mill.: Fabaceae] is the second most important crop after chickpea which is rich source of protein, essential amino acids, iron and iodine, infected by one of the important sucking insect pest i.e. *Empoasca kerri* causing economic loss to the crop. We aimed to identify here to check the incidence of insect on different genotypes of pigeonpea viz., UPAS 120, AL 1747, PAU 881 and Paras and influence of prevailing weather parameters on insect-pest and experiment conducted at Chaudhary Charan Singh Haryana Agricultural University, Hisar, Haryana, India.

Methods

The population of *E. kerri* was recorded on five randomly selected and tagged plants in each genotype from three trifoliolate leaves (upper, middle and bottom) of each plant by the visual count method and data on weather parameters was calculated with the help of OP Stat.

Results

The results of this study manifested the commencement of population of *E. kerri* nymphs from 29th SMW, increased slowly and reached maximum during 33rd SMW on different varieties/genotypes viz., PAU 881 (3.35 nymphs/3 leaf), AL 1747 (3.30 nymphs/3 leaf), Paras (4.20 nymphs/3 leaf) and UPAS 120 (2.55 nymphs/3 leaf). On the basis of genotypes, mean population of leafhopper nymphs was maximum on PAU 881 (0.93 nymphs/3 leaves/plant) followed by Paras (0.91 nymphs/3 leaves/plant), AL 1747 (0.83 nymphs/3 leaves/plant) and UPAS 120 (0.67 nymphs/3 leaves/plant and correlation of weather parameters with the population of leafhopper manifested as: significant and positive with minimum temperature ($r=0.58^{**}$) and maximum temperature ($r=0.47^*$), whereas non-significant and negative with relative humidity (Morning) and positive and non-significant with relative humidity (Evening & Average), wind speed, sunshine hours and rainfall.

Conclusions

The genotypes tested here showed UPAS 120 as one of the most resistant genotypes against *Empoasca kerri*, can be used for commercial purpose.

Keywords: *Empoasca kerri*, population, genotypes, weather parameters

BIOLOGY AND MANAGEMENT OF TEAK DEFOLIATOR: *Hyblaea puera* Cramer (Lepidoptera: Hyblaeidae)

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ABSTRACT

Study on biology and life cycle of *Hyblaea puera* C. (Lepidoptera: Hyblaeidae) was carried out during kharif season of 2020 in the Laboratory of Department of Entomology, Institute of Agriculture Sciences, Bundelkhand University, Jhansi (India). The common laboratory conditions viz., 30°C temperature and 73% relative humidity (RH) were maintained for the

investigation. Results reveals that there were fifth larval instars. Average larval duration was 13.83 days and that of pre pupa, male and female pupa were 2.29, 4.39 and 7.0 days, respectively when reared in common laboratory condition fed with teak foliage. The longevity of male and female adult was found as 6.05 and 7.50 days, respectively. The pre oviposition, oviposition and post oviposition duration were found as 2.22, 3.0 and 3.28 days, respectively. Average number of eggs laid by the female during its life cycle was found to be 119.21. The total life cycle of male and female were found as 25.95 and 26 days, serially. In the field studies were conducted on the management of *H. puera* was carried in different bio-pesticides viz: *Bacillus thuringiensis* var. *Kurstaki* (5% WP), *Metarrhizium anisoplae* (2×10^8 cfu), *Verticillium lecanii* (2×10^8 cfu), Neem oil (5% EC), Neem Seed Kernal Extract (Crude extract), *Baveria bassiana* (2×10^8 cfu). Experimental results revealed that the trees treated with bio-pesticides registered significantly difference of teak defoliator over the treatment of untreated control. Among them the treatment of *Baveria bassiana* (14.94 damage leaves/ plant) were found in significantly more effective against the pest as compared to other bio-pesticides NSKE, Neem oil, *Verticillium lecanii* and *Bacillus thuringiensis* var. *Kurstaki* were found moderately effective and proved significantly superior over NSKE, Neem oil, *Bacillus thuringiensis* var. *Kurstaki* and *Metarrhizium anisoplae* after, NSKE, Neem oil, *Bacillus thuringiensis* var. *Kurstaki* and *Metarrhizium anisoplae* proved significantly less effective among the bio-pesticides evaluated against *H. puera*.

Keywords- Biology, Bio-pesticides, *H. Puera*, teak.

INSECT LIFE CYCLE MODELLING: A NEW GENERATION TOOL FOR PREDICTING THE INSECT DISTRIBUTION UNDER CLIMATE CHANGE SCENARIO AND USING THE OBTAINED DATA FOR DEVISING SUITABLE PEST MANAGEMENT OPTIONS

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ABSTRACT

The insect's development, distribution and establishment are mostly governed by the favourable climatic conditions. If any insect gets conducive condition, its population proliferates well and immediately reach the economic threshold level, causing serious threat to crops. Changing climatic conditions over the years also determines and affects the insect demographics in a particular area, due to which the status of pest keeps changing from minor to major or vice versa, over the years. Insect Life Cycle Modelling (ILCYM), a temperature based phenology modelling software developed by International Potato Center, Peru, is having its utility in futuristic prediction of insect distribution across different geographical regions according to the interest of researcher, keeping in mind the changing climatic condition over the years for a particular geographic location. This predetermination of the establishment route of various insects over the geographical area, strengthens the agrarian community for becoming alert for new invasion and will help in limiting the pests damage capacity by helping in pre development of the suitable and eco-friendly pest management programs according to the status of the insect population, that will be going to prevail in future years, with respect to the changes observed in climatic conditions. Further, it can also solve the problem of timely devising and adoption of available integrated pest management options. Thus, the thrust must be given for maximum utilization of this software, as this can prove as a boon for the agararian community and mankind by ensuring the minimization of the yield loss caused by insect infestation, thus contributing to the global food security as well.

Keywords: ILCYM, Phenology, Modelling, Insects distribution, Climate change

FUTURE OF FARMING: THE HYDROPONICS

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ABSTRACT

There is a big gap between the food we produced these days and the food required to feed each person in 2050. There will be almost 10 billion persons in the world by 2050—approximately and 3 billion additional mouths to feed than there were in 2010. In order to overcome the scarcity of quality and quantitative food in the future, we should adopt vertical farming that is helpful in increasing productivity in fewer area. Hydroponics is a good example of vertical farming. Thus, Hydroponic farming might be called the future of agriculture due to increasing population, shrinking land and water resources. The hydroponic word was derived from the two Greek words, first is Hydro which means water, and the second is Ponos which means labor, which literally says that “water working”. Hydroponic farming means raising plants in a water solution rich in nutrients instead of soil. This technique is also called aquaculture, soilless culture, nutria-culture, or tank farming. Nowadays it’s become popular in metropolitan cities due to its effective resource management and high-quality food output. Numerous benefits of this technique such as round-the-year production; less time required for the growing of crops than conventional growing; nominal disease and pest incidence; 70 to 90 % savings of water; Higher yields achieved in a smaller space; Nutrients are precisely controlled and Soil-borne pests and diseases are eliminated.

Conclusively we can say; that hydroponics is a technique that will help to feed the future population. In hydroponics, it is possible to cultivate short-duration crops, and vegetables throughout the year in very small spaces with less labour, so hydroponics can play a countless contribution in areas with shortage of soil, water and in adverse climatic conditions in future.

Keywords: Hydroponic, agriculture, yield, aquaculture and soilless culture.

OVIPOSITION DETERRENT EFFECT OF SOME BOTANICALS AND SAFER INSECTICIDES AGAINST *Callosobruchus chinensis* L. INFESTING PIGEON PEA IN STORAGE

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ABSTRACT

Pulse beetle, *Callosobruchus chinensis* L. is one of the major insect pests infesting various pulse crops all over the world. Damage starts in field condition and carried to storage where beetles can cause total destruction within a short period of time. The use of chemical insecticides as a management practice have posed a major threat to mans as well as environment. So, there is a need for the search of suitable alternative methods of pest control. Botanically derived plant extracts as insecticides are environmental-friendly and biodegradable. Percentage inhibition of egg laying was recorded at ten days after release of five pairs of adult beetles per fifty grams of pigeon pea host grain. Oviposition deterrent activity of various botanicals viz., mustard oil @5ml/kg, neem oil @ 5ml/kg, garlic extract @ 5ml/kg,

turmeric leaf oil @ 5ml/kg, Yam bean seed powder @ 5g/kg, Yam bean seed extract @ 5ml/kg, Neem seed kernel extract @ 5ml/kg along with two safer insecticides viz., Cypermethrin @ 10 EC @ 0.05 ml/kg and Spinosad 45SC @ 4ppm/kg were investigated and revealed that maximum inhibition of egg laying was recorded when pigeon pea seeds were treated with Cypermethrin 10 EC @ 0.05 ml/kg with 88.67% inhibition followed by Spinosad 45SC @ 4ppm/kg seeds with 79.25%. Among botanicals, mustard oil @5ml/kg proved to be the most efficient treatment in reducing oviposition by *Callosobruchus chinensis* in stored pigeon pea grains with per cent inhibition of 74.98 % and least effective treatment was recorded in Yam bean seed powder @ 5g/kg seeds (39.91%). All the treatments were found to be significantly superior over control. Storage pests mainly *Callosobruchus* sp. are the major threat to stored pulses in warehouses as well as conventional storage system. Indiscriminate use of pesticides leads to many harmful effects viz., pest resurgence, resistance, toxic effect to consumers etc. so use of botanicals in managing storage pests should be encouraged and more research should be carried out to explore the possibility of new plants possessing insecticidal properties.

Keywords: *Callosobruchus*, Botanicals, Oviposition, Spinosad, Pest resurgence.

CROP IMPROVEMENT FOR QUALITY TRAITS IN RAPESEED – MUSTARD

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Background

Brassica oilseeds are one of the most significant oilseed crops because of its greater ability to grow in a diverse agro-climatic zones across the world. Rapeseed mustards are the second most important edible oilseed crops in India after groundnut and play pivotal role in India's oilseed economy. Depending on its fatty acid content, this crop is frequently utilised for a variety of industrial uses, including the production of edible oils, fuel and non-fuel. While the leftover seed meal after oil extraction is fed to livestock.

Important quality traits for rapeseed-mustard

The primary breeding goals of *brassica* breeders worldwide are the development of canola type (double zero) cultivars with low erucic acid (2%) and low glucosinolates (30 moles/g in defatted seed). Additionally, the availability of yellow seeded strains (triple zero) offers a direct possibility to enhance oil quality (strong antioxidant potential and less anti-nutritional components like tannin) and quantity (up to 1.5 percent). The present focus on cultivar development is yield and oil content in addition to low levels of erucic acid and glucosinolates, which should now place a greater emphasis on creating high linoleic acid cultivars.

Genetics of important quality traits in rapeseed-mustard

High seed oil content in rapeseed (*B. napus*) is mainly controlled by the maternal genotype, while xenia effects had also a certain impact on the seed oil content. The inheritance of oil content was fitted with an additive dominant-epistasis model, with dominant and additive effects being the main components. Whereas, the erucic acid in rapeseed-mustard oil has been shown to be governed by embryonic genotypes and is governed by two genes which is present in each respective genome in amphiploids species viz., *Brassica napus*, *Brassica carinata* and *Brassica juncea*. The biosynthetic pathways of glucosinolates is regulated by complex genetic factors and show sporophytic type of inheritance.

Breeding for improvement of the quality traits

For utilization of novel genes/alleles for improved quality traits (low fiber, low glucosinolate, low erucic acid), high heterosis (high oil content, high yield), introduction and hybridization of valuable crop wild relatives and other genetic stocks should be undertaken by exploring the

newer area which are having rich rapeseed-mustard biodiversity like China, Canada, Sweden, Russia, Spain and Australia.

Conclusion

Brassica oil and seed meal quality may be significantly improved by conventional plant breeding techniques; however, marker assisted/molecular breeding requires the identification of genes and related markers that make this crop so nutrition-rich.

Keywords: Breeding, erucic acid, glucosinolates, marker, oilseed and quality traits.

MILLETS AS A SOLUTION TO COMBAT FOOD AND NUTRITIONAL SECURITY IN INDIA

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ABSTRACT

Millets are the ancient crops of the humankind. They are group of grasses that are extensively cultivated for food and fodder. In India, millets crop includes a number of small-grained cereal grasses capable of growing in less fertile soil and adverse climatic condition. Millets are staple food for vast majority of rural poor in arid and semi-arid regions of India and also have a high feed value for livestock, poultry and fish. Developing countries like India are very much dependent on millets for their food and nutritional security. Despite these potential benefits, however, in India overall production of millets has increased over the past few decades, from 15.4 MT in 1950 to 42.9 MT in 2019 but the area dedicated to millets has fallen. Introduction of HYVs of wheat and rice suppress the demand of millets as a result millets lost their place in farmers' field. To fulfil the demand of the burgeoning population, farmers started producing high yielding varieties of cereals and thus millets importance has decreased.

But with the few years millets are popularizing again in Indian agriculture which are emerging as a solution to many prevailing problems in the developing countries like India. Increasing malnutrition, lifestyle disorders, declining soil quality as well changing climate pattern all these factors pursuing us to move again towards our first crop i.e. millet. These are nutritious with health benefits requiring significantly lesser inputs and cost of cultivation along with naturally being tolerant to most biotic and abiotic stresses. These features accentuate millets as crops of choice in the present scenario. Millets which played a crucial role for humans to adopt sedentary life from hunter-gatherer ways can also support healthy living in a good environment.

Keywords: Millets, food, nutritional security, nutricereals, drought

PERFORMANCE OF CHILLI HYBRID UARCHH 43 UNDER DIFFERENT LEVELS OF SPACING AND FERTILIZER DOSE ON GROWTH AND YIELD PARAMETERS

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ABSTRACT

The experiment was carried out to evaluate the effect of spacing and fertilizers on growth and yield parameters of chilli hybrid UARCHH 43 during *Kharif*, 2019-20 at GPB block, College of Agriculture, University of Agricultural Sciences, Raichur. Field experiment was conducted

in two factorial RCBD (Randomized Complete Block Design) with six treatments and three replications. Results revealed that, wider spacing of 60 cm × 60 cm had greatly influenced the plant height at maturity (166.22 cm), number leaves per plant (258.32), number of primary branches (6.72), number of secondary branches (9.04), days to 50 per cent flowering (40.06), number of fruits per plant (38.26), fruit length (10.84), fruit diameter (2.90 cm), number of seeds per fruit (32.87), and fruit yield (45.61). Qualitative parameters such as oleoresin content (11.27 mg/100g), colour value (60.97 %) and pungency (50560.04 SHU). Fertilizer dose 120 per cent had significantly increased the plant height (166.22 cm), number leaves per plant (268.64), number of primary branches (7.28), number of secondary branches (9.44), days to 50 per cent flowering (41.61), number of fruits per plant (41.56), fruit length (11.60 cm), fruit diameter (2.76 cm), number of seeds per fruit (36.39) and fruit yield (48.83). Qualitative parameters such as oleoresin content (11.10 mg/100g), colour value (57.38 %) and pungency (50556.88 SHU).

Keywords:- Chilli, Qualitative, Chemicals, Fertilizers and Spacing.

FUELWOOD CONSUMPTION PATTERNS AND FUELWOOD SPECIES USED IN NORTH EAST INDIA

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ABSTRACT

Fuelwood is the primary source of energy for domestic uses in rural villages of North east region of India. Most of the fuelwood is extracted from natural forests, which is one of the primary causes of forest degradation and deforestation. To study the fuelwood consumption pattern in the north east, India, literature from the scientific journals, edited books, and other scientific databases was reviewed. This literature review has showed that a total of 66 plant species are used as a fuel by the local people of the region. At many remote places, poor accessibility to alternate sources of energy and deprived socio-economic conditions of the people are primarily responsible for their reliance on freely available fuelwood in nearby forests. Different plant species based on their local availability were used as fuel at various locations and average fuelwood consumption found 3.15 kg/capita/day. Review showed that *A. lucida*, *S. fruticosum* and *P. lanceaefolium* have better fuelwood properties and can be considered for inclusion in the energy plantation programme of north-east India. The compiled information on fuelwood consumption patterns and fuelwood species used in north east India can form the baseline database which will help in the conservation of forest resources of the region and policy making.

Keywords: Fuelwood, Forest resources, North- East India, Energy plantation programme, Policy making.

EFFECTS OF CLIMATE CHANGE ON FISHERIES AND AQUACULTURE: MITIGATION ASPECTS

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ABSTRACT

Aquatic systems make up more than two-thirds of the surface of the Earth, the amount of evidence currently available on the effects of climate change is very limited, and many of the ideas and presumptions are still up for debate. Oceans play a crucial part in regulating the climate as well as in absorbing heat and the increased CO₂ levels brought on by our activity. According to model predictions, ocean warming, greater stratification, and rising emissions will diminish the ocean's potential to absorb CO₂ in the future. Freshwater systems have a close relationship to climate since they can both affect atmospheric processes that are relevant to climate and serve as indicators of climate change. Freshwater systems were ranked among the most endangered ecosystems by the IPCC. Earth as a result of the numerous anthropogenic influences they experience. Infrastructure for hydropower, water consumption for irrigation, and agricultural land use are the results. Fragmentation of water bodies, alteration of flow patterns, and an ongoing floodplains and wetlands are cut off from the rivers that support them. It is anticipated that these pressures would persist as human demand for water increases. Resources increase together with the expansion of urban areas and agriculture, as well as global warming.

Keywords: Climate change, Fisheries, Aquaculture and Mitigation aspects

EFFECT OF NANOCOMPOSITE ON PLANT GROWTH PARAMETERS AND MULTIPLICATION OF *Meloidogyne incognita* ON OKRA

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ABSTRACT

A pot experiment was carried out to study the effects of nanocomposite on plant growth parameters and multiplication of *Meloidogyne incognita* on okra. The experiment comprised of six treatments in order of T1= AgNP @ 100 ppm, T2= ZnONP @ 100 ppm, T3= AgNP @ 50ppm + ZnONP @ 50 ppm, T4= carbofuran @ 1.5 g/pot, T5= Inoculated control (nematode alone) and T6= Control. Each treatment was replicated five times following Completely Randomized Design. Except the treatment with inoculated control (nematode only), all the treatments improved plant growth parameters in okra and reduced number of galls per root system, egg masses per root system, number of eggs per egg mass and final nematode population in soil. Among all the treatments, the treatment with AgNP @ 50ppm + ZnONP @ 50 ppm was found to be the best treatment in increasing plant growth parameters and the treatment with carbofuran @ 1.5 g/pot was effective in reducing root galls, egg masses, number of eggs per egg mass and final nematode population in soil. In the study on the effect of nanocomposite on the biochemical changes in okra infected with *M. incognita* indicated that

plants inoculated with AgNP @ 50ppm + ZnONP @ 50 ppm had significantly increased nitrogen, phosphorus, potassium, total sugar, and total free amino acids contents compared to control plants and inoculated plants.

Keywords: Okra, Nanocomposites, Nanoparticles, Plant growth parameters, *Meloidogyne incognita*

RESPONSE OF FERTIGATION ON GROWTH OF TOMATO (*Solanum lycopersicum* L.) cv. ARKA RAKSHAK

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ABSTRACT

Fertigation is a horticultural water management technology that supplies water and fertilizer simultaneously in a drip irrigation system, feeding a crop by injecting soluble or liquid fertilizers into water and then transporting them into root zone. It is a modern fertilizer application method of precision farming. Pertaining to this an experiment entitled “Response of fertigation on growth and yield of tomato (*Solanum lycopersicum* L.) cv. Arka Rakshak” was laid out comprising twelve treatment combinations (I₀-50% PE, I₁-75% PE, F₁- Entire fertilizers applied to soil with furrow irrigation (RDF), F₂- 50 % NPK fertigation + 50% NPK as basal, F₃-75% NPK Fertigation + 25% NPK as basal, F₄-75% NPK fertigation, F₅-100% NPK fertigation and F₆- 100% N fertigation and P and K as basal and combination of these treatments) and replicated thrice in Factorial Randomized Block Design. Based on the result obtained the maximum plant height at 60 days (66.42) was observed under treatment I₀ and F₅ (70.11). Similar trend was observed under same treatments in case of number of branches per plant at harvest (12.77 and 12.36 respectively). Interaction effect of above said treatments found significant as well. Minimum days to first flowering and days to first harvesting were recorded under treatment I₁ and F₅ (34.12, 32.89) and 71.50, 72.89 respectively).

PATTERN OF MARKET ARRIVALS AND PRICES OF SOYBEAN IN AKOLA DISTRICT OF MAHARASHTRA, INDIA

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ABSTRACT

In this study an attempt has been made to study the pattern of market arrivals and prices of Soybean in Akola district of Maharashtra. The present study was based on the time series data of monthly prices and arrival of Soybean were collected from major APMC'S of Akola district for the period of 10 years i.e., from 2011 to 2020. The study was carried out by employing the econometric tools like ADF test, Johansen's Multiple Co-integration test, ARCH-GARCH model and Granger Causality test were used to study price volatility and co-integration among selected markets. The study reveals that there is inverse relationship between prices and arrival of Soybean in selected market of Akola district. The selected markets for Soybean having long run equilibrium relationship for the prices of Soybean and there exist co-integration among them. The volatility shocks in the prices of Soybean is quite persistent in the selected markets.

Keywords: Seasonal variation, cyclical variation, ADF test, ARCH-GARCH, Co-integration,

PHYTOCHEMICAL STUDIES IN *Fagonia bruguieri* DC. AND *Seetzenia lanata* WILLD.

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Purpose

Plants play an important role in search for novel chemical compounds. Some of them have potential to fight against pathogenic microorganisms and reactive oxygen species, etc. Resistance against antibiotics is increasing day by day. It is imperative to search for a novel effective and safe antibiotic. One of the primary causes of ageing is due to cell damage by reactive oxygen species, plant based chemical compounds helps us fight against reactive oxygen species. Purpose of the study is to identify antimicrobial activity; antioxidant activity in rotenoid extract of two plants (*Fagonia bruguieri* DC. and *Seetzenia Lanata* willd) belong to the family of zygophyllaceae. Plants are adapted to grow in arid and stressful environment of great Indian Thar desert.

Method

In this study different concentration of rotenoid extract from *Fagonia bruguieri* DC. and *Seetzenia Lenata* willd. (Complete plant) was evaluated by *In-vitro* antimicrobial activity. Agar well diffusion was used against five different bacterial and fungal strains (*T. Rubrum*, *M. canis*, *E. floccosum*, *B. subtilis* and *P. aeruginosa*). Colorimetric ABTS antioxidant assay was performed to find out IC₅₀ value. TLC Bioautography Assay was also performed by 0.05% DPPH methanolic solution.

Results

Antimicrobial activity was observed against *T. Rubrum* and *M. canis* on different concentrations of plant extract. Autobiography essay shows no band of antioxidant activity on thin layer chromatography plate.

Conclusions

Both plants rotenoid extract have potential to be used as a fungicide.

Keywords: - Zygophyllales, Zygophyllaceae, *Fagonia bruguieri* DC., *Seetzenia Lanata* Willd., ABTS, DPPH, Two-dimensional Thin layer chromatography (TLC), Bioautography Assay.

PHYLOGENETIC ANALYSIS IN THE FAMILY OF ZYGOPHYLLACEAE

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ABSTRACT

Purpose

Zygophyllaceae is a family of flowering plants known to grow in arid and semi-arid areas worldwide. Study till now reports 285 numbers of species and 22 genera. Among them, the genus *Seetzenia* contributes 1-2 species globally. In this study, we establish the phylogenetic relationship between *Seetzenia Lanata* Willd. with its closely related species (belonging to the family of zygophyllaceae). Study till now haven't reported any absolute phylogenetic relationship between these plants.

Method

Genomic DNA is isolated followed by the measurement of DNA with the help of 1% Agarose Gel Electrophoresis. Isolated Genomic DNA is Amplified with the help of Polymerase Chain

Reaction (PCR). DNA Sequencing was proceeded with the help of ABI 3730xl sequencer. The phylogenetic tree was constructed with the help of MEGA.

Results

Close relationship between *Tribulus terrestris* and *Balanites maughamii* was observed correspondingly close phylogenetic relationship was also observed in *Fagonia arabica* and *Fagonia laevis*. *Seetzenia Lanata* Willd. belong to different clade.

Conclusions

The barcode sequence reason between *Fagonia* species is more conserved.

Keywords: - Zygophyllales, Zygophyllaceae, *Fagonia*, *Tribulus*, *Seetzenia Lanata* Willd., matK, ITS.

PERFORMANCE OF DIFFERENT INTERCROPS IN POPLAR BASED AGROFORESTRY IN THE SUB-TROPICS OF JAMMU AND KASHMIR

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ABSTRACT

The present investigation, “Performance of different intercrops in Poplar based agroforestry in the sub-tropics of Jammu and Kashmir” was conducted at the experimental Farm at Chatha, during the years 2017 to 2019. The study was aimed to explore the possibilities of growing different vegetable crops as intercrops namely Tomato, Okra and Brinjal in kharif and Spinach, Cabbage and Potato in rabi under the canopy of Poplar trees planted at a spacing of 5x4 m. The effect of light intensity and integrated nutrient application on growth, physiology and yield of intercrops and soil physico-chemical properties and economics has been studied to work out the optimum tree-crop combination with respect to growth yield and economics.

The finding of the study revealed that the poplar had a very dense canopy due to which about 50 percent light intensity was able to reach on ground. As light is the main requirement for photosynthesis, the growth of all the vegetable crops were significantly lesser as compared to sole cropping. Yield under the intercropping system was also significantly reduced due to the low light interception. Maximum yield was recorded in treatment T1 (RDF) in brinjal, tomato and okra in both the years. While in rabi crops cabbage under T1 performed significantly better as intercrop. In both the seasons, crops grown with recommended dose of fertilizer performed better in comparison to FYM or VC. Yield in all the crops reduced significantly under shade of poplar trees. Based on benefit cost ratio, in kharif season tomato crop with RDF performed significantly better on open condition with respect to growth and yield. While the performance of brinjal was better under intercropping system. In rabi season cabbage performed significantly better in comparison to spinach and potato in open condition. Under intercropping the maximum B:C ratio was attained in spinach.

There was relatively lesser benefit in growing vegetables crops under 5-6 years old poplar plantation in comparison to open area. Only the possibility of growing shade loving crops can be there under poplar plantation to effectively utilize the land.

Keywords: Agroforestry, Poplar, Vegetables, sub-tropics

REVAMPING EFFECTS AND CURTAILING EFFECTS OF NATIVE BIO-AGENTS ON BLACK AROMATIC RICE OF MANIPUR.

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ABSTRACT

Rice is one of the economically important cereal crops in the world and a significant staple food for feeding much of the world's population. White rice is the most commonly consumed rice, but there are several rice cultivars which contain colour pigments, such as black and red rice. The dark purple coloured black rice is popular owing to its unique aroma and also due to the high nutritional value. The dark purple colour of black rice is due to the high anthocyanin content, located in the pericarp layers. However, the crop is attack by different insects and pests. Diseases are among the limiting factor that reduce the quality and quantity of the grain. Disease management by the use of pesticides are environmentally undesirable. Studies were conducted by using different *Trichoderma* spp. and *Bacillus* sp at different combinations and in alone in order to evaluate the growth and yield parameters of the crop and also screening against the important foliar plant pathogens. The combined treatments of *Trichoderma* spp and *Bacillus* sp showed positive significant increase in the seed germination, vigour, growth and yield of the crop as compared to control. There is also reduction in the disease severity when treated with the bioinoculants as compared to the untreated control. Therefore, it can be used as effective bio-control measure for rice foliar diseases blast besides increasing the yield of rice crop. Hence, combination of biocontrol agents with different mechanisms of disease control will have an additive effect and results in enhanced disease control as compared to their individual application.

Keywords: Bioinoculants, biocontrol, *Trichoderma* spp, *Bacillus* spp,

GROWTH, YIELD AND OIL CONTENT OF SUNFLOWER AS INFLUENCED BY MICRONUTRIENTS (ZN AND B) GROWN UNDER ALLUVIAL SOIL OF WEST BENGAL, INDIA

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ABSTRACT

During *rabi* season of 2020-21, a field trial was conducted at farmer's field located in Pachkahania, Bara Jagulia, Nadia, West Bengal, to evaluate the effect of Zn and B application on growth, yield and oil content of sunflower under sub-tropical condition. The experiment was conducted in Randomized Complete Block Design (RCBD) with twelve treatments and each treatment being replicated thrice. It was evident from the study that applications of zinc and boron micronutrients have more profound effect on the growth, yield and yield components of the crop over the control, with the application of N₈₀P₄₀K₄₀Zn₄B₂ being superior to all the other treatments employed in the investigation for all the attributes observed. Application of

N₈₀P₄₀K₄₀Zn₄B₂ recorded 35.49% head diameter, 43.25% number of seeds/head, 26.66% seed weight/head, 46.50% yield and 51.32% oil yield higher over control of hybrid sunflower variety KBSH 78. The study also revealed that there is a positive correlation between the seed yield and vegetative and yield attributes with the oil productivity directly depending upon the seed yield and oil content.

Keywords: CGR, DMA, LAI, Micronutrient, Oil content, Sunflower

COMPARATIVE STUDY OF DISTRIBUTION AND THREATS OF SMOOTH COATED OTTER (*Lutrogale perspecillata*) BETWEEN GERUWA AND BABAI RIVER OF BARDIYA NATIONAL PARK

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ABSTRACT

This study assessed the distribution and threats of *Lutrogale Perspecillata* in Geruwa and Babai river of Bardiya National park. Inner channels of Geruwa river have been studied many times, so this study was done in western channel which is least studied and pressurized section by local people. Whereas Babai river is strictly restricted for human reach. This research aims to compare the distribution and threats in two different nature of ecosystem. Total 26 transects were laid for Geruwa river and 39 transects were established for Karnali river. Questionnaire survey was done among 90 (45 for each river) key informants to ask existing threats faced by Otter. Obtained data were analyzed by ArcGis 10.3, Ms-excel, SPSS. Chi-square test was used to check the association between threats. Friedman test was used to calculate mean rank of people's perception. A total of fourteen live otter and fifty otter signs (Nineteen from Geruwa river and thirty one from Babai river) were recorded. Signs comprise scats, tracks, food leftovers. Location of the sign sites were recorded using GPS. Construction works and sand/boulder extraction were almost equally affecting the river dynamics which were affecting otter distribution as well.

Keywords: Otter threats, Distribution, Geruwa

ROLE OF *Trichoderma* SPECIES AND THEIR SECONDARY METABOLITES IN THE IMPROVEMENT OF CHILLI HEALTH AND YIELD

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ABSTRACT

Trichoderma, a filamentous soil inhabiting ubiquitous fungus, offers multifarious activities to benefit plants include: control phytopathogenic fungi, improve plant growth and increase soil fertility. It is used as a biofungicide and biofertilizer in sustaining many crops especially vegetable crop. Most of the herbaceous crops at seedling stage are sensitive towards biotic and abiotic constraints, which emphasized the healthy seedling development. Among the vegetables, chilli (*Capsicum annum* L.) is an important annual herbaceous vegetable and spice grown in tropical and subtropical region throughout the world. The study was aimed to determine the impact of *Trichoderma* strains and their secondary metabolites such as harzianic acid (HA) and viridin on the percent seed germination and seedling vigour for higher crop production under polyhouse conditions. The two *Trichoderma* strains namely, *T. harzianum* and *T. viride* were isolated from *Curcuma longa* L. (turmeric) rhizosphere and used to treat the

chilli seeds. For dry chilli seeds (100 in numbers) coating, 5×10^5 cfu ml⁻¹ spore suspension of each *Trichoderma* species was prepared with 2% starch (2gm of starch per litre of water) as an adhesive to evaluate the percent seed germination and seedling vigour in chilli crop. Among the two *Trichoderma* strains, *Trichoderma harzianum* along with harzianic acid was found most effective in improving the percent seed germination and seedling vigour over untreated seeds. Also, higher vigour index values with better germination of chili seeds after *T. harzianum* seed coating help in reducing the seed dormancy. Thus, study results concluded that *Trichoderma* is an effective substitute of chemical fertilizers and fungicides that helps to overcome the residual risk development in animal, human and environment health and it could be used as biofungicides and biofertilizers in improving the crop protection and production.

Keywords: Trichoderma; Chilli; Secondary metabolites; seed germination; seedling vigour.

DEVELOPMENT OF FISH COOKIES USING LOW VALUE FISHES: A STEP TOWARDS NUTRITIONAL AND FOOD SECURITY

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ABSTRACT

Fish is one of the most delicious and nutritious food items in the world. It contains quality proteins, essential amino acids, good fats (omega 3 fatty acids), vitamins and minerals. In spite of the nutritional quality, due to one and other reasons like small size, irregular shape, unattractive appearance, typical flavor, presence of more pin bones etc., some fishes fetch low price or simply discarded on the sea beaches. This activates are not only reducing/hampering valuable resource utilization but also participating in environmental pollution. Protein can be recovered from these fishes and used for product development for protein enrichment in food. Food-on-the-go” is the most recent trend as women actively participated into the business life and spending less time for cooking homemade food. Cookies/biscuits are the most preferable and consumable food items in the modern fast life. Cookies/biscuits are generally prepared from cereal which are low in protein especially lack in essential amino acids like lysine and methionine. To meet the requirement of protein to a greater extent, incorporation of quality protein is necessary and Bakery products can easily be supplemented with protein, vitamins and minerals in order to meet and satisfy consumer all over the world. Fish protein, a fish product with concentrated protein content (between 75 and 95%), can be incorporated in cookies. Fish protein concentrate (6-10%) is an excellent dietary supplement and can be used to fortify diverse range of cereal products to improve flavour, taste and nutritive value. Incorporation of fish protein in cookies may be the best way towards nutritional/food security as the consumers opt for easily available healthy snacks in the market, such as protein cookies, biscuits and so on.

Keywords: Fisheries resource, Fish Protein, Fish Cookies, Food Security

INFLUENCE OF WEED MANAGEMENT PRACTICES ON GROWTH AND YIELD OF RABI POTATO UNDER NORTHERN HILL ZONE OF CHHATTISGARH

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ABSTRACT

The field experiment was carried out at Potato Research Station, Mainpat, IGKV(C.G.) during *rabi* 2019-20 and 2020-21. An experiment entitled “**Influence of weed management practices on growth and yield of *rabi* potato under Northern Hill Zone of Chhattisgarh**” was laid out in Randomized Block Design having eight weed management practices viz. W₁-Metribuzin 70% WP @ 0.75 kg ha⁻¹, PE, W₂-Pendimethalin 38.7 % CS 1.0 kg ha⁻¹, PE, W₂-Oxyflourfen 23.5 % EC @ 0.1 kg ha⁻¹, PE, W₄-Atrazine 50% WP @ 1.0 kg ha⁻¹, PE, W₅-Paraquat 24 % SL @ 0.5 kg ha⁻¹ early POE after 10 % germination of potato, W₆-Mechanical weeding 40 DAP, W₇-Hand weeding 20 and 40 DAP and W₈-Unweeded check. The result of the experiment revealed that, all the growth parameters *i.e.* plant height, number of shoots plant⁻¹, shoot fresh and shoot dry weight plant⁻¹, yield attributes and yield were maximum under hand weeding (20 and 40 DAP). Total tuber yield was increased 71% over the unweeded check.

CONSEQUENCE OF ORGANIC COMPOSTS AND NUTRIENTS ON WHEAT (*Triticum aestivum* L.)

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ABSTRACT

Wheat (*Triticum aestivum* L.) is number one cereal of the world and is grown on the largest area. It is cultured on about 220 million hectares area in the world and delivers almost 21% of our food calories and 20% of protein for more than 4.5 million people. In India, during past three decades, intensive agriculture involving exhaustive high yielding varieties of cereals particularly wheat has led to heavy mining of nutrients from the soil. The crop removes annually large quantities of plant nutrients from soil. The number and degree of micronutrients is also increasing at fast pace because erratic, excessive and imbalanced use of chemical fertilizers has increased which causes high the demand of micronutrients for achieving higher yield. Wheat area is decreasing every year and there is a very little scope for expansion of area in future. So, there is urgent need to maintain the soil fertility for stability and sustainability in the productivity of wheat crop. There are lot of agricultural wastes like crop residues, cow dung, poultry manure and by products of agriculture-based industries like press mud, bagasses, *etc.* which can be recycled to soil which not only increase the chemical, physical and biological properties of soil but also improve the crop quality by balanced nutrition. Therefore, the present investigation was done to evaluate the response of different combination of organic material and inorganic material on productivity of wheat. The experiment was laid out in randomized block design having eight treatments *i.e.*, Control (No fertilizer), 100% RDF NPK, 100% RDF NPK+ Zn +Fe, 75% RDF NPK+ Carpet waste compost+ Zn+Fe, 75%RDF NPK+Wheat straw compost+ Zn+Fe, 75% RDF NPK+ Bagasse compost+ Zn+Fe, 75% RDF NPK+Paddy straw compost + Zn+Fe, 75% RDF NPK+Pressmud compost+ Zn+Fe and was replicated thrice. Result indicated that among all the treatment combinations highest grain yield and straw yield was recorded in the treatment combination of 75% RDF NPK+ Pressmud+ Zn+Fe. The minimum yield was observed in control treatment.

Keywords: Fertilizer, RDF, physical, chemical, Biological, ..etc

PERFORMANCE ASSESSMENT OF STRESS TOLERANT RICE VARIETIES (STRVS) UNDER DIFFERENT CROP ESTABLISHMENT SYSTEMS IN RAINFED STRESS-PRONE ENVIRONMENT

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ABSTRACT

Rice (*Oryza sativa* L.) is globally recognized as one of the most important food grain. It is staple food for more than half of the world's population. Rice environments in India are extremely diverse and complex, i.e. grown under a wide range of agro-ecological conditions. As major portion (55 per cent) of rice producing area is rainfed, crop often suffer from a variety of stresses like moisture stress, excess moisture/flooding and salinity. The major challenge is to mitigate the potential adverse effects of changing climate so that growth in rice production can be sustained and food security can be achieved. . One of the important ways to ensure food security and at the same time provide viable incomes for poor rice farmers in the future is to develop new crop and resource management options like, crop establishment systems and appropriate varieties, that are more tolerant to the adverse effects of a more volatile climate under stress-prone environment.

Keeping these points in view, present investigation entitled “Evaluation of STRVs under different crop establishment systems in rainfed stress-prone environment” was carried out during the *kharif* seasons of 2017 and 2018 at the Agricultural Research Farm, Department of Agronomy, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh (India) to assess the performance of crop establishment system and stress tolerant rice varieties (STRVs) in rainfed stress-prone environment of eastern India. The experiment was laid out in split-plot design and replicated thrice using STRVs viz, V₁-DRR42, V₂-DRR44, V₃-Sukha dhan5, V₄-Sukha dhan 6, V₅-Sarjoo52 in sub plots as sub plot treatments and assigning three crop establishment methods: CE₁-puddled transplanted, CE₂-direct drill seeding on flat bed, CE₃-direct seeding on raised bed (FIRB) in main plots as main plot treatments.

Among crop establishment systems, direct seeding on raised bed (CE₃) produced significantly increased plant height, number of tillers m⁻², dry matter accumulation, leaf area index than puddle transplanting (CE₁) where as all these growth parameters remained at par with direct drilling on flat (CE₂) at all stages during both the years of experimentation. Among STRVs, DRR 44 was superior over other tested varieties while it remained at par with DRR 42. However, CE₃-direct seeding on raised bed produced significantly increased yield attributes and yield. The number of panicle m⁻², panicle weight, number of grains panicle⁻¹, test weight, grain and straw yield than puddle transplanting. Among tested STRVs DRR 44 produced significantly higher yield attributes and yield over other varieties except DRR42, it remained at par with DRR 44. Higher nutrient uptake was recorded in direct seeding on raised bed followed by direct drill seeding on flat and puddle transplanting where as among STRVs DRR 44 remained at par with DRR 42 but significantly higher nutrient uptake than rest varieties. Further, higher net return and B:C was recorded in direct seeding on raised bed followed by direct drill seeding on flat and puddle transplanting. In different varieties tested higher net return and B:C ratio was produced in DRR 44 followed by DRR42, Sarjoo 52, Sukha dhan 6 and Sukha dhan 5.

It can be concluded that establishment of rice by direct seeding on raised bed/direct drill seeding on flat with stress tolerant rice varieties DRR 44/DRR42 should be practiced for better stress tolerance, higher yield stability and net return under rainfed stress-prone environment of eastern Uttar Pradesh.

Keywords- FIRB, Direct drill seeding, Puddled Transplanting.

BIOLOGY AND MANAGEMENT OF LACE BUG, *Cochlochila bullita* (Stål) (Hemiptera: Tingidae) ON *TULSI*

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ABSTRACT

Present study envisages the result of studies conducted on various aspects of biology, seasonal incidence and management of lace bug, *Cochlochila bullita* (Stål) in the laboratory as well as field. Under laboratory conditions eggs were laid by the female bug mostly singly but sometimes in groups also on the under surface and margin of leaves and tender shoots within the air chamber. The incubation period varied from 3 - 7 (mean 5 ± 1.24) days. The nymph passed through five instars to complete the nymphal period. Newly moulted nymphs were pale brown in colour. Later on, the cuticle colour changed to brown to black. The first instar lasted for 2 to 4 (mean 2.9 ± 0.73) days. The second instar occupied 2 to 4 (Mean 2.8 ± 0.78) days. The third instar larval duration was for 2 to 3 (mean 2.3 ± 0.48) days. The Fourth instar occupied 1 to 3 (mean 2.0 ± 0.81) days. The fifth instar took 1 to 2 (mean 1.2 ± 0.42) days for its development. The total nymphal period varied from 8 to 16 (mean 19.8 ± 3.58) days. The total life cycle of *C. bullita* from egg to adult emergence varied from 11.0 to 23.0 (mean 19.8 ± 3.58) days. Females were significantly larger than male with respect to body length. The female can be differentiated from the male by the presence of an ovipositor whereas male has a distinct genital capsule with hidden structure (parameres). The adult individuals reared in the laboratory survived for 27 to 36 days with average of (mean 33.7 ± 4.78) days. Total life duration was recorded as: 38-59 (mean 50 ± 8.39) days.

Among the chemical insecticides and plant products under test, overall best performance was found in case of three times spraying of prophenophos 50EC @ 1 ml/l applied at fortnightly intervals in reducing lace bug population 6.20, 4.70, 3.37 lace bug per plants as against 20.40, 33.40, 43.20 lace bug per plant in untreated control after 1st, 2nd, and 3rd spraying which was at par with imidacloprid 17.8 SL@ 0.3ml/l and malathion 50 EC@ 1ml/l. All plant products were least effective in reducing the lace bug population in comparison to synthetic chemicals but significantly superior to the untreated control. The overall mean per cent reduction in lace bug population, was recorded with prophenophos (73.97 %) followed by imidacloprid (68.40 %) and malathion (67.49 %) as compared to 45.22 %, 44.81 %, and 41.41 in *karanj* oil @2%, NSKE@5% and *neem* oil 2% after 3rd spray. Damage intensity caused due to infestation of *C. bullita* on the *tulsi* crop was also assessed by estimating the fresh herbage yield under protected and unprotected conditions. In protected plot yield was 5.4 tonnes/ ha whereas in unprotected plot yield obtained was 3.6 tonnes/ ha. Therefore, 33.33 per cent herbage yield loss was recorded in unprotected plot when compared with protected plot.

PERCEPTION OF FARMERS ABOUT CULTIVATION OF FISH IN CAGE CULTURE

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ABSTRACT

India is one of the largest fish producing countries in the world and shares 7.58 per cent of the total global production. It contributes around 1% to India's Gross Domestic Product (GDP) and over 5% to the agricultural GDP (FAO, 2018). India's total marine fish landings were recorded at 3.49 million tonnes in 2018, which was 9.00 per cent lower than the previous year. Average per capita fish consumption in India is 9 kilograms (kg) per annum against the global per capita fish consumption of 16 kg. Demand for sea food has increased from 6.9 % to 9.9% over the years. To meet this demand, to reduce the post-harvest losses of 20-25 per cent people have found an alternate method i.e. cage fish farming. Cage culture is an aquaculture production system where fish are held in floating net pens. Cage culture of fish utilizes existing water resources but encloses the fish in a cage or basket which allows water to pass freely between the fish and the pond permitting water exchange and waste removal into the surrounding water. Compare to fresh water fishers, cage fish farming has resulted in high fish yield with easy maintenance in this connection present study has been conducted to know the perception of farmer towards cage fish farming. For the study was conducted in Udupi district of Karnataka state, from the district two taluks having highest cage fish farming namely Kundapura and Baindur was selected from each taluk two villages having highest cage fish farming selected from each village 30 farmers who are following cage fish farming from last 3-4 years were selected thus the total sample for the study was 120. The result indicate that nearly one third of the respondents strongly agreed that there is no logistic facilities to reach market (40.83%), There is no established value chain (33.33%), Floating cages are more cost effective (35.83), It serves as an alternative source of livelihood to fisherman during fishing holidays (34.17%) cage culture helps in easy harvesting (35.00%) and facing Difficulty in cleaning the cage regular to avoid net clogging (35.00%). Whereas majority of them have disagreed for Difficult to get required depth for the cage fish farming (34.17%) followed by Initial investment required for cage culture is huge (30.00%). Even though cage fish farming is cost effective many time farmers are lacking technical guidance and governmental support to make it more successful. In this regard proper policy measures and extension services has to strengthen to achieve the success with sustainable production.

COMPARATIVE MORPHOLOGY AND MOLECULAR PHYLOGENETIC ANALYSIS OF ARECANUT (*Areca catechu* L.) CULTIVARS

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Purpose

Arecanut (*Areca catechu* L.) is a high value commercial crop of India, which is also called betel nut. Arecanut is mainly used for chewing or masticatory in combination with betel leaves and sometimes as Tambula. It is also used as an important commodity in all religious, social and cultural functions in India. It is also been used in Ayurveda and Veterinary

medicines. Declining cultivation of arecanut due to multiple biotic stresses calls for collection and evaluation of genetic diversity analysis of diverse arecanut accessions.

Methods

Ten areca nut cultivars were assessed for their genetic diversity by morphological and molecular markers. Ten arecanut cultivars were grouped into different clusters using D² analysis and molecular markers *viz.*, RAPD, ISSR and RGP.

Results

Ten arecanut cultivars were grouped into four clusters using D² analysis. DNA markers: RAPD, ISSR and RGP, exhibited 22.47%, 14.07% and 19.03% polymorphism, respectively and produced six clusters each. The PIC value of the RAPD marker ranged from 0.19 to 0.32, with an average of 0.2. ISSR marker varied from 0.17 to 0.26, with an average of 0.22. The RGP markers exhibited PIC value from 0.21 to 0.29 with an average 0.24. The highest PIC value was obtained in RGP2 (0.29). When compared with morphological diversity, the Sagar Local and Keladi Local were grouped together in the same clusters both in case of morphological and RAPD based molecular clustering. Similarly, SAS-1 and Mohitnagar were individually grouped both in case of morphology and ISSR based clustering indicating high level of genetic differences of these genotypes with other genotypes. In comparison of RGP based clustering and morphological grouping, Sagar Local and Sreemangala were found grouped together.

Conclusions

The best measure to analyse genetic diversity among genotypes would be with the use of all information, both from morphological characters and DNA based markers. Highly divergent, high performing genotypes would be great importance to utilize in recombinant breeding in order to get high heterotic recombinants and further studies of breeding works.

Keywords: Arecanut, RAPD, ISSR, RGP, YLD, Genetic diversity

ASSESSMENT OF GENETIC DIVERSITY FOR YELLOW LEAF DISEASE RESISTANCE AND SUSCEPTIBLE IN ARECANUT (*Areca catechu* L.) USING MOLECULAR MARKERS

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Purpose

Areca nut (*Areca catechu*) once considered an unhealthy addictive stimulant has been turned into medicine for curing schizophrenia and glaucoma and as a mild stimulant and digestive aid when consumed in low quantities. It provides assured income and livelihood security to marginal and small farmers with minimal inputs. Nevertheless, its Production is threatened by many biotic stresses including Yellow Leaf Disease (YLD) as the substantial one. The yellow leaf disease is an endemic disease in Sringeri and Koppa talukas of Chikkamagaluru, Karnataka as evidenced by higher incidence values.

Methods

The characterisation done by the genetic divergence among the YLD resistance and susceptible genotypes of areca using multiple markers; ISSR, RAPD and RGP markers.

Results

The highest polymorphism among the areca nut genotypes was observed with the resistant gene primer (RGP), exhibiting polymorphic information content (PIC) ranging from 0.18 to 0.30 with an average PCI of 25.03%. The PIC value of OPAF 06, UBC 351 and RGP1 were 0.30, 0.18 and 0.18 respectively. Major allele frequency ranged from 67 to 97 per cent within the

research material indicating the presence of genetic diversity. The markers RAPD, RGP and ISSR, differentiated the susceptible and resistant genotypes into clear-cut clusters.

Conclusions

These polymorphic markers that were identified and validated in the present study have great importance for the diagnostics and management of YLD.

Keywords: Arecanut, RAPD, ISSR, RGP, YLD, Genetic diversity

INCREASED AREA, PRODUCTION AND PRODUCTIVITY OF MUSTARD IN CHHINDWARA

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ABSTRACT

Chhindwara is major largest district of MP in terms of agricultural diversity also, covering an area of 11815 km². Chhindwara is known as corn city, it covers almost all crops including mustard also. Mustard is becoming popular rabi crop in Chhindwara district. Mustard seeds are small round and varies from yellowish brown to black in colour. It is an important spice in India as well as used for oil also. The botanical differentiation included black mustard (*Brassica nigra*), brown Indian mustard (*B. juncea*), and white or yellow mustard (*B. hirta/sinapis alba*). India's mustard oil production is expected to touch 40 lakh tonnes (LT) by 2021-22, driven by sustained rise in crop acreage. In MP, the district of Morena leads in mustard production, with a share of 27% to the state's total production. Mustard seeds are a rich source of oil and protein. The seed has oil as high as 46-48%, and whole seed meal has 43.6% protein. Mustard has covered an area of 2.80 ha in the year 2021-22. Farmers are taking it as major rainfed crop of district with well adopted cultural practices.

EFFECT OF N AND K APPLICATION ON YIELD AND QUALITY OF POMEGRANATE CV. BHAGVA

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ABSTRACT

India is the largest producer of Pomegranate in the world with production of around 2.79 MT from an area of 0.25 million ha and occupies the first position in the world (Anon, 2018). Alone Maharashtra accounts for more than two third area, while other states like Andhra Pradesh, Uttar Pradesh, Gujarat, Rajasthan, Karnataka and Tamilnadu share the rest area. In M.P. pomegranate is an important fruit crop of the arid region covering an area of 9675.20 ha with a production of 114266.29 tonnes and productivity 11.81 tonnes per hectare. Moreover, in recent years the pomegranate has shown great importance for human health because of the high antioxidant content of its juice and peel, and its properties which prevent cancer and cardiovascular diseases. Pomegranate is high value crop and its entire tree has great economic and medicinal importance and is considered beneficial for the patients of leprosy, dysentery and diarrhea. The rind of the fruit contains about 30 per cent tannin which can be used for tanning leather. Like other fruit pomegranate also needs, optimum amount of nutrition for quality production of fruits, therefore, on adequate quantity of fertilizers need to be applied at appropriate time for optimum growth quality and yield. The response of N and K in fruit crop has been reported by various workers. This prompted us to plan an experiment in pomegranate

‘Bhagva’ to study the effect of N and K fertilization on plant growth, productivity and fruit quality. Keeping these facts investigation were on “Effect of N and K application on yield and quality of pomegranate cv. Bhagva in hast bahar” has been conducted. On the basis of result obtained, it is concluded that the level of 125% RDN found superior over rest of the levels of N under study, which was significantly influenced the vegetative growth parameter and Physico-chemical parameters of Pomegranate fruits .As regards to, levels of K significant effect on yield and physico-chemical parameters of Pomegranate fruits. The interaction effect of N and K showed significant effect on vegetative growth, yield and quality parameter of Pomegranate fruits. It is concluded that recommended dose of N with 125% levels of K is the best combination and showed superiority over rest of the other combination with respect to N and K fertilizer.

INFLUENCE OF DIFFERENT LAND USE SYSTEMS ON SOIL PHYSICO-CHEMICAL PROPERTIES: ITS IMPLICATION IN CARBON MANAGEMENT

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ABSTRACT

Climate change is the major global concern. To combat it, immediate action is essential. Land use systems are an important part of the ecosystem. Tree-based land use system is in vogue due to its positive impact on physical and chemical parameters of soil and availability of soil carbon. The management activities in different land use systems occurs both geographically and temporally, thus ultimately affects the physico-chemical properties of the soil. The physical and chemical characteristics of soil acts as performance standard to interpret the soil quality which cannot be quantified directly. It may be possible to identify patterns of variation in soil carbon storage potential by comparing the soil physico-chemical parameters of various land use systems, which is critical information in the context of climate change. The collective information may be used as the basis for creating statistical models that account for potential outcomes of various land uses and future interventions. Hence, the current study provides the detailed reviews of the study carried out to analyse the variation in the soil properties with different tree based land use system insight to the most efficient land use systems to achieve sustainable farming methods. The following conclusion may be drawn from this review: (i) Comparison among soil physical and chemical properties with different tree-based land use system (ii) Carbon sequestration potential of different land use systems for mitigative action towards climate change.

Keywords : Land use systems, Physico-chemical properties, Carbon potential

EFFECT OF PHOSPHORUS, ZINC AND THEIR LIQUID BIO INOCULANTS ON SOIL FERTILITY OF LENTIL

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ABSTRACT

A Field experiment was conducted to explore the effect of phosphorus, zinc and their liquid bio fertilizers on soil fertility of lentil during *Rabi* season 2019 at Instructional Farm, College of Agriculture Kota, Rajasthan using variety Kota Masoor-3 as a test crop. The experiment was laid out in randomized block design with 10 treatments *viz.* T₁ - Absolute control, T₂ -

Recommended phosphorus dose (40 kg ha⁻¹), T₃ - ZnSO₄ 25 kg ha⁻¹ soil application, T₄ - Biophos @ 5 ml kg⁻¹, T₅ - Biozinc @ 5 ml kg⁻¹, T₆ - Biophos @ 5 ml kg⁻¹+ Biozinc @ 5 ml kg⁻¹, T₇ - 50% RD phosphorus + Biophos @ 5ml kg⁻¹, T₈ - 12.50 kg ZnSO₄ + Biophos @ 5ml kg⁻¹, T₉ - 50% RD phosphorus + Biophos @ 5ml kg⁻¹+ Biozinc @ 5ml kg⁻¹, T₁₀ - 50% RD phosphorus + 12.5 kg ZnSO₄+ Biophos @ 5 ml kg⁻¹+ Biozinc @ 5 ml kg⁻¹.

Application of 50% RD phosphorus + 12.5 kg ZnSO₄+ Biophos @ 5 ml kg⁻¹+ Biozinc @ 5 ml kg⁻¹ recorded the maximum increment in available nitrogen (289.87 kg ha⁻¹) and in available potassium (259.31 kg ha⁻¹) while, in case of available phosphorous content (24.35 kg ha⁻¹) and available Zinc (0.76 mg kg⁻¹) recorded the significant increase in the application of Recommended phosphorus dose 40 kg ha⁻¹ and application of ZnSO₄ 25 kg ha⁻¹ in soil.

INCIDENCE AND THEIR MANAGEMENT OF FRUIT FLY (*Carpomyia vesuviana*) ON BER

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ABSTRACT

Identification-Egg: Female flies insert eggs under the skin of fruit in clusters of 10 to 50 about 1/25 to 1/8 inch below the fruit surface. The eggs measure about 1/25 by 1/250 inch and are white, elongate, and elliptical. They hatch in 1-1/2 days. **Larva:** The white larva is legless, and resembles an elongated cone. The mouth is at the pointed end of the body. There are 3 larval stages, or instars. The third instar is about 2/5 inch long. The entire larval stage lasts for 11-15 days. **Pupa:** When mature, larvae drop to the ground and pupate in the soil. The puparium is yellowish-brown and seed-like. Adults emerge in about 10 days. **Adult:** Generally, the abdomen has two horizontal black stripes and a longitudinal median stripe extending from the base of the third segment to the apex of the abdomen. These markings may form a "T" shaped pattern, but the pattern varies considerably. Females begin to lay eggs about 8 days after emergence from the puparium. Under optimum conditions, a female can lay more than 3,000 eggs during her lifetime, but under field conditions approximately 1,200 to 1,500 eggs per female is considered to be the usual production. **Nature of damage-**Infestation starts with the onset of fruit setting. The excreta of the larva accumulate in the galleries, which may sometimes result in rotting of the fruit. Infested fruits become deformed and their growth becomes checked. A large number of such fruits drop off. **Management-** Prophylactic measures are the essential component for the successful management of *C.vesuviana*. Field sanitation, Destruction of wild bushes, Collection of infested fruits and summer ploughing to expose the overwintering pupa to hot summer breaks the reproduction cycle of fly. Growing of resistance cultivar like Tikidi, Umran, Mundia Banarasi, Sanaur-1, Safeda selection, Illaicihi, Zg-3, Chhuhara would give better yield and also reduce the protection cost. However synthetic chemical are presently employed as major tools against fruit fly Organophosphate and synthetic pyrethroid insecticides are extensive use. Therefore it is necessary to incorporate the all available tactics in integrated manner and incorporation of neem based formulations and biological pesticide, Spinosad, bait application, male annihilation technique are essential to manage the *C.vesuviana* in successful manner in the scenario of organic cultivation. (Vadivelu, K. 2014). Two sprays of quinalphos 30 EC @ 1.5 ml litre of water, first at pea stage of fruit growth and second spray after 15-20 days are very effective. **Keywords-** *Ziziphus sp.*, *Carpomyia vesuviana*, Management

ALTITUDINAL VARIATION IN BIOMASS AND CARBON STOCK OF FORESTS: IMPLICATION FOR CLIMATE CHANGE MITIGATION

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ABSTRACT

Carbon inventories are urgently needed for understanding climate dynamics and implementing climate mitigation strategies. Forests play vital role in combating climate change through carbon sequestration in the atmosphere and serving as a carbon sink in the form of carbon pool systems of forest ecosystems. Among terrestrial ecosystems, forest stores more carbon and biomass than any others. Each forest species accumulates carbon and biomass above and below ground uniquely. The relationship among aboveground biomass, carbon stock and species richness along elevation gradient may interpret strategies for sustainable forest management and its conservation. The variation in altitude directly influences the temperature, humidity, light intensity and rainfall that cause a change in the type of forest. The altitude gradient also has a great effect on the ecological distribution of forest type in mountainous regions (Wei et al., 2015). According to Inter-Governmental Panel on Climate Change (IPCC), the forest ecosystems cover 30% area of the world which are the largest sink storing carbon worldwide (Inter-Governmental Panel on Climate Change [IPCC], 2006). They also play an important role in balancing terrestrial carbon cycle globally.

There are four components of carbon (C) pools in a natural forest ecosystem: vegetation, soil, litter and woody debris. Quantifying these C pools and their contributions to forest ecosystems is important in understanding C cycling in forests. Forest ecosystem plays a crucial role in the global carbon cycle; as such, mitigating high atmospheric concentrations of carbon dioxide and other greenhouse gases by naturally taking carbon from the atmosphere through photosynthesis. Verification and accounting of carbon stock in forest ecosystem have been renowned as a potential strategy to reduce and stabilize atmospheric concentrations of greenhouse gas. Forest sequesters and store more carbon than any other terrestrial ecosystem and it is an important natural break on climate change. It acts as a carbon reservoir by storing large amount of carbon in trees, undergrowth vegetation, forest floor and soil. The mitigative role of India's forests was estimated to 9.3% at the year 2000; and 4.9% in 2020 for the annual emissions of the country (Kishwan *et al.*, 2012). Precise information of forest carbon stock is important for understanding the offsetting capabilities of the forests. The precise estimation of forest carbon is also required to understand the role of the forest for mitigative actions to achieve the National Determined Commitment (NDC) such as REDD+ and evaluating the role of forests for their ecosystems services to the poor. The estimates of forest carbon are also required for evaluating forest degradation, as anthropogenic extractions from forests result in the degradation of forests (Malik et al., 2016).

Keywords: ecosystem ,carbon storage, altitudinal gradient, climate change.

DROUGHT STRESS IN FLOWER CROPS: PHYSIOLOGICAL EFFECTS AND ITS MANAGEMENT THROUGH AGRONOMIC ALTERNATIVES

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ABSTRACT

Water scarcity is a serious environmental factor that hinders plant productivity. Since the severity and length of the stress are both important factors, the loss in agricultural output caused by drought likely exceeds losses from all other causes. Understanding the interaction between the physiological, biochemical, genetic, and agronomic bases of drought is crucial for its effective management, which is necessary to maintain sustainable flower production. In order to counteract the harmful consequences of drought stress, flowering and ornamental plants have evolved special adaptation mechanisms. The plants that are resistant to drought stress exhibit many coping mechanisms, including morphological, physiological, and biochemical changes. To prevent water loss and ensure photosynthesis, these reactions include raising the root/shoot ratio, slowing growth, altering the structure of the leaves, and reducing leaf size and total leaf area. In this review, influence of drought on flower yield and quality has been analyzed critically at both cell and crop level, and the possible management options to mitigate the severity of the drought stress are proposed. The literature that is available has been systematically analyzed to describe the effects of drought stress on physiological and biochemical features (such as photosynthesis, water relations, nutrient absorption, and oxidative damage), morphological and growth parameters, yield, and quality. Based on the examination of the effects of drought stress, a number of management techniques have been evaluated and explored, including the exogenous application of hormones and osmoprotectants, seed treatment, and soil nutrient management. The discussion leads to the conclusion that flower crops adapt to water stress by adjusting their osmotic balance, maintaining their turgor, maintaining their ability to absorb carbon, and controlling their hormones. Comprehensive study on the integration of many management alternatives, including as agronomic management, traditional breeding, and modern biotechnology developments, is required for the long-term enhancement of flower crop production and quality under drought stress. This may potentially play a big role in a climate change scenario.

Keywords: Drought, stress, photosynthesis, osmoprotectants,

INFLUENCE OF LIMING ON DYNAMIC OF AVAILABLE NUTRIENTS IN SOIL OF UPPER BRAHMAPUTRA VALLEY ZONE (UBVZ) OF ASSAM

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ABSTRACT

Soil acidity plays a major role in determining the nutrient availability to plants. Liming the degraded and acidic soil is the most common management practice used for amelioration of acid soil by neutralizing the soil acidity and overcoming the constraints associated with soil acidification. An incubation study was conducted to study the effect of lime (CaCO₃) application on available macro and micronutrient in UBVZ of Assam. Soil samples were

collected from Sibsagar and Jorhat districts with lime treatment at 3 different doses viz., LR10, LR25 and LR50. The initial soil physico-chemical properties were recorded before liming. The soil samples were incubated in laboratory at different period viz. 15, 30, 60 and 90 days after liming (DAL) at Field Capacity. The application of different rates of lime progressively increase available nitrogen, phosphorus, potassium and boron while decreased in micronutrient viz. iron, manganese, zinc and copper. The nitrogen, phosphorus and potassium content of soil increased from initial value with application of lime @ LR10, LR25 and LR50 respectively. The progressive increased continued till 30 days. However, micronutrient content of soil (Fe, Mn, Zn and Cu) started declining with application of lime but boron content increased with application of lime @ LR10, LR25 and LR50. The finding of the study showed that liming @ LR10 found effective in increasing available soil macronutrients and residual effect last till 90 days.

Keywords: Lime, Macronutrient, Micronutrient and Incubation

STUDIES ON DIFFERENT CROP ESTABLISHMENT TECHNIQUES AND NITROGEN MANAGEMENT ON BASMATI RICE VARIETY (*Pusa basmati 1509*)

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ABSTRACT

An experiment entitled “**Studies on Different Crop Establishment Techniques and Nitrogen Management on Basmati Rice Variety (*Pusa basmati 1509*)**” was conducted during *Kharif* season of 2018 at Research Farm, College of Agriculture, Central Agricultural University, Imphal, Manipur. The experiment was laid out in Factorial Randomized Block Design with three replications. The treatment comprised of two methods of crop establishment viz. broadcasting and transplanting and five integrated nitrogen management viz. 100% RDN through urea, 75% RDN through urea + 25% RDN through FYM, 50% RDN through urea + 50% RDN through FYM and 100% RDN through FYM and control to evaluate the best establishment techniques, best nitrogen management and economic feasibility establishment techniques and nitrogen management. The soil of the experimental field was clay with pH (5.42). The soil was high in organic carbon (1.09%) and medium in available nitrogen (301 kg ha⁻¹) and available potash (225 kg ha⁻¹) but low available phosphorous (16 kg ha⁻¹). The recommended dose of N:P₂O₅:K₂O was (60-40-30 kg ha⁻¹). Half the dose of nitrogen along with full dose of phosphorous and potassium were applied at the time of final land preparation. Half of the remaining nitrogen was applied at tillering stage (20 DAS) and the other half at panicle initiation stage (50 DAS). The results revealed that application of integrated nitrogen management from the application of 75% RDN through urea + 25% RDN through FYM significantly influenced growth, yield attributes and yield over control. The maximum plant height (125.87 cm), plant population m⁻² (358.33), number of tillers m⁻² (357) and number of effective tillers m⁻² (258.17), panicle length (25.52 cm), number of spikelets panicle⁻¹ (91.23), number of filled grains panicle⁻¹ (83.30), grain yield (3038 kg ha⁻¹), straw yield (6092 kg ha⁻¹) and harvest index (33.13%) were recorded from the application of 75% RDN through urea + 25% RDN through FYM under transplanting. From the above findings, it can be concluded that establishment of basmati rice through transplanting along with the application of 75% RDN through urea + 25% RDN through FYM gave the highest gross return (Rs.183780 ha⁻¹), net return (Rs.132510 ha⁻¹) and benefit cost ratio (2.58).

Keywords: Rice, INM, crop establishment, nutrient, growth, yield.

BIOMASS PRODUCTION AND NUTRIENT STATUS OF HIGH-ALTITUDE PASTURE/RANGELANDS LANDS OF KASHMIR HIMALAYA J&K-INDIA

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ABSTRACT

The present study was carried out in alpine and high land pastures of temperate zone of Kashmir valley under the Project ‘Improvement of grazing land/pastures through participatory management approach’ funded by DST SEED Division, GOI. The study area includes whole of the Kashmir valley. The study area was divided into three circles i.e. North Kashmir, Central Kashmir and South Kashmir. In each circle three districts were selected for the study and three sites were studied from each district. In south Kashmir three districts shopian, Anantnag and kulgam were selected located between 33°52'.31'N, 72°89'.29'E, Central circle three districts Srinagar, Ganderbal and budgam were selected located between 34°23'.15'N, 74°72'.70'E, at an altitude between 1550-3500m and in North Circle Bandipora, Baramullah and Kupwara were selected located between 34°28'.65'N, 74°46'.34'E, at an altitude between 1550-3500m. The highest and lowest values of average biomass was recorded as 4.48 tha⁻¹, 1.1 tha⁻¹ in south, 4.42 tha⁻¹, 1.01 tha⁻¹, in north and 5.34 tha⁻¹, 1.11 tha⁻¹ in central Kashmir respectively. The maximum 25.4 tha⁻¹ yield and crude fibre 22.7% among prominent legumes was recorded in red clover and crude protein 33.2% in white clover. The maximum 12.5 tha⁻¹ yield among prominent legumes was recorded in Orchard grass while crude fibre 34.2%, crude protein 10.4% was recorded in *Agrotis alba*.

Keywords: -Grassland, soils, alpine, nutrient, Crude protein, Crude fibre, Pastures

SI: A QUASI ESSENTIAL ELEMENT FOR CROP NUTRITION

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ABSTRACT

Elemental silicon (Si), is the eighth most common element in nature, and is the second most abundant element in the earth's crust, after oxygen, which is mainly composed of silicates. However, most of the Si present in the soil is in the form of silicon dioxide that plants cannot uptake. Besides having abundant availability, the plant-available Si in the soil is mostly a limiting factor. In shoot plant tissues, the mean Si concentration ranges between 0.1 and 10% of the dry. Comparison with contents of Ca (0.1 to 0.6%), S (0.1 to 1.5%), N (0.5 to 6%), P (0.15 to 0.5%) and K (0.8 to 8%) showed that Si in plants could be present in an equivalent amount, or even larger than several macronutrients. Silicon (Si) is considered non-essential for plant growth and development, however, increasing evidence in the literature shows that this metalloid is beneficial to plants, especially under stress (abiotic and biotic) conditions. Si has a key role in plant-environment relationships because it can improve plants' abilities to withstand edapho-climatic and/or biological adversities by acting as a “natural anti-stress” mechanism that enables higher yields and a better-quality end product. Silicon plays a large number of diverse roles in plants and does so primarily when the plants are under stressful conditions, whereas under benign conditions its role is often minimal or even nonexistent. Since the Si-derived benefits are more obvious under stress conditions, it is widely considered a quasi-essential element. Subsequently, the Association of American Plant Food Control

Officials (AAPFCO) (AAPFCO, 2014) officially announced Si as a plant “beneficial substance”. Moreover, the International Plant Nutrition Institute (IPNI) has also declared Si as a “beneficial substance” or “quasi-essential.” for plants.

SUPPRESSING ANTHRACNOSE AND MAINTAINING FRUIT QUALITY USING SALICYLIC ACID WITH MAP, SHRINK AND CLING WRAP PACKAGING IN WHITE PULP DRAGON FRUIT (*Hylocerus undatus*).

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Purpose

Dragon fruit (*Hylocereus spp.*) belongs to the family Cactaceae and originated from Mexico and Central America. Being non-climacteric in nature, dragon fruit has a short shelf-life at room temperature. Postharvest factors like moisture loss, shrivelling, senescence and spoilage significantly affect its visual appearance, shelf life and market value besides. The aim of present study was to determine the effect of salicylic acid (SA) along with modified atmosphere packaging (MAP), shrink (SWP) and cling wrap packaging (CP) in white pulp dragon fruit during cold storage.

Methods

Fruits were treated with 2mM SA for 5 minutes and then packed in MAP, SWP and CP. Packed fruits were stored at 6 °C. Physico-chemical analysis were done on weekly intervals and disease infection was monitored continuously up to last day of storage.

Results

Findings of the study revealed that SA exhibited promising effect on reducing the anthracnose infection and extended the storage life of white pulp dragon fruit in combination with different packaging. Among packaging treatments, MAP maintained better fruit quality (weight loss, TSS, acidity, ascorbic acid, antioxidant activity, phenols and flavonoids, etc.) but spoilage was higher. Whereas, cling wrap packaging (CP) recorded minimum spoilage (11.6%), and longest storage life up to 26-28 days, though fruit quality was comparatively lesser than MAP. SWP was not effective and recorded highest spoilage.

Conclusion

Hence, white pulp dragon fruit treated with salicylic acid (2mM) in combination with cling wrap packaging could be stored up to 28 days at 6 °C with least change in quality and lowest spoilage.

Keywords: salicylic acid, anthracnose, MAP, cling wrap packaging,

A COMPARATIVE STUDY OF BIOMASS AND CARBON STOCK IN TROPICAL AND TEMPERATE FORESTS OF NEPAL.

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ABSTRACT

Estimation of total biomass and carbon sequestration in any forest is crucial as it gives ecological and economic benefits through various environmental services. Forest being largest terrestrial depository of carbon stocks is the best solution for reducing emission in developing and landlocked countries. With an aim to quantify the carbon stock densities in the two different forest types—the Tropical and the Temperate, two Community Forests (CFs) having the dominance of *Shorea robusta* in tropical and *Castanopsis sps* in temperate zones were selected from Ilam district (Chure and Mid-hill) for the purpose of the study. Stratified random sampling with 1 % sampling intensity was used to collect necessary data. The total carbon stock in the CFs of the Tropical and the Temperate were found to be 95 Mg ha⁻¹ and 75.59 Mg ha⁻¹, respectively. The biomass in the CF of the tropical forest was found to be higher (202.14 Mg ha⁻¹) than the one in the temperate forest (169.34 Mg ha⁻¹). Carbon sequestration was found to be 1.19 times higher in tropical forest than in temperate forest per hectare because of abundance of trees with greater diameter, height and wood specific gravity in tropical region, though there were no significance difference ($p < 0.05$) between the carbon sequestered by both forests relating to diameter and height classes. Community forests in Nepal sequester notable amount of carbon which can be beneficial in future under REDD+ programme. In future, involvement of local people and user groups of community forest in carbon estimation and regular monitoring and updating the data will provide a fair basis for payment for carbon savings. This will help in improvement of livelihoods of community people as well as strengthens the community and ownership. These estimates suggest that community forests have great potential and role in mitigating climate change and its effects. Availability of precise statistics on carbon sequestered by forests will enable us to grab financial resources from international conventions.

Keywords: Carbon, Biomass, tropical, temperate, climate change

AN ASSESSMENT ON STATUS OF LANDUSE LANDCOVER BASED ON LANDSAT IMAGERY BY USING GOOGLE EARTH ENGINE (A CASE STUDY OF KASKI DISTRICT, NEPAL)

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ABSTRACT

Land use is the human use of land and land cover refers to physical and biological cover on the surface of the land. Land use land cover changes are one of the foremost aspects of environmental changes caused by human-induced activities mainly in rapidly developing areas. The land use/cover pattern of a region is an outcome of natural and socio-economic factors and their utilization by humans in time and space. Information on such land use change pattern is required for sustainable development planning. The rate of urbanization is increasing day by day in developing cities parallel with infrastructure development and population pressure. This study was carried out in the Kaski District of Nepal with the aim of generating LULC map using Google Earth Engine (GEE) tools. Landsat-8 data of the year 2019 were used to generate the land use land cover map of the study area. Random Forest machine learning algorithm was

adopted for the classification of these images. In this study, the study area was classified into seven land classes. The classified map was obtained with an overall accuracy of 78.42%. The result showed that, the maximum land is covered by forest (46.08%) followed by agricultural (16.70%), bare rock (13.32%), snow (10.16%), bare land (6.74%), settlement (5.58%) and waterbody (1.42%). The study revealed that settlement has increased close to the cities and urban areas. The study demonstrated that GEE platform can be used to quickly generate baseline information on land cover status to inform land use planning decisions.

Keywords: LULC, Random forest machine learning algorithm, Kaski, GEE

INCREASED AREA, PRODUCTION AND PRODUCTIVITY OF MUSTARD IN CHHINDWARA

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ABSTRACT

Chhindwara is major largest district of MP in terms of agricultural diversity also, covering an area of 11815 km². Chhindwara is known as corn city, it covers almost all crops including mustard also. Mustard is becoming popular rabi crop in Chhindwara district. Mustard seeds are small round and varies from yellowish brown to black in colour. It is an important spice in India as well as used for oil also. The botanical differentiation included black mustard (*Brassica nigra*), brown Indian mustard (*B. juncea*), and white or yellow mustard (*B. hirta/sinapis alba*). India's mustard oil production is expected to touch 40 lakh tonnes (LT) by 2021-22, driven by sustained rise in crop acreage. In MP, the district of Morena leads in mustard production, with a share of 27% to the state's total production. Mustard seeds are a rich source of oil and protein. The seed has oil as high as 46-48%, and whole seed meal has 43.6% protein. Mustard has covered an area of 2.80 ha in the year 2021-22. Farmers are taking it as major rainfed crop of district with well adopted cultural practices.

SUPREMACY OF PSYCHOLOGICAL CHARACTERS INFLUENCING SOCIO ECONOMIC STATUS OF NFSM BENEFICIARIES

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ABSTRACT

Apart from the personal and other characteristics of farmers, the study on psychological variables majorly influencing the farmer's status is gaining importance. The study was conducted in Belagavi and Haveri districts of Karnataka where, all the three components of NFSM namely NFSM – Rice, NFSM – Pulse and NFSM – Coarse Cereal were implemented. Three taluks in each district were selected drawing one taluk for each NFSM component. From each NFSM component 5 interventions were considered for the study and among the selected taluk, six beneficiary farmers were selected randomly; also the interventions considered for impact analysis were based on the achievements of financial targets fixed by the NFSM authorities. Thus, the total sample for the study was 180. In order to analyze the influence of various characters of the beneficiaries on their socio economic status, regression analysis was carried and it was noted from the study that in all the three components of the NFSM when compared with personal and other characteristics, the psychological characters of the beneficiary farmers viz., scientific orientation, orientation towards incentives and management

orientation influenced significantly on extent of adoption of NFSM interventions thereby influencing socio economic status of the farmers. Therefore, it is important to note that the beneficiaries should be motivated to positively enhance their psychological acceptance towards the interventions of government programmes irrespective of their personal and economic characters.

Keywords: Government programmes, Interventions, Psychological characteristics, socio economic status

DEVELOPMENT AND EVALUATION OF FORMULATIONS OF *Nomuraea rileyi* (Farlow) SAMSON AGAINST *Spodoptera litura* (Fabricius) ON CABBAGE

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PURPOSE

Mycopesticides holds special place as they have capacity to invade the cuticle of hexapodes at all stages. They are advantageous compared to other microorganisms as they need not to be consumed by insect. In addition, mycopesticides are self-perpetuating and often cause epizootics in nature. *Nomuraea rileyi* (Farlow) Samson is a cosmopolitan species infecting many of the lepidopteran insects. Efforts have been made to formulate the *N. rileyi* commercially for the farmers use. However, maintaining the spore viability for longer period of time is a challenging issue. Therefore, the present work is carried out on development and evaluation of formulations of *N. rileyi* for the management of *Spodoptera litura* (Fabricius).

METHODS

A total of 26 different formulations (edible oil, talc powder and combination of edible oil + talc powder) of *N. rileyi* were developed and screened against laboratory reared third instar larvae of *S. litura*. Further, the virulence of selected formulations was studied for three months at different storage conditions. These selected formulations of *N. rileyi* were also tested under semi-field condition against *S. litura*.

RESULTS

Among all the different formulations tested against *S. litura*, the formulation of groundnut oil recorded highest mean mortality of 83.33 per cent followed by combination of groundnut oil + rice grain (80.00%), combination of groundnut oil + wheat grain (73.33%), mustard oil + rice grain (73.33%). The most of the formulations of *N. rileyi* developed were recorded more than 50.00 per cent mean mortality of *S. litura* under laboratory conditions. The storage of selected formulations in refrigerator (4°C) and mud pot filled with wet sand recorded the highest mortality of *S. litura* compared to storage under room temperature (27.0 ± 1.0°C) and incubator conditions (35°C) after three months of storage period. Under semi field condition, maximum mean per cent mortality was recorded in the groundnut oil (31.73 %).

CONCLUSIONS

Incorporation of different edible oils as adjuvant, improves the efficacy of formulations and the virulence of the fungi. The developed efficient formulation (groundnut oil) can be used for the management of *S. litura* after testing under field conditions. This formulation maintained the spore count of 2×10⁸ cfu/ml after three months storage period under low temperature (refrigerator and mud pot filled with wet sand).

Keywords: *Nomuraea rileyi*, *Spodoptera litura*, Formulation, Spore viability, Storage

DEVELOPMENT AND EVALUATION OF FORMULATIONS OF *Lecanicillium lecanii* (Zimm.) ZARE AND GAMES AGAINST *Myzus persicae* (Sulzer)

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PURPOSE

Entomopathogenic fungi (EPF) are the one which can able to cause disease in insect by mere contact with the cuticle as compared to other entomopathogens like viruses, bacteria and nematodes *etc.* which requires either ingestion through food or through natural openings. These fungi are the most versatile bio control agents and species specific with low risk of infesting on non-target organisms. Among the EPF, *Lecanicillium lecanii* (Zimm.) Zare is an important fungus in suppressing the sucking insect pests like aphids, leafhoppers, thrips, whitefly, scales, mealy bugs and mites. However, existing formulations of this fungus available in the market having poor efficacy under field condition. Therefore, the present investigation was undertaken on development and evaluation of different formulations and their efficacy against *Myzus persicae* (Sulzer) both under laboratory and field conditions.

METHODS

A total of 26 different formulations of *L. lecanii* were developed which includes oil, powder based and combination of both oil and powder were evaluated against *M. persicae* under laboratory conditions for their efficacy. The spore virulence was studied in the best four formulations at monthly intervals up to three months at different storage conditions. Pot culture experiment and field studies were also conducted to evaluate the effectiveness of formulations of *L. lecanii* against *M. persicae*.

RESULTS

Among all the formulations of *L. lecanii* evaluated against *M. persicae*, the groundnut and sesamum oil recorded highest mean mortality of 96.66 per cent followed by sunflower oil (95%), coconut oil (94.15%) and mustard oil (93.33%). The virulence of these four formulations were highest in the sesamum and groundnut oil-based formulations followed by groundnut oil in combination with rice grain-based formulation at different storage condition (refrigerator and mud pot filled with wet sand) even after three month of storage period. Further, the groundnut oil and sesamum oil formulations were resulted in highest mean mortality of *M. persicae* under pot culture experiment and field conditions, respectively.

CONCLUSIONS

The formulations prepared by incorporating the different edible oils (sesamum and groundnut oil) in development of formulations of *L. lecanii* were superior in suppressing the aphid population. The similar results were obtained under pot culture experiment and field level study. Further, the developed formulation can be stored under low temperature (refrigerator and mud pot filled with wet sand) to maintain their spore viability for further use. Hence, presently developed formulations can be used as one of the components in Integrated Pest Management (IPM) of sucking insect pests in Cabbage.

Keywords: *Lecanicillium lecanii*, *Myzus persicae*, Formulations, Spore viability

INFLUENCE OF CLIMATE CHANGE ON KHARIF RICE PRODUCTION IN BIHAR, INDIA

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ABSTRACT

Growing recognition of climate change and increasing population during twentieth century have put challenges in front of scientific community and policy makers for more production worldwide. Rice is a major staple food in Asia. In rice production India has second place in the world and Bihar state has 6th position in the country. Rice is mainly grown in kharif season in Bihar. Kharif agriculture is much vulnerable towards weather extremes like decline in rainfall intensity, rainy days frequency of flood and others. The aim of this study is to see the impact of rainfall on rice production and forecast the kharif rice in Bihar. This study deals the influence of rainfall on rice production during kharif season based on secondary published time series annual data on rice production (million tons) and rainfall (mm) during kharif season for the period 2000 to 2017. Time series ARIMAX (Auto Regressive Integrated Moving Average with repressors) model is used for data analysis. Data during 2000 to 2015 are used for training set and 2016-17 used for testing set. Best model was selected based on Akaike Information Criteria (min. is better). Results showed that rice is grown more than 80% area (around 28 lakh ha) of total rice cultivated land (33 lakh ha) during kharif season in Bihar. Maximum production was observed 71.18 million tons during year 2011 and minimum 18.28 in 2004. Maximum rainfall was observed 1433.48 (mm) during 2007 and minimum 792.63 mm during 2009. ARIMAX model with ARIMA (2,1,0) with *kharif* rainfall found to be the best fit model rice production in Bihar during 2000 to 2017. Rainfall showed positive significance ($p < 0.03$) on *kharif* rice production. ARIMAX Model validated with original rice production for the year 2016 and 2017 less than 10 % error prediction. The model forecasted that the *kharif* rice production in Bihar will increase in the upcoming year till 2025. Hence, this study will be useful for scientific community and policy makers to develop the plan for food security.

Keywords: Rice, Bihar, Kharif, ARIMAX model, forecasting, food security

IMPACT OF ZERO TILLAGE ON RABI CROPS: A CASE STUDY IN BIHAR, INDIA

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ABSTRACT

Environmentally sustainable approaches is the demand of time for agricultural development to meet the requirement of ever increasing population. Zero tillage (ZT) is one of the eco-friendly agricultural technique which encourage minimum soil disturbance. It is a proven technology for enhancing crops productivity and boosting economic output and minimizes emission from agricultural machineries. This technique also reduces the requirement of irrigation, which is a major concern in low rainfall areas. The present study aims to evaluate the impact of ZT technology on rabi crops (wheat, chickpea, lentil and mustard) cultivation during 2020-21 in Gaya district of Bihar. Results shown that zero tillage has increased grain yield of wheat, chickpea, lentil and mustard by 12.5, 11.1, 4.7 and 6.6% over conventional farming, while the

net return and benefit-cost ratio were found to have rise by 35.3 and 78.6%, 24.67 and 41.6%, 17.6 and 37.4%, 17.0 and 24.4%, respectively. Results also showed that crops sown by ZT technology helped in advancing sowing time as well as reduced cost of cultivation for the selected crops. This rise of profitability was mainly due to decrease in cost of cultivation, irrigation and labour. This study suggested the positive impact of ZT implementation on rabi crops by sustaining production and profitability in Bihar.

Keywords: Zero tillage, Rabi crop, Wheat, Chickpea, Lentil

A RESEARCH STUDY ON ENVIRONMENTAL CONSIDERATIONS FOR MANAGING MENSTRUAL HYGIENE

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ABSTRACT

INTRODUCTION: The subject mentioned in this research paper is crucial to the clean-environment movement's goal of advancing civilization. These kinds of developments are now required by the age of germs in order to create a safe and healthy way of living. To control menstrual bleeding, girls in rural regions utilize tissue paper, cotton, wool, old clothes, or a combination of these materials. Qualitative research shows that only girls who are aware of a variety of standard sanitary pads prefer to use them. However, many females cannot afford or cannot find these pads. When these pads are drained, they swell up from being saturated with fluids, causing sewage blockage, which is a major issue worldwide. Menstrual waste can be disposed of by incineration. However, burning pads creates fumes that are harmful to the environment and human health since they include the carcinogenic and poisonous chemical dioxin. Given this shortcoming, natural fiber-based biodegradable sanitary napkins are an excellent substitute for establishing a hazard-free workplace.

OBJECTIVES: This research paper focuses on the:

- I. Types of absorbents used at the time of menstruation
- II. Attitude level of adolescent girls towards disposing sanitary pads.

METHODOLOGY:

- i. **POPULATION GROUP:** The adolescent girls of age group 13-19 years studying in the government schools
- ii. **SAMPLE SIZE:** 400 sample sizes were considered for the pre-intervention programme.
- iii. **SAMPLING METHOD:** Purposive Random Sampling.
- iv. **LOCALE OF THE STUDY:** Lucknow City (Uttar Pradesh), India
- v. **TOOLS AND TECHNIQUES USED IN THE STUDY:** Self modified questionnaire was prepared and used for the intervention study. 400 samples were selected for the pre-intervention and 200 samples were considered for the Post-intervention study. Lecture method, demonstration method, power-point presentation, question and answer session were included for the intervention study. The respondent was first asked to fill a declaration form for their participation in the study and the participation was purely voluntary.

RESULT AND DISCUSSION: From the intervention study it was found out that the responders used reusable sanitary pads. Respondents favored disposable pads because they thought they were easy to use and hygienic. Reusable sanitary pads were regarded as a sustainable option by the majority of respondents. Girls between the ages of 13 and 19 are enrolled in school. Students were less inclined to utilize reusable sanitary pads that had already been used.

Keywords: Intervention, Absorbents, Hazard-Free, Menstrual Waste

ENTREPRENEURSHIP IN AGRICULTURE

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ABSTRACT

Skill and knowledge are the driving force of socio-economic development of a country. Agriculture is a sector which can employ a large number of youths. If skilled youth are available in the country, there will be no shortage of skilled manpower for the agriculture, industries, factories and other manufacturing units. All this will definitely boost productivity. With a greater emphasis on skill development and entrepreneurship, the country has the potential to become the world skill capital. When the huge segment of youth in the country is being provided with appropriate skills, they can generate many employment opportunities for others also. The present government under the leadership of Hon'ble Prime Minister Sh. Narendra Modi is focusing more on skill development of Youth. For this many programmes have launched and many policies have been made to promote entrepreneurship ecosystem in the country. A different Ministry of Skill Development and Entrepreneurship (MSD&E) has been created and entrusted with the task of skilling India. The government has set up the National Skill Development Corporation to provide skill related training to 500 million individuals by 2022. The Pradhan Mantri Koushal Vikas Yojana (PMKVY) is an important programme in this direction. Under this programme, the youth are being provided with short term training in relevant skills.

The Ministry of Agriculture and Farmers' Welfare, Government of India has also started a flagship programme Agri Clinics and Agribusiness Centers (AC&ABC) to create a pool of agri-entrepreneurs in the country. Under AC&ABC, National Institute of Agricultural Extension Management (MANAGE), Hyderabad is providing 45 days free residential professional hand holding training program to graduates from agriculture and allied sciences. Skill Training of Rural Youths is another initiative by MANAGE to skill youths coming from backwards areas in different agriculture and allied related vocations.

A holistic entrepreneurial ecosystem in the country is now stimulating so many entrepreneurial opportunities for the youths and they now understand that government cannot provide jobs to all of them. Instead by setting up their own income generating enterprises, they can generate millions of jobs for many other like them.

PHYTO-ASSISTED SYNTHESIS OF SILVER NANOPARTICLES (AGNPS) AND SCREENING OF THEIR ANTIMYCOTIC ACTIVITY: AN APPROACH TO DEVELOP NANO BASED FUNGICIDE

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ABSTRACT

Herein, an attempt has been made to develop simple, eco friendly and a safer antifungal agent. With this view, we prepared silver nanoparticles (AgNPs) by using *Calotropis procera* leaves and screened the impact on pathogenic fungi. The nanoparticles were characterized by using scanning electron microscopy and ultraviolet spectroscopy absorbance. Transmission electron microscopy revealed the spherical shape of particles with a average size of 20 nm. From our

experiment, the results are evidence that the silver nanoparticles have the potential to inhibit the growth of pathogenic fungi *Aspergillus* sp. From this study, we concluded that synthesized AgNPs have the potential to act as an antifungal agent.

Keywords: AgNPs, *Calotropis procera* Plant, *Aspergillus* sp.

ON THE QUEST TO FOOD SECURITY: A STUDY ON THE RESILIENCE OF INDIGENOUS MAIZE CULTIVARS

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ABSTRACT

Chak-Hao Chujak, a local maize cultivar is popular and one of the most commonly grown in Manipur. It has unique characteristic of soft and stickiness even though it is dried and stored for long time unlike the normal maize. Among the agro-techniques non-monetary inputs like sowing date and selection of good seed varieties are the two management aspects to be considered for improving the yield of maize. The performance of the different local maize cultivars is studied under rainfed valley condition of Manipur. Additionally, the adaptability of the cultivars under varying time of cultivation is also studied. Significantly higher growth and yield parameters was recorded in Chak-Hao Chujak (Angouba) followed by Chak-Hao Chujak (Amuba) and the lowest was observed in Chak-Hao Chujak (Angangba). Maize sown on 30th May was found to be performing superior as compared to those plants sown on 15th May and 14th June respectively.

Highest net returns and B:C ratio (Rs.1,65,902.50 and 5.07) was obtained from Chak-Hao Chujak (Angouba) sown on 30th May and lowest Net returns and B:C ratio (Rs. 1,05,022.50 and 3.21) was obtained from Chak-Hao Chujak (Angangba) sown on 14th June of 2020.

HETEROSIS – A TOOL TO COMBAT BIOTIC & ABIOTIC STRESS

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ABSTRACT

With the ever-increasing population in the world coupled with climate change, it is challenging to serve the people with food produced in the available arable land from existing varieties. This food crisis can be tackled by increasing the productivity per unit of land. The most successful and widely used tool to overcome this challenge is the deployment of hybrids. Hybrids are benefitted from a phenomenon called “Heterosis,” wherein the hybrid progeny has superior performance compared to parental lines. Genetic divergence between parents positively correlates with heterosis in hybrids. Ecotypes adapted to different stress environments exhibit natural variation in stress-responsive gene expression owing to epigenetic modifications. In such ecotypes, stress-responsive genes are constitutively expressed. These stress-responsive genes are under circadian clock control, which are endogenous timers that regulate various biological processes to synchronize internal conditions with daily and seasonal environmental conditions and allocate resources during the most valuable times of day and year. Epigenetic reprogramming of clock genes and stress-responsive genes in hybrids, leads to repression of stress-responsive genes under normal conditions, thereby diverting the energy for much-needed biological processes such as photosynthesis. This repression leads to growth vigour and

biomass heterosis. Under stress conditions, the stress-responsive genes are induced to above mid-parent levels at a specific time of the day, resulting in elevated stress response. Hence, heterosis helps find the middle ground between stress response and growth, and expression differences of stress-responsive genes between plants should be considered when selecting parents to develop hybrids that perform better under normal and stressful conditions.

Keywords: - Heterosis, Circadian clock, Stress response, Natural variation in plants

SUPERABSORBENT POLYMERS: PROSPECTS AND IMPACTS ON SOIL HEALTH

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ABSTRACT

Superabsorbent polymers (SAP) are a three-dimensional matrix made of hydrophilic polymers that are linear or branched and can absorb, swell, and retain a lot of water while retaining their physical structure. The hydrophilic functional groups such as carboxyl, amino, amide, hydroxyl, and sulfonic groups are responsible for their higher water absorbency. SAP were frequently utilized in disposable diapers, hygiene napkins, cement, medicine delivery systems, sensors, and agriculture because of their exceptional water retaining capacity. In the soil system, the SAP particles could be thought of as "miniature water reservoirs". Agricultural SAP are synthetic polymers generally made from petroleum products. Most often, they are created through cross-linking polymerization, which can be done physically or chemically. SAP of various types has been produced in large quantities using both natural and synthetic polymers, including chitosan, alginate, collagen, dextran, cellulose, and chitin. Synthetic polymers include acrylic acid, methacrylic acid, polyethylene glycol, vinyl acetate, polyvinyl alcohol, and various acrylates. SAP materials have the power to improve soil conditions that are beneficial to plant growth and increase water availability to plants. However, the impact of these materials on soil must be carefully evaluated by comprehending how soil reacts to SAP application and how much SAP can change its properties. It will contribute to improving the general function of the soil, which could promote agricultural and reclamation success. The extent of cross-linking in the polymer structure was shown to affect the biodegradability of SAP, and the biodegradability of SAP in soil was improved by the inoculation of a fungal consortium. However, more research on the biodegradability of SAP in soil needs to be done. In general, SAP soil treatment can modify the soil's physical, chemical, and biological qualities and can adjust soil health to promote plant growth.

Keywords: - Soil health, Superabsorbent polymers (SAP), Synthetic polymers, Water reservoirs.

PHYSICO-CHEMICAL ANALYSIS OF CHHANA WHEY BEVERAGE BLENDED WITH KOKUM (*Garcinia indica*) Syrup And Honey.

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ABSTRACT

Whey is the watery part of milk that remains after separation from the milk yogurt / coagulated product that results from acid or proteolytic enzymes mediated coagulation of milk. Whey beverages are pure water, which contains sugars, flavors, edible acids and pigments, and is

sometimes carbonated with carbon dioxide gas. Kokum syrup is much appreciated as a health drink, the fruit is used as an anthelmintic and cardio tonic. Kokum juice from rind is used against piles, colic problems, dysentery and diarrhea. Honey is a natural sweetener produced by honey bees. Natural honey is a sweet, flavorful liquid food of high nutritional value and immense health benefits. Henceforth considering the utilization of dairy byproduct i.e. chhana whey also the nutritional and medicinal values of Kokum (*Garcinia indica*) and honey the fresh, healthy and refreshing herbal kokum whey beverage is produced.

Whey beverage was prepared from chhana whey obtained from cow milk. Honey and kokum syrup was added in chhana whey at different levels. Honey was added at two level 14 percent and 16 per cent respectively, while kokum syrup was added at three different levels viz. of 10, 12.5 and 15 per cent of whey and it is represented as H₁K₁, H₁K₂, H₁K₃, H₂K₁, H₂K₂, H₂K₃ respectively. H₁K₀, and H₂K₀ are the control treatment in which kokum syrup was not added, it contains only chhana whey mixed with 14 and 16 percent honey respectively.

The prepared kokum whey beverage was objected to physicochemical analytical work such as total solids, fat, protein, carbohydrates, ash and pH, it contained on an average 22.60, 0.324, 0.537, 18.55, 1.009 and 5.40 per cent total solids, fat, protein, carbohydrates, ash and pH, respectively. From the investigation it was concluded that the most acceptable quality whey beverage can be prepared by using honey at the rate 14 per cent of the whey and kokum syrup at the rate 12.5 per cent of whey.

Keywords:- Whey beverage, kokum syrup, honey, chhana, total solids, fat, protein, carbohydrates, ash, pH

PREPARATION OF *kulfi* By Incorporating Betel Vine Leaves Extract

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ABSTRACT

Kulfi is a popular indigenous frozen milk product prepared from cow or buffalo milk or a combination thereof or from cream and or other milk products, with or without adding sugar, fruits, chocolates, edible flavour and permitted food colour. Betel vine has immense social, religious and medicinal value. Betel vine leaves are good source of vitamin B and C, carotene and dietary calcium. Considering the rich flavour, nutritive value and palatability of betel vine, delicious *kulfi* was prepared.

Betel vine *kulfi* was prepared by concentrating whole milk to about two folds followed by addition of sugar, cream and betel vine leaves extract was added according to the different treatments and freezing the mix in aluminum or plastic moulds, usually of conical shape and is rich source of carbohydrates, dietary fiber, protein, iron and potassium. Betel leaves extract was added at different levels viz, 10, 15 and 20 per cent represented as T₁, T₂ and T₃ respectively and T₀ is control without incorporation of betel vine leaves extract, cream was added at 14 per cent and 12 sugar at per cent of unsweetened condensed milk for all treatments. The betel vine flavoured *kulfi* prepared by using 15 per cent betel vine extract was observed as most acceptable. The most acceptable betel vine *kulfi* was analyzed for its physico-chemical attributes. On an average it contained total solids (35.5 %), fat (11.06%), protein (5.46%), total sugar (15.26%), ash (1.12%) and titratable acidity (0.209%). From the study it is concluded that betel vine leaves extract can be incorporated successfully in preparation of a delicious milk product *kulfi*.

Keywords:- *Kulfi*, betel vine leaves, extract, milk, total solids, fat, protein, total sugar, ash, titratable acidity

EVALUATION OF SORGHUM (*Sorghum bicolor*) GENOTYPES FOR QUALITATIVE AND QUANTITATIVE PARAMETERS UNDER PADDY FALLOWS

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ABSTRACT

Sorghum [*Sorghum bicolor* (L.) Moench] ranks the fifth most important food crop in the world and is a dietary staple for over 500 million people in over 30 countries. Paddy fallows basically imply to those lowland *kharif* sown rice areas, which remain uncropped during *rabi* (winter) due to various reasons such as lack of irrigation, cultivation of long-duration varieties of rice, early withdrawal of monsoon rains leading to soil moisture stress at planting time of winter crops, waterlogging and excessive moisture in November / December, lack of appropriate varieties of winter crops for late planting and socio-economic problems like stray cattle, blue bulls etc. Sorghum in paddy fallows is gaining popularity among the farmers and the crop is exclusively cultivated in paddy fallows under zero tillage condition (Mishra *et al.*, 2011). It is now grown in more than 14,000 ha area in paddy fallows with an average productivity of 6.9 t per ha. Sorghum cultivation under zero tillage has many economic and environmental benefits over conventional tillage, such as lower labour and fuel needs, reduced soil erosion, reduced runoff, increased soil organic carbon contents and increased soil biological activity (Anon, 2018). So the present investigation was undertaken to evaluate the sorghum genotypes suitable for Raichur district condition under paddy fallows. The experiment was conducted with fifteen genotypes *viz.*, CSV 37, CSV 42, DSV 6, SPH 1883, CSH 14, CSH 16, CSH 25, CSH 41, CSH 9, LAILA, KSSH 186, SONAL, VJH 15, SARPANCH and JIVA 96 comprising of public, private hybrids and varieties replicated thrice. The experiment was conducted under zero till condition, no ploughing and levelling operations were carried out during the cropping period.. Seeds were treated with imidacloprid 7 gm per kg and sown with a spacing of 45 cm between rows and 15 cm between plants. All 15 genotypes were evaluated for qualitative and quantitative parameters and results revealed absence of anthocyanin colouration for leaf sheath and stigma and yellow colouration of stigma. The genotype CSV 42 recorded significantly highest (42.68 %) pollen sterility percentage and genotype LAILA showed significantly highest (73.12 %) pollen viability compared to other genotypes. Similarly all 15 genotypes are also evaluated for quantitative parameters, among them the genotype VJH 15 was recorded significantly highest plant height at 60, 90 DAS and at maturity (199.67 cm, 217.33 cm and 229.33 cm) whereas, the genotype JIVA 96 was recorded highest panicle length (17 cm), panicle weight (63.16 g) and lesser (54.0) number of days to 50 per cent flowering. However LAILA genotype has recorded highest panicle width (17 cm), seed set percentage (77.20 %), grain yield per plant (35.28 g) and grain yield per hectare (5227.31 kg / ha) but CSH 16 genotype has recorded highest test weight (2.98 g) (Al-Lahham, *et al.*, 2013).

From the above results it is concluded that genotypes varied significantly for quantitative characters like plant height, days to 50 percent flowering, panicle length, panicle width, panicle weight, seed set percentage, grain yield per plant, grain yield per hectare and test weight. Reason for varied differences among the genotypes is due to genetic variation, genetic makeup, environmental factors (temperature) and nutrition availability among the genotypes. From this study LAILA and JIVA 96 are suitable for cultivation under paddy fallows based on yield and pollen sterility.

APPLICATION OF COMPOSITE FLOUR IN DEVELOPMENT OF PASTA AND VALUE ADDITION WITH SHATAVARI (*Asparagus racemosus*)

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INTRODUCTION-The incorporation of buckwheat can be justified in composite flour based pasta as it has beneficial nutraceutical properties and can be regarded as functional food due to the presence of various important bioactive compounds such as flavonoids, phenolic acids, bioactive polysaccharides, and bioactive proteins with high amounts of essential amino acids. Potential health benefits of buckwheat include antioxidant activity, anti-inflammatory, antihyperlipidemic, anticancer, antidiabetic, antiobesity, antihypertensive and hepatoprotective activity. Buckwheat is also used in gluten free diet for celiac patients.

Asparagus racemosus regarded as “rasayana” (plant drugs promoting general wellbeing by increasing cellular vitality and resistance), due to the presence of major bioactive components namely group of steroidal saponin, flavonoids (kaempferol, quercetin, rutin) and polyphenols. The significant properties of Shatavari are anti-oxidant, anti-inflammatory, anti-diabetic, hepatoprotective, anticancer, anti-lithiatic, cardio-protective, hypolipidemic, fertility activity, anti-ulcerative, galactagogue effects, enhance immune responses, anti-arthritic, anti-abortionifacient, and analgesic.

OBJECTIVES- The present study aims on functionality enhancement by incorporating buckwheat flour with wheat flour and value addition by incorporating Shatavari into pasta to fortify the food product with enriching nutrients for boosting immunity, curing diseases and restoring health.

METHODS- Four products with different concentrations of buckwheat flour in wheat flour were prepared (10% , 20%, 30%, 40%) to assess the quality and acceptability of pasta. Pasta formed with addition of 20% buckwheat flour had overall acceptability score of 6.20, suggesting acceptability. This was then taken as standard composition for addition of variable percentages of *Asparagus racemosus* (10% , 20%, 30%). Products were assessed for their organoleptic qualities using hedonic rating scale. Best product was assessed for nutritional properties (Energy, Carb, Protein, Fat)

RESULTS- 20% Shatavari incorporated buckwheat and wheat flour pasta scored best in the organoleptic evaluation. Nutritional analysis of the same product revealed better results in energy, carbohydrate & protein quality as compared to the control.

CONCLUSION- Bioactive components of Buckwheat & *Asparagus racemosus* have been found effective in management of manifestations of variable ailments. Elaborative comprehensive studies needs to be performed based on therapeutic intervention of Buckwheat & *Asparagus racemosus* and other related products & can be proved to have potential to cure diseases.

Keywords- Buckwheat, Shatavari, *Asparagus racemosus*, value added product development, organoleptic evaluation, nutritional analysis.

INFLUENCE OF BORON, CALCIUM NITRATE AND NAA ON INITIAL SEED QUALITY OF CHILLI

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ABSTRACT

An experiment was conducted to study the influence of seed treatment with boron, calcium nitrate and growth regulator (NAA) on germination and growth parameter of chilli cultivar Varada (GCS-94-68) during 2019-2020 at Seed Testing Laboratory, Seed Unit, University of Horticultural Sciences, Bagalkot. The experiment was laid out complete randomized design comparing with seven treatments viz NAA (25 and 50 ppm), boron (3 and 4 ppm), calcium nitrate (1 and 2 gm/lit of water) and absolute untreated control. The results revealed that boron (3 ppm) recorded significantly highest initial seed germination (86.33%) over control (61%) and on par with all other treatments. Seeds treated with boron (3 ppm) were shown highest seedling length and vigor Index (7.13 and 612.62 respectively) over untreated control (3.96 and 242.07 respectively).

Keywords: Chilli, Boron, Calcium nitrate, Growth regulator, Seed quality

GENETIC DIVERSITY STUDIES IN CLUSTER BEAN (*Cyamopsis tetragonoloba* (L.) Taub.)

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ABSTRACT

The investigation on “Genetic diversity studies in cluster bean” was conducted in the field of Vegetable Science of KRC College of Horticulture, Arabhavi in randomized block design with two replications. Forty-three cluster bean genotypes were evaluated for 23 characters to study the divergence and the data obtained was subjected to D² analysis. As many as thirteen divergent clusters were grouped by using Trocher’s method.

Cluster IV is the largest cluster having 13 genotypes followed by clusters VI with seven genotypes, cluster VIII with four genotypes and cluster XI with three genotypes (CBG - 25, CBG - 39, CBG - 42). Cluster I (CBG-18, CBG -28), cluster II (CBG - 21, CBG - 41), cluster III (CBG - 6, CBG - 35), cluster V (CBG - 30, CBG - 32), cluster VI (CBG - 15, CBG - 20), cluster IX (CBG - 33, CBG - 40) and cluster X (CBG - 31, CBG - 37) had two genotypes each. Cluster XII (CBG - 38) and cluster XIII (Pusa Navbahar) had one genotype each.

Intra and inter-cluster average D² values are presented in Table-12. Among the thirteen clusters, cluster XI with three genotypes showed maximum intra-cluster distance (D² = 2450.455) followed by cluster VII (D² = 2392.701), cluster IV (D² = 1987.573) with maximum number of genotypes (13), cluster VIII (D² = 751.835), cluster X (D² = 567.128), cluster IX (D² = 538.542), cluster VI (D² = 254.677), cluster V (235.835), cluster III (218.029), cluster II (178.980) and cluster I (154.427). The cluster XII and cluster XIII had no intra-cluster distance (D² = 0.000) as they possessed single genotype in each. Based on distance between clusters i.e. inter-cluster distances (Table-12), the maximum distance was observed between cluster XII and XIII (D² = 20513.842) followed by cluster XI and XII (17634.514), cluster II and XII (D² = 15843.412), cluster III and XII (D² = 13585.321), cluster VII and XII (13198.409), cluster X and XIII (12598.564), cluster X and XI (10259.579), cluster IX and XII (9200.085), cluster II and X (8772.010) and cluster VII and X (7364.097). The least inter cluster distance was observed between cluster I and VI (233.280) followed by cluster II and III (280.272).

CORRELATION AND PATH ANALYSIS STUDIES IN CLUSTER BEAN (*Cyamopsis tetragonoloba* (L.)Taub.)

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ABSTRACT

The correlation and path analysis studies was conducted in 43 genotypes of cluster bean (*Cyamopsis tetragonoloba* (L.)Taub.) in the field of Dept. of Vegetable Science, KRC College of Horticulture, Arabhavi.

Among 23 different characters studied, vegetable pod yield per plant is highly significant (both at $p = 0.01$ and $p = 0.05$) and positively correlated with stem girth ($r_G = 0.690$), weight per ten pods ($r_G = 0.609$), pod length ($r_G = 0.493$), pod breadth ($r_G = 0.453$), plant spread (E-W) ($r_G = 0.380$), plant height at 45 DAS ($r_G = 0.372$), plant spread (N-S) ($r_G = 0.332$), hundred seed weight ($r_G = 0.320$), plant height at 90 DAS ($r_G = 0.311$), number of branches at 45 DAS ($r_G = 0.304$) and number clusters per plant ($r_G = 0.293$) and it was also positively and significantly correlated with number of branches at 90 DAS ($r_G = 0.237$) only at $p = 0.05$ but negatively and significantly (at $p = 0.05$) correlated with number of seeds per pod ($r_G = -0.217$). The path coefficient analysis for vegetable pod yield per plant was performed with a set of 16 independent characters. Stem girth had high direct and positive effect (1.777) on vegetable pod yield per plant and it also had high indirect effect via plant spread (E-W) (0.674), plant spread (N-S) (0.568), cluster length (0.568) and days to vegetable pod harvesting (0.334). Plant spread (E-W) had high direct and positive effect (1.375) on vegetable pod yield per plant and it also had high indirect effect via plant spread (N-S) (1.011), stem girth (0.871), days to first flowering (0.458) and number branches at 45 DAS (0.303). Plant spread (N-S) had high direct and positive effect (1.081) on vegetable pod yield per plant and it also had high indirect effect via Plant spread (E-W) (1.286), stem girth (0.934), days to first flowering (0.559) and number branches at 45 DAS (0.300).

Days to first flowering had high direct and positive effect (3.332) on vegetable pod yield per plant and it also had high indirect effect via plant height at 90 DAS (0.851). Days to vegetable pod harvesting had no positive direct effect (-3.914) on vegetable pod yield per plant and it had high indirect and positive effect through days to first flowering, plant height at 90 DAS (0.968), plant spread (E-W) (0.376) and plant spread (N-S) (0.300).

Weight per ten pods had high direct and positive effect (0.630) on vegetable pod yield per plant and it also had high positive indirect effect through number of clusters per plant (0.317) and stem girth (0.302). Number of seeds per pod had high direct and positive effect (0.781) on vegetable pod yield per plant.

EFFECT OF DIFFERENT LEVELS OF FERTILIZERS (NPK) ON PRODUCTIVITY AND NUTRIENT DYNAMICS OF BROWNTOP MILLET

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ABSTRACT

A field experiment was conducted at Agricultural Research Station, Baljigapade, Chikkaballapur taluk and district, which comes under the Eastern Dry Zone of Karnataka during *Kharif* season 2018. The experimental plot in the field was laid out following a randomized complete block design (RCBD) with fourteen treatments and three replications. The treatments included two levels of N and P₂O₅ (20 and 30 kg ha⁻¹) and three levels of K₂O (10, 20 and 30 kg ha⁻¹). Farmyard manure was applied at the rate of 6.25 t ha⁻¹ to all the treatments except absolute control. Results indicated that application of 30 kg N+30 kg P₂O₅+30 kg K₂O ha⁻¹ with Farm Yard Manure (FYM) increased the macronutrient availability in soil N (150.29 kg ha⁻¹), P₂O₅ (17.60 kg ha⁻¹), K₂O (160.84 kg ha⁻¹). Application of FYM @ 6.25 t ha⁻¹+30 kg N+20 kg P₂O₅ +20 kg K₂O ha⁻¹ significantly increased growth, yield, macronutrient content and uptake by brown top millet grain and straw against absolute control. The grain yield of browntop millet was increased by 61.46 percent in T₁₀ and 59.07 percent in T₉ as compared to the absolute control.

EFFECT OF ELEVATED CARBON DIOXIDE AND TEMPERATURE ON GROWTH AND YIELD IN GROUNDNUT (*Arachishypogaea* L.) GENOTYPES

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ABSTRACT

Purpose

Four genotypes of groundnut (*Arachishypogaea* L.) viz., K-9, TMV-2, GPBD-5 and R2001-2. were raised in open top chambers at elevated carbon dioxide and elevated temperature (550ppm and 2 °C respectively) during *Rabi* 2016 to investigate the effect of raised levels of CO₂ and temperature on various growth and yield parameters. The plant height, chlorophyll content, leaf area index, number of nodules, test weight and seed yield per plant were recorded highest under treatment T₄ (elevated CO₂ and elevated temperature). Similarly, negative impact on growth and yield parameters under treatment T₅ (elevated temperature) high temperature decreased the growth parameters. There was significant interaction of elevated CO₂ and elevated temperature on vegetative growth. The beneficial effects of increased CO₂ on photosynthesis and growth were overwhelmed by the negative effect of high temperature on growth.

Methods

An investigation was carried out to study the effect of elevated levels of CO₂ and temperature on growth of groundnut under Open Top Chamber (OTC's) at Main Agricultural Research Station (MARS), University of Agricultural Sciences, Raichur, Karnataka. The five treatments (Control condition, Reference chamber (390ppm CO₂), 550 ppm carbon dioxide, 550 ppm carbon dioxide + 2⁰Crise in temperature and 2⁰C rise in temperature) along with four genotypes (K-9, TMV-2, GPBD and R2001-2) were laid out in pots as two factorial completely randomized design with three replication during *rabi* season 2016. The present investigation

was carried out during *rabi* season of 2016 at Main Agricultural Research Station Raichur (MARS), Raichur, which is situated in the North Eastern Dry Zone (Zone-II) of Karnataka between 16° 15' N latitude and 77° 20' E longitude with an altitude of 389 m above the mean sea level.

Results

In the investigation during grand growth period *i.e.* 60 DAS, plants grown under elevated CO₂ at 550 ppm with elevated temperature (2 ° C rise) (T₄) recorded highest plant height (36.19 %), number of nodules per plant (24.12 %), chlorophyll content (46.64) and leaf area index (95.83 %) when compared with ambient CO₂ with ambient temperature (T₂) (control OTC). This drastic increase in growth parameters is function of elevated CO₂. However, there is decrease in growth parameters too *i.e.* plants grown under ambient CO₂ with elevated temperature (2 °C rise) (T₅) has recorded decreased of plant height (10.86 %), number of nodules per plant (11.53 %), chlorophyll content (41.28) and leaf area index (36.96 %) when compared with ambient CO₂ with ambient temperature (T₄) (control OTC).

Genotype TMV-2 showed little higher leaf area index, canopy temperature and chlorophyll content at harvest as compared to K-9. This might be due to fast growing, bushy and spreading habit of genotype which progressively increased in branching. Further, the differential behaviour among the genotypes could be explained solely by the variation in their genetic makeup and their differential behaviour under different climatic conditions. Genotype TMV-2 recorded comparatively maximum plant height and proved significantly superior to rest of the genotypes. This might be due to erect growing habit of genotype TMV-2 which resulted in vertical growth rather than horizontal spread of plants. Tripathy *et al.* (1999) and Virendra *et al.* (2008) at different locations also reported differential growth behaviour of groundnut genotypes in terms of plant height, canopy temperature, number of nodules per plant, leaf area index and chlorophyll content were found to be higher in genotype TMV-2 than K-9, indicating the healthiness of plants, dark green natured leaves and higher chlorophyll content than genotype TMV-2.

Conclusions

The study revealed that all the genotypes where shown significant variation with respect to growth aspects. However groundnut shown positive performance under elevated CO₂ conditions, compared to elevated temperature conditions. The genotype TMV-2 performed well compared to K-9 under treatment T₄ (elevated CO₂ + elevated temperature) showing highest plant height, number of nodules and leaf area index. Similarly negative impact on growth parameters under treatment T₅ (ambient CO₂ and elevated temperature) among the genotypes TMV-2 performed better than K-9 and other genotypes. Study helps to select suitable genotype for varying climatic conditions.

Keywords: Climate change, Elevated CO₂, Temperature, Ground nut and OTC

EFFECT OF BIODEGRADABLE PACKAGING MATERIALS COMBINATION ON SEED QUALITY OF CHICKPEA SEEDS DURING STORAGE

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ABSTRACT

Packaging materials and containers made of natural biopolymers are particularly interesting due to their biodegradability, since most of these products have a relative short service life and end up in landfills. So, there is increasing interest in biodegradable packaging material made from renewable and natural materials, such as starch, proteins of animal and vegetable origin, fats and resins. Botanicals like neem seed oil are culturally acceptable in communities with a tradition of plant use, and they are gaining popularity as substitutes for synthetic pesticides. The bags were treated with neem seed oil and they were control (HDPE bag), single layered GAB bag, GAB bag in gunny bag, GAB bag in HDPE bag, cloth woven bag, polythene bag and biogreen bag (commercially available). Among the interaction effect between neem seed oil treatment to bags and selected biodegradable packaging material combinations, the seeds stored in neem seed oil treated GAB bag in HDPE bag had a significant effect on seed germination (94.00 %), abnormal seedling (3.00 %), seedling length (25.41 cm), seedling dry weight (558.51 mg) and seedling vigour index-I (2379), lower moisture content (7.88 %), 100 seed weight (24.46 g), number of eggs laid per 10 g of seed (6.54), number of adults emerged per 100 g of seed (1.33), per cent seed damage (5.00 %), per cent weight loss (1.33 %), per cent seed infection (1.00 %), lower EC (0.656 dSm⁻¹) and dehydrogenase enzyme activity (1.805 OD value) maintained good seed health throughout the storage period as the lowest values were recorded in untreated cloth woven bag. Hence these biodegradable plastics can be used in the seed storage and can be improved and used in long term storage.

COMPARATIVE MORPHOLOGY AND MOLECULAR PHYLOGENETIC ANALYSIS OF ARECANUT (*Areca catechu* L.) Cultivars

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ABSTRACT

Purpose

Arecanut (*Areca catechu* L.) is a high value commercial crop of India, which is also called betel nut. Arecanut is mainly used for chewing or masticatory in combination with betel leaves and sometimes as Tambula. It is also used as an important commodity in all religious, social and cultural functions in India. It is also been used in Ayurveda and Veterinary medicines. Declining cultivation of arecanut due to multiple biotic stresses calls for collection and evaluation of genetic diversity analysis of diverse arecanut accessions.

Methods

Ten areca nut cultivars were assessed for their genetic diversity by morphological and molecular markers. Ten arecanut cultivars were grouped into different clusters using D² analysis and molecular markers viz., RAPD, ISSR and RGP.

Results

Ten arecanut cultivars were grouped into four clusters using D² analysis. DNA markers: RAPD, ISSR and RGP, exhibited 22.47%, 14.07% and 19.03% polymorphism, respectively and produced six clusters each. The PIC value of the RAPD marker ranged from 0.19 to 0.32, with an average of 0.2. ISSR marker varied from 0.17 to 0.26, with an average of 0.22. The RGP markers exhibited PIC value from 0.21 to 0.29 with an average 0.24. The highest PIC value was obtained in RGP2 (0.29). When compared with morphological diversity, the Sagar Local and Keladi Local were grouped together in the same clusters both in case of morphological and RAPD based molecular clustering. Similarly, SAS-1 and Mohitnagar were individually

grouped both in case of morphology and ISSR based clustering indicating high level of genetic differences of these genotypes with other genotypes. In comparison of RGP based clustering and morphological grouping, Sagar Local and Sreemangala were found grouped together.

Conclusions

The best measure to analyse genetic diversity among genotypes would be with the use of all information, both from morphological characters and DNA based markers. Highly divergent, high performing genotypes would be great importance to utilize in recombinant breeding in order to get high heterotic recombinants and further studies of breeding works.

Keywords: Arecanut, RAPD, ISSR, RGP, YLD, Genetic diversity

ASSESSMENT OF GENETIC DIVERSITY FOR YELLOW LEAF DISEASE RESISTANCE AND SUSCEPTIBLE IN ARECANUT (*Areca catechu* L.) using Molecular Markers

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Purpose

Areca nut (*Areca catechu*) once considered an unhealthy addictive stimulant has been turned into medicine for curing schizophrenia and glaucoma and as a mild stimulant and digestive aid when consumed in low quantities. It provides assured income and livelihood security to marginal and small farmers with minimal inputs. Nevertheless, its Production is threatened by many biotic stresses including Yellow Leaf Disease (YLD) as the substantial one. The yellow leaf disease is an endemic disease in Sringeri and Koppa talukas of Chikkamagaluru, Karnataka as evidenced by higher incidence values.

Methods

The characterisation done by the genetic divergence among the YLD resistance and susceptible genotypes of areca using multiple markers; ISSR, RAPD and RGP markers.

Results

The highest polymorphism among the areca nut genotypes was observed with the resistant gene primer (RGP), exhibiting polymorphic information content (PIC) ranging from 0.18 to 0.30 with an average PCI of 25.03%. The PIC value of OPAF 06, UBC 351 and RGP1 were 0.30, 0.18 and 0.18 respectively. Major allele frequency ranged from 67 to 97 per cent within the research material indicating the presence of genetic diversity. The markers RAPD, RGP and ISSR, differentiated the susceptible and resistant genotypes into clear-cut clusters.

Conclusions

These polymorphic markers that were identified and validated in the present study have great importance for the diagnostics and management of YLD.

Keywords: Arecanut, RAPD, ISSR, RGP, YLD, Genetic diversity

EFFECT OF YOGA PRACTICES AND DIET THERAPY ON NUTRITIONAL STATUS OF ADULT POPULATION IN BRAMHAVARCHAS INTERNATIONAL YOGA ACADEMY

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ABSTRACT

Yoga is the science of right living and such is intended to be incorporated in daily life. It works on all aspects of the person : the physical, vital, mental, emotional, psychic, and spiritual. Diet is used as therapeutic purpose not only because of the presence of nutrients but food also contains chemical substances which act as antioxidants, detoxifying agent or blocking or suppressing agents or help in excreting toxic substances or maintain proper intestinal flora. Study was carried out on 30 adults aged between 20-60 years. Yoga and diet therapy was given to every adult. Effect of yoga practices and diet therapy was found to be very effective on the nutritional status of adult. 72% of the respondents improved health after joining Brahmavarchas International Yoga Academy and 28% of the respondents had not improvement in their health because they were not follow any rule of Brahmavarchas International Yoga Academy.

GENETIC VARIABILITY OF AJWAIN GENOTYPES UNDER NORTHERN DRY ZONE OF KARNATAKA

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ABSTARCT

Ajwain (*Trachyspermum ammi* L.) is a cross pollinated crop belongs to a family apiaceae (2n=18) exhibits high variability for the economic characters. Studies on variability helps in locating the desirable plant type either for direct introduction or for use in the further breeding programme. The objective of the experiment is to identify the genotypes of producing higher growth, yield and quality in ajwain. An investigation on ajwain was undertaken during rabi season in 2020-21 at Department of Plantation, Spices, Medicinal and Aromatic Crops, College of Horticulture, Bagalkote to study the characterization of ajwain (*Trachyspermum ammi* L.) genotypes under northern dry zone of Karnataka. The experiment was laid out in Randomized Complete Block Design (RCBD) with two replications and twenty-eight treatments. All genotypes showed significant differences for all the characters studied. Wide variability existed among the genotypes for all the morphological and yield traits. The annova showed that mean sum of squares due to genotypes were significant for all the parameters studied. Among the twenty-eight genotypes studied, High GV and PV was recorded by the traits viz., number of umbels per plant and number of seeds per umbel. High GCV and PCV was recorded by the traits viz., number of flowers per umbellets, number of umbels per plant, number of seeds per umbel, Harvesting index, essential oil, oleoresin. Low GCV and PCV was recorded by the traits viz., days to 50 per cent flowering, days to physiological maturity and number of umbellets per umbel. High heritability coupled with high genetic advance was recorded by days to germination, plant height at 150 days, number of branches per plant at 150 das, days to flower initiation (10%), days to 50 per cent flowering, number of flowers per umbellets, number of

umbels per plant, number of umbellets per umbel, number of seeds per umbel, seed yield per plant (g), harvesting index, test weight in grams, essential oil and oleoresin.

Keywords: Ajwain, Variability, Yield

DIVERSITY OF FRESHWATER EUGLENOPHYTES IN WETLANDS OF BHAGALPUR DISTRICT, BIHAR, INDIA

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ABSTRACT

Euglenophyta are small, unicellular flagellates which are predominantly found in freshwater environments and are generally colorless (Gupte and Iyer, 2015). Euglenophyta comprises distinct group of free-living protists which are phototrophic, colorless phagotrophic and osmotrophic species, and are bacteriophagic in nature (Brosnan *et al.* 2003). Algae play an important role in biodiversity and primary productivity of an ecosystem. The study of phytoplankton is a very useful tool for the assessment of water quality and productivity of any type of water body and also contributes to understanding of ecology of lentic water bodies (Pawar *et al.*, 2006). Euglenoids frequently serve as bioindicator of organic pollution and also serve as connecting organisms between flora and fauna. We performed this study to explore the diversity of euglenoids from different wetlands of Bhagalpur district, Bihar (India). The present study aimed to study the distribution and ecology of euglenoids in different wetlands of this district and to analyze the changes that occur within the communities of phytoplankton which provide the platform to determine the trophic state of different wetlands.

Methods

For the study, phytoplankton samples were collected from few selected wetlands in each of 16 blocks of Bhagalpur district (Latitude-N **25.253391**/Longitude- E **86.989059**) on seasonal basis (summer, winter and monsoon) over a period from December 2019 to June 2022. The study is based on the field and laboratory work. Samples were collected using a plankton net (65µm pore size) and were preserved in 4% formalin in high quality plastic bottle for enumeration of euglenoids. Euglenoids were identified up to the species level with the help of Camera Lucida diagram and using monographs, available literature and manuals such as Wehr and Sheath (2003), Roy and Pal (2016) and Satpati and Pal (2017).

Results

In the present study, a total of forty-three species of Euglenophyceae under six genera i.e., *Euglena* (12 species), *Phacus* (14 species) *Trachelomonas* (10 species), *Lepocinclis* (2 species), *Strombomonas* (4 species) and *Cyclidiopsis* with (01 species) were recorded from the different wetlands of Bhagalpur district, Bihar (India). Among all the species recorded, species like *Euglena gracilis*, *Euglena viridis*, *Euglena limnophila*, *Phacus acuminatus*, *Phacus circulates*, *Phacus limnophilia*, *Phacus orbicularis*, *Phacus tortus*, *Phacus longicauda*, *Trachelomonas bernardi*, *Trachelomonas caudate*, *Trachelomonas curta*, *Strombomonas schauinslandii*, *Strombomonas acuminata*, and *Lepocinclis acus* appeared to be dominant in all the seasons during the study period. According to Palmer (1969) pollution index, presence of euglenoid species such as *Euglena gracilis*, *Euglena viridis*, *Euglena pisciformis*, *Euglena acus*, *Euglena oxyuris*, *Euglena proxima*, *Trachelomonas volvocina*, *Lepocinclis ovum* and *Phacus pleuronectus* in the wetlands under investigation suggested these wetlands as nutrient rich and moderately polluted. From the perusal of the available literature, it appears that this is

the first report on the diversity of euglenoids from Bhagalpur district of Bihar, India, which is quite rich.

Conclusions

On the basis of above findings, we may conclude that there is high diversity of euglenoids in wetlands of Bhagalpur district. Our work confirms statements made in other publications that euglenoids occur in mineralized and polluted water which is similar with the finding of Alves-da-Silva and Hahn (2001). Based on the present study, we suggest that the presence of various heterotrophic euglenoid taxa in the freshwater wetlands might be treated as indicators of mineralization of water and water pollution. Knowledge of the taxonomy and biogeography of euglenoids in wetlands of Bihar State is still poor and we need more environmental studies of this group.

Keywords: Algae, Biodiversity, Euglenophyceae.

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ROASTING OF CEREALS GRAINS: A REVIEW

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ABSTRACT

Cooking makes food digestible. The cooking medium affects the quality of cooked food. Frying in oil may add fat to the food, boiling in water may transfer contaminants to the food, and roasting in sand may improve a product's flavor. Popping is the simultaneous gelatinization and expansion of starch that occurs when grains are subjected to high temperatures for a brief period of time. During this process, superheated vapour created by immediate heating inside the grains cooks the grain and swells the endosperm quickly, breaking the outer skin. Puffing, like popping, is a controlled expansion of the kernel in which the vapour pressure escapes via the micro pores of the grain structure due to high pressure or heat gradient. Roasting is a method of cooking that employs dry heat to roast food evenly on all sides at temperatures of at least 150 °C (300 °F) from an open flame, oven, or other heat source. Caramelization and Maillard browning on the surface of the food can enhance the flavour of roasting. Roasting employs indirect, dispersed heat (similar to that found in an oven) and is ideal for cooking meat in a larger, entire piece at a slower rate

Keyword: Roasting, Popping, Puffing, Sand Roasting, Puffing Temperature

IMPACT OF FRONT-LINE DEMONSTRATION ON YIELD ENHANCEMENT OF *Rabi Sorghum* IN HAVERI DISTRICT OF NORTHERN KARNATAKA

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ABSTRACT

One of the major constraints of local *rabi* sorghum cultivation is low productivity due to non-adoption of recommended package of practices and improved varieties. To overcome this ICAR-Krishi Vigyan Kendra, Haveri (UAS Dharwad, Karnataka) conducted frontline demonstrations in farmers' fields at various villages in the district with high yielding sorghum variety SPV-2217 and applying scientific practices in cultivation. The *rabi* sorghum productivity and economic returns under improved technologies were calculated and compared with the prevailing farmers' practice. It was observed that on an average 23.81 percent higher grain yield was recorded in demonstration plots than the local check. The average extension gap, technology gap and technology index were 3.20 q ha⁻¹, 5.96 q ha⁻¹ and 22.91 percent, respectively. Average of six years data revealed that SPV-2217 variety under improved practices recorded higher yield ranging from 14.98 to 25.29 q ha⁻¹ during different years of study. On an average the recommended practice gave higher net returns of Rs. 37970 ha⁻¹ and B:C ratio of 3.33 as compared to farmers practice (Rs. 27873 ha⁻¹ and 2.67, respectively).

Keywords: Front line demonstration, Sorghum, Improved variety, Improved production practices, farmers' practice

IMPACT OF CLUSTER FRONTLINE DEMONSTRATIONS ON REDAGRAM PRODUCTIVITY IN HAVERI DISTRICT OF NORTHERN KARNATAKA

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ABSTRACT

Red gram (*Cajanus Cajan* L.) is an important pulse crop in India, plays a major role in augmenting the income of small and marginal farmers of Northern Karnataka. The low production of traditional varieties of red gram was a cause of concern for the farmers at large. To overcome this problem of low yield, ICAR-Krishi Vigyan Kendra in Haveri district has conducted cluster frontline demonstration in field of adopted villages. The present study was conducted by KVK, Haveri during 2021-22 *kharif* season with twenty five cluster frontline demonstrations in Hunasikatti and Kamododha villages of Haveri district. The results of demonstrations showed that cultivation of high yielding variety GRG-152 of Red gram has given yield increase of 28.92 % over local check. The technology gap ranges from 3.55 in 2021-22. This high extension gap requires urgent attention from planners, scientists, extension personnel and development departments. The technology index varies from 60.64. The changes will accelerate the adoption of newer technologies to increase the productivity of green gram in this area. There is a need to adopt multi-pronged strategy which involves enhancing green gram production through horizontal and vertical expansion and productivity improvements through better adoption of improved technology. The difference in technology gap in different years was due to better performance of recommended varieties with different interventions and

more feasibility of recommended technologies during the course of study. Similarly, the technology index for all demonstrations in the study was in accordance with technology gap. It can be concluded that the red gram production could be enhanced by adoption of improved technologies through Cluster Front Line Demonstrations. Hence, there is a need to disseminate the improved technologies among the farmers with effective extension methods li

Keywords: Extension gap, Farmers practice, Frontline Demonstration, Red gram, Technology gap, Technology index

RESPONSE OF NUTRIENTS ON GROWTH AND YIELD ATTRIBUTES OF BROWN TOP MILLET [*Brachiaria ramosa*]

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ABSTRACT

Challenges in 21st century like climate changes, water scarcity, increasing world population, rising food prices, and other socioeconomic impacts are main threat to agriculture and food security worldwide, especially for the poor. Hence there is need of alternative nutritive food source. Millets refers to small seeded grasses that are cultivated as grain crops grown on dry regions of temperate, tropical and subtropical situations. Small millets grown in Asia and Africa. Browntop millet is hardy and heat tolerant crop, and tolerant to drought but can also grow low areas of flooded. The crop grows well even shaded condition also and can grow under tamarind trees. The crop survives under arid conditions and has the potential to spread widely because of its rich nutritional value as well as its ability to adapt to climate change. The study was conducted during Iait *Rabi* 2019-20 at ICAR- Krishi Vigyan Kendra, Haveri to Nutrient Management on growth and yield of Brown top millet. The experiment was laid out in RCBD comprising of eight treatments replicated thrice. Studies revealed that the growth parameters, yield attributes and grain yield of Brown top millet differed significantly due to foliar application of NPK along with RDF and soil application of micronutrients along with RDF. The results indicated that the application of RDF + FYM 6t/ha + foliar nutrition of 19:19:19 @ 2% at 30 and 45 DAS recorded significantly higher plant height (69.75cm), number of tillers per plant and number of grains per plant (436) at harvest over the other nutrient levels. And also on par with Foliar nutrition of 19:19:19 @ 2 % at 30 and 45 DAS + FYM 6 t/ha) In grain yield (7.65 q/ha) and straw yield (14.52 q/ha) recorded significant higher with application of T5 and also on par with RDF of crop + FYM 6 t/ha) over the other treatments levels. The gross returns, net returns and BC ratio were also higher with the same treatments (Rs37865, Rs.21365 and 2.39 respectively) as compared to all other treatments and absolute control.

Keywords : Nutrient management, Brown top millet, Economics

ENHANCING FERTILIZER EFFICIENT AND WATER MANAGEMENT IN THROUGH FERTIGATION IN CROPS

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ABSTRACT

Considering the importance of drip method of irrigation in the sustainable use of irrigation water, efforts are being made to propagate the adoption of DIM from 1970 onwards in India. It provides efficiently in providing irrigation water and nutrients to the roots of plants, while

maintaining high yield production. Modern drip irrigation has arguably become the world's most valued innovation in agriculture since the invention of the impact sprinkler, which replaced flood irrigation. This is because high water application efficiencies are often possible with drip irrigation, since there is reduced surface evaporation, less surface runoff, as well as minimal deep percolation. Due to the way the water is applied in a drip system, traditional surface applications of timed-release fertilizer are sometimes ineffective, so drip systems often mix liquid fertilizer with the irrigation water. Drip irrigation has the greatest potential for the efficient use of water and fertilizers. The limited area of wetting under trickle irrigation reduces the active root zone and also the foraging area of plants to draw water and nutrients from the soil. For minimizing the cost of irrigation and fertilizers, adoption of drip irrigation with fertigation is essential which will maximize the nutrient uptake, while using minimum amount of water and fertilizer. Fertigation gives advantages such as higher use efficiency of water and fertilizer, minimum losses of N due to leaching, supplying nutrients directly to root zone in available forms, control of nutrient concentration in soil solution and saving in application cost. Thus, fertigation becomes prerogative for increasing the yield of most of the crops under drip irrigation.

Keywords :Drip irrigation, Fertigation, WUE and Crops

APPLICATION OF NANOTECHNOLOGY IN PRECISION AGRICULTURE

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ABSTRACT

In modern large amount of fertilizers, pesticides, herbicides are used in crops to achieve more production per unit area but using more dose than the optimum of these chemicals and fertilizers lead to several problems like environment pollution, low input use efficiency, degrade the quality of produce, develop resistant to weeds, disease insect and pest, degrade the soil, causes deficiency of micronutrients in soil, toxicity to different beneficial living microorganism present above and below the soil etc. Excessive use of fertilizers, pesticides and insecticides also caused several health issues in population. Despite these problems there is also challenge to feed the growing population of country. Therefore in future, there is need to produce nutritive agricultural produce rich in protein and other essential nutrient required to the human and animal consumption that is why emphasis should be laid on production of high quality food with required quantity of nutrients and proteins. The application of nanotechnology to agriculture and food industries is carrying increased weight because of the potential benefits ranging from improved food quality and safety to reduced agricultural inputs and improved processing and nutrition. Agriculture, food and natural resources sector is a part of those challenges like sustainability, vulnerability, human health and happy living. The aim of nanomaterials in agriculture is to reduce the amount of spread chemicals, minimize nutrient losses in fertilization and increased yield through water and nutrient management. Nanotechnology has the potential to develop the agricultural and food industry with novel tools for the molecular management of rapid disease detection, enhancing the ability of plants to absorb nutrients among others. The significant interest of using nanotechnology in agriculture includes specific applications like nanofertilizers and nanopesticides to track products and nutrients levels to increase the productivity without decontamination of soils and waters and protection against pest and diseases. For solving these problems in crop production Nano-fertilizers, pesticides may be the effective tools in agriculture for better pest and nutrient management in precision agriculture.

APPLICATION OF BIO-NANOTECHNOLOGY IN AGRICULTURE AND FOOD SAFETY

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ABSTRACT

In last few decades nanotechnology has delivered extensive research with emergence in Agriculture, Engineering, Biotechnology, Food-technology and Medical sciences. Bio-nanotechnology is an emergent field having enormous prospective to certainly impact on the agriculture and food industry. Thus, it is indispensable to take smart bio-nanotechnology awareness in agriculture. Despite a lot of information about individual nanomaterial is available but toxicity level of many nanoparticles is still imperceptible. Due to not as much of facts the application of these nano-materials is limited for risk assessments and effects on human health. Basic appreciative of how nanomaterials, the building blocks of bio-nanotechnology, interact with the cells and their biological consequences are beginning to evolve with lots of scopes and hopes in agriculture. Bulk material is divided into small size particles with one or more dimensions in the nanometer range or even smaller, the individual particles exhibit unexpected properties which are different from those of the bulk material. Due to distinct properties of nano materials like improved plant disease resistance, detect the mycotoxins in food, efficient nutrient utilization and enhanced plant growth. Bio-Nanotechnology combines biological principles with physical and chemical approaches to produce nano-size particles with specific functions. It also represents an economic substitute for chemical and physical methods of nanoparticles formation. Metal nano particles exhibit good anti-pathogenic, anti-bacterial, and anti-fungal activities due to electrostatic interaction of nano particles with bacterial cell membrane and their accumulation in cytoplasm. Nano-fertilizers may contain zinc, silica, iron and titanium dioxide, gold nano-rods, core shell QDs, etc. The carbon nanotubes and nanoparticles of silver, zinc oxide, etc can be really helpful in remediating the plant growth by ensuring that the nutrients are utilized optimally by the plants. Nanoscale biomaterials can take part in pathogen detection as well as helps in nanoscale purification systems for improved food quality. Some important aspects covered such as nano-additives, intelligent packaging, control and nutraceuticals delivery, nano-coding of plastics and paper materials and nano-encapsulation and target delivery. Nanoparticles have been effectively entrenched in the packaging materials for making food storage, thus minimizing pathogenic growth on stored foodstuffs.

ACID LIME FRUIT WASTE UTILIZATION FOR DEVELOPMENT OF VALUE ADDED PRODUCT - CHUTNEY

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ABSTRACT

Lime is an inexpensive citrus fruit, popular for its culinary and medicinal uses, with natural antibacterial effect, antioxidant, anti-carcinogenic properties and boosts the immune system. Its rind is rich in fibre, nutraceuticals, antioxidants and phytochemicals. During peak season, lime growers leave fully ripe fruits on tree unattended that causing post harvest and economic losses. Acid lime wastes value added products have therapeutic value which provides health security and small scale industrial applicability After extracting juice the acid lime fruit waste

is left unused .Hence study was undertaken on utilization of fruit waste for development of value added product *chutney*.. The whole fruit weight of acid lime was ranging from 30.33 to 53.66g. Vitamin C content of lime waste was 217.50mg, content of the products retained even after drying, however the content decreased after processing fruit waste into products. . Protein content was ranging from 17.44 to 20.13 g%. Lime fruit waste had more magnesium and zinc content however the content slightly decreased after processing fruit waste into products. Dietary fiber content was high (65.2 to 67.28 g%). Nutrient content of product showed significant decrease in the majority of the nutrients after processing into product. The shelf life study indicated the products was found acceptable even after four months of storage except spicy chutney which could be stored only up to three months. Microbial evaluation of the products indicated products were safe for consumption

BIOMASS DEGRADATION AND AMMONIA OXIDATION USING *BACILLUS SP.* ISOLATED FROM THE EUTROPHICATED WATER BODY

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ABSTRACT

Screening of heterotrophic nitrifying bacteria as an alternative source of biological removal of nitrogen compounds in polluted lake water was carried by soil samples collected from the lake bed. The bacterial isolate were subjected to primary and secondary enrichment was performed. Culture samples showing nitrate production were subjected to confirmatory test. Change of colour from pink to yellow and decrease in pH indicated the presence of nitrifying bacteria. The ammonia oxidizing bacteria isolated belongs to genus *Bacillus sp.* Isolation and characterization using 16s ribosomal RNA. In this study, the *Bacillus sp.* isolated from the beds of Kukkarahalli lake soil is a bacterial resource for nitrification and it has a possible bioremediation role in water contaminated by deoxidized nitrogen. *Bacillus sp.* was tested in batch to adsorb Nitrogen compounds from eutrophicated water bodies. The removal of ammonia, nitrite and nitrate nitrogen from synthetic solutions was demonstrated successfully in laboratory with using *Bacillus sp.*

Keywords: Degradation, *Bacillus sp.* , Ammonia, Nitrogen.

RESPONSE OF CHELATED MICRONUTRIENTS, GROWTH REGULATOR AND BIOFERTILIZERS ON GROWTH AND FLOWERING OF POMEGRANATE (*Punica granatum L.*) cv. BHAGWA

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ABSTRACT

Chemical fertilizers have several negative impacts on environment and sustainable agriculture. Therefore, chelated micronutrients, growth regulators and biofertilizers have been used as a replacement of chemical fertilizers. A chelate describes a kind of organic chemical complex in which the metal part of the molecule is held so tightly that it cannot be 'stolen' by contact with other substances, which could convert it to an insoluble form. Chelating agents are organic molecules that can trap or encapsulate certain metal ions like Ca, Mg, Fe, Co, Cu,

Zn and Mn and then release these metal ions slowly so that they become available for plants to take them up, Gibberellic acid is an important plant growth regulator that is actively involved in cell elongation and other important physiological functions in plant growth, development and flowering and Biofertilizers are biological preparations of efficient microorganisms that promote plant growth by improving nutrient acquisition. They enhance soil productivity by fixing atmospheric nitrogen, solubilizing soil phosphorus, and stimulating plant growth. The purpose of this study was to avoid use of chemical and also the evaluation of the influence of chelated micronutrients, growth regulator and biofertilizer on growth and flowering of some selected plants of pomegranate cv. Bhagwa.

The research was conducted on experimental fruit orchard of Department of Horticulture, VNMKV., Parbhani, during *Mrig bahar* in 2018-19 and 2019-20. The experiment was laid out in FRBD, which is replicated twice with two factors *i.e.* Factor A: methods of plant propagation (P) *i.e.* P₁: Air layered plants, P₂: Tissue cultured plants and Factor B: different nutrients concentrations *i.e.* N₁: Chelated micronutrients (CM.) @ 3.0 g/lit, N₂: CM. @ 4.0 g/lit, N₃: GA₃ @ 75 ppm, N₄: GA₃ @ 100 ppm, N₅: Biomix @ 0.3%, N₆: Biomix @ 0.4%, N₇: CM. @ 3.0 g/lit and Biomix 0.3%, N₈: CM. @ 3.0 g/lit and GA₃ 75 ppm and Biomix 0.3%, N₉: CM. @ 3.0 g/lit and GA₃ 75 ppm, N₁₀: GA₃ 75 ppm and Biomix 0.3%, N₁₁: Control. The maximum vegetative growth of plant *viz.*, plant height, number of branches, number of leaves/branch, girth of the stem, and plant spread in both (N-S and E-W) directions were studied with plants propagated with air layered plants sprayed with chelated micron. @ 3.0 g/l + GA₃ @ 75 ppm + Biomix @ 0.3%. Earliest flowering initiation and earliest 50% flowering from initiation was recorded in air layered plants sprayed with combined application of chelated micron. @ 3.0 g/l and GA₃ @ 75 ppm, maximum total number of flowers and male flowers were registered in air layered plants sprayed with chelated micron. @ 3.0 g/l + GA₃ @ 75 ppm + Biomix @ 0.3% while, higher sex ratio was recorded air layered plants sprayed with Biomix @ 0.3 %.

Keywords: Pomegranate, Bhagwa, Chelated Micronutrient, PGR, Biomix,

NUTRITIONAL PRESERVATION IN DEHYDRATED BALSAM PEAR (*Momordica charantia* L.)

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ABSTRACT

Dehydrated bitter gourd slices have the potential to become an important value added product because of relatively inexpensive, easily and quickly cookable and rich in several nutrients, which are essential for human health. In this experiment we tried three different drying methods namely sun drying, cabinet drying and solar drying. With a view study was designed to find out best method of drying and its effect on nutritional and qualitative composition of *Momordica charantia* using local variety. The experiment was conducted in FRBD consist of 21 treatment combinations, consisting of three drying methods *i.e.* sun drying(D₁) cabinet drying (D₂) and solar drying (D₃) and seven levels of pre-treatment of chemicals *viz.* KMS-0.1%,(T₁), KMS-0.2% (T₂), Salt-1.5% (T₃), Salt-2% (T₄), MgCO₃- 0.20% (T₅), MgCO₃-0.25% (T₆) and control (T₇) which were replicated twice. The results of present investigation indicated that chemical pre-treatment T₆ (MgCO₃-0.25%) dried under cabinet drying was found superior in maintaining minimum moisture, drying ratio, dehydration ratio, while maximum rehydration ratio, Vit. A, Vit. C, iron, phosphorus thought the storage period s. However, the T₇ (control) treatment had registered the maximum moisture, drying ratio, dehydration ratio whereas minimum rehydration ratio, Vit. C, Vit. A, Phosphorus, iron. In case

of the dehydration methods, the cabinet drying was found to be superior in maintaining the lower percent of moisture, drying ratio, dehydration ratio, higher percent of rehydration ratio, vitamin C, vitamin A, phosphorus and iron. Interaction effect of treatment combination consisting of T₃D₂ i.e. MgCO₃ 0.20% + cabinet drying stood superior for all above parameters followed by D₂T₆ i.e. MgCO₃-0.25% + cabinet drying of fried bitter gourd chips with respect to colour, texture and flavour as evaluated by five member expert panel in sensory evaluation test and exhibited maximum consumer acceptability.

Keywords: Bitter gourd, Cabinet Drying, Sun Drying, Vitamin A, Vitamin C, Iron, Phosphorus

LAND SHAPING STRATEGIES TO INCREASE AGRICULTURAL PRODUCTIVITY IN FLOOD-PRONE AND WATERLOGGED ECOSYSTEMS

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ABSTRACT

Water plays a key role as a base to the crop productivity of different systems, but somewhere the excess water i.e., the waterlogged situations are not congenial to the production systems. Accordingly, the productivity, stability and sustainability of the agro-ecosystems differ in different agroclimatic zones in India. Occurrence of flood is frequent phenomenon in many countries. In India, about 41.13 million ha is prone to floods, which is about 13% of 329 million ha of the geographic area affecting about 9% of the population. On average, floods of different types cause waterlogging (perennial and seasonal) in about 11.6 million ha in the country. These waterlogging ecosystems may be considered as the most challenging with respect to management of natural resources and productivity of agricultural crops. There are a few options which could be adopted as adaptation and mitigation strategies to address the waterlogged ecosystems. Among those, land shaping strategy is an effective option. A wide range of land shaping strategies and engineering solutions can be utilized to mitigate the impact of waterlogging on overall productivity of the land. Land shaping technique includes modification of the land surface creating different types of land situations like raised land/ridges, medium land and normal low land apart from farm pond /sunken bed/ furrows primarily for harvesting of rainwater and creating a source of water for irrigation during post-monsoon season after recession of floods, reducing anaerobic conditions to a part of the land surface through raised & wide beds and growing of multiple and diversified crops round the year. By this land modification techniques, there is ample scope of growing fruit and seasonal vegetable crops on the raised beds and on the pond dykes, and fish culture in sunken water body of different depths and in ponds. This approach and practices would ensure a multi-enterprise integrated farming (apiculture, mushroom cultivation, vermicomposting, medicinal and aromatic crops) for nutrition security to farmers, income generation round the year, and enhancing productivity of the waterlogged areas.

Keywords: Land shaping, crop productivity, waterlogging, integrated farming

HEAT TRANSFER AND FRICTION CHARACTERISTICS OF ARTIFICIALLY ROUGHENED EVACUATED TUBE COLLECTOR SOLAR AIR HEATER

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ABSTRACT

A 3-D CFD (computational fluid dynamics) investigation on heat transfer and friction characteristics of rib roughened evacuated tube collector solar air heater was carried out in ANSYS Fluent 15.0. Circular rib in the form of artificial roughness was applied underneath the absorber of evacuated tube collector solar air heater to disturb the heat resistive viscous sublayer by inducing turbulence in flow region closer to the absorber without interrupting the main flow. The roughness geometry parameters i.e. relative roughness pitch (P/e) of 6 and relative roughness height (e/D_h) of 0.064 was considered for investigation. The Nusselt number and friction factor have been evaluated for Reynolds number range of 2500-8000. The RNG $k-\epsilon$ turbulence model was selected for analysis and periodic conditions were applied to flow only at inlet of roughened evacuated tube collector solar air heater. The maximum enhancement in Nusselt number and friction factor for rib roughened evacuated tube collector was 1.65 and 2.79 respectively. The thermohydraulic performance parameter of rib roughened evacuated tube collector solar air heater was also evaluated and found to be varied between 1.14-1.18 for Reynolds number range of 2500-8000.

Keywords: Nusselt number, friction factor, solar air heater, thermohydraulic performance

ROLE OF NANOTECHNOLOGY IN FOOD PROCESSING, PRESERVATION AND PACKAGING

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ABSTRACT

Nanotechnology has transformed a wide range of scientific and technical disciplines, including the food business. Food manufacturing, packaging, practical food growth, food safety, and the detection of foodborne infections are just a few of the nanotechnology applications that have evolved as a consequence of the increased requirement for nanoparticles in various food industry domains. Nanostructures have aroused a lot of focus in recent years due to their unique features, which make them suitable for packaging materials since they increase mechanical, kinetic, and gas barrier capabilities while remaining non-toxic and ecologically benign. The most frequent nanoparticles found in processed foods are montmorillonite (MMT), nano zinc (ZnO-NPs) coated silicate, kaolinite, silver NPs (Ag-NPs), and titanium dioxide (TiO₂NPs). These nanostructure-coated sheets inhibit oxygen, carbon dioxide, and other volatile organic molecules. Nanotechnology's usage in enhancing food nutrition and organoleptic qualities, as well as some remarks on safety issues and regulatory questions surrounding nano-processed food items, have been briefly discussed. The most difficult aspect of making these nanocomposites is ensuring that they are evenly distributed throughout the polymer matrix as well as that they are compatible. The most difficult aspect of making these nanocomposites is ensuring that they are fully delivered and stabilized within the polymer matrix. As a result,

increased nano-packaging material efficiency, such as mechanical stability, degradability, and antibacterial efficacy, is becoming increasingly important. Nanotechnology's application and impact on food nutritional and sensory qualities are briefly discussed, as well as some remarks on nano-based functional additives and preservation safety laws.

Keywords: *nanocomposites, nanotechnology, Montmorillonite, titanium dioxide*

NEXT GENERATION SEQUENCING (NGS)” HAS THE POTENTIAL TO REVOLUTIONISE MODERN BIOLOGY

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ABSTRACT

The massively parallel sequencing technology known as "Next Generation Sequencing (NGS)" provides extremely high throughput, scalability, and speed. Using this approach, the nucleotide sequence of entire genomes or specific DNA or RNA portions can be ascertained. The biological sciences have undergone a revolution because of NGS, which enables laboratories to carry out a wide range of tasks and investigate biological systems at a depth never before imaginable. A wide range of applications for next generation sequencing are made possible by novel sample preparation and data analysis techniques.

In addition to sample re-sequencing, which compares the obtained data to the reference sequence to find variation existing in the sample, next generation sequencing can be used to *de novo* sequence genomes. The range of genetic variation types, sizes, and frequencies that may be analyzed has been considerably expanded by NGS. Beyond genetic variation, NGS provides a perfect platform to study gene expression below the noise level of microarrays, analyze allele-specific gene expression, explore alternative splicing, histone modifications, transcription factor binding, and perform methylome analysis at base-pair resolution. In complicated trait genetic investigations, SNP finding and genotyping are currently the most often employed NGS applications. NGS is more accurate than Sanger sequencing, requires fewer samples, and can find variations with lower allele frequencies. Genetic analysis has been transformed by the speed, throughput, and accuracy of next-generation sequencing (NGS), which has also opened up new applications in forensic, environmental, agricultural, and clinical science, as well as genomic and clinical research.

Next generation sequencing has opened up a wide range of opportunities for the study of complex trait genetics. Although there are still many production, study design, analysis, and interpretation problems, there has been progress in creating, calibrating, and enhancing instruments for more precise data delivery and potent association analysis. NGS is expected to fundamentally alter how complex trait genetics research is conducted and may hold the key to tying sequence polymorphism to polygenic phenotypes throughout the whole variation, frequency, and effect size spectrum. Early articles demonstrating the power of NGS demonstrate how it opens the complete spectrum of genomic changes for the genetic investigation of complex phenotypes. The potential of NGS will be realized with further advancements in analytical tools.

Keywords: Genetic analysis, RNA, DNA, Genome, Next generation sequencing

ASSESSING THE IMPACT OF HYDRATION TREATMENT ON STORABILITY OF VEGETABLE CROP SEEDS

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ABSTRACT

Hydration in its traditional sense, soaking of seeds in water before sowing, has been the experience of farmers in India in an attempt to improve crop stand establishment but the practice was without the knowledge of the safe limit of soaking duration (Harris 1996). Using of hydration treatments in seed production increases gradually. More and more seed companies offer these treated seeds for the sale. The sense of this treatment is to improve the seed quality for good establishment of optimal crop stand. The hydration methods positively influence speed and uniformity of germination and emergence, which are reflected in higher uniformity of crop stand, especially in sub-optimal environmental conditions and this positive effect carries over to the harvest (TeKrony, Egli, 1991).

PURPOSE

Hydration is pre-soaking treatment, hydrated seeds are directly use in sowing and the storage of these seeds is not presupposed, or only shortly before sowing. But how long does the hydrated seeds persist higher quality when stored for longer period. Keeping in view these facts, the experiment was conducted with objectives to find out the in general effect of hydration on storability of vegetable crop seeds.

MATERIAL AND METHODS

The experiment was conducted at Seed Testing Laboratory, Seed Unit, UHS, Bagalkot, Karnataka, India. The standard seeds local popular varieties of onion (var. Arka Kalyan), carrot (var. Jatta local), cucumber (var. Dharwad local) and cluster bean (var. PNB) were used for this study. Each crop seed is treated by pre-hydration in distilled water at different durations as per treatments viz., Crops (C): C₁: Onion, C₂: Carrot, C₃: Cucumber and C₄: Cluster bean and soking durations (D): D₁: Control D₂: 3 hours D₃: 6 hours D₄: 9 hours. After hydration the seeds are dehydrated in two steps: at first free water was quickly drained off and then seeds are let open for 24 hours on filter paper at room temperature 25 °C and relative humidity (RH) 50%. All treated and untreated (control) samples are stored at room temperature in cloth bags. The observations on different seed quality parameters were recorded monthly up to 9 months of storage. The experiment were laid out in Factorial CRD with three replications.

RESULTS

The data recorded on different seed quality parameters like germination percentage, seedling length, seedling vigour index and seed moisture content differed significantly irrespective of crops and hydration durations. Among the crops the onion seeds recorded significantly higher seed germination (62.63%) compared to other crops at end of 9 months of storage. Other quality parameters like seedling length, seedling vigour index and moisture content varied from crop to crop. Among the soaking duration the seeds stored without hydration recorded higher germination (59.56%), seedling length (10.85 cm), seedling vigour index (640) and lower moisture content (5.76%) after 9 months of storage. As increase in the hydration period decrease in the quality parameters were noticed irrespective of crops

CONCLUSIONS

It is concluded that, hydration treatment and storage of vegetable seeds is not found to be feasible. Because soaking of vegetable seeds in water reduced the seed viability very quickly during storage i.e. within 6 months of storage. Hydration treatment is best for on-farm sowing

Keywords: Vegetable crops, Hydration, Storage, Germination.

EFFECT OF DIFFERENT PLANT SPACING AND SOWING DATES ON SEED YIELD AND QUALITY OF FENNEL (*Foeniculum vulgare*) IN NORTHERN DRY ZONE OF KARNATAKA

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ABSTRACT

Fennel (*Foeniculum vulgare*) is a plant of the *Apiaceae* (*Umbelliferae*) family. It is an herbaceous and perennial plant that originated from the Mediterranean and southern Europe; hot air is favorable for its development. Generally, the cultivation of this plant in areas with warm summers and long, cold winter is not too successful. Germination occurs at 6 to 8 °C, but the optimum temperature for germination is 16 to 65 °C. Now in most parts of the world, such as in central and southern Europe, Asia (India, Japan and China) and many African countries as well as Brazil and Argentina, most agricultural lands are cultivated fennel and largely used to impart flavour to a number of foods items and medicinal purpose. The growth and production of medicinal plants like other types of plants are affected by genetic and agronomic factors and maximum yield is only obtained when an appropriate combination of climatic conditions and plant density is provided for the plant (Rasam *et al.*, 2007).

Purpose

Climatic conditions are most important factor for production of quality seeds. To get the economic yield in any of the crop sowing of crop at appropriate season/time is most important to avoid abiotic stresses. The fennel crop prefers dry climatic conditions for growth and development, the same conditions usually there in the Northern Dry of Karnataka. Due to the medicinal and economic importance uses of fennel, the present trend is to increase the seed production and improve the quality of this crop. It is one of the alternate crops suitable for the Northern Dry Zone, the present study was conducted.

Material And Methods

The experiment was conducted during 2016-17 and 2017-18 at the University of Horticultural Sciences, Bagalkot, Karnataka, India. The freshly harvested seeds of fennel var. Ajmer Fennel-1 were collected from NRC Seed Spices, Ajmer, Rajasthan. The experiment was laid out in factorial RBD design with three replications. The main factors are different plant densities viz., S₁: 45x10 cm, S₂: 45x20 cm and S₃: 45x30 cm and Sub factors are different sowing dates viz., D₁: 1st week of October, D₂: 3rd week of October and D₃: 1st week of November. The observations on growth yield and quality parameters were recorded and statistically analysed.

Results

The data recorded on different growth and yield parameters like plant height, number of umbels per plant, number of seeds per umbel and seed yield per hectare was found to be superior in crop sown in the 1st week of October at spacing of 45 x 10 cm (S₁D₁) in both the seasons and pooled over data (135.5 cm, 24.35, 97.65 and 718.3 kg/ha respectively). The seed quality parameters like 1000 seed weight, seed germination percentage and seedling vigour were significantly superior in crop sown in the 1st week of October (D₁) in both the seasons and pooled over data (6.47 g, 87.78 % and 1060, respectively). Whereas, non-significant difference was observed for seed quality parameters in different plant spacing irrespective of sowing dates.

Conclusions

It is concluded that crop sown at spacing of 45 x10 cm in 1st week of October had produced significantly higher seed yield and quality compared to other spacing's and sowing dates. To get higher seed yield and quality in Northern dry zone of Karnataka the fennel crop should be sown in

1st week of October at spacing of 45 x 10 cm.

Keywords: Fennel, seed yield, seed germination, seed vigour

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PGPR AS BIOFERTILIZER AN ESSENTIAL COMPONENT OF SUSTAINABLE AGRICULTURE

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ABSTRACT

Growing environmental concerns are potentially narrowing global yield capacity of agricultural systems. Fertilizer overuse has triggered soil infertility due to continuous deposition of chemical residues, increasing soil acidity, decreasing biological activities, altered soil physical characteristics and diminished microelements. Agricultural productivity rests on the foundation of microbial diversity in the soil, and in recent years, PGPR have emerged as an important and promising tool for sustainable agriculture. Plant growth promoting rhizobacteria (PGPR) are a group of useful bacteria that colonize the plant roots and significantly enhances the plant growth promotion. The region around the plant root referred to as the rhizosphere, is the zone where various microbial activity occurs.; PGPR performs crucial functions such as increasing the uptake of nutrients for plant development and preventing plant against plant pathogens. Inoculation of crop plants with certain strains of PGPR at an early stage of development improves biomass production through direct effects on root and shoots growth. The use of PGPR as biofertilizers has gained importance worldwide. PGPR is also considered as the potential alternative for chemical fertilizers. For example, the growth primitive effects of PGPR have been reported in a numbers of crops. Thus, the application of PGPR is an available and under-exploited mechanism to enhance yield and improve resilience of crop plants to the various conditions challenging crop growth, development and yield. However, environmental conditions, such as the soil temperature, pH and soil fertility do not just affect plant development, they also have influence on the efficiency of PGPR, which in turn alters the ability of cultivated plants to produce biomass and food materials under climate change related environmental extremes.

Keywords:- PGPR, Sustainable Agriculture, Biofertilizer, Growth promoting activities

SOLVING CONFLICTS FOR SUSTAINABLE MANAGEMENT OF WATER RESOURCES USED IN AGRICULTURE BASED ON GAME THEORY

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ABSTRACT

Excessive use of water resources to increase profits in the agriculture sector will bring the tragedy of the commons. The protection of water resources in sustainable development planning for meeting an environmental goal, and maximizing the net profit of farmers for an economic goal, conflicts with the short term, and it is necessary to establish a balance between them. For this purpose, this study aims to determine the amount of optimal use of water resources and net profit of agriculture in four different scenarios of the cultivation pattern by using four conflict resolution methods.

Keywords: Game theory, Environmental effects, cultivation pattern, conflict resolution, water resources management.

ASSESSING THE IMPACT OF HYDRATION TREATMENT ON STORABILITY OF VEGETABLE CROP SEEDS

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ABSTRACT

Hydration in its traditional sense, soaking of seeds in water before sowing, has been the experience of farmers in India in an attempt to improve crop stand establishment but the practice was without the knowledge of the safe limit of soaking duration (Harris 1996). Using of hydration treatments in seed production increases gradually. More and more seed companies offer these treated seeds for the sale. The sense of this treatment is to improve the seed quality for good establishment of optimal crop stand. The hydration methods positively influence speed and uniformity of germination and emergence, which are reflected in higher uniformity of crop stand, especially in sub-optimal environmental conditions and this positive effect carries over to the harvest (TeKrony, Egli, 1991).

Purpose

Hydration is pre-soaking treatment, hydrated seeds are directly use in sowing and the storage of these seeds is not presupposed, or only shortly before sowing. But how long does the hydrated seeds persist higher quality when stored for longer period. Keeping in view these facts, the experiment was conducted with objectives to find out the in general effect of hydration on storability of vegetable crop seeds.

Material And Methods

The experiment was conducted at Seed Testing Laboratory, Seed Unit, UHS, Bagalkot, Karnataka, India. The standard seeds local popular varieties of onion (var. Arka Kalyan), carrot (var. Jatta local), cucumber (var. Dharwad local) and cluster bean (var. PNB) were used for this study. Each crop seed is treated by pre-hydration in distilled water at different durations as per treatments viz., Crops (C): C₁: Onion, C₂: Carrot, C₃: Cucumber and C₄: Cluster bean and soking durations (D): D₁: Control D₂: 3 hours D₃: 6 hours D₄: 9 hours. After hydration the seeds

are dehydrated in two steps: at first free water was quickly drained off and then seeds are let open for 24 hours on filter paper at room temperature 25 °C and relative humidity (RH) 50%. All treated and untreated (control) samples are stored at room temperature in cloth bags. The observations on different seed quality parameters were recorded monthly up to 9 months of storage. The experiment were laid out in Factorial CRD with three replications.

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Keywords: Vegetable crops, Hydration, Storage, Germination.

SHOT HOLE BORER: AN EMERGING PEST OF POMEGRANATE ITS DIAGNOSIS AND MANAGEMENT

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ABSTRACT

Polyphagous Shot hole borer (PSHB) *Euwallacea (Xyleborus) fornicatus* Eichh. is a small beetle that has become a major pest infesting the collar region of the plant by making numerous pins or shot holes causing a discontinuity in the conducting vessels and affecting the conduction of water and nutrients to the upper portion of the plant. Consequently, the drying of the twigs becomes imminent. The drying progressed from the tip towards the base and in severe cases, the entire plant dried up. Polyphagous Shot hole borer *Euwallacea (Xyleborus) fornicatus* will be active throughout the year with higher activity during the monsoon period. The adult emerges after the receipt of the unseasonal rains in May-June. The gravid female beetle attack plants under stress, freshly dead or dying plants and also colonize healthy trees, and cause damage through mass accumulation. Adult females will usually disperse during the day and females tend to colonize stems, and branches of pomegranate plants, the initial infestation is characterized by white dripping fluid from the beetle entrance holes in the young plant of <2 years old plants and in plants >2 years old fine yellow color fine dust around the collar region of the plants. Females will typically make a divided or simple gallery encircling the stem, with a few longitudinal tunnels in small branches. Eggs are laid in small clusters once the entrance tunnel has been completed. The grubs, with typically three instars, feed entirely on symbiotic ambrosia fungi cultivated in longitudinal galleries of twigs. Pupation takes place inside the same communal gallery. Newly emerged females stay in the galleries for several days. Once mating occurs, females leave the gallery through the original entrance hole. Beetles feed on a cultivated fungus within the xylem of woody hosts. The one life cycle of the beetle will be completed in 35-45 depending on the climatic conditions of the location and the suitability of the host plant. The beetles have overlapping generations and the Haplodiploidy method of

reproduction. Beetles have a specialized pocket-like structure called mycangia where they transport (Vector) symbiotic fungi to newly colonized trees. The fungi are obligate symbionts of the beetles and serve as their source of nutrition. The symbiotic fungus invades the tree's vascular tissue causing cambial necrosis, sugar or gum exudates, branch dieback, and mortality of the host plant. It infests on other alternate hosts Castor, tea, coffee, Avocado, guava, teak, etc. PSHB is currently managed throughout the Maharashtra and Karnataka states of India with effective monitoring, stem pasting, soil drenching, and stem spray techniques.

Keywords: Fungi, Haplodiploidy, Mycangia, Pomegranate, Polyphagous, Symbiotic.

EVALUATION OF CHLORANTRANILIPROLE FOR MANAGEMENT OF POD BORER, *Maruca vitrata* And Its Residue Dissipation In Cowpea

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ABSTRACT

Cowpea is nutritionally important legume crop grown in semi-arid and semi-humid tropics of Asia for vegetables. Despite its importance, the productivity of this crop is under threat by biotic stresses. This decline due to activities of complex of insect pests, notably caused by key pest cowpea pod-borer, *Maruca vitrata*. Severe infestation by the borer can cause up to 80% yield losses. In view of that, control of this pest is therefore important for sustainable cowpea production. A field experiment was conducted to find out the viable and environmentally friendly control measure. The effect of pesticides on mean populations of *M. vitrata* showed that plots treated with chlorantraniliprole 18.5 SC, showed lower pod borer populations and high yield than the untreated control plots. Lower pod infestation was recorded in synthetic insecticide treated plots which were with Spinosad 45 SC, Fipronil 5% SC, Flubendiamide 39.35% SC and Cypermethrin 25 % EC. All the insecticidal treatments were better than the control in suppressing pod infestation caused by *M. vitrata*. Least cowpea pod damage in plots treated with chlorantraniliprole compared with the control that recorded significantly higher pod damage due to increased larval population. In-vitro evaluation of the selected newer molecules was carried out under laboratory conditions and the results showed that chlorantraniliprole was the most effect insecticide against the cowpea pod borer, *Maruca vitrata*. Thus, chlorantraniliprole proved best control measure against *Maruca vitrata* in cowpea, which is an eco-friendly management option. Further, standardized the chlorantraniliprole residue estimation method by GC-ECD. Residues were extracted from cowpea matrices using ethyl acetate and cleanup was given by using primary secondary amine (PSA), magnesium sulfate and graphitized carbon black (GCB).

Keywords: cowpea, chlorantraniliprole, novel insecticides, *Maruca vitrata*, eco-friendly management, residue dissipation

AWARENESS LEVEL OF LISTENERS OF RADIO BUNELKHAND

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ABSTRACT

Radio takes a significant place at grass root level for rural development. It is economical, and the cost per person to reach is very low. Radio has been one of the oldest mass media access points for information seekers. Community Radio outlets may carry news and information programming geared towards the local area, Community stations can be valuable assets for a

specific region, because as operated, owned and driven by the communities, they serve. In the field of agriculture, farmers are information hunger specially, the information that suits to their local problem and solution in local. The Community Radio can play a significant role in revamping extension network not only for the purpose of dissemination of views and information, but also for education, advertisement and entertainment. The intent to which Radio Bundelkhand contributes to impressing the overall situation of listeners is not well documented and no such study is conducted over before for particular community radio on awareness of listeners. Thus, the present research study entitled. Awareness and listening behavior of the listeners of Community radio in Niwari district of Madhya Pradesh was undertaken. Out of three blocks Orcha block is selected purposively and study is completed with total of 120 listeners from 12 villages Orcha Block. Awareness level of the respondents revealed that majority (71.66%) of the community radio listeners had medium level of awareness. Relationship between various selected variable like education, cosmopolitaness, extension participation, mass media participation and information seeking behavior were found to be positive and significant relationship with the awareness level, whereas land holding negatively non-significant and age, gender, size of family, and annual income positive and non-significant.

INTEGRATED DISEASE MANAGEMENT TECHNOLOGY FOR SESAME UNDER CLIMATE CHANGE

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ABSTRACT

Sesame (*Sesamum indicum* L.) is one of the world's oldest oilseed crops and has been cultivated in Asia since ancient times and largely produced for its oil and is also used as a flavoring agent. The seeds of sesame contain 40 to 63 percent oil, which contains significant amount of oleic and linoleic acids. In the country, it is grown in 15.62 lakh hectares area with production of 7.84 lakh tones and productivity of 502 kg/ha during 2018. Sesame phyllody is the most destructive disease in India. Among the fungal diseases, *Macrophomina* root & stem rot, *Alternaria* leaf blights, *Phytophthora* leaf spot, *Cercospora* leaf spot, Powdery Mildew are important diseases of sesame. The incidence of important diseases varies from state to state based on agro climatic situations. Seed treatment with Thiram (0.2%) + Carbendazim 50WP (0.1%) and two foliar sprays should be done with wettable sulphur (0.25%) was most effective to minimize the incidence of powdery mildew. Seed treatment with Thiram (0.2%) + Carbendazim 50WP (0.1%) or *T. viride* @ 10 g/kg and two foliar sprays of (Mancozeb 2% + Carbendazim 1%) was effective for management of the *Alternaria* and *Cercospora* leaf spot disease. Seed treatment with Imidacloprid (17.8 SL @ 5 ml/kg) followed by foliar spray of Acetamiprid 20% SP @ 0.3 g/l was found effective in reducing the vector population and phyllody incidence. Seed treatment with *T. viride* @ 10 g/kg, furrow application of enriched *T. viride* (2.5 kg in 100 kg of FYM) @ 250 kg/ha followed by two foliar sprays of combo-product (Tebuconazole 50% + Trifloxystrobin 25%) @ 0.5 g/l was found and economical for the management of *Macrophomina* root and stem rot of sesame.

EFFICACY OF FUNGICIDES FOR MANAGEMENT OF ROOT & STEM ROT UNDER CLIMATE CHANGE

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ABSTRACT

Sesame (*Sesamum indicum* L.) is commonly known as ‘Til’ also called as “Queen of oil seeds”. It is belonging to family Pedaliaceae having Chromosome no. $2n=26$ and originated from Africa. Sesame, probably the most ancient oil seed plant cultivated in many parts of the world. Sesame seeds are a rich source of protein (20%) and edible oil (50-52%) and contain about 47% oleic acid and 39% linoleic acid. In the field trial conducted for the management of root & stem rot disease of sesame, all the treatments were found to be superior over control. Table 4.7 & Fig. 4.4 indicated that among the treatments, T1 (foliar spray of Tebuconazole 50% + Trifloxystrobin 25% @ 0.5 g/l at capsule initiation and second spray after 15 days interval) recorded the minimum disease incidence 22.4% and the maximum yield of 617.33 kg/ha, followed by T6 (Spraying of Carbendazim + Mancozeb @ 2.5 g/l at capsule initiation and second spray after 15 days interval) having disease incidence of 27.1% and yield of 582.7 kg/ha. T2 (Spraying of Azoxystrobin @ 1.0 ml/l at capsule initiation and second spray after 15 days interval) recorded the maximum disease incidence 37.3% and the yield of 494 kg/ha.

IN VIVO EVALUATION OF FUNGICIDES FOR MANAGEMENT OF ROOT & STEM ROT

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MANAGEMENT OF ROOT AND STEM ROT OF SESAME BY SEED SOAKING METHOD IN DIFFERENT PLANT EXTRACTS UNDER *IN-VIVO* (SICK POT CONDITION)

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ABSTRACT

Effect of sixteen-plant extracts were evaluated for the management of root & stem rot of sesame by seed soaking method under *in-vivo* (sick pot condition) at 20 per cent of concentrations in two sesame variety. In variety RT346, garlic extract was found most effective as a seed treatment among all the tested plant extract against *M.phaseolinaby* 78.44 per cent of healthy plant followed by the onion 77.28 per cent. In VRI1 variety, garlic extract was found most effective as a seed treatment among all the tested plant extract against *M.phaseolinaby* 79.66 per cent of healthy plant followed by the onion 75.81 per cent.

DETECTION OF *CITRUS YELLOW MOSAIC VIRUS (CYMV)* & *CITRUS GREENING BACTERIUM (CGB)* IN SWEET ORANGE BY MULTIPLEX PCR

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ABSTRACT

Citrus is one of the most economically important fruit crops in India. Commercially grown citrus includes sweet orange, acid lime and mandarin. Citrus Yellow Mosaic (CYMV), a viral disease and citrus greening bacterium (CGB), a bacterial disease are the two most important diseases that are impending fruit production through the world. A method of multiplex polymerase chain reaction (PCR) was developed for the simultaneous detection of *Citrus yellow mosaic virus* (CYMV) and citrus greening bacterium, *Candidatus Liberibacter asiaticus* (CLa) from sweet orange trees. Initially total DNA from individual CLa and CMBV infected citrus plants were mixed infected field sample for both pathogens were detected by Multiplex PCR. Using multiplex PCR two different fragments of 1024 bp and 451 bp specific to CYMV and CGB respectively were simultaneously amplified. The consistent result of multiplex PCR was compared with Simplex PCR for detection of each pathogen. The Multiplex PCR method developed in the present investigation proved to be highly sensitive, economic and reliable methods for detection of citrus greening bacterium (CGB) and the *Citrus yellow mosaic virus* (CYMV) in citrus trees from the orchards. The technique should prove highly useful in disease surveys, nursery certification and quarantine applications.

Keywords: Citrus Virus & Bacterial disease and detection

REVEALING CURRENT STATUS OF CHARCOAL ROT OF SOYBEAN IN CENTRAL INDIA AND MORPHO-CULTURAL VARIABILITIES IN ITS PATHOGENIC AGENT

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ABSTRACT

Soybean cultivation in India is predominantly concentrated in the central niche including Madhya Pradesh, Maharashtra and Rajasthan. Charcoal rot caused by *Macrophomina phaseolina* (Tassi) Goid [synonym: *Rhizoctonia bataticola* (Taub.) Butler] is a major disease in soybean crop across the world. Incidence of major diseases at different growth stages of soybean were recorded at JNKVV, Jabalpur during Kharif 2018 and 2019. Apart from this, an intensive survey was conducted in six agroclimatic zones covering 16 districts to determine status of charcoal rot of soybean in Madhya Pradesh during Kharif 2018 and 2019. Based on maximum incidence, Collar rot (4.88 %) and Green mosaic (8.38 %) at early stage of growth (V2-V3); YMV (35.00 %) and Bacterial pustule (8.00 %) at early reproductive stage (R2-R4), and Aerial blight (30.63 %), Pod blight (10.63 %) and Charcoal rot (65.13 %) at late reproductive stage (R5-R7) were predominant disease under agro conditions of Jabalpur. The maximum incidence of charcoal rot was recorded in Satpura Plateau (19.06 %) followed by Kymore Plateau & Satpura Hills (18.81 %) and Central Narmada Valley (15.60 %). District (16) and variety (13) wise incidence of charcoal was varied and it was maximum in Seoni (26.30 %) and in JS 95-60 (27.76 %). The highest incidence of charcoal rot was recorded in the fields which had previous cropping pattern of Maize-Chickpea (26.88 % at Seoni). Whereas the field followed cropping pattern of Rice – Wheat (10.75 %) had comparatively lower incidence. Isolation of pathogen was made from each district sample and its characterization was done based on typical Cultural and morphological characteristic. Based on rapid radial growth, seven isolates i.e. MP-1(JBP), MP-2(NAR), MP-4(CWA), MP-6 (HBD), MP-3 (SEO), MP-9 (SGR) and MP-14 (SHR) were designated as Fast Growing Isolates (FGI). Most of the isolates had partial fluffy to fluffy growth and their colony color varied from dark black or black (5), greyish black (9) and greyish (2). Number of sclerotia /microscopic field (10x) varied significantly from 41.07 (Mp-10 (RSN)) to 77.20 (Mp-4(CWA)) and shape of microsclerotia was oblong and round. These research findings revealed overall scenario of charcoal rot of soybean in key growing areas of India that will be helpful deriving effective management strategies for this disease.

A REVIEW ON FOOD SECURITY THROUGH FINGER MILLET AND ITS ROLE IN FOOD PROCESSING

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ABSTRACT

In India, majority of people are deficient in nutrients like calcium, proteins and minerals. So, it is necessary to identify such type of food sources which have rich nutritional properties. Now days, consumers want processed or ready-to eat products to satisfy their appetite. Therefore, it's a great challenge to develop such foods that are nutritionally superior and also highly acceptable to the consumers. Present study is undertaken on nutritional security and processing

of finger millet. According to the previous studies, finger millet is well recognized because of its higher dietary fibers, calcium and phenolic compound. It also has beneficial effect such as anti-diabetic and anti-microbial properties. Though it is nutrient-rich, but to keep pace with the consumer's choice, finger millet can be processed through popping, extrusion and malting and fermentation processes. The popular ready to eat products that can be prepared by blending finger millet flour with other cereals or legume flour are vermicelli, noodles, popped millet, *Ragi* soup, which have significant health benefits as well as fulfill the consumers demand of processed products.

Keywords: Finger millets, Nutrient-rich, Processing

EXAMINING THE CORRELATION BETWEEN PERSONAL VARIABLES AND ATTITUDE OF POSTGRADUATE SCHOLARS TOWARDS E-RESOURCES

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ABSTRACT

e-Resources became the centre of every higher education intellectual activity today. Understanding the importance of e-resources most of the universities generously participating to provide access to these resources to facilitate learning, teaching and research. The present study area was state of Rajasthan by selecting three agriculture universities i.e., MPUAT (Udaipur), SKNAU (Jobner) and SKRAU (Bikaner) purposively. Among these three universities 180 respondents were selected randomly. The basic information regarding the personal profile characteristics were collected from the postgraduate scholars. To determine the relationship of each independent variable with the dependent variable i.e., attitude of postgraduate scholars towards e-resources the coefficient correlation 'r' value was used. The coefficient correlation 'r' clearly showed that age, training, internet use and ICT skills had significant relationship with the utilization pattern of e-resources at 1 per cent level of significance. The other variables like academic performance and computer exposure were associated at 5 per cent level of significance. Remaining independent variables like gender and annual income does not have any relationship with the dependent variable.

Keywords: *e*-resources, attitude, coefficient correlation, Postgraduate scholar

WILD EDIBLE: AN ALTERNATE SOURCE OF NUTRITIONAL SECURITY

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ABSTRACT

Wild edible plants (WEPs) have high nutritional and nutraceuticals properties, they are now globally significant for their potential to biodiversity conservation, food security, nutrition, dietary and culinary diversification, health and income generation but unfortunately their use is still limited relative to their economic potential as their value still remain unknown. They are inexpensive and readily accessible. Many value added products can also be obtained from WEP species. However, many of these plant species are now threatened and in the verge of extinction due to over extraction, deforestation, and pollution. This warrants sustainable conservation, documentation of indigenous knowledge base and its subsequent sustainable utilization. The information on wild edible plants is scattered in botanical monographs,

informal notes and tribal oral tradition. The useful properties of non-domesticated crops known in local communities, require proper study and documentation in order to validate and spread this useful knowledge. Therefore, exploration and listing of these plants with their ethno-biological values are important for knowing and evaluating their economic potential.

Keywords: Nutritional security, Economic potential, Value added, wild edible, health

LAVENDER CULTIVATION AS A VIABLE INCOME GENERATING UNIT FOR LIVELIHOOD SECURITY UNDER AROMA MISSION AT JAMMU AND KASHMIR: A SUCCESS STORY

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ABSTRACT

To make agriculture sustainable, the price of agricultural commodities must be sufficient but variations in price may occur depending on market demand. So, by adopting lavender cultivation at rural level farmers may minimize the price gap by price of their medicinal plants and ultimately people get good quality of lavender plant-based products like cosmetic oil, incense sticks at rural level. This sets good example and also increases extra income from the agriculture at rural level by youth. Smell the lavenders Purple Revolution’ changes fortunes of J&K farmers under Aroma Mission or Purple Revolution’, is an initiative of the Central government to transform the lives of the farming community in Jammu and Kashmir. Pertinently, the Purple or Lavender Revolution was launched in 2016 by the Union Ministry of Science & Technology through the Council of Scientific & Industrial Research’s (CSIR) Aroma Mission. The mission aims to support the domestic aromatic crop-based agro-economy by moving from imported aromatic oils to homegrown varieties.

Keywords: Lavender Cultivation, Rural Youth, Livelihood, Income

PHYSIOLOGICAL BASIS OF SELECTION OF PARENTS FOR DEVELOPMENT OF HYBRIDS IN OKRA [*Abelmoschus esculentus* (L.) MOENCH] GENOTYPES

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ABSTRACT

The present study aimed to evaluate the variability among the twenty-nine genotypes of okra genotypes collected from the different institutions for physiological and yield. All the characters evaluated in the experiment exhibited significant variation within the genotypes. Variability components like genotypic co-efficient of variation, phenotypic co-efficient of variation were high for the all the traits. Broad sense heritability showed the higher influence of genotypic variation in the expression of the character phenotypically and less influence of environmental variation indicating the selection is better performing genotype and using the selected genotype as parents to develop superior hybrid is better method of crop improvement to improve the character evaluated in the experiment. Genetic advance over mean was high for the all the characters. Based on the performance genotype, were selected as better genotypes for physiological and yield trait.

Keywords: Okra, Yield

PHYSICO-CHEMICAL AND HEAVY METALS CHARACTERISATION OF SUGAR AND DAIRY INDUSTRY EFFLUENT AND THEIR POTENTIAL IMPACT THE ENVIRONMENT

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ABSTRACT

The wastewater discharge from industries into the aquatic resource is a critical environment issue in most of the developing nations including India. Over the years, inappropriate industrial wastewater disposal has been a major undesirable source of concern for environment. The noxious contaminants which were present in the industrial effluents may cause a serious toxicity effect on living organism when come in contact with biological environment. Effluent irrigations cause various changes in soil, like enhance leaching, change in pH, suppression of pore regions. The toxic chemicals present in the effluent can affect the biological nutritional process, as well as physical characteristics of soil. A large number of bacteria and fungi can be found in industrial effluent. A few microorganisms are helpful for the plants while some others cause different diseases born by contaminated source of water. The extensive heavy metals contamination in industrial wastewater can lead augmentation of heavy metals in the topsoil, which can reduce crop yield and quality as well toxics heavy metals can increase the toxic index of water source. There are many sugar mills and dairy industries effluents which having high levels of organic matter, nutrients, and metal contents. This industrial pollution may alter the natural state as well adverse impact on aquatic ecosystems. This study is focused on investigating the physico-chemical characteristics and metal contents of sugar and dairy industry effluent after treatment and its adverse effect on the environment. The treated effluent samples were collected from Saharanpur India. The various physicochemical parameters and metal constituents of the wastewater were analyzed according to (APHA *et al.*,) and Trivedi and Goel 1986 standard methods. Sugarcane effluent had a translucent nature whereas dairy effluent had a creamish white appearance. Results show that the physicochemical properties of the sugar industry's wastewater (mg/L) were pH 7.6 ± 0.488 , Turbidity (NTU): 2.1 ± 0.860 , total dissolved solids (TDS): 888 ± 170 , Electrical Conductivity ($\mu\text{S}/\text{cm}$): 1243 ± 246 , DO: 6.1 ± 1.62 , 3 days biochemical oxygen demand (BOD₃): 13 ± 1.50 , chemical oxygen demand (COD): 47 ± 6.71 , whereas in dairy industry pH was 7.9 ± 0.409 , Turbidity (NTU): 92 ± 3.93 , total dissolved solids (TDS): 714 ± 251 , Electrical Conductivity ($\mu\text{S}/\text{cm}$): 1112 ± 299 , DO: 6.0 ± 1.51 , 3 days biochemical oxygen demand(BOD₃): 12 ± 1.32 , chemical oxygen demand (COD): 46 ± 8.54 . The metal constituents of the sugar industry and dairy industry wastewater were, respectively: Cd: Nil in both, Cr: Nil in both, Ni: Nil in sugar industry & 0.524 mg/L, Pb: Nil in sugar industry & 1.29 mg/L, Zn: 0.459 & 1.66 mg/L, Fe: 0.463 & 1.36 mg/L, Mn: 3.93 & 8.17 mg/L, As: Nil in both. The dissolved oxygen content showed a decreasing trend from January to June in both dairy and sugar industry effluent. COD values seems in increasing order from January to June in dairy industry. Turbidity values seems in increasing order from January to June in sugar industry. All the other parameters except heavy metals did not show any specific trend, rather they were fluctuating with significant coefficient variance. Heavy metals contamination in treated water might be due to in-process leaching out, accumulation of respective heavy metals (highly toxic pb and Mn) from the production process. However, all the parameters except heavy metals were within the permissible limit as prescribed by CPCB standard for irrigation water. Hence, these properties indicate that if the effluents are not properly treated before being discharged into the environment, they may have adverse effects on aquatic and terrestrial ecosystems. Therefore, we recommended that wastewater treatment method should be effective on heavy metals removal. We also recommend that discharging limits for heavy metals should be in the CPCB standard for Sugar and dairy industry.

NATURAL RESOURCE MANAGEMENT: UTILIZATION OF POST-HARVESTED BANANA PSEUDOSTEM FOR PRODUCT DEVELOPMENT

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ABSTRACT

Purpose

India is best known for agriculture. Agriculture provides the raw material for many industries and also generates waste in large amount, especially in some type of horticultural products such as banana. After harvesting banana fruits, banana pseudostem is considered horticultural waste. In India, farmers' have to need to spend labour, money and time to clean the waste banana pseudostem from their farms. Most Indian farmers know that they can extract the fiber and prepare the products by using banana pseudostem. But they do not know how. As banana farming generates a huge quantity of biomass and banana is cultivated round the year. So, the supply of raw material is available round the year for producing fibers and to produce a wide range of products. Therefore, keeping in mind the problem, it is necessary to give practical experience to the farmers, about fiber extraction process and development of products for better management of this naturally available banana pseudostem.

Methods

In this study mechanical method was used to extract the fiber from banana pseudostem and training was organized to train the farm women for preparing products. Consumer acceptability was also checked of these products by selling, to know the demand of these products.

Results

The result shows that maximum farmers were interested in extraction and selling of banana fibers whereas more than 50% of females were preparing banana fiber products for sale. It was also observed that maximum respondents like all products made from banana fibers and banana pseudostem. Respondents were ready to buy these products.

Conclusions

It can be concluded from this study that the extraction of fiber and development of products from banana pseudostem will help farmers' in reducing banana waste after harvesting the fruits. By using this method, farmers can manage these naturally available banana wastes and consider them as naturally available resources for fiber extraction. This way of natural resource management helps the farmers in generating income from waste and also helps to save the environment.

Keywords: Banana waste, Banana products, Banana pseudostem management, Banana fiber

PRINCIPAL COMPONENT ANALYSIS IS AN EFFICIENT TOOL FOR HIGHLIGHTING THE RELATIONSHIPS WITH IN YIELD AND YIELD ATTRIBUTES OF GREENGRAM [*Vigna radiata* (L.) Wilczek]

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ABSTRACT

A total of 39 genotypes of mungbean were taken for analysis in the present study for statistical analysis related quantitative traits. To investigate the Principal Component Analysis (PCA) is an analysis technique used primarily to display patterns in multivariate data among these mungbean genotypes using quantitative traits. The present study was carried out at the BSP Soybean unit, College of Agriculture, JNKVV, Jabalpur, and Madhya Pradesh. The genotypes were sown in six rows of with 30 X 10 cm spacing under RCBD design with three replications. The seed sowing was made in the month of November. The statistical methods and parameters used for deriving inference were to Principal Component Analysis (Massy, 1965 and Jolliffie, 1986). It aims to display the relative positions of data points in fewer dimensions while retaining as much information as possible. PCA assumes that the relationships between dependent variables are linear. Large datasets are more prevalent than ever and are frequently challenging to comprehend. A method for lowering the dimensionality of such datasets, improving interpretability while minimising information loss, is principal component analysis (PCA). It accomplishes this by producing fresh, uncorrelated variables that maximise variance one after the other. As a result, PCA is an adaptive data analysis technique. Finding these new variables, the Principal components, simplifies to solving an eigenvalue/eigenvector issue, and the new variables are specified by the dataset at hand, not a priori. It is also adaptable in the sense that numerous variations of the technique have been created to fit different data formats and types. This essay will begin by outlining the fundamental concepts of PCA and outlining what it can and cannot accomplish. Based on the results of PCA, promising lines Identified are: TJM 124, TJM 134 and Pusa Vishal for yield and resistance. Genotypes TJM 141, TJM 145 and TJM 134 contributed maximum PC scores in different PC components. These identified genotypes should be utilized for crop improvement programme for yield improvement traits.

Keywords: Mungbean, Principal component analysis, PC Score

ECONOMIC ANALYSIS OF MILK PRODUCTION IN CHITWAN, DISTRICT, NEPAL

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ABSTRACT

The study was conducted to identify the most profitable dairy farm type in Chitwan district. Based on a proportional stratified random sampling procedure, a total of 120 sample size was stratified in to cow farms (78), buffalo farms (19) and mixed farms (23). Log-lin regression analysis showed that primary occupation, active number of family members, practice of record keeping, and access to credit significantly increased the average annual income of dairy

farmers. Similarly, resource use efficiency using the Cobb-Douglas production function analysis illustrated that, animal feed-fodder and labor were over utilized whereas veterinary medicine and utility costs were underutilized in the livestock farming. Moreover, the average cost of production was significantly higher on buffalo farms as compared to cow farms and mixed farms. The cow farm had a significantly higher B:C ratio of 1.51 as compared to buffalo farm and mixed farm. Scaling technique showed that the high cost of feed and fodder, followed by the low farm gate price of raw milk, inadequate technology, and limited chilling facility were main challenges faced by dairy farmers in the study area. Value chain analysis identified seven functionaries viz. input supply, production, marketing, collection, processing, retailing, and consumption in the milk value chain. Producers-Consumers was the most efficient marketing channel in the study area, with the largest producer's share. The study findings, thus demonstrated that dairy farming can be made more profitable by distributing resources as efficiently as possible, bringing down production costs, strengthening the value chain through the diversification of milk products and storage facilities, and lowering the market margin of raw milk so as to increase dairy farmer's share in milk price.

Keywords: Dairy business, profitability, resource use efficiency, value chain

PRECISION AGRICULTURE AND SUSTAINABILITY

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ABSTRACT

Precision agriculture is a method in which agriculture inputs are used in specific amounts to get better average yields, compared to traditional cultivation techniques. Precision agriculture can comfort in handling crop production inputs in an environmentally responsive way. By utilizing place specific knowledge, precision agriculture can target amounts of fertilizer, seed and chemicals for soil and other circumstances. Precision agriculture provide options for replacing information and knowledge for physical inputs. In this review I am covering precision agriculture which can contributes in numerous ways to long term sustainability of agriculture production, permitting the spontaneous suggestions that precision agriculture should shrink for environmental loading by utilizing fertilizer and pesticide only where and when they are needed. Precision agriculture can maintain sustainable ecology that come from additional beset usage of inputs that decrease losses from surplus applications and from reduction of losses due to nutrient inequalities, weed escapes, insect damage and reduction in pesticide resistance development. Precision agriculture can offer a sustainable solution to address food security and conserve natural resources at the same time in India. The recent information technologies and space technologies such as personal computers, GPS, GIS, remote sensing etc., for monitoring crop yields and sensing soil related variables, are the tools available to make precision agriculture a success.

Keywords: Precision agriculture, sustainability, environment, GPS and GIS

STUDY ON VULNERABILITY ASSESSMENT IN DIFFERENT DISTRICTS OF CHHATTISGARH PLAINS ZONE-II OF CHHATTISGARH STATE

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ABSTRACT

The present research work entitled "Study on vulnerability assessment in different districts of Chhattisgarh Plains Zone-II of Chhattisgarh state" was conducted at Department of Agrometeorology, Raipur during 2021-22. Climate change vulnerability is a complex, multidimensional process influenced by indicators. The data of agricultural (cropping intensity, irrigation intensity, area under cultivation, production, productivity, area), Climatic (annual and seasonal rainfall), Demographic (Population density and literacy rate), Geographic (forest cover) and occupational indicator (agricultural labour, Industrial worker, non-workers and total workers) of respective districts for period 2004-2020 were collected and analysed for the study and their Garrett's ranking was done. Agricultural vulnerability was observed more in Bilaspur district and less in Korba district while, Climatic vulnerability was observed high in Korba district and low in Bemetara district. Demographic vulnerability was reported highest in Balod district and lowest in Mungeli district. Korba district was showing high vulnerability for Geographic vulnerability and less vulnerability for Janjgir-Champa district. Occupational vulnerability was reported more in Bilaspur district and less in Kabirdham district. The cumulative vulnerability index and Garrett ranking was observed high in Bilaspur district and Lowest index for vulnerability was found in Kabirdham district.

Keywords: Vulnerability assessment, climate change effect, Chhattisgarh

ASSESSMENT OF SILKWORM, *Bombyx mori* L. BREEDS FOR *BmNPV*

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ABSTRACT

Grasserie is the most serious viral disease of mulberry silkworm, *Bombyx mori* L. and is highly prevalent in autumn season. The main causative agent of this disease is *Bombyx mori* nuclear polyhedrosis virus (*BmNPV*). It is known by various names such as jaundice, milky disease, hanging disease and nuclear polyhedrosis. The main factors that influence this disease are *BmNPV* polyhedra, high temperature and humidity. The severity of this disease is often high under contaminated rearing environment with unhygienic conditions. Twenty bivoltine silkworm breeds were screened for disease tolerance against *BmNPV*. The silkworm larvae were orally inoculated with a viral suspension of 1×10^2 PIB's/ml by smearing onto mulberry leaves and fed to silkworms during the 4th instar. All the breeds were reared upto spinning under standard rearing practices. Further, the response of *BmNPV* on silkworm larvae was categorized into apparent tolerance, tolerance and susceptibility. Out of all the breeds, 02 breeds showed tolerance followed by apparent tolerance and most of the breeds were highly susceptible to *BmNPV*. The silkworm breeds assessed for their tolerance and susceptibility to *BmNPV* explores the way towards the identification and utilization of *BmNPV* tolerant breeds so as to minimize the crop loss due to disease during silkworm rearing and also for the evolution of specific hybrids for use in future breeding programmes as well.

Keywords: Silkworm, Breeds, *BmNPV*.

STUDY THE EFFECT OF BEE ATTRACTANTS ON FORAGING ACTIVITIES ON NIGER (*Guizotia abyssinica* L. f. Cass.) Crop

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ABSTRACT

Purpose

Niger (*Guizotia abyssinica*) is a significant oilseed crop grown in Ethiopia and India and known as the lifeline of tribal agriculture and economy in India. It is a completely cross pollinated crop with a self-incompatibility mechanism. Honeybees are responsible for 70 to 80% of insect pollination. It also has been reported that bee pollination results in a 22 to 33% increase in niger seed yield and that honeybees were the major pollinators. In present investigation we studied the effect of bee attractants on foraging activities honeybees and other pollinators associated with the niger crop.

Methods

The attractants were sprayed twice, first at 10 percent and second at 50 percent flowering stages. Recommended agronomical package of practices were followed for raising good seed production plot. Spraying of insecticides will be avoided during flowering stage of the crop.

Results

The results at 10% flowering stage revealed that, the highest population of *Apis mellifera* (45.25 /m² /5min), *Apis indica* (27.58/m²/5min) and non-*Apis* sp. (25/m²/5 minutes) were recorded from the plots in which sugar solution 10% was applied while the highest population of *Apis florea* (22.25 /m² /5min) was noticed with rose water 10%. The highest population of *Apis dorsata* (50.71/m²/5 minutes) was received with foliar spray of 10% mahua flower extract. Similarly at 50% flowering, the highest population of *Apis mellifera* (42.67 /m²/5 minutes) and *Apis indica* (26.54/m²/5 minutes) were recorded with the foliar spray of sugar solution 10%, however *Apis florea* (24.29 /m²/5 minutes) and *Apis dorsata* (52.46 /m²/5 minutes) were recorded maximum with 10% mahua flower extract. The highest population of non-*Apis* pollinators (24.54 /m²/5 minutes) were recorded with the foliar spray of 10% honey solution.

Conclusions

The pollination can be increased in niger by applying suitable attractants according to the bee species and other pollinator performance, this can contribute to a higher yield in Niger.

Keywords: Niger, pollination, honeybee, attractant, non-*Apis* pollinator.

NATURAL PRODUCTS SUPPRESS THE GLUCOSE TOXICITY DURING DIABETES

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Purpose

Glucose toxicity is a common phenomenon during Diabetes. It brings about structural alterations of biomolecules and causes damage to cellular components. Natural products like thymoquinone and phycocyanin can be used for the suppression of glucose induced toxicity. We have used several parameters to study the toxic effect of glucose and role of phytochemicals in vitro.

Methods

Glucose was incubated with serum albumin for several weeks to induce the glucose toxicity. Spectroscopic techniques were used to characterize the toxic products and their suppression by phytochemicals. The structural alterations were analysed using the electrophoretic techniques.

Results

The analysis of results indicate that glucose interacts with serum albumin and leads to generation of toxic products collectively known as advanced glycation end products. This interaction also caused structural and functional loss of serum albumin. The presence of thymoquinone and phycocyanin caused the suppression of formation of Glycation products as well as structural alterations.

Conclusions

These results indicate that high glucose concentration leads to generation of several toxic products which in turn cause damage to biomolecules especially proteins. Thymoquinone and phycocyanin were found to interfere with these interactions and suppress the glucose induced toxicity.

Keywords: Diabetes, hyperglycemia, glucose toxicity, glycation, serum albumin

IMPACT OF CLIMATE- RESILIENCE ON FINGER MILLETS (*Eleusine coracana* L. Gaertn)

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ABSTRACT

Finger millets (*Eleusine coracana* L.) is an important coarse cereal of tropical climate. It comes under millet categories and most prominent climate resilient crop. It is utmost favourable crop for drastic changes in the climatic variations. It is mainly grown under rainfed and short drought spell situation in poor and marginal soils of the hill region as well as in plain areas of India. Finger millets are nutritionally superior to other major cereals as they are rich in dietary fibres, resistant starches, vitamins, essential amino acids, storage proteins and other bioactive compounds that possess additional health benefits, requires significantly fewer input costs of cultivation and are naturally tolerant to most biotic and abiotic stresses. These millets are known for their climate resilient features including adaptation to a wide range of ecological conditions, less irrigational requirements, better growth and productivity in low input conditions, less reliance on synthetic fertilizers and minimum vulnerability to environmental stresses. Millets have several morpho-physiological, molecular and biochemical characteristics (such as level of antioxidants) that favours better tolerance to environmental stresses than major cereals. The short life cycle of millets assists in escaping from stress as they require 12-14 weeks to complete their life cycle. However, the prevalence of stress conditions and their consequences are circumvented by several traits such as short stature, small leaf area, thickened cell walls and the capability to form dense root system. The exceptional tolerance of millets towards diverse abiotic stresses including drought, salinity, light and heat that makes them a tractable system at the cellular, molecular and physiological levels. Therefore, finger millet can be grown under a wide spectrum of extreme climatic conditions, Thus they can be termed as “farmer friendly” crops providing them better returns, which are subjected to changing climatic conditions.

Keywords: Climate change, biotic and abiotic stress, importance, finger millet

SOWING TIME INFLUENCE MUNG BEAN CULTIVARS PRODUCTIVITY IN CHITWAN, NEPAL

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ABSTRACT

Mungbean is a commercially promising legume in the Terai region of Nepal. The productivity of Mung bean in Nepal is very low accounting for approximately 0.5 kg ha⁻¹. To achieve the potential yield of mungbean promising cultivars should be planted at the optimum sowing time. A field experiment was conducted at the Agriculture and Forestry University (AFU), Rampur, Chitwan during the spring of 2019. The experiment was laid out in a split plot design (SPD) with three replications and 16 treatment combinations. The main plot factor consisted of four sowing dates at 15 days interval (13th February, 28th February, 15th March and 30th March) of 2019 and sub-plot factor consisted of four cultivars viz. Kalyan, Pratikshya, Pratigya and Pant-5. The results showed that earlier planting i.e., Feb 13 planting resulted in delayed emergence and slower growth and the lowest yield. The March 15 to March 30 plantations resulted in significantly faster emergence, germination, growth and higher yield. Cultivar Pant-5 yielded a higher grain yield which was statistically at par with Partigya and Partikshya due to its genetic make-up. In our study there was no significant difference between cultivars used and the sowing date. In conclusion mungbean plantations from March 15 to March 30 are the optimum sowing time for higher productivity and high potential yield of mungbean cultivars.

Keywords: Pulse crop, planting time, Mung bean etc.

EFFECT OF FEEDING HYDROPONIC HORSE GRAM SPROUTS OF GROWTH PERFORMANCE OF KONKAN KANYAL GOATS

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ABSTRACT

An experiment was conducted to study the effect of feeding hydroponic horse gram sprouts on growth performance of goats. Twenty Konkan Kanyal goats (4 to 6 months old) were divided into four groups and fed hydroponic horse gram sprouts viz., T₁ (0%), T₂ (15%), T₃ (30%) and T₄ (45%). The result of study showed that daily dry matter intake was significantly ($p < 0.05$) higher in T₃ (667.02g) than T₁ (619.36g), T₂ (654.73), T₃ (663.59g). Digestible crude protein (g/d) and metabolizable energy (MJ/d) intake of kids was 38.28 and 4.32 in T₁, 38.36 and 4.50 in T₂, 38.50 and 4.54 in T₃ and 38.73 and 4.77 in T₄ respectively. Average daily gain was higher in T₃ (91.24g) than T₁ (85.73g), T₂ (90.89g) and T₄ (90.19g). The feed cost per kg live weight gain (Rs) was 50.71 in T₁, 65.68 in T₂, 81.97 in T₃ and 85.23 in T₄. Therefore, it is concluded that 15% horse gram sprouts with 85% basal feed found beneficial for higher growth performance and economic profitability in goats.

HERBS SUPPLEMENTATION AND FOLLICULAR DYNAMICS, HORMONAL PROFILE AND ANTIOXIDANT STATUS OF DELAYED PUBERTAL SAHIWAL HEIFERS UNDER EASTERN HIMALAYAN

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In dairy heifers, anoestrus has been recognized as the most common form of infertility conditions hindering the production irrespective of geographical location of the country. The incidence of pubertal anoestrus is varied between 38.7 to 64.1% in heifers. Sahiwal is important milch breed of Indian subcontinent known for its quality milk production, disease resistant and better adaptability. The ovarian physiology of *Bos indicus* is quite different from the *Bos taurus* and many reports on follicular dynamics of European breeds (*Bos taurus*) are available however similar kind of reports are very meager in *Bos indicus*.

Objective

The objective of the present study was to investigate the dynamic growth patterns of ovarian follicles in delayed pubertal heifers with particular reference to Sahiwal breed reared under eastern Himalayan agro-climate, other than its home tract and amelioration through medicinal herbs (*Aegle marmelos* and *Murraya koenigii*).

Methodology

Ovarian scanning was performed daily by real-time ultrasonography for 21 days prior to start of the herb treatment (n=25) in order to observe the follicular developmental pattern in delayed pubertal heifers. The trial-1, comprising of 25 delayed pubertal Sahiwal heifers aged between 30 to 37 months and weight between 210 to 255 Kg at Kyrdemkulai, Meghalaya. In trial-2 a total 11 delayed pubertal crossbred heifers, aged between 25 to 30 month and body weight varies between 210 to 240 Kg.

Ultrasonography and Progesterone estimation

All the delayed pubertal Sahiwal heifers were subjected with real-time B mode ultrasonography (EXAGO- ECM, France) with a frequency 7.5 MHz daily from start of supplementation of herbs to onset of estrus. Blood sampling was done to estimate the level of plasma progesterone prior to supplementation, to ascertain anoestrus, 3 sampling was done at an interval of 10 days (day -21st, -10th and 0th). All data pertaining to follicular development and progesterone were statistically analyzed using SPSS software package for windows (SPSS-20.0).

Results

The proportion cycles showing one-wave, two-wave and three-wave dynamics were 9.1% (1/22), 72.7% (16/22) and 18.2% (4/22), respectively. The one-wave dynamics showed a peculiar pattern characterized by a larger growth phase up to day 9.5 with a relatively faster growth rate of 1.04 ± 0.09 mm/day followed by regression for a period of 6 days and then again growth phase with a relatively slower growth rate of 0.65 ± 0.18 mm/day reaching the DF diameter of 11.5 mm by day 20.5 and finally culminated in to ovulation. In two-wave follicular dynamics the mean diameter of the DF was 10.7 ± 0.20 and 11.6 ± 0.16 mm which attained by a mean day of 7.78 ± 0.36 and 21.4 ± 0.30 following emergence of 1st and 2nd wave, respectively. The growth rate of DF was 0.93 ± 0.04 and 1.04 ± 0.04 mm/day during 1st and 2nd wave, respectively, and was significantly higher ($P < 0.05$) in the 2nd wave than the 1st wave in two-wave dynamics. However, the growth period of DFs did not differ ($P > 0.05$) significantly between 1st and 2nd wave (7.69 ± 0.44 vs. 7.0 ± 0.67 days) in the study. The regression rate and the regression period in 1st wave were 0.83 ± 0.07 mm/day and 8.0 ± 0.49 days, respectively. The

difference in the mean maximum diameter, growth rate, growth period and the regression period of the second LF did not differ significantly between 1st and the 2nd waves in the two-wave dynamics in Sahiwal heifers in the study. The mean maximum diameter of the DF was 10.45 ± 0.57 , 10.36 ± 0.75 and 11.97 ± 0.48 mm which attained by a mean day of 8.25 ± 0.75 , 15.50 ± 1.16 and 22.50 ± 0.29 following emergence of 1st, 2nd and 3rd wave, respectively in three wave dynamics. The difference in the mean maximum diameter of DFs among the waves remained non-significant ($P > 0.05$). The growth rate of DFs was 1.08 ± 0.20 , 1.01 ± 0.19 and 1.38 ± 0.17 mm/day during 1st, 2nd and 3rd wave, respectively, and remained similar ($P > 0.05$) among the waves. Similarly, the growth period of DFs remained similar ($P > 0.05$) among the waves (6.25 ± 0.81 vs. 7.00 ± 1.35 and 5.25 ± 0.25). The mean diameter of corpus haemorrhagicum was 8.52, 9.42 and 8.13 mm in one- wave, two-wave and three wave cycle respectively. But the differences in the mean at which first visualized 4.5 ± 0.5 , 3.75 ± 0.25 , 4.5 ± 0.18 day respectively. The maximum area in different wave pattern were 238.27 ± 14.09 , 221.47 ± 14.19 and 318.78 ± 55.48 mm² in one wave, two wave and three wave pattern varies non-significant.

Following herb supplementation, 15 heifers were supplemented with herbal powder orally for 9 days and rest 10 heifers were kept as un-supplemented control. Results showed an unusually prolonged persistency of follicle in about 44.4 (28/63) percent of the waves, slower growth rate DF and failure of DF to reach ovulatory size unlike cyclical heifers. However, following herb supplementation, the diameter of the largest follicle reached up to 11.9 ± 0.22 mm with a relatively faster ($P < 0.09$) growth rate of 0.96 ± 0.05 mm/ day as compared to 9.08 ± 0.45 mm with slower growth rate of 0.71 ± 0.07 mm/ day in untreated control heifers. Except progesterone, the mean concentration of plasma E₂ and insulin was significantly higher in herbs supplemented group than the control. Further, herbs also reduced the level of oxidative stress by decreasing MDA concentration and concurrent increase in TAC, ascorbic acid and glutathione in the supplemented heifers. Positive effects of herb supplementation resulted in to higher ($P < 0.01$) estrus response in treatment (93.3%) than the control (40.0%) heifers, and amplified similarly in pregnancy rate (60 % vs 20 %).

Conclusion

In conclusion, present study suggests that slower growth rate, failure of LF to attain the pre-ovulatory size and increased level of oxidative stress probably the reason of delayed puberty in Sahiwal heifers. Supplementation of medicinal herbs promotes the growth rate of LF to attain the preovulatory size and decreases oxidative stress leading to estrus induction and fertility in delayed pubertal Sahiwal heifers.

EFFECT OF FUNGICIDES AGAINST SEED BORNE MICROFLORA OF SOYBEAN *IN-VITRO*

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ABSTRACT

The experiment entitled “Effect of fungicides against seed borne microflora of soybean *in-vitro*” was conducted at Department of Plant Pathology and Agriculture Microbiology. The experiment was laid out in CRD design with four replication and three treatments. The treatment carbendazim + mancozeb (0.2 %) recorded no incidence of these internally seed borne pathogens, *Fusarium oxysporum*, *Fusarium moniliforme*, *Macrophomina phaseolina*, *Alternaria alternata*, *Colletotrichum truncatum* as against 77, 81, 76, 57 and 82 per cent in the control treatment as well as showed no incidence of these externally seed borne pathogens,

Aspergillus flavus, *Aspergillus niger*, *Aspergillus candida*, *Curvularia lunata*, *Cladosporium* sp., *Penicillium* sp., *Phoma medicaginis*, *Botrytis cineria* and *Mucor* sp. respectively as against 96, 94, 97, 72, 78, 83, 80, 78 and 73 per cent in the control treatment as compared to vitavax. The seed treatment with carbendazim + mancozeb (0.2 %) recorded 86, 82, 88, 77 and 89 per cent seed germination of soybean seeds internally infected with *Fusarium oxysporum*, *Fusarium moniliforme*, *Macrophomina phaseolina*, *Alternaria alternata*, *Colletotrichum truncatum* respectively as against 65, 67, 71, 64 and 68 per cent in respective control treatment and showed 2347.8, 2182.2, 2631.2, 1572.0 and 2430.33 seedling vigour index with these pathogens as against 614.8, 711.8, 987.3, 731.0 and 946.2, respectively in the control treatment. This treatment showed 88, 81, 80, 78, 76, 83, 82, 86 and 77 per cent seed germination of soybean seeds externally infected with *Aspergillus flavus*, *Aspergillus niger*, *Aspergillus candida*, *Curvularia lunata*, *Cladosporium* sp., *penicillium* sp., *Phoma medicaginis*, *Botrytis cineria*, *Mucor* sp. respectively as against 68, 66, 62, 63, 65, 66, 69, 68 and 64 per cent in respective control treatment and showed 2352.56, 1932.40, 1896.32, 1782.45, 1690.0, 2142.03, 1999.30, 2286.0 and 1716.43 seedling vigour index with these pathogens as against 884.21, 711.11, 684.37, 666.66, 617.14, 794.44, 733.33, 857.89 and 644.11, respectively in the control treatment.

Keywords: Soybean, Vitavax, carbendazim + mancozeb, pathogens.

EFFECT OF ROCK PHOSPHATE IN PRESENCE OR ABSENCE OF ORGANIC MANURES AND LIME ON PHOSPHORUS TRANSFORMATION AND YIELD OF SOYBEAN

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A pot experiment was conducted to study the effect of rock phosphate (RP) applied in presence or absence of organic manures (viz., FYM, vermicompost and compost) and lime on release and fixation pattern of P, its uptake and yield of soybean (var. JS-335) with the treatment combination: T₁-control, T₂-soil+RP, T₃-soil+RP+FYM, T₄-soil+RP+compost, T₅-soil+RP+VC, T₆-soil+RP+lime, T₇-Soil+RP+FYM+lime, T₈-soil+RP+compost+lime and T₉-soil+RP+VC+lime. Results revealed that Saloid-P, Organic P and Total P in soil gradually declined up to harvest comparing with initial value. Significantly higher accumulation of saloid-P, Al-P, Fe-P, Ca-P and RS-P were found in rock phosphate treated soil in presence and absence of organic manure and lime over untreated control showing the conversion of applied phosphorus to different inorganic forms. Irrespective of different treatments, there was increased built up of Al-P, Fe-P, RS-P and Active P up to 60th days and then decline till harvest. This shows the fixation and release pattern of these forms in soil. However, Ca-P accumulation gradually increased till harvest. P-uptake by soybean increased with the crop age. Among the different treatments T₂ showed higher accumulation of Al, Fe, RS-P as well as Active and total inorganic P at different stages of crop growth. There was higher accumulation of saloid-P and Ca-P in soil treated with lime comparing with the corresponding unlimed soil. Contrary to this, there was higher built up of Fe-P, Al -P and RS-P in unlimed soil than limed one. Liming enhanced organic P mineralization thereby increasing P availability. Higher P uptake was observed in T₉ followed by T₈. Among the different treatments, T₉ gave higher pod yield (g/plant). Effectiveness of rockphosphate as a P source for crop production is enhanced by the solubility effect of organic manures and lime application.

Keywords: Phosphorus, Rock phosphate, Organic manure, Lime, Yield

IMPORTANCE OF DRIED FLOWERS IS THE BEST IDEA FOR THE AGRIBUSINESS SECTOR

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ABSTRACT

Dried flowers are a form of flower preservation, meaning that a flower's beauty and shape are preserved so it can be used as a more permanent home decoration, a meaningful gift, or even as an alternative to fresh wedding flowers. Yes! We can make money by growing flowers. The dried flower business is a highly profitable industry all over the world. We must all be unaware that flower production is one of agriculture's fastest-growing crop trends. All types of flowers are in high demand, especially rare and difficult-to-grow varieties. Dried Flowers: **A Profitable Venture** if you start a dried flower business, you can make a good income for the first year. This is a business that may be launched from home and run part-time. Remember, flowers are one of the most profitable plants, with one of the best returns of any specialized crop. You can make an income by growing, processing, and selling dried flowers. After investing in this business, you can easily get a profit of more than 25 thousand per month. If we talk about the cost of only one packet of dry flowers in the market, then it is sold and bought for more than 300. Yes, if the proper marketing and services are provided, this business can be very profitable. Perhaps one of the most important benefits of dried flowers is their long-lasting ability. When kindly cared for, great quality dried flowers can last from several months to several years! This means that the stunning arrangements handcrafted for, you can stick around and continue to brighten your day. The availability of your favorite flowers is also guaranteed when choosing dried flowers – waiting for the changing seasons is no longer necessary as they are available throughout the entire year. Because of their availability and long-lasting quality, dried flowers make the perfect investment for your home décor and even as an enduring gift for a loved one. The product obtained from the use of dried flowers is used to decorate the walls. Apart from this, natural-looking books can be made and sent while sitting at home. Handmade paper from dried flowers, greeting cards, gifts, books, boxes, lampshades, attar (perfume), vases, photo frames, handicrafts, bouquets, vases, candle stands, soaps, jute bags, and beauty things for walls. Greeting cards and other gift items given as gifts to relatives and acquaintances on special occasions are also made from flowers. Best of Many flower species like roses, hibiscus, lotus, sunflower, jasmine, evergreen, lilac, caner, amaltas, champa, lavender, gerberasi, orchids, etc. are the most widely used in the dry flower trade.

Keywords- Agribusiness, importance, marketing and variety of flower

EFFECT OF *Aegle Marmelos* and *Murraya Koenigii* ON FERTILITY RESPONSE AND LARGE FOLLICLE DEVELOPMENT IN DELAYED PUBERTAL HEIFERS UNDER SUB-TROPICAL HILL ZONE OF EASTERN HIMALAYA

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ABSTRACT

Delayed puberty is recognized as a major infertility problem in dairy heifers both under the field as well as farm condition. The incidence is reported to vary between 38.7 to 64.1% and 12.92 to 52.50 % under farm and field condition, respectively (Luktuke et al., 1978, Shrivastava and Kadu, 1992). Causes of delayed puberty are multi-factorial in nature and remained the

subject of investigations over the decades (Abeygunawardena and Damatawewa, 2004; Das et al., 2016). Among the factors, nutrition in general plays an important role for emerging the condition under field condition while minerals, more specifically trace elements are suspected to be the major concern both under farm as well as field condition (Das, personal communication).

Recently, medicinal plants have drawn attention to researchers due to their nutraceutical values besides medicinal properties. Thus, they appeared future promise to poor farmers for treating the ailing livestock as being cheaper, efficacious and safer alternatives to costlier hormones (Kadu et al., 2001; Mehrotra, 2011). Medicinal plants like *Aegle marmelos* and *Murraya koenigii*, have shown acceptable estrus induction and fertility response in anoestrus animals under sub-tropical Indian climate (Dutt, et al., 2010; Kumar et al., 2012; Das et al., 2016).

Objective

To examine the effect of *Aegle marmelos* and *Murraya koenigii*, as an alternate therapy, on the estrus induction and fertility response in a delayed pubertal heifers reared under sub-tropical hill zone of Eastern Himalayan climate.

Methodology

Location of study and experimental animal

The study involved two states of North-East India i.e., Meghalaya and Sikkim. In Meghalaya, The trial-1, comprising of 25 delayed pubertal Sahiwal heifers aged between 30 to 37 months and weight between 210 to 255 Kg at Kyrdemkulai, Meghalaya. In trial-2 a total 11 delayed pubertal crossbred heifers, aged between 25 to 30 month and body weight varies between 210 to 240 Kg.

Grouping of the animals

In trial-1, a total 25 delayed pubertal Sahiwal heifers were taken and monitored for 21 days before start of feeding of herbs. Thereafter, the heifers divided in into two groups i.e. Group-I (G-I, n=15) and Group-II (G-II, n=10). In trial-2 a total 11 heifers were taken and monitored for 21 days thereafter divided into two groups i.e. Group-III (G-III, n=6) and Group-IV (G-IV, n=5).

Herbs collection and dose preparation

The green leaves of *Aegle marmelos* and *Murraya koenigii* were collected from in and around Indian veterinary Research Institute, shade dried and grinded to powder form. The dose of powdered herbs was calculated for each heifers by dose extrapolation from rat (50% ethanolic extract effective @1000mg/kg for augmentation of ovarian function to cattle using dose equivalent system (Van Miert, 1986) and subsequently converted into powder form by the method described previously (Mehrotra, 2002; Jondhale, 2007; Dutt et al., 2010).

Ultrasonography and Progesterone estimation

All the delayed pubertal Sahiwal heifers were subjected with real-time B mode ultrasonography (EXAGO- ECM, France) with a frequency 7.5 MHz daily from start of supplementation of herbs to onset of estrus. Blood sampling was done to estimate the level of plasma progesterone prior to supplementation, to ascertain anoestrus, 3 sampling was done at an interval of 10 days (day -21st, -10th and 0th). All data pertaining to follicular development and progesterone were statistically analyzed using SPSS software package for windows (SPSS-20.0).

Results

The estrus response obtained following the supplementation of *Aegle marmelos* and *Murraya koenigii* and control heifers. The proportion of heifers that showed estrus was significantly higher ($P<0.01$) in herb supplemented group (93.3%) than that of control (40.0%) group in trial-1. Similarly, in trial -2, the proportion of heifers supplemented with herbs showed a significantly higher ($P<0.05$) estrus response (83.3%) than that of control (20.0%) heifers in this study. The estrus heifers of both herbs supplemented and unsupplemented groups were

inseminated and pregnancy diagnosis was made at 90 days of insemination. The result of pregnancy was significantly higher ($P < 0.01$) in trial-1 (60.0 vs 20.0) and in trial-2 ($P < 0.05$) (66.67 vs 20.0) herb supplemented and control heifers respectively.

Kaplan-Meier survival analysis results indicate that heifers that underwent the herb treatment had a median time to estrus induction 9.0 days. This was longer than that of control group for which mean estrus induction time was undefined because more than 50% animals was anestrus at end of one estrus cycle. A log rank test was conducted to determine if there were differences in the survival distributions between two groups. The survival distributions for the two groups were statistically significantly different ($\chi^2 (1) = 10.73, P < 0.001$).

The mean interval between the start of herb supplementation and the onset of estrus were 9.4 ± 0.88 and 12.2 ± 1.28 days in trial-1 and -2 respectively. However, the difference in the mean interval between the start of herbs supplementation and onset of estrus did not differ ($P > 0.05$) significantly between groups in each trial.

The largest follicle of each wave was recorded and it was found that the diameter of the largest follicle in the responded heifers was 11.9 ± 0.22 mm and 11.5 ± 0.19 mm in the herb and control group, respectively. The difference in the mean diameter of LF in responded heifers between the groups did not differ ($P > 0.05$) significantly. However, the diameter of the LF in non-responded control heifers (9.08 ± 0.45 mm) was significantly ($P < 0.05$) smaller than the LF of responded heifers of both herbs supplemented and control groups. A very recent report by Kumar et al., 2016 in Sahiwal heifers under tropical agro-climatic condition found that the LFs in untreated control heifers reached above 8.0 mm in size, ranging from 6.1 to 10.2 mm, with mean diameter of 8.7 ± 0.62 mm. However, on herbs supplementation, the largest follicle reached above 12 mm in size, ranging between 12.5 to 13.2 mm, with mean diameter of 12.8 ± 0.08 mm in treatment group and the differences in the mean diameter of largest follicle between the groups differ significantly ($P < 0.001$). The mean plasma concentration of progesterone was recorded in the Sahiwal heifers before and after herb supplementation as well in control is presented in table 3. Prior to treatment, the mean concentration fluctuated between 0.15 ± 0.04 and 0.26 ± 0.13 ng/ml in the herb group and between 0.12 ± 0.04 and 0.22 ± 0.07 ng/ml in control group during pretreatment day -21 to day 0 of sampling. The difference in the mean plasma progesterone concentration between herb and control heifers at day-21, day-10 and day 0 did not differ ($P > 0.05$) significantly. Similarly, the difference in the mean concentration of plasma progesterone between the herb supplemented (0.23 ± 0.06 ng/ml) and un-supplemented (0.14 ± 0.12 ng/ml) heifers remained non-significant ($P > 0.05$) at the day of estrus. The mean concentration of plasma progesterone increased ($P < 0.001$) significantly at day 10th following estrus in both the supplemented (4.57 ± 0.50 ng/ml) as well as non-supplemented (4.18 ± 0.36 ng/ml) heifers.

Conclusion

In conclusion, *Aegle marmelos* and *Murraya koenigii* in combination were effective in eliciting the estrus response and fertility in anoestrus heifers reared under Eastern Himalayan agro-climatic condition and also promoting the terminal growth of the follicle to attain larger size of preovulatory follicle.

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ANTIBIOTIC RESIDUES IN ANIMAL ORIGINATED FOOD: A MAJOR PUBLIC HEALTH THREAT

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ABSTRACT

The antibiotic residues in animal origin food like milk, meat and their products are a growing public health concern due to their involvement in the development of some complications like antimicrobial resistance, carcinogenicity, bone marrow suppression, gastrointestinal toxicity etc. The indiscriminate use of antibiotics for the treatment of diseases and improved animal production results in the deposition of these residues in milk and meat although their use is not highlighted for the foods consumed by human beings. The problem caused by these antibiotic residues in the food chain by the direct toxicity to humans or by indirectly to the possibility of the emergence of resistant bacterial strains ultimately leading to the failure of antibiotic therapy. Others significant amount of antibiotics used in animal production and therapeutic settings is excreted into the environment, endangering both land and aquatic ecosystems. Because the industrial production of food animals would greatly increase the usage of antimicrobials, the issue could soon become more urgent.

Keywords: Animal food, Antibiotic residues, Public health

INTEGRATED FARMING SYSTEM FOR SUSTAINABLE FOOD SECURITY

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ABSTRACT

Integrated farming system is a judicious mix of agricultural enterprises, which combines the activities of crops and horticulture, animal husbandry, fishery, forestry and other sciences related to agriculture within an area simultaneously at a time or so. Implementation of integrated farming system minimizes risk of crops failure of one type of crop, promotes higher income, and creation ecological farming system which is able to make the best of local resources as efficiently as possible for the purpose of sustainable environment friendly farming systems. Food security needs to be redefined as ‘livelihood security for the household and all members within which ensures both physical and economic asses to balanced diet, safe drinking water, primary education, environmental sanitation and basic health care (Chaudhary *et al.*, 2019). The integration of components like dairy, poultry, goatry, fisheries, mushroom, etc. along with crop production not only meets the food demand but also caters to the need of protein, fat, vitamins and minerals required for good health. These components can ensure round the year availability of good quality food. When the living standard is improved then the cereals consumption is reduced and subsequently replaced by other products such as milk, eggs, fish etc. which is rich in animal protein. Thus, it can be emphasized that integration of livestock, horticulture and agro forestry systems will lead to better diversity and quality of food. It plays a role in suppressing environmental pollution, land degradation as well. It is an efficient and environment friendly farming system utilizing the potential of local resources in optimal way for sustainable development of agriculture.

Keywords: Agriculture, Sustainable, Integrated, Farming, Food Security

PREVALENCE OF *ESCHERICHIA COLI* ISOLATED FROM RAW AND PASTEURIZED MILK IN JAIPUR CITY IN INDIA

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ABSTRACT

Milk is extremely nutritious balanced food having high biological value in nature due to which it gains significance in diet of large population. Fresh, non-pasteurized milk generally contains varying numbers of microorganisms, depending on the care employed in milking, cleaning and handling of milk utensils. Zoonotic pathogens present in raw milk are of great Public Health and economic significance. In the present study, an attempt to isolate and identify *E. coli* from raw and pasteurized milk was made. A total of 120 samples comprising of raw milk (80) and pasteurized milk (40) were processed for the isolation of *E. coli*. These 120 samples of raw and pasteurized milk samples were collected randomly from local milk vendors, milk store, milk parlour, dairy booth and retail dairies located in different parts of Jaipur city, Rajasthan. Out of 120 samples, the prevalence of *E. coli* was recorded in raw milk and pasteurised milk samples as 31.25% (25) and 27.5% (11) respectively. Milk borne diseases have become a serious public health concern worldwide as the rate of consumption of milk and milk products has increased. In order to assure public health safety, microbiological analysis and continuous monitoring is required to produce wholesome and sanitary milk and milk products.

Keywords: Milk, *E. coli*, Prevalence

VALUE ADDITION IN JACKFRUIT

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ABSTRACT

Value addition is the process of changing or transforming a product from its original state to a more valuable state. Value addition to agricultural products is the process of increasing the economic value and consumer appeal of an agricultural commodity. Various value-adding technologies such as processing and preservation techniques, dehydration and drying technology, freezing technology, packing, labelling, *etc.* can be applied to agricultural produce to increase its value. Total value of any agricultural produce is increased by performing certain post-harvest processing operations rather than selling it as such after harvest. Every year a huge amount of jackfruit is produced in India. Jackfruit production has been reported to be 1876.66 thousand tonnes (NHB, 2021). Out of this a significant portion goes to waste due mainly to its perishable nature and seasonal glut. The post-harvest losses in jackfruit are around 30-35% during the peak season. Jack fruit has great potential for value addition and more than 100 items can be prepared from jack fruit right from immature stage to well ripened stage. The importance of the fruit, seed and rind is known very little to the growers and consumers. Hence, value addition is important to utilize the surplus fruits available during the season as well to improve the livelihood of the farmers by producing value added products. There are various value-added products like pickle, chips, papad, jam, starch flour *etc.* can be prepared from unripe fruit, half ripe fruit, full ripe fruit and seeds too. Jackfruit being rich in nutritional,

medicinal and processing qualities can play a very significant role in the livelihood security of the rural communities through enhanced household income, employment generation and environmental protection.

GENDER PARTICIPATION IN MECHANIZATION IN AGRICULTURAL ACTIVITIES

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ABSTRACT

As people grow older gender differences and gender inequalities get distinguished and demarcated with differing consequences. As regards the volume of workload is concerned, women work longer hours than men. In addition to family responsibility, they also under take agriculture and livestock activities and share community responsibilities. However, most of the works they perform does not get rewarded economically and hence remain invisible. In the despite of various social, economic and various other constraints women had high level of participation in agriculture and they were very committed in their participation. Involvement of women in farm decision making was found medium. The poor women were contributing more to household income by working as a labour even under poor working conditions and with lower wages to improve the economic conditions of the family. There were no land ownership amongst female and even they do not have any right on their earnings. Women accept to work in farms because they can get employment without proper training or education. In spite of having more shares of females as agricultural labour than men, they get lower wages than males. In significance of female labour in agriculture and allied activities. However the role of women in agriculture as female labour is not highlighted in India. Despite of their presence in activities of sowing, transplanting and post-harvest operations they were considered as an invisible worker. The activities like irrigation, selection of crops, field preparation, hoeing and marketing of vegetables and wholesale products were performed by adult males, whereas activities like taking food to farm, weeding, harvesting and storage were performed by adult females.

Keywords: Agriculture, Gender, Work, Activities, Labour

BIOREMEDIATION: A NOVEL APPROACH FOR FOOD WASTE MANAGEMENT

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ABSTRACT

The term “bioremediation” refer to a broad concept that encompasses all procedure and actions used to restore a contaminated environment to its pre- contamination state. The employment of microbes or their enzymes, which are either indigenous and stimulate by the addition of nutrients or optimum conditions during the sowing help in desirable outcomes. Food waste creation has significantly increased over the last several years as a result of the rising industrialization and urbanisation of the world. Food trash is typically collected with other garbage kinds and has significant quantities of salt and moisture. When combined with other

elements, food waste that has a high level of pollutants creates a lot of poisonous substances and has harmful effects. Advanced and efficient waste management systems must be implemented in order to bridge the gap between waste production and disposal management in order to deal with the production of food waste on every scale. The bioremediation of wastewater produced by several food sectors also heavily relies on microorganism. The use of such approaches has a number of benefits, but the key one is that the ecology of the ecosystem is not interfered with. Although bioremediation's use in the food sector is not new, advances in microbiology and genetic engineering have offered scientists a useful tool for addressing environmental toxins. Among the new toxins that have entered the in the food chain, pesticides, herbicides, insecticides, cleaning chemicals, and others. The production of liquid waste by the food industry shares many features with other businesses, such as high BOD and COD, but differs in the amount of organic compounds it contains, which poses serious issues for the land and water resources. By using bioremediation techniques, pollutants are converted into chemicals that autotrophic organisms may absorb and use without harming them.

Keywords: Bioremediation, Enzymes, Microorganism, BOD, COD

IMPACT OF CLIMATE CHANGE ON TEMPERATE FRUIT CROPS AND ITS RESILIENCE WITH SPECIAL REFERENCE TO APPLE PRODUCTION

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ABSTRACT

Climate change occurs when changes in Earth's climate system result in new weather patterns that last for at least a few decades, and maybe for millions of years. The expected increase in the global average surface temperature of 1.8 to 4.0 °C by 2100 makes the climate change a greater matter for concern now. By the year 2100, sea levels will have risen 7 to 23 inches. In 2100, carbon dioxide levels are anticipated to increase by 100%. Annual river flow and water availability will rise at higher altitudes while falling in some arid areas at midlatitudes and in the tropics. Fruit crops are perennial, making the effects of global climate change and rising climatic variability more noticeable. The altered environmental conditions have an impact on the fruit crops' productivity and quality by altering the blooming pattern, physiology of growth and development, and biotic stressors such disease-pest incidence. As a result, it presents a significant challenge to scientists everywhere. The most crucial steps to lessen the catastrophic impact of climate change are mitigation and adaptation. Additionally, according to researchers at DOH, Mashobra, winter temperatures and precipitation, particularly in the form of snow, are essential for causing dormancy, bud break, and assuring apple flowering. Less than 1,000 hours of chilling causes poor fruit set, which then causes poor yield. In the early 1980s, it was known that apples were grown in Himachal Pradesh at elevations of between 1200 and 1500 metres [4]. In the 2000s, orchards moved to elevations of 1500–2500 metres. Due to the rise in surface temperature during the 1980s, apples are now grown in Himachal Pradesh at elevations of more than 3500 metres. One of the most crucial factors for apple growth is the chilling hours, and any alterations to these ideal environment conditions have an impact on apple growth and ultimately apple yield. Less chilling hours mostly cause abnormal flowering and blooming, which increases the likelihood that apple buds may go into dormancy. The shift of apple and other temperate fruit orchards orchards to the high altitudinal region due to continuously decreasing chilling hours. Consequently, the low-altitude region's temperature is continuously rising. People in the low altitudinal region who formerly relied solely on the apple crop for

their subsistence are now forced to switch to vegetable crops like peas, potatoes, and other vegetable crops due to the unfavourable weather conditions. However, Systematic breeding to develop low-chill fruit cultivars for temperate climates that can be produced on large tracts of land beneath low hills and northern plains. It is necessary to produce environmentally friendly chemicals to end the period of rest. Development of novel approaches that can be used to control the chilling needs of temperate fruit crops. Since it is believed that global warming is inevitable, efforts should be made to change the temperate fruit crops' chilling needs in various ways so that the effects of the changing environment can be lessened more effectively.

Keywords: Climate Change, Apple production, Climate Resilient Temperate Fruit.

CLIMATE CHANGE AND IMPACT ON WATER RESOURCES

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The water cycle is part of everyday lives but climate change may have direct consequence on everyday water need there are many things that everyone can do to lessen the impact of changes such as developing horticulture, plantations etc.

The global warming climate change and its related cause adversely affect local environment which in turn causes its bad impact on water resources even land use demands for water energy rising standard of living and all other such activities will likely to have adverse effect on water resource, hence the climate change leads to change in the hydrological cycle with the exceptional seasonal change or variation due to global warming. The El-Niño considered as the strongest naturally occurring climate change consistently on the Indian sub-continent can impact heavy rain fall which affected the water resources due to mixing with dissolved chemical moieties silts and other polluting materials dumped into water bodies. Moreover the other environmental happenings like drought, volcanic eruptions etc also act as additional factors in climatic change adverse effect on water resources.

Keywords: Climate change, Global Warming, Water Reservoir, Rain fall

Introduction

The climate change and variability play an important role on human health causing bad effects on water resources such as lakes, rivers, seas etc. and in turn drastically affect water and food supply. Moreover, the climate change refers to a change in the nature of the climate that can be identified by changes in the mean and / or the variability of the properties that persists for an extended period. Hence, the climate change on potentially vulnerable regions include the temperature rise disproportionately such as regions around the Pacific and Indian oceans are subjected to heavy rainfall which affects the water resources. The surface runoff carrying dissolved salts, silts, etc. At about 2.5°C warming there is melting glaciers and loss of snow cover over Himalaya are expected to threaten the stability and reliability of northern India primary glaciers affect rivers. The river Ganga will be loss dependent on ice melt water due to high rain fall downstream during the monsoon season.

Surface Run off

In addition, as runoff dumps sediments and other contaminants into water bodies and harm fish and other wild life. Fertilizer runoff can cause algal bloom that ultimately ends up suffocating aquatic critters and causing stinky mess.

The problem is compounded by warming water, which decreases DO level that is needed by aquatic animals. Moreover, heavier rainstorms will also increase surface runoff of the water flows

over the ground. This moving water dump polluting materials, silts, garbage etc in water resources.

Impacts on Hydrology cyclic

The climate change in particular has much importance on the hydrology and water resources availability globally. The rise in temperature and precipitation are the consequences of the increase in concentration of greenhouse gases availability of water resources and more over climate will accelerate the global hydrological cycle. Evaporation moisture content in soil, ground water recharge will also affected by climate changes and also put stress on fresh water resources of different uses.

The main parameters of hydrology cycle are the precipitation evaporation run off ground water and soil moisture and these are linked with temperature change.

Effect on Climate Changes on Water and its Resources

Water cycle and Water Demand:

The research shows a drastic change in hydrological cycle due to change in temperature and increase greenhouse gases in the atmosphere has given rise to series of impact on earth-

Variation in seasonal distribution and amount of precipitation.

Underneath most situations intensification in precipitation intensity

Radical change in stability of snow and rainfall

Rise in evaporation and evapotranspiration and loose of moisture in soil

Continuous change in green cover causing direct impact on global temperature.

Resulting financial transaction in association of land capitals.

Rapid melting of ice

Threat of fire and its risk in various parts of the world

Amplified coastal flood and loss of wetland

Plant physiology and condensed transpiration with effectiveness of water usage caused by CO₂.

Fluctuation trend – Rainfall and Drought configurations:

Increase in rainfall will also increase a province’s vulnerability to a variety of factors, counting with:

Submerging of land

Removal of top soil i.e soil Erosion.

Impacts on Water Quality:

Watersheds have an inadequate ability to check the contamination stanching as of growing municipal, business and unindustrialized practices. Major sources in scarcity of water is due to water quality degradation. Deterioration in purity of water end through the increase in surface overflow and precipitation. When water flow from higher levels they carry particulates, it will encompass of new biological components of pathogens and toxin. The impure contains which are stored in groundwater stashes as the growth will dazzle and drive to blush in liquidated water. Increase in water temperature will be the most significant source of water dilapidation. Upsurge in water temperature will lead towards the flush in bacteriological inhabitants and always create a damaging element in health of all human being. Moreover, water infection rate poorly disturbs diverse

Conclusion

Climate change scene generation technology changed from simple analysis and transplantation historical data to consider the development of greenhouse gas emissions GCM simulation. Also the hydrological simulation technology has changed from simple statistical model development to consider the atmosphere-vegetation-the exchange of soil distributed hydrological model. But because of the people do not have enough understanding to the atmosphere and the mechanism of the hydrologic cycle and the intrinsic link between them , the current study there are the following several insufficient:

There is a large uncertainty of climate model prediction. This kind of uncertainty mainly comes from the uncertainty of emissions scene, GSM and scale degradation technique and the physical process parameter, etc.

In both precipitation and runoff process of land surface hydrology there are strong time uniformity grid, while most of GCM assume that model of mesh vegetation and soil in horizontal plane is uniform which makes the simulation accuracy is not high.

DEMONSTRATION OF PANI PIPE-INDICATOR TOOL OF ALTERNATE WETTING AND DRYING IN PADDY UNDER TUNGABHADRA COMMAND AREA FARMERS OF KOPPAL DISTRICT

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ABSTRACT

ICAR-Krishi Vigyan Kendra, Koppal (Gangavathi), Karnataka state has conducted frontline demonstrations on alternate wetting and drying (AWD) practice in transplanted paddy growing TBP area in Koppal district during *khari* season of 2020-21 and 2021-22. A Demonstration was conducted at farmer's fields of Hanval and Hoskera villages of Gangavathi block. Demonstrated technology of alternate wetting and drying in transplanted paddy was compared with farmer's practice of continuous flooding. The remaining agronomic practices were same followed in demo and farmer practices in FLD in two locations with ten farmer's field. The data on productivity, economics and water saving in demonstrated plots were compared with farmer's practice (Continuous flooding method). The demonstrated plots were 12.23 per cent higher grain yield than farmer's practices. The extension gap, technology gap and technology index were 9.27 q ha⁻¹, 3.0 q ha⁻¹ and 3.41 per cent, respectively. The lower cost of cultivation (Rs. 63,763 ha⁻¹), higher gross return (Rs. 1,51,950 ha⁻¹), higher net return (Rs. 88,188 ha⁻¹) and B:C (2.38) was observed in demonstrated plot as compared to farmers practice of continuous flooding. Higher yield and returns due to reduced cost of cultivation. The demonstrated technology was observed less number of irrigation (21.5) and average per cent of water saving (18.86%) to complete the life cycle of paddy as compared to farmer's practices created greater awareness and motivated the other farmers to adopt AWD practices in TBP farmers of Koppal district.

Keywords: AWD, Paddy, Pani pipe, Returns, Water saving

IMPACT OF MGNREGA ON WAGE AND EMPLOYMENT GENERATION OF RURAL WOMEN: A CASE STUDY OF BALLARI DISTRICT IN NORTH-EASTERN KARNATAKA REGION

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ABSTRACT

The study was undertaken to assess the impact of the MGNREGA scheme on change in wage and employment of rural women after joining MGNREGA in Ballari district of Karnataka state. Ballari district was selected purposively for the study with a pre-set objective of assessing the impact of MGNREGA on wage and employment generation of rural women. For evaluating specific objective designed of the study, required primary data was collected from the 160 sample respondents (80 beneficiaries and 80 non-beneficiaries). Beneficiaries of MGNREGA perceived high wage rate (Rs.275/day) than Rs.255/day from non-farm work of non-beneficiaries. Income flow of MGNREGA beneficiaries was regular in a year as beneficiaries employed 207.68 working days higher than non-beneficiaries (145.55 days/year). It was concluded that, the MGNREGA impact on women wage and employment generation was positive and the beneficiaries had better livelihood security than non-beneficiaries in study area.

Keywords: beneficiaries, non-beneficiaries, wage rate, employment, MGNREGA

A STUDY ON PARTICIPATION AND CONSTRAINTS IN MGNREGA PERCEIVED BY RURAL WOMEN IN BALLARI DISTRICT

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ABSTRACT

The study conducted in Ballari district of Karnataka state was aimed to analyze the extent of participation of rural women under MGNREGA and also focused on constraints perceived by rural women in MGNREGA scheme. The study adopted multistage sampling technique for gathering information. The required primary data was collected from the 80 beneficiaries of MGNREGA scheme. The findings revealed that, in Ballari district the highest participation of women in MGNREGA was observed in Hospete taluk (55.28 %) and the number of women person-days generated in Ballari district has increased over the years (2011-12 to 2019-20) with a compound annual growth rate of 23.86 per cent. The study was also conducted on constraints regarding MGNREGA faced by women under different aspects related respondent households viz., family, work and worksite. The MGNREGA respondents conveyed that, the main constraint faced at family level was women workforce were feeling laborious nature of work and in case working nature, it was hard for women respondents to give her efficiency.

Lastly, the study focused on constraints at worksite, which revealed that, non-availability of crèche facility was the major constraint in the study area.

Keywords: participation, constraints, MGNREGA, women respondents, person-days

AWARENESS ON FUNDAMENTAL DUTY, RIGHTS AND RESPONSIBILITIES TOWARDS PROTECTING ENVIRONMENT

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ABSTRACT

Environmental protection is a catchphrase these days. Some actions and laws have been adopted by governments and organizations to protect the environment. Fundamental duties and rights for the citizens of the nations were recognized through these Acts and Laws. According to Article 51A(g) of the Indian Constitution, every citizen of India has a responsibility to preserve and enhance the natural environment, including forests, lakes, rivers, and animals, as well as to have compassion for all living things. The top 10 nations, including New Zealand, Norway, Sweden, Finland, Denmark, Switzerland, Canada, the Netherlands, Australia, and Austria, are reportedly those that concern the most about the environment. The effectiveness of each nation's evaluated by the "environmental protection laws" or "citizens' attitudes and behaviours" toward environmental conservation. With this framework, an attempt will be made in this study with the objective to determine the awareness among citizens towards the fundamental duties and responsibilities in relation to the environmental protection. The study will be descriptive and inferential in nature. To reach the maximum respondents from all over India the questionnaire will be distributed via online mode. The questionnaire includes 3 sections; it begins with the demographic profile of respondents, other section deals with the awareness regarding fundamental duties and rights and responsibilities towards environment protection. This study encourages the spread of awareness and acknowledges environmental friendly practices among citizens, which are critical to the effectiveness of environmental legislation. Furthermore, this study heartens Indian citizens' to pull the bull by the horns by assuring that little measures toward environmental protection result in huge impacts on developing a more sustainable lifestyle.

Keywords: Awareness, Citizens, Environment Protection, Fundamental Duties, Responsibilities, Rights.

EFFICACY OF SILVER OXIDE NANOPARTICLES AGAINST PLANT-PATHOGENIC BACTERIUM UNDER *IN VITRO* CONDITIONS

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ABSTRACT

The effect of silver oxide nanoparticles (Ag₂O NPs sized 38.23 nm), in three concentrations (0.05, 0.10 and 0.20 gL⁻¹) was observed on bacterial pathogen *Ralstonia solanacearum* (*Rs*) by disc diffusion method, under *in vitro* conditions. This pathogen is known to cause wilting in a wide range of host plants (particularly solanaceous crops), which under severe conditions can severely decline the yield of affected crops. *In vitro* test by disc diffusion method showed antimicrobial nature of Ag₂O NPs on tested pathogen with varied concentration-based effects. Concentration of Ag₂O NPs was the determining factor for the NPs efficacy in growth suppression of the bacterium. Paper discs dipped in 0.20 gL⁻¹ Ag₂O NPs caused broader inhibition zone among all three concentrations of NPs. Broader inhibition zone (7.79 mm) was formed against *Rs* with paper disc dipped in 0.20 gL⁻¹ Ag₂O NPs followed by 0.10 gL⁻¹ Ag₂O NPs (5.12 mm) and 0.05 gL⁻¹ Ag₂O NPs (2.67 mm). Thus, 0.20 gL⁻¹ Ag₂O NPs solution can be recommended for the control of this widely spread bacterial pathogen. However, it will be interesting to explore this dose of NPs under field conditions.

GENETIC DIVERSITY STUDIES BY MORPHOLOGICAL AND MICROSATELLITE MARKERS AND TRANSFERABILITY OF MICROSATELLITE MARKERS ACROSS THE CUCUMIS SPECIES

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Cucumber (*Cucumis sativus* L.) is the second most important crop of cucurbits belongs to family cucurbitaceae with 2n=14 chromosomes. Some of the melon species (*Cucumis melo*) are also commonly known as cucumbers with 2n=24 chromosomes, fruit of this species were similar to the sativus types.

Purpose

The present investigation aimed to assess the diversity and transferability of microsatellite markers across these two species. Local cultivars of cucumbers (*Cucumis melo*) which were commonly cultivated in Karnataka, and sativus types are considered in the present study.

Method

The present investigation was carried out with forty cucumber germplasm, which includes, local collections from different regions of Karnataka were evaluated in randomized block design for morphological and molecular characterization at the Department of Biotechnology and Crop Improvement, COH, Bagalkot during 2019-20. In the present investigation 14 quantitative traits were considered for evaluation. Growth yield and yield attributed were considered for recording the observations. These parameters were considered for genetic divergence analysis using Mahalanobis's D² statistics.

Results

Forty local collections of cucumber were classified into three clusters, of which five local genotypes of cluster II showed maximum intra-cluster distance. The inter cluster average D²

value was maximum between cluster II and III. Fourteen characters extended their contribution to the genetic diversity. Among these, maximum contribution to genetic diversity was from Node at which first female appears. This was followed by pulp thickness, fruit length and Vine length had considerable contribution towards divergence. The relative contribution towards diversity viz, average fruit weight, number of male flowers followed by fruit diameter, number of branches per vine, number of female flowers and fruit yield per vine. Molecular characterization of forty genotypes of cucumber was carried out by using 21 SSR markers. Dendrogram revealed three major clusters from 40 genotypes. The number of alleles ranged from 1 to 5, PIC value ranged from 0.00 to 0.625 with a mean value of 0.238. Out of the 21 primers used for the study, 19 primers showed considerable % polymorphism. Similar results have also been reported by the earlier studies of Jing *et al.* (2012) and Pandey *et al.* (2013) in cucumber. These groups of primers can be used suitably to assess genetic diversity in both sativus and melo collections, all markers amplified in both species indicating that these SSRs can be used across the species. The results also indicated that both the species have some similarities at molecular level. Using Darwin software, the neighbor joining tree constructed, which divided the collections in to three main clusters. The dendrogram revealed three major clusters. Cluster 1 formed two sub clusters with 7 and 5 local types per cluster, cluster II formed two sub clusters with 8 and 12 local types each respectively and cluster III formed two sub clusters with 5 and 3 local cultivars per cluster which is in agreement with previous worker Pandey *et al.* (2013) in cucumber.

Conclusions

Morphological and molecular characterization revealed the extent of diversity available in cucumber collections. Maximum amount of variability depicted by microsatellite markers and SSR markers used in the present investigation amplified in both the species indicating that SSR can be used across the species.

Keywords: cucumber, microsatellite markers, diversity, transferability, sativus and melons

PHARMACOGNOSTIC STUDIES OF *E. thymifolia*... A UNANI MEDICINAL PLANT

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ABSTRACT

Traditional systems of medicine and practices that are recognised by Government of India are 1. Ayurvedic, 2. Siddha, 3. Unani, 4. Yoga, 5. Homeopathy. Unani is one such traditional system of medicine followed and adopted in many countries. It involves the use of plants and minerals as a source of medicine. In spite of many merits and sustainable effects, Unani folk medicine is losing its charm in this modern world of synthetic medicine which offers instant relief but has many side effects. However, in the case of traditional / folk medicine, proper characterization of the plants concerned remains the goal for effective therapy. The present study was aimed to characterize *Euphorbia thymifolia* in traditional as well as folk medicinal systems. In Hindi it is known as Dudhi and in unani as Chhothi Dudhi. In Amravati district Maharashtra it was found to be used by hakims to treat diseases like kidney stone, leprosy, in bleeding, white discharge in women and to nail injury. Here pharmacognostic studies of the herb has been done. Anatomy of all the plant parts is studied while phytochemical investigations were made to know the presence of various bioactive molecules, amino acid composition and minerals.

EFFECTS OF SIMULATED ACID RAIN ON BIOCHEMICAL AND PHYSIOLOGICAL CHARACTERISTICS OF *Withania somnifera* (L.)

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ABSTRACT

Acid rain is a worldwide environmental hazard that can affect plants directly and indirectly by causing leaf damage and acidification of the soil. The yield and growth of *Withania somnifera* is affected by simulated acid rain (SAR). The pot study is set up in a Randomized Complete Block Design (RCBD) with three replicates of five treatments and a control. Two to three times a week, *W. somnifera* plants were exposed to varying concentrations of SAR at pH 3.0, 4.0, 5.0, and 6.0, as well as control. This study showed the effect of different pH levels of simulated acid rain (SAR) on the biochemical, physiological properties, and activity of various enzymatic and non-enzymatically important antioxidant molecules. The plant growth, chlorophyll, carotenoids, and protein content in the leaves of *W. somnifera* dropped dramatically as the acidity of SAR increased. When the plants were subjected to a simulation of acid rain, both the growth and yield of *W. somnifera* were negatively impacted and caused chlorosis and necrosis. Our findings showed that SAR at pH 5.0 and 3.0 might inhibit photosynthesis activity, protein content, and the antioxidant defence system, leading to metabolic abnormalities and eventually impairing plant development and growth. In contrast, SAR at pH 6.0 had no harmful effects on *W. somnifera* when no other stressors were present. This is notably affected when the pH value drops from pH 5.0 to pH 3.0.

Keywords: Antioxidants · Chlorophyll · Growth · Protein SAR

SCREENING OF INDIGENOUS CHAK-HAO RICE (*Oryza sativa* L.) GENOTYPES OF MANIPUR FOR RESISTANCE REACTIONS AGAINST YELLOW STEM BORER (YSB), *Scirpophaga incertulas* (Walker)

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ABSTRACT

Rice genotypes indigenous to Manipur were screened for resistance reactions against yellow stem borer at the research field of College of Agriculture, Central Agricultural University, Imphal, Manipur. The study was carried out keeping in mind the ever growing popularity and lack of research in the field of insect infestation in Chak-hao rice genotypes and to know its biochemical properties with regard to insect infestation. The experimental design followed was Randomized Block Design, with three replications and 19 genotypes (treatments). Insect infestation was recorded at 30, 45, 60, 75 and 90 DAT. Analysis of variance was performed after appropriate transformation of mean values obtained from the various experiments. Considering the average of six observations *i.e.* at 30, 45, 60, 75 and 90 DAT, the lowest per cent dead heart was observed in Kota Chak-hao with 3.58 per cent. Wairi Chak-hao showed highest per cent dead heart with 5.37 per cent. For finding the resistance reactions, biochemical parameters such as total sugars, reducing sugars, total phenols and orthodihydroxy phenol were analysed. The result showed that sugar content and insect infestation were positively co-related and phenol content whereas insect infestation were negatively co-related. From the present study we were able to understand to certain extent that the insect infestation is lesser in comparison to that of common rice and the attributes such as phenolic content plays a major role in imparting resistance to the insect pest of Chak-hao rice genotypes.

Keywords: Screening, Yellow stem borer (YSB), Randomized Block Design (RBD), Biochemical Analysis.

THE IMPACT OF THE TRAINING OF MUSHROOM CULTIVATION

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ABSTRACT

The organism of the fungal lineage mushroom rust, smut, puffballs, truffes, morels and yeasts as well as many less well-known organisms (Blackwell et al 2011). Edible mushroom has for a long time been recognized not only as a delicacy, but also for their use as food in man's diet. Mushroom is a wonderful gift of nature to the poor people for its nutritional and economic security. Mushroom have been found to be rich source of protein, lipid, amino acids, glycogen vitamins and minerals elements. (Okhuoya et al,2010). The nutritional and medicinal value of mushroom have been recognized. In recent times however mushroom have assumed greater importance in the diets of both rural and urban as well as.

There are many advantages of Mushroom cultivation

Waste such as cereal straws are largely burnt by the farmers, which causes air pollution. However, this raw material can actually be used for the cultivation of mushrooms. The kind of bio conversion exercise can greatly reduce environmental pollution.

It serves as means of generating employment particularly for rural women and youth in order to raise their social status. It provides the people an additional vegetable of high quality and enrich the diet with high quality protein, minerals and vitamins which can be of direct benefit of the human health and fitness. Mushroom cultivation is a cash crop. It improves economic standard of the people some warm mushroom e.g. *Volvariella volvacea* (straw mushroom) and *pleurotus saroj kaju* (Oyster mushroom) are fast growing organisms and can be harvested 3 to 4 weeks after spawning. It is short return agricultural business and can be immediate benefit to the community.

The study was conducted in Kishanganj district of Bihar, Total 74 respondent (Men and Women) were selected from three villages to study the impact of the training of mushroom cultivation, relevant data were collected with the help of personal interview. The data were analyzed using appropriate Statistical Tools. Keeping in view the above facts the present study was conducted to find out the impact of mushroom cultivation on Socio – economic of respondent of Kishanganj district of Bihar. And constraints faced by them during mushroom cultivation. The data were personally collected by the researcher compiled and interpreted as per objectives of the respondents of the study. The finding indicated that most of the respondents of the study are more young age group i.e. (67.56%) and had secondary level of education i.e. (50%) with small to medium

Family size (74.64%). On the other hand, most of them had medium level of social participation (37.83%). However they were high economic motivation i.e. (42.29%). Although they were low innovativeness (58.11%) minded. The respondent had medium level of risk orientation i.e. (39.18%).

Among the 74 respondents 65 respondents had taken up mushroom cultivation. From the constraint it could be inferred that non availability of market was reported to the major reason(67.56%), followed by lack of money (40.54%),lack of resources available (37.83%),lack of time and energy (29.72%),lack of technical advice (27.02%) were the major constraints in mushroom cultivation.

Keywords: Mushroom cultivation, Impact, socio-economic condition, constraints.

CULTURAL AND MORPHOLOGICAL VARIABILITY AND FUNGICIDAL SENSITIVITY OF *Alternaria species* ISOLATES CAUSING EARLY BLIGHT OF POTATO

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ABSTRACT

The present investigation entitled “Cultural and Morphological Variability and Fungicidal Sensitivity of *Alternaria species* causing Early Blight of Potato” is carried out at the Division of Plant Protection, ICAR- Central Potato Research Institute, Regional Station, Modipuram, Meerut, U.P., India, during the year 2021-2022.

The aim of this investigation is to study about the cultural and morphological characteristics and variability in isolates of different *Alternaria species* (*Alternaria alternata* and *Alternaria solani*) causing early blight of potato. Growth of fungal isolates is observed on culture media (PDA) and morphological characters such as number of septa, length and width of conidia, mycelium width etc. are observed. The main objective of a plant pathologist is the management of disease therefore, one more aim of this investigation is the sensitivity of the isolate against the fungicides. Two fungicides, Mancozeb 75% WP and Azoxystrobin 23% SC in three different concentrations of 5pp., 10 ppm, and 15 ppm are taken to perform this experiment under *in vitro* conditions. Lastly, the growth inhibition percentage is calculated in which the result showed that Azoxystrobin is comparatively more effective than Mancozeb at the concentrations of 5ppm, 10 ppm and 15 ppm.

SALT STRESS AND ITS MANAGEMENT IN DIFFERENT HORTICULTURE CROPS

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ABSTRACT

Salt stress is a major abiotic stress causing severe damage to plants by way of affecting at all biochemical, morphological and molecular levels. In the world, more than 20% of land used for crop production is adversely affected by high salt concentration. In India, an estimated 2.0 Mha salt-affected area has been reclaimed while 6.73 M ha still suffers from salinity and nearly 16 M ha is predicted to become salinized by 2050. Salt stress caused by salinity retards water absorption by the plants by raising the osmotic pressure of the soil solution. Salinized plants facing ‘physiological drought’ fail to extract the available water. Osmotic stress-induced water deficiency in saline soils is strikingly similar to the effects of drought.

Different plants respond to salt stress in different extents. Salt-affected soils must be reclaimed to restore their productivity for increasing food production. The approaches for the management of salt amelioration strategies include leaching, incorporation of different organic and inorganic amendments, mulching, and development of salt-tolerant crops. Among different strategies, the incorporation of organic amendments is beneficial, cost-effective, environment friendly, and sustainable for the amelioration of salt stress and enhancement of crop production

due to the extensive roles of organic amendments in improving the soil’s physical, chemical, and biological properties. some horticulture crops like pomegranate, aonla, sapota, bael, karonda, jamun, tamarind and date palms are relatively tolerant to salinity

Keywords: Salt stress, Organic amendments, Amelioration, abiotic stress.

EFFECT OF CROP GEOMETRY, AGE OF SEEDLINGS AND NUTRIENT MANAGEMENT PRACTICES ON YIELD, NUTRIENT CONTENT, UPTAKE AND POST-HARVEST NUTRIENT STATUS OF FINGER MILLET

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ABSTRACT

A Field experiment was conducted at Agricultural college farm, Bapatla during the *kharif* seasons of 2018 and 2019 to study the effect of crop geometry, age of seedlings and nutrient management practices on yield, nutrient content, uptake and post-harvest nutrient status of transplanted finger millet. The experimental design was split plot with three replications. The main-plot factor comprised of three crop geometries with different age of seedlings (30x10 cm with 30 days old seedlings, 30x30 cm with 15 days old seedlings and 45x45 cm with 15 days old seedlings) and seven nutrient management practices (S₀: absolute control, S₁: FYM @ 10 tonnes ha⁻¹ + application of *dravajeevamrutham*, S₂: FYM @ 10 tonnes ha⁻¹ + application of *dravajeevamrutham* along with wooden log treatment, S₃: FYM @ 10 tonnes ha⁻¹ + 100% RDF, S₄: FYM @ 10 tonnes ha⁻¹ + 100% RDF along with wooden log treatment, S₅: FYM @ 10 tonnes ha⁻¹ + 125% RDF, S₆: FYM @ 10 tonnes ha⁻¹ + 125% RDF along with wooden log treatment) in subplots. The experimental results inferred that significantly higher yield and nutrient uptake of finger millet were recorded in the spacing of 30x10 cm along with application of FYM @ 10 tonnes ha⁻¹ + 125% RDF along with wooden log treatment and higher available nutrients were observed in 45x45 cm spacing with application of FYM @ 10 tonnes ha⁻¹ + 125% RDF along with wooden log treatment.

GREEN TECHNOLOGIES: A PROMISING APPROACH FOR SUSTAINABLE DEVELOPMENT OF ENVIRONMENT

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ABSTRACT

Environment is degrading day by day due to the anthropogenic activities caused by human being. Hence, it has created a major environmental concern worldwide and forced us to rethink about its adverse effect and to minimize it. Under such circumstances green technology can be utilized as one of the promising approaches which is not only environment friendly but also will help us to attain the sustainability. It can be describing as development and application of products, equipment’s and systems used to conserve the natural environment and resources which reduces the negative impact of human activities. The green technologies are based on four pillars i.e. energy, environment, economy and social. It can be achieved by enhancing the energy use efficiency from the clean energy sources, conserving environment and minimizing adverse impact on it, improving the economy and ultimately enhancing the quality of life. Adoption of these green technologies will provide direction to improve the health of environment and reduce the pollution. Awareness among the youngsters is very much essential

for flourishing our earth as a green planet. Till now, the adoption of green technologies is at its infancy stage. A lot of initiative is needed to be taken by the government to save our earth from being degraded and develop our earth as a green planet. Green technology has greater potential to transform our earth in the upcoming future.

MORPHOLOGICAL CHARACTERIZATION OF PALMAROSA (*Cymbopogon martinii*) For Essential Oil Concentration

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ABSTRACT

Cymbopogon martinii (Roxb.) W. Watson, commonly known as palmarosa or rusa grass, is a perennial evergreen aromatic plant cultivated for its essential oil. The essential oil has high demand in cosmetics, tobacco products, and perfumery industries. Palmarosa belongs to the family Poaceae with a chromosome number of $2n = 20$ and is native to India. India exports ~147 tons of palma essential oil to the USA and Europe. An open-pollinated population developed as breeding material at the CSIR-Institute of Himalayan Bioresource Technology (CSIR-IHBT), Palampur, was used in the study. A total of 64 lines selected from the breeding material were screened for morphological traits and biomass yield. The character recorded has a direct or indirect effect on the essential oil of the crop. A significant variation was recorded for the following traits: plant height, stem thickness, number of effective tillers, leaf length, flower head length, flower head diameter and above-ground biomass. Selected lines can be developed as varieties for cultivation and used in breeding programs to develop palmarosa varieties with higher essential oil yield and wider adaptability.

Keywords: Biomass; *Cymbopogon martinii*; essential oil; Palmarosa

INFLUENCE OF WEATHER PARAMETER AND DATE OF SOWING ON SEVERITY OF YELLOW MOSAIC OF SOYBEAN AND ITS VECTOR (WHITEFLY) POPULATION

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ABSTRACT

Soybean (*Glycine max* (L.) Merrill) is one the most useful and widely distributed legume crop. Soybean ranks first in production among oil seed crops across the world. Yellow mosaic disease is the major disease which are observed in the Central Asia. It is exclusively transmitted by whitefly (*Bemisia tabaci* Genn.) in persistent manner. A field Experiment was undertaken to record the influence of prevailing weather and vector (Whitefly) on yellow mosaic disease severity in soybean. Four varieties were sown on two dates, first date of sowing was 25th June 2021 and second date of sown was 10th July 2021. Yellow mosaic disease was first noticed in second fortnight of July. It was characterized by the presence of green yellow mosaic pattern. Whitefly i.e. the vector of disease was present all over the season in timely and late sown

conditions. The maximum whitefly population 7.73 per plant (by cage) and 3.29 per plant (by visual) observed at 29th SMW in timely sown condition. Whitefly was comparatively higher in timely sown condition than late sown conditions. It was recorded that YMD Progression and severity (36.71 %) was very higher in comparison to progression and severity (14.33 %) in late sown condition. YMD severity was rapidly increased between 30th SMW (2.52 %) to 33th SMW (33.73 %) was recorded in timely sown conditions. It was revealed that most sensitive age of crop for YMD infection was 30-50 during that period rapid progression of YMD was favored by maximum temperature of 27.7-32.6 °C, mean temperature of 25.1-28.6°C, mean RH of 80-90 % with moderate to high rainfall and presence of sufficient whitefly population. Study revealed that whitefly population positively correlated with mean temperature and sunshine hours and negatively correlated with rainfall, mean RH, rainy day and wind speed. Whereas disease progression was negatively correlated with max temp, mean temp and sunshine hours in timely sown and positively correlated with max temp, mean temp, sunshine hours and whitefly population in late sown condition.

FLOW-CYTOMETRY PROTOCOL STANDARDIZATION FOR GENOME SIZE ESTIMATION IN *Heeng* (*Ferula assa-foetida*)

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ABSTRACT

Ferula assa-foetida (*Heeng*), native to Afghanistan, Iran, Uzbekistan and Turkey, is an herbaceous spice and medicinal plant from the *Ferula* genus of the Apiaceae family. India alone consumes about 40% of the world's *Heeng* (oleo gum resin) produce. After the successful introduction of the *Heeng* plant for domestication in India by the CSIR-Institute of Himalayan Bioresource Technology (CSIR-IHBT), flow cytometric (FCM) study was performed to standardize the flow-cytometric protocol and estimate the genome size of the introduced *Heeng* plant. Five common lysis buffers and their modifications, i.e., Galbraith buffer and its three modification (G1, G2, and G3), Woody plant buffer and its three modification (W1, W2, and W3), Tris.MgCl₂ buffer and its three modification (T1, T2, and T3), Baranyi's buffer and its three modification (B1, B2, and B3), and Otto's buffer along with its three modifications (O1, O2, and O3) were used to isolate the intact nuclei from *Heeng* leaf samples using one-Step protocol. Flow cytometric studies were performed using leaf tissues of ferula species i.e. *F. assa-foetida* and *F. jaeschkeana* along with three internal reference standards i.e. Tomato (*Lycopersicon esculentum* L. var. 'Stupicke'), Pea (*Pisum sativum* var.), and radish (*Raphanus sativus* L.) with 'BD Accuri C6+ Flow-Cytometer'. The parameters such as side scatter (SSC), forward scatter of light (FSC), coefficient of variation of DNA peaks, and the number of nuclei released from sample tissues were recorded. Among all five lysis buffers, sharp peaks were observed in the Baranyi's and Otto's buffer along with their modifications. Even among their six modifications, the best results were recorded in the O1 and O2 modification of Otto-1 buffer. Hence, the modification O1 and O2 of the Otto-1 buffer can be considered for further flow- cytometry work in *Heeng*.

Keywords: Baranyi's buffer; *Ferula assa-foetida*; Flow cytometry; genome size; Otto's buffer

TEMPORAL VARIATION OF BENTHIC MACROINVERTEBRATES AND WATER QUALITY STATUS OF BAGMATI RIVER AND ITS TRIBUTARIES

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Purpose

The Kathmandu Valley's inhabitants have long depended heavily on the Bagmati River, which provides a multitude of environmental resources, including drinking water, hydropower, cultural and religious traditions, and thriving biodiversity. However, the Bagmati river system, although being the holy river, has been impaired by rapid population growth and haphazard urbanization in the valley. The discharge of domestic, industrial, and agricultural effluents; the dumping of garbage; quarrying of sand; open defecation; and the connection of sewage systems have exacerbated the river's state. That is why assessing the river's water quality and identifying the stressors is essential for its restoration. Therefore, the focus of this research study is to examine the state of the river basin's ecology.

Method

The study utilizes the approach of biomonitoring whereby benthic macroinvertebrates (BMIs) were used as a biological indicator. The sampling of BMIs was conducted in accordance with the multi-habitat sampling approach. The study was conducted at 14 sampling sites along the Bagmati River and its tributaries in the Kathmandu valley during two post-monsoon seasons; i.e. (Oct-Dec, 2020) and (Oct-Dec, 2021). Sub-samples of benthic macroinvertebrates were collected using a kick net at each site, and collected samples were preserved in a 5% formaldehyde solution. Sorting and identification of organisms were performed in the laboratory up to the family level.

Results

Our results from the study of two seasons based on the GRSBIOS/ASPT index showed that upstream has retained its quality and is categorized as Class I, indicating a clean and unpolluted river system, whereas downstream of the Bagmati River, quality has deteriorated to such a level that its ability to filter itself seems impossible. These sites in downstream are categorized as Class IV and Class V, indicating poor water quality with extreme levels of pollution. Taxonomic richness was found to be high in upstream with a gradual decrease in downstream. Only sensitive families such as Ephemeroptera, Tricoptera, and Plecoptera were found to be dominant, posing a high taxonomic composition. The downstream of this river system in both seasons was dominated by pollution tolerant families such as Chironomidae spp.

Conclusion

The study shows the temporal variation in the benthic composition and the water quality of two post-monsoon seasons. In view of the findings of this study, it can also be concluded that, the key factors that determined the macroinvertebrate fauna in the observed study sites were river pollution, which directly impaired water quality.

Keywords: Bagmati River, Benthic macroinvertebrates, GRSBIOS/ASPT, Taxonomic richness

SALT STRESS AND ITS MANAGEMENT IN DIFFERENT HORTICULTURE CROPS

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ABSTRACT

Salt stress is a major abiotic stress causing severe damage to plants by way of affecting at all biochemical, morphological and molecular levels. In the world, more than 20% of land used for crop production is adversely affected by high salt concentration. In India, an estimated 2.0 Mha salt-affected area has been reclaimed while 6.73 M ha still suffers from salinity and nearly 16 M ha is predicted to become salinized by 2050. Salt stress caused by salinity retards water absorption by the plants by raising the osmotic pressure of the soil solution. Salinized plants facing ‘physiological drought’ fail to extract the available water. Osmotic stress-induced water deficiency in saline soils is strikingly similar to the effects of drought.

Different plants respond to salt stress in different extents. Salt-affected soils must be reclaimed to restore their productivity for increasing food production. The approaches for the management of salt amelioration strategies include leaching, incorporation of different organic and inorganic amendments, mulching, and development of salt-tolerant crops. Among different strategies, the incorporation of organic amendments is beneficial, cost-effective, environment friendly, and sustainable for the amelioration of salt stress and enhancement of crop production due to the extensive roles of organic amendments in improving the soil’s physical, chemical, and biological properties. Some horticulture crops like pomegranate, aonla, sapota, bael, karonda, jamun, tamarind and date palms are relatively tolerant to salinity

Keywords: Salt stress, Organic amendments, Amelioration, abiotic stress.

ECO-BIOLOGY AND MANAGEMENT OF ONION THRIPS, *Thrips Tabaci* LINDERMAN IN TIRHUT DIVISION OF BIHAR

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ABSTRACT

Thrips tabaci Linderman is a ubiquitous polyphagous pest that infests approximately 140 plant species but proved as a major pest of onion. This pest transmitted Irish yellow spot virus (IYSV) and caused up to 100% damage to onion (*Allium cepa* L.). The population of *Thrips tabaci* is spreading more faster when temperature rises between 20.8-27.7°C and decreased with rainfall, relative humidity and wind speed of 13.7 kph. Bihar state has fourth position in both production (1064.17 thousand tones) and productivity (19.86 tonnes/hectares) of onion in India. The different districts of Tirhut division in Bihar (Muzaffarpur, Vaishali, Sitamarhi, Sheohar, East Champaran & West Champaran) are the centre for onion production but due to infestations of onion thrips, *Thrips tabaci*, dependence on the supply of kharif onion from Nasik and other parts of Maharashtra has likely to be increased recently. After survey it was recorded that the frequency of attack and crop damage is more in Muzaffarpur, Vaishali and Sitamarhi in comparison to other districts in Tirhut division. The attack is more on older plants of onion where outer and upper section of leaves receives 95% of eggs approximately. Staggered planting of onion and balanced nutrients results in less colonization of onion thrips.

Keywords: THRIPS TABACI, IYSV, Damage, Tirhut Division, *Allium cepa* L.

AGRIBUSINESS: AN APPROACH TO EMPOWER WOMEN FARMERS

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ABSTRACT

Women farmers' contribution in an agrarian country cannot be underestimated. With the changes in the climate and technologies, women farmers have to update themselves on various fronts and for this many public and private service providers are playing a pivotal role. Women are also playing a significant role in the sustainability of livelihood and food security. From the last few decades, agribusiness has emerged as a profitable option for income and food security. Agribusiness involves the various post-harvest activities which turn the raw products into consumable forms with value added component. No doubt, women are involved in this area also from the starting of the civilization. Government has also recognised the contribution of women in agribusiness sector and is putting efforts in terms of subsidies, programmes and schemes to mainstream women and farm women to come into agribusiness sector and empower themselves. Mainstreaming women in agribusiness area will not only give wings and strength to women farmers in the terms of food and income security but also they can be empowered in decision making process, financial management, leadership and much more. This review paper is based on the contribution of women in food and income security through agribusiness, their potential, challenges involved and strategies for the same.

Keywords: Women, farm women, agribusiness, income and food security

EFFICACY OF BOTANICALS EXTRACT AGAINST STORAGE GRAIN PEST RICE MEAL MOTH (*Corcyra cephalonica*)

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ABSTRACT

Primary storage grain pests causing deteriorations in food grains, which make easier for a secondary pest to invade and establishment of secondary fungus associated with grains lead to nutritional depletion and resulting in economic losses. Use of synthetic chemical produces toxic effect to humans and environment health. Therefore, the present study has been planned to examine natural plant extracts as substitutes to synthetic insecticides for suppression of storage grain pest in environmentally sustainable manner. Laboratory experiment was conducted to investigate the insecticidal activity of three botanicals which are rhizome of sweet flag (*Acorus calamus*), fruits of black pepper (*Piper nigrum*) and flower buds of clove (*Syzygium aromaticum*) against larvae of rice meal moth (*Corcyra cephalonica*) in a completely randomized design (CRD). It was concluded that rhizome extract of sweet flag showed significantly maximum mortality (88 %) as compared to remaining botanicals. The mortality percentage of black pepper and clove was 80 % and 73 % whereas, no mortality was observed in control after seventh day of larvae released. This study results suggest that rhizome of sweet flag have high insecticidal properties which will be effectively used for controlling the storage insect pests without causing any hazardous effects.

Keywords: *Corcyra cephalonica*, Botanicals, Sweet flag (*Acorus calamus*), Black pepper (*Pepper nigrum*), mortality.

INFLUENCE OF ORGANIC FERTILIZER COMBINATIONS ON BIOCHEMICAL AND PHYSIOLOGICAL METABOLISM OF ONION PLANTS IN RELATION TO THRIPS INFESTATION IN *Allium cepa*

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ABSTRACT

Onion thrips, *Thrips tabaci*, is a major pest and a potent vector of iris yellow spot virus. Effective ecofriendly management practices are lacking. Objective of this study was to evaluate the influence of organic fertilizer combinations on biochemical and physiological metabolism of onion plants in relation to thrips density and bulb yield. Combinations were; commercial organic compost + pongamia cake + neem cake (ONP); vermicompost + pongamia cake + neem cake (VNP); vermicompost + mustard cake + neem cake (VNM); synthetic fertilizer as a control (UNN).

Thrips density was significantly greater in chemical fertilizer treatment (UNN) compared to ONP, VNP and VNM. Lowest thrips density was recorded in VNM irrespective of bulb yield. Onion plants treated with ONP were found to be tolerant against *T. tabaci*. Because ONP plants gave significantly higher yield than VNP and VNM irrespective of higher density on ONP than VNP and VNM. Fertilizer treatments didn't significantly affect the physiological parameters of onion plants. Plant height was significantly influenced by application different combinations of fertilizer whereas didn't affect the number of leaves per plant.

Incidence of IYSV was higher in chemical fertilizer treated plants compared to organic combinations but non-significantly affect the severity of IYSV. Total phenolics and flavonoid content negatively affected the thrips density whereas bulb yield was positively affected by these components. Reducing sugar was negatively correlated with thrips density as well as bulb yield. Oxalic acid content was highly affected by the application of different treatments and significantly high quantity was observed in ONP. Large number of calcium oxalate crystals were found at the pierced site of onion leaves in organic compost treated onion plants. Calcium oxalate helped onion plants of ONP treatment to coping with the damage caused by thrips feeding, therefore resulted in the higher yield despite of thrips density higher than VNP and VNM. Combination of organic compost, pongamia cake and neem cake could be integrated as a fertilizer application with the other sustainable management practices of onion thrips.

ECOFRIENDLY SOLUTION TO COMBAT NUTRITION DEFICIENCY USING MICROGREENS AND NANOTECHNOLOGY

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ABSTRACT

Creating sustainable farming techniques and maintaining food security have become two of the top problems in the agriculture sector. There is an increased global demand for food and a rise in nutritional deficiencies as a result of the world's population growth, which has prompted calls for new sustainable agricultural practices. Nanotechnology in conjunction with soilless and microgreen farming may offer a revolutionary answer as well as a more productive and sustainable alternative to traditional farming. F sheet is a declaration of intent to live healthily. F-sheets are foldable farm sheets with an eco-friendly base that is 3D printed (3-5 cm thick), with jute fiber as the plant substrate which is biodegradable, and organic seeds mixed into the

substrate using soluble paper and nanoparticles as the binding agent. These materials are enriched with essential plant nutrients and minerals. By better managing nutrients and water, nanoparticles in soilless farming primarily aim to reduce nutrient losses while also enhancing yields. Due to their high specific surface and related reactivity, nanoparticles can provide the plant with more soluble and usable forms of nutrients. Additionally, F sheets allows controlled release of active nutrients, to ensure that the necessary nutrient is available throughout the growing process. So, nanotechnology could be exploited to preserve the microgreens in F sheets, thereby extending their shelf life. Based on the Nutritional requirement of the customer, F sheets can be customized and sold in variety of types like, Infant model, Workout/gym/CrossFit Model, Gestation/Pregnancy Model and General Model. F-sheet offers biodegradable, environmentally friendly, and very economical planters to enhance organic consumption around the year and simple gardening/zero cropping in less space with high durability and sustainability. F sheet is committed to provide healthy and nutritious food to every household in an affordable prize to promote better lifestyles. F sheet has been filed for patent and is waiting for its approval.

INFLUENCE OF WEATHER PARAMETER AND DATE OF SOWING ON SEVERITY OF YELLOW MOSAIC AND ITS VECTOR (WHITEFLY) POPULATION

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ASSESSMENT OF COMBINING ABILITY FOR YIELD AND PROCESSING TRAITS IN TOMATO (*Solanum lycopersicum*)

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Purpose

Tomato (*Solanum lycopersicum* L.) being the most popular crop of every cuisine and very interested crop of a breeder and cash remunerative crop of farmers and processing industries is most demanding crop of the world.. Tomato hybrids for dual purpose like for fresh market and processing industry is gaining lot of importance as there is a huge demand in both the segments and if price fall in fresh market the produce can be sent to the processing industry. The hybrid development in tomato has generated increased interest among the breeders due to possibility of combining a complex of valuable attributes. The very systematic way for developing F1 hybrids depends mainly on selection of desirable parents. The information obtained from general combining ability (GCA) of parents and specific combining ability (SCA) of crosses helps us to select suitable parents and cross combination respectively. The Line X Tester analysis is very popular and most common method used to estimate the important genetic parameters; general combining ability (GCA), and specific combining ability (SCA) of the parents and crosses, respectively. Therefore, present investigation was planned to study the combining ability of some apparently superior genotypes for yield and some desirable traits like fruit color, TSS, lycopene, fruit pH, number of locules and pericarp thickness etc suitable for processing purpose.

Methods

The experiment was carried out in experimental block of Dept. of vegetable science at College of Horticulture, Bagalkot, Karnataka, India during 2019-2020 in randomized block design with two replications. Combining ability effects were estimated for different quality traits along with yield in L X T pattern using ten lines and three hybrids. The parental lines were chosen based on the *per se*, diversity and desirable traits. Total of thirty hybrids have been evaluated along with their thirteen parents. The variances for general combining ability (GCA) and specific combining ability (SCA) were highly significant indicating the presence of additive as well as non-additive gene effects in the traits studied. The relative magnitude of these variances indicated that non additive gene effects were more prominent for majority of the characters under study.

Results

The combining ability results revealed that, L 8 exhibited significant gca effects and proved a good combiner for fruit color, number of locules, lycopene and ascorbic acid whereas, L 2 is good combiner for TSS, pericarp thickness, L 3 for fruit pH (-ve direction), number of fruits per plant and yield per plant. Among the tester T 2 (DMT-2) is good combiner for number of locules, fruit pH polar diameter, equatorial diameter, number of fruits per plant and yield per plant and T 3 (Arka Vikas) is revealed best for lycopene, titrable acidity, polar diameter, number of fruits per plant and yield per plant. Cross combinations L 8 x T 1 (PKM-1) for number of locules , ascorbic acid, fruit pH (-ve direction) and equatorial diameter, L 2 x T 3 (Arka Vikas) for titrable acidity, number of fruits plants showed significant sca effects in desirable direction and regarded as good specific combiners.

Conclusion

The parents L 8, L 2, L 3 and T 2 (DMT 2), T 3(Arka Vikas) showing good significant gca effects in a desirable direction can be used as parental line hybridization programme and cross combination exhibiting good significant sca effects in a desirable can be exploited for exploitation of heterosis.

Keywords: General combining ability, Specific combining ability, Line x Tester, Quality traits.

PHYTOREMEDIATION: MODERN AND ECO-FRIENDLY WAY TO REMEDIATE HEAVY METAL POLLUTED SOIL

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ABSTRACT

Heavy metal contamination is a serious issue for agricultural production and food safety because of the negative consequences and rapid buildup in the environment. Numerous strategies have been created to reduce the presence of heavy metal contamination and remediate damaged soil. Heavy metal-polluted soil can be remediated using a procedure known as phytoremediation. Therefore, the development of the ideal plant species for phytoremediation through genetic engineering will require a thorough understanding of the mechanisms of heavy metal uptake, translocation, and detoxification in plants, as well as the identification and characterization of various molecules and signaling pathways. Additionally, chelating substances and microorganisms can be used to enhance soil health, encourage plant growth and fitness, or increase the bioavailability of heavy metals, allowing heavy metal buildup in plants. The plant removes any remaining heavy metals through phytostabilization, photodegradation, rhizofiltration, phytodegradation, and phytovolatilization. Radioactive metals such as Cd, Pb, Se, and Cs as well as diesel fuel spills are reduced by three times by Indian mustard. Cereal crop like *Oryza sativa* L. removes Cu and Cd from contaminated soil. Spinacia oleracea, sometimes known as spinach, is a plant that cleans polluted soil of Cd, Cu, Fe, Ni, Pb, Zn, and Cr. Pulse crops like *Cicer arietinum* remove Pb and Cr from contaminated soil.

PERFORMANCE OF SOIL LESS GROWING MEDIA IN RELATION TO DIFFERENT FERTIGATION LEVELS ON DIFFERENT VEGETATIVE AND QUALITATIVE CONTRIBUTING COMPONENTS IN SWEET PEPPER (*Capsicum annum* var. *grossum*) Cultivar Orobelle Grown Under Naturally Ventilated Polyhouse

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ABSTRACT

The research trial was carried out to study the Performance of soilless growing media in relation to different fertigation levels on sweet pepper (*Capsicum annum* var. *grossum*) cultivar orobelle grown under naturally ventilated polyhouse in the year 2021 at Experimental Farm Chhappang of Dr. Khem Singh Gill Akal College of Agriculture, Eternal University, Baru Sahib. The experiment was laid out in Randomized Block Design with three replications and nine treatment combinations. Growing media M₁ (Vermicompost +sand 3:1) recorded best results for vegetative characters (Days to first flowering, Plant height, Plant spread, Leaf area, Number of leaves per branch and Internodal distance) and qualitative characters (Carotenoides, Ascorbic acid, Pericarp thickness and TSS). Among the different fertigation levels F₃ (200 kg NPK/ha) recorded best results in vegetative characters viz. (Days to first flowering, plant height, plant spread, leaf area, number of leaves per branch and Internodal distance), qualitative characters (Pericarp thickness, and TSS) whereas fertigation levels F₂ (150 kg NPK/ha) recorded best results in qualitative characters (ascorbic acid and carotenoid). Among the different treatment combination M₁F₃ (Vermicompost + Sand (3:1) + 200 kg NPK/ha) recorded best vegetative characters (days to first flowering, plant height, plant spread, leaf area, number of leaves per branch and Internodal distance) and qualitative characters (pericarp thickness and

TSS) M₁F₂ (Vermicompost + Sand (3:1) + 150 kg NPK/ha) gave the best results for qualitative characters (carotenoid and ascorbic acid).

Keywords: Soil less, Vermicompost, Growing media, qualitative

CHANGES IN SOIL NUTRIENTS IN THE POST FLOOD SCENARIO IN SELECTED TREE-BASED LAND USE SYSTEMS OF THRISSUR, KERALA, INDIA

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ABSTRACT

Purpose

Floods have affected millions of people in India over the last few decades, and they are predicted to get worse as the climate warms. Flood-like occurrences can disrupt farming productivity by changing soil qualities. Kerala experienced a flood in August 2018 that lasted three to five days due to significant and unexpected rain that month. Flooding has a distinct effect on soil properties in different land use systems. The current study was focussed on the impact of flood on available NPK of soils at forest, rubber, home gardens, coconut and open land use systems at Thrissur district of Kerala.

Methods

Soil samples were collected from 0 -20 cm depth from flood affected and adjacent non flood affected of these land use systems after six months of flood. Available NPK were determined by standard methods.

Results

A decrease in available nitrogen content after flood was observed in rubber (206.4 kg/ha), homegarden (101.2 kg/ha) and open (219.9 kg/ha) land use system while an increase was observed in forest (70.5 kg/ha). Available phosphorus was higher at forest (29.82 kg/ha), rubber (47.6 kg/ha) and homegarden (25.33 kg/ha) (tree dominated systems) after flood while lower at coconut (48.8 kg/ha) and open (105.35 kg/ha) land use system. Available potassium was lower in all land use system after flood.

Conclusions

The tree dominated system have less effect on soil available NPK due to flood compared to tree less system. Among the tree dominated system forest shows a higher resilience to flood. Introduction of tree species into land use systems will enhance the adaptation of that land use system to flood like events.

Keywords: Soi flooding, Land use systems, Nitrogen, Phosphorous, Potassium

FEMALES’ PREFERENCE FOR READYMADE *KURTIES* AND THEIR FITTING PROBLEMS

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Purpose

In Indian, many women residing at homes and/ or working in the offices prefer to wear traditional salwar, kameez and sarees. However, most of young females have a great crush about *kurties* because it is easy to wear, comfortable and create a traditional look. These young females worn these *kurties* with a variety of lower garments that include jeans, skirt, palazzo, lehnga and salwar etc. Beside this, a large variety of *kurties* with different colours, sizes, designs and styles are available in the market. But each consumer has some specific preference for their readymade *kurties* and facing some problem with it. Thus, this study was planned to know the females’ preference for readymade *kurties* and their problems. The study was conducted in two universities i.e., Govind Ballabh Pant University of Agriculture and Technology, Pantnagar and Thakur Dev Singh Bist (DSB) University, Nainital campus located in Udham Singh Nagar and Nainital districts respectively from Kumaon region of Uttarakhand state of India. In the present study, a survey method was used for data collection and a self-structured questionnaire cum interview schedule was used as a tool. A stratified random sampling method was used for sample selection. A total one hundred females between 21-31 years of age were selected as the sample size for study. Collected data analyzed by using frequency and percentage. It can be concluded from the study that maximum respondents from both place were preferred readymade *kurties* and gives reasons for preferring readymade *kurties* i.e., comfortable, time saving, available in wide variety and unique in design. Maximum numbers of respondents from GBPUA&T, Pantnagar opted to wear below knee length readymade *kurties* with jeans and salwar. On other hand study shows that more than 50 percent respondents from DSB Campus, Nainital were preferred to wear hip-length readymade *kurties* with jeans and between knee and hip length kurti with salwar. More than 65 percent respondents of 21-31 years of age from GBPUA&T, Pantnagar and DSB campus, Nainital were facing fitting problems with readymade *kurties* and these fitting problems were related to looseness and tightness of readymade *kurties* at various points such as neckline, shoulder, armhole, sleeve, bust, waist and hip.

Keywords: Readymade *kurties*, Construction method, *Kurties* construction, *Kurties* fitting, Fitting problem.

NATURAL RESOURCE MANAGEMENT: UTILIZATION OF POST-HARVESTED BANANA PSEUDOSTEM FOR PRODUCT DEVELOPMENT

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Purpose

India is best known for agriculture. Agriculture provides the raw material for many industries and also generates waste in large amount, especially in some type of horticultural products such as banana. After harvesting banana fruits, banana pseudostem is considered horticultural waste. In India, farmers’ have to need to spend labour, money and time to clean the waste banana

pseudostem from their farms. Most Indian farmers know that they can extract the fiber and prepare the products by using banana pseudostem. But they do not know how. As banana farming generates a huge quantity of biomass and banana is cultivated round the year. So, the supply of raw material is available round the year for producing fibers and to produce a wide range of products. Therefore, keeping in mind the problem, it is necessary to give practical experience to the farmers, about fiber extraction process and development of products for better management of this naturally available banana pseudostem.

Methods

In this study mechanical method was used to extract the fiber from banana pseudostem and training was organized to train the farm women for preparing products. Consumer acceptability was also checked of these products by selling, to know the demand of these products.

Results

The result shows that maximum farmers were interested in extraction and selling of banana fibers whereas more than 50% of females were preparing banana fiber products for sale. It was also observed that maximum respondents like all products made from banana fibers and banana pseudostem. Respondents were ready to buy these products.

Conclusions

It can be concluded from this study that the extraction of fiber and development of products from banana pseudostem will help farmers' in reducing banana waste after harvesting the fruits. By using this method, farmers can manage these naturally available banana wastes and consider them as naturally available resources for fiber extraction. This way of natural resource management helps the farmers in generating income from waste and also helps to save the environment.

Keywords: Banana waste, Banana products, Banana pseudostem management, Banana fiber

EFFECT OF NITROGEN AND POTASSIUM ON GROWTH AND QUALITY ATTRIBUTES OF CORIANDER (*Coriandrum sativum L.*).

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ABSTRACT

Coriander (*Coriandrum sativum L.*) is an aromatic annual herb, that belongs to the family Apiaceae, and is a native of the Mediterranean region. The leaves have a pleasant aroma. It is a thin stemmed, small bushy herb, much branched, grows about 25 to 50 cm tall, with alternate and compound leaves which are highly segmented and linear as they reach upper extremities. Coriander leaves are a rich source of vitamin C (135 mg/100 g), vitamin A (6918 µg/100 g), and protein. Its leaves are used for flavoring curries, sauces, and soups. Application of nitrogen significantly increased the number of leaves (13.97 at 30 DAS) plant⁻¹ and they were more pronounced with an increased (90 kg ha⁻¹) of nitrogen, which could be due to a higher level of N may be attributed to the better nutritional environment in the root zone as well in the plant system. The level of nitrogen significantly improved the chlorophyll content of leaves (SPAD value) (19.71). It was recorded at a maximum of 90 kg N ha⁻¹. The maximum number of leaves plant⁻¹ and chlorophyll content of leaves (SPAD value) (18.66) was observed at 50 kg K ha⁻¹. The growth and quality parameters of the coriander crop can be increased with the application of 90 kg ha⁻¹ nitrogen and 50 kg potassium ha⁻¹.

Keywords: Coriander, Nitrogen, Potassium, Growth, Quality, etc.

RESPONSE OF FERTIGATION LEVELS AND DIFFERENT HYBRIDS ON VEGETATIVE ATTRIBUTES AND QUALITATIVE ATTRIBUTES OF CUCUMBER (*Cucumis sativus* L.) Grown Under Polyhouse Conditions.

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ABSTRACT

Research trial was carried out at Experimental Research Farm Chhappang, Dr. Khem Singh Gill Akal College of Agriculture, Eternal University, Baru Sahib, District Sirmour, Himachal Pradesh in the year 2021. The experiment was laid out in Randomized Block Design with three replications and sixteen treatment combinations. In the research trail four fertigation levels were used along with four commercial hybrids of cucumber are used which are mostly grown by farmers in Sirmour valley. Among the different hybrids Aviva recorded minimum value of vegetative attributes like days to 1st flowering, days to 1st female flowering, inter nodal length, node of 1st female flower, days of 1st picking, and maximum value in number of flowers/vines, horizontal leaf width, vine length, number of leaves/vine and qualitative character pericarp thickness was also recorded by the same hybrid, while hybrid H₄ (Amber) recorded maximum TSS and Titrable Acidity. Among the different fertigation levels (F₃=150kg NPK/ha) fertigation levels recorded minimum value of days to 1st flowering, days to 1st female flowering, inter nodal length, node of 1st female flower, days of 1st picking whereas maximum number of flowers/vines, horizontal leaf width, vine length, number of leaves/vine and qualitative character like TSS, Titrable Acidity, pericarp thickness. Among the different treatment combinations, hybrid Aviva fertigated at 150kg NPK/ha, recorded minimum value in growth characters like days to 1st flowering, days to 1st female flowering, internodal length, node of 1st female flower, days of 1st picking, whereas maximum value of number of flowers/vines, horizontal leaf width, Vine length and number of leaves/vine while qualitative characters maximum like TSS, Titrable Acidity, pericarp thickness.

Keywords: Pericarp, Numbers, Titrable acidity, Treatment, Qualitative, Vine length

ASSOCIATION OF (GT)_N POLYMORPHISM WITH EXPRESSION PROFILE OF NRAMP1 GENE AND INCIDENCE OF BRUCELLOSIS IN MURRAH BUFFALO

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ABSTRACT

Brucellosis is a widespread infectious bacterial disease caused by Gram negative facultative intracellular bacteria of Genus *Brucella*. Recently, (GT)_n microsatellite polymorphism at 3' UTR of Natural Resistance Associated Macrophage Protein 1 (NRAMP1) gene has been found to be associated with resistance/susceptibility to *B. abortus* in cattle. The aim of present study was to find association between polymorphism and expression profile of NRAMP1 gene in buffalo. Murrah buffaloes (n=125) maintained at farm were screened by three serological tests namely Rose Bengal Plate Test (RBPT), Standard Tube Agglutination Test (STAT) and Indirect Enzyme Linked Immunosorbent Assay (Indirect ELISA) to identify seropositive and seronegative status. Animals that were negative and positive for all the three tests were finally included in the study. Numbers of GT repeats were determined by using fragment analysis. On the basis of results of serotyping and genotyping, buffaloes were classified in four groups with

respect to seropositive/seronegative and GT₁₃/non GT₁₃ groups. Four seropositive and four seronegative animals related with GT₁₃/Non GT₁₃ were used for the expression profiling. Total RNA was isolated from blood leucocytes by Trizol BD method. After preparation of first strand cDNA, the expression profile of NRAMP1 gene was studied using RT-qPCR SYBR green assay. β -actin was used as an endogenous control and all samples were run in duplicate. Expression of NRAMP1 gene was studied according to their genotype and seroprevalence. According to genotype, expression of NRAMP1 gene was less in GT₁₃ in Murrah buffalo, as compared to non GT₁₃. In case of seropositive animals, NRAMP1 expression in Murrah buffalo was more as compared to seronegative animals. Association study (SPSS 14) shows no significant association between GT₁₃ and non GT₁₃ with NRAMP1 gene expression. In case of seroprevalance, there was also no significant association between seropositive and seronegative animals with NRAMP1 expression profile.

Keywords: Murrah buffalo, Polymorphism, Brucella, RT-qPCR, NRAMP1 gene

CONSTRAINTS PERCEIVED BY TISSUE CULTURE BANANA GROWERS

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ABSTRACT

The present study entitled “Constraints perceived by tissue culture Banana growers” was undertaken in Akola district of Maharashtra State. An exploratory design of social research was used. The present investigation was carried out in the six selected village in Akola district. The said villages were selected purposively because of maximum area under cultivation of tissue culture Banana. From each village, twenty farmers were selected randomly who cultivated the tissue culture Banana from last five years. Thus, total 120 farmers constitute the sample for the study. The salient findings of the present study are summarized as under.

From the present study, it is observed that majority of the tissue culture banana growers (75.00 %) were observed in high level of knowledge about tissue culture banana production technology practices and 56.67 per cent of them were observed in medium level of adoption of tissue culture banana production technology practices.

Moreover, only 16.66 per cent banana growers are not adopting the complete hardening of seedlings before transplanting the tissue culture banana seedling in main field. More than fifty per cent (56.67%) banana growers have adopted the secondary hardening partially.

Cent per cent banana growers expressed the constraints of maximum numbers of second grade hands were produced in tissue culture banana, non availability of storage facility and non-existence of Govt. marketing agency like APMC. Cent per cent tissue culture banana growers reported high cost of tissue culture seedlings (97.50%), complete hardening seedlings are not provided by the supplier (90.83%), maximum expenditure on propping in tissue culture plants (80.83%), low yield shown in tissue culture ratoon crop (77.50%), load shedding of electricity (89.16%) and fluctuating market prices (68.33%) were expressed by the respondents. Majority of respondents (89.16%) expressed lack of knowledge about proper stage of hardening and its transplanting whereas, 85.00 per cent of respondents reported that, sufficient time is not available for hardening before the transplanting.

Keywords: Adoption, Constraints, Tissue culture, Banana Production Technology

STATUS OF GRAIN DISCOLOURATION OF PADDY IN JAMMU DIVISION

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ABSTRACT

Rice (*Oryza sativa* L.) is a *Kharif* crop belonging to the family Poaceae and is cultivated in the tropical and subtropical regions of the world. About 90 per cent of the world's rice is grown and consumed in Asia and 60 per cent of the world population also depends on rice for half of the calorie intake from this crop. Globally, rice is cultivated on an area of 163.57 million hectares with production and productivity of 499.07 million tonnes and 4.56 tonnes ha⁻¹. In India, rice is grown over an area of 45.05 million hectares with a production of 115.60 million tonnes and productivity of 2.55 tonnes ha⁻¹. In the U. T. of Jammu and Kashmir rice occupies an area of 0.27 million hectares with production and productivity of 0.59 million tonnes and 2.2 tonnes ha⁻¹ respectively. Rice is the staple food for more than 60 per cent population in India. It is used in various food products. Cooked rice, breakfast cereals, desserts and rice flour are important food products of rice. It is also used to prepare local beer, while rice hull is used as fuel, fertilizer, packing and insulation. Rice bran is used as the substrate for mushroom cultivation. Straw from the leaves and stems is used as bedding for animals. Rice flour is used to prepare many traditional foods on special occasions. The paddy is affected by many diseases caused by fungal, bacterial and viral. Among these diseases, grain discolouration is one of the most important rice diseases and emerging as a threat to the seed industry all over the world. This disease leads to 75 per cent yield losses in rice due to minimized grain weight, floret sterility, inhibition of seed germination, reduction of stands, as well as year-to-year transmission because of the seed-borne nature of the pathogens. Grain discoloration is also known as glume discoloration, dirty panicles, or pecky rice. Grain discoloration is an early indication of poor-quality seeds associated with micro-organisms. Survey of major rice growing areas of Jammu Division *viz.*, Jammu, Samba, Reasi, Kathua, Rajouri and Udhampur was conducted during *Kharif* season (2021) to ascertain the status of grain discoloration in paddy. The mean per cent disease incidence ranged from 24.78 to 11.79. The highest per cent discolouration was observed in Jammu followed by Rajouri, Udhampur, Reasi, Kathua districts and least incidence was noticed in Samba district.

Keywords: Discolouration, Mycoflora, Rice

ASSESSMENT OF *ACORUS Calamus* Linn. Accessions For Morphological Traits And Yield Parameters

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Purpose

Acorus calamus Linn. usually known as sweet flag belongs to the family Acoraceae. The Acoraceae family comprises of 115 genera and 2,000 species, of which about 25 genera and

over 140 species has been reported from India. The genus *Acorus* is named from Dioscorides' Greek word *Acoron*, which was derived from *Coreon*, which meant pupil, because it was used in herbal medicine to cure eye inflammation, while the species *Calamus* is named after Dioscorides' Greek word *Calamus* (a reed). Among different species of *Acorus*, *calamus* has been an item of trades in many cultures for thousands of years and has been used medicinally for a wide variety of ailments. This herb is usually found on the banks of streams and in swampy areas. A perusal of literature revealed that there is a great variability in the populations with respect to morphological and chemical characters of *Acorus calamus* collected from different parts of the world and from India also therefore the present attempt has been made to study the variability present in the *Acorus calamus* germplasm of North eastern region of India.

Mehtods

This experiment consisting of 40 accessions of *Acorus calamus* was carried out at the experimental field of Department of Forest Products and Utilization, College of Horticulture and Forestry, Central Agricultural University, Pasighat, Arunachal Pradesh located at located at 28.07°N, 95.33°E and 155 m above msl during 2021-2022. With the objective referred 14 traits viz., plant height, number of leaves, leaf length, leaf width, leaf colour, leaf area index, number of prominent veins, number of lets, number of scales, rhizome length, rhizome width, rhizome weight, rhizome yield and oil content were studied. The data obtained were subjected to appropriate statistical analysis however among the 14 traits study 2 traits viz., number of leaf and number of prominent veins was not subjected to statistical analysis as there were no variation in these traits among the accessions.

Results

On the basis of the mean performance of the accessions studied, plant height ranged from 56.64 cm to 110.80 cm, fresh rhizome weight ranged from 17g to 159.80g, rhizome yield ranged from 761.60 kg/ha to 7159.04 kg/ha. The accessions IC-0632808 (2.80%), IC-0632810 (2.30%), IC-0632792 (2.00%) showed high oil content among all the accession studied. Variation in other morphological characters under study is also found. Rhizome yield showed strong significant positive correlation with rhizome length (0.940) followed by rhizome weight (0.926), leaf width (0.729), number of leaves (0.647), leafarea index (0.558), leaf length (0.414), plant height (0.406), number of lets (0.338). In rhizome associated traits rhizome weight showed maximum positive direct effect on oil content followed by rhizome length and rhizome width. The accessions were divided into major seven clusters where maximum accessions were group in cluster 1 which consists of 16 accessions and check (Swarna swara). Cluster 5, cluster 6 and cluster 7 consist of 1 accession each. Cluster 6 showed maximum mean value for economically important below ground traits including rhizome length (74.2 cm), rhizome weight (159.80 g), rhizome yield (7159.04 kg/ha) and oil content (1.86%). The inter cluster D² value was shown maximum between cluster 6 and cluster 3. Intra cluster distance was found highest in cluster 4.

Conclusions

In the present study, accession IC-0362796 (7159.04 kg/ha) gives maximum rhizome yield. Accession IC-0632808 yielded maximum oil content followed by IC-0632810 and IC-0632792. The accession IC-0632808, IC-0632810 and IC-0632792 might be used for further breeding programme to develop a variety for obtaining high oil content in future research work.

Keywords: *Acorus calamus*, cluster, correlation, oil content, rhizome yield

EVALUATION OF RADHA -4 VARIETY OF RICE UNDER THE DIFFERENT ESTABLISHMENT METHODS AND WEED MANAGEMENT AGAINST THE GROWTH AND PHYSIOLOGICAL PARAMETERS

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ABSTRACT

Rice contributes majorly to the overall food grain production in India that is the chief source of consumption in majority of households. In the coming time period where growing rice would be a challenge not only because of surging water crisis or increased global warming but also because of land constraints, it is very important to adopt the strategies where we it can be grown in the multiple ecologies, while efficiently adopting according to the surroundings. One such effort was put in our research conducted at LPU farm, Lovely Professional University, where two rice varieties were evaluated for the growth and physiological parameters under different establishment methods and weed management. Research was conducted in split-split plot design where, main plots consisted of two establishment methods- SRI and Aerobic, sub-plots constituted two rice varieties- PB 1211 and Radha -4 and sub- sub plots constituted of weed management practices- weed free, pre-emergent fb post emergent herbicide and weedy check. The result declared that the among the two varieties, Rdaha-4 had better growth parameters like Net Assimilation Rate (NAR), stem dry weight /unit length, leaf area index and number of tillers, under the SRI condition with weed free treatment. Similarly physiological parameters like chlorophyll content, stomatal conductance, transpiration ratio and LAI was found to be higher in Radha-4. However, the total height of the plant and the length of the internode (penultimate to the 5th penultimate node) was found to be higher in case of the variety PB-1211 under the aerobic method with weedy check condition which probably explains the lodging of the plants under the same treatments.

Keywords: ecology, global warming, rice varieties, weed management, spacing

IMPACT OF SERICIN PROTEIN FORTIFICATION ON THE COCOON TRAITS OF SILKWORM, *Bombyx mori* L.

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ABSTRACT

Nutrition plays the crucial role in improving the biological and commercial parameters of silkworm. It derives all the nutrients required for growth and development from mulberry leaf. Hence, the nutritional quality of mulberry leaves directly influences the silkworm growth and development of silkworm. The fortification of nutrient enriched mulberry leaves enhances the growth and development of silkworm and ultimately improves the economic parameters. The sericin is a globular protein obtained from silkworm cocoons usually discarded as waste during degumming. An attempt was carried to study the influence of sericin enriched mulberry leaves on the commercial and technological parameters of silkworm. The results revealed the significant improvement in the cocoon indices viz., good cocoon percentage, cocoon length, cocoon weight, shell weight, shell ratio as well as the technological aspects of cocoons.

Keywords: Nutrition, Sericin, silkworm, mulberry.

EVALUATION OF FODDER CROPPING SYSTEM IN INTER SPACE OF COCONUT PLANTATION FOR YIELD AND SILAGE QUALITY IN COASTAL SANDY SOIL

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ABSTRACT

Present study was conducted with an objective to study the feasibility of using biochar and flyash as soil amendments in coastal sandy soil for enhancing fodder growth, yield and quality of silage in inter space of coconut. A field experiment was conducted at ICAR – Central Plantation Crops Research Institute, Kasaragod, Kerala, located at 12° 30' North latitude and 75° 00' East longitude, with an altitude of 10.7 m above mean sea level. The soil of the experimental field was sandy (*Quartzip sammments*) in texture, having 99.1 per cent sand, 0.2 per cent silt and 0.7 per cent clay. The soil was low in total nitrogen, available potassium and organic carbon. However, it was high for available phosphorous. The experiment was laid out on fixed site in two consecutive years (2018-19 and 2019-20) in the interspaced of forty-year-old coconut *var.* West Coast Tall garden in split plot design consisting five main plot treatments (M1: Sole fodder sorghum cv. CSV 32F, M2: Sole fodder maize cv. African tall, M3: Sole fodder cowpea cv. C-152, M4: Fodder sorghum + Fodder cowpea (1:1 row ratio), M5: Fodder maize + Fodder cowpea (1:1 row ratio) and three sub plot treatments (S1: FYM @ 15 t ha⁻¹, S2: Flyash and Biochar @ 10 t ha⁻¹ each + FYM @ 15 t ha⁻¹, S3: Coir pith burial @ 5 t ha⁻¹ + FYM @ 15 t ha⁻¹). After harvest of crop silage was prepared in plastic containers with air tight lid with a capacity of 10 kg. After cutting the plants at 50 % flowering stage, fresh weight of each net plot was recorded and converted into tonnes per hectare of coconut garden. Silage quality viz., pH, moisture content, volatile fatty acids (VFA), Total N and ammonia nitrogen were estimated by following standard procedures. In an experiment with evaluation of fodder crops intercropping grown in interspaced of coconut plantation for yield and silage quality of fodder, the results (average of two years) revealed that intercropping of maize and cowpea @ 1:1 row ratio with combined application of biochar and flyash @ 10 t ha⁻¹ recorded higher total green fodder yield (37.16 t ha⁻¹) with higher net returns (₹ 1, 14, 434 ha⁻¹) and B:C (1.94) and also produced better quality silage. Plant percent P and K content was higher in intercropping system compared to sole crop of maize and sorghum. With regard to cowpea nutrient composition, significantly higher N and K content was recorded in cowpea grown with maize in 1:1 (2.89 and 1.05 %, respectively) over cowpea grown with sorghum in 1:1 row ratio (2.57 and 0.81 %, respectively) and cowpea grown as sole crop (2.50 and 0.73 %, respectively). Among the soil amendments, the mean per cent N, P and K content of fodder maize / fodder sorghum was significantly higher for combined application of biochar and flyash @ 10 t ha⁻¹ each and FYM @ 15 t ha⁻¹ (1.86, 0.26 and 1.57 %, respectively) over FYM @ 15 t ha⁻¹. Similar trend was observed in cowpea. On the basis of the results obtained in the present investigation, it is concluded that to achieve higher total fodder yield and better quality silage, fodder maize/ fodder sorghum and fodder cowpea intercropping in 1:1 row ratio can be recommended with application of biochar and flyash @ 10 t ha⁻¹ each along with FYM @ 15 t ha⁻¹ under coastal sandy soil.

ECOFRIENDLY MANAGEMENT OF *Meloidogyne incognita* Infesting Okra Under Coconut Intercropping Garden

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ABSTRACT

Plant-parasitic nematodes are unseen foes found in the roots of a variety of intercrops like spice, fruits, vegetables, medicinal plants and weeds that are cultivated in coconut gardens in south India, An estimated about US\$ 2.5 billion losses are attributed to plant nematodes every year. Okra, *Abelmoschus esculentus* (L.) Moench, is one of the most significant crops in India and also world. It is frequently grown as intercrop with coconut in south India. The lucrative cultivation of okra in the coconut system is endangered by the root knot nematode *Meloidogyne incognita*, which is reducing crop productivity and having a significant negative economic impact. There are nematode controlling nematicides that can be used, but they are relatively expensive, harmful to humans and animals. In the nematode-infested fields, eco-friendly integrated solutions using bioagents and antagonistic plants can be very effective in treating the nematode problem and other soil-borne diseases. These are particularly successful in reducing nematode damage in current and future crop cultivation in the coconut agro-ecosystem by producing antagonistic compounds. Present study to carry out a field experiment was conducted in root knot nematode, *M. incognita* infested coconut garden with the five treatments and four replications by following RBD design. Among the treatment, *T. harzianum* @ 5 g/plant alone and in combination with marigold planting between two rows of okra was found effective to improve the crop growth, suppressing nematode population and reduce number of gall/plant (74.5 and 84.83%, respectively) compared to control. *Trichoderma* grows better in coastal regions of Kerala due to the vast canopy of coconut palms that provide partial shade and maintain the ambient microclimate in the fields. Based on our findings, marigold planted in between okra and apply fungal bioagents *T. harzianum* used as one of the component in the integrated management of *M. incognita* infesting okra which cultivated as intercrops with coconut gardens in coastal Kerala.

EFFECT OF MULCHING AND SPACING IN GROWTH AND YIELD OF OKRA (*Abelmoschus Esculentus*) IN DANG, NEPAL

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ABSTRACT

A field experiment was conducted to study the effect of mulching and spacing on growth and yield of Okra during March to June 2021 in Dang, Nepal. The experiment was laid out for altogether twelve treatment combinations from two factors in randomized complete block design with three replications. The three different plant spacing under first factor was 50 cm x 20 cm, 50 cm x 30 cm and 50 cm x 40 cm while four mulching materials namely black plastic, silver with black plastic, straw mulch and without mulch were considered as second factor.

Significantly least germination days of 8.89 and 9.42 was observed in silver on black plastic mulch and 50 cm x 40 cm respectively. Silver on black plastic mulch enhanced the growth parameters like plant height, leaf number, leaf length, stem girth and canopy diameter. Significantly the largest canopy diameter of 83.40 cm was recorded in silver on black plastic mulch. Significantly the highest yield of 18.56 mt/ha was produced by silver on black plastic mulch than other mulches. All growth parameters were found superior in wider spacing but the highest plant height was found in narrow spacing. The maximum yield of 18.57 mt/ha was obtained in 50 cm x 20 cm than other spacing. Growth and yield was not significantly affected by the combination of spacing and mulching. The combination of 50 cm x 20 cm plant spacing with silver on black plastic mulching gave the highest yield of 21.74 mt/ha. The highest B:C ratio was obtained from silver on black plastic mulch and (50 cm x 20 cm) plant spacing. From this study, it was concluded that silver on black plastic mulch with 50 cm x 20 cm performed the better result than other treatments.

Keywords: Okra, Spacing, Mulching, Yield

TRADITIONAL INDIGENOUS MILK PRODUCT: DESIGNED COLOSTRUM CAKE

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ABSTRACT

The kharvas or colostum cake is an indigenous milk product prepared from colostrum milk. It is prepared since many years by adopting local procedure or recipe. i.e., by steam cooking of the mixture of colostrum milk admixed with normal milk, sugar and condiments. Thus, a smooth junket is formed which is then cut into pieces of desirable size and served as delicacy, either in hot or cold state. Attempts have been made to prepare artificial colostrum cake by utilizing white of egg, whey protein powder and other ingredients. However it is found that this artificial colostrum cake lacks typical flavour. In phase I optimum level of white of egg and whey protein powder for preparation of good quality artificial colostrum cake was determined. In this phase three levels of white of egg and two levels of whey protein powder were used simultaneously in combination to determine most optimum level. Overall six different mixes were prepared. The optimum level was determined on the basis of sensory evaluation of the product. The results revealed that treatment T₃ i.e. artificial colostrum cake prepared by using 50 per cent cow milk, 15 per cent white of egg, 10 per cent whey protein powder and 25 per cent skim milk powder secured highest score, so it was selected for further studies in phase II. In the phase II enrichment of artificial colostrum cake was examined by blending with alphonso mango pulp. The most acceptable treatment in the present study was observed to be T₃ i.e. blending with 15 per cent mango pulp with overall acceptability score of 8.07 followed by treatment T₂ prepared by using 10 per cent mango pulp with score of 7.84 while lowest score was obtained by treatment T₄ prepared by using 20 per cent mango pulp with score of 7.50.

Keywords: *Kharvas*, Colostrum cake, whey protein powder etc.

MORPHO-PHYSIOLOGICAL EVALUATION OF RICE (*ORYZA SATIVA* L.) GENOTYPES FOR LOW LIGHT INTENSITY

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ABSTRACT

A field experiment was conducted at Regional Agriculture Research Station, Karjat, Dist. Raigad (Maharashtra, India) during *Kharif* 2017 to study Evaluation of rice (*Oryza sativa* L.) genotypes for low light intensity. The experiment consisted of two factors *viz.* two treatments (T1-Without shade net and T2-Shade net condition) and sixteen genotypes laid out in *factorial* randomized block design with three replications. The Morphological parameters *i.e.* No. of tillers/plant, No. of productive tillers/plant, No. of leaves/plant, Stem wt./plant (g), Leaf wt./plant (g), Total dry wt./plant (g), AGR, RGR, NAR, LAI, SLW, Total no. of spikelets/panicle, No. of filled spikelets/panicle, Panicle length (cm), 1000 grain weight (g), Grain yield/plant (g), Straw wt./plant (g) and HI (%) at various growth stages were significantly reduced under shade net condition. However, Days to 50% flowering, Days to maturity, Leaf area/plant, plant height and total chlorophyll content was recorded maximum in all the genotypes under shade net condition due to the shade stimulates cellular expansion and rapid cell division as compared to without shade net. The highest grain yield was exhibited in genotype Palghar-2 and lowest was recorded Karjat-BM4 genotype under low light condition. The overall minimum yield reduction percentage was exhibited in genotype Karjat-5-8-13-15-7 and maximum was in Ratnagiri-4 under shade net condition. Whereas, the maximum harvest index was observed in Palghar-2 and minimum was in Karjat-8 under shade net condition. Therefore, on the basis of overall yield reduction percentage, HI and other important traits under shade net, Palghar-2 genotype can be identified as relatively tolerant to light stress. Whereas, genotype Karjat-BM4 was most sensitive for the shade net condition or low light stress in all the tested genotypes. Therefore, Palghar-2 produced better grain yield/plant under shade net condition and could be rated as shade tolerance genotype.

Keywords: Rice, Shade, Tolerance and Light

RESPONSE OF GRAFTS OF DIFFERENT SCION VARIETIES ON DIFFERENT ROOTSTOCK OF MANGO (*Mangifera indica* L.) Under Nursery Conditions

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ABSTRACT

The investigation was carried out at College of Horticulture, Bidar to study the “Performance of grafts of different scion varieties on different rootstock of mango (*Mangifera indica* L.) under nursery conditions” with thirty six treatments comprising of twelve rootstocks (Kurukkan, Kitchner, Olour, EC-95862, Kensington, Peach, Nekkare, Muvandan, Bappakai, Mylepelian, Starch and Local) and three scions (Baneshan, Dashehari and Kesar). Among different rootstocks, Nekkare registered minimum days for sprouting, maximum sprout length,

graft success, height of grafted plant and number of leaves per graft (12.47 days, 6.08 cm, 89.17%, 29.4 cm and 18.33 respectively) whereas the maximum scion girth and root-collar diameter was registered with Bappakai (5.67 and 6.57mm respectively). In scion varieties Kesar recorded minimum days for emergence of sprouts (15.92 days), maximum sprout length (5.39 cm), graft success (85.83 %), height of grafted plant (26.74 cm), scion girth (5.55 mm) and root-collar diameter (6.51mm). In case of different rootstock scion combinations, Nekkare grafted with Kesar recorded minimum number of days taken for sprouting (11.4 days), maximum sprout length (7.15 cm), graft success (95 %), height of grafted plant (33.55 cm) and number of leaves per graft (19.7) whereas, scion girth and root-collar diameter was found non-significant.

Keywords: Rootstock, Scion, Stionic combination, mango, grafting success

EFFECT OF SOLID CARBON DIOXIDE ON PULSE BEETLE IN REDGRAM –WAY TO ECOSTORE PEST MANAGEMENT

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ABSTRACT

Investigations on the effect of solid CO₂ on the biology and development of pulse beetle in red gram carried out during the year 2019-20 at the Centre for Agro-climatic Studies, Department of Agricultural Entomology, College of Agriculture, Raichur Karnataka, revealed that the in the red gram seed treated with 90 and 70 per cent CO₂ concentrations, there was no egg laying from the day of treatment of CO₂ up to 30 days after treatment compared to the untreated check where 51.80 eggs per 10 seeds were recorded at the end of the 30 days . The 50 per cent CO₂ treatment however was not successful in causing cent per cent mortality of the insect. At 30 days after treatment the highest seed damage was noticed in the untreated check (32.40 %) and the lowest damage in the 90 per cent CO₂ treatment (13.93 %), and was on par with 70 and 50 per cent CO₂ treatments. There was no seed weight loss in 90 and 70 per cent CO₂ treatments. The egg count, per cent seed damage, seed weight loss and adult mortality data suggest that both 90 and 70 per cent CO₂ concentrations were able to check the growth and development of the pulse beetle without affecting the quality of seeds and its germination

INTEGRATED DISEASE MANAGEMENT TECHNOLOGY FOR SESAME UNDER CLIMATE CHANGE

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ABSTRACT

Sesame (*Sesamum indicum* L.) is one of the world’s oldest oilseed crops and has been cultivated in Asia since ancient times and largely produced for its oil and is also used as a flavoring agent. The seeds of sesame contain 40 to 63 percent oil, which contains significant amount of oleic and linoleic acids. In the country, it is grown in 15.62 lakh hectares area with production of 7.84 lakh tones and productivity of 502 kg/ha during 2018. Sesame phyllody is the most destructive disease in India. Among the fungal diseases, *Macrophomina* root & stem rot, *Alternaria* leaf blights, *Phytophthora* leaf spot, *Cercospora* leaf spot, Powdery Mildew are important diseases of sesame. The incidence of important diseases varies from state to state

based on agro climatic situations. Seed treatment with Thiram (0.2%) + Carbendazim 50WP (0.1%) and two foliar sprays should be done with wettable sulphur (0.25%) was most effective to minimize the incidence of powdery mildew. Seed treatment with Thiram (0.2%) + Carbendazim 50WP (0.1%) or *T. viride* @ 10 g/kg and two foliar sprays of (Mancozeb 2%+ Carbendazim 1%) was effective for management of the *Alternaria* and *Cercospora leaf spot* disease. Seed treatment with Imidacloprid (17.8 SL @ 5 ml/kg) followed by foliar spray of Acetamiprid 20% SP @ 0.3 g/l was found effective in reducing the vector population and phyllody incidence. Seed treatment with *T. viride* @ 10 g/kg, furrow application of enriched *T. viride* (2.5 kg in 100 kg of FYM) @ 250 kg/ha followed by two foliar spray of combo-product (Tebuconazole 50% + Trifloxystrobin 25%) @ 0.5 g/l was found and economical for the management of *Macrophomina* root and stem rot of sesame.

ANTIBACTERIAL AND ANTIOXIDANT ACTIVITIES OF AGARICUS BISPORUS (J.E. LANGE) IMBACH FROM INDIA

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ABSTRACT

To study about my Research area In the present study, antibacterial and antioxidant (DPPH free radical scavenging activity) activity of an edible mushroom, *Agaricus bisporus* collected from Pakistan was investigated. In antibacterial assays, n-hexane showed 3.56, 2.45, 18 and 2.58 mm inhibition zone diameter (IZD), chloroform showed 6.33, 15.16, 15 and 1.67 mm (IZD) while, ethyl acetate exhibited 29, 22, 36 and 25.13 mm (IZD) against four test plant pathogenic bacteria viz., *Pseudomonas syringae* Van Hall, *Ralstonia solanacearum* Yabuuchi et al. *Xanthomonas axonopodis* Dowson and *Erwinia carotovora* (Jones) Waldee, at 100 mg/ml concentration. Optical density was recorded at 517 nm. n-hexane extract showed 60.73, 47.6 and 33.05%, chloroform showed 98.95, 45, 82.88 and 87.68% whereas, ethyl acetate exhibited 89.83, 65.82 and 23.59% free radical effects as compared to control. Gas chromatography mass spectrometry analysis showed the highest concentration of mono(2-ethylhexyl) phthalate.

Keywords: Bioactive constituents, Mushroom, Bactericide

TRASH MULCHING TECHNIQUES AFFECTING SOIL HEALTH AND CANE YIELDS IN SUGARCANE PLANT-RATOON SYSTEM

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ABSTRACT

Trash mulching techniques viz. Urea / Vermicompost / FYM / *Trichoderma viride* / *Azotobacter*+PSB improved soil health parameters significantly in terms of physical, chemical and biological properties of soil after harvest of sugarcane ratoon crop. Among various mulching treatments improvement was significantly more in plots treated with *Trichoderma*. The mean sugarcane plant height (185.43 cm-232.87 cm) and ratoon crop's height (175.56 cm - 220.65 cm) varied significantly at 280 days old sugarcane crop. The highest dry matter production was recorded in *Trichoderma* inoculated trash mulching treatment (Plant 26.64 t ha⁻¹ and Ratoon 24.94 t ha⁻¹). Sugarcane trash mulching resulted in enhanced number of millable cane, cane yield and sugar yield of plant and ratoon crop over no trash treatment. The

brix percent of cane juice for plant (18.80-20.07) and ratoon crop (17.91-19.31) varied significantly in the treatment of *Trichoderma* inoculated trash only. The quality of juice in terms of brix, pol and purity were comparatively better in trash treated plots over no trash treatment. Sugarcane trash mulching (10 t ha⁻¹) either treated with urea (N 25 kg ha⁻¹)/ FYM (5 t ha⁻¹)/vermicompost (2.5 t ha⁻¹), or inoculated with *Trichoderma viride* (500gm t⁻¹ of trash) / Azotobacter+PSB (5 kg ha⁻¹) improved soil health in terms of soil organic carbon, soil microbial biomass carbon, soil respiration, water holding capacity, bulk density and soil resistance with significant improvement in yield and juice quality of sugarcane plant ratoon system in calcareous soil.

Keywords: Trash mulching, soil properties, cane yield, sugar yield

POPULATION DYNAMICS OF MAJOR INSECT PESTS OF APPLE

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ABSTRACT

Major insect pests of Apple recorded were Green apple aphid, (*Aphis pomi* De Geer); Pale tussock moth, (*Calliteara pudibunda* Linneaus); Tussock moth, (*Euproctis guttata* Collenette); Giant looper, (*Ascotis selenaria* Denis & Schiffermuller) and Cocoa tussock moth, (*Orgyia postica* Walker). Results obtained during the study revealed that aphid population attained its peak on 25th SMW (3rd week of June, 2018) with the mean population of 34.75 aphids/ 10cm apical length of twig/shoot/plant. Pale tussock moth population reached to its peak during 28th SMW (2nd week of July, 2018) with mean larval population of 3.82 larva/ plant. Tussock moth attained its peak on 35th SMW (last week of August) with average larval population of 4.15 larvae/ plant. Giant looper population was highest on 28th SMW (2nd week of July, 2018) with larval population of 3.46 larvae/ plant. Cocoa tussock moth population was highest of 4.75 larvae/ plant which were obtained on 26th SMW (27th June, 2018). Correlation coefficient (r) studies indicated significant correlation between the mean population of green apple aphid and maximum temperature. Mean larval population of Tussock moth and cocoa tussock moth showed significant correlation with minimum temperature. Linear regression graph was also worked out and fitted to determine the impact of independent variables on dependent variables.

Keywords: Green apple aphid, Pale tussock moth, Tussock moth, Giant looper, Cocoa tussock moth, correlation, regression.

PARASITIC POTENTIAL OF *Trichogramma japonicum* AND RELATIVE TOXICITY OF INSECTICIDES

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ABSTRACT

Parasitic potential of *Trichogramma japonicum* Ashmead on different host and relative toxicity of insecticide under field conditions various researchers found that the highest emergence of parasitoid's on *S. cerealella* eggs followed by *E. kuehniella* eggs. The highest parasitism by *T. japonicum* was reported on *E. kuehniella* eggs. The higher proportions of flying *T.*

japonicum were observed when reared on *E. kuehniella* and *C. cephalonica* egg. Field studies showed that *T. japonicum* mass-reared on *E. kuehniella* showed higher parasitism of its natural host, *S. incertulus* eggs. Hence, by considering these biological characteristics and field results, *E. kuehniella* could be leveraged for the mass rearing of quality parasitoid's of *T. japonicum* in India. The relative toxicity of the insecticide in quinalphos 25 EC had a negative impact on *T. japonicum* egg parasitization as well as adult emergence. Further, lambda-cyhalothrin 5 EC and fipronil 5 SC were found to be harmless for the adult emergence of *T. japonicum* whereas, being found to be slightly and moderately harmful to the egg parasitization. The other insecticides were discovered to be relatively less toxic to *T. japonicum* adult emergence and egg parasitization. Flubendiamide 39.35 SC, Chlorantraniliprole 18.5 SC, Thiacloprid 21.7 SC, and Thiamethoxam 25 WG can be used in the IPM programme of rice as a consolidated manner with *T. japonicum* based on the relative toxicity effect as they were found to be comparatively safer than the rest of the tested insecticide during the current investigation.

Keywords: Parasitism, *Trichogramma japonicum*, Relative toxicity, Insecticide.

EFFECT OF SUGARCANE BAGASSE-DERIVED BIOCHAR ON BIOAVAILABILITY OF ARSENIC IN SOIL

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ABSTRACT

Arsenic (As) hazard is a significant environmental problem due to its cycling through the water-soil-plant-human/animal-continuum. It is a hazardous trace element that has been wreaking havoc on many nations, including India, particularly in the areas surrounding the Ganga delta basin. Excess As can have negative health impacts on people, including both carcinogenic and non-carcinogenic concerns. Most arsenic pollution is geogenic in nature, and overusing groundwater for agriculture has been identified as a key contributor to arsenic pollution. As a result, soil has been a significant source and sink of As in polluted areas. Numerous researches have concentrated on using various organic amendments to reducing the mobility and bioavailability of As in polluted soil. Biochar derived from sugarcane bagasse has advantages over other soil remediation techniques. It is an effective agent for lowering As bioavailability because it persists in soil for a longer period of time, has a high cation exchange capacity, a porous structure, and is naturally alkaline. In addition to this it contains a large number of carboxyl and hydroxyl groups, which can reduce the bioavailability of heavy metals, thus reducing plant absorption and food chain transfer.

Keywords: Arsenic, Geogenic, Bioavailability etc.

AN OVERVIEW OF CONSTRUCTION OF FERRO-CEMENTED DHEENABANDHU MODEL BIOGAS PLANT

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ABSTRACT

In India, a program of biogas development has been underway for a number of years under the auspices of khadi and village industries commission (KVIC). Several educational and research institutions have been engaged in various aspects of biogas plant design, construction, installation and maintenance techniques, as also cheaper feed stock materials usage for gas plants. Biogas is produced by bacteria through the bio-degradation of organic material under anaerobic conditions. Natural generation of biogas is an important part of bio-geochemical carbon cycle. It can be used both in rural and urban areas. Biogas is lighter than air and has an ignition temperature of approximately 700 °C [diesel oil 350 °C; petrol and propane about 50 °C]. The temperature of the flame is 870 °C. Biogas consists of 50 to 65% CH₄, 35 to 50% CO₂, 30 to 160 g/m³ of water and 4 to 6 g/m³ of H₂S. Longer the digestion process, higher the methane content and hence its calorific value. Throughout the world, a countless number of designs of biogas plants have been developed under specific climatic and socio-economic conditions. Materials used in the plant design are Cement, Sand, Gravel, Water, Bricks, Cobble Stones. Construction involves Site Selection, Site Layout, Construction of Digester Main Chamber, Concrete Foundation for Digester, Outlet Chamber Construction, Construction of Inlet Tank, Complete inlet tank with mixer, Lay-out of Pipeline, Construction of Gas Line Condensate Drain Valve Box, Schematic for Condensate Drain Valve in Gas Line, Compost Pits with Brick Walls for Stability. For proper function of the plant, the optimal temperature has to be maintained in the digester. Therefore, a sunny site should be selected to keep the digester near 35 degrees. Gas pipe length should be kept as short as possible. The plant should be at least 10 meters away from groundwater wells or surface water bodies to protect water from pollution.

Keywords: Biogas Plant, Dheenabandhu, Digester, KVIC

SOIL MICROBIAL RESOURCES FOR NUTRIENT USE EFFICIENCY IN INTEGRATED NUTRIENT MANAGEMENT SYSTEM

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ABSTRACT

The agriculture sector is challenged by increasing global demand for food, scarcity of arable lands and resources alongside multiple environment pressures which needs to be managed smartly through sustainable and eco-efficient approaches. The macronutrients such as nitrogen (N), phosphorus (P), potassium (K), and sulphur (S) supplied by mineral fertilizers are vital to crop production. The chemical fertilizers are used by farmers to achieve desired crop yields but the recovery of applied inorganic fertilizers by plants is low in many soils. Estimates of overall efficiency of these applied fertilizers have been about 50% or lower for N, less than 10% for P, and close to 60% for K (Basak et al., 2010). These lower efficiencies are due to significant losses of nutrients by leaching, run-off, gaseous emission and fixation by soil. These losses can potentially contribute to degradation of soil, and water quality and eventually lead to overall environmental degradation. These are compelling reasons of the need to increase nutrient use efficiency (NUE). Overall, the NUE by crop plants is 50% under all agro-ecological conditions. The improvement of NUE is an important goal to harvest better crop yield on sustained basis. One of the solutions could be the use of agriculturally beneficial microorganisms which contribute directly (i.e., biological N₂ fixation, P solubilization, and phytohormone production etc.) or indirectly (i.e., antimicrobial compounds biosynthesis etc.) to crop improvement and

fertilizers efficiency. In fact, the combined usage of beneficial microorganisms and mineral resources is an emerging research area that aims to design and develop efficient microbial formulations which are highly compatible with mineral inputs, with positive impacts on both crops and environment. Generally, microbial-based bioformulation may be classified into four types: (i) NF bacteria, (ii) P solubilizing/mobilizing microorganisms, (iii) composting microorganisms and (iv) biopesticides (Bargaz et al., 2018). In addition, microbial groups exhibit such plant growth promoting traits (i.e., phytohormones, siderophores, amino acids, and polysaccharides etc.) that plausibly contribute to an additional crop improvement.

The plant beneficial rhizosphere microorganism (PBRMs) increases the availability of nutrients for the plant in the rhizosphere (Meena et al., 2017). The methods by which this increase takes place involves fixation of nitrogen, solubilization of unavailable forms of nutrients, siderophore production, and ammonia production (Meena et al., 2017). Plants release phyto siderophores to enhance their Fe uptake, phyto siderophores typically have a lower affinity for iron than microbial siderophores. Thus, these plants are unable to uptake sufficient amounts of iron. From the above study it can be concluded that the microbial activities in the rhizosphere directly helps for the nutrient accessibility *viz.* N, P, K, S, Fe, Zn etc. in soil by taking part in nutrient dynamics.

Keywords: Nutrient use efficiency, Beneficial Microorganism, Integrated nutrient management.

IRRIGATION AND FLOOD MITIGATION STRATEGIES IN AGRICULTURAL FIELDS FOR THE NORTHERN HIMALAYAN REGION, INDIA

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ABSTRACT

In India, about 5.7 m ha (both inland and coastal salinity) land is affected and on account of this, there is an estimated annual loss of about Rs 20,000 crore. Almost 1.5m ha area is affected in Punjab, Haryana, and Rajasthan only. Unfortunately, this subject is most neglected and not being addressed by any ministry (Agri., Rural Development, Water Resources) and state governments. Irrigation of agricultural fields, no doubt is regarded as essential for food security for humanity. But over many years it has become a part of the problem because of the turning of well-irrigated lands into saline areas and is hastening the process of wet desertification. This process has happened all over the world, be it developing or developing or developed countries, in all the old irrigation commands which were having good productivity but after few years negative effects on productivity have been noticed. The reclamation of this soil is not easy, like reclaiming alkali soil but it is very difficult and complex due to unfavorable geo-hydrological and agro-climatic conditions of the area. Moreover, the problem has to be tackled on a cluster basis as per drainage pattern and the individual farmer may not succeed. The issue was well investigated tried vertical drainage, surface drainage, bio drainage, and sub-surface drainage along with well-skimming technology but concluded that sub-surface horizontal drainage with integration with surface drainage is the only solution for the areas which are under natural depression having poor aquifer conditions with poor underground water quality.

However vertical drainage can be tried in marginal areas but due to its long gestation period, farmers do come forward easily. May be due to a lack of knowledge or will at any level. The technology of reclamation is available with a lot of data but only the right political will is needed.

CLIMATE RESILIENT FRUIT CROPS – IN A CHANGING CLIMATE SCENARIO, A POSSIBLE SOLUTION TO ENSURE NUTRITIONAL SECURITY

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ABSTRACT

As a result of many disruptive anthropogenic activities and disruptive misuse of nature, our biosphere is in grave danger. The climate of the entire planet is rapidly changing. Climate change is a severe hazard to humans as well as the environment. No one is immune to its devastation, and the devastating impact on the plant kingdom must never be neglected, as humans rely on them not just for food security but also for nutritional security in order to survive. Most significantly, all flora and wildlife are necessary for maintaining the ecological equilibrium. Climate change has a particularly negative impact on fruit crops. We need to focus on climate smart fruit crops as a possible option to ensure that nutritional security is maintained and fruit crops are available even under changing climate conditions. Even in a changing climate, fruit crops such as dragon fruit, phalsa, pumello, bael, wood apple, aonla, karonda, Barbados cherry, pomegranate, and fig can be grown. These fruit crops are not only nutrient-dense, but they are also a viable option for mitigating the effects of climate change.

Keywords: Climate Resilient, Fruit Crops, Nutritional Security, ClimateChanging, anthropogenic

VERMICOMPOSTING AS AN APPROPRIATE AID IN SUSTAINABLE AGRICULTURE

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ABSTRACT

The soil performs ecological services for the survival and nourishment of life. Therefore, maintaining and improving soil health has paramount importance for sustainability of ecosystem. Application of vermicompost as organic manure in soil built-up organic carbon, improve nutrient status, enhance cation exchange capacity, microbial activities, microbial biomass carbon, enzymatic activities and also aid in sustainability in the environment. Earthworm cocoons multiply through vermin culture and make soil more permeable, improve water infiltration and moisture retention. The temperature of the earthworm feed should be in the range of 20-35 °C along with relative humidity of 60–80%. Typically, red worms double the rate of carbon loss and accelerate the carbon mineralization. The best original raw material to be used for vermicompost production is cattle manure. In this process, the nutrients contained in the organic matter are partly converted to bioavailable forms. The hormones and enzymes are believed to stimulate plant growth and discourage plant pathogens, vermicompost brought about average increases of 26% in commercial yield, 13% in total biomass, 78% in

shoot biomass, and 57% in root biomass. The positive effect of vermicompost on plant growth reaches maximum when vermicompost accounts about 30 to 50% of the soil volume. It helps to neutralize the pH of the soil. It improves plant growth by enabling the growth of new shoots and leaves thereby increasing plant productivity. The continued use of chemical fertilizers causes health and environmental hazards such as ground and surface water pollution by nitrate leaching. Vermicompost is rich in microbial populations and diversity, particularly fungi, bacteria and actinomycetes. Reduces use of water for irrigation, reduces pest infestation, reduces termite attack, reduces weed growth; fasten the rate of seed germination and rapid seedlings growth and development; greater numbers of fruits per plant (in vegetable crops) and greater numbers of seeds per year (in cereal crops) are some of the beneficial effects of the vermicompost usage in agricultural production. Manure application in fields can reduce overall costs and pollution without affecting yields. Physico-chemical analysis had shown that vermicomposting reduces total organic carbon (TOC) and carbon-nitrogen (C/N) ratio but increases nitrogen-phosphorus-potassium (NPK) content when compared to compost and other agricultural wastes

Keywords: vermicomposting, soil health, yield, sustainability

HEAT STRESS: YIELD AND QUALITY RUN DOWN FACTOR IN LATE SOWN WHEAT

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ABSTRACT

Wheat is one of the most important Poaceae family species produced all over the world for the survival of human nutrition such as bread manufacturing and bakery. In human nutrition, wheat is a low-cost source of calories, proteins, and carbohydrates. But presently, in cropping system because of changing climate high temperature is a serious concern in agricultural systems across the world, creating unanticipated geographical and temporal changes that cause lower plant growth, development, production, productivity and other nutritional factors (Parent et al., 2010). The temperature greater than optimal shows adverse effects on plants, is considered as heat stress (Kumar et al., 2015). Wheat growing areas are predominantly being affected by high temperature stress. The likely vulnerable region includes Eastern Gangetic Plains of India comprising of vast tracts of Bihar. By 2050, the region will be recognized as heat stressed, irrigated, short season production mega environment. Among the various factors, late harvesting of rice crop resulting late sowing of wheat crop is the main factor which coincide the flowering and grain filling stage with heat stress causes significant reduction in growth and yield parameters (Wollenweber et al., 2003) and grain yield (Russel & Wilson, 1994). Even short period of high temperature (35-40°C) during grain development could have a negative effect on grain quality and shrinking of grains. To reduce the effect of heat stress and stop yield reduction in late sown wheat foliar spray of synthetic compounds like KNO₃ and CaCl₂ played beneficial role in wheat facing high temperature stress. Foliar spray of KNO₃ (0.5%) and CaCl₂ (0.1%) concentration both during booting and anthesis stage protected flag leaf chlorophyll content, throughout the post anthesis stage period and maintained lower level of electrolytic leakage and proline content in the leaves which signified lower degree of stress as well as higher heat tolerance capacity consequently improves all yield and yield attribute. Agronomic strategies for mediating future increases in ambient temperature include practices that conserve water (e.g., tillage and stubble retention), fertilization during critical growth stages and timing of sowing.

IMPACT OF HEAT STRESS ON WHEAT CROP AND ITS POSSIBLE MANAGEMENT PRACTICES

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ABSTRACT

Global climate models predict an increase in mean ambient temperatures between 1.8 and 5.8°C by the end of this century (IPCC, 2007). Future climates will also be affected by greater variability in temperature and increased frequency of hot days and more severity. To get sustainable food for growing population we need to adapt new crops and crop varieties to the future climate, we need to understand how crops respond to elevated temperatures and how tolerance to heat can be improved (Halford, 2009). Temperature above the optimum for growth can be deleterious, causing injury or irreversible damage, which is generally called ‘heat stress’. Heat stress is a function of the magnitude and rate of temperature increase, as well as the duration of exposure to the raised temperature (Wahid et al., 2007). Plants detect changes in ambient temperature through perturbations in metabolism, membrane fluidity, protein conformation and assembly of the cytoskeleton (Ruelland and Zachowski, 2010). Such reactions activate adaptive processes like expression of heat shock proteins, until new cellular equilibriums are reached. High temperatures causing heat stress in wheat are expected to increase in frequency across the globe. Heat stress substantially affects grain setting, duration and rate, and ultimately grain yield. Nonetheless the timing, duration and intensity of heat stress determine its impact on grain yield. The harsh conditions of heat stress can be minimized by developing tolerant genotypes and agronomic strategies. Even though in wheat, mechanisms of heat tolerance on a physiological basis are relatively well-understood, research into assimilate partitioning and phenotypic flexibility are needed.

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CLIMATE CHANGE AND APPROACHES FOR ITS MITIGATION

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ABSTRACT

The greatest significant environmental threat to humanity's future is climate change, which has ramifications for natural ecosystems, agriculture, and human health. The term "climate change" refers to a change in climate patterns primarily brought on by natural systems and human activity-related greenhouse gas emissions. A review of general circulation models (GCMs) on climate change shows that during the next 100 years, the average global surface temperature is

projected to rise by 1.5–4.5°C as a result of growing greenhouse gas concentrations. The average temperature has decreased by 6°C between the previous ice age and the current climate. As a result, sea levels will rise, climate zones will move poleward, and storms and soil moisture will be reduced. Agriculture production is expected to be impacted by global warming. If the current emission rates continue, anthropogenic activities would likely increase global warming by 1.5 °C between 2030 and 2052, which is now roughly 1.0 °C above pre-industrial levels. Thus mitigation of climate change is a serious issue which needs to be addressed. A variety of techniques, including traditional mitigation technologies like nuclear power, renewable energy, carbon capture and utilization (CCU), fuel switching, and efficiency improvements, the carbon capture and storage technology, etc., will be beneficial in mitigating climate change. Additionally, appropriate and better crop varieties, adjustments to cultural norms, water management, microclimate alterations, soil organic carbon build-up, etc. are viable adaptation strategies that will aid in climate change mitigation.

CLIMATE CHANGE AND ITS IMPACT - CLIMATE CHANGE AND ABIOTIC STRESS MANAGEMENT

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ABSTRACT

Abiotic stress factors, mainly salinity, drought, flooding and high temperature, are the main elements which drastically limit the horticultural crop productivity globally. Abiotic stress leads to a series of morphological, physiological, biochemical and molecular changes in plants that adversely affect growth and productivity. Extreme environmental events in the era of global climatic change further aggravate the problem and remarkably restrict the plant growth and development. The mechanisms underlying endurance and adaptation to environmental stress factors have long been the focus of intense research. Plants overcome environmental stresses by the development of tolerance, resistance or avoidance mechanisms. Plant acclimation to environmental stresses is the process to adjust to a gradual change in its environment which allows the plants to maintain performance across range of adverse environmental conditions. Stress tolerance mechanisms in horticultural crops are gaining attention because most agricultural regions are predicted to experience considerably more extreme environmental fluctuations due to global climate change.

Keywords: Abiotic stress, Climate Change, Aggravate, Horticultural Crops, Environmental Stress

IMPACT OF DIFFERENT ORGANIC MANURES ON SOIL BIOLOGICAL PROPERTIES IN BASMATI RICE-BERSEEM SYSTEM ON JAMMU REGION

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ABSTRACT

Organic manure applications can affect the soil biological properties. In a rice based cropping systems there are wide variations in the soil chemical characteristics throughout the crop cycle. The present study was conducted to study the impact of different manures on soil bacterial & fungi population, microbial biomass carbon & nitrogen, dehydrogenase and phosphatase activity in a rice (basmati)-berseem system during 2018-19 and 2019-20. The treatments were T₁-Control (No application); T₂-Farm Yard Manure (FYM) (100 % N); T₃-Vermicompost, VC (100 % N); T₄ - FYM (50% N) + VC (50 % N); T₅-FYM (50% N) + Poultry manure, PM (50 % N); T₆-FYM (50% N) + Neem cake, NC (50 % N); T₇-VC (50% N) + PM (50 % N) and T₈-VC (50% N) + NC (50 % N). Bacterial population was significant highest in combined application of FYM with PM and alone application of VC over control after harvest of rice and berseem, respectively but fungi population was significant highest in FYM along with VC during both years. Dehydrogenase activity was significant highest in VC and VC with PM over control after harvest of rice and berseem respectively but phosphatase activity was significant highest in combined application of VC and PM and FYM with VC over control after harvest of rice and berseem, respectively. The microbial biomass carbon was significant highest in FYM with NC but microbial biomass nitrogen was significant highest in VC with PM than control after harvest of rice and berseem respectively.

Keywords: organic manures, soil bacterial and fungi population, dehydrogenase and phosphatase activity, microbial biomass carbon and nitrogen, rice-berseem system

EFFECTIVENESS OF VOCATIONAL TRAININGS FOR FARM WOMEN CONDUCTED BY KRISHI VIGYAN KENDRA JEOLIKOTE, UTTARAKHAND

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ABSTRACT

Training is one of the commonly used methods to improve the knowledge and skill of the trainees that helps to change the outlook and attitude of farmwomen and thereby making them empowered. Krishi Vigyan Kendras are working at grassroot level to empower the farm women by imparting training. The study was conducted in Nainital district. A total sample size of 90 respondents was selected i.e 45 beneficiaries and 45 non beneficiaries through purposive sampling and proportional allocation method respectively. Difference between women empowerment of beneficiaries and non beneficiaries was determined. Association with selected variables was calculated by using ‘chi square’ test. The opinions from the beneficiaries regarding the vocational trainings conducted under KVK were studied. ‘Z’ test was used to see the effectiveness of vocational trainings through KVK on empowerment. The findings of the study revealed that majority of the respondents in both the groups belonged to middle aged group, had education up to high school in both beneficiaries and non beneficiaries i.e (51.11%) and (53.33%) respectively. About three fourth (73.33%) of beneficiaries and (88.88%) of non beneficiaries had small size of land holding, with low annual income level i.e. (71.11%) and (44.44%) of the non beneficiaries and beneficiaries respectively. Results revealed that, majority of the beneficiaries (73.33%) and only (6.66%) of non beneficiaries had high level of risk orientation, with maximum number of non beneficiaries (77.77%) among low level of scientific orientation. Regarding the women empowerment all most equal number of respondents in both the categories had medium level of empowerment i.e (24.44%) of beneficiaries and (28.88%)

of non beneficiaries. Significant differences was found between beneficiaries and non beneficiaries in case of high level of empowerment i.e. (75%) of the beneficiaries had high level of empowerment where as only (15.55%) of non beneficiaries were having high level of empowerment. Empowerment had significant association with selected independent variables such as scientific orientation, and risk orientation at 5 % level of significance. Further the difference between the beneficiaries and non beneficiaries in terms of empowerment were found significant at 1 % level of significance. Findings of the study will be useful to the KVKs, planners, extension personnel's that will enable them to form strategy in helping the farm women to learn more need based skills for their all round development.

EFFECT OF CONSERVATION AGRICULTURE ON CHEMICAL PROPERTIES UNDER DIFFERENT CROPPING SYSTEMS IN ALLUVIAL SOIL OF BIHAR

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ABSTRACT

Soils are our most precious natural resource. Maintaining them in a state of high productivity on sustainable basis is extremely important for meeting people's basic needs particularly in a state like Bihar which is largely dependent on agriculture. In order to meet the ever increasing demand for food for the growing population, farmers are bound to grow more crops without adopting proper crop establishment techniques and cropping systems which leads to severe exploitation of natural resources. Besides this, imbalanced and improper use of chemical fertilizers adds to the deteriorating condition of soil health which has been given very little attention in the past to tile judicious use of our soil resources. Conservation Agriculture offers an opportunity for arresting and reversing the downward spiral of resource degradation as well as leads to an environmentally sound sustainable agriculture. Organic materials hold great promise due to their local availability, as a source of multiple nutrients and their availability to improve soil characteristics. Keeping these views in mind, the present study was carried out in the post harvest soil (2017) of the ongoing Conservation Agriculture experiment on “Effect of rice establishment techniques on crop yield of different rice based cropping systems” which was initiated in Kharif - 2011 at BAC Farm, Sabour, Bhagalpur. The experiment has been laid out in a split plot design which includes three main plots of different rice establishment techniques *viz.* Zero tillage (ZT), Permanent bed (PB) and Conventional tillage (CT) and sub-plot treatments comprising of rice crop in three different cropping systems *viz.* rice-wheat (R-W), rice-maize (R-M) and rice-lentil (R-L). The results show that Rice establishment techniques like ZT & PB significantly increased the organic carbon (0.49 to 0.65%), cation exchange capacity (10.05 to 13.21[cmol (p⁺) kg⁻¹]). pH of soil under conservation agriculture were found statistically non- significant and soil pH declined from 7.48 to 7.13 due to various treatment combinations. EC ranged between 0.26 to 0.31 dS/m due to interaction effect of establishment methods (T) and cropping systems (S).

LEGUME VEGETABLES: PARADIGM FOR NUTRITIONAL SECURITY

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ABSTRACT

Legume vegetables (Garden pea, French bean, Cowpea, Cluster bean, Lima bean, Winged bean, etc.) are an important source of protein in a well-balanced human diet. Furthermore, they contain a significant number of carbs, vitamins, and minerals, as well as a variety of other health-promoting bioactive substances. As consumers grow more aware of the significance of a well-balanced diet, demand for both fresh and processed legume vegetables is continuously increasing. Vitamins A and C are also abundant in the immature pods of legume plants. They are reasonably inexpensive and sustainable, have a low glycaemic index, are high in protein and fibre, and are extremely beneficial in the treatment of diabetes, cardiovascular disease, some malignancies, and a variety of degenerative diseases. The overall goal was to present current information about legume vegetables, which are thought to have a lot of potential in terms of various nutrients and biomolecules that have a lot of promise in terms of supporting our various health problems and alleviating them on a worldwide scale.

Keywords: leguminous vegetables, glycaemic index, degenerative disease

SPATIAL VARIABILITY OF FE UNDER DIFFERENT LAND USE SYSTEM IN LOWER GANGETIC PLAINS OF BIHAR

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ABSTRACT

At present, community-based land-use and land-cover planning for sustainable soils management system are recommended to protect, conserve and rehabilitate the remaining natural environment for Kosi region. Geospatial modeling techniques are designed to discover patterns in data that include a geospatial (map) component. In this context, enrichment of soil micronutrients and their management is crucial for plant nutrition, and this is more relevant to acid to neutral soils for offering the Fe nutrients in young alluvial plain in soils of Bihar. In this study, total 80 soil samples were collected from different land use and brought under GIS environment for run the geostatistical models of the test element. The Circular model, Spherical model, Exponential model and Gaussian model were used to validate the Semivariogram model for Fe under different land use developed by using different algorithms. The present study also develops the prediction map after comparing the Random Forest model (RFM) with best fitted model of geostatistics through OK method. This model could accurately confirm for every soil property based on ME (Mean error), Root Mean Square Error (RMSE), Mean Standardized Error (MSE), Root Mean Square Error (RMSSE), respectively. The results revealed that distribution of Total Fe was found in following sequence like forest land> horticultural land> grass land> agricultural land> barren land, respectively. Whereas, distribution of residual Fe was found varied in the following sequence like horticultural land> forest land> grass land>

agricultural land > barren land, respectively. The logistic regression was widely used for predictions or judgement on soil properties due to ability to high nonlinear dimensional relationships, resistance to "overfitting" and further ability to determine the relevance of the variables, and ordinary krigging (OK) interpolation method of unknown soil properties. Moreover, the exponential model was best fitted model for prediction of available Fe with good accuracy level. The variability of Total Fe was varied from 12-64 percent which was mainly controlled by three key soil parameters like soil acidity, clay content, CaCO₃ content. Therefore, this study supports that a growing amount of sophisticated data from remote sensing, particularly proximal sensing, allows agricultural planners to bridge the gap between data and decisions, which ultimately leads to decision-making processes for Fe nutrition in the soils.

Keywords: Remote Sensing and GIS, Semiverogram model and Land Use

OPTIMIZING SOIL MOISTURE AND PAR UTILIZATION WITH FERTILIZER SPLITTING FOR RAINFED RICE (*Oryza sativa* L.) UNDER INDO-GANGETIC PLAIN

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ABSTRACT

The present investigation was carried out entitled “Optimizing Soil Moisture and PAR Utilization with Fertilizer Splitting for Rainfed Rice (*Oryza sativa* L.) under Indo-Gangetic plain” during the *Kharif* season of 2017 and 2018 on a sandy loam soil of Bihar Agricultural College farm, Sabour to derive inputs for rationalizing the use of K and N fertilizers by splitting and real-time management respectively for making them more suitable for rainfed conditions. Nutrient and water management are important for diversifying and intensifying the rainfed rice-based cropping systems. Results revealed that the recommended fixed time split N applications under rainfed conditions are not adequate to synchronize N supply with actual N demand due to variations in crop N demand. During 2017, N_{SPAD} resulted in an additional N application of 33 kg ha⁻¹ in 5 out of 9 cases. However, during 2018 no plot under N_{SPAD} received any extra N application. This could have possibly resulted because of greater uniformity among various plots due to the cultivation of lentil crops in the preceding *rabi* season. It was generally observed that N- application time through 1st topdressing increased beyond the active tillering stage by up to one week. However, the 2nd top dressing was still achieved the by panicle initiation stage. Under rainfed conditions, real-time N management can promote crop growth. Real-time N management as in N_{SPAD} and N_{GS} resulted in reduced tiller mortality during the reproductive stage. Reduced tiller mortality is suggestive of optimized soil moisture and radiation utilization under real-time N management application in two split doses stimulated tillering in rice crops. The tillers were significantly higher by 5.24 and 7.28 percent with K application in two split doses over the single basal application and no K application respectively and decreased the death of tillers during the reproductive stage of the crop. K application in two split doses also significantly increased the number of effective tillers by 5.30 and 7.64 percent over the single basal application and no K application respectively. Thus, it can be concluded that SPAD-based N application is the best treatment in terms of growth, yield, and nutrient uptake on account of N fertilizer splitting in rainfed conditions. This assumes greater significance considering that despite the uncertainty in the soil moisture regime of the rainfed rice crop, optical sensor measurement can help better fertilizer nitrogen management.

MOLECULAR PROFILING OF ADOPTED RICE VARIETIES OF BIHAR BY USING MICROSATELLITE SSR MARKERS.

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ABSTRACT

Twenty-two rice varieties were planted in RBD with 3 replications during 2018-19 at Rice Research farm, RPCAU, Pusa, Samastipur, Bihar to study the molecular characterisation of different adopted rice varieties of Bihar. Amplification reaction was performed with fifteen microsatellites based SSR primers RM 566, RM 520, RM 555, RM 324, RM 521, RM 431, RM 28166, RM 5791, RM 319, RM 416, MRG 2894 IRR 2894, MRG 2805 HAU 2805, RM 321, RM 286 and RM 70 targeting the chromosomes of the rice genome. Amplification was successfully achieved with all the primer pairs used during investigation. Polymorphism among the varieties was recognized on the basis of presence or absence of bands, in addition to variation in number and position of bands. Primer pair MRG 2805.HAU 2805 showed maximum polymorphism, therefore it can be utilized for further characterization of rice genome. A total of 92 shared and 48 unique allelic variants were generated by using the fifteen primer pairs. The number of shared alleles per locus ranged from four in case of RM 319 and MRG 2805 HAU 2805 to eleven in case of RM 5791. 118 Summary and Conclusion Similarly, the number of unique alleles per locus ranged from one in case of RM 319 and MRG 2894 IRR 2894 to ten in the case of RM 521. The cluster analysis based on similarity index of simple matching grouped the studied rice genotypes into six clusters, and no geographical isolation was observed. Microsatellite marker-based analysis revealed unique or variety specific allele which could be useful as DNA fingerprints in the identification and preservation of rice varieties. The use of fifteen microsatellite markers in the analysis of rice entries exhibited a remarkable higher level of genetic polymorphism, which allowed unique genotyping of twenty-two entries included in the analysis. In other words, selection for these varieties for further research program may be rewarding.

ENCAPSULATION TECHNOLOGIES OF FUNCTIONAL ANTIOXIDATIVE MOLECULES FROM BLACK RICE: RECENT TRENDS AND FUTURE ASPECTS

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ABSTRACT

As a result of the recent popularity of the encapsulation technique, which is used to protect bioactive compounds from various environmental stresses (such as low pH, high temperature, light, moisture, and so on) and to regulate the controlled release of bioactive compounds at their target sites. Cyanidin 3-glucoside, cyanidin 3-rutinoside, cyanidin 3-galactoside, cyanidin 3,5-diglucoside, malvidin 3-galactoside, peonidin 3-glucoside, and pelargonidin 3,5-diglucoside are the most commonly isolated and identified antioxidative compounds found in black rice. When antioxidative compounds like anthocyanins are incorporated into a food matrix system, requires special protection, such as encapsulation, to maintain stability during processing and storage because anthocyanins are highly sensitive compound. Spray drying, freeze drying, and liposomal encapsulation techniques have all been explored for encapsulating sensitive molecules and have resulted in various viable encapsulation approaches such as

microencapsulation and nanoencapsulation. Quantification and comparison of encapsulated anthocyanin from various methods are required. The development of functional food and the validation of biomolecule functionalities in a carrier food matrix will result from the successful development of a delivery system and validation of biomolecule functionalities in a carrier food matrix, addressing issues related to lifestyle or metabolic diseases.

Keywords: Anthocyanin, Freeze drying, Liposomal, Microencapsulation, Nanoencapsulation, Spray drying

ASSESSMENT AND SUITABILITY OF IRRIGATION WATER QUALITY FOR MAKHANA GROWING AREAS UNDER LOW LAND ECOSYSTEM IN KOSI REGION, BIHAR USING REMOTE SENSING AND GIS

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ABSTRACT

Makhana (*Euryale ferox Salisb.*), also known as Gorgon nut or Fox nut, is an important aquatic crop, belonging to the family Nymphaeaceae. Makhana is an aquatic and emergent macrophyte. It is grown in stagnant perennial water bodies like ponds and depressions, oxbow lakes, swamps, and ditches. It is a plant of tropical and subtropical climates. It is mainly cultivated in the states of Bihar, West Bengal, and Assam. Bihar is one of the leading producers of makhana accounting for more than 85% of the total production in India. The different districts like Madhubani, Darbhanga, Sitamarhi, Saharsa, Katihar, Purnia, Uphaul, Kishanganj, and Araria districts are the major producer's districts in the state. For its proper growth and development, the conductive range of air temperature is 20-35^oc, relative humidity 50-90%, and annual rainfall 100-250 cm. While, consideration of results, revealed that pH 6.01-7.41, calcium 32-38 mg/l, magnesium 3-5 mg/l, potassium 0.40–1.50 mg/l, sodium 0.28-1.46 mg/l, bicarbonate constant at 50 mg/l, phosphate 0.04-0.12 mg/l, electrical conductivity constant at 0.05 mg/l for the dry season. The lower value of EC signifies a low concentration of dissolved ions and organic matters. The result further revealed the presence of a varying degree of dissolved salts in the study water. However, the value of EC and TDS of water in the Kosi region is within the permissible limit for irrigation, and water is suitable for irrigation purposes in terms of EC and TDS. The makhana-based integrated farming system under pond and field conditions. Overall, we recommended that farmers should have to encourage the judicious use of biofertilizers and biopesticides to avoid the soil and surface water. There must be an action plan have to formulated for the short-term and long-term management for the judicious use of surface water resources and other natural resources after taking into account the population of the people, agricultural activities, availability of water resources, etc. There should be sustainable watershed management to protect the quality and quantity in the Kosi region, and an irrigation plan has to formulate complete information on the substantial use of Kosi region water for irrigation purposes.

Keywords: Makhana, pH, EC, TDS, RS and GIS,

MICROBIOLOGICAL ASPECTS OF ORGANIC MATTER DECOMPOSITION AND THEIR IMPLICATIONS FOR SOIL QUALITY

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ABSTRACT

Most studies show that increasing soil organic matter is beneficial to soil fertility, function, and agricultural production systems. The decomposition process, which disintegrates soil organic matter into smaller and smaller pieces and subsequently inorganic compounds. The key role of various microorganisms in organic carbon decomposition and soil ecosystem maintenance. Decomposition is predominantly a microbiological process, Heterotrophic microflora and microfauna, which includes bacteria, fungi, actinomycetes, and protozoa, perform decomposition and Decomposition of organic substances is mostly an enzymatic process. Microbial cells produce constitutional enzymes. Extracellular enzymes produced by microorganisms are required for the decomposition of soil organic matter (SOM). Microbes secrete enzymes to acquire carbon (C) or limiting nutrients as well as to target the most abundant substrates. The actual rate and extent of the process are affected by environmental factors, such as soil temperature, moisture, oxygen, nitrogen content, the quality and quantity of available carbon substrates, and soil management. The constant addition of decaying plant residues to the soil surface promotes biological activity and the carbon cycling process in the soil. Carbon dioxide (CO₂), energy, water, plant nutrients, and resynthesized organic carbon compounds, all are released during the decomposition process. The decomposition of dead material and modified organic matter results in the formation of humus, a more complex organic matter. Soil characteristics are affected by humus. It darkens the soil as it slowly decomposes, enhances soil aggregation and aggregate stability, enhances the ability to draw in and retain nutrients, and supplies N, P, and other nutrients.

Keywords: Soil organic matter, soil fertility, soil ecosystem, decomposition, microorganism, enzyme & humus.

POST HARVEST LOSSES IN HORTICULTURE CROPS

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ABSTRACT

A huge loss of horticultural products due to improper management of pre or post-harvest. According to ASSOCHAM, each year, approximately 2 lakh metric tonnes of fruits and vegetables and other horticultural produce are lost due to poor management and a lack of food processing industry and modern cold storage facilities. The total post-harvest loss in India is estimated at around 14–36% in fruit and 10–25% in vegetables. Maximum post-harvest loss was reported in papaya (90-100%), mandarin (20-95%), vegetable cauliflower (49%), and tomato (40-60%). Among the states, maximum post-harvest losses are reported in (2021) West Bengal, worth over Rs 13,657 crore, followed by Gujarat (Rs 11,400 crore), Bihar (Rs 10,700 crore) and Uttar Pradesh (Rs 10,300 crore). However, according to NHB (2019-20), total fruit and vegetable production is around 99.07 million metric tonnes and 191.77 million metric tonnes, respectively. In total horticulture production, different fruits and vegetables contribute the highest amounts in the case of fruit. Fruits such as bananas, mangoes, citrus, papaya, and

guava account for a major share of total fruit production across India. In terms of vegetables, tomatoes, onions, brinjal, and tapioca account for the majority of the country's vegetable production. There are three main pre-harvest factors that affect post-harvest loss, such as 1. Cultural practises (irrigation, application of fertilizer, and GR). Training and Pruning 3. Maturity standard, etc., and they have several post-harvest factors that affect post-harvest loss: such as harvesting, grading, packaging, storage, transport, etc. Post-harvest loss is also affected by biochemical factors like transpiration, respiration, and ethylene, so if proper management is done, it can reduce the huge loss of post-harvest loss of horticultural produce.

SOIL ORGANIC CARBON IN DIFFERENT AGROFORESTRY SYSTEMS INFLUENCED BY SEASONS AND DEPTHS

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ABSTRACT

An experiment was conducted to study on soil organic carbon storage under three agroforestry systems in four seasons (summer, winter, spring and autumn) and two depths (0-15 cm & 15-30 cm) at Pusa farm of Dr. Rajendra Prasad Central Agricultural University, Bihar. Three agroforestry systems included kadamb, litchi and simarouba-based plantation. All agroforestry systems were 14 years old and turmeric had been grown as intercrop for 10 years. A control plot with five replications was also taken under the investigation. It was found that there were significant improvements in soil organic carbon under agroforestry systems compared to the control plot. Soil organic carbon was found influenced by seasons and winter shows the highest organic carbon stock, while lowest at summer. Significant variations of soil organic carbon with depths were also reported. The accumulation of soil carbon was higher in upper soil over lower soil. Soil organic carbon storage in simarouba-based agroforestry had reported highest i.e 11 % more than kadamb based agroforestry system, which was 6 % more than litchi based agroforestry system in the upper soil layer. The study strengthens ideas about the potentiality of agroforestry development to enhance sustainable soil management.

Keywords: Soil Organic Carbon, Agroforestry, Simarouba, Litchi

IMPACT OF HEAT STRESS ON WHEAT CROP AND ITS POSSIBLE MANAGEMENT PRACTICES

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ABSTRACT

Global climate models predict an increase in mean ambient temperatures between 1.8 and 5.8°C by the end of this century (IPCC, 2007). Future climates will also be affected by greater variability in temperature and increased frequency of hot days and more severity. To get sustainable food for growing population we need to adapt new crops and crop varieties to the future climate, we need to understand how crops respond to elevated temperatures and how tolerance to heat can be improved (Halford, 2009). Temperature above the optimum for growth can be deleterious, causing injury or irreversible damage, which is generally called ‘heat stress’. Heat stress is a function of the magnitude and rate of temperature increase, as well as the duration of exposure to the raised temperature (Wahid et al., 2007). Plants detect changes

in ambient temperature through perturbations in metabolism, membrane fluidity, protein conformation and assembly of the cytoskeleton (Ruelland and Zachowski, 2010). Such reactions activate adaptive processes like expression of heat shock proteins, until new cellular equilibriums are reached. High temperatures causing heat stress in wheat are expected to increase in frequency across the globe. Heat stress substantially affects grain setting, duration and rate, and ultimately grain yield. Nonetheless the timing, duration and intensity of heat stress determine its impact on grain yield. The harsh conditions of heat stress can be minimized by developing tolerant genotypes and agronomic strategies. Even though in wheat, mechanisms of heat tolerance on a physiological basis are relatively well-understood, research into assimilate partitioning and phenotypic flexibility are needed.

WATER BALANCE BASED CROP PLANNING UNDER SOIL HEALTH CARD PROGRAMME OF NICRA VILLAGE GANDHINAGAR DISTRICT JHANSI.(U.P.)

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ABSTRACT

The Soil Health Card (SHC) Programme is a unique information initiative of its kind in India pioneered and initiated by the Government of Uttar Pradesh and Chandra Shekhar Azad Agricultural University for the benefit of farmers of at the grass-root level. The Soil Health Card System is web based information system designed to run on a networked environment including intranet, internet and on U.P.SWAN (Uttar Pradesh State Wide Area Network). This is a repository of agricultural information for the benefit of farmers, agricultural scientists and decision makers at Government level.

A huge database has gone into for development of Soil Health Card System. More than 294 soil samples collected(April 2011-March 2017) from different farmers fields of NICRA Village Gandhinagar District Jhansi.(U.P.) were analysed at different Soils Testing Labs not only of Government of Uttar Pradesh but also of other organizations. These huge records of soil data were converted into digital format and put into the Soil Health Card System. All soil data on N, P, K, EC, pH, Organic Carbon etc were subjected to first quality check and verification using standard procedures/guidelines developed by the Senoir Researc fellow, scientists of Chandra Shekhar Azad Agricultural University,Kanpur. Along with the soil data all other information on districts, talukas, villages, farmers, crops and crop related parameters were also gone into database. Based on soil analysis fertility status of farmers field has been reported, which are further used while making fertilizer recommendations for different crops for village/farmer. In addition to village/farmer wise soil and crop related data, taluka wise daily,weekly & annualy rainfall data of 73 years (1944 to 2017) has also been supplied to SHC database. Moreover, taluka wise weekly potential evapotranspiration (PET) data has also been supplied. Based on physical properties of soil (Soil texture, depth etc) obtained from NBSS&LUP map, the available water capacities (AWC) were derived for different soil types. The moisture adequacy index (MAI) was computed using mean weekly rainfall of last 30 years, PET and AWC, and thereby the length of growing period (LGP) was determined, which was useful is suggesting alternate crops and cropping pattern of village/taluka. Economic data on cost of cultivation and market price has also gone into database to determine the profitability of different crops. The recommendation of the alternative crops has been given with a generic ranking of crops in terms of its profitability. The SHC System not only provides Soil Health Card for each farmer ready for print format but also facilitate to generate and get various reports in different format including graphical. Thus, it provides information about farmer’s field, which can be accessed at anytime and anywhere.

EFFECT OF DIFFERENT DOSES OF SULPHUR AND ZINC ON PRODUCTIVITY OF LINSEED (*Linum usitatissimum*)

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Introduction

Linseed (*Linum usitatissimum* L.), also known as flax in India, Aksebji, Alsi, and Jawas. Flaxseed is a self-pollinated and Rabi oilseed crop that belongs to the Linaceae family and order Geranial. It has a non-edible oil content of 33-45 percent and a crude protein content of 24 percent. It is cultivated in 0.017 M ha in India, with a total production of 0.09 MT and a productivity of 574 kg per ha.

In India, available sulphur deficiency affects approximately 58.6 percent of total Indian soil, with more than 60 percent of soils in Bihar being deficient. Sulphur is required for the synthesis of sulphur-containing amino acids such as cystine, cysteine, and methionine, as well as protein synthesis. Intensive cropping with high-yielding varieties depletes soil's inherent macro and micronutrient reserves.

Approximately 51.2 percent of Indian soil is zinc deficient, with more than 50 percent of Bihar soil being zinc deficient (Shukla et al. 2021). More than 300 enzymes, including alkaline phosphatase, carbonic anhydrase, Cu-Zn superoxide dismutase, and alcohol dehydrogenase, require Zn for catalysis. Zinc is an essential component that aids in the metabolism of nitrogen as well as several biomolecules such as proteins, lipids, and auxin cofactors, and it also plays an important role in plant nucleic acid metabolism.

Materials and Methods

The experiment was conducted at the Bhola Paswan Shastri Agricultural College , Purnea farm, using Indian linseed variety Sabour Tisi 1 under FRBD statistical design. The recommended fertilizer was applied at the rate of 120 Kg N, 60 Kg P₂O₅ and 40 Kg K₂O ha⁻¹ uniformly in all plots as feeder dose. The study was consisted of two factors viz. zinc and sulphur with four doses of sulphur and three dose of viz. 0.0, 20, 40, 60 Kg ha⁻¹ and 0, 5, 10 Kg ha⁻¹ , respectively were applied as basal dose.

Purpose

To study the effect of levels of sulphur and zinc on the productivity and oil content of linseed.

Result and Discussion

Interaction effect

Except for 1000-seed weight and oil content, the interaction effect of sulphur and zinc fertilisation had a significant influence on all of the studied parameters. The interaction of 60 kg S ha⁻¹ and 5 kg Zn ha⁻¹ produced the highest seed yield. The highest seed yield was most likely the cumulative effect of the highest number of branches plant-1, seeds siliqua-1, and one of the highest numbers of siliqua plant-1 discovered at the same interaction treatment.

The interaction of 60 kg S ha⁻¹ and 5 kg Zn ha⁻¹ produced the highest stover yield. However, the highest harvest index was found at the interaction effect of 20 kg S ha⁻¹ and 0 kg Zn ha⁻¹, which was statistically similar to the interactions of 40 kg S ha⁻¹ and 0 kg Zn ha⁻¹, 0 kg S ha⁻¹ and 5 kg Zn ha⁻¹. The highest seed yield and oil content were the result of the cumulative performance of the mustard yield components. This could be due to some synergistic properties of combined sulphur and zinc fertilisation up to certain levels, as some researchers have reported (Kumar and Singh, 1980). Other studies have discovered a synergistic response of sulphur and zinc interaction in increasing mustard seed yield.

On the contrary, the interaction between no sulphur and no zinc fertilisation resulted in the lowest seed yield . The lowest seed yield at 0 kg S ha⁻¹ 0 kg Zn ha⁻¹ could be the result of a

combination of the lowest number of branches plant⁻¹, siliqua plant⁻¹, and the lowest number of seeds siliqua⁻¹ discovered in the same treatment. The lowest stover yield was discovered at the same treatment, which was comparable to 0 kg S ha⁻¹ 0 kg Zn ha⁻¹. The lowest harvest index was discovered between 20 kg S ha⁻¹ and 5 kg Zn ha⁻¹, which was also comparable to 0 kg S ha⁻¹ and 10 kg Zn ha⁻¹, and 20 kg S ha⁻¹. A lack of one or more essential plant nutrients, such as sulphur and zinc, may be to blame for the poor performance of yield attributes, which hastened the lowest seed yield and oil content of mustard. Another study found a lower yield of mustard with no sulphur and zinc fertilisation.

Conclusion

The current study suggested that sulphur and zinc played an important role in increasing mustard seed yield and oil content. As a result, sulphur and zinc at rates of 60 kg ha⁻¹ and 5 kg ha⁻¹, respectively, could be applied to increase the seed yield and oil content of the Sabour Tisi 1 variety of Linseed.

EFFECT OF STCR BASED NUTRIENT MANAGEMENT ON POTASSIUM UPTAKE AND YIELD OF RICE CROP IN RICE-BASED CROPPING SYSTEMS OF INDO-GANGETIC PLAINS, INDIA

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ABSTRACT

Blanket fertilizer recommendations do not ensure balanced use of fertilizers as they do not take into account the spatial variation in soil fertility. Soil test crop response (STCR) based nutrient management in combination with a specified target yield considering the native soil status is regarded as a soil and fertilizer-based precision farming strategy for obtaining a specified yield with balanced crop nutrient demands. This study was conducted to study the effect of STCR based nutrient management on uptake of potassium (K) in an alluvial soil for two rice-based cropping systems. Soil samples were collected before sowing and after harvesting of rice crop from experimental plots under randomised block design (RBD) fertilized with general fertilizer recommendation (GFR), farmers' practice and STCR based recommended dose with and without Integrated Plant Nutrient System (IPNS) for low, medium and high target yield. K uptake was determined by plant digestion with triacid mixture. The results showed that the uptake of K and yield of rice grain after harvest of rice differed significantly under different treatments in both rice-wheat (R-W) and rice-maize (R-M) cropping systems. In R-W system, the grain yield. The farmers' practice as well as GFR improved the uptake of K over control and increased its content significantly by 17.1 and 23.0 per cent respectively in the R-W system and by 15.3 and 30.1 per cent respectively in R-M system. It was also observed that grain and straw K uptake was significantly enhanced under STCR with IPNS treatment over other treatments. Thus, the soil test based balanced fertilizer recommendations under STCR-Integrated Plant Nutrient Supply (IPNS) may help in the maintenance and build up of soil fertility and better nutrient uptake.

Keywords: Soil test crop response, Integrated Plant Nutrient System, fertilizer recommendation, potassium uptake

TREND ANALYSIS OF TEMPERATURE IN DIFFERENT DISTRICTS OF NON-MAHANADI BASIN REGION OF CHHATTISGARH

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ABSTRACT

Climate change is showing visible impact on our environment that drives the attention of the scientific community to analyse the trends of climatic parameters and their possible consequences. An agrarian nation like India may experience severe agricultural economic disruptions due to climate change and variability. As temperature being the one of the most significant weather parameters, its evaluation is necessary for the assessment of effects of the climate change. Considering the fact, the current study has tried to investigate the trend of maximum and minimum temperature on annual and seasonal basis using daily temperature data for over a period of 31 years (1989-2019) for different districts viz., Balrampur, Bastar, Bijapur, Dantewada, Narayanpur and Sukma of Non-Mahanadi basin region of Chhattisgarh. The meteorological data were collected from the Department of Agrometeorology, IGKV, Raipur. Non-parametric Mann-Kendall (MK) test was utilized to analyze the existence of trends in temperature series. All the 6 districts of Non-Mahanadi basin region showed significant increasing trend for annual maximum temperature. Two districts namely Bijapur and Dantewada showed significant increasing trend for maximum temperature during summer season. Significant increasing trend was found in Balrampur and Sukma district for maximum temperature during south-west monsoon. All the districts showed significant increasing trend for maximum temperature during north-east monsoon except Balrampur district. Only Balrampur district reported significant increasing trend for minimum temperature during annual, summer and south-west monsoon seasons.

Keywords: Mann-Kendall test, trend, temperature, Non-Mahanadi

DROUGHT MITIGATION AND IMPROVEMENT IN PHYSIOLOGY AND BIOCHEMISTRY OF MOISTURE STRESS GROWN COWPEA (*Vigna Unguiculata* L.)

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ABSTRACT

Drought is a wide-spread problem seriously influencing production and quality of the crop. A field experiment was conducted during *rabi* 2019, at MARS, Raichur. The objective of this investigation was to study the effect of drought mitigating chemicals on physiological and biochemical traits in cowpea grown under residual moisture stress. Among the treatments, foliar spray of pulse magic and chickpea magic had the profound effect in improving physiological and biochemical attributes viz., photosynthetic rate (19.50, 18.50 μ mol CO₂ m⁻² s⁻¹), transpiration rate (4.19, 4.15 m mol H₂O m⁻² s⁻¹), water use efficiency (4.65, 4.46 μ mol CO₂ m mol⁻¹ H₂O), relative water content (80.78, 78.51 %), chlorophyll (a, b and total), membrane stability index (70.42, 67.90 %), proline content (9.26, 8.86 μ mol g⁻¹ fr.wt.) and catalase activity (130.00, 125.83 units g⁻¹ fr.wt. min⁻¹) at 60 DAS. Pulse magic, is a new combi product developed in the year 2014 from the Zonal Agricultural Research Station, Kalaburagi,

University of Agricultural Sciences, Raichur as it contains major nutrients, micro nutrients and PGR which helped the crop to achieve maximum yield potential by improving physiological and biochemical attributes.

Keywords: Flowering stage, foliar spray, pulse magic, chickpea magic

NITROGEN STATUS IN PADDY FIELDS OF IMPHAL WEST DISTRICT, MANIPUR, INDIA AND ITS CRITICAL LIMIT IN SOIL AND PADDY

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ABSTRACT

Nitrogen fertilizer is the maximum consumer by paddy constituting one-third of the total N consumption of the world and therefore, is the main limiting plant nutrient in the production of lowland rice. A distribution study was done for twenty five samples of Imphal West district, Manipur to evaluate the nitrogen status and its different fractions. The collected samples from different paddy fields were also used for the pot study to determine the critical limits of nitrogen in soil and rice crop (var. CAU R-1). Results revealed that the magnitude of different nitrogen fractions were in the order: total hydrolysable organic N (720.32-1130.44 mg kg⁻¹)>amino acid N (290.00-375.60 mg kg⁻¹)> unidentified N (209.00-491.33 mg kg⁻¹)>non hydrolysable-N (165.31-467.99 mg kg⁻¹)> hydrolysable NH₄⁺-N (158.67-276.00 mg kg⁻¹)>(serine+threonine)-N (48.56-86.00 mg kg⁻¹)> hexosamine-N (44.56-74.92 mg kg⁻¹)>exchangeable NH₄⁺-N (37.32-72.12 mg kg⁻¹)>soluble NO₃⁻-N (21.83-41.64 mg kg⁻¹) representing 74.67, 26.31, 25.34, 25.33, 18.45, 5.25, 4.57, 4.03 and 2.59 per cent of total N, respectively. Amino acid-N form is the dominant organic fraction of nitrogen in soil. Correlation studies showed that the inorganic and organic fractions of nitrogen were positively correlated among themselves. A positive and significant correlation between total N and other forms of N in the soils indicated the dependence of different fractions of nitrogen on total nitrogen. For the pot experiment, dry matter yield, nitrogen concentration and its uptake of rice was greatly influenced by different levels of nitrogen and highest dry matter accumulation, nitrogen concentration and its uptake was observed in soils treated with 60 kg N ha⁻¹. The critical limit of available N in rice growing acidic soils of Manipur, India was found to be 257 kg ha⁻¹ and 1.04% for rice plant.

Keywords: Nitrogen forms, Critical limit, Soil, paddy

EFFECT OF ENRICHED VERMI-COMPOST ON PRODUCTION PERFORMANCE OF TOMATO IN MADHUBANI DISTRICT OF BIHAR

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ABSTRACT

Tomato growers of Madhubani district do not produce quality fruit at high yield due to lack of scientific knowledge regarding improved production technologies including proper use of fertilizers. Farmers face the problem of low yield of Tomato due to imbalanced fertilizer, for that purpose KVK Sukhet, Madhubani-II conducted on farm trial (OFT) at 08 different locations within the district by enhancing the vermicompost with bio fertilizer like PSB and Azatobacter as a integrated approach during 2020-21 and 2021-22. During the trial we select 04 treatment i.e. T1: Farmer practice (Use of imbalanced fertilizer) T2: 100% RDF (N:P:K:;

120:80: 80 kg/ha) T3 : 75 % RDF + Enriched Vermi-compost -2.5 ton/ha. Vermi compost enriched with Azetobactor (500 g/ton of vermi) and T4 : 75% RDF + Enriched Vermi-compost -2.5 ton/ha. Vermi compost enriched with Azetobactor and PSB (500 g/ton of vermi). The increment of yield was found significantly higher in T4 & T3 treatment i.e 35.84 and 33.67 during 2020-21 and 40.01 and 37.34 during 2021-22, respectively as compare to farmer’s practices as well as 100% RDF during the both years. The B:C ratio was found that higher in both the enriched vermicompost treated plot as compare to farmers practices and 100% RDF. So to achieve higher and sustainable yield in tomato, crop should be fertilized with 75% RDF + Enriched Vermi-compost -2.5 ton/ha. Vermi compost enriched with Azetobactor and PSB (500 g/ton of vermi) as soil application along with other recommended agronomical practices.
Keywords: Vermicompost, PSB, Azatobactor, Madhubani, OFT

MOLECULAR CLONING AND EXPRESSION ANALYSIS OF CRYPTOCHROME, DGCRY2, AND FLOWERING LOCUS T, DG FT GENES IN PHOTOSENSITIVE AND PHOTO-INSENSITIVE CHRYSANTHEMUM (*Dendranthema x grandiflora* Tzvelev) Genotypes

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Purpose

Chrysanthemum (*Dendranthema x grandiflora*) is a typical short day (SD) plant and it is one of the most important floriculture crops, which enjoy a major share of the cut flower and potted mum market. Under natural conditions, variations in the flowering time are mainly dependent on their critical photoperiod. Plants sense photoperiod signals to confirm the optimal flowering time. CRYPTOCHROME (*CRY*) and FLOWERING LOCUS T (*FT*) genes play vital roles in photoperiodic flowering in chrysanthemum. CRYPTOCHROME (*CRY*), a vital photoreceptor which mediates light signals, controls photomorphogenesis in higher plants. The FLOWERING LOCUS T (*FT*) gene plays crucial roles in regulating the transition from the vegetative phase to the reproductive phase. The aim of the present study was to correlate expression of *DgCRY2* and *DgFT* in promoting floral transition with respect to the phenotypes in photo-sensitive and photo-insensitive chrysanthemum genotypes.

Methods

In this study, photo-sensitive (Arka Yellow Gold) and photo-insensitive (Arka Pink Star) chrysanthemum genotypes were subjected to SD conditions and their floral primordial transition were studied under stereomicroscope and correlation of transcriptional expression *DgCRY2* and *DgFT* genes in photo-sensitive and photo-insensitive chrysanthemum genotypes were studied.

Results

Findings of the study revealed that photo-sensitive (Arka Yellow Gold) and photo-insensitive (Arka Pink Star) chrysanthemum genotypes when subjected short day (SD) treatment exhibited variations in both *DgCRY2* and *DgFT* expression patterns. Gene expression analysis revealed that the expression level of *DgCRY2* was significantly higher in Arka Pink Star that was transferred to short day (SD) conditions for eight days i.e., at involucre differentiation stage, whereas, expression level of *DgCRY2* was significantly downregulated in Arka Yellow Gold at this stage. However, *DgFT* gene showed the highest expression levels at initiation of floret

primordial stage i.e. 12 SD in Arka Pink Star. The expression of *DgFT* decreased during initiation of floret primordial stage in Arka Yellow Gold.

Conclusion

Our results provided evidence for the role of *DgCRY 2* and *DgFT* in controlling floral transition and laid a foundation for the further elucidation of the functions of *DgCRY* and *DgFT* genes in chrysanthemum. These genes could serve as a vital target for the genetic manipulation of flowering time in chrysanthemums.

Keywords: Chrysanthemum, Cryptochrome, Flowering Locus T, Photoperiod signals

ECO-FRIENDLY AND ECONOMIC APPROACH TO ENCAPSULATE BIO-AGENT FOR LONG TERM STORAGE AND EASY DELIVERING AT FARMER'S LEVEL”

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ABSTRACT

In present scenario, use of biocontrol agents (BCAs) is gaining much more attention in agricultural due to their potential of replacing chemical agents up to a remarkable level with maintaining the environment safety. In addition, they also play a vital role in enhancing the plant growth and soil quality. *Trichoderma* is one of those bio control agents which is being more extensively used for crop disease management. Different formulations of *Trichoderma* spp. such as powder, liquid and tablets are available in the market. Success of these formulations depends on the storing facility, easy availability, effective delivery methods and cost. Till date, none of the formulations have been proven perfect as each of them have their own limitations. One of the formulations Tricho capsule contains pure viable culture of *Trichoderma* having mycelium, resting spores and carrier encapsulated in hollow hard gelatine capsule. The advantages of this preparation are long shelf life as about three years, simple preparation process, improved disease resistant effect and management of wide range of vegetables, fruits, flowers, cereals and crop disease like *Sclerotinia* blight, *Fusarium* wilt, etc. This technique also helps farmers for mass production at field level for soil applications. It also reduces the quantity and cost of applying bio control agent in soil because it requires least quantity as compared to other formulations of *Trichoderma* spp. For instance, the normal requirement of any formulation for cereals and vegetable crops seed treatment 4 gm per kg of seed. It replaced with just two capsule per kg of seed where each capsule weight approx 1 gm. Farmers can also be self-capable for mass culturing after obtaining some technique knowledge and handling. In this paper our emphasis is on providing better option to the farmers having long storage and easy availability.

Keywords: *Trichoderma*, Bio control agent, Formulation, Mass production.

ECOFRIENDLY METHOD FOR MANAGING SOIL AND SEEDBORNE DISEASES IN VEGETABLES CROPS THROUGH SEED BIOPRIMING

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ABSTRACT

Seed is an important initial investment in agriculture and a healthy seed can lead for enhancement in production with good quality of farm produces. It is estimated that 30% diseases are of seedborne nature and can be simply managed through the using of disease-free seeds for sowing. The losses due to seed-borne diseases in developing countries are estimated to be 60-80% higher than in industrialized countries. Conservatively estimated, seed-borne diseases cause losses in the order of 50 million tonnes of food annually. Similarly soilborne pathogens such as *Fusarium* spp., *Sclerotium rolfsii*, *Sclerotinia sclerotiorum*, *Rhizoctonia* etc. also possess a major threat to crop production on a global scale all over world. These phytopathogens cause highly devastating diseases which affect crop since germination hence an early protection in form of seed biopriming will provide advantage to crop for uniform, swift & higher stand establishment. Seed biopriming enables controlled seed hydration and active colonization of AIMs i.e. *Trichoderma* spp., *Pseudomonas fluorescent*, *Bacillus* spp. etc on seeds thereby activating its metabolism without substantial germination and augmented establishment of the biocontrol agent prior to pathogen infection. Besides, it also assists in rapid germination, as well as enhances resistance to both biotic & abiotic stress conditions. Further, seed biopriming also provides greater protection from foliar diseases through various biocontrol mechanisms and induced systemic resistance (ISR). In this context, seed biopriming prove to be a promising, ecofriendly and economical technique in comparison to seed treatment, soil application & foliar spray, thereby providing a significant contribution to sustainable agriculture.

Keywords: Seed biopriming, Bio control agent, *Trichoderma*, Soil and seedborne disease.

EFFECT OF GIBBERELIC ACID ON MYCELIAL GROWTH OF *Hericium erinaceus*

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ABSTRACT

The edible and therapeutic lion's mane mushroom is a member of the basidiomycete family. It is indigenous to Asia, Europe, and North America. It normally grows on forest wood, but recently there has been a trend to cultivate it on sterilised substrates in order to improve productivity and shorten the length of its culture cycle. To investigate the impact of various gibberellic acid (GA) concentrations on the mycelial proliferation of *Hericium erinaceus* on different media, an experiment was conducted. At 12 days following inoculation, malt extract agar (MEA) medium supplemented with 30 ppm (GA) produced the highest mycelial growth of 8.50 cm and the lowest of 6.70 cm (DAI), while at 12DAI, potato dextrose agar with 30 ppm (GA) added produced the highest mycelial growth of 9.60 cm and the lowest of 6.80 cm. In the case of sawdust extract, agar medium supplemented with 30 ppm (GA) produced the highest

mycelial growth of 6.80 cm and the lowest one of 4.50 cm with 10 ppm at 12 DAI, while wheat straw extract, agar medium supplemented with 30 ppm, produced the highest mycelial growth of 5.60 cm and the lowest one of 3.50 cm with 10 ppm at 12 DAI. In rice straw extract agar media, 30 ppm produced the highest mycelial growth of 5.20 cm and 10 ppm produced the lowest growth of 3.40 cm at 12 DAI. The lowest mycelial colony measured 3.40 cm with 10 ppm on rice straw extract agar media at 12 DAI, while the highest, measuring 9.60 cm, was discovered at 30 ppm in potato dextrose agar. 30 ppm outperformed the other two concentrations in terms of *Hericium erinaceus* mycelial colony proliferation.

Keywords: Gibberellic acid, *Hericium erinaceus*, mycelial growth.

RESPONSE OF RAINFED INDIAN MUSTARD TO DIFFERENT TILLAGE PRACTICES AND MULCHING

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ABSTRACT

A field experiment was conducted during the *rabi* season of 2019 at College of Agriculture, Central Agricultural University, Imphal, Manipur. The experiment included the combination of two soil tillage systems viz., Conventional Tillage (L₁) and Minimum Tillage (L₂) and four different mulching materials viz., No mulch (M₁); Rice straw mulch (M₂); Polythene mulch (M₃) and Tree leave mulch (M₄). The Experiment was laid out in split plot design with different level of tillage (main plot), mulching materials (sub plot) and each treatment was replicated thrice. Growth and yield of Indian mustard was influenced by different tillage practices and mulching. Maximum plant height (165.33 cm.), number of siliquae per plant (197) and seed yield (1790 kg/ha) and oil yield (692 kg/ha) were recorded in combination of (L₁M₃) which received in Conventional tillage + Polythene mulch and minimum seed yield was recorded in combination of (L₂M₁) 1441 kg/ha which received in Minimum tillage + No mulch. Maximum harvest index was recorded in combination of (L₁M₂) 27.50% which received in Conventional tillage + Rice straw mulch and minimum harvest index was recorded in combination of (L₁M₄) 24.13% which received in Conventional tillage + Tree leaves mulch. The highest benefit cost ratio (0.72) was recorded in Minimum tillage + Rice straw mulch because there was less input cost for tillage or ploughing activities and mulching material cost. Highest energy use efficiency, energy productivity but lowest specific energy was observed in Minimum tillage with No mulch and energy use efficiency, energy productivity but highest specific energy was observed in Minimum tillage with Rice straw mulch.

Keywords: Indian mustard, tillage, mulching, yield and energy

UTILIZATION OF *Parthenium Hysterophorus* AS A GOOD SOURCE OF ORGANIC WASTE FOR VERMICOMPOSTING

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ABSTRACT

Parthenium hysterophorus L. belongs to family Asteraceae is an aggressive invasive alien weed species native to the Americas but now widely spread in Asia, Africa and Australia. It

spreads rapidly in all regions of the country, along roads and railways, through grazing areas and arable lands, adversely affecting crop production, animal husbandry and biodiversity. It is poisonous, pernicious, allergic and aggressive and causes a serious threat to human being and livestock. It reduces production from livestock by causing various health problems and by causing scarcity of animal fodder by invading pasturelands. Several control methods (chemical, biological, mechanical and integrated) are being used and most of the methods are not successful due to rapid re-infestation of the plant. Vermicomposting is a better option as earthworms enhance the process of waste conversion and produce a better product. By this process there is a safe disposal of waste biomass in to highly rich manure and is a step towards sustainable development by utilizing weed waste into black gold. Vermicompost production and utilization has been shown to be a great asset towards cleaner environment. Many scientists also reported that *Parthenium* can be used as a raw material for vermicomposting, if mix with cow dung in appropriate quantity. Therefore, vermicomposting of the weed may be used for sorting out the problems associated with it. It may also give us comprehensive benefits such as control of weed population, reduced use of chemical fertilizers, giving nutrients back to the desired crop that are sucked by the weed and that too, in an environmental friendly way.

Keywords: Parthenium, Vermicompost, earthworm, environment, nutrient, soil

STUDY THE MORPHOLOGICAL AND BIOCHEMICAL PARAMETERS OF SESAME FOR RELATIVE SUSCEPTIBILITY AGAINST MAJOR SUCKING INSECT PESTS

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Purpose

Sesame (*Sesamum indicum* L.) is one of the oldest oilseed crop, originated in India. It is attacked by large number of insect pests, sucking insect pests (leafhopper, mirid bug and whitefly) are of major importance. Leafhoppers and whiteflies act as vectors for the incidence of phyllody and leaf curl disease in sesame respectively. Phyllody causes up to 80% yield loss. It is, therefore, extremely important to devise means to reduce the extent of damage without adversely affecting the agro-ecosystem. So, resistant/tolerant variety is the right choice. We aimed to study the morphological and biochemical parameters of sesame responsible for relative susceptibility against major sucking insect pests.

Methods

Based on previous field screening data, 15 genotypes were selected (based on the number of insect pests population/plant) to study the role of morphological and biochemical parameters of sesame for relative susceptibility to leafhopper, whitefly and mirid bug.

Traits	Methods
1. Chlorophyll content index	By SPAD (Shukla et al., 2007)
2. Canopy temperature	Infrared thermometer
3. Total ash content (%)	AOAC, (1980)
4. Silica (%)	AOAC, (1980)

Results

The ash content (%) showed significant negative correlation with the populations of leafhopper ($r=-0.879$), mirid bug ($r= -0.857$) and whitefly ($r= -0.817$) while silica content showed non-significant (\pm) impact on the incidence of tested sucking insect pests population. Chlorophyll content index showed significant positive correlation ($r= 0.497$) with the population of

leafhopper while it had non-significant (\pm) correlation with the population of whitefly and mirid bug.

Conclusion

The morphological and biochemical parameters can play a vital role in resistance and susceptibility against whitefly, leafhopper and mirid bugs in different genotypes of sesame. By doing two to three years of trials we can get exact response and with the breeding procedures, resistance can be incorporated in desirable genotypes.

Keywords: biochemical, morphological, sesame, sucking insect pests, ash and silica.

ROLE OF TRICHODERMA MEDIATED BIO-FERTILIZERS ON PLANT GROWTH

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ABSTRACT

Trichoderma is a filamentous and avirulent symbiotic fungus that are used as bio-pesticide and bio-fertilizer. Application of Trichoderma reported to promote the plant growth and yield along with increasing nutrient availability. Several species of Trichoderma are accounted to produce different kinds of secondary metabolites which are essential for plant growth regulation. Some Trichoderma strains are also stated to colonize root surfaces and cause significant changes in plant metabolism. Moreover, Trichoderma is recorded to produce organic acids that reduce soil pH and also permit the solubilization of phosphates, micronutrients and mineral cations like Fe, Mn, and Mg that are useful for plant physiology. Studies have revealed that metabolites of Trichoderma or its roots colonization, changes the proteome and transcriptome of plants. However, very less studies carried to investigate the combined effect of Trichoderma-enriched biofertilizer and chemical fertilizer on growth, yield attributes, yield and nutritional quality of crops under field conditions. Efficient use of Trichoderma-enriched biofertilizer alone or in combination with chemical fertilizer may increase yield and quality of produce decrease the amount of N:P:K use and associated environmental contaminants. It can reduce the cultivation cost of crops and also minimize the toxic chemicals in the crop ecosystem by disproportionate use of synthetic fertilizer. Trichoderma is also reported to improve the flowering quality of Chinese cabbage and enhanced its tolerance of flowering Chinese cabbage to environment stresses. Trichoderma as a bio-fertilizer is considered to enhance the nutrient uptake and tolerance against the environmental stresses. All the evident studies proved Trichoderma bio-fertilizer as an important tool for management of soil fertility and also helps in plant growth. This can be used as an alternative or amendment to produce plant growth hormones and volatile compounds, contributes to solubilize phosphates that are usually unavailable to the crop and also enhance the uptake of macro and micro nutrients by the plants.

MYCELIAL COMPATIBILITY GROUPING, CARPOGENIC SCLEROTIAL GERMINATION AND RESISTANT BEAN SOURCE AGAINST *Sclerotinia sclerotiorum* FROM KASHMIR, INDIA

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ABSTRACT

White mold disease caused by *Sclerotinia sclerotiorum* (Lib.) de Bary is one of the most devastating fungal diseases of bean (*Phaseolus vulgaris* L.). The present investigation was carried out with eighty isolates of *S. sclerotiorum* collected from major bean growing areas of the four Districts of North-Kashmir viz. Baramulla (36 isolates, B01-B36), Bandipora (08 isolates, N01-N08), Ganderbal (17 isolates, G01-G17) and Kupwara (19 isolates, K01-K19). The isolates were found to vary in cultural and morphological characteristics. 22 Mycelial compatibility groups (MCGs) were formed with seven MCGs constituted by a single isolate implying a high genotypic variability among the isolates. The isolates within MCG were mostly at par with each other. Most of the MCGs were fast growing. The six fast growing isolates representing six MCGs shown variability in pathogenicity with isolate G04 as most virulent and B01 as least virulent. The colony diameter and disease scores were positively correlated. Among 63 bean genotypes screened for resistance using the most virulent isolate majority showed susceptible reaction while 11 shown intermediate reaction and only one genotype WB-1402 was found to be resistant. In Kashmir, the carpogenic germination was not yet reported and only myceliogenic germination was presumed to initiate the infection and sclerotia were believed to spread the inoculum. However, in this study a lot of variability in terms of MCGs was seen which suggested spread of the inoculum to longer distances through ascospores and hence a study was undertaken to ascertain the involvement of sexual spores in spreading the disease and sclerotia were found to germinate carpogenically and produce disease through ascospores.

Keywords: Germplasm screening, Mycelial compatibility group, Resistant source, *Sclerotinia sclerotiorum*, White mold, Kashmir

IMPACT OF CLIMATE CHANGE ON PLANT DISEASES

BABLI

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ABSTRACT

Climate changes adversely affect changes in the hydrosphere, biosphere and other atmospheric and interacting factors. Human activities driven by demographic, economic, technological and social changes have a major impact on climate change are the foremost factors. The climate influences the incidence as well as temporal and spatial distribution of plant diseases. The main factors that govern growth and development of mostly foliar diseases are extreme temperature, fluctuating light and rainfall. The climate change affects the survival, vigor, rate of multiplication, penetration of pathogens, sporulation, rate of spore germination, direction of spreads and dispersal of inoculum potential. Climate affects all life stages of the pathogen and host and clearly poses a challenge to many patho-systems. The environmental change, especially when combined with pathogen and host introductions, may result in unprecedented effects.

Keywords: climate change; temperature; carbon dioxide; plant diseases.

DRINKING WATER AUGMENTATION THROUGH ROOFTOP RAINWATER HARVESTING – A CASE STUDY FROM RAICHUR, KARNATAKA

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Purpose

We need water for many activities in our day- to-day life. However, supply of good quality water is an utmost concern in the era of increasing population of the world. Hence, rooftop rainwater harvesting is one of the best options for supply of quality water for domestic needs of the people in rural and urban areas.

Methods

Rooftop rainwater harvesting system was designed for rooftop area of 902 m² for Boys’ hostel and the system was scientifically designed considering collecting area, rainfall intensity and probable rainy days. Accordingly, rooftop rainwater was collected in 65.3 m³ capacity RCC tank and supplied for drinking and domestic purposes. The outlet from tank was connected to recharge the nearby borewell and one pipeline was designed to divert towards nearby farm pond in case of heavy down pour of rainfall.

Results

The percentage of rooftop water harvest ranged from 81-92% (runoff versus rainfall) for various rainfall events during 2021-22 for RCC rooftop. The stored rain water quality was carried out and the quality parameters like, pH, TDS, EC, Ca, Mg, Cl and Carbonates ranged between 6.8-7.6, 55-75 mg/l, 0.18-0.28 dS/m, 0.6-1.6 mg/l, 0.0-0.2 mg/l, 0.6-1.5 mg/l and 0.0 mg/l respectively which are well within the recommended BIS standards for drinking water.

Conclusion

Rooftop rainwater harvesting was found to be one of the promising sources for drinking water supply and domestic needs along with better quality standards in comparison to other water supply sources.

Keywords: Rooftop water; Rainwater harvesting; Drinking water; Water Quality.

IMPACTS OF CLIMATE CHANGE ON BIODIVERSITY

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ABSTRACT

Climate change is an important cause of the irreversible transformation of habitats, of the rapid extinction of species, and of the dramatic changes in entire communities, especially for tropical assemblages and for habitat and range-restricted species, such as mountaintop and polar species. Climate change almost always exacerbates the problems caused by other environmental stressors including: land use change and the consequent habitat fragmentation and degradation; extraction of timber, fish, water, and other resources; biological disturbance such as the introduction of non-native invasive species, disease, and pests; and chemical, heavy metal, and nutrient pollution. As a corollary, one mechanism for reducing the negative impacts of climate change is a reduction in other stressors. The effects of climate change on biodiversity are required in formulating conservation and management strategies that best retain biodiversity into the future. Significant challenges in modeling climate change impacts arise from

limitations in our current knowledge of biodiversity. Community-level modeling can complement species-level approaches in overcoming these limitations and predicting climate change impacts on biodiversity as a whole. However, the community-level approaches applied to date have been largely correlative, ignoring the key processes that influence change in biodiversity over space and time. Here, we suggest that the development of new ‘semi-mechanistic’ community-level models would substantially increase our capacity to predict climate change impacts on biodiversity.

Keywords: climate; Land use; Degradation; Nutrient pollution.

SOIL MANAGEMENT PRACTICES THAT IMPROVE SOIL HEALTH

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ABSTRACT

Soil is a very important and sensitive resource of any country, as the crop yield of a nation on which the whole population depends is directly linked to the soil health. The dependence of a nation on others for meet the demand of its population for food and other crop products is a matter of great concern. Management techniques that focus on soil health (SH) are promising solutions to mitigate some environmental impacts and may increase economic returns. The holistic approach considers soil management as a way of enhancing agricultural production while not forgetting environmental quality, human and animal health. This leads to the concept of soil health. Changes in soil health are estimated by using physical, chemical and biological indicators. Soil health is mainly dominated by various soil biota and their activities, influences or functions. A review of various research papers and books revealed and confirmed that the following soil management practices improve soil health, particularly through their influence on soil micro-flora and fauna: conservation tillage practices or conservation agriculture, crop rotations, intercropping with legumes, cover cropping, agro-forestry, use of organic manure and crop residues, soil liming, and inoculation with effective microorganisms. These practices have a positive influence on soil microbial and faunal activities and increase soil microbial populations, diversity, and functions. The soil health is of very great importance for motivating farmers to use soil management practices for all field crops.

Keywords: Soil Health; Soil Management Practices; Conservation tillage; Crop Rotations.

A RESEARCH STUDY ON ENVIRONMENTAL CONSIDERATIONS FOR MANAGING MENSTRUAL HYGIENE

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ABSTRACT

Introduction

The subject mentioned in this research paper is crucial to the clean-environment movement's goal of advancing civilization. These kinds of developments are now required by the age of germs in order to create a safe and healthy way of living. To control menstrual bleeding, girls in rural regions utilize tissue paper, cotton, wool, old clothes, or a combination of these materials. Qualitative research shows that only girls who are aware of a variety of standard

sanitary pads prefer to use them. However, many females cannot afford or cannot find these pads. When these pads are drained, they swell up from being saturated with fluids, causing sewage blockage, which is a major issue worldwide. Menstrual waste can be disposed of by incineration. However, burning pads creates fumes that are harmful to the environment and human health since they include the carcinogenic and poisonous chemical dioxin. Given this shortcoming, natural fiber-based biodegradable sanitary napkins are an excellent substitute for establishing a hazard-free workplace.

Objectives

This research paper focuses on the:

- I. Types of absorbents used at the time of menstruation
- II. Attitude level of adolescent girls towards disposing sanitary pads.

Methodology

- i. POPULATION GROUP: The adolescent girls of age group 13-19 years studying in the government schools
- ii. SAMPLE SIZE: 400 sample sizes were considered for the pre-intervention programme.
- iii. SAMPLING METHOD: Purposive Random Sampling.
- iv. LOCALE OF THE STUDY: Lucknow City (Uttar Pradesh), India
- v. TOOLS AND TECHNIQUES USED IN THE STUDY: Self modified questionnaire was prepared and used for the intervention study. 400 samples were selected for the pre-intervention and 200 samples were considered for the Post-intervention study. Lecture method, demonstration method, power-point presentation, question and answer session were included for the intervention study. The respondent was first asked to fill a declaration form for their participation in the study and the participation was purely voluntary.

Result and Discussion

From the intervention study it was found out that the responders used reusable sanitary pads. Respondents favored disposable pads because they thought they were easy to use and hygienic. Reusable sanitary pads were regarded as a sustainable option by the majority of respondents. Girls between the ages of 13 and 19 are enrolled in school. Students were less inclined to utilize reusable sanitary pads that had already been used.

Keywords: Intervention, Absorbents, Hazard-Free, Menstrual Waste

MEDICINAL PLANTS AND THEIR USE IN FOOD PRODUCTS

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ABSTRACT

A medicinal plant is any plant which, in one or more of its organs, contains substances that can be used for therapeutic purposes or which are precursors for the synthesis of useful drugs. India harbours many species of medicinal plants but are not utilized at their full potential. These are used with the intention of health maintenance. Medicinal plants have numerous health benefits due to activity of phytochemicals, such as antioxidant activity, digestive stimulant action, anti-inflammatory, antimicrobial, antimutagenic, anticarcinogenic potential, hypolipidemic activities, emollient, cooling, nervine tonic, antispasmodic, constipating, aphrodisiac, antacid, diuretic, rejuvenating, carminative, stomachic, tonic, anabolic, appetizer nervous disorders, dyspepsia, diarrhoea, dysentery, tumors, inflammations, hyperdipsia, neuropathy, hepatopathy, cough, bronchitis, hyperacidity, gonorrhoea, piles, diabetes, rheumatism, gastric troubles, headache, for increasing lactation and certain infectious diseases and nutritive herbal plant.

Many phytochemicals with potential biological activity have been identified, mainly from four biochemical classes: terpenes, alkaloids, glycosides, and polyphenols. While hedonistic human behaviour constantly causes man to seek indulgent foods, the desire to eat "healthily" is also on the rise. Functional foods have been defined as "foods that provide benefit beyond basic nutrition". Many Food products have been developed using extracts from these plants like guava bar (stevia and shatavari), Herbal milk (alovera and tulsi), herbal ladoo (aonla and mulethi), mixed fruit jam (alovera). ice - cream (stevia) white bread with aloe vera, Candies, bar, Munch, chewing gum, instant aloe vera tea granules, aloe vera gum for sore or bleeding gums, etc. Also, these are used as food additives (stevia as sweetener, rosemary as preservative, etc). Therefore, medicinal plants - based food can be developed more to meet the organoleptic, nutritional and medicinal properties.

ADVANCEMENTS IN THE MANAGEMENT OF SUSTAINABLE FOOD

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ABSTRACT

Sustainable Food Management is a methodical strategy that aims to reduce food waste and the effects it has across the whole life cycle, from the use of natural resources to production, sales, and consumption, and finishing with decisions about recovery or final disposal. By managing food sustainably, we can reduce costs for businesses and consumers, support those who lack enough to eat in our communities, and protect natural resources for future generations. This strategy, which builds on the well-known "Reduce, Reuse, Recycle" tagline, transforms how we think about environmental conservation and more completely acknowledges the effects of the food we waste. Food waste is considered not only a sustainability problem related to food security, but also an economic problem since it directly impacts the profitability of the whole food supply chain. Methane, a potent greenhouse gas that contributes to global warming, is produced when food waste decomposes. One-third of the food produced worldwide is thrown away uneaten, adding to the environmental load. Obstacles to preventing large-scale food waste processing include actors who contribute to food waste, effective cost/benefit food waste utilisation methods, sustainability and environmental issues, and public acceptance. To accomplish this, however, there are a number of obstacles that must be overcome. One such problem is raising consumer awareness and knowledge. No sustainable, eco-friendly food waste utilisation and management strategy can be successful without consumer approval of measures to reducing food waste. The current effort has also highlighted the requirement for more thorough investigations into the where, why, and quantity of food waste produced between farm and fork.

CHALLENGES IN ORGANIC FARMING BY THE FARMERS OF MADHYA PRADESH

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ABSTRACT

"Organic agriculture is a holistic production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles, and soil biological activity. It emphasises the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems. This is accomplished by using, where possible, agronomic, biological, and mechanical methods, as opposed to using synthetic materials, to fulfil any specific function within the system." (FAO/WHO Codex Alimentarius Commission, 1999). The study is conducted in the state of Madhya Pradesh in four district Bhopal, Rewa, Shahdol and Satna representing four different Agro-climatic zones. Mean and total weighted score was used for the study. Awareness regarding the process of certification of organic product, linkage of market of organic product, timely availability of quality input are the major challenges faced by the farmers. Organic product is more perishable having short life span due to which it requires primary processing and proper cold chain infrastructure. Farmers need proper infrastructure like training, storage houses, proper market linkage, market intelligence, market information, proper road network for the supply of Agri-produce at right time, developing the chain of cooperatives so that risk associated with the organic farming can be minimised and profit can be increased. Government needs to create infrastructure dedicated to organic production. India has vast potential to explore the unexplored sector of organic farming.

DESIGNED MILK FOR HUMAN HEALTH BENEFIT

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ABSTRACT

Milk is a natural complete food, which provides fat, protein, essential vitamins, minerals and also a good source of calcium which is essential for the prevention of bone disorders such as osteoporosis. With the changing social and eating behaviour, the milk should be of special value so that it can compete with other dairy products and energy drink. For this, milk have to be designed in such a way which increases its properties according to the need of the challenging scenario. Designing of the milk means production of the milk that has certain specific values viz., improve the immunity, utilization of lactose and alleviate diarrhea. Designer milk is not now a dream but a real possibility. Recently there is a rising interest in dairy biotechnology for altering the composition of milk by nutritional and genetic manipulations for the well being of human. Milk and milk products are considered as complete food containing most of the nutrients required for healthy life. The nutrients contents and its proportion in the milk can be modified by either incorporating required functional ingredients directly into fluid milk, dairy products or modifying the feed formulation of lactating animals to get desired milk composition. The modification of feed formulation not only results in secretion of milk of desired composition but also reduces the chances of incidence of certain

diseases in lactating animals. Modification or enrichment in milk, milk products can be done in several ways such as modifications in protein, amino acid composition, modifications in fat, fatty acid profile, alteration in lactose, humanization of bovine milk. eliminating β -lactoglobulin from milk, milk with human therapeutic proteins, decreasing of milk allergies, melatonin enriched milk and many more types of the modified or enriched milk can easily be obtained for the specific proposes. As consumer preference for animal products is likely to continue, it would be important to modify animal products in such a way that dietary risks are minimized while there would be maximum benefits in respect to processing of products. Rapid development of genetic technology has placed the dairy processors open to improvement by modern biotechnology, while novel horizons beckon in nutrition, food technology and pharmacology.

DEVELOPMENT AND EVALUATION OF VALUE-ADDED PRODUCTS FROM KODO MILLET

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ABSTRACT

Most of the population rests on a cereal-based diet because cereal grains are good source of carbohydrates, energy and vitamin B complexes but lack in micronutrients and functional compounds. Kodo millet (*Paspalum scrobiculatum*) is gluten-free nutritious grain rich in dietary fibre, polyphenols, antioxidants and phytochemicals but not well utilized by the food industry for development of value added products. Development of kodo millet supplemented value added products, enhance the nutraceutical, sensorial and functional properties of products. Extruded products such as pasta is commonly made from durum wheat-derived semolina flour, which contains gluten causes celiac disease (gluten intolerance) is very common now a days. So to overcome that kodo millet can be utilized for supplementation of pasta to improve its nutritional value and develop gluten-free pasta. Apart from this it is found to possess antibacterial properties against *Staphylococcus aureus*, *Leuconostoc mensteroides* and *Bacillus cereus*, high antioxidant content that protect against oxidative stress, the low glycemic index of kodo millet flour improves the glucose level in blood stream and its gluten free property is suitable for people suffering from celiac disease. In spite of high nutritional value kodo millet is not exploited on commercial scale due to certain constraints like non-binding property due to lack of gluten and its bitter after taste. Thus in order to harness its functional properties it can be combined with other millet and cereal crops for the preparation of different value added products. It seems to be feasible to utilize kodo millet which is a minor millet to raise farmer's income, apart from providing the population with many health benefits.

Keywords: kodo millet, nutritional value, health benefits, value added products

EFFECTS OF PROBIOTICS ON GUT HEALTH

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ABSTRACT

Gut health is term increasingly used in medical literature and by the food industry. It includes multiple positive aspects of gastrointestinal track. Human microbiome is defined as the

ecological community of commensal, symbiotic, and pathogenic microorganisms that literally share our body space and have been all but ignored as determinants of health and disease. Gut microbiota increases the metabolic capacity of the host, provide vitamins (e.g. B2, B12, K and folic acid) and protect from colonization with pathogenic bacteria. Probiotics restore the composition of the gut microbiome and introduce beneficial functions to gut microbial communities, resulting in amelioration or prevention of gut inflammation and other intestinal or systemic disease phenotypes. Probiotic strains (probiotics) are defined as “live microorganisms which when administered in adequate amounts confer a health benefit on the host”. Natural probiotics as supplements as well in foods are yogurt, sauerkraut, pickles. Dietary nutrients may be converted into metabolites by intestinal microbes that serve as biologically active molecules affecting regulatory functions in the host. Mechanisms of probiosis include manipulation of intestinal microbial communities, suppression of pathogens, immunomodulation, stimulation of epithelial cell proliferation and differentiation and fortification of the intestinal barrier. This seminar describes how diet and intestinal luminal conversion by gut microbes play a role in shaping the structure and function of intestinal microbial communities. Proposed mechanisms of probiosis include alterations of composition and function of the human gut microbiome, and corresponding effects on immunity and neurobiology.

INVESTIGATING MOTIVATING FACTORS OF WOMEN ENTREPRENEURS IN TELANGANA STATE

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Purpose

The aim of this paper is to investigate the motivating factors or factors influence on the success of women entrepreneurs who own and manage micro and small enterprises in Telangana State, India.

Methods

The study was carried out in three districts of Telangana State and examined 180 women entrepreneurs who had been in enterprises for at least 2 years. A self-administered questionnaire (Benzing et al. 2009) has been used to collect the data. The questionnaire had 11 items related to motivational factors. Analysis was carried out using SPSS.

Results

According to the study's findings, the majority of women entrepreneurs (46.67%) were between the ages of 24 and 32, had a college education (31.11%), and had 2 to 5 years of entrepreneurial experience (68.89%). The study revealed that independence, financial security, and recognition were the major factors that motivated women entrepreneurs to succeed in their entrepreneurial competences. Discussions with the respondents also revealed that family support was a huge factor and the biggest motivation for them to establish and manage their enterprises.

Conclusion

The present study attempted to investigate the motivating factors that contribute to women entrepreneurs' success. In the study, five motivation factors (earning, independence, recognition, security and satisfaction) were studied. The findings revealed that independence, financial security, and recognition were the major motivating factors. The outcome of the study can be used by academicians, policy makers to motivate women to establish their own enterprises.

Keywords: Entrepreneurship, Women Entrepreneurs, Motivation, Empowerment, Enterprises.

PESTICIDE EXPOSURE OF VEGETABLE FARMERS IN BANDA DISTRICT OF UTTAR PRADESH

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ABSTRACT

Pesticides are widely regarded as the most appealing way of pest control because they require less labour and produce more per hectare of land than other methods. Imbalanced and widespread use of these pesticides posed serious health and environmental risks. However, farmers are becoming more conscious of the significance of protecting themselves against pesticide-related dangers is still scarce, notably in Bundelkhand region of Uttar Pradesh state of India. The present study was conducted to assess the extent of pesticide exposure of vegetable farmers of Banda district of Bundelkhand region of Uttar Pradesh. For this purpose, a sample of 90 vegetable farmers from 6 selected villages was surveyed with face-to-face interview method. Collected data was tabulated and analysed with the help of SPSS software. Major findings of the research showed that Majority of vegetable growers were having medium level-knowledge about safe use of pesticides (73.33%); 80 per cent of vegetable growers were aware that pesticides residual could be found in plant parts; and 50 per cent of vegetable growers were exposed to pesticides stored in houses. Skin irritation (56.70%), headache (54.40%) and blur vision (41.10%) were the common symptoms reported by the vegetable farmers exposed to pesticides while applying.

COMPARATIVE ANALYSIS OF QUALITY ATTRIBUTES OF SELECTED FODDER GRASSES IN HOMEGARDEN AGROFORESTRY SYSTEM AND OPEN AREA SOLE FARMING

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ABSTRACT

Livestock production is the backbone of the Indian agricultural system contributing about 4.1 % to the total GDP and 25.6 % to the agricultural GDP. However, the productivity of livestock is constrained due to inadequate feed and fodder as well as due to a deficit in crude protein. Kerala, the southernmost state in India, well popular for its homegarden agroforestry system with livestock as an integral component, is producing only 60 % of the roughage requirement. The remaining demand is met by importing protein-rich fodder grasses from neighbouring states and that offsets the profit of farmers to a great extent. Cereal fodder crops like maize, pearl millet and sorghum are potential fodder grasses due to their high nutritional content. Thus, the cultivation of quality-rich cereal fodder grasses in the indigenous farming systems of Kerala, particularly the homegardens appears to be a viable approach for enhancing the sustainability of livestock production in the state. With this background, a comparative analysis of quality attributes of cereal fodder grasses viz., maize, pearl millet and sorghum in terms of their crude protein and crude fibre content in two land use systems namely

homegardens and open area sole farming was carried out. The study also compared the quality parameters of cereal fodders with hybrid napier, the most cultivated fodder grass by the farmers in the state. The study revealed that fodder grasses cultivated in homegardens exhibited relatively higher crude protein and lower fibre content. Among the cultivated fodder grasses, the percentage of crude protein content was observed to be higher in maize, whereas fibre content was least noticed in maize and pearl millet. Thus, the study indicates that the cultivation of fodder crops under partial shade yields higher quality grasses than open area cultivated ones. The study also indicated that fodder maize, African tall can be successfully cultivated in partially shaded homegardens to enhance quality forage production.

EVALUATION OF CARROT (*Daucus carota* L.) Accessions For Yield And Quality Traits

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Purpose

Carrot (*Daucus carota* L.) is an important root vegetable crop of Apiaceae family originated from Afganistan. There are lot of challenges such as increasing and stabilizing carrot production and prices in the country due to lack of high yielding and stable varieties, especially in the tropical types. Hence, there is a need to develop high yielding genotypes suitable for tropical conditions. The aim of the present study was to evaluate carrot accessions for yield and quality traits.

Methods

The experiment was laid out in a randomized block design with three replications and observations were recorded on randomly selected 5 single plants for the various yield and quality characters.

Results

The analysis of variance revealed that sufficient variation existed among the accessions for all the traits studied. Based on the mean performance, the accessions recorded highest root weight and was found promising for yield and quality traits like highest TSS(°Brix) and total carotenoid content(mg/100g) respectively.

Conclusion

Hence, the accessions which recorded highest yield and other traits can be further used for carrot breeding improvement programmes.

Keywords: carrot, accessions, yield, quality traits, breeding programmes

MUTATION: RESOURCE FOR FUTURE CROP IMPROVEMENT

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ABSTRACT

Plant breeding requires genetic variation of useful traits for crop improvement and mutation is the ultimate source of genetic variation. Mutation breeding is a fundamental and highly successful tool in the global efforts of agriculture to feed an ever increasing and nutritionally demanding human population. The physical and chemical mutagens, their effects and their utility are discussed. Mutation refers to sudden heritable change in the phenotype of an individual. The term mutation was originally coined by Dutch botanist Hugo De Vries while working with *Oenothera lamarckiana*. Mutation is the most commonly used method in asexually propagated crops and self-pollinated crops for creation of variation that used for improvement of crops. Induced mutations are considered as an alternative to naturally occurring variation as the source of germplasm for plant improvement programs and as an alternative to hybridization and recombination in plant breeding. The induction of mutations has been used to enhance the yield, better nutritional quality and wider adaptability of world's most important crops such as wheat, rice, pulses, millets, oilseeds, etc. The total area covered by commercially released mutant cultivars clearly indicates that they have played a significant role in solving food and nutritional security problems in many countries. Of all the mutant varieties developed, majority of mutants were produced through direct mutagenesis of the plant propagules, and also there are several reports of mutants derived by irradiating rooted stem cuttings, which paves the way for *in vitro* mutagenesis. The production of mutants by irradiation of *in vitro* cultured tissues provides a means to treat large populations which would not have been possible before. These would finally lead to rapid enhancement of crops with improved yield, increased biotic and abiotic stress and reduced agronomic inputs. Thus, mutation assisted plant breeding will play a crucial role in the generation of designer crop varieties to address the threats of global climate change and challenges of world food insecurity.

Keywords: Mutation, genetic variation, induced mutation, mutagenesis

PRECISION FARMING - AN INNOVATIVE APPROACH FOR SUSTAINABLE AGRICULTURE

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ABSTRACT

After the green revolution, the agricultural production system changed rapidly. Nonjudicial use of agrochemicals started polluting surroundings while on the other hand, sparse use of micronutrients leads to widespread deficiency in approximately all major crops. In this new era of farming an amalgamation of precise technologies with intensified farming is the need of the hour. Precision farming aggregates satellite-based technologies, Internet of Things networks, Artificial Neural networks, and artificial intelligence with age-old yet intensified farming practices to obtain higher precision of inputs and lower use of environmentally fragile substances. GIS, GPS, and other remote sensing-based crop management are the future when

climate change is posing the greatest threat to agriculture and crops are prone to unpredicted damage. The only way to get higher yield from limited resources is by changing agriculture into what we call Precision Agriculture, Climate Smart Agriculture, or as I prefer to call it Water-Smart Agriculture”. Precision agriculture, holistically addresses the point where all these challenges intersect and are essential to meet the needs of this growing population. It is quite clear that the only way to grow more food is to increase the yield while saving the environment from further degradation. It is not just food, it is the four F’s – Food, Feed, Fiber and Fuel. Precision agriculture provides important issues toward a more sustainable agriculture. **Keywords:** Precision Agriculture, Internet of Things, Artificial Intelligence, Artificial Neural Networks

A NOVEL NATURAL COLORANT AND EVALUATION OF ITS FUNCTIONAL QUALITY FROM BLOOD FRUIT OF NORTH-EAST INDIA

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Purpose

The present study aimed to develop an efficient extraction method of anthocyanins from blood fruit as well as the study of its storage stability under different conditions of temperature, light and pH.

Methods

Conventional and ultrasound-assisted extraction of anthocyanin from blood fruit flesh was carried out using aqueous methanol, ethanol, acetone and isopropanol solvent system to evaluate the finest quality of anthocyanins with efficient extraction. HPLC-ESI-MS detection technique was used for the analysis of the individual anthocyanins present in blood fruit.

Results

The highest monomeric anthocyanin content of blood fruit extracts was found for the methanol extracts (2.42 ± 0.15 mg C3GE/g). The results of color value, antioxidant activities, and co-pigmenting compounds suggested that the methanol extract is better than the other solvents extract. HPLC-ESI-MS detection technique revealed that the cyanidin-3-O-glucoside fraction of anthocyanin is more concentrated in methanol extract prepared with ultrasonic method than that of the conventional methods. The anthocyanins of ultrasonic extract exhibited the highest shelf-life as compare to conventional extract.

Conclusions

Blood fruit’s novel pigments possess functional qualities like stable color, stronger antioxidant activity, and longer shelf-life, therefore, it can be used as a natural coloring agent for food, cosmetics, and pharmaceutical and antioxidant.

Keywords: Anthocyanins, blood fruit, cyanidin-3-O-glucoside, ultrasound assisted extraction.

WEED DYNAMICS AND YIELD OF DIRECT-SEEDED RICE AS INFLUENCED BY HERBICIDES UNDER DIFFERENT AGRO-ECOSYSTEMS

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ABSTRACT

Purpose

Rice (*Oryza sativa* L.) is an important staple food for more than 60 % of the world population. It supplies 20 percent of the total calories required by the world and 31 percent needed for the Indian people. Direct seeded rice is an emerging production technology in India due to insufficient water, labour, and capital input requirements. But direct seeded rice has the problem of severe weed infestation. The success of DSR depends largely on weed control, especially with chemical methods, as mechanical weed control is labour intensive and not cost-effective. Therefore, applying several herbicides in combination or sequence can be more helpful.

Methods

The study was conducted during the *kharif* 2019 at Research Farm, College of Agriculture, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (M.P.) with 2 mainplot treatments (rainfed and irrigated agroecosystems) and 8 subplot treatments (bispyribac sodium @ 25 g *a.i./ha*, fenoxaprop-p-ethyl @ 60 g *a.i./ha*, fenoxaprop-p-ethyl + penoxsulam @ (60 + 26.7) g *a.i./ha*, cyhalofop + penoxsulam @ (135 + 26.7) g *a.i./ha*, bispyribac sodium + (metsulfuron methyl + chlorimuron ethyl) @ (25+4) g *a.i./ha*, triafamone + ethoxysulfuron @ (40+20) g *a.i./ha* as post-emergence herbicides, hand weeding twice and weedy check) replicated thrice. Rice variety MTU 1010 was seeded on 12th June 2019 in rows 20 cm apart using seed drill. Weed density (no./m²) were recorded species wise in each plot using quadrat from the area selected randomly for observations.

Results

The results indicated that weed flora of the experimental field was mainly dominated by *Echinochloa colona* with a mean relative density of (30% and 28.6%) followed by *Alternanthera sessilis* (26% and 25%), *Cyperus rotundus* (18.9% and 18%) and *Cynodon dactylon* (18.4% and 17.9%) under rainfed and irrigated agroecosystems. The highest weed control efficiency of (97% and 97.4%) at 90 DAS was recorded with hand weeding under rainfed and irrigated agroecosystems respectively which was closely followed by bispyribac sodium @ 25 g *a.i./ha* (89.5% and 89.6%) and fenoxaprop-p-ethyl + penoxsulam @ (60 + 26.7) g *a.i./ha*. Growth parameters and yield attributing characters of rice were higher in plots receiving bispyribac sodium @ 25 g *a.i./ha*, which registered the maximum values of these parameters. Similarly, the highest grain yield was recorded with bispyribac sodium @ 25 g *a.i./ha*.

Conclusions

It was concluded that effective management of weeds and higher grain yield of direct seeded rice was registered with bispyribac sodium at 25 g *a.i./ha* under rainfed and irrigated agroecosystem.

Keywords: Agroecosystem, Bispyribac sodium, Rice, Weeds

MORPHOLOGICAL CHARACTERIZATION OF *Sclerotinia sclerotiorum* CAUSING STEM ROT OF INDIAN MUSTARD (*Brassica juncea* L.)

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ABSTRACT

Stem rot caused by *Sclerotinia sclerotiorum* (Lib.) de Bary, is the most calamitous fungal disease that causes serious damage to Indian mustard. Present investigation was carried to find morphological variability among isolates of *Sclerotinia sclerotiorum*. All the isolates-initiated formation sclerotia by aggregating hyphae after 6-7 days of post inoculation. Later on, sclerotia of all isolates got pigmentation and became black in colour. Pattern of sclerotial formation varied among isolates and sclerotia of Udr, Mwl, Ctr and Nmr isolates were formed near rim of Petri dish. Sclerotia formation were attached to the rim pattern in isolates Ggr, Ang, Hng and Rvr, while Bharatpur district isolates (Btr and Dig) were in scattered pattern. In case of number sclerotia per plate, significant range of sclerotial number 13-26 per plated was recorded. Highest number (26) of sclerotia was in Dig isolate followed by in Btr isolate (25). Isolate Hnh and Rvr were produced similar number of sclerotia (24) and Ang, Ggr, Nmr, Ctr isolates formed 22, 21, 17.34 and 17 numbers of sclerotia, respectively. Lowest number (13) of sclerotia was in Mwl isolates while Udr isolate formed 14 sclerotia. Variability in size of sclerotia was also been observed where, maximum size (35.34mm length and 22 mm width) of sclerotia was formed in Btr whereas minimum size (28.34mm length and 17 mm width) of sclerotia was in Mwl isolate. Sclerotial length and width was varied from 26.67-33.34mm and 18-20 mm, respectively.

Keywords: Variability, sclerotinia, isolates and mustard

BIOLOGICAL CONTROL OF THE DIAMONDBACK MOTH, *PLUTELLA XYLOSTELLA* IN *CRUCIFERS*: A REVIEW

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ABSTRACT

The diamondback moth (*Plutella xylostella* L.) is one of the most calamitous cosmopolitan insect pests of cruciferous crops. It has shown significant resistance to almost every ersatz insecticide applied in the field. In certain parts of the world, economical production of crucifers has become almost unfeasible due to insecticidal control failures. Consequently, increased efforts worldwide have been undertaken to develop integrated pest management (IPM) programs, principally based on manipulation of its natural enemies. Although over 130 parasitoid species are known to ambush various life stages of DBM, most control worldwide is achieved by relatively few hymenopteran species belonging to the ichneumonid genera *Diadegma* and *Diadromus*, the braconid genera *Microplitis* and *Cotesia*, and the eulophid genus *Oomyzus*. Its natural host range is limited to cultivated and wild *Brassicac*s that are characterized by presence of glucosinolates, sulfur-containing secondary plant compounds. Adults utilize an integrated suite of chemical and morphological cues for host plant location and recognition.

Keywords: Biological control, crucifers, diamondback moth and insecticide resistance.

PROMOTION OF POTENTIAL AGRI-ENTREPRENEURS START-UP DEVELOPMENT IN NORTH EAST INDIA: A WAY FORWARD

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Purpose

A growing industry, agribusiness promotes the expansion of the agricultural and related sector, which is essential to economic progress. Additionally, it still plays a significant part in the expansion of the area and the entire nation. Like the North Eastern Region, which has a wealth of agricultural and horticultural bio-resources, has a lot of promise in the agribusiness industry. The region is a major producer of fruits, vegetables, spices, orchids, bamboo, and fragrant and medicinal plants. For value chain growth, the globe is drawn to the bamboo forests of Mizoram, the lakadong turmeric of Meghalaya, the Tezpur Litchi and Bhoot Jolokia (chilli) of Assam, the Tree tomato of Nagaland, the Queen pineapple of Tripura, the Kachai Lemon of Manipur, and the organic nature of Sikkim. The export of agricultural goods has increased by 85.34 percent in the previous six years, and foreign exchange transactions have increased from USD 2.52 million in 2016–17 to USD 17.2 million in 2021–22 in the region. The principal export markets have been Bangladesh, Bhutan, the Middle East, the United Kingdom, and Europe (APEDA 2022).

Methods

A systematic open ended interview schedule was developed, focused group discussion and unit visit was done and collected primary data on educational qualification, gender wise startup, total turnover, employment generated, new product launched, destination of products, farmers live touched, etc from the Agri-preneur startups and analysed with the suitable statistical tool such as mean, median, mode, chi-square, analysis of variance etc.

Results

This is made possible by the ongoing work of the agribusiness incubation center and other line departments to develop the capacity of North East India to become Atmanirbhar (self-reliant) through programmes on the value chain, market linkage, networking, legal support, development of business strategies, technological support, and grant in aid. Accordingly, the Ministry of Micro, Small, and Medium Enterprises-funded Incubation Centre at North Eastern Hill University's Tura Campus assisted 50 adolescents and 300 entrepreneurs under the Agri-Clinic & Agribusiness Center Scheme. They are successfully operating a firm that generates more than 3 crores and more than 1000 jobs.

Conclusions

The supported Agri- entrepreneurs starts up are performing well in term of agribusiness with locally available special produce of the region in production, processing and agri-input supply domain. However, there are many challenges such as lack of logistic support, cold storage facilities, packaging materials, branding, system data and institutional linkage gap which are need to be bridge the gap.

Keywords: Agri-business, Agri-entrepreneurs, Capacity building, Livelihood, Market linkages, North-Eastern India.

DEVELOPMENT OF NEXT GENERATION INTELLIGENT PACKAGING SYSTEM FOR FOOD PRODUCTS THROUGH INNOVATIVE INTEGRATED GREEN APPROACH

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Purpose

There is an increasing need to develop smart packaging technology to support consumer’s desires for a more environmentally friendly approach to packaging in general. Food packaging is a critical barrier in the fight against food borne disease and potential security issues like tampering or fraudulent activities. “Next Generation Intelligent Packaging System” is an innovative and integrated green approach to ensure a high degree of safety and security in packaged food segment. This research was aimed to develop a smart packaging solution to increase the safety and security. The emerging innovative and interdisciplinary green approach will lead to develop next-generation “Intelligent Packaging” system for perishable convenience food products.

Methods

The proposal based on nanomaterial loaded with edible plant based luminescent compounds which act as green-sensor as well as green-preservative. The smart nanomaterials are highly sensitive to change the color even in slight quality variations such as physical, chemical, and biological within the controlled packaging system. Smart nanomaterials were produced through nanoencapsulation technique, which can be highly sensitive and indicated even the slightest quality variations by changing the color during the supply chain. Subsequently, this quality changes can be monitored and measured accurately in a real time basis and also be demonstrated by an external device (portable/handy) using hyperspectral imaging system.

Results

Smart packaging embedded with digitalization technology that provides a compelling business for food processors with huge potential to reduce costs and increase profits and its market is forecasted to grow at an annual average rate of 5.9%, reaching \$7.56 billion by 2023 apart from normal functionalities. Smart packaging offer processors with powerful tools to accomplish product quality tracing in in their food safety management programs subsequently, there will be fever possibility of product recall visibility by digital platform. Smart nanomaterial predominantly acts as sensor of food spoilage (green-sensor), antimicrobial agent (green-preservative), extending shelf life, and enriching immune booster (phytonutrients). This innovative and interdisciplinary approach will overcome the issues related to food quality and safety, cost, marketability, consumer acceptance and environmental protection alarms.

Conclusions

The outcome of smart packaging technique will greatly help to meet the urgent market’s needs, sustainable green environmental growth, and escalating country’s economic growth. Hence, there is clear evidence stating that the high potential to improve safety and security of convenience food products and also necessary to ensure food quality and safety at present Covid-19 pandemic situation. “Next Generation Intelligent Packaging System” is an innovative and integrated green approach, which will be a promising multidisciplinary technique to ensure quality and security of perishable convenience food products.

Keywords: Green preservative; Green sensor; Hyperspectral Imaging System; Luminescent Compound; Next Generation Intelligent Packaging; Smart Packaging; Smart Nanomaterial;

FUNCTIONS OF STARCH BASED EDIBLE COATINGS FOR THE PRESERVATION OF FRUITS AND VEGETABLES

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ABSTRACT

Fruits and vegetables are essential in the human diet due to the health and nutritional benefits. However, they have short postharvest life and remain as a living tissue and cause much physiological, biochemical pathological changes until they are consumed and finally lead to economic losses. Due to transpiration during post-harvest handling fruits and vegetables lose weight which directly affect their texture and cause shrinkage and hence impact their shelf life. Therefore restriction imposed on agrochemicals by many countries, search has led to many preservation techniques like edible coatings. The efficiency of edible coatings depends upon their composition. Polysaccharides, including starch, cellulose, pectin, alginates, chitosan and others, are naturally occurring polymers, widely used as coating materials. Such coatings can be applied in the form of coatings that create as semi permeable membrane which act as a barrier to gases and water vapor, reducing respiration and weight loss hence maintaining the firmness of the fresh product and also provide gloss to the coated products. Coatings are able to act as carriers containing wide variety of functional ingredients, such as antimicrobials, antioxidants, anti-browning agents, nutrients or flavoring and coloring compounds thus enhancing food stability, quality and safety of food product. The film provides a barrier against water vapor and gases and thus lower levels of O₂ and higher levels of CO₂ inside the fruit, which helps to control the enzyme activities, contributing to maintain the firmness of the coated product during storage. Starch-based formulations have the advantage of their food contact properties since starch is edible and low cost and has good carrying properties for different actives which can protect fruits and vegetable from microbial decay or physiological disorders.

Keywords: Edible coatings, Preservation, Anti-microbial, Starch, Functional properties

UTILIZATION OF BROWN RICE FOR DEVELOPMENT OF CONVENIENCE FOOD PRODUCTS

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ABSTRACT

The consumer demand for healthy and high-quality foods has led both industry and scientific community to develop new functional foods with greater beneficial health effects. Whole grains are gaining popularity due to their high nutritional value and bioactive compounds involved in protective effects against chronic diseases, making them valuable ingredients for the development of convenience foods. So, there is an increasing demand for nutritious processed foods such as popped products, crackers and snack products, hence substitution of brown rice flour in the formulation of value added products is the need of hour. Further, the utilization of brown rice could also be exploited in the processing of gluten free products, breakfast cereals and convenience foods. Thus, there is a need to develop more value added products and processes to enable optimal utilization of brown rice as a source of nutrients. It is well-known that brown rice is deemed as a good source of nutritional values for human. It is excellent source of vitamins like thiamine (vitamin B₁), riboflavin (vitamin B₂), niacin (vitamin

B₃) and fiber and also low in calories. It would be interesting to process the brown rice to be a more convenient and preferable product, namely instant brown rice or quick cooking brown rice, as brown rice requires long cooking time of about forty-five minutes. Thus in the present research, brown rice are utilized for the development of convenience products by making them instant by different drying methods viz. hot air drying and microwave drying, and then they are utilized for the development of convenience foods like instant *khichdi*, nutri-bar along with other healthy ingredients.

Keywords: *Brown Rice, Functional Foods, bioactive compounds, chronic diseases, convenience foods, instant, khichdi, Nutri-bar, ingredients.*

STANDARDIZATION OF MINIGRAFTING TECHNIQUE IN CITRUS WITH *IN-VIVO* RAISED SCIONS

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ABSTRACT

Propagation techniques for citrus are of extreme importance, since they ensure high yield rates, high genetic fidelity, and high phytosanitary quality. The aim of this study was to standardize the minigrafting technique as a method for propagation. Two commercial citrus cultivars viz. Kinnow mandarin and Mosambi sweet orange were minigrafted on two rootstocks viz. Carrizo and Rough lemon (on 4-, 5- and 6-month-old rootstocks) under protected conditions. Results suggested that minigrafting could be a useful technique for shortening the propagation period in citrus. Kinnow mandarin when minigrafted on rough lemon rootstocks (on 4 months old) it took minimum number of days to sprouting (12.28 days). However, when Kinnow mandarin was minigrafted on 4-month-old Carrizo rootstock it recorded the highest bud intake (80.00 %) and survival percentage (100.00%). When Kinnow was minigrafted on 6-month-old Carrizo rootstock it had a maximum stock girth (3.28 mm) and scion girth (3.24 mm), maximum number of shoots (4.16) and maximum number of leaves per shoot (7.56). Mosambi minigrafted on Carrizo rootstocks (4 months old) took minimum number of days to sprouting (18.64 days). However, Mosambi recorded highest bud intake (68.00%) and survival percentage (85.23%), when minigrafted on 4 months old Carrizo rootstocks. Mosambi minigrafted on 6 months old Carrizo rootstock it had a maximum stock girth (3.04 mm) and scion girth (2.98 mm), maximum number of shoots (3.64) and maximum number of leaves per shoot (7.11). The above findings revealed that, 4-month-old rootstocks were more suitable for minigrafting for both the citrus cultivars in terms of bud intake and survival percentage. However, 6-month-old rootstocks were more suitable for minigrafting in terms of plant traits for both citrus cultivars viz. Kinnow mandarin and Mosambi.

Keywords: Kinnow mandarin, minigrafting, propagation, Carrizo.

EFFECT OF CTC TEA WASTES AS ORGANIC MANURE IN GROWTH AND DEVELOPMENT ON *ABELMOSCHUS ESCULENTUS* (L.) MOENCH

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Purpose

In the six northern districts of West Bengal, there are numerous tea garden and factories spread out in the Himalayan and Sub – Himalayan regions. The Sub – Himalayan Garden and factories mainly produce CTC (crush, tear and curl) teas. As an essential byproduct of CTC tea processing, these gardens cumulatively produce a huge quantity of Factory Tea Waste (CTC-FTW). It has been estimated that these tea gardens of North Bengal produce around 15 million kg of CTC-FTW per year, if not disposed properly, is a potent soil, water and air pollutant. Beside this large number of tea waste is produced in tea shops and domestic consume of CTC tea, it is called domestic tea waste (CTC-DTW).

Methods

In the present study, a potential use of CTC tea wastes (CTC-FTW & CTC-DTW) as Organic Manure in *Abelmoschus esculentus* (L.) has been evaluated. Field trial was conducted using CTC tea waste as organic manure with different ratios of CTC tea waste plus Cow dung (CD) in nine different treatments and it distributed into three groups like [Group- 1 (T₁: 100% CD)], Group- 2 [T₂: 75% CD & 25% CTC-FTW; T₃: 50% CD & 50% CTC-FTW; T₄: 25% CD & 75% CTC-FTW; T₅: 100% CTC-FTW], Group- 3 [T₆: 75% CD & 25% CTC-DTW; T₇: 50% CD & 50% CTC-DTW; T₈: 25% CD & 75% CTC-DTW; T₉: 100% CTC-DTW] for two successive sessions.

Results

Organic manure analysis of each treatment was done before application of the Organic manure into the field. After which plant physiological parameters of each treatment like pigment analysis (chlorophyll and carotenoid content), total Protein, Sugar, Phenol antioxidant property of plants like [Superoxide dismutase (SOD), Ascorbate peroxidase (APOX), Gluathione reductase (GR), Peroxidase (POX), Catalase (CAT)] were estimated during its fruiting time. During this study it was found that T₃ & T₄ of Group-2 (CTC-FTW & Cow dung mixture) and T₇ & T₈ of Group-3 (CTC-DTW & Cow dung mixture) give better results than Group-1 (control) i.e. T₁ (Cow dung). Beside this soil and fruit quality of Group-1 (control) and best results of each group i.e. T₄ of Group-2 and T₈ of Group-3 were also evaluated.

Conclusions

It was found that T₄ (Group-2) gives best result, T₈ (Group-3) gives more or less same results like T₄ of Group-2 and both were gives better results than T₁ control (Group-1) in both soil and fruit quality evaluations.

Keywords: CTC tea waste. CTC-FTW, CTC-DTW, plant trial etc.

IMPACT OF CONVENTIONAL AND CONSERVATION TILLAGE PRACTICES ON SOIL PROPERTIES

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ABSTRACT

Farming systems today have more obvious and detectable social, ecological, economic and environmental implications than ever before because of the growing concerns about agricultural sustainability and the environment. Tillage is basic & important component of agricultural production technology influences agricultural sustainability through its effects on soil processes, properties and crop growth. The conventional soil management practices resulted in losses of soil, water and nutrients in the field, and degraded the soil with low organic matter content and a fragile physical structure, which in turn led to low crop yields and low water and fertilizer use efficiency. It is therefore essential to select a tillage practice that sustains the soil physical properties required for successful growth of agricultural crops. Conventional tillage practices involving soil turnover usually decrease soil organic carbon (SOC) concentration. Conservation tillage increases SOC concentration leading to enhancement in soil quality and resilience. In many regions, conservation tillage has been shown to contribute to preserving soil properties. However, in order to promote this practice in new areas, it is necessary to generate information about its results in local environmental conditions. While indicated that intensive tillage loosens the soil, it buries the crop residues and exposes the soil to high-intensity rainfall and high wind speeds that lead to severe erosion. Therefore, conservation tillage practices, such as NT and MT were developed to protect the soil from wind and water erosion.

Keywords: Tillage, conservation tillage, conventional tillage, erosion, soil properties

MPCAS: IDEAL HOME FOR WILD MEDICINAL PLANT RESOURCES

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Purpose

The Indian Traditional medicine system has been broadened with the view of their applications based on region and community specific medicinal plants. e. Medicinal Plants Conservation Areas (MPCAs) areas are the virgin broad leaf forest with diverse vegetation. The term MPCA (Medicinal Plants Conservation Area) denotes a forest patch or area of about few hectars selected for conserving distinctive populations or diversity of medicinal plants in their wild natural ecosystem. The MPCAs (Medicinal Plants Conservation Area) model is thus an *in-situ* conservation initiative in which a patch of forestland of about 200 ha to for the purpose of conservation of diversity of medicinal plant populations in their own natural habitat where the conventional forestry administration operations are kept to minimum. Considered as a pioneering *in-situ* conservation effort, currently a network of 106 – 108 MPCAs are operational across 11 – 12 states in India. The MPCAs are established in biological diversity areas such as Himalaya, North-East India and Western Ghats, covering different bio-geographic regions. Three MPCAs (North Rajabhatkhawa MPCA, Sursuti MPCA and North Sevoke MPCA) of sub-Himalayan region of West Bengal have recorded the occurrence of a rich spermatophytic

flora. The taxonomic distribution of medicinal plants in these regions is also quite wild and rich.

Methods

Entire floristic study was made through conventional process of survey during 2017-2020. The phytosociological study of the different forested MPCAs, nested quadrates were plotted and minimum of 0.03% areas were covered under quadrate sampling for the better assessment of Biodiversity. For tree layer 10 × 10 m, shrubs and climbers 5 × 5m and herbs 1 × 1 m quadrates were plotted in random methods during three different seasons, namely designated as pre-monsoon [March – April], monsoon [May – July] and post-monsoon [September – November]. The quadrate data are gathered and analyzed through computing for percentage of Frequency, Abundance, Density, Relative Frequency, Relative Density, Relative Abundance and Important Value Index for all the recorded plant species. Using these data, concentration of species (Simpsons Index 1949), Species Richness (Margalef Index 1958 and Menhinick Index 1964), and Species Diversity (Shannon-Weiner Index 1963) etc. has been determined. Frequency (F), Density (D), Abundance (A), Relative Frequency (RF), Relative Density (RD), Relative Abundance (RA) or Relative Dominance (RDm) [for tree layer only] and Importance Value Index (IVI) were analysed to understand the importance of diverse species in forest

Result

Present study shows that the angiosperms are represented by 626 species under 397 genera belonging to 102 families, which include Pteridophyte and Angiosperms (monocot and dicot flora). Around 38 (34 %) of endemic species of monocot and dicot species are acknowledged to be exclusively endemic to the Darjeeling foothills and adjoining area of Terai and Duars region of West Bengal. Among the 77 threatened species, under Least Concern (LC), Near Threatened (NT), Vulnerable (VU), Endangered Species (EN), Critically Endangered species (CR) found in the three MPCAs of North Bengal. Out of the 626 species of recorded flora, 89 species have been enlisted as exotics species mainly found in marginal and road side area of the three MPCAs of North Bengal. The concentration of dominance expresses if there is dominance of one or a few species in the sampled area. Concentration of dominance for tree strata was calculated using Simpson index and the result (ranging from 0.95 – 0.99) showing significant values for all the three MPCAs. Species richness for same vegetation were measured using Menhinick and Margalef Index and calculated values were appeared to be very high for all the studied MCPAs i.e., ranging from 3.27 to 3.76 and 1.49 – 1.63 respectively denoting the high arboreal spermatophytic diversity. The diversity of the plant's community of different MCPAs was reflected by Shannon-Weiner index. Its values were found to be high for two MPCAs i.e., North Sevoke and Sursuti whereas it showed extremely low value for NRVK. The present data is indicating a heterogeneous assemblage of herbs, shrubs, climbers and trees in a diverse and stable habitat for North Sevoke, Rajavatkhawa and Sursuti MPCAs. Total of 364 species of useful medicinal values with NTFPs have been recorded that includes parts of medicinal plants, fruits and tender shoot as edible, religious value, ornamental, fodder, fuel etc. Developmental works, Unscientific collections from wild, Predominance of grey market in the medicinal plant trade, Exploitation of Forest fringe dwellers and forest villagers, Absence of a true data base on our medicinal plant resources etc. and natural threats like Climate change, earthquake, fire etc.

Conclusions

Establishment of more such small pieces of dense forested patches need to be declared as MPCAs because these areas provide double layer of protection from various anthropogenic pressure as those areas not even allowed ecotourism.

Keywords: MPCAs, Forest, Ethno-medicine, Biodiversity, Conservation, Phytosociology

VALIDATION OF STCR BASED FERTILIZER PRESCRIPTION ON THE FARMER’S FIELD AT LANJODA FOR RAJESHWARI VARIETY OF RICE

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ABSTRACT

A field experiment was conducted on “Validation of STCR based Fertilizer prescription on the farmer’s Field at Lanjoda village, District-Kondagaon (C.G.)” during *Kharif* season, 2020 with the three objectives; To test the validity of fertilizer prescription equation developed for Rajeshwari variety of rice. The fertilizer prescription equations previously developed for rice (variety-Rajeshwari) in STCR project as $FN=5.00T-0.78SN-0.3ON$, $FP= 1.40T-2.78SP-0.27OP$ and $FK-1.57T-0.10SK-0.09OK$ were validated on farmer’s field with rice variety Rajeshwari. The experimental field was laid out in randomized block design with three replications, consisting of seven treatments as control ($N_0 P_0 K_0$), farmers practice ($N_{80} P_{50} K_{30}$), GRD ($N_{100} P_{60} K_{40}$), STCR based dose for TY 50 q ha⁻¹ ($N_{102} P_{28} K_{45}$), STCR based dose for TY 50 q ha⁻¹ with FYM ($N_{95} P_{24} K_{39} + 5 t ha^{-1} FYM$), STCR based dose for TY 60 q ha⁻¹ ($N_{151} P_{42} K_{61}$) and STCR based dose for TY 60 q ha⁻¹ with FYM ($N_{145} P_{38} K_{55} + 5 t ha^{-1} FYM$). The soil of experimental field belongs to the soil order of *Vertisol* having clayey in texture. The initial soil test values were as pH 7.2, EC 0.12 dsm⁻¹, organic carbon 5.4 g kg⁻¹, available nitrogen 198 kg ha⁻¹, available phosphorous 15.92 kg ha⁻¹ and available potassium 365 kg ha⁻¹. The applied fertilizer N, P₂O₅ and K₂O were calculated on basis of soil test for the targeted yield treatments 50 and 60 q ha⁻¹ with and without FYM by using initial soil test values to achieving the yield targets.

Keywords: STCR, FYM, Soil Test, *Vertisol*

SOIL AND FOLIAR APPLICATION OF ZINC, IRON, MAGNESIUM AND BORON FOR ENHANCING QUALITY POMEGRANATE PRODUCTION IN ARID REGION

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ABSTRACT

In India, livelihood security of 70% of the farming community is reliant on success or failure of crops in drylands. Pomegranate is one of the most suitable horticultural crops that have potential to provide sustainable livelihood security in these regions due to its very high return on investment and good performance in dryland areas with little need of irrigation. In this row, for production and quality of pomegranate there is need of effective nutrient management to reduce the fruit splitting or cracking which is a major physiological disorder affecting the quality of pomegranate fruit in arid climate. Plants of Bhagwa var. of pomegranate having uniform size, vigour and of bearing stages at 5 years age in mrig bahar were selected for the investigation. All the plants were either sprayed or soil applied or treated by both the method according to treatments to fulfil the nutrient requirement of crop for reduce the cracking and to enhance quality of fruit. were. The soil application and first spray was done in second week of July, followed by one month after the first spray. There is a significant decrease in cracking on all treatments compare to the control. Plants treated with combination of soil and foliar application of ZnSO₄ @ 50 g + FeSO₄ @ 50 g + MgSO₄ @ 50 g + Boric acid @ 25g + ZnSO₄

@ 0.2 % +FeSO₄ @ 0.2 % + MgSO₄ @ 0.2 % + Boric acid @ 0.1 % found most effective to increase quality production among the other treatments. It might be concluded that application of some nutrients ZnSO₄, FeSO₄, MgSO₄ and Boric acid had a positive influence in reducing the cracking problem and enhancing the quality of pomegranate fruits.

Keywords: Nutrient management, Fruit cracking, Pomegranate

UTILIZATION OF BROKEN RICE FOR PREPARATION OF READY-TO- EAT PRODUCTS

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ABSTRACT

Rice and wheat are the main energy providers in Asian diets. The bakery products that are consumed throughout the world including India are developed from wheat flour which is high in gluten and is considered to be the main cause of celiac disease, so rice flour is a best option for utilizing it in making various products such as crackers, pancakes, baby foods etc that is naturally gluten-free. Rice is also well known for its unique functional properties such as flavor carrying ability and hypoallergenicity that makes it useful for making different food products. An issue of concern is the breakage of rice kernels in different milling processes, and these broken are not generally accepted by the consumers. Millers see broken rice as a loss in view of its low sale in the market. Rice when milled, around 14% of broken grains are released and have similar composition as head rice. Broken rice grains can be converted into flour and can be mixed with some other ingredients to improve the quality of the flour. Various studies were performed for the preparation of many products using broken rice flour along with other ingredients such as cookies, gluten-free pancakes, crackers etc. that are consumed by gluten-allergic people.

Keywords: Broken rice flour, gluten-free, hypoallergenicity, celiac diseases, bakery products.

UTILIZATION OF PEARL MILLET IN FOOD FOR ENHANCING IT'S NUTRITIONAL BENEFITS

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ABSTRACT

Millets are traditional crops with exceptional nutritional benefits and health advantages. As the prevalence of lifestyle diseases increases particularly in urban areas, thus making millet products more popular and favoured among people due to their nutritious health benefits. Pearl millet is the staple food of majority of the poor and small land holders. Its potential to be grown in areas where wheat, maize, and other cereal crops fail to endure because of their inability to withstand drought and high temperatures. Climate change and other natural disasters can cause food security issues, which can increase food prices and decrease the availability of food resources. Pearl millet can act as a substitute nutritious crop by providing adequate nutrition for an active and healthy life. In comparison to other significant cereal crops, it is a cheap source of nourishment. A good supply of vitamins, minerals, dietary fibre, protein, and energy may be found in pearl millet. It has a higher fat content than other cereals and a better ability to digest fat and also a high amount of nutritionally significant n-3 fatty acids. Highest quantity

of macronutrients and is particularly rich in resistant starch, dietary fibres, and both soluble and insoluble fibres is present in pearl millet. Pearl millet cereals are used to produce various conventional foods which can provide nutraceutical health benefits by consuming them. Thus, pearl millet, has the potential for use as a dietary component for tackling micronutrient deficiencies.

Keywords: millet, pearl millet, food, health benefits, nutrition

ASSESSMENT OF BIORESOURCES AND BIODIVERSITY OF TEA GROWING LANDSCAPES IN DARJEELING DISTRICT OF HIMALAYA HOTSPOT IN INDIA AND THEIR CONSERVATION

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Purpose:

Darjeeling is situated almost at the central part of IUCN recognised Himalaya Hotspot for biodiversity conservation and is rich in biodiversity. Darjeeling is also the land of tea, timber and tourism. Over 30% species of higher plants of this region are endemic. Tea plantation in Darjeeling hills began in 1840–1841 and in foothills from 1860. Today’s Tea gardens have replaced very rich local vegetation. In fact 69.5% decline in forest cover that was directly converted to tea in the Eastern Himalayas between 1874 and 2010.

The climate of Darjeeling is much favourable for the tea-cultivation. But, the general observation till date is that Tea growing landscapes also supporting increased number of diverse native flora and fauna. Because most of the Tea landscapes that are close to protected areas with predominantly native vegetation. Records provided indication of a positive scenario for biodiversity support within tea growing landscapes.

Due to the varied climate condition of the region a very rich floristic diversity of Cryptogams and Phanerogams from the Tea plantation is expected. Because tea plantations were established several years ago, most of them are more than 150 years old and this vegetation are not subject to sudden changes in microclimatic conditions. The high species richness of pteridophytes, bryophytes, lichens will be expected from here because of the shade trees canopy and density of vegetation.

The Tea growing landscape create a long term suitable conditions for survival, development and distribution of rare, critically endangered, endemic plants in otherwise changed environment. Quite a good number of new taxa will be expected from this region. So these habitats will be treated as an important hotspot for these species and it should be respected for active biodiversity conservation.

Methods:

Present study was conducted in nine Terai Tea Estates (127 – 145 m amsl), three mid-hill Tea Estate (1300 – 1600 m amsl) and three up-hill Tea Estates (1900 – 2200 m amsl) in Darjeeling District. This research work aims to prepare a detail assessment of floristic diversity of Cryptogams and Phanerogams, vertical distribution of epiphytes, usefulness & poisonous weeds, RET and botanically interesting species, native shade trees, vegetation analysis, ethnobotanical survey for better management and conservation of natural resources of Tea growing landscapes of Terai *i.e.* foothills and Hills of Darjeeling District of West Bengal.

Results:

Recent survey has recorded 825 species of plants as tea garden weeds which include 85 species of Pteridophytes, 03 species of Gymnosperms, 597 species of Dicotyledons and 140 species of Monocotyledons. A good number of useful plants are available inside the tea gardens. This has recorded the ethnobotanical significance of 425 plants under different categories like: Wild

edibles 138 spp, Rice beer production 13 spp, Fodder 60 spp, Medicinal and Aromatic 333 spp, Dye yielding 09 spp, Religious 40 spp, Ornamentals 50 spp, Fibre yielding 18 spp and Miscellaneous 76 spp. During the ethnobotanical survey among the tea garden workers in Hills and in the Terai of Darjeeling, quite a good number of useful and poisonous plants were recognized from this region which recorded 219 species of useful and 40 species of poisonous weedy plants. Under such seriously inhospitable habitat conditions a good number of RET, endemics and naturalized exotics are also growing there. Quite a good number of new records of taxa will be expected from this region.

Conclusions:

This study helps to examine if the tea plantation provides higher quality of agricultural matrix for rare, endangered and common species in relation to environment. Through vegetation analysis and vertical distribution pattern analysis, we can predict the species richness and diversity and their relationship with the habitat. Documentation of native shade trees and other important plants will help to select of potential indigenous plants for tea ecosystem. Up to date data of RET, endemics and useful plants from tea gardens to prepare conservation strategies with the help of IUCN guidelines. It is important to formulate serious strategies for the conservation of these plants and related traditional knowledge for further research and the result can be used for the economic up-gradation of these poor people of tea garden areas. This work certainly generates the awareness to society about the benefits of tea ecosystem to mitigate global warming through conserving region’s biodiversity.

Keywords: Biodiversity, Hotspot, Tea, Darjeeling, Ethnobotany, Cryptogams, Phanerogams, Conservation.

ALTERATION IN THE ENDURANCE OF WOOD VIA REACTIVE REINFORCEMENT

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Abstract

The technique of reactive reinforcement of polyacrylonitrile (PAN) which was applied to wood of mango has done via multiple wood polymer composites (WPCs) which further leads to enhanced mechanical properties, and resistance against solvents, chemicals and biodegradation. This process includes the reactive reinforcement of PAN into mango wood via the treatment of leached mango wood panels with the concentration of acrylonitrile (AN,20-60 v/v) and 2,2-azobisisobutyronitrile (1 wt%) in the solution of dimethyl formamide over 12h under ambient conditions followed by curing at $95 \pm 10C$ for more over 6h. This causes a series of formation of wood polymer composites with different PAN loading ranges between 5.5-15.00. The surface analysis technique such as Scanning Electron Microscopy and wood content data shows that the loading in weight percentage happens in the matrix of mango wood. The percentage of PAN loading of around 8.85 by weight was perfectly found best to enhance the compressive, impact and static bending strength of wood polymer composites. The loading in PAN leads to enhancement of resistive properties of wood polymer composites in hot water, organic solvents and aqueous hydroxide. This also confirms its resistance against decay fungus *Coriolous versicolor*. The present paper shows a feasible method of reinforcement of PAN into MW to achieve the WPCs with improved strength, stability in degrading chemicals, and controlled biodegradation processes.

Keywords: Mango wood, Polyacrylonitrile, Wood polymer composites, Reactive reinforcement, Wood Modification.

AGROFORESTRY FOR IMPROVING SOIL HEALTH AND LAND PRODUCTIVITY

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ABSTRACT

A field experiment was carried out during 2019–20 and 2020-21 to study the effect of poplar-based agroforestry system on soil chemical properties and nutrient dynamics. Present study was conducted in an already established three and four year-old plantation of *Populus deltoides* with six different spacings viz., 3×3 m, 4×3 m, 5×3m, 6×3m, 7×3m and 8×3m. During first week of November of 2019-20 and 2020-21, five different wheat varieties (WH 1184, HD 3226, HD 3086, PBW 725 and DBW 88) were sown in interspaces of poplar spacing's and sole wheat varieties were sown in open condition (devoid of tree) as control. Intercropping of winter season crops in poplar spacing's showed better available of macronutrients than sole cropping. Soil pH decreased considerably under different poplar spacing and maximum decrease of 2.65 per cent was recorded in 3x3 m spacing over control. However, soil organic carbon (SOC) increased with the decrease in poplar spacing and maximum SOC (0.57%) was observed under 3×3m followed by 4×3m (0.55%), 5×3m (0.52%) and least under sole cropping (0.37 %) after harvesting of wheat crop during 2020-21. The available soil N, P and K increased significantly under different spacings of poplar-based cropping system from initial values. The higher available nitrogen (158.16 kg/ha), phosphorous (15.52 kg/ha) and potassium (311.90 kg/ha) was recorded at a depth of 0-15 cm under 3×3 m spacing as compared to other spacings and sole cropping (open environment) after harvesting of wheat crop during 2020-21.

Keywords: Agroforestry, nutrient status, poplar, spacing, soil chemical properties.

EVALUATION OF VARIABILITY IN SOIL PROPERTIES INFLUENCING PIGEONPEA (*CAJANUS CAJAN L.*) YIELD: A MULTIVARIATE STATISTICAL APPROACH

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Purpose

The aim of the study was to reveal the variability in soil properties influencing pigeon pea (*Cajanus cajan L.*) seed yield under semi-arid rainfed condition.

Methods

Secondary data on soil properties and yield of pigeon pea for two site years viz., 2018-19 and 2019-20 was collected, where the soils were initially classified into series level and further these series were divided into soil phase units. Surface soil samples from each soil phase units were collected before sowing of pigeon pea and subsequently crop growth parameters at critical stages were collected by the soil scientists. Principal component analysis (PCA) is used as a dimension reduction technique and it is an extremely powerful technique often used to indicate the significance and non-significance of specific variables influencing crop yield. Therefore, in the present study both physico-chemical properties and crop growth parameters were subjected to PCA and resulting components were subjected to stepwise linear regression analysis to check the significant effect of soil properties on crop yield.

Results

The principal component analysis with varimax rotation resulted in five components for both the site years having eigenvalues greater than one explained more than 80 percent of variability. The stepwise linear regression analysis showed that the pigeon pea seed yield was linearly

correlated with PC1 (P<0.01), PC2 (P<0.01), and PC4 (P<0.05) of soil properties with $R^2 = 0.767$ during 2018-19, whereas during 2019-20 the seed yield was linearly correlated with PC1 (P<0.01), PC2 (P<0.01), and PC5 (P<0.05) of the soil properties with $R^2 = 0.692$. In site year 1 Fe, Zn, Cu, Mn, Ca, P, K, Mg determined the yield. In site year 2, Fe N, P, Cu, Zn, Mg, and clay determined the yield.

Conclusions:

The principal component analysis performs a reasonable dimension reduction and operates well with highly correlated variables, therefore all the PC's with high cumulative variance should be considered for principal component regression analysis. In site year 1 Fe, Zn, Cu, Mn, Ca, P, K, Mg and in site year 2, Fe N, P, Cu, Zn, Mg, and clay which were identified from principal component regression analysis can effectively explain the yield variability and need to be applied in site specific way to increase the crop yield.

Keywords: Principal component analysis, Stepwise regression analysis, Variability in soil properties, Yield

POLLEN MORPHOLOGICAL STUDY OF LINDERNIACEAE MEMBERS FROM EASTERN HIMALAYA

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Purpose

Linderniaceae is one of the recently established angiosperm family and shows more or less pantropical distribution. Although, a widely distributed family, there are no Light microscopic pollen morphological study on Linderniaceae. Here we studied pollen morphology of 16 taxa of four different genera under the light microscope.

Methods

Fresh and dried pollens were studied under light microscope following the acetolysis methods suggested by Erdtman (1952, 1969) and Halbritter et al. (2018).

Results

Pollen grain type, shape, outline, size, length of the polar axis (P) and equatorial diameter (E), P/E ratio, and exine thickness were documented for 16 taxa of four genera. Pollens were monads, isopolar and radially symmetric. The mean P value varied from 13.96 μm in *L. procumbens* to 27.36 μm in *T. violacea*. The mean E value varied from 13.63 μm in *L. procumbens* to 24.02 μm in *T. violacea*.

Conclusions

Pollen grains of Linderniaceae shows more or less similar types of characters, which varies qualitatively and quantitatively in different genera. *Torenia* shows highest exine thickness values varied from 1.36 – 1.79 μm . Rest three genera show lesser exine thickness and distinguishable by their polar outline type, i.e., Circular in *Bonnaya*, Lobate in *Lindernia*, Triangular in *Vandellia*.

Keywords: LM, light microscopy, pollen morphology, Linderniaceae

EFFECT OF CLIMATE VARIABLES ON YIELD OF MAJOR CROPS IN SAMASTIPUR DISTRICT OF BIHAR

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ABSTRACT

Climate change influences crop yield vis-a-vis crop production to a greater extent in Bihar. Its impacts are well recognizing today and it will affect both physical and biological system. Therefore, this study has been planned to assess the effect of climate variables on yield of major crops, adaptation measures undertaken along with the identification of constraints faced by the farmers in Samastipur district of Bihar. Secondary data on yield of maize and wheat crops were collected from Directorate of Economics and Statistics, Government of Bihar, and data of climatic variables were obtained from department of Meterology, RPCAU, Pusa, Bihar for the period from 1999-2019 to describe the effects of climate variable namely rainfall, Maximum and minimum temperature on yield of maize and wheat. In addition to this cost of cultivation and minimum support price of maize and wheat were also collected from published sources to assess the impact of climatic variable on income of farmers over the study period. Further to assess the adaptation measure taken as well as problem faced, a household survey of 120 farmers were conducted in two block s(Pusa and Tajpur). To assess the impacts of climate change on crop yields, regression model was used after obtaining lagged values of model variables. Results from the analysis of time series data indicated that annual rainfall were positively and significantly related to yields of wheat crops while maximum temperature and minimum temperature had a negative impact on maize and wheat yields. It actually revealed that other factors, such as; type of soil, soil fertility and method of farming may also be responsible for crop yield. Findings of study clearly indicated that income and cost of cultivation has no significant relationship with climate variable, means income of farmers changed due to change in the other factors rather than change in climatic variable over the period under study as cost of cultivation increases with increased in the price of input over the period not due to change climatic variable. Thus It may be concludes that food-crops grown in summer are adversely affected by the current trend of climate. On the other, summer crops are adversely affected by increase in rainfall and maximum temperature, though rainfall is at declining trend in winter, increase in temperature has positive relationship with yield growth of winter crops. With this, we can recommend that any program dealing with minimizing adverse impact of climate change on food-crops production should first consider the crops like maize and wheat. Moreover, these two crops are important staple food for Samastipur district. Micro-level findings substantiate that farming experience and access to information on climate change have a positive and significant influence on farmers. Other variables such as education, farm size and livestock ownership are positively and significantly related to the choice of adaptation measures. The majority of the farmers suggested for soil and water conservation (SWC) practices could be a better option to cope with the adverse effects of climate.

Keywords: Climate Variable, cereal crops, adaptation measure, Bihar etc

COMPARATIVE PROFILE OF ENTREPRENEURIAL BEHAVIOR OF VEGETABLE NURSERY GROWERS IN TIKAMGARH DISTRICT OF MADHYA PRADESH, M P INDIA

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ABSTRACT

The present investigation was carried out at Tikamgarh district of Madhya Pradesh and it covers 140 women respondents were sampled using questionnaire to determine the women's empowerment through vegetable nursery production and extent of change in their knowledge skills and attitude. In assessing women participation in vegetable nursery growers, data were analyzed with frequency count, percentages, means and hypothesis was tested using chi-square test. Majority of the sample belongs to medium socio-economic condition. (58.0 %) of the women were between 28-46 years age group, majority (72.0 %) of them were married and (39.0 %) having family sizes of 4-5 persons, majority of the women belongs to lower caste and small farm size of holding.

The results of the study reveal that age group of 30-40 years participated actively in training programmes and as the age group increases the participation gets decreases. Results indicated that lack of transportation facility, unavailability of well-established markets, lesser market price, higher input cost, lack of coordination with family members regarding farm activities are the major constraints encountered by the women vegetable nursery growers. Main source of information of targeted sample have faith on neighbors, relatives, fellow farmers and agriculture agencies.

To bridge the gap between women nursery vegetable growers and adoption of improve production- protection practices it is the bare need that competent administration agencies promote healthy and harmonious interpersonal and intrapersonal relations among the women and agriculture agencies, promote gender imbalance in society, self-esteem and self-confidence.

PRODUCTIVITY, POTENTIALITY AND SOIL-SITE SUITABILITY ASSESSMENT FOR RICE CROP IN THE MORIDHAL WATERSHED OF DHEMAJI DISTRICT OF ASSAM USING REMOTE SENSING AND GIS TECHNIQUES

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ABSTRACT

A study was undertaken to carry out the productivity and suitability evaluation of the soils of the Moridhal watershed in Dhemaji district of Assam. Satellite image interpretation led to the recognition of four different physiographic units in the studied area which included: upper piedmont plain, lower piedmont plain, alluvial plain, and flood plain. One hundred seventy surface soil samples representing different physiographic units were collected and analyzed in the laboratory for various soil parameters. The productivity and suitability of the soils were computed and assessed by following standard procedures. The productivity index of studied soils varied from 12.13 to 62.14 could be ranked as: alluvial plain>flood plain>lower piedmont plain>upper piedmont plain. However, through adoption of proper improvement measures the

soils could be improved to land index values of 41.04 to 90.25. The land index value for winter rice, autumn rice and summer rice could categorize into permanently unsuitable (N2) to moderately suitable (S2). The studied soils in terms of their suitability for winter rice, autumn rice and summer rice could be arranged in the sequence: flood plain> alluvial plain> lower piedmont plain> upper piedmont plain. Land suitability tools have been extensively applied to identify better management practices in agricultural areas. The assessment of the soils of Moridhal watershed exhibits various limitations in terms of productivity as well as rice suitability. However, some of these limitations can be improved if proper management practices gearing towards integrated soil fertility management are applied.

Keywords: Moridhal watershed, Land evaluation, Soil-site suitability, Remote sensing, GIS

BIOGENIC SYNTHESIS OF SILVER AND GOLD NANOPARTICLES FROM ROBUST ENDOPHYTES ISOLATED FROM ENDEMIC MEDICINAL PLANTS AND DEVELOPMENT OF COST-EFFECTIVE FORMULATIONS AGAINST PLANT PATHOGENS

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Purpose

Plant pathogens have acquired resistance against conventional fungicides. The use of endophytes against plant pathogens and the biosynthesis of nanoparticles from medicinal plant sources in managing virulent pathogens are being successful in many crops. The present study explores the amalgamation of identifying fungicide compatible novel endophytes which are able to synthesize nanoparticles in inhibiting multiple pathogens and developing low cost formulations for sustainable agriculture.

Methods

Screening for potential endophytes from medicinal plants (*Pimpinella tirupatiensis* and *Boswellia ovalifoliolata*) by dual culture technique, compatibility studies with systemic and non-systemic fungicides, green house studies and multilocational field trials were conducted. Further, the silver and gold nanoparticles synthesized under controlled conditions were characterized by UV spectroscopy, FTIR and Scanning electron microscopy. Moreover the antimicrobial, antifungal, and development of talc based formulations and their shelf life against plant pathogens were tested.

Results

Out of 450 isolates, the potential bacterial leaf endophytes viz., MSB18, JNB19, HPB18, CHM19 from medicinal plants were found to be aggressive in controlling both highly virulent fungi and bacteria viz., *Cercospora arachidicola*, *Colletotrichum gloeosporioides*, *Aspergillus flavus*, *Aspergillus niger*, *Sclerotium rolfsii*, *Sclerotium oryzae*, *Xanthomonas oryzae*, *Ralstonia solanacearum* and *Xanthomonas campestris* upto 100%. These endophytes were highly compatible (95%) with systemic fungicides and were able to synthesize both silver and gold nanoparticles efficiently. The talc-based formulations of these novel endophytes were proved to be best in combating the pathogens both in green house studies and field trials and also enhanced plant growth parameters. The shelf life these formulations and the inhibitory potential tested upto 120 days will be discussed.

Conclusions

The four-fungicide compatible novel leaf endophytes which suppressed the test pathogens upto 100%, are able to synthesize nanoparticles in this study can be further explored to enhance the quality and yield of the crops with low-cost production.

Keywords: medicinal plants, endophytes, nanoparticles, plant pathogens, formulations.

RESPONSE OF DIFFERENT LIQUID ORGANIC MANURES ON GROWTH, YIELD AND QUALITY OF PEA (*PISUM SATIVUM* L.)

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ABSTRACT

The present experimentation entitled “Response of different liquid organic manures on growth, yield and quality of pea (*Pisum sativum* L.)” was conducted at Horticulture farm, Department of Horticulture, Rajasthan College of Agriculture, Udaipur during *Rabi* season of the year 2020-2021. Eight treatment combinations comprising different liquid organic manures in different concentrations were tried in Random Block Design (RBD) with four replications.

The results of the experiment showed that the application of T₈ treatment (*i.e.*, Jeevamruth @ 500 liters/ha at the time of sowing and 30 DAS + Panchagavya @ 4% sprays at 30 and 45 DAS + Vermiwash @ 10% sprays at 35 and 50 DAS) were recorded significantly highest values of different characters of pea such as plant height, number of leaves, leaf length (cm), leaf width (cm), leaf area (cm²), number of pickings, pod length (cm), pod diameter (cm), number of pods per plant, pod weight (g), pod yield per plant (g), pod yield per plot (kg), pod yield per hectare (t), net returns (Rs/ha), TSS (°Brix), chlorophyll content (mg/g) and also enhances soil properties (*i.e.*, organic carbon (%)) and available NPK (kg/ha) and microbial population (*i.e.*, bacteria, fungi and actinomycetes (cfu per g) as compared to other treatments.

EFFECT OF SOIL AND FOLIAR APPLICATION OF SILICON ON GROWTH, YIELD AND QUALITY OF BLACKGRAM [*VIGNA MUNGO* (L.) HEPPEL] GROWN UNDER ORGANIC FARMING

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ABSTRACT

A field experiment entitled “Effect of Soil and Foliar Application of Silicon on Growth, Yield and Quality of Blackgram [*Vigna mungo* (L.) Hepper] Grown under Organic Farming” was conducted during *kharif 2019* at the Organic Farming Unit, Rajasthan College of Agriculture, MPUAT, Udaipur. The soil of the experimental site was clay loam in texture with 241.2, 20.9 and 351.3 kg ha⁻¹ available nitrogen, phosphorus and potassium, respectively with pH 8.32.

The experiment was laid out in factorial randomized block design with three replications and 20 treatments. The treatment combinations consist of five levels of silicon (Control, 25, 50, 75 and 100 kg ha⁻¹) as soil application and four concentrations of foliar spray of silicon (Control, 1 %, 2 % and 3 %). The blackgram variety Pratap Urd-1 was sown on 26 July, 2019 at 30 cm row to row spacing by using recommended seed rate of 16 kg ha⁻¹.

A significant increase in plant height at harvest, dry matter accumulation at 60 DAS and at harvest, shoot length and root length at 45 DAS, 60 DAS and at harvest, number of root nodules at flowering initiation recorded maximum with soil application of 100 kg silicon ha⁻¹ as compared to control and 25 and 50 kg silicon ha⁻¹. Application of 100 kg silicon ha⁻¹ recorded significant increase in number of seeds pod⁻¹ and 1000 seed weight (g) at harvest as compared to control, 25, 50 and 75 kg silicon ha⁻¹.

The combined effect of soil and foliar application of silicon recorded maximum number of pods plant⁻¹ and seed yield of blackgram with the application of silicon @ 100 kg ha⁻¹ and foliar application of silicon @ 2 %. Similarly, maximum net return and benefit cost ratio of blackgram was recorded with the combined application of silicon @ 100 kg ha⁻¹ and foliar application of silicon @ 2 % as compared to the rest of combination of treatments.

Protein content in seed of blackgram was also found significant higher with soil application of 100 kg silicon ha⁻¹ as compared to control and application of silicon @ 25 and 50 kg ha⁻¹. Soil application of 100 kg silicon ha⁻¹ recorded significant increase in content and uptake of nitrogen, phosphorus, potassium, zinc, iron, sulphur and silicon by seed and haulm of blackgram, over control, 25, 50 kg silicon ha⁻¹.

However, a non-significant effect on harvest index was observed with soil application of silicon. Available N, P, K, Zn, Fe, S, and Si content of soil increased significantly with soil application of 100 kg silicon ha⁻¹ after harvest of blackgram as compared to control.

Foliar application of silicon @ 3 % significantly increased plant height at harvest, dry matter accumulation, shoot length and root length at 60 DAS and harvest as compared to control, 1 % of foliar spray of silicon.

Number of seeds pod⁻¹ and 1000 seed weight (g) at harvest also found significantly higher with foliar application of silicon @ 3 % as compared to control and 1 and 2 % of foliar silicon spray. Foliar application of silicon @ 3 % recorded significant increase in both content and uptake of N, P, K, Zn, Fe, S, and Si by seed and haulm of blackgram over control and 1 % silicon. Foliar application of silicon had no significant effect on available N, P, K, Zn, Fe, S, and Si content of soil after harvest of blackgram. However, foliar application of silicon had no significant effect on harvest index of blackgram.

EVALUATION OF DIFFERENT ONION (*ALLIUM CEPA* L.) VARIETIES FOR GREEN LEAVES

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ABSTRACT

Green leafy vegetables have a unique place among vegetables because of their colour, flavour and health benefits. They serve as rich sources of β-carotene, ascorbic acid, iron, zinc, folate and dietary fibre, but there is one stem vegetable that is not very well known for its health benefits, that is green onions. Green onion belongs to the onion family and are harvested young before the white bulb has time to form properly and are tender. They are mild with a long white slender neck and hollow green tops i.e. the leaves. Fresh, green onions

are gaining popularity with consumers and have become the fastest growing segment in the onion market. Green leafy vegetables are seasonal, and abundant supply during the peak season results in spoilage of large quantities. Preservation of these green leafy vegetables can prevent huge wastage and makes them available in the lean season at remunerative prices. Keeping this in view the green leaves yield and quality of different onion varieties for vegetable purpose and their quality parameter after dehydration were evaluated. The present investigation was carried out in Randomized Block Design. The overall evaluation of 18 genotypes for green leaves yield as well as dehydrated onion leaves was conducted in the year 2017-18. The result revealed that better leaf quality can be obtained at 45 DAT. Also T₃ i.e., Baswant-780 followed by T₁₈ i.e., N-2-4-1 showed better result for green leaf yield and quality. Whereas, for dehydration ratio all treatment showed non-significant results making all the cultivars suitable for dehydration.

EFFECT OF VERMICOMPOST AND BIOFERTILIZERS ON QUALITY PARAMETERS OF FENUGREEK (*TRIGONELLA FOENUM-GRÆCUM* L.)

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ABSTRACT

A field experiment was conducted to study the “Effect of vermicompost and biofertilizers on growth, yield and quality of fenugreek (*Trigonella foenum-græcum* L.)” at the vegetable farm, Department of Vegetable Science, College of Horticulture and Forestry, Jhalrapatan City, Jhalawar during *rabi* season 2018-19. The experiment consist of 16 treatment combinations of vermicompost (@ 3tonnes per ha) and biofertilizers (*Rhizobium*, PSB and *Azospirillum*) and control as RDF was laid out in simple RBD with three replications of each.

The result showed that there was a significant effect of vermicompost and biofertilizer on growth, yield and quality parameters as compared to control. The treatment T₁₅ (Vermicompost (@3tonnes per ha) + *Rhizobium* + PSB + *Azospirillum*) was found most effective in the increasing quality attributes over control. The maximum seedling length (13.90 cm), chlorophyll content of leaves (1.60 mg), vigour index I (1348.30), vigour index II (1250), root length (6.40 cm), shoot length (7.50 cm), test weight (16.46 g) and protein content of seed (21.88 %) were recorded under treatment T₁₅. The EC (1.02 dS m⁻¹) was decreased due to effect of vermicompost and biofertilizers in treatment T₁₅ over control.

FRACTIONATION OF DIFFERENT INORGANIC POOLS OF PHOSPHORUS IN VERTISOLS WITH DIFFERENT ORGANIC SOURCES

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ABSTRACT

An experiment was carried out in the laboratory of Department of Soil Science and Agricultural Chemistry, JNKVV, Jabalpur. In this study through incubation study in lab, soil samples were pre incubated at 25°C for 1 week prior to actual incubation to stabilize the microbial activity. There were three Rock Phosphates of origin Jhabua, Udaipur-I, Udaipur-II and eleven treatments including the control and soils were analysed for phosphorus inorganic pool fractions. The aim of this study was to investigate the composition of Phosphorus (P) forms in vertisols with different organic sources and to identify the factors affecting the P forms in these soils for the purpose of reducing the fertilizer risks. Soil P was sequentially extracted by NH₄Cl, NH₄F and H₂SO₄, and inorganic (Pi) P in each fraction were determined. Initially

when analyzed it was found Ca-P>Res P>Al-P>Fe-P>Saloid-P and percent contribution was 30.71>26.91>16.29>10.60>8.18 respectively may be due to the alkaline nature of the soil. After incubation with rock phosphates, the dominance of different inorganic P fractions in followed the order: Ca-P>Fe-P >Al-P>Saloid-P. The incubation experiment showed a positive impact of the organic acids and FYM in their ability to release P from all the RP sources. Among the various treatments, FYM@ 5 tonne ha⁻¹ has maximum contribution in Saloid (13.34 kg ha⁻¹), Fe-P (29.65 kg ha⁻¹), Al-P (19.29 kg ha⁻¹) and Ca-P (40.82 kg ha⁻¹) fraction. **Keywords:** Fractionation, P Pools, Rock phosphate, saloid P, soil, FYM.

STUDIES ON SOIL AND WATER QUALITY AS AFFECTED BY MUNICIPAL SOLID WASTE (MSW) DUMPINGS AND THEIR EFFECT ON CROP PERFORMANCE

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ABSTRACT

The research was carried out to study the soil and water quality affected by municipal solid waste (MSW) dumping and their effect on crop performance around the municipal solid waste dumping site, Mandur, Bengaluru rural during kharif 2013 and summer 2014.

The results of the physical properties showed that soil texture was sandy loam, bulk density was lower at the dumping site and increased with increase in distance and soil depth. Soil moisture content, pH, EC, OC, CEC, total bacteria, total fungi were higher at the dumping site and decreased with increase in the distance.

Available major and secondary nutrients, DTPA extractable micro nutrients and heavy metal concentration were higher at the dumpsite and decreased with increase in the distance and soil depth. The same trend also followed in water samples analysed for pH, EC, SAR, BOD, COD, CO₃, HCO₃, Ca, Mg and heavy metals in both borewell and tank water samples in both seasons. During summer 2014, soil nutrient status and chemical properties of water samples were higher as compared to kharif 2013.

The yield data of the crops grown around the dumping site were affected and the yields were improved with increase in distance from the dumping site. Though the same trend was noticed during summer but the yields were higher. The nutrient uptake in different crops also followed the yield trend but the nutrient concentrations were found higher near the dumping site as compared to away from the dumping site. Higher nutrient uptake was noticed during summer 2014 as compared to kharif 2013.

FACTORS OF PRECISION FARMING AFFECTING AGRICULTURAL VALUE CHAIN

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ABSTRACT

Precision Agriculture has become a tool for optimizing the cost of production of agricultural commodities through the combination of technological factors and software, and the prime objective of Value Chain Management is to reduce the gaps between stakeholders in the value chain, finally increasing the margin of profit. This concept is omnidirectional and acts as a complementary tool for Agricultural Value Chain Management. The major objective of this

paper is to find the precision farming factors affecting each stage of primary activities in the agricultural value chain using secondary data. To achieve the objective, ANOVA or Kruskal-Wallis test is used to find out the efficiency and dominance of precision agriculture in agricultural value chain management at each stage of its primary activities. From the result it is concluded that (i) both technological and software factors are dominating the efficiency of inbound logistics, (ii) for operations, software factor is enhancing the efficiency, (iii) for outbound logistics, technological factors of precision agriculture are improving the efficiency of the value chain and marketing & sales - (v) sales are influenced by software factors. Hence from the study, it is proven that precision farming tools and techniques are very useful for agricultural value chain models in terms of economy. It can lead Indian agriculture in a more sophisticated way and accelerate the economy of the country. The development of new precision farming software linked to the agricultural value chain is highly recommended.

EFFECT OF SURFACE STERILIZATION FOR REDUCING MICROBIAL CONTAMINATION IN *IN VITRO* PROPAGATION OF PAPAYA (*CARICA PAPAYA* L.) VAR. RED LADY

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ABSTRACT

Papaya (*Carica papaya* L.) is propagated through seed shows variable performance. Conventional method of propagation like cutting or grafting has not been found successful in papaya. Normally, Red lady is dwarf self-pollinated variety resistant to ring spot virus. Papaya variety Red Lady is propagated through seed. The plant raised from seeds have a mixed inheritance which make them highly variable in performance. Although, desirable characteristics of variety Red Lady the growers are not able to adopt this variety due to very high cost of seed. In this regard, micropropagation represents the economic way of continuously producing new uniform true-to-parental type planting materials of known superior lines and disease-free plants. Effect of different surface sterilization agents i.e. mercuric chloride (2,3,4 minutes), sodium hypochlorite (5,10,15 minutes) and ethanol (30 seconds) singly or in combination were tested on the explant of papaya var. Red Lady under *in vitro* condition. All the sterilization agents performed better results when used individually or in combination for different time intervals. Minimum contamination (10%) and death cultures (20%) was obtained in those explants which were treated with mercuric chloride 0.1% for 2 minutes followed by mercuric chloride 0.1% for 3 minutes. Maximum contamination (50%) and death culture (40%) was noticed in those explants which were treated with sodium hypochlorite 5% for 15 minutes. Maximum culture establishment (70%) was obtained in those explants which were treated with mercuric chloride 0.1% for 2 minutes followed by mercuric chloride 0.1% for 3 minutes (60%). Minimum culture establishment (10%) was noticed in those explants which were treated with sodium hypochlorite 5% for 15 minutes followed by sodium hypochlorite 5% for 10 minutes (15%).

Keyword: Papaya, Mercuric chloride, sodium hypochlorite, ethanol, micropropagation etc.

QUALITATIVE PHYTOCHEMICAL ANALYSIS OF ETHANOL AND AQUEOUS EXTRACT OF *CAYRATIA MOLLISSIMA* - AN ENDANGERED FRUIT OF WESTERN GHATS OF INDIA

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ABSTRACT

Cayratia mollissima also known as Kanakallate in Kannada Language is a fruit, which is grown on a creeper plant, belongs to the family Vitaceae and is reported to be an endangered species. It was later found that is grown in a place called Dhaigoli, a small village far from Kasargod, Kerala in India. Fresh sample was collected and Ethanol, Aqueous Solvent extracts were extracted. These extracts were then used for Qualitative Phytochemical analysis. These extracts were then analysed for different Phytochemicals like Alkaloids by Iodine, Waganer's and Dragendoff's tests, Flavonoids by Pew's, Shinoda and NaOH Tests, Glycosides by K-K, Glycosides, Concentrated Sulphuric Acid and Molisch's Test and Phenols by Elagic Acid and Phenols test. The result reveals the presence of Phenols and Flavonoids. And absence of other Phytochemicals. The results infers that the fruit is beneficial and has Nutraceutical properties which will be helpful for the mankind and further this fruit's other Biological Activities has to be studied to explore the benefits of *Cayratia mollissima*.

Keywords: *Cayratia mollissima*, Nutraceutical, Phytochemicals.

EFFECT OF PLANT GROWTH REGULATORS AND ORGANIC MANURES ON GROWTH, YIELD AND QUALITY OF RIDGE GOURD [*LUFFA ACUTANGULA* (L.) ROXB]

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ABSTRACT

The use of plant growth regulators and micronutrient at proper stage play an important role in sex expression and yield of ridge gourd. Sex expression and sex ratio in ridge gourd are yield governing factors. The yield of this crop depends upon the number of female flowers produced on the vine. In ridge gourd, the production of staminate flowers is much more than of pistillate flowers. These situations lead to the use of plant growth regulators like NAA (Naphthalene acetic acid), ethrel (2-chloroethyl-phosphonic acid) and GA₃ in ridge gourd which play an important role in sex expression and sex ratio. Gibberellins are used for embolden cell enlargement, rupturing the seed dormancy in some plants which requires light for germination, emboldens alpha-amylase production in germinating cereal grains, emboldens bolting/flowering in response to long days, induces maleness in dioecious flowers, play an

important role in development of seedless fruit. NAA is used in chemical thinning and prevention of fruit drop or induction of flowering, increase fruit setting, size and thus increasing yield. NAA interacts at the gene level by synthesizing enzymes required for the synthesis of cell wall and cytoplasmic components. Organic manures supply both macro and micro plant nutrients, they favour aggregation of fine soil particles, thereby promoting good soil structure and it is also essential for healthy development of soil micro-organisms which further carry out biochemical transformations, play active role in decomposing organic matter and help in releasing the essential plant nutrients. Organic manuring (FYM) can play a vital role in the sustainability of soil fertility and crop production. They also reduction EC and rise water holding capacity and phosphate availability of soil, besides ameliorating the fertilizer use efficiency, microbial activity and enhancement soil porosity. Low nitrogen impairment due to slow release of nutrients from FYM is an surplus profit.

Keywords: Plant growth regulators, Yield, Organic manures, FYM, Soil, NAA, GA₃)

IMPORTANCE OF AGROFORESTRY

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ABSTRACT

Agroforestry is a collective name for land-use systems and technologies where woody perennials (trees, shrubs, palms, bamboos, etc.) are deliberately used on the same land-management units as agricultural crops and/or animals, in some form of spatial arrangement or temporal sequence. In agroforestry systems there are both ecological and economical interactions between the different components. Agroforestry systems are intensively managed to maintain their productive and protective functions through cultivation, fertilization, irrigation, pruning, and thinning. Ideally, components are structurally and functionally combined and actively managed to optimize the positive biophysical interactions between them. In some systems, for example, the trees are regularly coppiced (severely cut back), and the cuttings are applied as mulch to the soil. Such management not only encourages new tree growth but also augments the light levels reaching shaded crops, reduces weeds, and helps to maintain soil moisture.

EFFECT OF DIFFERENT PHOTOPERIOD ON GROWTH AND FLOWERING OF CHRYSANTHEMUM (DENDRANTHEMA X GRANDIFLORA TZVELEV) AND EVALUATION OF ITS GENOTYPES FOR PHOTOINSENSITIVITY

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Purpose

Chrysanthemum is one of the leading commercial flower crop. It may be grown successfully under natural day conditions during autumn to initiate flowering. By altering the photoperiod in the polyhouse, flowers are available round the year. An advantage of photo-insensitive cultivars for chrysanthemum growers would be elimination of a photoperiod requirement for flowering. So, in the current scenario of climate change it is necessary to identify photo-

insensitive chrysanthemum cultivars for commercial production and it remains effective tool for further chrysanthemum breeding.

Methods

A total of 20 genotypes were evaluated for vegetative growth and flowering traits under naturally ventilated polyhouse in completely randomized design with three replications. The genotypes were imposed with photoperiod of 15/9 hours for 30 days after transplanting and black in (dark conditions) until flower bud initiation.

Results

Findings of the study revealed that the photoperiod T₉ (Photoperiod 16/8 hrs + No Black in) significantly recorded maximum plant height (46.86 cm) and leaves per plant (115.78). The photoperiod T₅ (Photoperiod of 15/9 hrs + Black in for 10/14 hrs) significantly recorded early flower bud appearance (22.32 days), T₂ (Photoperiod of 14/10 hrs + Black in for 10/14 hrs) recorded early first flower opening (58.88 days) and early optimum flowering (77.23 days). In genotype effect, Arka Pink Star recorded early flower bud appearance (13.09 days), first flower opening (33.30 days) and optimum flowering (55.57 days). However, photoperiod T₅ (Photoperiod of 15/9 hrs + Black in for 10/14 hrs) recorded significantly maximum flower diameter (4.18 cm), number of flowers per plant (52.94) and flowering duration (31.75 days), while, genotype V₁₂ (Kargil) recorded maximum number of flowers per plant (96.43) and longer flowering duration (38.52 days).

Conclusion

The genotypes classified into seven response groups (8, 9, 10, 11, 12, 13 and 14 weeks) which could help in the correct choice of genotypes for round the year flowering. Further, the genotypes viz., Arka Pink Star, Pusa Anmol, Ajay, Marigold, Arka Kirti, Winter Queen, Kargil and Punjab Gold showed flowering across different photoperiod, indicating photo-insensitive behaviour. These genotypes can be utilised for the development of photo-insensitive genotypes with desirable horticultural traits.

Keywords: chrysanthemum, photo-insensitiveness, response group, year round

EFFECT OF DIFFERENT LEVELS OF FERTILIZERS (NPK) ON PRODUCTIVITY AND NUTRIENT DYNAMICS OF BROWNTOP MILLET

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ABSTRACT

A field experiment was conducted at Agricultural Research Station, Baljigapade, Chikkaballapur taluk and district, which comes under the Eastern Dry Zone of Karnataka during *Kharif* season 2018. The experimental plot in the field was laid out following a randomized complete block design (RCBD) with fourteen treatments and three replications. The treatments included two levels of N and P₂O₅ (20 and 30 kg ha⁻¹) and three levels of K₂O (10, 20 and 30 kg ha⁻¹). Farmyard manure was applied at the rate of 6.25 t ha⁻¹ to all the treatments except absolute control. Results indicated that application of 30 kg N+30 kg P₂O₅+30 kg K₂O ha⁻¹ with Farm Yard Manure (FYM) increased the macronutrient availability in soil N (150.29 kg ha⁻¹), P₂O₅ (17.60 kg ha⁻¹), K₂O (160.84 kg ha⁻¹). Application of FYM @ 6.25 t ha⁻¹+30 kg N+20 kg P₂O₅ +20 kg K₂O ha⁻¹ significantly increased growth, yield, macronutrient content and uptake by brown top millet grain and straw against absolute control. The grain yield of browntop millet was increased by 61.46 percent in T₁₀ and 59.07 percent in T₉ as compared to the absolute control.

Keywords: Browntop millet, growth, yield and productivity

SYNCHRONIZED APPROACH OF MICROBES MEDIATED WITH CHELATED MICRONUTRIENT NUTRIPRIMING TO AUGMENT FE AND ZN CONTENT IN RICE AND LENTIL BASED CROPPING SYSTEM

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ABSTRACT

In plants, Fe and Zn are essential to several biological processes once they are required for key metabolic reactions and biological functions. Currently, the biofortification of crops like Cereals with micronutrients such as iron (Fe) and zinc (Zn) is extremely important due to the deficiencies of these micronutrients in the human diet and in soils. Biofortification is a bouquet of approaches that focus on improving the availability of micronutrients biologically in staple food products like wheat, maize, pearl millet, rice, and others. Zinc and Fe deficiency is a predominant micronutrient disorder in crop plants and humans worldwide, adversely impacting crop productivity and human health. Seed reserves of micronutrients are considered as ‘starter fertilizer’ and vital under soil conditions with their low supply, as well as under stress conditions such as drought stress. There are several options for enriching seeds with Fe and Zn. Seed treatment with Fe/Zn by priming or coating has been suggested as useful and cost-effective option for increasing seed Zn concentration. Seeds enriched with zinc (Zn) and Fe are usually associated with better germination, more vigorous seedlings and higher yields with better content in edible parts. Taxonomically, the soils of the study area fall in the order “*Inceptisols*” and sub group “*Typic Ustifluvents*” (Soil Management Support Services 1985). These soils are alkaline in reaction. Seed priming with 2 mg L⁻¹ Fe + 2 mg L⁻¹ Zn has been shown to be non-cytotoxic, ensuring a high rate of germination (80%) improves the stand establishment, as well as improving tillering, grain yield and micronutrient Fe and Zn grain contents in most cases. The use of microorganisms to help the crop plant in more efficient and effective uptake and translocation of Zn and Fe is a promising option that needs to be effectively integrated into agronomic or breeding approaches. This work revealed that seed priming with Fe and Zn micronutrients with microbes mediated constitutes a useful and alternative approach for the agronomic biofortification of Rice and Lentil based cropping system.

Keywords: Biofortification, Priming, Microbes, Chelated Micronutrient, Rice- Lentil Cropping system

BOLLWORM RESISTANCE MANAGEMENT IN *Bt* COTTON

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ABSTRACT

Boll worm resistance management programs for *Bt* cotton must have a strong science- based framework because the underlying questions are scientific in nature; but scientific considerations must be balanced with an understanding of grower economics, and of how these economics affect behavior. Refuge Approaches like as Structured refuges are a dedicated

portion of the farming operation devoted to a non-*Bt* variety. These refuges are planted as discrete fields blocks, border rows surrounding a *Bt* field, or rows within the *Bt* field. Seed blends refuge-in-the-bag incorporate non-*Bt* seed with *Bt* seed in the same seed bag. The advantage of seed blends is that growers don't need to coordinate the planting of a separate refuge – refuge compliance is therefore assured. Natural refuge refers to wild hosts, weeds, or other cultivated crops that can serve as a source of susceptible insects. Such a refuge can be effective if the target pest feeds on multiple plant hosts and doesn't specialize solely on the *Bt* crop. Natural refuge has been approved only as an bollworm resistance management strategy for *Bt* cotton.

Keywords: *Bt* cotton, Structured Refuge, Seed blends, Natural Refuge

EFFECT OF STCR BASED NUTRIENT MANAGEMENT ON POTASSIUM UPTAKE AND YIELD OF RICE CROP IN RICE-BASED CROPPING SYSTEMS OF INDO-GANGETIC PLAINS, INDIA

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ABSTRACT

Blanket fertilizer recommendations do not ensure balanced use of fertilizers as they do not take into account the spatial variation in soil fertility. Soil test crop response (STCR) based nutrient management in combination with a specified target yield considering the native soil status is regarded as a soil and fertilizer-based precision farming strategy for obtaining a specified yield with balanced crop nutrient demands. This study was conducted to study the effect of STCR based nutrient management on uptake of potassium (K) in an alluvial soil for two rice-based cropping systems. Soil samples were collected before sowing and after harvesting of rice crop from experimental plots under randomised block design (RBD) fertilized with general fertilizer recommendation (GFR), farmers' practice and STCR based recommended dose with and without Integrated Plant Nutrient System (IPNS) for low, medium and high target yield. K uptake was determined by plant digestion with triacid mixture. The results showed that the uptake of K and yield of rice grain after harvest of rice differed significantly under different treatments in both rice-wheat (R-W) and rice-maize (R-M) cropping systems. In R-W system, the grain yield. The farmers' practice as well as GFR improved the uptake of K over control and increased its content significantly by 17.1 and 23.0 per cent respectively in the R-W system and by 15.3 and 30.1 per cent respectively in R-M system. It was also observed that grain and straw K uptake was significantly enhanced under STCR with IPNS treatment over other treatments. Thus, the soil test based balanced fertilizer recommendations under STCR-Integrated Plant Nutrient Supply (IPNS) may help in the maintenance and build up of soil fertility and better nutrient uptake.

Keywords: Soil test crop response, Integrated Plant Nutrient System, fertilizer recommendation, potassium uptake

CLIMATE CHANGE AND ABIOTIC STRESS MANAGEMENT

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ABSTRACT

Climatic change is increasing the impact on these stresses, e.g., drought and heat, on agricultural systems. Consequently, palpable effects on natural and agricultural systems are ever more experienced. Plants have evolved mechanisms that facilitate persistence in environments characterized by continual and recurrent environmental stresses. Climate change has evoked the variations in temperature, rainfall and atmospheric conditions and has exposed the plants to harsh and extreme climatic conditions that adversely affect the morphological, developmental, cellular and molecular processes in plants. The major climate change-driven abiotic stresses in plants include elevated CO₂ concentration, high temperature, salinity and drought. Useful agronomic practices adopted by farmers such as alteration of irrigation techniques, crop rotation, variation in sowing and harvesting time and different cropping schemes that are very helpful for adaptation of crop under climatic or abiotic stress. Plant breeding techniques have shown better adaptability in crops under different abiotic stress environment. The development of stress resistance varieties helps plants to escape stressful conditions and promises food security under adverse climatic conditions. Phytohormones are important regulators dealing with environmental stress responses in plants and play a vital role in mediating various biochemicals, physiological and signalling pathways under abiotic stress conditions. Osmoprotectants are compatible solutes that maintain water balance in the cell without disturbing normal processes of plants. Heat shock proteins are that maintain cellular balance under both normal and stressful conditions. Bio stimulants are one of the methods to improve plant resistance towards drought stress and also bio stimulants application has shown to provide tolerance towards salinity stress in plants.

Keywords: Climate, change, stress, management.

LONG-TERM TILLAGE PRACTICES AND RESIDUE INCORPORATION BUILD-UP PHOSPHORUS STRATIFICATIONS: A REVIEW

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ABSTRACT

Crop residues are essential for soil productivity conservation of nutrients. Phosphorus (P), as a macronutrient, continues to be a key limiting factor in agricultural output across the world. Nearly 30-65% of soil P present in the form of organic compounds that must be decomposed and release as orthophosphate and uptake by plant roots. Agricultural techniques such as tillage and crop residue management have a big impact on phosphorus cycling on cultivated land and also various studies revealed that no-tillage and crop residue application rates alter the availability of different P species and soil phosphatase enzymes. No-tillage with crop residue application boosted the activities of soil phosphatases and the concentrations of soil P species measured by ³¹P NMR. Among the three no tillage (NT) and residue application rates (NTR) at 33%, 67%, and 100%, no tillage with 2.5, 5.0, 7.5 t ha⁻¹ residue application respectively, NTR 33% was the most effective in improving soil properties. Over residue burning, residue

retention or assimilation enhanced stratification of P and soil organic carbon. Regardless of the nutritional treatments, wheat residue incorporation or retention resulted in a higher SOC and P stratification ratio than residue burning. Reduced tillage and residue retention in weathered soils might diminish P fixing, increase labile P, enhance P build-up and also increase phosphatase mineralization. By increasing organic anion, competition for P binding sites or organic matter inputs under residue retention might limit P fixation. It was realised that the no tillage system, residue incorporation and P fertilisation altered the distribution of P forms across the soil profile, potentially increasing soluble inorganic P loss in surface runoff and organic P loss in drainage or decreasing inorganic as well as organic P bioavailability in deeper soil layers.

Keyword: ³¹P NMR spectroscopy, residue application rate, no-tillage, phosphorus,

SATELLITE AND DRONE BASED REMOTE SENSING OF CROPS AND SOILS FOR SMART FARMING

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ABSTRACT

Global food and environmental security would be threatened by current climate and socioeconomic problems. A promising strategy to enhance effective, sustainable, and economical crop production is smart farming (SF), which is based on advancements in sensing, robotics, and information and communication technology. The background requirements for SF and the function of remote sensing are discussed in this study. On the basis of some of the most important case studies, recent developments in remote sensing technology are discussed. These developments include platforms, sensors, and algorithms for diagnostic data of crops and soils. A constellation of related satellites operating together enables timely or frequent observations, and their spatial resolution (1-10 m) is useful for agricultural regions with relatively tiny farmlands. The effective application of high-resolution satellite sensors would significantly aid regional-scale diagnosis and decision-making in SF. Drone-based remote sensing would enable affordable, flexible, and high-resolution assessments of crops and soils. The optical, thermal, and/or video pictures can be used to provide diagnostic data on crop development, water stress, soil fertility, weed, disease, lodging, and 3D topography. The efficiency of labour and material applications as well as profitability would be considerably improved by the integration of the remote sensing function and drone-based seed, insecticide, and fertiliser application.

Keywords: Diagnosis, Geoinformation, Plant Nutrition, Precision Farming, Soil Fertility, Spectral image.

CLIMATE RESILIENT PRODUCTION TECHNOLOGY IN RICE FARMING

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ABSTRACT

Rice is one of the major staple cereal crops of India grown in various climatic regions. At present, 44 mha of land acreage is under rice mainly in the eastern, western coastal and Indo-

Gangetic plains. Rice production is increasingly threatened by the erratic nature of onset of monsoon rain and climate change. Wide variation in rainfall pattern affects the timing of nursery and transplanting of rice and direct threat to our food production system. Since climate change is a continuous process, the rice production system requires specific adaptation strategies to prevent yield losses and its variability. Therefore, there is need of better production technologies including the Climate resilient practices viz; System of rice intensification (SRI), Direct Seeded Rice (wet DSR- Drum seeder and dry DSR- Tractor mounted), Integrated Nutrient management (use of Liquid Biofertilizers, Leaf Colour Chart and other nutrient management tools), Water management techniques which would result in greater water use efficiency, cultivation of lodging and drought tolerant varieties and crop diversification. Adoption of these practices will significantly increase the grain yield and farm profit and total water requirement will also reduce as compared to the conventional practices. A very low percentage of farmers are aware of these practices. Therefore, training programmes need to be organized to enhance the adoption of knowledge and skill of these intensive practices. The spread of climate resilient production technologies would benefit rice production system's resilience.

Keywords: Climate resilient agriculture, Direct Seeded Rice, Integrated Nutrient Management, Rice Production

CROP RESIDUE MANAGEMENT IN TRANS-GANGETIC PLAINS

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ABSTRACT

ENVIRONMENT SAVIOUR is a common noun that can be utilized to praise anything that reduces the stress on the environment. Remedies to Stubble Burning can draw severe attention regarding this ideology in the developing country like India. The majority of the Indian population is dependent on agriculture for livelihood and cater to the food and nutritional needs of the nation. During green revolution era a great shift of cropping system is seemed from traditional crops like maize, pearl millet, pulses and oilseeds to rice -wheat cropping system in the green revolution belt Punjab, Haryana, and western U.P. India, with 17 Per cent of the world population and an agrarian background generates large volumes of food grains such as rice and wheat for domestic consumption as well as for export. According to the Directorate of Economics and Statistics, in 2017–2018, India generated 99.7 Mt of wheat and 112.9 Mt of rice. Of the various crops grown, mostly crop residue of rice, wheat and sugarcane are being burnt. In India, there is need for attention to crop residue management. Other stakes which need to be addressed are economic difficulties in farming and its related industries (Devi *et al.*, 2017). During the dry period when green forages are scarce, crop residues and farm wastes represent the important source of feeds for ruminants upon which animal production is based. Large scale burning of crops increases CO₂, CO, N₂O and NO_x in the atmosphere and has led to shocking increase in the air pollution. Need based interventions led to the significant decline in stubble burning incidents in the selected villages and as a result of these efforts, 12000 acres farmland was made free from stubble burning (CII, 2019).

Keywords: Stubble Burning, Livelihood, Crop Residue Management

MICROBIOLOGICAL METHOD OF CONTROLLING *FUSARIUM* WILT OF REDGRAM (*CAJANUS CAJAN* L.) UNDER POT EXPERIMENT

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ABSTRACT

A pot experiment was conducted under greenhouse at department of Agricultural Microbiology, GKVK, UAS Bengaluru, to develop and evaluate the efficiency of microbial consortium for control of wilt disease of Redgram. RGF1 screened (pre (75.00%) and post emergence (91.67%) disease incident) and selected for pot experiments from other wilt causing *fusarium* isolates isolated from wilted Redgram plants. RGB8 and RGP7 among forty bacterial isolates and RGT4 among ten fungal isolates were selected as efficient biocontrol agents based on antagonistic activity against selected pathogen. Pot experiment (Where, redgram seeds were treated with RGF1 as challenge inoculum) revealed that the treatment involving consortium of RGB8, RGP7 and RGT4 along with pathogen RGF1 showed significantly higher biocontrol activity (70%) and plant growth parameters like plant height (111.33cm), number of leaves (35.00) and significantly higher microbial population compared to all other treatments. Molecular identification of pathogen reveals that, it belongs to *Fusarium* genus and molecular identification of selected bio agents were identified as follows, RGB8 belongs to *Bacillus*, RGP7 belongs to *Pseudomonas* and RGT4 belongs to *Trichoderma* genus. Hence, from these results we can suggest that, use of microbial consortium against *Fusarium* wilt can be recommended as an eco-friendly and cost effective means of disease control.

Keywords: Biocontrol, wilt, consortia, *fusarium*

HI-TECH HORTICULTURE, HORTICULTURAL INNOVATIONS, FOOD PROCESSING, AND VALUE ADDITION.

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ABSTRACT

Horticulture deals with flowers, fruits, vegetables, species, plantation, medicinal crops which are commercial today in agriculture and it fulfils the day-to-day needs for huge population and maintains the quality, quantity by using modern practices within a short period & efficient use of space like hydroponics, aeroponics, vertical farming can be adopted rural areas which can be installed on the trace on building even automatic green-house, drones are a part of innovative horticulture which can cut off the lab or related problems, yield can be increased, new entrepreneurial opportunities can be created. Horticulture crops can be used even in offseason because of processing of that crop like mango can be available in jam juice & many other and these horticulture crops can be used in wide range of industries like nutraceutical, medicinal, food processing, cosmetic and many more, different type of value added can be prepared like jam, jelly, RTS, tomato ketchup, potato chips, pickles from tomato, carrot, canned peas & pine apple. Now days many processed food products have gained lots of popularity because of health-conscious nature of the product and less time consumption for preparation in the busy mornings and liked by all age group peoples like oats, corn flakes.

Keywords: horticultural crops, modern practices, processing industry, less time.

POST-HARVEST MANAGEMENT OF FRUITS AND VEGETABLES TO REDUCE LOSSES AND NUTRITION SECURITY

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PFE, CAET, DRPCA, Pusa

ABSTRACT

Post-harvest management refers to the systematic handling of agricultural products/commodities after harvesting. In India post-harvest losses accounts to 30-40 percent in case of horticultural crops which is much more than the losses in cereals. It has been estimated to about Rs. 926.51 billion which constitutes 0.6 percent of country's GDP. India is the second largest producer of fruits and vegetables in the world after China, however due to a lack of adequate cold storage and refrigerated transportation facilities, each year, fruits and vegetables worth Rs. 13300 crores deteriorate. Out of total produce, only 2.2 percent fruits and vegetables are processed in India. Among major producing states, West Bengal accounts highest loss followed by Gujarat, Bihar and Uttar Pradesh. The estimated loss of 30 to 40 percent of fruits due to inappropriate storage, handling, packaging and transportation and adversely affects the Indian economy. In the country where malnutrition and hunger are on peak, appropriate post-harvest management is utmost important. Post-harvest changes refer to all the functions and processes occurring in the fruits and vegetables after harvest. It deals with the changes occurring in the produce once they are detached from the plant. Fresh fruits and vegetables are the living entities with high perishable nature. Various physical, physiological and biochemical changes occur during fruit ripening which include both anabolic as well as catabolic process. Physiological changes in vegetables include respiration, ripening and senescence, transpiration, sprouting etc. Respiration also affects fruit ripening. The Post-harvest quality and life of horticultural commodities are strongly affected by many factors involved in their growing and development. Many pre-harvest climatic, genetic and agromorphic factors have direct or indirect impacts on fruit quality and behavior after harvest, thus they should also be taken care of for quality produce. Maturity at harvest is the most important factor that determines post-harvest- life and final quality such as appearance, texture, flavor, nutritive value of fruit- vegetables. Use of immediate post- harvest handling methods like curing, pre-cooling, etc may be helpful in extending the shelf life of vegetables.

Food processing industry sector has tremendous growth prospect in India and particularly in Bihar and UP. Presently, Government is taking initiatives to promote cold-chain infrastructure development through several schemes and initiatives with the adoption of latest technology and access to infrastructural facilities, these problem needs to be gradually catered and post-harvest wastage can be minimized. Strong communication and idea sharing among farmers, post-harvest scientist, food technologists and market experts of fruits and vegetables, both of which can lessen the post-harvest losses. Training and capacity building for different post-harvest operations and value addition activities in rural areas should be organized. The right and scientific processing is necessary to preserve the physical appearance, flavor, market value and other properties of consumable commodities. In order to alleviate the global shortage of fruits and vegetables and achieve nutrition security as well as for income generation, much effort is needed for proper post-harvest management and value addition for reducing fruit and vegetable losses worldwide.

PERFORMANCE EVALUATION OF ZERO ENERGY COOL CHAMBER

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ABSTRACT

A zero energy cool chamber (ZECC) having a brick wall cooler followed by plastic container has been used for the observation of variation in temperature and relative humidity and for the purpose three types of vegetables brinjal, tomato and okra was kept in the chamber for four days and the shelf life of vegetables was studied. As of the fact generally in ambient conditions vegetables are kept only for 4-5 days after that deterioration starts and in ZECC it can be kept from 9-13 days. The ZECC was made from locally available materials such as bricks, sand and khuskhus. The two-brick wall having a gap of 8 cm between the walls and sand was filled in this gap and was kept in moist condition throughout by continuous supply of water. The principle of this ZECC is based on natural evaporation cooling mechanism. After observation the results was that the variation of average RH was in between 77.6 % to 91.7% from DAY 1 to DAY 4 for ZECC and it was between 72.8 % to 85.7% for ambient condition. The variation of average temperature was in between 34.34 °C to 31.7° C at the ambient condition and in ZECC it is between 29.47° C to 23.27° C. The weight loss was more in ambient condition than inside the Zero Energy Cool Chamber. Maximum weight loss was observed in OKRA after 4 days in ambient conditions (8.44%) and minimum weight loss in ambient conditions after 4 days was observed in case of TOMATO (5.4%). Inside ZECC, after 4 days the maximum weight loss was observed in case of TOMATO (2.6%) and minimum weight loss was recorded in case of BRINJAL (1.68%). A ZECC is most commonly found in hot, arid climates where access to electricity is sparse. Often used by small scale farmer store duce post-harvest loss in developing countries. Sand remains saturated throughout the process. Fruits and Vegetables respire, giving off source of heat that drives the heat and mass transfer out of the system. Water travels from the wet sand out through the brick, evaporating off of the surface of the outer brick wall, creating a cooling effect at each layer of the chamber.

INDUCTION OF HERMAPHRODITE FLOWERS FOR MAINTENANCE OF GYNOECIOUS LINES IN BITTER GOURD (*MOMORDICA CHARANTIA*. L)

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Purpose

Bitter gourd (*Momordica charantia* L., $2n = 2x = 22$) is an economically important vegetable of the family Cucurbitaceae well known for its anti-diabetic properties. It is basically monoecious crop, hence development of gynoecious lines has become thought-provoking for breeders due to its multiple benefits in improvement programs like, higher yield, earliness and uniformity. The gynocious sex forms are recessive in nature and their early detection is difficult. So exogenous application of hormones can also assist to their maintenance by altering sex form.

Methods

The gynoeocious germplasm, ‘IIHRBTGy-491’ was treated with different hormones for induction of maleness for their maintenance.

Results

Significant total number of hermaphrodite flowers with abundant pollen were obtained in the treatment of silver nitrate 250 ppm and ovary length of hermaphrodite flowers also found significantly larger with the same treatment followed by STS 6 mM. There is a total of 61 and 47 gynoeocious plants produced out of 62 and 53 plants respectively from the subsequent generation by pollination with hermaphrodite flowers of other gynoeocious plants (sib mating) and of same gynoeocious plant.

Conclusion

silver nitrate 250 ppm was found most effective for the induction of maleness than others.

Keywords: silver nitrate, sex modification, gynoeocy

POTATO, MORE CONSUMPTION CAN LEAD TO INCREASE THE RISK OF DIABETES

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ABSTRACT

Potatoes area unit a predominant staple in most diets of the Western world and therefore the primary non-grain food item made globally. Potatoes primarily contain starch and usually have a high glycemic index (GI) and glycemic load (GL). Compared with different macromolecule sources, potatoes have a coffee energy density owing to their highwater content. India has a calculable seventy-seven million folks with polygenic disorder that makes it the second most affected within the world, after China. Diabetes is a disease which occurs when the blood glucose level is too high. Type-1 diabetes is usually diagnosed in children and young adults, although it can appear at any age. Type-2 diabetes occurs most often in middleaged and older people. India has the second highest range of kids with kind one polygenic disorder. Excess consumption of potato might increase the sugar level leading to diabetes. Keyword: Potato, glycamic index, diabetes, type-1 diabetes, type-2 diabetes, gestational diabetes

SCREENING OF BARLEY (*HORDEUM VULGARE L.*) GENOTYPES FOR THE STABILITY PARAMETERS IN MADHYA PRADESH INDIA

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ABSTRACT

The field experiment was conducted to analyze the stability parameters in Barley genotypes under different environments (E1, E2 & E3). For screening of stability purpose different parameters were taken into consideration viz, days to days to 50% flowering (DFF), days to maturity (DM), plant height (PH), number of tillers plant⁻¹ (NTPP), number of effective tillers plant⁻¹ (NETPP), number of dead tillers plant⁻¹ (NDTPP), number of spikelet’s ear⁻¹ (NSPE), number of ears plant⁻¹ (NEPP), number of grains ear⁻¹ (NGPE), number of grains plant⁻¹ (NGPP), ear head length (EHL), ear weight (EW), peduncle length (PL), 100 grain weight (HGW), biological yield plant⁻¹ (BYPP), yield plant⁻¹ (YPP) and harvest index (HI). The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications during the experimental years. To grade different stability performance, four grade

were established (above average stability, below average stability, specific adaptation and stable stability for the different traits). On the basis of results of study it can be included that RD- 2660 shows the highest percentage of stability for parameters days to 50% flowering (DFF), plant height (PH) and number of dead tillers plant⁻¹ (NDTPP). Genotype Raj 4229 having best stability for character days to maturity (DM) and for plant height (PH), JB-58 indicated best stability performance for traits plant height (PH), number of spikelet's ear⁻¹ (NSPE) and number of grains ear⁻¹ (NGPE) and genotype K-508 exhibited excellent stability for traits number of tillers plant⁻¹ (NTPP), number of effective tillers plant⁻¹ (NETPP), number of spikelet's ear⁻¹ (NSPE) and number of grains ear⁻¹ (NGPE). The above said results indicated that out of 25 genotypes RD-2660, Raj-4229, JB-58 and K-508 performing best for the better stability in all the three environment.

Keywords: Barley, stability, grain yield, environment, genotypes, Eberthart and Russell model, G x E interaction, *regression coefficient*.

INFLUENCE OF OSMATIC DEHYDRATION ON MARKING NUT (*SEMICARPUS ANACADIUM* L.)

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ABSTRACT

Marking nut is one of the underutilized minor crops growing wildly in our country. This fruit has got great medicinal properties and health benefits. But its importance is not completely understood and the fruits go waste. Therefore, it is necessary to develop value added products and the osmotically dehydrated fruits have good potential. The inclusion of osmotic process in conventional dehydration has two major advantages of quality improvement and energy savings. There was a significant difference found in the samples prepared from different pretreatments of osmotic dehydration. Osmotic pretreatment T3 (Sucrose 60° Brix. + 18 hrs of immersion + Drying at 60° C) had a great influence on quality and organoleptic properties of the fruits with maximum solid gain (86.40 %), carbohydrates (75.78 %) and minimum scores for moisture (13.60 %). Also, the highest scores for organoleptic parameters like color (4), appearance (4), texture (3.75) and taste (3.75) were recorded in same sample.

VARIABILITIES STUDIES ON SEEDLINGS PROGENIUS OF MARKING NUT UNDER NORT-EATERN TRANSITIONAL ZO, NE OF KARNATAKA

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ABSTRACT

A survey was carried out in North Eastern Transitional Zone of Karnataka and evaluated for growth, fruit, yield, quality parameters in seedling progenies of marking nut. The study revealed that, seedling progenies of marketing nut registered variation for growth, nut, apple, yield and quality parameters. The maximum apple weight (7.80 gm) was registered with 31.23 percent of co efficient of variation. Similarly, the maximum nut weight 9.37 gm was registered with 36.29 percent co efficient of variation. With respect the quality parameters studied among the seedling progenies of marking nut studied also showed variations for TSS (13.12⁰ Bricks), Acidity (1.93%) and protein (3.71%) with a co efficient of variation of 19.23, 64.27 and 7.27 percent registered among the seedling progenies study for quality parameters. The variation respect to yield parameters was also recorded for number of panicle per plant (172), number of

fruits per panicle (28.00) and fruit yield (11.36 kg/plant) with co efficient of variation (68.99, 53.53 and 73.40) respectively. Among the seedling progenies studied strain A-19, A-40, A-24, A-49, A-30 registered maximum apple and kernel weight. However, seedling strain A-50, A-27 and A-46 registered maximum protein content and seedling strains A-30, A39, A-43 and A-41 registered maximum fruit yield.

CROP RESIDUE: QUALITY AND EFFECT ON NUTRIENT DYNAMICS IN SOIL

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ABSTRACT

Crop residue quality refers to the biochemical composition of the residue *i.e.* nutrient content, C/N ratio, lignin, polyphenols content *etc.* The chemical composition and the amount of nutrients present in crop residues affect the nutrient dynamics in soil by controlling the rate of decomposition. The most important indicators of crop residue quality were proved to be the C/N ratio and lignin concentration. The amounts and patterns of nitrogen (N) mineralization from decomposing crop residues are affected by their initial chemical composition and quality (Kumar and Goh, 2003). Kumar and Goh (2003) proposed modified plant residue quality index (PRQIM) to include C/N, lignin/N and polyphenol/N ratios of crop residues to integrate these three major variables that control the residue decomposition and nutrient release. Different residues differ in their effect on nutrient dynamics. The soybean residue had a higher decomposition rate than the maize residue regardless of their placements into the soil or on the soil surface (Li *et al.*, 2013). When mungbean residue was added to the rice/wheat or maize/wheat mixture, decomposition of the residue mixture was enhanced by 12.3% and 3.5%, respectively (Datta *et al.*, 2019). The vetch residues decomposed faster than those of wheat and pea due to their more favourable chemical composition for biodegradation (Schmatz *et al.*, 2016). Irrespective of temperature and clay content, mineralization of rice residue N was significantly higher than wheat residue N (Roy *et al.*, 2011). The availability of applied phosphorus (P) is controlled by the sorption– desorption characteristics of the soil and incorporation of residues reduced P sorption; and increased P release (Gupta *et al.*, 2007). The long-term application of gliricidia loppings as compared to sorghum residues had a significant effect on all the P fractions in soils (Sharma *et al.*, 2020). Crop residues of red clover, field pea, canola and wheat released more than 90% of their accumulated potassium (K) in one year (Lupwayi *et al.*, 2005). Wheat straw (9000 kg ha⁻¹) + cotton residue (7500 kg ha⁻¹) performed better than the 300 kg K₂O ha⁻¹ treatment in terms of balancing soil K depletion and keeping adequate K fertility status (Jiang *et al.*, 2019). Hence, biochemical composition of crop residues bring insight into the nutrient dynamics and modeling the complex set of interrelated factors affecting nutrients dynamics is required to predict outcomes in diverse environments and to provide decision-aid tools to farmers.

Keywords: Crop residue, Quality, nutrient dynamics, Biochemical composition, C:N

ESSENTIAL OILS AS POTENTIAL ALTERNATIVE BIOCONTROL PRODUCTS AGAINST PLANT PATHOGENS

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Introduction:

Essential oils (EO) are naturally produced by aromatic plants and contain a diverse range of volatile molecules, the majority of which are secondary metabolites with a variety of biological activities. They have been used for a long history of time for different purposes. There is currently a great deal of interest in using them as plant protection products as an alternative to new agro-chemicals with broad antimicrobial spectrum properties.

Components of Essential oils:

It is believed that the EOs with good antifungal activity have phenolic or aromatic components in their chemical composition. Essential oils are typically rich in various compounds, containing 20 to 60 active substances, and can be distinguished by up to three major components, which are present in relatively high concentrations compared to other compounds present in trace amounts. For example, Linalool (68%) is found in *Coriander sativum* EO, limonene (54%), and pinene (7 and 3.5%) in *Pinus pinea* EO, carvacrol (65%) and thymol (15%) in *Origanum heracleoticum* EO, menthol (59%) and menthone (19%) in *Mentha piperita* EO. These major constituents of EO are frequently responsible for their biological properties. Letessier *et al.* (2001) reported that the essential oils of *Artemisia afra*, *Pteronia incana* and *Rosmarinus officinalis* were found to display antimicrobial activity against 41 microbial strains, which includes food spoilage and common plant pathogenic bacterial and yeast strains.

Mechanism of action:

The mechanism of action of essential oils is the accumulation in the cell, the effect on cell permeability, the disruption of major organelle membranes, and the alteration of general morphology, which causes leakage and death of the organism's cell. In terms of antifungal activity, it appears that their mechanism of action involves penetration through cell walls and direct damage to both cytoplasmic and mitochondrial membranes. This causes changes in permeability, which leads to leakage and, ultimately, cell death. Iscan *et al.* (2016) discovered extensive fungal cell wall damage and cytoplasmic membrane damage after applying thymoquinone, a major component of black cumin seed essential oil.

Conclusion:

New emerging techniques, such as EO formulation via emulsion or encapsulation, may enable EO to appear on a larger scale as a means to improve both biological activity and stability, with economic considerations. In this regard, both technologies may represent novel approaches for EO to enter the market as viable biocontrol products. A feasible and gradual transition could be the use of EO, preferentially formulated in accordance with the preceding considerations, in conjunction with synthetic pesticides in a traditional pesticide crop management system, allowing for a reduction in pesticide amounts used towards an integrated pest management system.

Keywords: Essential oils, Linalool, limonene, thymoquinone and synthetic pesticides.

STATUS OF SMUT, WILT AND POKKAH BOENG DISEASES IN WEST CHAMPARAN DISTRICT OF BIHAR

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ABSTRACT

Sugarcane (*Saccharum officinarum* L.) is one of the most important cash crop which is cultivated in the tropical and subtropical regions globally and contributes 70% of world sugar production and provides raw material for many other by products. Among all districts of Bihar, West Champaran is the highest sugarcane growing districts of the state. Sugarcane is grown as a major field crop by majority of the farmers in the district but there are various factors which are responsible for lowering down the production and productivity of sugarcane diseases are one of them. About 55 diseases of sugarcane have been reported from India in which more than 20 diseases of sugarcane have been reported from Bihar which are caused by different pathogens. Among them wilt, pokkah boeng, smut are serious concern in Bihar during recent past. During the survey of different sugarcane localities in West Champaran district was observed that the incidence of smut, wilt and pokkah boeng diseases increased and affected the several popular commercial varieties. During the survey of different sugarcane growing areas in West Champaran district increasing trends of these diseases was observed ranging from 2 to 20 per cent depending upon the locality and varieties of sugarcane and it was also observed that the incidence of smut, wilt and pokkah boeng diseases increased and it has affected popular varieties like Co 0238, Co 0118, CoJ 64, CoLk 94184, Co 0235, Co 0233 and CoH 160 cultivated in different localities. The incidence of smut, wilt and pokkah boeng disease ranged from 2 to 8 per cent, 5 to 20 per cent and 4 to 12 per cent was observed respectively.

Keywords - Status, smut, wilt, pokkah boeng, West Champaran

GROWTH, FLOWERING, FRUITING AND FRUIT QUALITY AS INFLUENCED BY SYNTHETIC GROWTH REGULATORS ON GUAVA VARIETY ALLAHABAD SAFEDS.

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ABSTRACT

Growth regulators like Auxins, Gibberellins and CCC are very useful in increase of self-life, enhancing fruiting, flowering and yield and fruit quality. Therefore, the study was carried out to know the effect of used growth regulators, The study constituted of 7 treatments (one control, two levels of Gibberellic acid @ 50 and 100 ppm, two levels of NAA @ 100 and 200 ppm, two level of CCC @ 200 and 400 ppm. The experiment was laid out in randomized block, design replicated thrice. The findings of the study indicated that all most all the synthetic growth regulators influenced the different parameters significantly, Viz:- Plant spread (8.87 m), number of branches plant⁻¹ (4.33), fruit breadth (8.33 cm), Total number of flowers per plant (61.12), Number of fruiting bud per plant (49.79), Numbers of fruits per plant (98.10), Fresh Fruit weight (g) (181.41), Dry fruit weight (g) (171.69), Fruit length diameter ratio (cm) (7.13), Total soluble solids (TSS) 0 Brix (10.89), Total sugar (%) (9.01) and Yield/plant (kg) (24.56)

were found to be higher under the treatment T3 (Naphthalene acetic acid @ 200 ppm while Acidity (%) was maximum in T0 Control (1.61). It can be concluded from the aforesaid results that the NAA@200 ppm is the best concentration having positive & significant effect on Vegetative growth and quality of fruits of Guava.

EXTENT OF KNOWLEDGE OF FARMERS ON ORGANIC FARMING IN BUNDELKHAND REGION OF UTTAR PRADESH

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ABSTRACT

Natural resources of countries are its national property, proper planning is required to make the most use of them. As a result, appropriate management measures are urgently required to safeguard agricultural areas' productive potential. Organic farming is a type of farming that avoids or limits the use of synthetic fertilizers, pesticides, growth regulators, and livestock feed additives. Adapting organic farming without jeopardizing agricultural production would seem to be the logical solution. Fertilizers, insecticides, growth regulators, and livestock feed additives are all avoided or limited in organic farming. Organic farming is practiced by many farmers in the state. The present study was conducted in Hamirpure district of Bundelkhand region of Uttar Pradesh to assess the knowledge of farmers on organic farming. The data was collected from twelve randomly selected villages of two blocks, 120 organic farming practitioners were selected by using simple random sampling as a respondent. Ex post facto research designed was employed for the study area. The knowledge schedule specially developed for the present study consisted of 22 items from different aspects of organic farming practices like inputs, manures, vermi composts, organic certification, diseases management, bio pesticides, bio fertilizers, alternatives of chemical fertilizer and pesticides and marketing managements etc. The results revealed that 81.66 percent of respondents had a medium level of knowledge about organic farming whereas 9.16 percent and 9.16 percent respondents having a high and low level of knowledge regarding organic farming respectively.

Keywords: Knowledge, organic farming, organic farming practices, input agencies, knowledge of respondents and certification agency.

STUDIES ON SOIL AND WATER QUALITY AS AFFECTED BY MUNICIPAL SOLID WASTE (MSW) DUMPINGS AND THEIR EFFECT ON CROP PERFORMANCE

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ABSTRACT

The research was carried out to study the soil and water quality affected by municipal solid waste (MSW) dumping and their effect on crop performance around the municipal solid waste dumping site, Mandur, Bengaluru rural during kharif 2013 and summer 2014.

The results of the physical properties showed that soil texture was sandy loam, bulk density was lower at the dumping site and increased with increase in distance and soil depth. Soil moisture content, pH, EC, OC, CEC, total bacteria, total fungi were higher at the dumping site and decreased with increase in the distance. Available major and secondary nutrients, DTPA extractable micro nutrients and heavy metal concentration were higher at the dumpsite and

decreased with increase in the distance and soil depth. The same trend also followed in water samples analysed for pH, EC, SAR, BOD, COD, CO₃, HCO₃, Ca, Mg and heavy metals in both borewell and tank water samples in both seasons. During summer 2014, soil nutrient status and chemical properties of water samples were higher as compared to kharif 2013. The yield data of the crops grown around the dumping site were affected and the yields were improved with increase in distance from the dumping site. Though the same trend was noticed during summer but the yields were higher. The nutrient uptake in different crops also followed the yield trend but the nutrient concentrations were found higher near the dumping site as compared to away from the dumping site. Higher nutrient uptake was noticed during summer 2014 as compared to kharif 2013.

CHARACTERIZATION OF SOILS UNDER DIFFERENT LAND-USES AND RESPONSE OF CA AND B NUTRIENTS TO TOMATO PRODUCTIVITY IN NORTHERN TRANSECT OF BANGALORE

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ABSTRACT

Soil survey was conducted to characterize soil and water quality in northern transect of Bengaluru. Two-hundred and forty-eight surface soil samples were collected from the study area under different landforms (agriculture, horticulture, flower and plantation). Results indicated that soils were strongly acidic to alkaline (4.33-8.55), non-saline (< 1 dS m⁻¹). The SOC (0.63 %), available N (350.56 kg ha⁻¹), P₂O₅ (46.04 kg ha⁻¹), K₂O (255.59 kg ha⁻¹), Fe (9.41 mg kg⁻¹), Zn (0.74 mg kg⁻¹) and Mn (6.46 mg kg⁻¹) were recorded highest in rural soils except Cu (1.41 mg kg⁻¹) than in urban areas. Eight profiles were studied in different landforms to know the vertical distribution of nutrients. In the present study, an attempt was made to characterize the existing soils under various land uses in northern transect of Bangalore, situated in the eastern zone of Karnataka (Zone V). Soils were deep to very deep, well drained, slight to moderate erosion, sandy loam to sandy clay loam in texture, and the structure was moderate, medium, sub angular blocky. The consistency varied from slightly-sticky slightly-plastic to moderately sticky moderately plastic. The soils were very strongly acidic to moderately alkaline in nature with pH ranging from 4.79 to 8.25, low electrical conductivity (EC) (0.04 to 0.61 dS m⁻¹) and low to medium organic carbon (OC) content (0.26 to 0.76 %). Exchangeable cations (Ca, Mg & Na), CEC, BS and ESP content of all the profiles increased with depth except exchangeable potassium. The available nitrogen, phosphorus and sulphur content decreases with depth. However, exchangeable Ca (1.5 m eq 100 g⁻¹) and available boron (0.5 mg kg⁻¹) were both found inadequate, nevertheless. Field experiments were conducted in the farmer's field to study the impact of these two deficient nutrients, on growth, yield and quality of tomato. Among different levels Ca @ 10 kg ha⁻¹ + B @ 2.2 kg ha⁻¹ + RDF + FYM recorded significantly higher growth, yield and fruit quality.

Keywords: CEC, SOC, Tomato, Calcium, Boron

PHYTO-REGENERATION AND DIVERSITY INDICES OF WEST RAJABHATKHAWA RANGE OF BUXA TIGER RESERVE OF WEST BENGAL, INDIA

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ABSTRACT

The present study was carried out to investigate tree species diversity, population dynamics, and tree species regeneration patterns at West Rajabhatkhawa Range, West Bengal, of Buxa Tiger Reserve, to better understand the regeneration dynamics and population structure of tree species. A total of 140 quadrats (size 2m x 2m) were set with the sampling intensity 0.1% for regeneration survey of the area by following random quadrat sampling method. This study documented about “106” regenerating tree species, representing “74” genera and “40” families from the study area from which about “47” percent of tree species showed “good” regeneration status. *Monoon simiarum* had highest seedlings density with 8125.00 seedlings ha⁻¹ followed by *Aglaiia spectabilis* (4642.86 seedlings ha⁻¹). *Monoon simiarum* showed highest IVI index of 15.19, followed by *Aglaiia spectabilis* (10.41). About 9 percent of the species had "fair" regeneration and 8 percent had "poor" regeneration status. The fair or poor regeneration might be due to insufficient seed dispersal that limits native species colonisation. However, it was observed that a total of 18 percent of tree species were classified as "not regenerating" and again 18 percent of tree species that were present in either sapling or seedling stage but no adult stage were categorized as new regeneration.

Keywords: *Rajabhatkhawa, Regeneration, Diversity, Quantitative*

TOWARDS ADOPTING NANOTECHNOLOGY IN IRRIGATION: PRESSURIZED IRRIGATION SYSTEMS

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ABSTRACT

India is predominantly an agricultural country and even with current orientation towards services, still agriculture contributes ¼th of total GDP of the country, 15 percent of total export and 65 % of total population’s livelihood. After independence, India has made remarkable progress in increasing food production and productivity, credit goes to concerted efforts made under various Agri revolutions. For agriculture Land and Water are two most important resources. In which, irrigation becomes lifeline of agriculture. It is a truth in agriculture “if we fail in irrigation, we will fail in agriculture”.

Nanotechnology has emerged as one of the most promising solutions to overcome the shortcomings of traditional agricultural irrigation practices. Adaption of nano-irrigation

system: is the best available way to utilize water and fertilizer efficiently under farm conditions. Excessive and unbalanced use of water is a common practice to grow more; to earn more. The rapid development of nanotechnology has been facilitating the transformations of traditional food and agriculture sectors, particularly the invention of nanosensors, nanopesticides and nanofertilizers. The type of Microirrigation system may vary with the type of crop selected and amount of water available for irrigation. The fertilizer solution is distributed evenly in irrigation. The availability of nutrients is very high therefore the efficiency is more. In this method liquid fertilizer as well as water soluble fertilizers are used. nanotechnology promises to improve crop productivity by this method, fertilizer use efficiency is increased from 80 to 90 per cent. There is a 40 to 50 percent gain in productivity due to the use of micro-irrigation. Micro-irrigation also reduces problems due to weed growth, soil erosion and the cost of cultivation in labour-intensive operations.

Keywords: Nanosensors, Micro-irrigation, Nanopesticides

REVEALING CURRENT STATUS OF CHARCOAL ROT OF SOYBEAN IN CENTRAL INDIA AND MORPHO-CULTURAL VARIABILITIES IN ITS PATHOGENIC AGENT

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ABSTRACT

Soybean cultivation in India is predominantly concentrated in the central niche including Madhya Pradesh, Maharashtra and Rajasthan. Charcoal rot caused by *Macrophomina phaseolina* (Tassi) Goid [synonym: *Rhizoctonia bataticola* (Taub.) Butler] is a major disease in soybean crop across the world. Incidence of major diseases at different growth stages of soybean were recorded at JNKVV, Jabalpur during Kharif 2018 and 2019. Apart from this, an intensive survey was conducted in six agroclimatic zones covering 16 districts to determine status of charcoal rot of soybean in Madhya Pradesh during Kharif 2018 and 2019. Based on maximum incidence, Collar rot (4.88 %) and Green mosaic (8.38 %) at early stage of growth (V2-V3); YMV (35.00 %) and Bacterial pustule (8.00 %) at early reproductive stage (R2-R4), and Aerial blight (30.63 %), Pod blight (10.63 %) and Charcoal rot (65.13 %) at late reproductive stage (R5-R7) were predominant disease under agro conditions of Jabalpur. The maximum incidence of charcoal rot was recorded in Satpura Plateau (19.06 %) followed by Kymore Plateau & Satpura Hills (18.81 %) and Central Narmada Valley (15.60 %). District (16) and variety (13) wise incidence of charcoal was varied and it was maximum in Seoni (26.30 %) and in JS 95-60 (27.76 %). The highest incidence of charcoal rot was recorded in the fields which had previous cropping pattern of Maize-Chickpea (26.88 % at Seoni). Whereas the field followed cropping pattern of Rice – Wheat (10.75 %) had comparatively lower incidence. Isolation of pathogen was made from each district sample and its characterization was done based on typical Cultural and morphological characteristic. Based on rapid radial growth, seven isolates i.e. MP-1(JBP), MP-2(NAR), MP-4(CWA), MP-6 (HBD), MP-3 (SEO), MP-9 (SGR) and MP-14 (SHR) were designated as Fast Growing Isolates (FGI). Most of the isolates had partial fluffy to fluffy growth and their colony color varied from dark black or black (5), greyish black (9) and greyish (2). Number of sclerotia /microscopic field (10x) varied significantly from 41.07 (Mp-10 (RSN)) to 77.20 (Mp-4(CWA)) and shape of microsclerotia was oblong and round. These research findings revealed overall scenario of charcoal rot of soybean in key growing areas of India that will be helpful deriving effective management strategies for this disease.

STATUS OF RUGOSE SPIRALLING WHITEFLY (RSW), *ALEURODICUS RUGIOPERCULATUS* MARTIN AND ITS ASSOCIATED COMPETITORS IN ECONOMICALLY IMPORTANT PLANTS FROM WEST BENGAL, INDIA

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ABSTRACT

Increased trade in the agricultural sector or an immediate outcome of globalization invites the chances of the introduction of alien pests. The spread of invasive pests has a greater influence on the economic well-being of the country. Instead of strict import regulations and international quarantine protocols, some pests are introduced accidentally which sometimes causes dramatic crop loss and adversely affects the food security of the nation. Early detection and identification of those species at the entry points are of foremost importance to restrict the invasion and thereby requires special attention. Whiteflies are polyphagous crop pests and are of global significance because of their economic importance. They are also considered the most often encountered species in international trade.

Not long ago several whitefly species have been identified and reported across the country. Of which, rugose spiralling whitefly (RSW), *Aleurodicus rugioeperculatus* Martin ((Hemiptera: Aleyrodidae) has been considered to be a notorious pest whose invasion harmed different economically important plants. In general, whiteflies are direct phloem feeders, invite plant diseases as well as sooty moulds on leaf surfaces by honeydew deposition. *A. rugioeperculatus* was recorded in India in 2016 and is believed to be entered through ornamental trade. Its occurrence was previously limited only to southern states. Due to its polyphagous nature, huge biotic potential and faster spread, the pest has been encountered in serious proportion in different regions of the country including the state of West Bengal. The objective of the present study is to understand the invasions of *A. rugioeperculatus* in different economic groups of plants and also to explore its co-existence pattern with other insect species.

METHODOLOGY

An extensive field survey was undertaken across the state of West Bengal in multiple locations to document the occurrence of *A. rugioeperculatus* and co-associated pests in different hosts. The insect specimens were collected along with infested plant parts from different sites and identification was done based on taxonomic characteristics investigated under Zeiss- Stereo Zoom Microscope at the Department of Agricultural Entomology, Bidhan Chandra Krishi Viswavidyalaya (BCKV), Mohanpur. The whitefly species were confirmed based on standard morphological descriptions

RESULTS

Several host plants of spiraling whitefly were reported from various parts of the world. As per the present investigation in West Bengal, *A. rugioeperculatus* were found colonizing different agricultural and horticultural crops. The incidence and infestation varied across the hosts and locations. However, the severity and infestation maximum on economically important crops viz., palms, banana, guava and other plantation crops. *A. rugioeperculatus* could be easily identified under field conditions from other species by its unique taxonomic characters and lethargic behaviour. The adult females laid creamy yellow eggs on the abaxial surface of the leaves in a concentric spiral fashion and immatures develop by sucking the plant sap. The infestation produced excess honeydew which encouraged the development of sooty mould fungus. The level of damage varied depending on the host species and the condition of the plant. The severity of this pest was found to be more on coconut and banana (>30 live egg spirals or adults/leaflet), moderate in arecanut (11-20 live egg spirals or adults/leaflet) and low

in other recorded hosts (<10 live egg spirals or adults/leaflet). In the present study, heavy sooty mould deposition and drying of leaves were observed on coconut and banana in certain areas of Nadia, Hooghly and North 24 Parganas, of West Bengal. The findings agree with (Hore, *et al.*, 2019), they reported moderate to high infestation of *A. rugioperculatus* in Banana from West Bengal. The pest, bondar’s nesting whitefly, *Paraleyrodes bondari* Peracchi (Hemiptera: Aleyrodidae) *rugioperculatus* was found to co-occur with *A. rugioperculatus* and was found to compete with RSW for the resources in all the host plants surveyed. The infestations produced characteristic circular white nests that appeared as a dot pattern. However, the feeding damage of *P. bondari* was lesser than *A. rugioperculatus*. At many locations, the striped mealybug, *Ferrisia virgata* Cockerell (Hemiptera: Pseudococcidae) and in few locations *Pseudococcus* sp. (Hemiptera: Pseudococcidae) were found co-existing with *A. rugioperculatus*. *F. virgata* was one of the highly polyphagous mealybugs known to attack numerous crops.

In addition, the study also unveiled scale infestation apart from nesting whitefly and mealybugs. In banana and guava, the infestation of scale insects *Ceroplastes* sp. (Hemiptera: Coccidae) and *Icerya* sp. (Hemiptera: Monophlebidae) was also observed along with the above whiteflies (Fig.1). The genus *Ceroplastes* and *Icerya* are the cryptic plant feeding insects which inflict substantial economic damage to fruits and other plants of economic importance. It seems that the whiteflies, mealybugs and scales have a partial niche overlap. In such combined incidences, one species may take over the breeding and feeding niche of another. However, population regulation is governed by several biotic and abiotic factors. The present findings were in line with Chakraborty *et al.* (2017), who conducted a detailed study on *A. rugioperculatus* and revealed infestation and co-existence of entomofauna in Southern parts of the country. During field investigation, we could able to see natural enemies especially coccinellids activity in the infested leaflets.



a. *A. rugioperculatus* infestation; Co-existence of *A. rugioperculatus* and b. *P. bondari*; c. *Ceroplastes* sp. ; d-e. *F. virgata*; f. *Icerya* sp.

CONCLUSION

The shift in the weather pattern, continuous dry spell and availability of host plants may favor pest multiplication and spread. Further increase in the whitefly and coccid population with sooty mould deposits could lead to economic setbacks. Management of invasive species is of great challenge as they spread rapidly; also association with other species in the same ecological niche makes the situation even more complicated. However, biological control,

which serves as the pivot point in the bio-suppression of invasive whiteflies in India, can be found to be an economical alternative to other pest management methods to combat the risks.

Keywords: Invasive pests, whiteflies, mealybugs, scales and management

INFLUENCE OF INTRA ROW SPACING ON GROWTH AND YIELD OF ONION

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ABSTRACT

A field experiment was carried out to investigate the influence of intra-row spacing on growth and yield of onion during the rabi season of October 2019 and April 2020 at research farm, J.N.K.V.V., College of Agriculture, Tikamgarh (Madhya Pradesh). The treatments consisted of three different intra-row spacing viz., 20X10 cm, 20X15 cm and 20X20 cm were laid out in Randomized Block Design with three replications. Result showed significant influence on growth and yield attribute for different intra row spacing. Maximum plant height (59.64 cm), number of leaves per plant (9.34), leaf length (59.64cm), leaf diameter(0.83cm), neck thickness (1.70 cm), bulb length (5.13cm), polar diameter (5.48cm), equatorial diameter (5.83cm), bulb weight (82.85g) bulb yield (17.24 kg/plot) and bulb yield (239.54 q/ha) were recorded with spacing 20x20 cm. Among all spacing 20x20 cm, is considered best for all the parameters except yield, for which spacing 20x10 (269.03 q/ha) cm is consider best.

EFFECTS OF FOLIAR APPLICATION OF NANO-NPK FERTILIZERS ON THE YIELD OF SOLE AND INTERCROP MAIZE

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ABSTRACT

An experiment was conducted at the Agricultural farm of Lovely professional university, Punjab, to investigate the effects of foliar application of nano NPK fertilizers on the yield characteristics of sole maize and intercrop maize. The experiment was laid out as a split-plot design with six treatments and three replications. Compared to the intercropped maize on the main plot, the sole maize yielded significantly higher averages of cobs length, cobs diameter, cobs weight, number of cobs/plants, number of grains/ cobs, test weight, straw yield, grain yield, biological yield, and harvest index respectively. Additionally, in the subplot, the use of 50 % RDF and 50 % nano NPK fertilizers significantly improved yield attributes, with the highest cobs length, cobs diameter, cobs weight, number of cobs/plants, number of grains/ cobs, test weight, straw yield, grain yield, biological yield, and harvest index respectively. According to the study's findings, sole maize combined with 50% RDF and 50% NPK nano fertilizers significantly increased crop yields.

Keywords: Foliar, Maize, Nano-fertilizers, Yield, Yield Attributes

EFFECT OF UMMB & MINERAL SUPPLEMENTATION ON GROWTH AND REPRODUCTIVE PERFORMANCE OF HEIFERS.

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ABSTRACT

Thirty heifers cross bred cows were randomly selected and equally divided into three groups. Animals were treatment with Group I UMMB (Urea Molasses Mineral Block) at the dose rate of 300g/day two time for 20 days orally, Group II Cheated Mineral mixture at the dose rate of 50g/day for 20 days orally, and Group III (Control) Common feeding & concentrate mixture (maize 40kg +wheat bran 40kg+soybean meal 17kg and salt 1% each), green fodders & wheat straw. Resulted that of group II , feeding of concentrated along with mineral mixture feeding are better than that of others groups for growth and reproductive performance in heifers in respect of B:C ratio(1.8) due to occurrence of normal heat and better 80 % conception rate .

Keywords: Heifer, Cross bred, concentrate, Mineral mixture and UMMB.

INFLUENCE OF DIFFERENT CONCENTRATION OF COW URINE ON GROWTH AND YIELD ATTRIBUTES OF BLACK GRAM (*VIGNA MUNGO*)

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ABSTRACT

A field experiment was conducted during summer season 2019 to influence of different concentration of cow urine on yield and yield attributes of black gram (*Vigna mungo* L.) at Crop Research Farm, Shri Guru Ram Rai University, Pathri Bath, Dehradun- Uttarakhand (India). The field experimental was laid out in completely randomized block design under 10 treatments with 3 replications. The result revealed that with the application of cow urine at 3% was recorded significantly influence on various growth and yield attributing characters of black gram. The maximum plant height (56 cm), number of pods per plant (62.67), grain yield (15.053 q/ha), straw yield (73.096 q/ha) and harvesting index (17.07) was found significantly higher under the treatments T₇ [Cow Urine at 3%] over all the treatments.

Keywords: Black Gram, Cow Urine, Growth, and Yield

A NEW APPROACHES OF COW PAT PIT (CPP)

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ABSTRACT

After Green revolution, use of excessive chemicals increases and it gives good results in few years; yield increased day by day and reduces food import from other countries. But in few years, excessive use of chemicals degraded soil fertility; pollute environment as well as human health. CPP is a special type of compost and it is prepared by cow dung, crushed egg shells and basalt dust with biodynamic preparations of 502- 507. It is also known as soil shampoo. After

fermentation 60kg of cow dung gives about 30-35kg CPP. It can be prepared by making a brick lined pit of about (90cm 60cm 30cm) and add good quality cow dung with egg shells and basalt and mix it properly and put that into the pit then make 5 holes and add BD preparations of 502 to 506. Add BD 507 in one hole with some water and then cover it with gunny bag. It contains many beneficial fungi, bacteria and other growth promoting hormones which are very good for soil health. CPP is prepared within 3-4 months and can be applied through ground spray, paste on the stem of fruits, soil inoculant, root dipping, seed soak etc. It is a sustainable method of compost preparation which is very beneficial for plant growth and development.

Keywords: Cow pat pit, soil shampoo, soil inoculant, root dipping.

CHARACTERIZATION, CLASSIFICATION AND ORGANIC CARBON STOCK OF INTENSIVE RICE GROWING SOILS OF KARNATAKA FOR ASSESSING SUITABILITY AND SUSTAINABILITY

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ABSTRACT

In order to evaluate the suitability and sustainability of the intensive rice growing soil under a framework of soil characterization, classification and organic carbon stock, eight taluks in Karnataka, India were pinpointed. Karnataka, an Indian state with an area of 1.44 million hectares and contribute to rice production by 2.57 million tonnes yearly. Soil pedon studies in eight taluks from different agro-climatic zones with hot arid to warm per-humid climate with annual rainfall ranging from 500 to 4000 mm. The soils studied were mostly very deep, well or somewhat excessively drained having varied potentials and constraints for rice crop production. Morphological, physical and chemical characteristics of the soils were examined, characterized and classified following USDA Soil Taxonomy. Soils studied belong to Alfisols (Shikaripur), Inceptisols (Belgaum), Vertisols (Khanapur), Aridisols (Shorapur) and Entisols (Kundapura). Pedons from high rainfall zones showed pH in strongly to moderately acidic range for both surface and sub-surface horizons. Soil organic carbon (SOC) stocks have been estimated using Grossman *et al.* (2001) and can be used as an indicator for assessing land quality. Very high SOC were recorded at Shikaripur (16.75 kgm⁻³), high at Belgaum (14.86 kgm⁻³), moderate at Khanapur (11.07 kgm⁻³) medium at Mandya (7.10 kgm⁻³) and low at for Davanagere (4.68 kgm⁻³) for 0-150 cm depth. Suitability for rice-growing soils was assessed by matching crop requirements with existing soil and land characteristics of the study region. Shikaripur soils followed by Sindhur and Belgaum pedons were found highly suitable and sustainable for rice cultivation. High soil quality was recorded for Belgaum soils with SQI value of 0.925.

Keywords: Rice-growing soils, soil organic carbon, suitability, agro-climatic zones

EFFECT OF COUPLED APPLICATION OF SULPHUR AND BORON ON NUTRIENT CONTENT OF LENTIL (LENS CULINARIS M.) GROWN IN ALFISOL OF MIRZAPUR

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ABSTRACT

Pulses are an important crop for agriculture production systems as they are not only rich in protein and minerals but also improve soil fertility via nitrogen fixation. Pulses are predominantly grown in low fertile rainfed areas which results in lower productivity and quality. Sulphur (S) and Boron (B) are among the major constraints of lower productivity of pulses in Alfisol soil Mirzapur. A pot experiment was conducted in the net house of the Department of Soil Science and Agricultural Chemistry, Institute of Agricultural Sciences, Banaras Hindu University for two consecutive years (2018-19 and 2019-20) to evaluate the response of lentil (var. HUL-57) to the application of graded levels of S (0, 15, 30 and 45 kg ha⁻¹) and B (0, 1, 2 and 3 kg ha⁻¹), along with the recommended dose of N, P, and K fertilizers. Sixteen treatments combination were taken in factorial CRD design and replicated thrice. Results revealed that N, P K content in grain and stover of lentil were increased significantly with the application of graded levels of sulphur up to 30 kg ha⁻¹ and boron up to 2 kg ha⁻¹. The nitrogen and phosphorus content in grain and stover was decreased at a higher level of S and B application however, potassium concentration in lentil stover was increased up to 3 kg B ha⁻¹ in both the years. Sulphur and boron content in grain and stover of lentil were increased significantly with application of sulphur up to 45 kg ha⁻¹ and boron up to application of 3 kg ha⁻¹ in both the years. The interaction effect between sulphur and boron significantly and synergistically increased N, P, K, S and B content and uptake of lentil. However, it was found that higher levels of sulphur and boron showed an antagonistic effect on nutrient content of lentil. The study suggested that soil application of S and B in Alfisol of Mirzapur (Uttar Pradesh) enhanced the nutrients content in grain and stover of lentil.

Keywords: Lentil, Sulphur, Boron, Nutrient Content

FEEDING PRACTICES ADOPTED BY SOJAT GOAT FARMERS IN PALI AND JALORE DISTRICT OF RAJASTHAN

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ABSTRACT

The present study was conducted in Pali and Jalore districts of Rajasthan, to find out the feeding management practices followed by Sojat goat farmers. For this, 160 respondents were selected. Data were collected through pre structured interview schedule. The results revealed that maximum goat rearers (78.75%) adopted semi stall feeding system and grazing was done mostly on community land (95.00%). The maximum goat keepers (93.75%) were sent their goats for grazing in the pasture for more than 5 hours daily. The results indicated that overall 87.50 per cent goat farmers fed concentrate with supplements to their goats. The results show that majority of goat rearers (60.00%) provide green fodder to whole flock. Majority of (92.50%) goat rearers did not preserve tree leaves and remaining (7.50%) are adopted this

practice. Major source of drinking water was common water trough. The maximum proportion of goat rearers (77.50%) fed 100-200 gm concentrate per goat per day. The percentage of farmers using pre-treatment of concentrate mixture before feeding like boiling, soaking and grinding the was 26.43, 49.29 and 24.28 per cent respectively. 95.00 per cent respondents did not feed mineral mixture may due to lack of knowledge in the research area.

Keywords: Concentrate, Feeding, Green fodder, Sojat Goat Keepers, Management

IN VITRO EVALUATION OF DIFFERENT FUNGICIDES AGAINST EARLY BLIGHT OF TOMATO INCITED BY *ALTERNARIA SOLANI*

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ABSTRACT

Tomato (*Solanum lycopersicum* L.) is a most profitable vegetable crop; afflicted by a number of diseases, the most serious and destructive of which is early blight caused by *Alternaria solani*, which causes quantifiable losses. The present study evaluated *in vitro* efficacy of nine fungicides at 3, 5 and 7 days after inoculation by following poison food technique. At three, five and seven days after inoculation, all the treatments were found significantly superior to over control. At 3 DAI, Hexaconazole, Difenoconazole, Tebuconazole + Trifloxystrobin and Azoxystrobin were found most effective fungicides which completely inhibited the radial growth of *Alternaria solani*. Minimum mycelia growth was recorded in Chlorothalonil (7.67 mm), whereas maximum mycelail growth (35.33 mm) was observed with Tricyclazole. At 5 DAI, No growth was observed in Hexaconazole, Difenoconazole and Azoxystrobin. Minimum mycelia growth was recorded in Tebuconazole + Trifloxystrobin (5.67 mm) whereas maximum mycelail growth (41.67 mm) was observed with Tricyclazole. At 7 DAI, completely inhibition of mycelia growth was recorded in Hexaconazole and Azoxystrobin. Minimum mycelia growth was observed in Difenoconazole (5.67 mm) and Tebuconazole + Trifloxystrobin (6.33 mm). Least inhibition was recorded in Pyraclostrobin (54.69 mm) and Tricyclazole (58.00 mm).

Keywords: Tomato, Early Blight, Fungicides, *Alternaria solani*

FRONT LINE DEMONSTRATION ON PERFORMANCE OF CHICKPEA IN MALWA REGION OF MADHYA PRADESH

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ABSTRACT

Pulses are good source of protein and commonly called the poor man's meat. Chickpea (*Cicer arietinum* L.) is a major legume crop of Fabaceae family. It is also known as gram and sometimes known as Egyptian or Kabuli chana particularly in northern India. India is the major chickpea producing country contributing over 75% of total world chickpea production. Cluster front line demonstrations (CFLDs) is one of the most powerful tools of extension because farmers, in general, are driven by the perception that “Seeing is believing”. The main objective of cluster frontline demonstrations is to demonstrate newly released crop production and protection technologies and its management practices in the farmer's field under the micro-farming situation. The 50 CFLDs on chickpea variety (RVG-202) was conducted by Krishi Vigyan Kendra Jaora, Ratlam under Jaora, Ratlam, Alote and Piploda blocks during 2021-22.

The critical inputs were identified in existing production technology through farmers meetings and group discussion. The findings in respect of chickpea overall yield trend of demonstrations ranged from 15.6 to 18.3 q/ha and yield increase ranged from 21.21 to 42.19 per cent over the local practices yield. The yield levels were considerably lower under local practices because of considerable variation in the extent of adoption of recommended technology depending upon the amount of risk involved in terms of cost, convenience, skill and knowledge about the concerned practice. Average gross returns and net returns of demonstration in chickpea crops was 29.55 and 39.60 per cent higher than the farmers' practices respectively. Average benefit cost ratio was found higher throughout the study in chickpea i.e. 2.52. The productivity was better over local practice under demonstrations. Hence, pulses production and protection technology have a broad scope for increasing the area and production of pulses at each and every level i.e., Farmers, State and National level.

Keywords: Chickpea, Cluster front line demonstration, Pulses, Yield.

CHARACTERIZATION OF CHICKPEA GENOTYPES ON THE BASIS OF MORPHO-PHYSIOLOGICAL TRAITS FOR HEAT STRESS TOLERANCE

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ABSTRACT

Global warming and extreme temperatures are predicted in the future hence identification of appropriate varieties that could adapt to such changes is imperative for sustaining crop productivity. Studies on climate change have indicated that the average surface temperatures are expected to raise by 3-5 °C, posing a major threat to crop production including legumes and agricultural systems worldwide, especially in the semi-arid tropics. India contributes a major share to the global chickpea area (70%) and production (67%). In India, due to delay in harvest of previous crops such as sugarcane, rice and maize, late sown chickpea gets exposed to high temperature (≥ 35 °C), of the summer, during grain filling, results in poor grain yield. Heat stress directly affects photosynthesis including photosystem II. To combat the detrimental effects of heat stress, plants have developed several mechanisms which ultimately lead to morphological, physiological, and biochemical alterations. Our interest is to identify such genotypes for heat tolerance. Here, assessed the response of four physiological traits and yield and yield-related traits in 30 chickpea advanced breeding lines grown in different dates as early(25th December), late(25th January), and very late(25th February) condition in three replications, using randomized block design to study physiological traits such as SCMRA, RWC, MSI and CTD along with yield parameters i.e. 100 seed weight , biological yield per plant , harvest index and seed yield per plant .Based on the tested physiological parameters and yield-related traits, JG23 x ICC4958, JG26 X ICC25741, JG14 x JG24, JG18 x ICC251097, JG63 x ICC14407 and JG14 x JG24 were identified as promising genotypes under HS.

Keyword: Heat Stress, Photosystem II, SCMRA, RWC, MSI and Seed Yield.

A UNIQUE PERSPECTIVE OF NANO-BIOTECHNOLOGY FOR AGRICULTURAL SUSTAINABILITY AND ENVIRONMENT SAFETY

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ABSTRACT

The GDP of a country is largely influenced by agriculture, which is also a key source of livelihood. Because conventional farming practices rely heavily on the usage of resources, chemical pesticides, herbicides, and fertilizers, they severely harmed the health of the farming community as well as polluted the soil and ground water. Nano-biotechnology is the science that has the potential to bring about radical changes in the way that agriculture is now practiced, realizing the ideals of precision farming and producing sustainable agricultural areas. Nanomaterials (NMs) such as nanopesticides, nanofertilizers and nano-packaging have enormous potential as an environmentally benign and economically feasible tool for enhancing safe agricultural productivity and maintaining environmental safety. One of the key uses for nanoparticles is nanofertilizer, as it makes it easier to add a precise amount of nutrition to the crops, which lowers the likelihood that nutrients will be lost and boosts crop fertility. Nanotechnology has a potential to identify diseases early on and enhance plant nutrient intake, which will benefit agriculture and food industry. The use of NMs reduces imbalance and unconscious use of synthetic fertilisers and pesticides, which reduces nutrient loss and increases agricultural productivity by ensuring that fertilizers and pesticides are distributed evenly while also increasing water and nutrient efficiency. Thus nano-biotechnology with promising effects in the agricultural sector, such as its unique techniques of applying fertilizers, pesticides and so on, may finally allow us to visualize the dream of attaining sustainable and eco-friendly agricultural technology.

Keywords: Nano-biotechnology, Sustainable agriculture, Precision farming, Nano-fertilizer, Nano-pesticides, Nano-packaging

ASSESSMENT OF GENETIC DIVERSITY OF FARMERS' VARIETY OF RICE FROM CENTRAL INDIA

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ABSTRACT

Hundred farmers' variety of rice collected from eight agro-climatic zones of Madhya Pradesh were investigated for morphological traits and genetic diversity using 28 simple sequence repeats (SSRs) marker. Among the 28 SSR markers, 22 markers showed polymorphism, rest six markers *i.e.*, (RM105, RM536, RM484, RM307, RM455 and RM124) were monomorphic, which were excluded from the study. In total, 67 alleles were detected with frequency ranging from 2 to 6 alleles per locus with an average of 3.05 alleles. Among the polymorphic markers, 10 markers, namely RM283, RM5, RM212, RM8, RM55, RM231, RM161, RM510, RM215 and RM201 produced two allele each, while 5 SSR markers, RM154, RM475, RM25, RM223 and RM209 produced three allele each, 4 markers *i.e.*, RM341, RM122, RM11 and RM234 generated four allele each and 2 marker namely RM263 and RM16 produced 5 allele each,

however maximum allele *i.e.*, 6 was produced by only one marker RM144. The highest polymorphism information content (PIC) value 0.617 was obtained by RM144 followed by RM341 (0.589) and RM263 (0.530). An average PIC value obtained was 0.255. UPGMA tree generated by Power Marker (version 3.25) based on 22 SSR marker exhibited clear-cut discrimination of the farmers’ varieties into two major clusters. The germplasm clustering pattern was irrespective to its place of origin reflecting the broad genetic base in the farmers’ varieties of rice of central India. Findings from this study also suggest that the diverse germplasm and polymorphic trait-linked SSR markers of farmers’ variety of rice are suitable for the detection of economically desirable trait loci/genes for use in future molecular breeding programs.

SURVEY OF ROOT-KNOT NEMATODE (*MELOIDOGYNE INCOGNITA*) ASSOCIATED WITH PEA IN MAJOR DISTRICTS OF MADHYA PRADESH, INDIA

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ABSTRACT

Pea (*Pisum sativum* L.) is one of the important Legume crops grown in India. Root-knot nematode (*M. incognita*) is a major problem, which causes galls/knots in the roots and causes considerable yield losses. Random survey of major pea growing districts *viz.*, Jabalpur, Hoshangabad, Dewas, Sagar and Vidisha was conducted to know the occurrence of root-knot nematode (*M. incognita*) during *Rabi* 2017. The soil and root samples were collected from different places and brought to the laboratory for analysis. The presence of root-knot nematodes was assessed following modified Cobb’s sieving and decanting method. All the localities surveyed during the course of investigation were found infested with root knot nematode. The plants infected with *M. incognita* were found devitalized, stunted with yellow leaves. The root system of such plants had severe galling with poorly developed roots. The results revealed that all the samples encountered the population of *M. incognita*. The nematode ranged from 120 to 395 nematodes (J_2) per 200 cm³ soil. Maximum (395 N) population of *M. incognita* was recorded in Panagar block of Jabalpur district with the light black soil followed by Chhattarpur village of Panagar block of Jabalpur district (360 N). With the same soil conditions Sihora recorded 325, 295 and 260 N/200 cm³ soil. Minimum population of *M. incognita* was recorded (168 and 215 N) in Shahpura block of Jabalpur with black soil followed by Patan block of Jabalpur district (242 and 225 N/200 cm³ soil). Itarsi block of Hoshangabad district recorded 150 N/200 cm³ soil with the deep black soil followed by 145 and 128 N with the same soil conditions recorded in Itarsi block. Pipariya block of Hoshangabad district with the shallow black soil recorded 142 and 120 N/200 cm³ soil. Hatpihya block of Dewas district encountered 250 N with the medium deep black soil followed by 235 and 220 N with the same soil conditions recorded in another locality of Hatpihya block. Khategaon block of Dewas district with the shallow black soil recorded 205 and 175 N/200 cm³ soil. Maximum (286 N) population of *M. incognita* was recorded in Deori block of Sagar district with the deep black soil followed by 270 and 240 N with the same soil conditions. Rehli block of Sagar district with the shallow black soil recorded 290 and 210 N/200 cm³ soil. Ganj basoda block of Vidisha district recorded 276 J_2 of *M. incognita* with the red sandy loam soil followed by 230 N with the same soil conditions. Tyonda block of Vidisha district with the red sandy loam soil recorded 255, 205 and 200 N/200 cm³ soil. Minimum 120 and 128 nematodes/200 cm³ soil nematodes were recorded in Pipariya and Itarsi blocks of Hoshangabad districts. However the nematode population varied from 120 to 395 N in the district surveyed.

Keywords: Pea, Survey, Root Knot Nematode, *M. incognita*

TECHNOLOGIES FOR REGENERATIVE AGRICULTURE AND CARBON FARMING

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ABSTRACT

Organic matter is degraded or dehumified as a result of soil usage in agriculture, such as ploughing, gathering plant feed, and grazing cattle, among other activities. Carbon dioxide (CO₂) is created as a result, which warms the planet. The International Organization for Climate Change's most recent statistics show that land use, including agriculture, forestry, and other activities, contributes 23% of all anthropogenic emissions of CO₂. By 2100–2150, the atmospheric CO₂ concentration will be reduced by 50–100 GtC (gigatons of carbon) by the application of regenerative technologies targeted at rebuilding the carbon content in agricultural soils. Regenerative agriculture has a dual (win-win) advantage because it accomplishes two tasks at once: it promotes the growth of sustainable agricultural production, the development of wholesome soils, the switch to organic farming, the production of environmentally friendly goods, etc., and it slows down the effects of climate change. Many practices promoted as regenerative, including crop residue retention, cover cropping and reduced tillage are central to the canon of ‘good agricultural practices’, while others are contested and at best niche (e.g. permaculture, holistic grazing). Carbon (C) farming refers to methods that are thought to accelerate the rate at which atmospheric CO₂ is absorbed and converted from plants and soil into organic matter. C farming is effective when C losses are outweighed by C gains from better land use or restoration techniques. The Intergovernmental Panel on Climate Change's 2018 report made it abundantly obvious that change is necessary to keep the effects of climate change to a 1.5 °C increase in global temperature. To achieve approximately zero global carbon dioxide emissions around 2050, this will require that 570 gigatons of carbon dioxide remain within the accumulated carbon budget. Limiting the effects of climate change to 1.5 °C will also require significant improvements in agriculture, forest management, and other human activities.

TRADITIONAL HERBAL MEDICINE IN WESTERN UTTAR PRADESH: A PHARMACOLOGICAL APPRAISAL

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ABSTRACT

Herbal Medicine can be defined as the total natural and traditional relationship and the interactions between man and his surrounding plant wealth from times immemorial, due to sheer, necessity, intuition, observation and experimentation. The present study highlights the importance of traditional herbal medicine from different regions of Uttar Pradesh. Detailed survey had been conducted in six districts (Aligarh, Bulandshar, Baghpat, Hapur, Meerut, and Muzaffarnagar) of Uttar Pradesh. The information regarding the use of herbal medicine were collected on the basis of frequent interviews with local physicians practicing indigenous system of medicine, villagers, priests and tribal folks. The plants were identified by using standard monographs and flora. Some past researchers also quoted uses of herbal medicine in diseases severe curing like cancer, diabetes, AIDS, skin disease and depression etc. The present study is focused to provide an effective knowledge on medicinal properties of

selected medicinal plants, so that this will be a pave way to cure diseases by herbal medicines without any side effect. Medicinal plants have great importance in providing health care to about 80% of the population in India. Plants have been an important source of precursors and products used in a variety of industries, including those of pharmaceuticals, food, cosmetics and agrochemicals. Gradually the folk medicines led to the rise of traditional system of medicine like Ayurveda in India. In Uttar Pradesh (India), tribal are using herbal medicine for long time.

Keywords: Herbal Medicine, tribals, Medicine, folk medicinal plants

DEVELOPMENT OF HYBRID STRAINS OF *LENTINULA EDODES* THROUGH INTRASPECIFIC HYBRIDIZATION FOR BETTER YIELD

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ABSTRACT

As we all known that *Lentinula edodes* (shiitake mushroom) is generally considered as an edible and medical mushroom, characterized by a special earthy aroma and prevention capabilities against several human diseases like cancer, diabetic, hypotensive, inflammatory, hypocholesterolemic etc. Shiitake is widely consumed and is highly prized for its velvety flavor and health benefits, but in India it is a specialty mushroom contributing less than 1% of total mushroom production till now. Therefore, it's a high time to focus on Shiitake mushroom research compared to other mushroom species. We have carried out an experiment to develop intraspecific hybrids of *Lentinula edodes* having earliness in production with higher yield compared to their parent strains. Five monosporus cultures of *Lentinula edodes* were isolated by spore print techniques and mated with four monosporus cultures, ten intraspecific hybrids were developed from different cross combinations of parents of *Lentinula edodes*. Out of 10 intraspecific hybrids, only 5 compatible hybrids strains were generated in which clamp connections were confirmed. The study of qualitative and quantitative responses during cultivation, Spawn running was faster in HSP 1-4 (Hybrid Spore Pair) followed by HSP 4-5, HSP 1-2, HSP 2-3 and HSP 3-4. Pinhead formation was quickest in HSP 3-4 followed by HSP 2-3, HSP 1-4, HSP 4-5 and HSP 1-2. The maximum no of basidiocarps was recorded in HSP 3-4 which is significantly at par with HSP 4-5 followed by HSP 1-4, HSP 1-2 and HSP 2-3. Maximum yield (501.21 g/kg substrate) was recorded in HSP 2-3 followed by HSP 1-4, HSP 4-5, HSP 3-4, HSP 1-2. Considering all the quantitative parameters like no. of basidiocarps per bag and biological efficiency, HSP 2-3, HSP 1-4, HSP 4-5 and HSP 3-4 may be selected for higher production.

Keywords: *Lentinula edodes*, Monosporus cultures, intraspecific hybridization, hybrid spore pair, yield.

EFFECT OF NITROGEN AND SULPHUR LEVELS ON GROWTH AND YIELD OF MUSTARD (*BRASSICA JUNCEA* L.)

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ABSTRACT

A field experiment was conducted during *Rabi* season in the year 2018-19 at Crop Research Farm, Shri Guru Ram Rai University, Pathri Bath, Dehradun- Uttarakhand (India) to determine the Effect of Nitrogen and Sulphur levels on growth and yield of Indian Mustard (*Brassica juncea* L.). Mustard is an oilseed crop which is widely grown in north India for oil extraction. Macro nutrient especially sulphur plays an important role in oilseed crop. The present study was having eight treatments with different combinations of nitrogen and sulphur levels having three replications. The experiment was done with kranti variety of mustard with 30 cm spacing in Randomised Block Design. It was concluded that among the different treatments the application of T₆ -NPK + S (100% + 100%) was found significantly higher followed by T₇ - NPK + S (100% + 50 %) to be more effective with maximum oil yield of 9.07kg/ha after harvesting of crop.

Keyword: Mustard, Nitrogen, oilseed, oil yield, Rabi, Sulphur

HYPOGLYCEMIC ACTIVITY OF MIXED HERBS ROOT EXTRACTS IN STZ-INDUCED DIABETIC MICE

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ABSTRACT

Salacia reticulata, used in traditional and local medicines in Western Ghats of Southern India for the treatment of diabetes, is widely used for its sugar lowering activity. Accordingly, the present study was designed to investigate the possible actions of ethanolic extract of roots of *Salacia reticulata* (EESR) and an ethanolic extract of local formulation (EELF) made by mixing roots of *Salacia reticulata* along with five other drugs, each one in equal ratios, namely heartwood of *Pterocarpus marsupium*, stem of *Tinospora cordifolia*, fruits of *Phyllanthus emblica*, roots of *Vetiveria zizanioides*, and heartwood of *Acacia catechu*, on sugar lowering effect of diabetic rats. In the first set of experiments, hypoglycaemic effects of oral administration at various doses (250 and 500mg/kg) of the both extracts (EESR & EELF) were examined in normoglycaemics, glucose-induced hyperglycaemic rats. Optimum effect was observed in all groups of animals with a dose of 500mg/kg of the extracts (EESR & EELF). In other part of the study, both extracts (EESR & EELF) of 500mg/kg was given to Streptozotocin (STZ) induced hyperglycaemic rats of different groups and blood sugar was recorded at an interval of 30 mins each for upto 360 mins to evaluate the intraday effect of EESR & EELF on blood glucose level. The last set of experiments was done by giving twice in the morning and evening the EESR & EELF orally at a dose of 500mg/kg for 21 days to check the inter day effect of extracts (EESR & EELF) on blood glucose of diabetic rats. Both the intraday study and the interday study have shown a significant decrease in blood glucose level of the diabetic and normal rats with the help of extracts. This treatment also prevented the elevation of the plasma, pancreatic, and kidney lipid peroxide levels, lowering of the plasma insulin level activities in diabetic mice. These results suggest that the ethanolic extract of *S. reticulata* along

with five other drugs could be a beneficial for the prevention of diabetes and obesity because of its multiple effects.

Keywords: *S. reticulata*, *Tinospora cordifolia*, *Antidiabetic activity*

EFFECT OF BIOSTIMULATION ON ESTRUS INTENSITY OF POSTPARTUM SAHIWAL COWS (*BOS INDICUS*)

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ABSTRACT

The present study was undertaken to investigate the effect of biostimulation on some behavioral aspects during peri-estrual period of postpartum Sahiwal cows. 24 post-partum Sahiwal cows were selected on basis of body weight and parity into 3 groups (T₀, T₁ and T₂) of 8 animals in each group for a period of 6 months. In T₀, the cows were not exposed to bull, in T₁, the cows were exposed to bull through a fenceline contact for 24 hours daily and cows of T₂ group were exposed to direct bull contact for 12 hours daily. The effect of intensity of estrus during first estrus in T₀ was largely weak (83.65%) and in T₁ was weak to moderate (54.05 & 36.48 %) whereas in T₂ the percentage of weak, moderate and intense was 34.48, 26.02 and 35.46, respectively. The percent mean intensity of estrus in second estrus was weak to moderate (69.75 & 31.12) in T₀ whereas, percentage of weak, moderate and intense estrus was 36.92, 40.90, 22.03 and 14.51, 29.98, 55.71 in T₁ and T₂ respectively. It was concluded that the biostimulation of Sahiwal cows by exposure to bull contact from 15-30 days post-partum improved the expression as well as intensity of estrus symptoms and reduced the days of first estrus post-partum in comparison to non-bull exposed cows.

Keywords: Biostimulation, Estrus behaviour, Estrus intensity, Sahiwal cows

AGROFORESTRY AS AN ENVIRONMENTAL AMELIORATING TOOL: A REVIEW

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ABSTRACT

Agroforestry is practiced globally by smallholder farmers. Increasingly, public-private partnerships (PPPs) are viewed as a way of facilitating benefits to smallholders from market opportunities. It is viewed as a profitable portfolio, compared to agriculture alone, and need to be recognized as venture. The increasing demand of technical and managerial skills and investment for this ecological - economic venture cannot be met by the public sector alone from its public-based resources. Agroforestry is the sustainable land-use system that deliberately integrates tree species with crops and/or livestock. This paper reviews the environment ameliorating services offered by agroforestry. Agroforestry's major ecological services are carbon sequestration in wood and soil, biodiversity conservation, soil and water conservation, and timber/non-timber revenue. Agroforestry has more potential for carbon sequestration as compared to croplands, pastures and grasslands. The documented Carbon

stored in agroforestry systems approximately ranged from 0.09 to 15.21 tons of Carbon ha⁻¹yr⁻¹. Lower values were observed for agroforestry systems with fewer woody components (e.g. hedge-row intercropping) and higher values for agroforestry systems with denser tree components and good soil conditions (e.g. homegardens). Thus, for sustainable development, agroforestry can be implemented for environmental amelioration.

Keywords: agroforestry, carbon sequestration, environment

ALTITUDINAL VARIATION IN BIOMASS AND CARBON STOCK OF FORESTS: IMPLICATION FOR CLIMATE CHANGE MITIGATION

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ABSTRACT

Carbon inventories are urgently needed for understanding climate dynamics and implementing climate mitigation strategies. Forests play vital role in combating climate change through carbon sequestration in the atmosphere and serving as a carbon sink in the form of carbon pool systems of forest ecosystems. Among terrestrial ecosystems, forest stores more carbon and biomass than any others. Each forest species accumulates carbon and biomass above and below ground uniquely. The relationship among aboveground biomass, carbon stock and species richness along elevation gradient may interpret strategies for sustainable forest management and its conservation. The variation in altitude directly influences the temperature, humidity, light intensity and rainfall that cause a change in the type of forest. The altitude gradient also has a great effect on the ecological distribution of forest type in mountainous regions (Wei et al., 2015). According to Inter-Governmental Panel on Climate Change (IPCC), the forest ecosystems cover 30% area of the world which are the largest sink storing carbon worldwide (Inter-Governmental Panel on Climate Change [IPCC], 2006). They also play an important role in balancing terrestrial carbon cycle globally.

There are four components of carbon (C) pools in a natural forest ecosystem: vegetation, soil, litter and woody debris. Quantifying these C pools and their contributions to forest ecosystems is important in understanding C cycling in forests. Forest ecosystem plays a crucial role in the global carbon cycle; as such, mitigating high atmospheric concentrations of carbon dioxide and other greenhouse gases by naturally taking carbon from the atmosphere through photosynthesis. Verification and accounting of carbon stock in forest ecosystem have been renowned as a potential strategy to reduce and stabilize atmospheric concentrations of greenhouse gas. Forest sequesters and store more carbon than any other terrestrial ecosystem and it is an important natural break on climate change. It acts as a carbon reservoir by storing large amount of carbon in trees, undergrowth vegetation, forest floor and soil. The mitigative role of India's forests was estimated to 9.3% at the year 2000; and 4.9% in 2020 for the annual emissions of the country (Kishwan *et al.*, 2012). Precise information of forest carbon stock is important for understanding the offsetting capabilities of the forests. The precise estimation of forest carbon is also required to understand the role of the forest for mitigative actions to achieve the National Determined Commitment (NDC) such as REDD+ and evaluating the role of forests for their ecosystems services to the poor. The estimates of forest carbon are also

required for evaluating forest degradation, as anthropogenic extractions from forests result in the degradation of forests (Malik et al., 2016).

Keywords: Ecosystem, carbon storage, altitudinal gradient, climate change.

IMPORTANCE OF TISSUE CULTURE IN FRUIT CROPS

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ABSTRACT

Fruit plant propagation by conventional methods is entirely dependent on the season, takes a long time, and necessitates a large land area for plantlet production; the resulting planting material may be exposed to soil-borne pathogens, insect pests, and viruses, resulting in a degradation in the quality of the planting material. This problem can be overcome by using tissue culture techniques that ensure large scale plant multiplication of true-to-type. Tissue culture created the possibility of generating a whole plant from single cells or tissues, which opened new approaches to plant improvement. It has become an essential technique to produce plants with desired genetics, characteristics, and productivity.

Keywords: Tissue culture, Fruit plants, True-to-type

INTERCROPPING OF LEMON GRASS UNDER *TERMINALIA CHEBULA* BASED AGROFORESTRY SYSTEM TO ENHANCE PRODUCTIVITY

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ABSTRACT

Agroforestry is an innovative approach that blends century old experience with new science in a small-scale framework and the notion of thought to produce potentially significant and transformative results. To achieve desired outcomes from agroforestry systems, multipurpose tree species are preferred by farmers as these species generate continuous revenue in a short period of time and also help in mitigating the effect of global warming. The suitability of species in agroforestry system varies in different agroclimatic conditions and choice of the farmers. *Terminalia chebula* is one such multipurpose tree species preferred by the farmers. It is a deciduous and a fast-growing tree and is well known for tanning leather, dyeing clothes and medicinal uses. The entire plant retains great medicinal significance and have been conventionally employed for the management of various human diseases. The fruits of the species are used locally in many medicines and are an important constituent of Triphala (a medicinal digestive stew) consisting of fruits of three trees namely *Emblica officinalis*, *Terminalia chebula* and *Terminalia bellerica* and commercially used in many ayurvedic medicines to treat diseases. Among the various intercrops such as agriculture, vegetables and floriculture; aromatic crops have special significance as they are extensively used in perfumery, flavouring, cosmetic and drug industries. Lemon grass are important commercial aromatic crops grown in different parts of India. Grass is cultivated mostly for its essential oil in tropical and subtropical region of Asia, South America and Africa. It has lot of medicinal properties, health benefits and also used in cosmetic and perfumery preparations. It can be used in regular tea consumption for a best aromatic flavour.

DYE EFFLUENT TREATMENT USING ACTIVATED CARBON (RICE BRAN)

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ABSTRACT

Wastewater treatment is a process used to remove contaminants from wastewater or sewage and convert it into an effluent that can be returned to the water cycle or used for other purposes. The treatment process takes place in a wastewater treatment plant (WWTP). In the present study activated carbon prepared from waste i.e. rice bran was used for effluent treatment. The powdered rice bran was treated with 5% NaCl for 24 hours. The acid activation process of 2.5 N H₃PO₄ was treated for 24 hours. Pyrolysis of carbon was done at 300°C temperature for 2 hours. For dye effluent treatment different concentrations of adsorbent 0.1%, 0.25%, 0.5% and 1.0% and time period 30, 60 and 90 minutes were used respectively. The resultant activated carbons were subjected to ball milling and characterized by using various analytical techniques. The clarity of the effluent was found at 1.0% concentration for 60 minute and the absorbency was recorded as 0.26nm. The adsorbent of porosity, ash content and moisture content were recorded as 0.205%, 35.96% and 10.84%. The adsorbent of rice bran bulk density was 0.692g/ml. The methylene blue was recorded 55mg/g of the adsorbent. The point zero charge, pH, surface area and iodine number were recorded i.e. 3.91, 6.99, 11.7 and 15.4 respectively.

Keywords: Rice bran, activated carbon, dye effluent, adsorbent, FTIR, pH.

IMPACT OF FERTILITY LEVELS AND LIQUID BIOFERTILIZERS ON GROWTH AND YIELD OF WHEAT (*TRITICUM AESTIVUM* L.)

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ABSTRACT

The aim of the present investigation is to study the impact of fertility levels and liquid biofertilizers on growth and yield of wheat (*Triticum aestivum* L.). The field experiment was conducted during Rabi 2019 at Instructional Farm of Agronomy, Rajasthan College of Agriculture, Udaipur, which is located in Rajasthan's agro-climatic zone IV-a. The experiment consisted of 16 treatments combinations comprising of four levels of fertility (Control, 75%, 100% and 125% RDF) and four levels of liquid biofertilizers (Control, *Azotobacter*, PSB and *Azotobacter* + PSB). Experiment was conducted under factorial randomized block design replicated thrice taking wheat var. Raj. -4238 as test crop. The Recommended dose of fertilizer (RDF) was 100:60:40 kg ha⁻¹ of N: P₂O₅:K₂O. Results showed that significant increase in plant height, total tillers m⁻¹ row length, effective tillers m⁻¹ row length, test weight, grain, straw and biological yield was observed with the combine application of 100% RDF and *Azotobacter* + PSB.

Keywords: Fertility levels, Biofertilizers, RDF, *Azotobacter*, PSB

STUDY OF PHYSICO-CHEMICAL PROPERTIES OF SASTA- OXBOW LAKE AT PAROO BLOCK IN MUZAFFARPUR, BIHAR, INDIA.

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ABSTRACT

Present study has been Conducted to investigate the Physico Chemical properties of water of Sasta oxbow lake at Paroo block in Muzaffarpur district, Bihar. During investigations physico-chemical properties of water was analyzed in three stations -Site -I Hirapur, Site II Sanpura and Site III Deoria. The Physico-chemical properties like pH, TDS, DO, BOD, COD, hardness chloride, calcium and magnesium were studied by various standard analytical techniques suggested by APHA. It was observed that most of the water quality parameters are in the acceptable limits for growth and development of aquatic organism accordance with WHO standards.

Keywords: Water quality, Physico-chemical parameters, Sasta oxbow lake, Muzaffarpur

ENTREPRENEURSHIP: AN EMERGING TREND FOR SELF-EMPLOYMENT

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ABSTRACT

Entrepreneurship is the most focused and least practised concept in Indian context. Despite of various start up friendly policies the implication rate is not up to the mark due to the presence of risk factor. When we use to discuss about Entrepreneurship eventually it is misunderstood with business, where as a thin line of difference is highlighted between Entrepreneurship and business. Starting the trend and grabbing the opportunity is known as entrepreneurship whereas following the trend is known as business. The term “entrepreneur” was coined by Cantillon in the early 18th century. Cantillon defines an entrepreneur as a ‘speculator in an uncertain environment’ (Cantillon, 1775). Entrepreneur is a person with vision, creativity, innovativeness and well known as a job giver instead of a mere job seeker. We can elucidate such persons having phenomenal characteristics to start their own venture to be financially independent by deploying own ideas that will turn into revenue generating practices as an entrepreneur. Reviewing various literature, we can culminate the qualities of an entrepreneur as follows. Innovativeness, Risk bearing ability, Perseverance, Locus of Control, Motivated, Passionate, Cosmopolite, Confident, Creative thinking, Knowledge seeking, and should be well equipped with communication and social skills. India being agriculturally way forward has attained self-sufficiency in maximum sector, in the same hand the consequences like distress sale and waste of perishable goods are observed. It can be diminished by establishment of various startups which will add value to the product which will ultimately provide financial development in the society. Providing appropriate training and creating awareness about the exciting facilities will definitely boost up entrepreneurial climate leading to economic inclusion.

Keywords- Entrepreneurship, start up, Risk bearing ability, Perseverance, Locus of Control, Training, Awareness, Entrepreneurial climate.

EFFECT OF DIFFERENT SOWING DATES AND MICRONUTRIENT ON GROWTH AND YIELD OF KHARIF SORGHUM GENOTYPE PARBHANI SHAKTI

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ABSTRACT

Effect of different sowing dates and micronutrient on growth and yield of Kharif sorghum genotype Parbhani Shakti experiments were carried out at SRS, VNMKV, Parbhani for year 2019-2020 in Kharif using 4 date of sowing and 4 level of micronutrient with 3 replications. Result revealed that sowing of sorghum after 7th July mostly affected by shoot fly disease incidence was increase with increase in date of sowing. Later sowing in 2020 reduced the yield; it found that there is no much effect of micronutrient on yield Kharif sorghum genotype Parbhani Shakti.

PREDICTION OF ACCEPTABLE WORKLOAD OF WOMEN IN FARMING SYSTEM THROUGH NOMOGRAM

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ABSTRACT

The present study was undertaken in bhabber Agroclimatic Zone of Nainital District of Uttarakhand State with the objective to construct Nomograms to predict acceptable workload as per physical fitness and strength parameters engaged in different production and farming systems. Measures of physical performance are meant to describe basic variables of importance for a satisfying work and leisure-time functioning. Studies of the structure of physical performance in relation to occupational work showed three main components; strength, endurance and movement quality (Hogan, 1991), A total of 05 subjects were selected to generate database on women working in agriculture activity like weeding of cauliflower and tomato crop in terms of physical strength, fitness and workload. Findings of the investigation show that mean age of the subjects involved in weeding was 29.6 yrs. Average height and average weight of the respondents was recorded as 154.2 cm and 47.8 kg respectively. BMI score all the respondents which represent their body type fell under low weight normal to normal category whereas few respondents fell in the category of below normal category of BMI. Weed in the field were mainly in the form of motha grass and few plants of doob grass as far as the type of weed concern. Mean length of carpals was 25.6 mm. Mean metacarpal length of thumb, index finger, middle finger, ring finger and little finger was 44.6 mm, 67.4 mm, 69.4 mm, 63.8 mm and 51 mm respectively. Mean inward distance of elbow from the upper hip point was 12.5 cm whereas outward distance was of 6.6 cm. After work values for average grip fatigue of the respondent for right hand was recorded higher. Compression forces due to gripping during the hand weeding were recorded 114 mm.

SYNCHRONIZING OESTRUS AND OVULATION IN THE BUFFALYPSO (*Bubalus bubalis*) USING DOUBLESYNCH PROTOCOL

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Purpose

Experiment was conducted to investigate (a) the effect of the Doublesynch protocol on pregnancy rate in buffalypso (b) the effectiveness of the Doublesynch protocol for oestrous synchronization and (c) to observe and record signs of estrous in buffalypso.

Methods

In this study, eleven buffalypsoes were administered PGF_{2α} on day 0, GnRH on day 2, a second PGF_{2α} injection on day 9, and a second GnRH injection on day 11. Timed artificial insemination (TAI) was performed 16 and 24 hours after the second GnRH injection. Eleven (n=11) buffalypso females were bred after spontaneous estrus was detected (control group). Oestrous behaviour and intensity were recorded in all the experimental animals, transrectal palpation and ultrasound was performed 60 days post-insemination to determine conception rate.

Results

All Buffalypsoes treated with the Doublesynch protocol elicited signs of swollen vulva and frequent urination which are classical signs of behavioural oestrus. The pregnancy rates were 54.5% using TAI in all the treated buffalypsoes and 45.5% for the control group buffalypsoes. The conception rate between Doublesynch treatment and Aripo farm herd were also compared and it was found that Doublesynch treated buffalypsoes were higher conception rate (54.5%) compared to the overall Aripo farm herd (24.0%) by artificial insemination.

Conclusions

The Doublesynch protocol effectively synchronized the estrus in buffalypsoes and TAI enhanced the pregnancy rate with classical signs of estrus in the buffalypsoes in comparison to untreated controls.

Keywords: Buffalypso, Doublesynch protocol, Conception rate and Behavioural signs.

CUCURBITACEAE VEGETABLES SIGNAL INTEGRATION FOR HYDROGEN SULPHIDE AND NITRIC OXIDE UNDER SALT STRESS

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Purpose

From past decades, soil salinity has been stated to be the primary cause of land degradation resulting in the downregulation of agricultural output owing to ionic as well as osmotic stress. Due to these plants are unable to express their supreme capacity affecting their overall growth and development under saline stress, as resultant of which a downfall in their commercial and economical value has been recorded. *Cucumis sativus*, the young fruit is commonly used in the form of vegetable/salad and is majorly cultivated, but various abiotic stresses have affected their growth. H₂S, NO, CO, and H₂O₂ are few destructive gases that are currently being studied

significantly for their role in signalling, which generally regulates the diverse biological and physiological processes in plants. H₂O₂, NO, CO, and plant hormones like ethylene and abscisic acid are among the gaseous signalling molecules with which H₂S interacts. In addition to this, hydrogen sulphide also interacts with calcium or induces the formation of persulfides from cysteine-containing proteins. This allows it to carry out its signalling and aid plants in developing tolerance to different abiotic stresses. In this study, we have to identify the signalling pathways that involve the combination of nitric oxide and hydrogen sulphide.

Methods

To understand the integrated crosstalk between H₂S and nitric oxide during sodium chloride (NaCl) stress in cucumber. Healthy seeds of plants belonging to the family Cucurbitaceae was selected and germinated. Seedlings were transferred to the plant growth germination chamber for the growth stage of secondary leaves to appear. Then, uprooted and acclimatized in the Hoagland solution. Different treatments of NaCl, H₂S donor, NO donor, inhibitor, and scavenger of NO will be given and different growth parameters will be analysed.

Conclusion

The present study recommends that H₂S and NO may be used to minimize the loss to cucumber plants in particular and other crops in general, caused by salt stress conditions commonly prevailing in the field.

Keywords: abiotic stress, signalling, cucumber, salinity

SIGNAL TRANSDUCTION AND SODIUM CHLORIDE STRESS AMELIORATION BY HYDROGEN SULPHIDE IN *SOLANUM MELONGENA*.

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Purpose:

Agricultural land holdings are falling as a result of massive urbanization, deteriorating 147 million hectares of land in India, of which around 6.74 million hectares of land deterioration is caused by salinity. This downfall in commercial and economic agricultural output is caused via disruption of ionic and osmotic balance under sodium chloride stress influencing their overall growth and development. The egg plant, *Solanum melongena* is widely grown and consumed in different parts of India with cultivation area and production rate of 758 thousand hectare and 13.15 million metric tons, respectively in the fiscal year 2021(Statistic 2021), but its growth is getting severely hampered under NaCl influenced land therefore, it has been selected as test plants for the present study. H₂S(NaHS) a well-known signalling molecule for its stress amelioration properties is taken to investigate its signalling pathway and NaCl toxicity management capabilities in the test plant (*Solanum melongena*).

Methods:

To understand the mechanism of NaCl stress amelioration and H₂S signalling pathway in *Solanum melongena*, healthy seeds of plants were selected and allowed to grow for 24-48hrs in a seed germinator at 25°C ± 2. Then, the seedlings were transferred to the plant growth chamber at the same temperature for the development of secondary leaves. Afterward, seedlings were uprooted and acclimatized in the Hoagland solution and were treated with various treatments including NaCl, donors, inhibitors, and scavengers of H₂S. Thereafter growth parameters were analysed.

Conclusion:

The present study recommends that H₂S can be used to minimize the loss caused by Sodium chloride stress to eggplant in particular and other crops in general.

Keywords: NaCl toxicity, Signalling, *Solanum melongena*, NaHS, eggplant.

VIRUS DISEASES OF ORCHIDS: AN OVERVIEW

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ABSTRACT

Orchids are diverse and widespread group of flowering plants that are often colourful and fragrant. These unique plants belong to the family orchidaceae, one of the most ecologically and morphologically diverse families of flowering plants. It is the second largest family of flowering plants, comprising about 28,000 accepted species, distributed in about 763 genera with more than 100,000 hybrids and cultivars. Orchids are one of the highly commercial crops in floriculture sector and are vigorously exploited due to their high ornamental and economic value.

Like other plants, Orchids too are vulnerable to virus attack. There are over 27 viruses reported to infect orchids. The two most important are *Cymbidium mosaic virus* (CyMV), which has been reported from 56 genera of orchids, and *Odontoglossum ringspot virus* (ORSV), which has been found to infect 20 orchid genera¹. Other newer viruses reported include CymMV, DenMV, PhCSV, CyRSV, CMV, OFV and many more. The mixed infections of *Cymbidium mosaic virus* and *Odontoglossum ringspot virus* are common which are transmitted by means of contaminated knife used in propagation or cutting flowers will transmit viruses to healthy plants. The viruses may involve a vector for their transmission, mechanical inoculation, division of infected plants, and contact between infected and healthy plants. Transmission of the virus causing *Cymbidium mosaic* in several *Cymbidium* species as well as in some of their hybrids is undoubtedly due to the natural activity of insect vectors. Proven insect transmitters include thrips, aphids and mites². Preliminary work indicates that aphids are capable of transmitting the virus. The green peach aphid, *Myzus persicae*, is known to be a vector of the virus from *Cattleya* to *Cattleya*. The viruses are not known to be transmitted by seed.

These viruses are resistant to degradation for long periods on tools and in the soil. The diseases are systemic: the virus particles are found in roots, bulbs, leaves, and flowers. The symptoms include chlorotic and necrotic spots, streaks, lines and rings in the leaves. Flowers may show necrotic spots and streaks as well as color break. The virus, if present, is present in all parts of the plant. Once infected, plants cannot be cured. In the present study an attempt has been to investigate different viruses infecting orchids - symptoms, characteristics, mode of transmission, economic losses caused by them and control measures to manage these diseases.

Keywords: *Orchids, virus diseases, Cymbidium, Odontoglossum, orchid diseases, CyMV, ORSV*

ETHNOBOTANICAL STUDY OF TRADITIONAL MEDICINAL PLANTS USED BY BHOTIA TRIBE IN NITI VALLEY, CHAMOLI DISTRICT

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ABSTRACT

The Bhotia tribe in Niti valley harbors numerous plants used by the local people for various purposes. The aim of this study is to document indigenous traditional knowledge of Bhotia tribes of medicinal plants in the Niti valley, Chamoli District of India. Ethnobotanical data were collected through semi-structured questionnaire surveys and in-depth interviews. It had been recorded that the indigenous peoples are conscious of roughly twenty-six medicinal plants that are utilized to treat fifteen different human maladies such as cough, fever, rheumatism, diarrhea, toothache, cuts and wounds, asthma, headache, stomachache, and skin disease etc. For curative purpose root part was mostly used. The majority of medicinal plants were not cultivated, maximum of them wildy found. For quantitative analysis of ethnobotanical data Relative frequency of citation (RFC), Informant Consensus Factor (ICF), Fidelity Level (FL) values and Use Value were calculated. Plant-related knowledge among various age groups was evaluated and it shows significantly higher numbers of medicinal plants were cited by men than women, and by older people than younger ones. Ethnomedicinal knowledge is often used as a basis for developing management plans for the conservation and sustainable use of medicinal plants in the area.

Keywords: Bhotia tribe, Niti Valley, Ethnomedicine, Fidelity Level values, Informant Consensus Factor

PERFORMANCE OF MEDICINAL PLANTS UNDER EUCALYPTUS BASED AGROFORESTRY SYSTEMS AT PRAYAGRAJ

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ABSTRACT

Growth performance of two medicinal plants *viz.* *Mentha arvensis* L. (Mint) variety CIM-Kranti and *Ocimum sanctum* L. (Tulsi) variety CIM- Ayu were studied under Eucalyptus based agroforestry systems at village Padilla, Prayagraj, Uttar Pradesh. Medicinal plants were transplanted in March 2022 at a spacing of 50.0 cm x 50.0 cm in Randomised block design with four replications under 5 years old Eucalyptus plantation. The trial comprised of 7 treatments *viz.* Mint+Tulsi, Sole Mint and Sole Tulsi under Eucalyptus and Open conditions respectively along with Sole Eucalyptus. During 1st harvest (100 DAT) the results show that, Tulsi and Mint attained maximum height 87.18 cm and 61.30 cm, number of branches 23.00 and 15.00, number of leaves per branch 26.00 and 20.00 and plant spread East-West directions 34.64 cm and 29.53 cm and north-south directions 33.20 cm and 27.24 cm under T₇ (Sole Tulsi) and T₆ (Sole Mint) under open conditions respectively. Whereas, minimum height 79.50 cm and 54.98 cm, number of branches 15.50 and 11.75, number of leaves per branch 21.50 and 13.75 and plant spread East-West directions 25.52 cm and 21.25 cm and north-south directions 24.28 cm and 20.43 cm were recorded under T₁ (Eucalyptus+Tulsi+Mint). Maximum fresh herbage yield for Tulsi and Mint was recorded under T₇ (Sole Tulsi) 165.84 Q/ha and T₆ (Sole

Mint) 97.24 Q/ha under open conditions respectively whereas, minimum value of fresh herbage yield for both of the medicinal plants was recorded under T₁ (Eucalyptus+Tulsi+Mint) 47.14 Q/ha and 27.95 Q/ha respectively. Medicinal plants performed better under open conditions in comparison to Eucalyptus based agroforestry systems.

Keywords: Growth, Height, Fresh herbage yield, Tulsi, Mint

DEVELOPMENT OF THERAPEUTIC AGENTS FROM FUNCTIONAL FOODS AGAINST SARS-COV2 INFECTION USING COMPUTATIONAL TOOLS

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Purpose

For the recently emerged, severe acute respiratory syndrome-2 (SARS-CoV-2), no therapy such as vaccines and specific therapeutic agents is available so far despite some protease inhibitors and antiviral agents. Phytomedicine may be developed as therapeutic agents in the prevention and treatment of current COVID-19 disease.

Method

We have screened 100 phytochemicals to develop as therapeutic agents against SARS-CoV2 using computation tools such as molecular docking and MD simulation analysis. Lipinski's rule of five and ADMET properties were also discussed to explore their drug ability parameters.

Results

Results of this study showed that luteolin, daidzein, curcumin, quercetin, etc. are the promising compounds of some daily eaten foods that may serve as preventive chemical agent of SARS-CoV2 encoded structural and non-structural proteins.

Conclusion

As per present study, the said phytochemical which are abundantly found in foods may be explored as preventive or therapeutic agents against SARS-CoV2 infection.

Keywords: Phytochemicals, Computational tools, molecular docking, molecular dynamic simulation, SARS-CoV2

IMPACT OF DIFFERENT INSECTICIDES AND PLANT EXTRACTS ON THE BIOLOGY OF *Pieris brassicae* (Linn.) ON CABBAGE IN INDIA

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ABSTRACT

Vegetables are the important source of minerals, proteins, carbohydrates and vitamins contributing a significant role in nutritionally balanced diet of predominantly vegetarian population of India. In India Cabbage (*Brassica oleracea* var. *capitata* L.) is one of the most important winter vegetables. Its center of origin is Mediterranean. There are many insect pests on cole crops which includes cabbage white butterfly, *Pieris brassicae* (Linn.) (Lepidoptera: Pieridae), *Plutella xylostella*(L.), diamondback moth (DBM), (Lepidoptera: Yponomeutidae) and leaf webber. Among them one of the most destructive pestsof cabbage is white butterfly, *Pieris brassicae* (Linn.) is causing damage at all the growing stages such as seedling, vegetative and flowering stage. The strategy ofpest management in India is mainly relying on chemical pesticides. Insecticide application against the larval stage of the *P. brassicae* is the primary

method of control. In review El-Lakwah results investigating the effects of two plant extracts in acetone (Datura leaves and Black pepper, *Piper nigrum* seeds), botanical insecticide NeemAzal-T/S and organophosphorus insecticide, chlorpyrifos-methyl (alone or in combination with the three previously mentioned treatments at its half-recommended rate) on cabbage-infesting insects (cabbage aphid *Brevicoryne brassicae*), cabbage butterfly (*Pieris brassicae*). Luik and Viidalepp investigated that the effect of NeemAzal-T/S (neem preparation) on cabbage butterfly (*Pieris brassicae*) larvae. Newly hatched larvae were fed with fresh cabbage leaves, and treated with 0.5 and 0.1% NeemAzal-T/S at the third-instar stage. NeemAzal-T/S exhibited a strong antifeedant activity against the third-instar larvae of *P. brassicae*. Such effect was found to be concentration-dependent & increased with increasing concentration of NeemAzal-T/S. Treatment with 0.1% NeemAzal-T/S resulted in 100% larval mortality during 4 days following treatment.

Keywords: *Pieris brassicae*, NeemAzal-T/S, Cabbage, Insecticide

TECHNOLOGICAL STATUS OF MUNG BEAN GROWERS IN JABALPUR DISTRICT OF MADHYA PRADESH

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ABSTRACT

Mung bean (*Vigna radiata*) is one of the most essential pulses crops. Mung bean is consumed as whole grains, sprouted form as well as daal in a variety of ways in homes. In Madhya Pradesh, during Twelfth Plan (2012-2017) the total area covered under mung bean was 2.51 lakh ha with 1.16 lakh tonnes of total production and productivity was 464 kg/ha as according to the annual report of directorate of pulses development (2016-17). However, the state lacks an average increase in yield when compared to the others states like Rajasthan, Maharashtra, Karnataka, and Gujarat which showed an increase in pulses production. Keeping this in mind the investigation was carried out during 2019-2020 to learn about the technological status possess by mung bean growers in the Kundam block of Jabalpur district, Madhya Pradesh. 120 farmers were selected from 12 villages of Kundam block with the help of a random sampling method. The study aims to find farmers' knowledge, adoption, and technological gap regarding improved mung bean production technology. The data were collected with the help of a pre-structured interview schedule and the collected data was carefully examined, classified, quantified, and tabulated. The study revealed that the mung bean growers had poor knowledge about seed and sowing management, field preparation management, high-yielding varieties, weed management, and insect and disease management. In the context of the adoption of improved crop production technology, it was observed that the majority of mung bean growers (52.50%) had a medium adoption level followed by 40.83 per cent had a low adoption level and only 6.67 per cent had high adoption level about mung bean production technology. Whereas in the case of technological gap it was revealed that 45.84 per cent of mung bean growers had a high technological gap followed by 37.50 per cent had a medium technological gap and 16.66 per cent had a low technological gap. It was observed that a very high technological gap was observed regarding the use of seed and sowing management, harvesting, insect and disease management, and weed management in mung bean cultivation.

INFLUENCE OF WEED MANAGEMENT PRACTICES ON GROWTH AND YIELD OF LENTIL (*Lens culinaris* L.) IN UTTARAKHAND'S SUBTROPICAL CLIMATE

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ABSTRACT

Weed competition is difficult for lentil because of its small height and poor foliage. Weeds typically cause a 70% reduction in lentil yield. A field experiment was done in rabi season of 2018-2019 session at Agriculture research farm, School of Agricultural Sciences, Shri Guru Ram Rai University, Dehradun, Uttarakhand, India, to find out the response of post emergence herbicides, pre-emergence herbicides, hand weeding, control plot and their interactions with reference to weed control, grain yield, and its economics. The Randomized Block Design (RBD) was used to conduct nine weed management treatments, including a control plot, with each treatment replicated four times. Pant L 639 lentil variety was manually sown in line on 01/11/2018. The net plot size was 4.00 x 1.80 m² with a row spacing of 25 cm. The recommended seed rate of 35 kg/ha and fertilizer doses of 20-17-16-20 kg/ha N, P, K, and S were applied. Herbicides were applied with a hand-operated knapsack sprayer. Nine treatments constituted viz. quizalofop ethyl @ 55 g ha⁻¹ as POE, imazethapyr @ 37 g ha⁻¹ as POE, chlorimuron ethyl @ 4.5 g ha⁻¹ as PPI, pendimethalin @ 1.5 kg ha⁻¹ as PE, pendimethalin + imazethapyr (ready mix) @ 0.20, pendimethalin + imazethapyr (ready mix) @ 1.5 kg ha⁻¹ as PE, pendimethalin @ 1.0 kg ha⁻¹ as PE + hand weeding at 90 DAS, hand weeding at 35, 65 and 90 DAS and weedy check. The hand weeding treatment had the lowest total weed population (8.17, 9.60, 9.62 NO./m² at 35, 65, and 90 days respectively), and the control plot had the highest total weed population (18.00, 21.85, 22.24 NO./m² at 35, 65, and 90 days respectively). *Anagallis arvensis* L., *Argemone Mexicana* L., *Cannabis sativa* L., *Cyperus rotundus* L., *Cynodon dactylon* L., *Chenopodium album* L., and *Parthenium hysterophorus* L. were the most common weeds discovered in the experimental plot. The application of Pendimethalin @ 1.5 kg/ha as PE + HW at 40 DAS resulted in the highest harvest index of lentil crop, while the control plot resulted in the lowest harvest index.

Keywords: *Weed, lentil, rabi, pendimethalin, hand weeding*

IMPACT OF ENVIRONMENTAL FACTORS AND DIFFERENT CITRUS GENOTYPES ON *XANTHOMONAS CITRI* SUBSP. *CITRI* INCITED CITRUS CANKER SEVERITY UNDER NATURAL CONDITIONS

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ABSTRACT

In the present investigation, 43 citrus genotypes, including 36 acid lime and 7 lemons, were screened out against natural infection of *Xanthomonas citri* subsp. *citri* (*Xcc*). Moreover, all the lemon genotypes showed a high level of resistance. However, acid lime cultivars exhibited a variable reaction against *Xcc*. The range of the average percentage of disease index (PDI) for three years varied from 0.00% to 55.36%. ALC-35 expressed the maximum average PDI

(55.36%), closely followed by the genotype ALC-107 (51.77%) and ALC-111 (47.22%). Genotype of lemon, Kagzi Kalan showed immune to the canker disease, while LS-5, LS-7 and Konkan Seedless had minimum PDI under natural infection in the field condition. On the basis of average PDI, ALC-35 and ALC-107 were categorised as highly susceptible, whereas 34 genotypes were classified as susceptible to *Xcc*. The average of three years area under disease progression curve (AUDPC) ranged from 0.00 to 2653. The genotype ALC-35 proved highly susceptible to *Xcc* with 2653.00 AUDPC, followed by ALC-107, ALC-111 and ALC-89. The lemon group was found to be highly resistant to *Xcc*. This study predicates about the effects of various environmental factors, including temperature, RH, rainfall, and wind speed. These variables correlated with PDI and AUDPC during the consecutive three years 2018-20. A significant positive correlation was observed through Pearson’s correlation coefficient. Results showed that the values of different weather parameters such as minimum temperature (24°C), maximum temperature (37°C), relative humidity (76%), and wind speed (6.4 Km/h), conditions were conducive for disease development. These findings will help breeders to include resistant/moderately resistant genotypes to develop high yielding varieties resistant to citrus canker and develop more effective management strategies to combat disease in the face of future climate change.

Keywords: Acid lime. AUDPC. Citrus canker. Lemon. PDI. *Xcc*

CLIMATE CHANGE MITIGATION ON AGRICULTURE, ECOSYSTEM AND RURAL LIVELIHOOD OF NORTH EASTERN HILLY REGION

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ABSTRACT

Globally, climate change is up-to the minute and it creates a great challenge for the local ecosystems of north east hilly region. This region in general is projected to be tremendously disposed to climate change due to its unstable geo-ecological, strategic location, trans-boundary river basins and international borders. It is an element that affects both socio-economic and cultural life of the people across the world besides influencing only in the ecosystem and environment though with spatially diverse intensity. Changing in the climate is a primary task for agriculture, food security and rural maintenances for thousands of North East people of India. Agriculture is considered as one of the greatest subdivision susceptible to the climate change. More than 60% of the north East hilly population is directly or indirectly depending on agriculture as a basis of livelihood and changing in the climate even now making unpleasantly impact on the lives of the population mainly the poor. In this framework, based on the current signals and scientific hypotheses, recent article offers a logical review of the climate change and its possibly influences on agriculture production, environment and livelihood of human in North East India.

Keywords: Climate Change, Agriculture, Ecosystem, Livelihood, North East India

A REVIEW: ORGANIC FARMING FOR SUSTAINABLE AGRICULTURE IN NORTH EAST INDIA

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ABSTRACT

Advancement of organic farming is possible in the North East Region of India. Low and minimal use of chemical fertilizers and synthetic compound are common in hilly ecosystems, despite inherent nutrient deficits and supplementing these to harness higher land, water and crop productivity. Currently, organic farming is gaining momentum as a sustainable crop and soil management practice specially for the small and marginal hill farmers by helping in enhancing soil health and carbon sequestration, providing multiple ecology services including mitigation of climate change. Integrated organic farming system will not only encourage organic food production but also decrease need on exterior resources through efficient recycling of on-farm biomass and additional resources particularly disease management. So, traditionally, bulky organic manure [farmyard manure] has been replaced through integrated organic nutrient management method by merging application of mixed compost, vermicompost, poultry manure, pig manure, in addition of in-situ and ex-situ bio-mulches and alley-cropping approach. Genuinely, marketing and value addition of organic products place a vital part of concern. So, certifying of organic products by the resource poor farmers is also another challenge for hilly farmers. With the policy support, farmers can be group and achieved certification in a cost-effective manner for their sustainable livelihood development.

Keywords: Organic farming, sustainable, hilly region, farmers, livelihood

IMPACT OF LAND COVER DYNAMICS ON ECOSYSTEMS SERVICE VALUE OF SIWALIK RANGE OF MADHESH PROVINCE, NEPAL

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Purpose

Change in land use land cover (LULC) are one of the main causes of the degradation of ecosystem services, particularly in Siwalik region which provide various ecosystem services to the surrounding areas. Additionally, human existence and wellbeing are dependent on this Ecosystem Services Value (ESV), hence preserving and maintaining the Ecosystem health is essential for long term supplies of these services. However, the LULC change of the siwalik and its impact on ESV is still not clear despite its importance. Thus, the study analyses LULC change from 2000-2020 and quantified its impact on ESV.

Methods

The study uses the remote sensing and Google earth engine to analyse the land use land cover change from 2000 to 2020 including 10 years gap. The village level workshops was conducted to list out the underlying causes of land use land cover change. To quantify the Ecosystem services value the study, use the Benefit transfer method.

Results

The result shows forest cover decreased from 1595.62 km² in 2000 to 1333.77 km² in 2010 and after that increase in 1469.82 km² in 2020. Also, the constant LULC decrease is found in

waterbodies (103.43 km² in 2000 to 78.30 km² in 2020) and agriculture (383.91 km² in 2000 to 334.83 km² in 2020). The total ESV of the siwalik range of madhesh province is estimated as 28 million US\$ per year in 2000, 34.45 million US\$ per year in 2010 and 44.26 million US\$ per year in 2020 of forest and agriculture. The elasticity of LULC on ESV is 1.43 for the period 2000-2010 due to decrease in forest cover and 1.34 for the period 2010-2020 which is relatively small due to increase in forest cover.

Conclusions

The forest cover increased, water bodies and agricultural land decrease. There is constant increase in ecosystem service value. The increase in ESV from 2000 to 2010 is relatively small as compared to 2020 due to decrease in forest cover. The result shows increase in ESVs due to increase in forest cover and by adjusting the ecosystem services value coefficient by inflation.

Keywords: Land use land cover change, ecosystem service valuation, chure region, Google Earth Engine, Ecosystem services, madhesh province

EVALUATION OF FOREST PRODUCT HARVESTING AND DISTRIBUTION PATTERN IN MID-HILL COMMUNITY FOREST OF NEPAL (A CASE STUDY FROM BHANGARA, DHARAAMDAANDA SAALGHARI AND AMBOTE CF OF KASKI DISTRICT)

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Purpose

Sustainable forest management requires proper harvesting of forest products. However, due to a lack of competence and awareness in harvesting, the forest condition is deteriorating and forest products are wasteful. Harvesting is a key aspect in reducing waste and harm while also ensuring forest sustainability so it is necessary to research this. Harvesting and equitable distribution aspects of different forest products (FP) are very crucial for sustainable management of community forest (CF).

Methods

Both primary and secondary data were collected from household survey, key informant interview, focus group discussion, Operational Plan (OP), and minute consultation. 20% of the total household (HH) of each CF was selected randomly selected incorporating proportionately from each well-being rank. Data were analyzed using descriptive statistics and presented in different charts and tables. The study accessed the harvesting and distribution practices and its deviation from the operational plan in three CFs of the mid-hill Nepal.

Results

Most of the users were, found using traditional equipment's because of money constraints and skills requirement to use modern tools, but are willing to use modern tools by taking training on using modern tools. Some of the deviations were observed in FP harvesting and distribution from that of OP in practice. FP was found distributed on equal basis and users were found satisfied with the distribution system. Slope was the major constraint for harvesting as most of the marked trees were not cut because of difficulty in extraction.

Conclusions and Recommendations

The study revealed that traditional methods were used during harvesting of FP with traditional tools like sickle, bill hook, axe and saw but the application of modern tools were in limited number. Advance harvesting tools and trainings on how to handle them should be provided to users, and regular monitoring should be done by forest officials to guide them at least during the harvesting period so that, users would be more responsible during harvesting operation.

Keywords: Harvesting, Community Forestry, Forest Management Plan, Product Distribution, Traditional Methods

ECONOMIC ANALYSIS OF DAIRY FARMING IN HIMACHAL PRADESH

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ABSTRACT

The present study entitled “Economic analysis of dairy farming in Himachal Pradesh” was undertaken to analyse the prospects of dairying. The population of indigenous cattle and buffaloes declined at 4.60 and 1.2 per cent, whereas, crossbred cattle increased at 3.4 per cent during 2003 to 2017 in the state. The ovine population also declined in the state by 0.40 per cent. Total milk production during 2017 was 1392.09 MT. The milk production of indigenous cows, crossbred cows and buffaloes, increased at CAGR of 2.28, 7.30 and 3.85 per cent respectively, during 2003 to 2017. The increased bovine milk production in the state was mainly due to increasing population of crossbred cattle and increase in Lactating Efficiency (LE). The LE of crossbred cattle was 52 per cent. The forecasted milk production in the state using Auto Regressive Integrate Moving Average model (ARIMA) for 2030 was estimated 2101 (000) MT. The net return per litre per SAU from local cattle was Rs 0.46 which ranged between Rs 0.05 for small farms and Rs. 0.87 for medium farms. In case of crossbred cattle, the net return per litre of milk production from crossbred cattle in overall category was Rs.8.59. Net returns were highest (Rs. 9.70 per litre), for large category farms followed by medium (Rs.7.60 per litre) and least for small category (Rs. 6.80 per litre) respectively. In case of buffalo net return per litre of milk production an overall category was Rs. 10.38, whereas, at disaggregate level net returns from buffalo were highest (Rs. 11.66 per litre) for large farmers followed by medium (Rs. 9.57 per litre) and small category farmers (Rs. 8.41). The technical coefficients of green fodder, dry fodder, concentrate and labour cost were significant at 5 and 10 per cent level of significance and positively influenced the milk production in case of crossbred cattle. However, labour was found negatively associated with milk production in large category. The mean technical efficiency (TE) in rearing crossbred cattle across the different dairy farm categories was different with an average TE of 62 per cent. In case of buffaloes, 53.98 per cent farmers at overall level were above the mean technical efficiency level. Only 5.31 per cent of farmers were in mean level of TE. The resource use efficiency of crossbred cattle in case of overall category indicated that green fodder (1.52) and concentrate (2.65) were underutilized, whereas, dry fodder (-0.26) and labour (-0.001) were over utilized. The resource use efficiency of buffaloes for overall category indicated that green fodder (0.41), dry fodder (0.21) and labour (-0.004) were over utilised, whereas, dry consumption of concentrate (4.45) was underutilized. The family size (-0.33), and land holding (-0.52) had negative effect on marketed surplus of milk on small farmers. Litreacy index (0.04) and milk production were found positive with marketed surplus of milk. Major constraints faced by the dairy farmers were lack of organized milk marketing facility at village level (65.84), non-availability of green fodder throughout the year (64.23), incidence of reproductive disorder (62.00), low productivity of animals (57.30) and less availability of land for fodder cultivation (58.28) in the state. However, these constraints across different categories were same.

Keywords: Economics, Milk production, Dairy, Cost, returns

STUDY OF *ALTERNARIA BRASSICAE* INTERACTION WITH *DIPLLOTAXIS ERUCOIDES* DERIVED *BRASSICA JUNCEA* INTROGRESSION LINES

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ABSTRACT

Brassica juncea is an important oilseed crop that is widely produced in the Indian subcontinent. Many fungal diseases limit *B. juncea* yield potential among them *Alternaria* blight is one of the serious diseases. The disease not only reduces its grain yield but also affects its oil quality in severe incidence of infection. This widespread disease can cause yield loss up to 70% of the crop especially as it effects seeds and siliquae. Hence, various strategies and control measures are used to control the disease in mustard. Study on host-pathogen interaction in *Brassica juncea* against *Alternaria brassicae* were effective to show the response of pathogen on host in susceptible and resistant genotype at different point of time. Screening of disease was conducted in *in-vitro* condition to check the growth of *A. brassicae* after inoculation in leaves. *In-vitro* and *in-vivo* inoculation was done to examine initial spore germination, diseases spread by cell death and callose deposition. In both *in-vitro* and *in-vivo* condition almost similar pattern was observed showing extensive cell death and higher callose deposition. Among the susceptible genotype ERJ-1 showed highest cell death and callose deposition followed by RLM and then RAPA. On the other hand, the resistant genotypes manage to restrict cell death, callose deposition and the pathogen growth. Among the resistant genotypes ERJ-159 showed least cell death and callose deposition followed by DE, ER and then ERJ-108.

Keyword: *Alternaria brassicae*, *Brassica juncea*, Host-Pathogen, Genotypes, Cell death, Callose deposition

EXTRACTION OF SILICA FROM AGRO WASTE AND STUDY OF ITS APPLICATIONS

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ABSTRACT

Large amount of agriculture waste produced across the world is a global concern as to how the waste should be treated or disposed off with minimum damage caused to environment. In this content processing of agro waste for extraction of natural biopolymers such as cellulose, pectin and other material such as silica has attracted the interest of researchers as it not only provides a suitable and eco-friendly means to consumer agricultural waste but at the same time the extracted biopolymer/biomaterial can be subsequently utilized for several other purposes. Silica is one such material which can be extracted from numerous agricultural waste such as rice straw, sugarcane bagasse and others. The isolated silica can be utilized in many ways such as treatment of polluted water, glass making, component of biofertilizer and can also be analyzed to assess catalytic effect of extracted silica in different processes. Hence, extraction of silica from agro waste and its subsequent application makes the whole process ecofriendly (preventing dumping of agro waste into ecosystem) economic resulting in value addition to several bioprocesses.

Keywords: Agro waste, silica, water purification, catalyst

ONE NEW SPECIES OF THE GENUS *PSEUDOSHIRAKIA* ACHTERBERG, 1983 (INSECTA: HYMENOPTERA: BRACONIDAE: BRACONINAE) FROM INDIA

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ABSTRACT

Hymenoptera is one of the largest orders of insects abundant in tropical and sub-tropical regions and probably most beneficial group for humans. Braconidae is one of the most important family of this order which is egg and larval parasitoids of many orders thus extensively used in biological control programmes against agricultural pests belonging to the order Lepidoptera, Coleoptera, Diptera, Neuroptera, Psocoptera and Hemiptera etc. In the present work genus *Pseudoshirakia* Achterberg (1983) is reported first time from India with description of one new species *Pseudoshirakia biharensis*. This genus is known only from its type species from the Palaerctic (Japan, China) and Oriental (Taiwan) regions. The genus was raised by Achterberg (1983) to accommodate *Bracon yokohamensis* Cameron (1910) known from China, Japan and Taiwan. as its type species. The new species *Pseudoshirakia biharensis* is closely related to *P. yokohamensis* Cameron (1910). However, it differs in having flagellomeres longer than wide, frons smooth, face smooth medially and somewhat finally transversally punctulate behind antennal socket, fore wing vein 1-SR+M straight, hind coxa smooth and shining, metasoma largely smooth and shining, 2nd metasomal suture without crenulate. This new species will definitely provide an addition to existing fauna and may be helpful for budding taxonomist around the globe.

Keywords: Insecta, Hymenoptera, Braconidae, *Pseudoshirakia*, new species, Parasitoids, biological control, India.

EFFECT OF BIOCHAR AND FYM AND ITS INTERACTION ON PHYSICO-CHEMICAL PROPERTIES OF SALT AFFECTED SOIL

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Purpose:

Fodder sorghum is important fodder crop in India Sorghum (*Sorghum bicolor* (L.) Moench) belongs to the family Poaceae. Sorghum is a warm- season, short-day annual grass. Locally known as Jowar, it is dual purpose crop cultivated predominantly in the Kharif season. It is a hardy crop tolerant to extreme drought conditions which could be attributed to its deep and extensive root system. Addition of biochar to agriculture soils has been projected as means to improve soil fertility and mitigate climate change. Biomass into biochar can not only result in the renewable energy (synthetic gas and bio-oil), but also decrease the content of CO₂ in the atmosphere, which reveal more research on the effect and behaviour of biochar in soil.

Method:

A pot house study was conducted on fodder sorghum at net house of the department of Soil Science and Agricultural Chemistry, B.A.C.A., A.A.U., Anand during *kharif*-2018. The experiment was laid out in completely randomized design (factorial). The treatment comprised four levels of biochar (B0: 0 t ha⁻¹, B1: 2.5 t ha⁻¹, B2: 5.0 t ha⁻¹, B3: 7.5 t ha⁻¹) and three levels of FYM (F0: 0 t ha⁻¹, F1: 5.0 t ha⁻¹, F2: 10.0 t ha⁻¹) with three replications. A bulk soil for pot study was collected from College of Agriculture, Anand Agricultural University, Vaso.

Result:

A pot experiment was conducted during *Kharif* - 2018 in the net house of the Department of Soil Science and Agricultural Chemistry, Anand Agricultural University, Anand to carry out a study on effect of biochar and FYM on yield, chemical composition of fodder sorghum (*Sorghum bicolor* (L.) Moench) and properties of salt affected soil. The soil of experiment was loamy sand having good drainage and pH 8.0 at 0-15 cm soil depth. The experiment was laid out in completely randomized design (factorial). The treatment comprised four levels of biochar (B₁: 0 t ha⁻¹, B₂: 2.5 t ha⁻¹, B₃: 5.0 t ha⁻¹, B₄: 7.5 t ha⁻¹) and three levels of FYM (F₁: 0 t ha⁻¹, F₂: 5.0 t ha⁻¹, F₃: 10.0 t ha⁻¹). Salient findings of the experimental results are summarized as below. The seed germination and plant population at 20, 40 DAS and at harvest influenced significantly by different levels of biochar and FYM. The application of biochar @ 7.5 t ha⁻¹ and 10.0 t ha⁻¹ individually recorded significantly highest seed germination and plant population of fodder sorghum at harvest as compared to control except the effect of application of FYM on plant population at 20 DAS was found non-significant. The interaction effect of different levels of biochar and FYM on seed germination and plant population at 20, 40 DAS and at harvest of fodder sorghum was found non-significant. The application of biochar @ 5.0 t ha⁻¹ gave significantly higher plant height of fodder sorghum at 20 DAS which was at par with higher levels of biochar as compared control. However, the effect of application FYM at different levels was found to be non-significant. In case of plant height at 40 DAS and at harvest i.e. 60 DAS, the application of biochar @ 7.5 t ha⁻¹ and FYM @ 10.0 t ha⁻¹ individually gave significantly highest plant height of fodder sorghum. The plant height increased with increases in application levels of biochar. The interaction effect between different levels of biochar and FYM was found significant with respect to plant height at 20 and 40 DAS. Significantly the higher plant height of fodder sorghum was recorded under the treatment combinations of B₃F₃ and B₄F₃ at 20 and 40 DAS, respectively. The interaction effect of different levels of biochar and FYM on plant height at harvest was found to be non-significant. The application of biochar @ 7.5 t ha⁻¹ produced significantly highest green forage and dry matter yield of fodder sorghum as compared to control. The result depicted that green forage and dry matter yield increased with each increase in levels of biochar. The dry matter yield of sorghum under the application of 7.5 t ha⁻¹, 5.0 t ha⁻¹ and 2.5 t ha⁻¹ was 85.60%, 68.63% and 45.75% higher, respectively over control. Among the treatments FYM, the application of FYM @ 10.0 t ha⁻¹ produced significantly highest green forage yield and dry matter yield of fodder sorghum as compared to control. The dry matter yield of sorghum under the application of FYM @ 10.0 t ha⁻¹ and 5.0 t ha⁻¹ was 10.35% and 8.39% higher respectively over control. The combined application of 7.5 t ha⁻¹ biochar and 5.0 t ha⁻¹ FYM (B₄F₂) produced significantly highest green forage and dry matter yield of fodder sorghum as compared to rest of the treatment combinations. Biochar has failed to draw any impact on nitrogen content and crude protein of fodder sorghum. However phosphorus and potassium content were affected significantly and maximum content highest phosphorus content was recorded with the application of biochar @ 5.0 t ha⁻¹ whereas significantly higher K content in fodder sorghum was recorded under the application of biochar @ 7.5 t ha⁻¹ over control. The nitrogen, potassium content and crude protein of fodder sorghum affected significantly by different levels of FYM but there was no significant distinction in phosphorus content. The significantly higher nitrogen and potassium content and crude protein content in fodder sorghum was recorded under application of FYM @ 10.0 t ha⁻¹ over control. Effect of interaction between different levels of biochar and FYM was found significant with respect to content of K of fodder sorghum only. The result revealed that application of 5.0 t ha⁻¹ biochar + 10.0 t ha⁻¹ FYM (B₃F₃) and 7.5 t ha⁻¹ biochar + 10.0 t ha⁻¹ FYM (B₄F₃) recorded significantly highest K content in fodder sorghum. The significantly higher uptake N, P and K by fodder sorghum were recorded under the application of biochar @ 7.5 t ha⁻¹ and FYM i.e., 10.0 t ha⁻¹ individually over rest of treatments. Effect of interaction between different levels of

biochar and FYM was found significant with respect to K uptake by fodder sorghum only. As per result the treatment receiving application of 7.5 t ha⁻¹ biochar + 10.0 t ha⁻¹ FYM (B₄F₃) gave significantly highest K uptake by sorghum.

Conclusion:

Growth and yield parameters like seed germination percentage, plant population, plant height, green forage yield dry matter yield and nutrient uptake were adjudged as ideal parameters to prove the biochar and FYM act as growth promoter. Biochar and FYM have significantly improved agronomic performance by applying them separately or in combination.

GENETIC VARIABILITY IN HEAT TOLERANT MAIZE (*ZEA MAYS* L.) HYBRIDS AND THEIR PARENTS FOR YIELD AND GRAIN QUALITY TRAITS

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Purpose

Maize (*Zea mays* L.) is an important cereal and staple food crop of the world. The rapidly increasing human population is an alarming issue and would need more food production under changing climate. Abiotic stresses like heat stress and temperature fluctuation are becoming key issues to be addressed for boosting crop production. Grain yield losses in maize from heat stress are expected to increase owing to higher temperature during growing season. This situation demands the development of maize hybrids tolerant to heat stress without compromising grain yield and quality under stress conditions. Association study helps to understand the correlation of yield with other yield related traits and quality traits.

Methods

Two sets of field experiments were conducted at Main Agricultural Research Station, Raichur to evaluate heat tolerant maize hybrids and their parents for yield and grain quality traits during late *Kharif* 2019. 14 hybrids + 3 commercial checks, 21 inbred lines + 2 testers were raised in RBD with 2 replications. Correlation and path analysis was carried out to understand the association of yield with other traits.

Results

Results revealed that plant height, number of grains per row, number of grains per cob, 1000-grain weight, shelling percentage, carbohydrate and β -carotene exhibited significant positive correlation with grain yield at phenotypic and genotypic levels. Path coefficient analysis in inbred lines revealed that among all traits, number of grains per cob, 1000-grain weight and plant height exhibited high positive direct effect on grain yield. High positive indirect effect on grain yield was exhibited by carbohydrate through plant height, number of grains per row, number of grains per cob, 1000-grain weight, dietary fiber content, phytic acid and β -carotene.

Conclusions

Selection of traits having positive association with yield results in improving the grain yield.

Keywords: Heat tolerance, Correlation, path analysis, quality traits

CHALLENGES FACED BY STUDENTS TOWARDS ONLINE EDUCATION DURING COVID-19

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ABSTRACT

Online education has quickly become an important tool for universities, colleges and other educational institutions during COVID-19. We have seen a considerable growth of digital technologies in this duration. Though students faced a lot of challenges during this period such as bad economic conditions, mental challenges, unstable internet, etc. The different field of courses faced different challenges. The main challenges were divided into four categories such as physical challenges, psychological challenges, technical challenges and other challenges. The physical challenges include lack of physical exercises, eyesight problems due to long screen time, etc followed by psychological challenges including lack of interest, stress and anxiety, lack of confidence, etc. The technical challenges were lack of electronic devices, unstable internet connectivity, privacy concerns and some other challenges with application software. Leaving the earlier mentioned challenges there were some other challenges which were lack of suitable environment at home for studies, additional expenditure of buying laptops and other gadgets, limit data, etc. Hence these were the challenges that cause hindrance in online education which are much needed to be resolved to reduce the gaps in the face-to-face and online education.

Keywords: Challenges, COVID-19 and Online education.

TO STUDY THE IMPACT OF DIFFERENT SOURCES OF NUTRIENTS IN VEGETABLE PRODUCTION

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ABSTRACT

Vegetables play an important role in nutrition as these provide vitamins and energy. At present vegetables are grown in 5.98 mha area with the production of 68.9 MT. However this amount is less than our nation requirement. The vegetables take large amount of nutrient. Hence, slow release of nitrogen fertilizers, integrated use of chemical fertilizers and organic sources of nutrient have proved to very effective for increasing nutrient use efficiency and crop productivity. While, reducing nutrient losses integrated nutrient management refers to a system which aims at improving and maintains the soil fertility for sustaining the increase of crop production. The presently role of fertilizers applied particularly of NPK has been supplied through chemical fertilizer source. Due to these reasons the produce of vegetables are poor and less in keeping quality and also the pest infestation increases year by year. Keeping these views in mind KVK Amroha has been conducted on farm trial in different farmer's fields of the Amroha district. We have used different organic sources such as FYM, vermi-compost, NADEP compost and green manuring with and without chemical source to meet out the vegetable fertilizer requirement. The results showed that 50% of organic source + 50% of

chemical source gave significantly highest yield in comparison to 25% organic source + 75% chemical source and 75% organic source +25% chemical source. The quality of produce found with the 75% organic source + 25% chemical source and also get less pest infestation. Hence we can conclude that organic nutrient management is a best practice to increase the yield and quality of vegetables. So at present there is need for nutritional research on vegetables with organic nutrient management to grow more and healthy production.

Keyword: Management, Nutrients, Organic and Vegetable.

SEEING THE UNSEEN: OPPORTUNITIES FOR UNDERSTANDING THE ECONOMIC CONTRIBUTION OF NTFPS

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Purpose

Non-Timber Forest Products are an integral part of most rural communities and its contribution is from time immemorial. The reliance on NTFPs is impacted by a variety of socioeconomic variables; nonetheless, it is well understood that the amount of dependency on NTFPs is not the same in every area of the world. Similarly, individuals have been collecting and using NTFPs for centuries, although the extent of benefit sharing varies. As a result, the purpose of this study was to document the NTFPs available in the study area, assess highly potential NTFPs for income generation activities, and document the contribution made by such highly potential NTFPs in Income Generation Activities of local people. The research was conducted in Macchapuchhre Rural municipality ward-1, Kaski district, entire Conservation Area Management Unit of ward.

Methods

To describe the types of NTFPs and their consumption patterns, primary data was collected through household surveys, key informant interviews, focus group discussions, and direct field observations. Representative household was visited on purpose to establish their reliance on NTFPs. Matrix ranking and pair wise ranking was also used.

Results

From the research a total of 50 NTFPs were identified in the community or nearby forest of which only 40 species were used by the locals. Some species of NTFPs were found to be sold in the market with only three being of high market value whose distribution was is high but extraction process is risky.

Conclusions

Thus, the potential of income generation from the forest was found to be medium as although Tusa, Nirmasi and Bikh were a source of income as they had a good market and was found in high frequency in the forest, the yearly earnings and the number of households involved was low. The most important benefits from the five NTFPs to the local people were fuel, food and income/employment. Benefits from other NTFPs apart from the above five were food from Sisnu, kurilo and Ainselu, medicine from Kutki, Kutomasi, Tejpat, Banlasun, Pakhanbed, Bhootkesh, Titepati and so on.

Keywords: *NTFPs, benefit sharing, utilization, livelihoods and IGAs.*

GENETIC VARIABILITY STUDIES FOR YIELD AND ITS RELATED TRAITS IN MAIZE (*ZEA MAYS* L.) INBRED LINES

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Purpose

Maize (*Zea mays* L.) is one of the important cereal crops of the globe due to its diversified use as food, feed, bio fuel, various uses in poultry and piggery industry. For improvement of a crop, it is important to know the extent of genetic variability present in the germplasm collection. The desired variability can be successfully utilized by various breeding programmes. Hence, the knowledge about the variability parameters is of paramount importance for any breeding programme.

Methods

The experiment consisting of 50 inbred lines was laid out in randomized block design at CADA experimental block, Bheemarayanagudi. The experiment was conducted with three replications. Observations were recorded on various yield parameters.

Results

The ANOVA revealed that significant variation exists among 50 inbred lines for 14 characters and non-significant for one character *viz.*, anthesis silking interval indicating the presence of variability among the inbred lines used for the study. High GCV and PCV were observed for number of grains per cob, grain yield per plant and grain yield (kg/ha). The high heritability coupled with high GAM were observed for number of grains per row, number of grains per cob, plant height, grain yield per plant, 1000 kernel weight and grain yield (kg/ha). High heritability coupled with high GAM indicating the preponderance of additive gene action.

Conclusions

Among the inbred lines used in the study, BGUDI 31, HS 4, P 52, P 16 were identified as promising inbreds for grain yield (kg/ha), grain yield per plant, number of grain rows per cob, 1000 kernel weight.

Keywords: Inbred line, Genetic variability, Heritability, GAM

IDENTIFICATION OF GROUNDNUT GENOTYPES WITH ENHANCED SEED OLEIC ACID (OMEGA-9 FATTY ACID) CONTENT

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ABSTRACT

Groundnut is a globally important oilseed as well as food crop and an excellent source of nutrients and energy; they have between a 25-28 % of protein and 50-55 % of lipids. The genotypes with low oleic acid and high linoleic acid are likely to develop rancid flavours, odors and low stability, when facing oxidation process. Oleic acid is a monounsaturated fatty acid helps in improving the shelf life of products and several health benefits like reducing amount of LDL (bad cholesterol) and boosting the levels of HDL (good cholesterol). In view of this, an experiment was carried out involving 49 high oleate groundnut genotypes during *khari*, 2017 in a simple lattice design at MARS, UAS Raichur. The genotypes were characterized both morphologically and at molecular level with 30 groundnut and trait specific (FAD2A) markers and observed good amount of genetic variability. Based on total oil, protein, O/L ratio, dry pod yield and oleic acid content the following genotypes *i.e.* ICGV-15033 (82.75 % OA), ICGV-16045 (82.40 % OA), ICGV-15035 (82 % OA), ICGV-16018 (81.85 % OA), ICGV-

16039 (81.60 % OA) and ICGV-16690 (81.35 % OA), were identified as high oleate lines. These selected genotypes were also exhibited superior characteristics for important morphological traits like early flowering and maturity, kernel and haulm yield, SMK (%), HI (%) and shelling outturn (%). The identified groundnut genotypes may directly used as a variety or as a parent in hybridization programme to develop the transgressive segregants for further improvement in quantity and quality parameters.

Keywords: Groundnut, oleic acid, fatty acid, genotypes.

EFFECT OF MULCHING ON FRUIT PRODUCTION

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ABSTRACT

Mulching is the process or practice of covering the soil surface to make more conducive conditions for growth, development and efficient production. The natural mulches such as leaf, straws, dead leaves and compost have been used since centuries. During the last 60 years, the synthetic material has altered the methods and benefits of mulching. There are two main types of mulching viz., temporary mulch and permanent mulch. The effect of mulching showed that optimum production of raspberry fruits was obtained in high tunnel with adequate nutrient application, resulting due to good water uptake, organic matter, fulfill chilling requirement, etc. were gave optimum cane height and plant growth rate. Due to their low chilling requirement, double cropping potential, high fruit quality and ease of manipulation in red raspberries fruits were found to be best grown under high-tunnel production. Strawberries were grown in the annual hill system. We have studied the effect of standard black polyethylene mulch and red reflective mulch on fruit size and production. Earliness and total marketable fruit yields were not affected by mulch color, while yield was significantly higher with red than black mulch. The trees were irrigated at an interval of 3, 5 and 7 days starting from first week of April to first week of May with black polythene and transparent polythene as mulch. Data of the experiment were found significantly superior with black polythene along with irrigation at 5 days interval to reduce the pre-harvesting fruit drop. While, the black polythene mulching and irrigation at 3 days interval was gave similar results as stated above. It was also found that black polythene was delayed fruit maturity by 1-2 days as compared to transparent poly film mulch.

RECENT ADVANCES IN PLANT PROPAGATION OF FRUIT CROPS

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ABSTRACT

Plant propagation is the process of creating or multiplying new plants. Most plants multiply from their seeds. Multiplication of plants using parts other than seeds is known as vegetative or asexual propagation. Other than seeds the various methods used for the multiplication of

plants are cuttings, layering, budding, grafting and specific plant parts. Certain plants like strawberry, pineapple, banana and mostly flowering plants are preferentially multiplied from their parts such as runners, rhizomes, suckers, bulbs etc. Cuttings are pieces of vegetative tissues (mostly stem, sometimes roots and rarely leaves) that when placed under suitable environmental conditions will regenerate the missing parts and produce a self-sustaining plant. Cuttings (hardwood or softwood) are mostly used for the fruit plants like grapes, pomegranate, mulberry etc. There are various number of propagation methods that can be used for propagating rare and endangered species or others that are very difficult to propagate by other methods. Although there is sufficient development of new technologies in the field of propagation but still the conventional method of propagation are used on large scale by the farmers. For the commercialization of these technologies, there is a need of making the farmers aware about the use of these technologies.

STANDARDIZATION OF PROPAGATION PROTOCOLS THROUGH SEEDS IN MALABAR EMBELIA (*EMBELIA TSJERAM-COTTAM*)

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ABSTRACT

Embelia tsjeram-cottam Burm f. is a threatened species found in Western Ghats, which is an important medicinal plant, fruits of which are used in variety of ayurvedic formulations. Natural regeneration through seeds is very difficult due to small embryo and abortive nature. Propagation through cuttings is also very difficult due to very poor rooting. Therefore, the work was initiated during 2017-18 to standardize seed propagation of this medicinal plant. Among the different germination inducing treatments, the seed treated with GA³ 750 ppm recorded early germination (32 days), highest germination rate (0.23%), Germination value (7.57), seedling height (4.54cm), number of leaves (2.10), etc. In case of vegetative propagation, there is no significant rooting found except treatment Soaking cuttings In NAA @ 1500 ppm for 24 hours. for producing sufficient number of seedlings of this species. Significant increase in number of new root, leaves and shoots and length of roots were recorded in seed GA³ 750 ppm+ KNO₃ 1.0% for 24hours otherwise increase the concentration of GA³.

IMPACT OF THERMAL MODIFICATIONS ON PHYSICAL AND CHEMICAL CHANGES OF *BOMBAX CEIBA* L.

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ABSTRACT

Thermal modification of wood is an environment-friendly alternative method for improving several properties of wood without the use of chemicals. Thermal modifications of wood samples were carried out at 80, 120, 160 and 200°C. The study revealed significant variation between physical and chemical properties of thermally modified wood of *Bombax ceiba*. The maximum value of specific gravity (0.422), moisture content (23.86%) and maximum moisture content (177.45%) were recorded in control, whereas the minimum value of specific gravity (0.368), moisture content (1.01%) and maximum moisture content (133.55%) were recorded at 200°C. The maximum cold water-soluble extractives (7.09%), hot water-soluble extractives (12.77%), and ash content (2.09%) were recorded at 120°C, whereas the maximum holocellulose content (70.27%) at 160°C and the maximum alcohol benzene soluble extractives

(12.86%), lignin content (33.16%), were observed at 200°C. The minimum cold water-soluble extractives (4.42%), hot water-soluble extractives (7.61%) and holocellulose content (64.79%) were found to be at 200°C, while the minimum alcohol benzene soluble extractives (9.06%) in control and lignin content (27.30%) at 80°C. High temperatures during thermal modification cause the degradation of hemicelluloses and lignin, resulting in the production of water, carbon dioxide, formic acid, acetic acid, and other substances.

PERFORMANCE OF FAST-GROWING TREE SPECIES UNDER HIGH-DENSITY AT PRAYAGRAJ

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ABSTRACT

Growth performance of three fast-growing trees, viz. *Populus deltoides* (Poplar), *Eucalyptus* spp. (*Eucalyptus*) and *Casuarina equisetifolia* (*Casuarina*) were studied, in high-density plantation at village Padilla, in Prayagraj, Uttar Pradesh with three different spacings, viz. 1×1 m, 1.2×1.2 m and 1.5×1.5 m. The trail was established in year 2021 and data was collected after one year. The data was statically analysed by one factor ANOVA. The result show maximum height in T₂: *Eucalyptus* (1×1m) 3.81 m followed by T₅: *Eucalyptus* (1.2×1.2 m) 3.78 m, T₈: *Eucalyptus* (1.5×1.5 m) 3.40 m which was at par with each other and minimum in T₉: *Casuarina* (1.5×1.5 m) 2.42 m whereas maximum height increment in T₂: *Eucalyptus* (1×1m) 2.43 m followed by T₅: *Eucalyptus* (1.2×1.2 m) 2.38 m, T₈: *Eucalyptus* (1.5×1.5 m) 1.96 m which was at par with each other and minimum in T₉: *Casuarina* (1.5×1.5 m) 0.97 m. The girth was maximum in T₄: *Poplar* (1.2×1.2 m) 6.91 cm followed by T₂: *Eucalyptus* (1×1m) 3.81 m, T₅: *Eucalyptus* (1.2×1.2 m) 3.78 m, T₁: *Poplar* (1×1m) 5.91 cm which was at par with each other and minimum in T₉: *Casuarina* (1.5×1.5 m) 3.22 cm whereas maximum girth increment in T₂: *Eucalyptus* (1×1m) 4.54 cm followed by T₅: *Eucalyptus* (1.2×1.2 m) 4.24 cm, T₄: *Poplar* (1.2×1.2 m) 3.93 cm, T₈: *Eucalyptus* (1.5×1.5 m) 3.80 cm which was at par with each other and minimum in T₉: *Casuarina* (1.5×1.5 m) 1.17 cm. This is early growth result; growth monitoring will continue to assess the performance of fast-growing tree species under High Density Plantation.

Keywords: High Density Plantation, Fast growing species, Height, Girth, Increment.

EFFECT OF DEWORMER AND MINERAL MIXTURE FEEDING ON PERFORMANCE OF CROSSBRED DAIRY CATTLE

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ABSTRACT

A field study was conducted at farmer field to find out the effect of dewormer and mineral mixture feeding on productive and reproductive performance of crossbred dairy cows. Thirty lactating animals were selected from two villages of Samastipur of Bihar. All animals divided in to two groups, treatment group (T) was fed one bolus of dewormer (Fenbendazole @ 5mg/kg B.Wt. orally) and commercial mineral mixture @ 60 g/day/cow till 90 days of lactation period

whereas other group, Farmer practice (i.e. Control) was kept devoid from dewormer and additional mineral mixture feeding. Feeding practices were similar in both the group except feeding of commercial mineral mixture in treatment group. Feeding of mineral mixture was started from 20 days of their calving till 110 days of lactation. Milk production and estrous sign of both groups were recorded at an interval of 0 days, 60 days and 90 days. The result of study indicated that average daily milk yield was found higher by 13.63% in treatment group as compare to control group and values of average daily milk yield from animals of farmer practice and treatment group were 8.8.lit. / Day and 10.0 lit/day, respectively. The first postpartum estrus symptom was observed in 66.6 % animals in treatment group and whereas only 26.6% in farmer practice group. Therefore, finding of result suggest that supplementation of mineral mixture and dewormer showed better productive and reproductive performance of crossbred dairy animals.

IMPACT OF PLANT GROWTH REGULATORS ON BER FLOWERING, YIELD AND QUALITY IN ARID REGION

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ABSTRACT

Ber comes to the market mostly in January to March when there is a scarcity of other fruits. So the growers of arid region get handsome cash from these fruits. Ber cultivation can be improved by the application of plant growth regulators. In production of ber PGR's play a significant role by regulating flowering, thinning of flower and improving fruit set and preventing pre-harvest fruit drop. Plants of ber having uniform size, vigour and of bearing stages at 6 years age were selected for the investigation PGR solution was prepared on the day of application of treatment. All the trees were sprayed according to treatments with help of the sprayer. The first spray was done in first week of September 2017, followed by second spray was pea stage of fruit. There is a significant reduction of fruit drop and increase in yield in all treatments compare to the control. Plants treated with NAA@20 ppm, GA₃@20 ppm and BAP@10 ppm found most effective to reducing fruit drop and increasing fruit set, fruit retention and physical parameters of fruit, yield and economics in terms of net return with good quality of fruit among the other treatments. It might be concluded that application of NAA, GA₃ and BAP had a positive influence in obtaining high quality, yield with higher net returns of ber cultivation in arid condition.

Keywords: Plant growth regulators, PGRs, Flowering in ber, Ber cultivation

ASSESSMENT OF KNO₃ AND GA₃ ON EXTENDING HARVESTING PERIOD IN LITCHI (*LITCHI CHINENSIS* L.) UNDER NORTH-WEST CONDITIONS OF BIHAR

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ABSTRACT

The litchi (*Litchi chinensis* Sonn.) is one of the most important subtropical fruit known for its taste, beauty, fragrance and aril quality. North West Bihar region is an important place in India for litchi growing. Short duration of availability of litchi fruits in the market is major challenge for litchi growers in this region. Hence, an On-field assessment trail was conducted by Krishi Vigyan Kendra, Madhopur at different places in West Champaran District of Bihar during two consecutive years *i.e.*, 2020-2021 and 2021-2022 to assess the efficacy of KNO₃ and GA₃ to extend the harvesting period in litchi under North-Western conditions of Bihar. The treatments consisted of two different chemicals *i.e.*, T₁- spray of KNO₃ (0.5%) at 30-35 days after fruit set, T₂- spray of GA₃ (100 ppm) at 35-40 days after fruit set and one control plot was also kept where farmers practice (no use of such type of chemicals) was carried out. Results indicated that maximum days taken for fruit set to maturity in the T₂ (65.81 days) followed by control (61.21 days) whereas, minimum 60.16 days was observed for fruit set to maturity in T₁. The effect of spraying of selected chemicals on litchi yield was found significant. The highest litchi yield (56.65 q/ha) was obtained under T₂ followed by (54.96 q/ha) under T₁ and it was lowest in control (51.16 q/ha). Maximum average benefit cost ratio was achieved under T₂- spray of GA₃ (100 ppm) at 35-40 days after fruit set (3.94) followed by T₁- spray of KNO₃ (0.5%) at 30-35 days after fruit set (3.70) however, minimum was under control (3.61). It can be concluded that harvesting may be delayed by 4-5 days by spraying of GA₃ @ 100 ppm at 35-40 days after fruit set and this would be beneficial for litchi consumers as well as growers. This would sustainably increase the income of the farmers of this district.

TRADITIONAL HERBAL MEDICINE IN WESTERN UTTAR PRADESH: A PHARMACOLOGICAL APPRAISAL

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ABSTRACT

Nature always stands as a golden mark exemplifies the outstanding phenomenon of symbiosis. The biotic and abiotic elements of nature are all interdependent. Herbal Medicine can be defined as the total natural and traditional relationship and the interactions between man and his surrounding plant wealth from times immemorial, due to sheer, necessity, intuition, observation and experimentation. The present study highlights the importance of traditional herbal medicine from different regions of Uttar Pradesh. Detailed survey had been conducted in six districts (Aligarh, Bulandshar, Baghpat, Hapur, Mathura, Meerut, and Muzaffarnagar) of Uttar Pradesh. The information regarding the use of herbal medicine were collected on the basis of frequent interviews with local physicians practicing indigenous system of medicine, villagers, priests and tribal folks. The plants were identified by using standard monographs and flora. Some past researchers also quoted uses of herbal medicine in diseases severe curing like AIDS, cancer, diabetes, depression, fever, PCOS, kidney stone, skin disease and thyroid etc. The present study is focused to provide an effective knowledge on medicinal properties of selected medicinal plants, so that this will be a pave way to cure diseases by herbal medicines without any side effect. Medicinal plants have great importance in providing health care to about 80% of the population in India. Plants have been an important source of precursors and products used in a variety of industries, including those of pharmaceuticals, food, cosmetics and agrochemicals. Gradually the folk medicines led to the rise of traditional system of medicine like Ayurveda in India. In Uttar Pradesh (India), tribal are using herbal medicine for long time.

Keywords: Herbal Medicine, tribals, folk medicinal plants, PCOS.

AGRICULTURE 4.0: INNOVATIVE APPROACHES FOR SUSTAINABLE AGRICULTURE TO COMBAT FUTURE PERSPECTIVE

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ABSTRACT

Agriculture 4.0, the forthcoming agricultural revolution centered on science and technology. Growers will no longer rely on the widespread application of water, fertilisers, and pesticides rather they will utilise technologies like robotics, temperature and moisture sensors, aerial photographs, and GPS technology. They will be able to cultivate crops in expanded regions and utilise pristine resources, such as sunlight and seawater. To combat the food crisis, the world must transform its deserts and oceans into food production facilities. Some general technological trends that have the most potential to disrupt the system are- Produce distinctively using innovative approaches. It includes hydroponics sea water technology that combines solar, desalination, and agriculture to enable the cultivation of vegetables in any place. This method is sustainable, non-reliant on fossil fuels, and landless. Aquaculture-grown algae can serve as an effective and affordable alternative for feedstock and fish meal. On the other hand, KAUST in Saudi Arabia is at the forefront of desert agriculture research. The ability of plants to adapt to harsh environments is contingent upon their connection with microorganisms. KAUST aims to identify microbes associated with plants growing in extreme heat, drought, and salt conditions. TIPA was established in order to develop viable bioplastics. A recyclable package that resembles a fruit or vegetable and decomposes without leaving any hazardous substance behind, similar to how an orange peel decomposes. Another method is to utilize innovative technologies to bring food production to customers, hence enhancing the food chain's efficiency. Vertical farming is one solution for supplying high-quality vegetables in a sustainable manner. Genetic engineering is necessary to handle future food demands. CRISPR can produce plants with important vitamins, minerals, and nutrients. 3D printing could transform "mush" into edible food through the use of hydrocolloids. Drone technology is transforming agriculture into a high-tech industry.

Keyword: Agriculture 4.0, GPS technology, sustainable, TIPA, CRISPR, 3D printing

CORRELATION AND PATH ANALYSIS FOR YIELD AND ITS RELATED TRAITS IN MAIZE (*Zea Mays* L.) Inbred lines

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Purpose

Maize (*Zea mays* L.) is one of the staple food crops of the globe and having importance due to its diversified use as food, feed and in various industrial applications. Yield is a complex character, which is influenced by a number of inter related traits. The nature of association between yield and its components helps in simultaneous selection for many characters associated with yield improvement. However, correlation analysis itself does not provide a true knowledge of the amount of contribution made by each of the yield attributes. Path analysis, a statistical technique that partitions correlations into direct and indirect effects, differentiates between correlation and causation.

Methods

The experiment consisting of 50 inbred lines was laid out in randomized block design at CADA experimental block, Bheemarayanagudi. The experiment was conducted with three replications. Observations were recorded on various yield parameters. Correlation and Path analysis was done for the recorded data on various yield and yield related traits.

Results

The important yield attributing traits *viz.*, shelling percentage, number of grains per row and plant height showed positive association with grain yield per plant both at phenotypic and genotypic levels. Number of grains per cob and shelling percentage has recorded highest positive direct effect on grain yield at phenotypic level. At genotypic level, the characters *viz.*, days to 50% anthesis, number of grains per cob, shelling percentage exhibited high direct positive effect on grain yield at genotypic level.

Conclusions

The selection for high shelling percentage and grains per row will inturn leads to improve the grain yield per plant as these characters had positive association with grain yield per plant.

Keywords: Inbred line, Correlation, Direct effect, Path analysis

GENETIC VARIABILITY AND ASSOCIATION STUDIES IN F₂ GENERATION OF THE CROSS GKVK6×KCG2 OF GROUNDNUT (*Arachis hypogaea* L.) FOR YIELD AND WATER USE EFFICIENCY RELATED TRAITS

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Purpose

Groundnut (*Arachis hypogaea* L.) is one of the important edible oilseed crops of the world which is native to Brazil in South America and presently cultivated throughout tropical, subtropical and warm temperate regions of the world. Kernels are rich source of edible oil (44-55%), dietary protein (25-33%), carbohydrate (20%), B-complex vitamins, especially thiamine and nicotinic acid but deficient in fat soluble vitamins A and D and almost lacking vitamin C. It also contains a higher proportion of unsaturated fatty acids including essential fatty acids like linolenic acid and linoleic acids. Thus, the crop has great future as oilseed as well as food crop. Haulm is an excellent fodder and oilcake is used for animal feed. Variability and association study is required to know the variability existing for different traits in the segregation generation and for further selection.

Methods

The F₂ generation of the cross GKVK6×KCG2 and their parents were planted in 20 m² plots with a spacing of 40 cm × 30 cm. Observations were recorded on individual plants of F₂ generation for days to first flowering, plant height, primary branches per plant, SCMR, SLA, pods per plant, pod yield per plant, kernel yield per plant, Shelling *per cent* and SMK *per cent*. Variability and Correlation analysis was carried out in F₂ generation using the recorded data.

Results

High GCV, PCV and heritability values were recorded for Plant height, SLA, Pods/plant, Pod yield/plant, kernel yield/plant and SMK. High significant positive correlation was seen for pods/plant, kernel yield/plant followed by Plant height with Pod yield/plant. Negative association was observed for SLA and shelling percentage with Pod yield/plant.

Conclusions

Sufficient amount of variability exists for yield and WUE related traits in the F₂ generation of the cross GKVK6×KCG2 and further selection will be effective.

Keywords: Variability, Heritability, Correlation, Water Use Efficiency

ASSESSMENT OF SOIL PHYSICAL AND CHEMICAL PROPERTIES OF MALPURA BLOCK OF THE TONK DISTRICT RAJASTHAN INDIA

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ABSTRACT

The study consisted of soil survey of the area followed by soil sample collection. The samples collected were analysed in the Soil Science Laboratory of the Rajiv Gandhi South Campus, Barkachha, Banaras Hindu University. Malpura is a Block in Tonk district Rajasthan. 60 representative surface soil samples collected from the Different Villages Different farmer's field in October 2021. The sample were collected from different places in village and composite sample was prepared. The soil sample were carefully Mixed, and finally 500gm soil sample was collected. Surface soil samples were collected to a depth of 0-15cm and was labelled with its particular geolocation for site specific Physicochemical information. Collected soil samples were analyzed for Bulk Density, Partical Density, Porosity, Water Holding Capacity, pH, EC, Organic Carbon (OC), nitrogen, phosphorus, potassium, Calcium, magnesium, sulphur, analysis showed the BD ranged from 1.12 to 1.46 with mean of 1.36 Mg/m³. PD ranged from 2.17 to 2.92 with mean of 2.63 Mg/m³. WHC and porosity range and respective from 26.69 to 44.92 and 38.72 to 53.57 %. PH and EC (dS m⁻¹) ranged from 6.20-8.60 and 0.11-1.66. OC ranged from 0.08-1.11% and available nitrogen, phosphorus, potassium and sulphur, were ranged from 62.72-551.94, 10.10-39.60, 246.40-397.60, 0.90-19.70 kg ha⁻¹, Calcium, magnesium, 1.10-25.50, 1.80-39.40 (Meq/100g).

Keywords: Soil physical, Soil chemical properties, Rajasthan

ORGANIC FOOD PRODUCTION AND ITS ROLE IN MELIORATING HEALTH

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ABSTRACT

Food quality and safety are the two important factors that have gained ever-increasing attention among general consumers. Conventionally grown foods have immense adverse health effects due to the presence of higher pesticide residue, more nitrate, heavy metals, hormones etc. In the quest for safer food, the demand for organically grown foods has increased during the last decades due to their probable health benefits and food safety concerns. Organic food consumption reduces the risk of allergic disease and of overweight and obesity. Organic food production is defined as cultivation without the application of chemical fertilizers and synthetic pesticides or genetically modified organisms, growth hormones, and antibiotics. The popularity of organically grown foods is increasing day by day owing to their nutritional and health benefits. Organic farming also protects the environment and has a greater socio-economic impact on a nation. India is a country that is bestowed with indigenous skills and potentiality for growth in organic agriculture. Although India was far behind in the adoption of organic farming due to several reasons, presently it has achieved rapid growth in organic agriculture and now becomes one of the largest organic producers in the world. Therefore, organic farming has a great impact on the health of a nation like India by ensuring sustainable development. Besides this, agroforestry is a sector which can contribute towards food as well as nutritional security at a large level by implementation of organic farming.

Keywords: Agroforestry, Organic farming, Sustainable development.

INFLUENCE OF BUNCH FEEDING AND SPRAYING ON SHELF LIFE AND PULP CHARACTERISTICS OF TISSUE CULTURE BANANA CV. NEY POOVAN (AB) UNDER HILL ZONE OF KARNATAKA

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ABSTRACT

A field experiment was conducted during 2018-19 at College of Horticulture, Mudigere. The objective of the study was to know the effect of bunch feeding and bunch spraying on quality attributes of tissue culture banana cv. Ney Poovan. The banana bunch stalk was fed with different nutrients like urea, sulphate of potash, banana special and organics like panchagavya and amritpani. The bunch spraying was practiced three times at one-month interval from shooting to harvest with 2,4-D (30 ppm) and compared with control (without bunch feeding and bunch spraying). The results revealed that treatment T₅ ((Bunch spray with 2, 4-D 30 ppm + T₂ -Bunch feeding with Urea 7.5 g + SOP 7.5 g) recorded the lowest physiological loss in weight (12.70 %) and maximum days taken to ripening under ambient condition (green life) and shelf life (5.90 days, 7.52 days respectively) where, as minimum (4.07 days and 5.83 days respectively) days taken to ripening under ambient condition (green life) and shelf life highest physiological loss in weight (16.81 %) was recorded in control (T₁). More pulp weight, peel weight and highest pulp to peel ratio (73.80 g, 11.00 g and 6.78 respectively) was found in T₅ (Bunch spray with 2, 4-D 30 ppm + T₂ -Bunch feeding with Urea 7.5 g + SOP 7.5 g) compare to bunches without bunch spraying and bunch feeding i.e. T₁ (Control) (48.07 g, 8.41 g and 5.73 respectively).

Keywords: Banana, Ney poovan, Bunch feeding, Bunch Spraying

EFFECT OF PRUNING INTENSITY ON GROWTH AND YIELD OF ACID LIME (*Citrus aurantifolia*) AT DEHRADUN VALLEY OF UTTARAKHAND

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ABSTRACT

A field experiment was conducted at Horticulture Research Block, Department of Horticulture, Shri Guru Ram Rai University, Dehradun, Uttarakhand to investigate the “effect of pruning intensity on growth and yield of acid lime (*Citrus aurantifolia*)”. The experiment was laid out in randomized block design with three replications and five treatments. The treatments comprised of Control i.e. No Pruning, (0% pruning intensity), 1/4 heading back and thinning out (30% pruning intensity), 1/2 heading back and thinning out (50% pruning intensity), 3/4 heading back and thinning out (70% pruning intensity) and No heading back only thinning out, (100% pruning intensity). Observations on various growth and yield attributes were recorded. Studies on vegetative and yield attributes were recorded using standard method of measurements. The result revealed that treatment T₄ (70% pruning intensity) found to be the most effective and beneficial for vegetative characters viz, plant height (cm), Number of leaves, Length of leaves (cm), Width of leaves (cm), Stalk length (cm), stem girth (cm) and yield attributes. From economic point of view treatment T₄ (70% pruning intensity) found to be profitable as compared to rest of treatments.

Keywords: Acid lime, heading back, plant height, yield attributes, pruning intensity

STUDY ON FLORISTIC DIVERSITY OF KUNIHAR FOREST BLOCK IN KUNIHAR FOREST RANGE OF KUNIHAR FOREST DIVISION

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ABSTRACT

The present investigations entitled “Study on Floristic Diversity of Kunihar Forest Block in Kunihar Forest Range of Kunihar Forest Division” were carried out to study floristic composition, phytosociology and spatial distribution of tree species, shrubs and herbs at two selected sites within the block. Both the sites were divided into well-defined quadrates: 10m*10m for trees, 5m*5m for shrubs and 1m*1m for grasses and herbs and both the sites were correspondingly analyzed for its floristic diversity and species distribution pattern. The data showed the presence of 10 tree species, 5 shrub species and 3 grass and herb species. Maximum dominance in case of tree species was shown by *Pinus roxburghii* in both the selected areas. IVI of *Pinus roxburghii* was the highest i.e., 134.41. Dominant shrub species was *Carissa spinarum* with IVI 94.07. Among grasses and herbs, *Chrysopogon fulvus* was dominant species with IVI 145.24. Majority of tree species showed contiguous distribution. Most shrub species were distributed randomly. All the grasses and herbs showed contiguous distribution.

Keywords: Floristic Diversity, composition, phytosociology

CAMEL MILK MARKETING

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ABSTRACT

Camels played a major role in the livelihood of pastoralists by supplying milk which is a by-product of camel breeding. The average daily yield of a lactating camel is 2.5 – 6 kg/day. A study was done in two zones of Rajasthan with the objective of examining the scope and constraints of camel milk marketing and associated development potential for the future. According to the study main constraints for camel milk marketability is lack of road and transportation facilities. There is absence of proper cooling facilities, lack of milk preserving centers. Majority of research showed that there is no well-developed and organized camel milk in the region. The majority of the marketing channel is direct in which milk producer directly sell their produce to the customer. There are only few market drivers who are involved in the camel milk production and marketing. The price of the camel milk varies mainly based on season, milk demand and supply around the study area. As fresh milk could not be kept for long hours, it has shelf life of 4-5 hours. It needs proper processing for increasing the shelf life-curd formation also required 10-12 hours. Distancing from the potential customer is another factor that determines the price within the study area. The other challenges are absence of organized market chain and absence of training and initiation for commercialization. However, there is good potential of camel milk in urban areas as there is popularity of camel milk due to its easy-to-digest property among lactose-intolerant consumers. In addition, camel milk is beneficial to diabetic suffering patients. It is expected to have a positive impact on the industry. Therefore, by solving the problems related to the camel marketing, storing and production, there is a wide scope of camel milk.

EVALUATION OF HYBRID VIGOUR TO DETERMINE YIELD AND YIELD ATTRIBUTING PARAMETERS IN OKRA (*Abelmoschus esculentus* L. Moench)

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ABSTRACT

Okra (*Abelmoschus esculentus* (L.) Moench) generally known as “Lady’s finger”, ‘Gumbo’ or ‘Bhindi’ belonging to the family Malvaceae is among the most important vegetable crops grown extensively throughout the country. Considering the importance and potential of the species there is a prime need for the improvement and development of new and hybrids varieties suitable for specific agro-climatic zones. In this context, heterosis breeding plays a vital role to improve the yield and yield attributing parameters of okra. Therefore, the experiment was laid out in a completely randomised design at School of Agriculture, Lovely Professional University, Phagwara. A total of 15 germplasm with 5 testers were sown at a spacing of 60 x 30 m during the first fortnight of March and the different parameters relating to the yield and yield attributing parameters viz. number of flowers, nodes per plant, number of pods per plant, length of pod, pod yield per plant etc would be assessed to evaluate the hybrid vigour. Further, various biochemical parameters such as ascorbic acid content, acidity, firmness, iodine content, mucilage content etc would be worked out to determine the quality parameters of the hybrid vigour. Hence, the present study would be helpful for the improvement and development of new and hybrid varieties for the different agro-climatic zones of India and will further help in improving the socio-economic status of okra growers.

Keywords: - Hybrid vigour, Yield, Germplasm, Tester, Okra etc.

EFFECT OF PLANT GROWTH REGULATORS (GA₃ AND NAA) ON THE GROWTH AND YIELD ATTRIBUTES OF TOMATO (*Lycopersicon esculentum* Mill.) AT LOW HILLS OF UTTARAKHAND

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ABSTRACT

Present experimental trial was conducted during the year 2018-19 at Horticulture Research block, Department of Horticulture, School of Agriculture Sciences, Shri Guru Ram Rai University, Dehradun, Uttarakhand, India to investigate the effect of GA₃ and NAA treatment on growth and yield attributes of Tomato. The experiment was laid out in randomized block design with three replications and twelve treatments. The treatments comprised following levels of GA₃ concentrations viz. 0ppm, 50ppm, 100ppm, 150ppm and NAA @ 0ppm, 25ppm, 50ppm. Healthy and uniform 25 days old seedlings were uprooted separately from the seed bed and were transplanted in the experimental plots in 05 April, 2019 maintaining a spacing of 60 cm x 60 cm between the rows and plants, respectively. Observations on various growth parameters, yield attributes and yield were recorded. Studies on vegetative and yield attributes were recorded using standard method of measurements. The result revealed that due to the interaction effect of different NAA and GA₃ the longest plant height at 60 DAT (106.00), maximum number of leaves plant⁻¹ at 60 DAT (87.66), maximum size of stem diameter (2.75 cm), were recorded from the treatment of 50 ppm NAA + 150ppm GA₃ that is N₂G₃ treatment. The maximum number of branches plant⁻¹ (10.00), maximum fresh weight of fruit (115.00 g), highest yield plot⁻¹ at 60 DAT (30.29 kg), highest yield plant⁻¹ (2.52 kg), highest yield (84.13 t ha⁻¹) was recorded from the treatment of 50 ppm NAA + 100 ppm GA₃ that is N₂G₂ treatment.

Keywords: NAA, plant height, number of branches, seedling, yield,

EFFECT OF BOTANICALS ON FALL ARMY WORM ON MAIZE IN DEHRADUN

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Being one of the major contributors to the economic growth of the country and being the third major crop with a yield of 29 million ton harvested with an average yield of 3.1 ton per hectare. Maize has been aptly coined as Queen of Cereals, but Fall Army Worm scientifically known as *Spodoptera frugiperda* has a major impact on the productivity in larger part of the world. We as entomologists have a responsibility to protect our Queen without disturbing our mother nature. We have tested the effects of some plant extracts such as Garlic, Green Chilli, Black pepper, Eucalyptus oil and cocoa against Fall Armyworm. After testing a majority of combination we observed that the mixture of Garlic, Green Chilli, Black pepper had provided significant result on the Fall. Other combination consisting of eucalyptus oil and castor oil also proved to be significantly affective against the Fall Army Worm followed by mixture of Garlic, Green Chilli and black pepper.

Keywords – Fall Armyworm, Botanicals, Garlic, Green Chilli, Black Pepper, Eucalyptus Oil

INDIAN TRADITIONAL METHODS OF WATER STORAGE AND PURIFICATION FOR A HEALTHY LIFE

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As we all know that water is an essential part of all living beings. There are many struggles for water in human history. Only those that properly harnessed water thrived while the others who failed became a victim of their misstep. Water scarcity is prevalent in many parts of India, we believe that no one in this world should fight over a bottle of water. Since there are not any alternate sources of water, in the absence of sufficient rainfall, their livelihood becomes questionable. Statistics says that today within the urban areas of India 7 in 10 people can forecast having running water in their homes. We believe that through our paper we'd be able to let the Indian people about their traditional methods of water storage and conservation. The adoption of conservation measures marks the enlistment of the community and enhances livelihood for a more robust future. In India, many policies developed for water resources management are either directly or indirectly enthusiastic about the quality of knowledge developed within the traditional age that has taught us the price of an easy life. The quality water wisdom ensured adequate availability of water for all. The requirement to search out and comprehend our ancient knowledge to use it in our modern society is the requirement of the hour to evade water stress conditions.

Keywords: water scarcity, alternate sources, livelihood, conservation measures

INSECT PROTEIN: AN UNTAPPED POTENTIAL IN INDIA

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ABSTRACT

The world population has reached 7.9 Billion as of August, 2021 and it is expected to cross 10 Billion by 2050. India is the second most populated country in the world and its population is set to reach 1.7 billion by 2050. Insects are abundant in protein source that may help in meeting food security. The main reason of consumption is the high nutritive value and healthy food source with low fat as obesity has become the havoc among Indians. Worldwide 1,900 edible insect species are consumed. Nearly 250 species in Africa, 549 species in Mexico, 177 species in China, 170 species in Myanmar, Thailand and Vietnam, 428 species in Amazon region while in India 255 insect species are edible. Around 255 species of insects are taken as food by different tribes of India. Insects being greatest in number and having ample biomass as compared to other food sources both for human beings and animals, can be adequately exploited for the betterment of mankind. Recent progress in research and development shows edible insects to be a promising alternative for the conventional production of meat, either for direct human consumption or its value-added products. Nevertheless, a tremendous amount of work still needs to be done by a wide range of Indian stakeholders in depth to fully realize the potential that insects offer for food and feed security.

Keywords: Entomophagy, Alternative Protein, Food security

EFFECT OF HIGH YIELDING VARIETIES ON MUSTARD CULTIVATION IN ARAJILINE BLOCK OF VARANASI DISTRICT OF UTTAR PRADESH

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India is the fourth largest oilseed economy in the world. Rapeseed mustard (*Brassica juncea* L.) is the third important oilseed crop in the world after soybean (*Glycine max*) and palm oil (*Elaeis guineensis* Jacq.). The mustard growing areas in India are experiencing the vast diversity in the agroclimatic conditions and different species of rapeseed mustard are grown in some or other part of the country. Mustard is cultivated mostly under temperate climate. The present study is confined to study the cost of cultivation of mustard on farms (marginal, small and large) in Sewapuri Block of Varanasi district of Uttar Pradesh. The study is based on the 30 farms (15 farms from each category) which were selected from three villages of the selected block. The data regarding socioeconomic profile and cost of cultivation were collected from the household. The simple average and percentage were used to get the results of the study. The average holding size were found 0.56 ha. and 1.5 ha. and 2.5 on marginal and small farms and large farms. The cost of cultivation of marginal, small and large farms on different landholding were found out Rs. 18,319.47 (cost A), Rs. 50,484 (cost B) and Rs. 65,977 (cost C). The yield, gross income, farm business income, net income and input-output ratio were found out on an average 16.76 quintal per hectare, Rs. 11,5966.66, Rs. 11,7860, Rs. 113973 per hectare the study showed that as the size of farm is increasing the cost of cultivation is increasing which means large and small farms as compare to marginal farms were using more resources which caused to increased their yield and net income. On the basis of observations this recommendation can be made development of High Yielding varieties with early maturity may be grown under better management condition as pure crop. And, timely and proper inter culture and other management operations be under taken to obtain better results.

ECONOMIC ANALYSIS AND CROP EQUIVALENT OF SUGARCANE (SACCHARUM OFFICINARUM) BASED INTERCROPPING SYSTEM IN WESTERN PLAIN ZONE OF UTTAR PRADESH

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ABSTRACT

An experiment was conducted during rabi 2017-18 at farmers field and crop cafeteria, K.V.K., Moradabad under Sardar Vallabhbhai Patel University of Agriculture & Tech., Meerut (Uttar Pradesh) to study the economic analysis and crop equivalent yield of sugarcane (*Saccharum officinarum*) based intercropping system in western plain zone of Uttar Pradesh. The experiment was laid out in randomized block design with three treatments of cropping system and three replications. i.e. (sole Sugar cane, sole Mustard, sole Garlic, S.cane + Mustard, S. cane + Garlic), were replicated. The application of fertilizer in sugar cane is 180:80:60 kg NPK/ha., in sole crop of Mustard is applied 120:60:40;30 kg NPKs/ha. And sole crop of Garlic, applied 100:60:4:25 kg NPKS /ha., and half dose of NPK&S applied in both intercrop of Mustard and Garlic. The soil of experimental field was sandy loam, slightly alkaline in nature with 8.09 pH and 0.22 EC. The soil is a low in organic carbon and available nitrogen (260kg/ha.), medium in available phosphorous (17.55 kg/ha) and potash (173 kg/ha.), low in zinc and sulphur. The sets planted in 20 Oct., 2015 with row to row spacing 90 cm, the row ratio of 2:1 was maintained in S.cane intercrop plots. Seed of Mustard (C.V. Ashirward) was used @ 4.0 kg/ha., the crop was sown with the help of Desi plough in between of two row of S.cane with one row of Mustard. Seed of Garlic (C.V. G-282) was used @ of 6.0 q/ha. Clove of garlic. The crop was sown with the help of manual labours in between of two rows of s.cane and six rows of garlic. Results revealed that maximum S.cane equivalent yield (748.50 q/ha.) was obtained in S.cane + garlic followed by S.cane + Mustard. The highest net income was obtained in S.cane + Garlic (Rs.3,18,258.00), Whereas lowest in sole crop of Mustard (Rs. 32,300.00). Among the second highest net return was obtained from the sole crop of Garlic (Rs.2,20,175.00). The highest B:C ratio (benefit cost ratio) was found in S.cane + Garlic (1:1.65) followed by S.cane + Mustard (1:1.27). The lowest B:C ratio was observed in S.cane sole crop (1:1.0). The land equivalent ratio (LER) was highest in S.cane + Mustard and lowest in control plots. Crop equivalent yield (CEY), land equivalent ratio (LER), benefit cost ratio (B:C ratio) was calculated by following formula

Keywords: Crop, Crop Equivalent Yield, Intercropping, Sugarcane.

EFFECT OF ORGANIC, INORGANIC AND BIOFERTILISER ON THE PERFORMANCE OF BASMATI RICE(*ORYZA SATIVA*)IN WESTERN U.P.

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ABSTRACT

Rice is the one of the important staple cereal foods in Human nutrition and a major food grain for about 75% of the world's population. Rice is one of the major crops cultivated in India, other parts of the Asia and rest part of the world. Organic, inorganic and bio fertilizer are the main plant nutrient sources for replenishing agricultural soils. Management by integrating organic sources of nutrient along with inorganic fertilizer may play an important role in improving and sustaining rice productivity moreover, Chemical fertilizer will play a major role as these contribute about 50 % to the increase in food grain production for ever increasing population of our country. The main aim of INM is to minimize the use Chemical fertilizers, maximizing profitability and reducing environmental pollution so it helps in maintaining soil fertility by fulfilling the plant nutrient requirement. The application of organic manure, biofertilizer inoculation along with RDF is significantly improved the N, P, K and S uptake by Rice over control. INM is also useful to enhance soil organic carbon and productivity. The 50 % organic fertilizer and 50 % Chemical fertilizer (CF) led to increase NPK availability and rice yield over the 100% CF treatment, reducing CF usage and leading for sustainable agriculture. This review provides a sustainable nutrient management strategy to improve crop yield with high nutrient use efficiency.

Keywords: INM, Chemical fertilizer, Bio fertilizer

EFFECTIVENESS OF PLANT EXTRACT AGAINST TERMITES CONTROL IN DOON VALLEY OF UTTARAKHAND.

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ABSTRACT

Termite is one of the most destructive insect pests in Doon Valley of Uttarakhand. They cause severe damage to many crops of economic importance, thus adoption of more ecofriendly pest management strategies become crucial in this regard. The effective use of biopesticides specially botanicals are not well investigated for their efficacy against termite under climate condition of Dehradun. We tested different combination of botanical against termite in field as well as laboratory condition at SGRR University Dehradun. Extract of cactus gave significant control of termite when compared with other treatment neem seed kernel extract also showed good control followed by Castor oil plant *Ricinus communis* L. Rest of the treatment were not effective and at par with control.

Keywords: Termite, Botanicals, Cactus, Neem Seed Kernal Extract

ANALYSIS OF TECHNICAL EFFICIENCY OF RICE PRODUCTION IN JHAPA DISTRICT OF NEPAL: A STOCHASTIC FRONTIER APPROACH

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ABSTRACT

Rice is the major staple crop in Nepal having a remarkable contribution to agriculture GDP which improves the income and livelihood of many farmers. Despite the high potentiality of rice production, there is low productivity and exist significant yield gap. This study aimed to estimate the technical efficiency and also identify the factors affecting it to explain the possibilities of increasing the profitability and productivity of rice. For the study, the Jhapa district was purposively selected as it was considered the most potential district in terms of production area and output level in Nepal. A sample of 100 farmers was selected randomly from the area of the government-implemented project PMAMP-Rice super zone in the year 2022. Primary information was obtained using the pre-tested questionnaire survey and key informant’s interview. Besides, secondary sources were various published books, articles, reports, and related literature. Descriptive statistics, stochastic frontier analysis (SFA), and the Tobit model for regression were used for data analysis. The stochastic frontier analysis revealed that with the increase in land by 1 percent, the output of rice increases by 0.37 percent at a 1 percent level of significance. The average technical efficiency of rice production was reported at 76 percent ranging from 47 percent to 92 percent in maximum. The majority of farmers (46 percent) were operating at an efficiency level of 0.8-0.92. The Tobit regression analysis revealed that years of schooling and membership in cooperatives were positive determinants while the use of credit facilities was found negatively related to technical efficiency scores of rice growers. Hence, the present study strongly recommended commercial rice cultivation by the farmers to increase the output level, for which, government and the concerned authorities should come up with more effective programs and services. There is still a substantial scope to increase the technical efficiency with the available technologies providing academic education, increasing the access to cooperatives, and right use of credit services by the farmers.

Keywords: Efficiency, Land, Productivity, Technical, SFA

PROFITABILITY AND ALLOCATIVE EFFICIENCY OF RICE PRODUCTION IN JHAPA DISTRICT OF NEPAL

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ABSTRACT

Rice is the prime cereal crop of Nepal which significantly contributes to food security and livelihood improvement. Rice is grown as a continuation of traditional practice and farmers are unable to use the optimum resources due to inadequate knowledge. This study was done to assess the profitability and resource use efficiency of rice production in the Jhapa district of Nepal to maximize the profit with the efficient use of resources. Jhapa district of Nepal was purposively selected for the study in the year 2022. The study area was selected based on higher production levels and productivity. Primary data was collected from the household survey of 100 rice farmers, randomly selected in the area of government implemented project PMAMP rice super zone using a pre-tested semi structures interview schedule. Secondary information was obtained by reviewing related literature. Descriptive statistics, benefit cost ratio analysis, Cobb-Douglas production function, and MVP-MFC analysis for the calculation of allocative

efficiency were done. The benefit-cost ratio analysis results in the gross margin of NPR 29031.26 and benefit cost ratio (1.45) indicating the profitable rice production in the study area. Cobb-Douglas production function analysis showed that the cost of labor, seeds, and machinery were significant positive determinants of gross returns of rice farming. The return to scale was only 0.37 exhibiting decreasing return to scale. Similarly, allocative efficiency analysis showed that the resources were not efficiently used and the cost for labor and machinery should be reduced by 240 percent and 172 percent respectively while increasing the seed cost by 58 percent by using more improved varieties in recommended doses. In conclusion, rice production is commercially viable with the ability to maximize profit. The identified inputs should be used rationally and efficiently to enhance the productivity and profitability of Rice farming.

Keywords: Rice, Cobb-Douglas, Labour, Machinery

INFLUENCE OF GROWTH ATTRIBUTES OF RICE BY ESTABLISHMENT METHOD, NITROGEN LEVELS, AND VARIETIES

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ABSTRACT

A field experiment was conducted to determine the response nitrogen levels under conservation agriculture and conventional agriculture for improved and hybrid varieties on the growth and yield of rice cultivars in the subtropical humid central terai of Nepal. The experiment was carried out with a three-factor Strip-split design: establishment method as a horizontal factor, varieties as a vertical factor, and nitrogen levels as a subplot factor in the rainy season. Establishment methods include conservation agriculture (no-tillage with residue and DSR) and conventional tillage (Puddled-TPR), varieties include hybrid Gorakhnath 509 and improved Sabitri and nitrogen levels were 0, 60, 120, and 180 kg N ha⁻¹. The leaf area index was 8.46 to 51.91% higher in conservation agriculture than in conventional agriculture. Conservation agriculture was a significantly higher total dry matter and tillers per meter square meter as compared to conventional agriculture. The numbers of grains per panicle and effective tillers per square meter were 12.13% and 29.7% higher in conservation agriculture. Plant height, leaf area dry weight, and nutrient uptake were not influenced by varieties. Nitrogen levels significantly influenced the leaf area index, total dry matter, and tillers per square meter in the experiment which were observed highest in 180 and 120 kg N ha⁻¹ as compared to nitrogen omitted plots. The grain yield at 180 kg N ha⁻¹ (4980 kg ha⁻¹) was similar to 120 kg N ha⁻¹. The grain yield of conservation agriculture (4766 kg ha⁻¹) was 25.87% higher than conventional agriculture (4106 kg ha⁻¹). Varieties singly do not affect growth attributes but the interaction of varieties, establishment method, and nitrogen level influence the yield and growth attribute in rice. Thus, for optimum growth and yield of rice conservation agriculture with 120 kg N ha⁻¹ is best for both hybrid and improved varieties.

Keywords: Leaf area index, conservation agriculture, conventional agriculture, dry weight

EFFECT OF INTERCROPPING ON WEED DYNAMICS AND SYSTEM YIELD OF SPRING MAIZE UNDER DIFFERENT PLANTING PATTERNS IN CENTRAL HILLS OF NEPAL

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ABSTRACT

A field experiment was conducted in sub temperate region to determine the effect of intercropping and planting geometry on weed dynamics and equivalent yield of spring maize at Palung, Makawanpur. The treatments were normal maize, sole carrot, sole radish, sole potato, normal maize plus carrot, normal maize plus potato, normal maize plus radish, paired maize only, paired maize plus carrot, paired maize plus potato, and paired maize plus radish laid out in RCBD with three replications. From the experiment, with the imposition of various intercropping practices, the total density and total dry weight of weeds decreased relatively. Weed dry weight and density were higher in normally spaced maize which was similar to paired maize as compared to intercropping. Similarly, maize yield did not vary significantly under different intercropping however maize equivalent yield was found significantly influenced. Significantly higher maize equivalent yield was observed for normal planting of maize (18.49) which is statistically at par with sole carrot (18.01). A significantly higher net return and benefit cost ratio was observed for normal maize with potato (248.48) which is statistically similar to normal maize with radish, paired maize with carrot, and paired maize with radish. Thus, for high equivalent yield normal and paired row maize is effective in reducing the weed problem and maize intercropped with potato is productive and profitable.

Keywords: Intercropping, Replication, Maize equivalent yield, weed density

MORPHOLOGY AND PATHOGENICITY OF *SCLEROTIUM ROLFSII* SACC ON LENTIL IN NEPAL

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ABSTRACT

Lentil is one of the most important pulse crops in Nepal. In recent years, the incidence of collar rots in lentil caused by *Sclerotium rolfsii* Sacc. had been increased rapidly. *S. rolfsii* is severe in leguminous and solanaceous crops causing 60% loss in farmer's fields but there is a lack of information about the diversity and pathogenicity of the pathogen in lentil. This disease occurs widely in the Terai as well as in the hill areas. *S. rolfsii* were isolated from the diseased root of lentil collected from seven different locations viz. Bara, Banke, Bardiya, Dang, Chitwan, Lalitpur, and Parsa and eight different crop species viz. rice, chilli, soybean, mustard, lentil, rajma, chickpea, and onion Morphological characters such as mycelial growth rate, number of sclerotia formed size of sclerotia, and number of days required to form sclerotia were studied. Pathogenicity of the isolates was done on Lentil variety “Simrik” in artificially inoculated soils in a screen house. Morphological characters of the *S. rolfsii* varied among the isolates. The fungus isolated from different locations and crops showed wilting and collar rot symptoms on lentil seedlings. *S. rolfsii* isolated from different locations were mostly virulent towards the crop. However, Parsa isolate had only 30% of mortality on lentil. While 90% mortality was recorded by Bardiya isolate. Similarly, the virulence of *S. rolfsii* isolated from different crops was significantly different from each other. The mustard isolate was the most virulent with 100% mortality in lentil. As compared to other isolates, the onion isolate had low mortality percentage (55.64%). The results of the present study indicate that management interventions are urgent and the strategies should incorporate a wise selection of non-host crops for crop rotation.

Keywords: Crop rotation, germination percentage, leguminous crops, non-host crop, post-emergence mortality

MILK SOMATIC CELL COUNT: AN INDICATOR OF INTRA-MAMMARY INFECTION IN DAIRY ANIMALS

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ABSTRACT

Mastitis, the result of intra-mammary infections exhibits serious economic problem in the dairy sector due to the loss in milk yield and quality. Clinical and sub-clinical occurrences are common where sub-clinical cases are asymptomatic and need additional diagnostic tools for identification. Somatic cell counts (SCC) in raw milk are an indicator for intramammary (IMI) infections and are thus helpful in sub-clinical mastitis forecasting. Somatic cells of 100,000 cells per ml are regarded as normal for uninfected milk and elevation above 200,000 cells per ml suspects IMI in cattle. The SCC can be estimated with a direct microscopic method or by flow cytometry. Different factors like stress, milking systems, milking frequency, parity, stages of lactation and shed management practices are significantly associated with SCC in milk. The major concerns of higher SCC are due to the hazardous effect on milk yield, milk quality, product processing, and pathogens that may have zoonotic importance. Good hygienic practices in the shed and supplementations in rations can lower SCC and reduction of IMI. The regular monitoring of SCC is the pathway for early prediction of sub-clinical cases and assessing udder health management techniques for beneficent dairy businesses.

Keywords: Dairy, Intra-mammary Infections, Mastitis, Somatic Cell Counts.

ANALYSES OF NUTRITIONAL, TECHNOLOGICAL, AND SENSORY QUALITY OF FISH - FILLET MUSCLE: A REVIEW

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ABSTRACT

Aquaculture has been the fastest growing food sector and product quality has become an issue of great concern. Fish is one of the most vulnerable and perishable aquatic products, encompassing a combination of characteristics such as wholesomeness, freshness, and integrity. The evaluation of fillet freshness, reflected by the appearance, taste, and texture of muscle, is therefore very significant for providing premium and high-quality products and for better consumer acceptance, as well as for international trade. Among the different components of flesh quality, the nutritional constituents (12.2–24 % protein, 0.08–13.1 % fat, 69.89–86.7% moisture, 0.5-2 % minerals, and 0.1-1 % carbohydrate), technological issues (pH 6.63 ± 0.04 - 6.31 ± 0.04 in 20 min. to 2 hrs. postmortem and Water holding capacity) and sensory dimensions are considered. Therefore, this review paper aims to present sensory evaluation and instrumental methods for evaluating fish flesh quality. Side by side, exogenous and endogenous factors influencing the flesh appearance, color, firmness, flavor, and nutritional and technological value of fish flesh are discussed. Moreover, the lapses and challenges of fish muscle quality are described and some viewpoints about current work and future trends are also presented.

Keywords: Freshness, sensory evaluation, color, texture, fish flesh

ASSESSMENT OF DIFFERENT WEED MANAGEMENT PRACTICES ON CONTROL OF WEED AND YIELD AND YIELD ATTRIBUTES OF HYBRID MAIZE IN CHITWAN, NEPAL

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ABSTRACT

Maize is cultivated in the terai, mid-hills, and high hills region of Nepal, and different weed management practices are followed to control weeds in the maize crop. Thus we aim to quantify the effect of different weed management practices on the control of weeds and the effect on the growth and yield of the maize crop. So, a field trial was conducted in the farmers' field of Chitwan, Nepal in a randomized completed block design using five treatments which were replicated four times in the summer season of the year 2019. Weed density and weed dry weight were taken at 30, 60, and 90 days after sowing (DAS) of maize, and yield and yield attributes were recorded at the time of maize harvesting. The result revealed that at 30 DAS both weed density and weed dry weight were lower and both weed control efficiency and weed control index were higher in both Tembotrione 42% SC and Atrazine 50% SC. But at 60 DAS and 90 DAS weed density, weed dry weight, weed control efficiency, and weed control index were found higher in two-hand weeding than in other treatments. Days to silking was later in weedy check than other. Ear diameter, kernels per row, thousand kernels weight, and shelling percentage of maize were seen as significantly highest in two-hand weeding and lowest was obtained in weedy check. Significantly highest grain yield was obtained in two-hand weeding which was followed by Tembotrione 42% SC, Atrazine 50% SC and one-hand weeding. So, two-hand weeding and Tembotrione 42% SC could be recommended for weed management for effective weed control and higher yield of maize.

Keywords: Hand weeding, Herbicides, Rampur hybrid-4, Tembotrione, Weed management

ASSESSING CARBON SEQUESTRATION IN AGROFORESTRY SYSTEMS IN CHURIYA RANGE OF NEPAL

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ABSTRACT

Agroforestry is a system that combines household and community-level food production ecosystem services along with income security. It has the potentiality of carbon sequestration and puts a positive impact on balancing the greenhouse gases. To assess the variance in carbon stock under the agro-forestry systems in the Churiya range, the research was carried out at Rakshirang Rural Municipality of Makwanpur district. A total of 30 households were sampled for this study; ten households from each of three different systems namely, Agrisilviculture, Silvopasture, and Homegarden for data collection. Purposive sampling was used for the sample plot selection from the selected agroforestry systems for biomass and soil carbon estimation. Each system consisted of ten sample plots. The diameter and height of all trees with DBH greater than 10 cm were measured. The diameter of the trees was measured at standard height, i.e., diameter at breast height. Above-ground biomass, below-ground biomass, and soil organic carbon were summed to determine the total carbon stock in the systems. Collected data was analyzed through tabular analysis, and volume and biomass estimation of the trees. Total carbon stock was found higher in the Silvopasture system (32.41t/ha) while it was 28.58 t/ha in the Agrisilviculture system and 30.71 in the Homegarden system. Results have shown the potentiality of agroforestry systems in climate change mitigation through carbon sequestration. Such systems need to be promoted for their efforts by encouraging them with some subsidized input support, financial support, or some capacity-building training by the government.

Keywords: carbon stock, agroforestry systems, climate change mitigation

EFFECT OF DIFFERENT METHODS OF PRIMING AND GROWTH REGULATORS ON EMERGENCE AND GROWTH OF HYBRID MAIZE.

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ABSTRACT

Priming and growth regulator is helpful techniques that increase germination, and plant growth and improves crop yield. To evaluate the effect of seed priming and growth regulator on seedling emergence, plant growth, and grain yield of hybrid maize, the experiment was conducted at NMRP, Rampur in October 2019. RML-95 /RML-96 pipeline hybrid was selected for research purpose with six priming treatments and control (unsoaked) were used in this experiment both in field and laboratory conditions. Seeds were soaked for 15 to 16 hours in priming solution and shade dry for 15 to 20 minutes (Znso₄ 10 g/liter of water, Hydro priming, Cacl₂ 20 g/liter of water, Cow urine 10 ml/liter of water, KNO₃ 10 g/liter of water, GA₃ 0.2 g/liter of water and Control (without priming)). Significantly highest germination percentage was recorded in GA₃ followed by cow urine in lab conditions and similarly there observed early emergence of seed in Hydro- priming and GA₃ priming as compared to other treatments in field conditions. There were significant differences observed in days to anthesis, days to silking, plant height, and ear height. Similarly, a significant difference was observed in no.of cobs/ha and grain yield. The highest grain yield was obtained in hydro priming (7636 kg/ha) followed by cow urine (7540 kg/ha) and GA₃ (7191 kg/ha) whereas the lowest grain yield was obtained in control (5998 kg/ha). In the experiment of best priming and growth regulators methods, the highest grain yield (7632 kg/ha) was achieved from hydropriming. Similarly, significantly higher thousand grain weight (368 g), days to 50% anthesis (84 days), and days to 50% silking (85 days) were significantly earlier in hydropriming. In the same way, days to 80 % emergence on the field was also recorded earlier by 4 days in hydropriming and GA₃ than in the control treatment.

Keywords: Cacl₂, GA₃, Growth regulators, Hydro-priming, Priming, Znso₄

ECONOMIC ANALYSIS OF MILK PRODUCTION IN CHITWAN, DISTRICT, NEPAL

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ABSTRACT

The study was conducted to identify the most profitable dairy farm type in the Chitwan district in 2022. Based on a proportional stratified random sampling procedure, a total of 120 sample size was stratified into cow farms (78), buffalo farms (19), and mixed farms (23). Log-lin regression analysis showed that primary occupation, active number of family members, the practice of record keeping, and access to credit significantly increased the average annual income of dairy farmers. Similarly, resource use efficiency using the Cobb-Douglas production function analysis illustrated that animal feed-fodder and labor were over-utilized whereas veterinary medicine and utility costs were underutilized in livestock farming. Moreover, the average cost of production was significantly higher on buffalo farms as compared to cow farms and mixed farms. The cow farm had a significantly higher B:C ratio of 1.51 as compared to the buffalo farm and mixed farm. The scaling technique showed that the high cost of feed and fodder, followed by the low farm gate price of raw milk, inadequate technology, and limited chilling facility were the main challenges faced by dairy farmers in the study area. Value chain

analysis identified seven functionalities viz. input supply, production, marketing, collection, processing, retailing, and consumption in the milk value chain. Producers-Consumers was the most efficient marketing channel in the study area, with the largest producer's share. The study findings, thus demonstrated that dairy farming can be made more profitable by distributing resources as efficiently as possible, bringing down production costs, strengthening the value chain through the diversification of milk products and storage facilities, and lowering the market margin of raw milk to increase dairy farmer's share in milk price.

Keywords: Dairy business, profitability, resource use efficiency, value chain

WEED EFFICIENCIES, YIELD, AND ECONOMICS OF DRY-DIRECT SEEDED RICE AS INFLUENCED BY TILLAGE METHODS AND WEED MANAGEMENT PRACTICES

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ABSTRACT

Weed is the major constraint for the success of Dry Direct Seeded Rice (DDSR). A field experiment was conducted to determine the effect of tillage methods and weed management practices on weed efficiencies, yield, and economics of DDSR at Agriculture and Forestry University, Rampur, Chitwan. The experiment was conducted in a split-plot design with three replications. The treatment consisted of two tillage methods (Zero tillage and conventional tillage) in main plots and eight weed management practices in subplots (weedy check, weed free, pendimethalin followed by hand weeding at 35 DAS, pendimethalin followed by 2,4-D Ethyl Ester, pendimethalin followed by bispyribac-Na, pendimethalin followed by penoxsulam, pendimethalin followed by ethoxysulfuron and pendimethalin followed by tank mixture application of bispyribac-Na and ethoxysulfuron). The rice variety used in the experiment was the Gorakhnath-509 hybrid. The best treatment in controlling weeds in DDSR was pendimethalin followed by hand weeding, pendimethalin followed by tank mixture application of bispyribac-Na and ethoxysulfuron, and pendimethalin followed by bispyribac-Na with the weed control index 73.82, 57.28 and 44.60 respectively and weed index -4.47, 2.55 and 0.80 respectively. There was a reduction in yield by 66.3 percent due to the presence of weed in DDSR as compared to weed free. All the weed management practices significantly improved the grain yield of DDSR in both zero and conventional tillage. The average grain yield of DDSR in the experiment was 3102.12 kg ha⁻¹. Grain yield was not influenced by tillage methods but was higher in conventional tillage (3305.96 kg ha⁻¹). Among the weed management practices pendimethalin followed by hand weeding had the highest grain yield (3742 kg ha⁻¹) which was statistically similar to pendimethalin followed by tank mixture application of bispyribac-Na and ethoxysulfuron (3638.61 kg ha⁻¹) and pendimethalin followed by bispyribac-Na (3552.31 kg ha⁻¹). Benefit cost ratio was not influenced by the tillage method but was higher in the conventional tillage system. Benefit cost ratio for pendimethalin followed by hand weeding was highest (1.45) and statistically similar to the plot treated with pendimethalin followed by bispyribac-Na (1.41) and pendimethalin followed by tank mixture application of bispyribac-Na and ethoxysulfuron (1.37). Pendimethalin followed by hand weeding, Pendimethalin followed by bispyribac-Na, and Pendimethalin followed by tank mixture application of Bispyribac-Na and ethoxysulfuron can be the option for controlling weeds in DDSR at Chitwan condition.

Keywords: DDSR, Weed, Yield, Economics, Efficiency

SOCIO-ECONOMIC ANALYSIS OF FOOD INSECURITY: A CASE OF BAJURA DISTRICT, NEPAL

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ABSTRACT

Food insecurity is the core socio-economic problem of Nepal. In this context, this study assessed the intensity, determinants of prevalent food insecurity problems, and coping strategies adopted by the resource poor households in the lowest developed Bajura district of Nepal. The study district was selected purposively and it was further categorized into two clusters based on lower and upper belt village for headquarter of the Bajura district. A total of 210 household-level cross-sectional data were collected using a personal interview schedule and a simple random sampling technique (105 households from each cluster). The intensity of food insecurity was measured using the headcount ratio, gap index, and severity index. Further, the binary logit model was used to assess the impact of different socio-economic variables on the status of household food insecurity. About 57% of the sampled households were found to be food insecure while the upper belt was relatively more compared to the lower belt. The land holding of the household had a negative and significant effect on the status of household food insecurity at a 5% level whereas adult equivalent, the status of household poverty, and the status of the damage done by drought were positive and had a significant effect on the status of the household food insecurity. Working as wage labor depending on off-farm income, depending on remittance, cutting off food consumption and seasonal migration were the most common coping strategies against food self-insufficiency at the household level in the Bajura district.

Keywords: Food insecurity, binary logit, coping strategies

EFFECT OF SEED PRIMING, MULCHING, AND NITROGEN MANAGEMENT ON PRODUCTIVITY, PROFITABILITY, AND NITROGEN USE EFFICIENCY OF SURFACE SEEDED WHEAT IN CHITWAN, NEPAL

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ABSTRACT

The productivity and profitability of surface seeded wheat have been threatened by poor nitrogen management, poor establishment, and the problem of weeds. Synchronizing the nitrogen application with crop demand, better crop establishment and mulching with rice straw would enhance the growth and yield of surface seeded wheat. We aim to assess, in surface seeded wheat, the effect of seed priming, mulching, and different nitrogen management methods on productivity, profitability, and nitrogen use efficiency. A field experiment was carried out at Rampur, Chitwan from December 2020 to April 2021 in surface seeded spring wheat with Vijay as the test variety. The experiment was laid out in a strip split plot design with two seed priming levels (hydro priming and without priming) as a vertical factor, two levels of mulching (rice straw mulch and without mulch) as a horizontal factor, and four nitrogen management methods (1/2 N at basal, 1/4 N at CRI and 1/4 N at 55 DAS, 1/2 N at 11 DAS, 1/4 N at CRI and 1/4 N at 55 DAS, 30 kg N ha⁻¹ as basal dose and application of 30 kg ha⁻¹ N when SPAD value <37, and control) in sub plots replicated thrice. The study found that though priming didn't significantly influence the productivity and nitrogen use efficiency of wheat, mulching significantly influenced on days to anthesis and maturity along with increased

grain yield by 10.8% over non-mulching. Moreover, significantly higher internal utilization efficiency and nitrogen efficiency ratio was observed in mulching. SPAD-based nitrogen management had a statistically similar grain yield (3943 kg ha⁻¹) with recommended nitrogen scheduling of 1/2 N at basal, 1/4 N at CRI and ¼ N at 55 DAS (4051.3 kg ha⁻¹). Partial factor productivity, agronomic use efficiency, and recovery efficiency influenced by SPAD-guided nitrogen management were significantly superior to all other nitrogen management methods. The interaction effect between nitrogen management and mulching was also significant for grain and total nitrogen uptake. Our findings indicate that hydro priming along with pre-sowing irrigation didn't enhance productivity but rice straw mulching (5 t ha⁻¹) enhanced yield and N use efficiency. Moreover, SPAD-guided nitrogen management can save nitrogen of 35 kg ha⁻¹ without reducing the yield of surface-seeded wheat.

Keywords: nitrogen use efficiency, surface seeded wheat, nitrogen management, mulching, priming, SPAD

BRIDGING THE YIELD GAPS OF MAJOR CEREALS THROUGH AGRONOMIC INTERVENTIONS IN NEPAL

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ABSTRACT

To identify the performance of major crops viz. rice, maize, wheat, and finger millet, their constraints in Nepal and potential agronomical interventions to cope, a brief review of the past works done was carried out. The results indicated that the area of rice, wheat, and finger millet in the recent past was not increased but the maize area was increased due to the adoption of the winter season maize in the irrigated areas of Terai and inner Terai. Rice, wheat, and finger millet yields in all agroecological zones are stagnating, although yield trends for maize increased due to the increased use of hybrids and winter maize in Terai and inner Terai. The lower population density of maize in the farmers' fields is a major factor associated with the yield gap in maize. Low and imbalanced doses of fertilizers, drought problems especially in the flowers and post-anthesis, and a very low rate of seed replacement are some of the responsible factors for yield stagnation and huge yield gap. Besides sub-optimal nutrient management, the poor soil and crop management practices (e.g., use of poor land preparation, poor and untimely crop establishment, insect, disease, and weed management) of farmers also contribute to poor yields. Lack of agriculture mechanization and production technologies that impart greater resilience to production systems. This result underscores the challenge of meeting increasing global agricultural demands. The yield gap can be minimized with assured irrigation and appropriate agronomic practices along with maintaining the seed supply chain of high-yielding and stable genotypes.

Keywords: yield gap, constraints, genotypes, irrigation, agronomic practices

PHENOTYPING OF RICE ACCESSIONS UNDER TIMELY IRRIGATED AND LATE RAINFED CONDITIONS.

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ABSTRACT

The development of drought-tolerant varieties of rice is one of the prime concerns of Nepal in the context of climate change and global warming. Therefore, the present study was conducted to evaluate rice accessions under normal and drought stress conditions to determine their potentiality under normal and stress conditions so that the genotype performing well under both conditions could be included in the further breeding program for the development of high-yielding drought-tolerant rice genotypes. This research was conducted by using 299 rice accessions (288-Entries + 7 Global checks + 4 Local Checks) from the International Rice Research Institute (IRRI) at the College of Natural Resource Management (CNRM), AFU, Khajura, Banke, Nepal. The experimental design used was Augmented Randomized Complete Block Design (Augmented-RCBD) with a 4 m² plot size (20 cm x 20 cm row to row and plant to plant spacing, respectively). The data were recorded for the yield and yield components such as days to flowering, the number of effective tillers, days to maturity, grain yield per plant, grain filling duration, plant height, grain yield, biomass, harvest index, and drought susceptibility index. The occurrence of low rainfall in late rainfed conditions after anthesis, 10 weeks of a dry spell during grain filling duration revealed enough days to render drought stress. The analysis of variance to the treatments under investigation in timely irrigated and late rainfed conditions showed significant ($P < 0.01$) differences among the checks and test genotypes. Various traits under timely irrigated conditions had high variation in developing effective tillers per plant (CV= 8.4) followed by grain weight per plant (CV=6.9), and grain yield (CV=6.6), while under late rainfed conditions, high variation was recorded in grain yield (CV=11.6) followed by effective tillers per plant (CV=11.2) and harvest index (CV=11.1). The drought susceptibility index among the check genotypes ranged from -0.44 to 1.97, while in the case of test genotypes (accessions), it ranged from -2.60 to 2.13. The traits under normal conditions had positive significant correlations; grain yield had a positive significant correlation with harvest index, grain weight per plant, plant height, days to flowering, days to maturity, and biomass. Under drought stress conditions, DSI was negatively correlated with all the studied traits, except days to flowering and days to maturity. Principal component analysis showed that the first three principal components accounted for 62.51 percent variation under timely irrigated conditions, and 75.57 percent variation under drought conditions. The observed variation among the genotypes of rice for various traits in present research revealed that some of the genotypes could be included in a breeding program for the development of high-yielding drought-tolerant genotypes.

Keywords: Rice, Late Rainfed, Drought, Drought susceptibility index, Accessions, Timely Irrigated

PRINCIPAL COMPONENT ANALYSIS IS AN EFFICIENT TOOL FOR HIGHLIGHTING THE RELATIONSHIPS WITH IN YIELD AND YIELD ATTRIBUTES OF GREENGRAM [*VIGNA RADIATA* (L.) WILCZEK]

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ABSTRACT

A total of 39 genotypes of mungbean were taken for analysis in the present study for statistical analysis related quantitative traits. To investigate the principal component analysis (PCA) is an analysis technique used primarily to display patterns in multivariate data among these mungbean genotypes using quantitative traits. The present study was carried out at the BSP Soybean unit, College of Agriculture, JNKVV, Jabalpur, and Madhya Pradesh. The genotypes were sown in six rows of with 30 X 10 cm spacing under RCBD design with three replications. The seed sowing was made in the month of November. The statistical methods and parameters used for deriving inference were to Principal Component Analysis (Massy, 1965 and Jolliffe, 1986). It aims to display the relative positions of data points in fewer dimensions while retaining as much information as possible. PCA assumes that the relationships between dependent variables are linear. Large datasets are more prevalent than ever and are frequently challenging to comprehend. A method for lowering the dimensionality of such datasets, improving interpretability while minimising information loss, is principal component analysis (PCA). It accomplishes this by producing fresh, uncorrelated variables that maximise variance one after the other. As a result, PCA is an adaptive data analysis technique. Finding these new variables, the principal components, simplifies to solving an Eigen value/ Eigen vector issue, and the new variables are specified by the dataset at hand, not a priori. It is also adaptable in the sense that numerous variations of the technique have been created to fit different data formats and types. This essay will begin by outlining the fundamental concepts of PCA and outlining what it can and cannot accomplish. Based on the results of PCA, promising lines Identified are: TJM 124, TJM 134 and Pusa Vishal for yield and resistance. Genotypes TJM 141, TJM 145 and TJM 134 contributed maximum PC scores in different PC components. These identified genotypes should be utilized for crop improvement programme for yield improvement traits.

Keyword: Mungbean, Principal component analysis, PC Score

EVALUATION OF RECOMBINANT INBRED LINES OF BREAD WHEAT (*TRITICUM AESTIVUM* L.) WITH A SYNTHETIC HEXAPLOID DONOR FOR KERNEL TRAITS

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ABSTRACT

Kernel parameters are important grain quality traits in bread wheat, which determine the market price, those are related to the yield and milling quality as well. Utilization of synthetic hexaploid donor to harness the diverse alleles for broadening of the genetic base is a novel breeding strategy of the bread wheat breeding programs across the globe. In this study, we evaluated 188 recombinant inbred lines (RILs) derived from HD2932 (Indian bread wheat cultivar) and Synthetic 46 (Syn46: Synthetic hexaploid donor) to identify the effect of the synthetic hexaploid donor on kernel parameters from which potential advanced breeding lines would be derived for a breeding program. Kernel parameters like kernel length (KL), kernel width (KW), kernel thickness (KT), and thousand kernel weight (TKW) were studied. Syn46 had larger kernels and a high TKW with respect to HD2932. Significant variation for KL, KW, KT, and TKW was observed in the population with transgressive segregants. The experiment was carried out for two seasons; it was observed that KL ranged from 5.13-7.5mm, KW ranged from 2.26-3.9mm, KT ranged from 2.57-3.41mm, and TKW ranged from 25.2-53.17g. Our results indicated that TKW had a significant positive correlation with KL and KT, but there was no correlation between KL and KW. Contrasting RILs were found to be stably inherited for kernel size with different background allelic combinations in both the cropping seasons. Potential RILs identified with desirable allelic combinations may be used for future breeding programs, and RILs with contrasting kernel parameters may be used to create nested RILs for further generation of variability.

EFFECT OF DIFFERENT PACKAGING MATERIALS ON THE STORAGE STUDY OF INSTANT DRINK POWDER

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Purpose

The *instant* drink powder formulation supplemented with banana and drumstick leaves can cater the protein, energy, vitamin and mineral requirement of the undernourished population. Protein quality of protein deficient population can be improved by the addition of whey protein concentrate-80 whereas vitamins and minerals will be supplied by banana and drumstick leaf powder in instant drink formulation.

Methods

The study investigated the effect of different packaging material such as aluminum pouch, HDPE bags, PET bottle and PET + Aluminum pouch on the storage study of instant drink powder. Instant drink powder was prepared by incorporating raw plantain powder, moringa powder, whey protein concentrates and sugar. Freeze drying was used for drying purpose for all powders incorporated.

Result

Some biochemical properties such as sensory evaluation, beta carotene and ascorbic acid were determined in instant drink formulation during storage studies in different packaging material.

Conclusion

The study conducted during storage under ambient conditions concluded that change in parameters like sensory evaluation, beta carotene content and ascorbic acid was affected by both storage time and packaging material.

Keywords: moringa powder, freeze drying, raw plantain powder, physical properties, whey protein concentrate

CLIMATE CHANGE IMPACT ON WATER QUALITY

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ABSTRACT

The Impact of climate change on water quality of water bodies are associated with the climatic extreme events (heavy rainfall and flood, heat, drought, wild fires, cyclones, hurricane, super storms etc). the specific sensitive water quality parameters, appropriate methodologies, risks on ecosystem and managerial practice to reduce the impact are to be considered. This review high light the of effect climate change on surface water bodies based on recent literatures on the impacts of climate change on water quality and promote practical opportunity for better management of these impacts. We conclude that consideration of climate change preparedness plan in catchments is the best option to adopt for minimization of climate change impacts on water quality of water bodies. The water quality parameters like temperature NO_3^- , Cl^- , PO_4 , including presence of pathogens like fecal coli formed bacteria which can change the quality of water both for domestic and agro based use moreover the risk associated with climate change causing adverse effect on water bodies may cause health ailments which are to be considered in this present paper.

Keywords: Climate Change, Water quality, Health ailments, Natural Calamities.

Introductin

Climate change refers to a period piece, Ten years or longer in climate average state and deviation in which both one or two occur significant change together in the sense of the statistics . It main show is a time state variable and happened vary significantly compared with starting time. The effects of climate change is multi-scale, all-round, multi-level, both positive and negative effects. Climate change not only affects the hydrological, biological and ecological system, but also affects the economy, life, so the future climate change effects the sustainable development of regional, national, and even the world are the most important. In addition to climate change the water cycle also changes. Higher temperature and evaporation rates could increase the demand for water in many areas. Due to influencing factors on precipitation falls.

Climate Change and The Water Cycle

Global warming and hydrological cycle are correlated as they are comprehensively related to climate change. The rise in weather temperature concern with precipitation change, melting of ice, and warming of water resources. Hence the major parameters of hydrological cycle are mainly affect

Precipitations

Evaporation

Run off

Groundwater, and

Soil moisture

Physicochemical Properties Of Water

Climate change alters physico-chemical water quality. Climate change directly affects the temperature of water. Indirectly, physical and chemical processes related to temperature in the water column will change. Changes that are expected to occur include; increased rates of (bio-) chemical processes, a decrease in oxygen concentration and changing stratification patterns.

A changing hydrology will indirectly affect the physico- chemical water quality. Heavy precipitation events will increase soil erosion, Which will lead to increased nutrient and pollutant run-off to surface waters. Water systems will become more eutrophic and as a result, water transparency will decrease. Droughts, as well as rising sea level, can lead to the salinization of surface waters. In general, it is expected that climate change will reduce the physico- chemical water quality.

Climate change however, poses a threats to the physico-chemical quality of surface waters. Different parameters of physico-chemical water quality are changing due to climate change which affects bio chemical process such as

Acidification

Salinization

Nutrient/ contaminants concentration,

Oxygen concentration

Light conditionsss.

Water Cycle System

Climate change directly led to precipitation and evaporation and runoff relates to water cycle. Climate change is the most main driver factor of water cycle. The constant change of the human society, human economic activities harder and harder, human activities this disturbance factors gradually strengthened the influence of water cycle in water resources own evolution process. The water cycle system called natural- artificial “binary” water cycle system.

Impact of Climate Change on Water Quality

Climate change aggravates existing surface water quality problems in the world. It can result in significant changes in the variables that affect the quality of water. The water quality of a given surface-water body is a direct reflection of the chemical inputs received from the air and surrounding land scape, and the biogeochemical process that transform those inputs within the water body itself.

Levels of water quality are assessed in terms of : physical characteristics, for example-

Color

Temperature

Taste

Turbidity

Hardness and

Smell or odour

Which are determined by senses of touch, sight, smell, and taste. The chemical characteristics used to assess water quality , include:

Conductivity

Dissolved Salts and Oxygen Demand

While biological characteristics comprise, for example, the amount of microorganisms present such as bacteria, protozoa and algae parameters.

Effects of Climate Change on Human Health

Climate change would make a large contribution to water-borne and vector-borne diseases in the world. The distribution and growth of pathogenic micro-organisms in water will increase and consequently, the number of human infections with these pathogens. In general, health effects can be caused by:

Cyanobacterial blooms,
Botulism,
Pathogenic amoebae, and
Vector borne pathogens.

Conclusion

The availability and quality of water is a key factor for sustainable industry and households, Moreover, population growth and global climate change are critical issues facing this trans-border region. Changes in temperature have predictable impacts on both water quantity and quality. Economic prosperity and social wellbeing are both strongly dependent, either directly or indirectly, on water quality and availability. Both small local villages and large urban centers need to be prepared to overcome the risks posed by the scarcity and contamination of water, though some populations are already experiencing shortages in water distribution and drainage services.

Climate change effects physico-chemical and microbiology water quality. climate change directly affects the temperature of water. For rivers, there are strong correlation between water quality and air temperature. Water temperatures impact on internal lake processes such as

Diffusion

Mineralization, and

Vertical mixing

Increase water temperature will affect ice cover and circulation patterns in lakes and rivers, as well as the rate of biogeochemical and ecological process that determine water quality. Besides climate change impacts on water availability and hydrological risks, the consequence on water quality is just beginning to be studied. The main conclusion which can be drawn is that a degradation trend of drinking water quality in the context of climate change leads to an increase of risk situation related to potential health impacts.

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ROLE OF COMMUNITY FOREST IN SOCIO-ECONOMIC IMPROVEMENT OF LOCAL PEOPLE (A CASE STUDY FROM SATANCHULI CF, CHITWAN)

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ABSTRACT

The ultimate goal of any CF is socio-economic upliftment of rural people. Key goal of community forestry is the long-term conservation of forest resources. To explore the role of Community Forest in for the improvement of Socio-economic condition of users group of Satanchuli Community Forest Chitwan district. Thus, the objectives of the study were to assess the Contribution of Community Forest in Socio-economic Condition (living standard, employment, income generation etc.) of local people. During research, primary data were collected using reconnaissance survey, household survey, direct observation, focus group discussion, wellbeing ranking. Whereas secondary data were collected from books, publications, literature, IOF Library, operational plan, minute, reports, pamphlets and internet. The results were present in tables, bar diagrams and pie-chart. Out of 84 respondents, 42% respondents were presently dependent on agriculture, 46% were keeping hen/duck for own or business purpose. Most of the users belonged to Bhramin/Cheetri community i.e. 38%.18% of the respondents were illiterate. FUG had generated funds, which were used in school construction, road construction, providing scholarship to poor intelligent students and conducting the training for skill development to carry out income generating activities. In this research expenditure of Satanchuli CF allocated 49% in local development, 14% in livelihood improvement, 27% in forest management and 10% in biodiversity conservation activities. CFUGs had conducted trainings, workshop and study tour to build capacity to users. There was positive change in both forest conditions and availability of forest products. Availability of forest product had increased after the implementation of CF programs. Finally, it is recommended that there must be increase in fund investment IGA and training for pro poor. Users should be provided forest product as per their demand and some special provision should be given to poor and DAGs.

Keywords: Community Forest, Role, Socio-economic, Users group, Income, IGAs

AN ASSESSMENT OF VEGETATION AND PREY BASE SPECIES IN THE GRASSLAND OF PARSA NATIONAL PARK, NEPAL

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ABSTRACT

Grassland, an area dominated by grass or grass like vegetation, roughly covers 31 to 43% of the Earth and 14% of the Nepal. This study was conducted in two different grasslands of Parsa National Park i.e. Bhata and Pratappur. The objective of the study was to assess the vegetation composition and prey base composition. Line transect method was used for vegetation survey. For prey base species, direct observation was done by using direct head count method and indirect observation was done by identifying pellets. The Importance Value Index (IVI) and Shannon-Weiner Diversity Index (H) was used to analyze the vegetation diversity and prey

base species diversity. Chi- square test was used to test whether the data are significant or insignificant.

Altogether, 25 and 38 types of grass species were recorded in Bhata and Pratappur. The IVI of *Saccharum sp* (Khar) in Bhata and *Imperata cylindrica* (Siru) in Pratappur was found highest with some invasive species like *Lantana camera* (Banmara), *Azeratum conyzoides* (Boke-jhar), etc. For the vegetation composition, H of Bhata and Pratappur was found to be 1.12 and 1.68. Similarly, for the prey base species, the H of Bhata and Pratappur was found to be 0.16 and 0.14 respectively. It results that vegetation diversity was higher in Pratappur whereas the prey species diversity was higher in Bhata. According to the data of habitat preferences, it was found that the *Axis axis* (Spotted deer) prefer Pratappur more by 8 % from Bhata, *Cervus unicolor* (Samber deer) and *Sus scrofa* (Wild Boar) prefer Bhata more by 4 % from Pratappur. The both vegetation diversity and prey base species diversity between Bhata and Pratappur was found insignificant.

Keywords: - *Composition, Diversity, Grassland, Prey base species, Vegetation*

HUMAN WILDLIFE CONFLICT IN ANNAPURNA CONSERVATION AREA, NEPAL

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ABSTRACT

Human Wildlife conflict is a serious challenge undermining the integrity of protected areas in developing countries. Developing effective human–carnivore conflict mitigation strategies requires an understanding of the spatio-temporal conflict patterns and the species involved. This study therefore aims to examine spatio-temporal variations in livestock loss, severity and magnitude of the problem, and the predators involved in the southwestern section of the Annapurna Conservation Area, Nepal focusing Bhujung sector. Simple random sampling method was adopted and 12.89% (n=127) households were selected for household survey. Descriptive statistics like mean, frequency, percentage and Chi-Square test were done. Livestock damage is major problem where goat was the most vulnerable livestock mainly from common leopard. Monkey, barking deer and porcupine were responsible for crop damage. Maize was found the main crop damage by wildlife. Average losses of livestock contributed to 3.97% of total livestock with economic loss of NRs.5409.13 per year per household whereby Average 111.83 kg per year per household crops damaged by wildlife with economic loss of NRs. 4102.83 per year per household. More than 90% reported that crop damage occurred during June to November. More than 61% (n=77) respondents reported that HWC is increasing. About 44% (n=55) respondents like to conserve wildlife for the ecological balance followed by 36% (n=46) due to beautifulness of wildlife. Local people adopting locally adaptive measures i.e. regular guarding, use of dog, making loud noise, unpalatable cropping, scarecrows & chasing, corral improvement, community herding and fox light for mitigation of conflict. Regular guarding and corral improvement were ranked the most effective measures to mitigate crop damage and livestock depredation respectively. This study suggests to encourage relief support for crop damages and insurance schemes of livestock as well as crops, livelihood support for local and improved community corrals in pastureland are recommended for reducing HWC.

Keywords: Human wildlife conflict, Livestock depredation, Crop damage, Corral management, People’s perception.

DISTRIBUTION, HABITAT USE AND THREATS TO FOUR HORNED ANTELOPE (TETRACEROUS QUADRICORNIS) IN BANKE NATIONAL PARK, NEPAL

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ABSTRACT

Four-horned antelope (FHA), listed as vulnerable (IUCN) and categorized as Appendix-III (CITES), is one of the least known mammalian species in Nepal. Despite few past records on the presence of FHA, however limited information on its ecological status, population distribution and habitat condition has shadowed its conservation concern in Banke National Park (BaNP) as it is youngest NP of Nepal. Therefore, this study was aimed to assess the habitat, distribution, habitat suitability and conservation threats to FHA in BaNP. Total 62 line transects was laid in the study area to find out its distribution. Altogether, eight Key informants' interview and four focus group discussions were conducted to collect the information regarding prevailing threats to FHA in the study area. MaxEnt model was used to predict current distribution using species occurrence points and bioclimatic variables along with non-climatic and anthropogenic variables. Logistic regression analysis was done to estimate resource selection probability and habitat use of FHA. Additionally, a nonparametric Friedman test was used to compare the mean ranks between each threat category. FHA were found to be restricted to dry deciduous and open hill forest in the northern and southern areas of the Park in an area of approximately 325 km². Within the dry deciduous forest, they were further restricted to flat short grass patches and hilly areas with open canopy patches of tall grass. Besides, the results showed that FHA preferred grassland and avoided the area with human disturbances. It was found that about (65 km²) area of the BaNP is highly suitable for FHA habitat. Among the existing threats (Illegal poaching, human intervention, improper habitat management, uncontrolled fire, increase in invasive species, water scarcity and fragile land structure), a threat due to Invasive species (6.48) was found higher in the study area. A Friedman's test showed that there was significant difference among different threat category ($\chi^2(6) = 108.192$, $p = 0.000$, <0.05). Therefore, this study suggests proper grassland management activities and reduction of human disturbances to conserve this threatened species in the study area.

Keywords: Four horned antelope (FHA), Banke National Park, Habitat suitability and distribution

AN ASSESSMENT OF PREY OCCUPANCY OF BIG CATS IN NON-PROTECTED AREAS (MAHABHARAT RANGE, DADELDHURA) OF NEPAL

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ABSTRACT

The latest sighting of tiger (*Panthera tigris*) in 2020, had shown the big cats presence in Mahabharat range of Dadeldhura. Survival of big cats depends on the prey availability in their co-existing habitats. So, study on prey occupancy of big cats was done to find out the species

composition, abundance and habitat used by prey species in this range. Presence-only data were collected through occupancy survey and vegetation survey in the core area with feasible 2*2 km² grids. Maximum Entropy (MAXENT) model was used to find the prey occupancy in the study area. To get the better result 10 environmental variables were computed. MAXENT model has shown better predictive performance with an ‘Area Under Curve’ 0.745. The result demonstrated that eight species of prey inhabit Mahabharat range. Among which Wild Boar was highly abundant followed by barking deer, rhesus macaque and Himalayan Goral. Mixed Oak Laurel Forest used by 38.5% of prey, 29.8% prey use west Himalayan fir hemlock oak forest, 23.3% prey use mountain oak rhododendron forest and 8.5% use Lower temperate Oak Forest. 27.5% (31.9 km²) of area show high prey occupancy probability, 39.5% (45.8km²) area show moderate and 33% (38.3 km²) area had low prey occupancy probability. This study may provide the baseline information for further research and conservation despite of very few studies and information documented in this range. Prey occupancy modeling could be planning tool to habitat management for both prey and predator at landscape level. Prey occupancy probability mapping should be applied practically as habitat management tools for both prey and predator.

Key words: *Prey, Occupancy, Abundance, Habitat*

ASSESSMENT OF EFFECTIVENESS OF WATERHOLES IN PARSA NATIONAL PARK, NEPAL

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ABSTRACT

Water is essential to many ecosystems that support humans and a vast range of other animals. The provision of water to wildlife in most protected areas of Nepal has flows wherever they can find it. But it is not acquired for Bhabar regions as the soil of Bhabar regions is primarily composed of gravel and conglomerates which cannot hold water and natural surface flowing water depends on atmospheric precipitation on raining season only. Therefore, such areas need waterhole for survival of wildlife. It is a pool of water in a dry area where animal goes to drink water. PNP lies in Chure-Bhawal areas So that the park holds limited numbers of water resources. The dry nature of Parsa has caused water to become constraint for animals. Such that provision of water to wildlife during dry season is crucial. No study was carried out on the utilization patterns of waterholes by major species in PNP.

The main objective of this study was to determine the status of waterhole and keep record of wildlife observed and its diversity in given period of time as well as the activity pattern of wild animals using waterholes in the preference of the time. The study was conducted in Parsa National Park which is located in central Nepal of Province 2 and 3 in Parsa, Bara, and Makwanpur districts. Site visits and observations was carried out for each waterhole site. The data collection of my research was based on camera trapping process for a month (April/May) at five major waterholes. The physical parameters of waterhole were taken by measuring tape whereas location was noted through GPS. The data were analysed by using Ms. Excel and Arc Gis 10.4. Moreover, diversity of animals using waterholes in given time was analyzed by the Shannon-Wiener Diversity Index.

The result of my study demonstrated that the fauna like Tiger, Leopard, Sloth bear, Fox, Jungle cat, Gaur, Blue bull, Elephant, Rhino, Spotted deer, Sambar, Barking deer, Wild boar and

Rhesus monkey were observed in waterholes and also Rhino Pokhari has the maximum species diversity, with a diversity index 2.2. This might be due to the reason that it is connected to Chitwan National Park, which provides easy movement of animals. and Nilgai Pokhari has the least species diversity with diversity index 1.36. It is due to its proximity to an East-West Highways which cause human disturbances. The species mostly preferred the waterholes having water throughout the year than those, which possess water seasonally. Moreover, maximum use of waterhole by predators were observed in morning and night time and prey used it mostly in daytime. Thus, this survey will provide insight into prey and predator water utilization in terms of time preference in order to assist management with future decision-making regarding waterholes

Keyword: Camera trapping, Predators, Utilization, Waterhole

EFFECT OF CUTTING AND BURNING ON GRASSLAND HABITAT IN BARDIA NATIONAL PARK, NEPAL

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ABSTRACT

Grasslands in Bardia National Park are important habitats for tigers (*Panthera tigris tigris*) and their prey. Different management interventions are being carried out for a long time. This study was carried out in Baghaura grassland aimed at comparing vegetation composition and physical properties i.e., height, above-ground biomass, and leaf-stem proportion with the herbivore's utilization pattern (or grazing intensity) of cutting and burning effect among three treatment plots of cutting only, both cutting and burning, and burning only of Bardia National Park. Vegetation composition was assessed through the point intercept method using 1m * 1m quadrat. Grass samples were collected and measured fresh weight. The samples were hand separated into green leaf, green stem, dead leaf, and dead stem and then weighted for biomass and leaf-stem proportion. Both species diversity and evenness were highest on burned only plots out of total available vegetation species (n=25) in *Imperata cylindrica* dominated grassland. Species richness was the same across all treatments. On physical properties, species height was found significantly higher in burned only plots. The proportion of green leaves and green stems was higher in cut only plots and that of dead leaves and dead stems with higher mean dry biomass in burned only plots. The grazing intensity determined by pellet group count and direct observation was found significantly higher on cut and burned plots. The negative correlation ($r=-0.474$, $P<0.01$) between grass species height and grazing intensity showed that grazing intensity decreases with an increase in the height of the grass in grassland with low grazers diversity ($H'=0.7$). Cutting only and control burning after cutting in small patches of grassland during the dry season is likely to provide fresh, high-quality forages for herbivores for longer time throughout the year, which is essential to meet the nutritional requirements of the herbivores.

Keywords: grassland, cut, burned, cut-and-burned, experimental plots

URBAN TREE DIVERSITY IN HETAUDA SUB METROPOLITAN CITY CENTRAL NEPAL (A CASE STUDY OF ASHOK AND PIPELE POKHARA COMMUNITY FOREST)

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ABSTRACT

Plants are universally recognized as a vital component of the world's biological diversity and an essential resource for the planet. Global Strategy for Plant Conservation (2011-2020) stated that two-thirds of the world's plant species are in danger of extinction and emphasized the documentation of plant diversity and conservation status. The study was carried out to access tree diversity of Hetauda sub-metropolitan city, in Makawanpur district. Two CFs; Ashok and Piple-Pokhara were studied laying the quadrat of 10*10 at the interval of 200 meters with 1% sampling intensity. Primary data were collected from the key informant, reconnaissance and vegetation survey. The Importance Value Index of two Community Forests was compared for the tree species and invasive species were documented. The conservation status of tree species was identified based on IUCN red list, CITES and Forest Act 2049. Altogether 17 species were documented; 16 in Ashok CF and 9 in Piple-Pokhara CF. Shannon's Weiner diversity index (H') was higher for Ashok CF (1.028) compared to Piple-Pokhara CF (0.29) which showed that Ashok has more diversity of trees species than Piple-Pokhara CF. The Simpson's index of Dominance; higher for *Shorea robusta* (0.49) in Piple-Pokhara than that of Ashok (0.40). Piple-Pokhara CF had higher homogeneity of tree community with the Pielou's evenness index (e) 0.48. *Shorea robusta* was the most important species in both CF with IVI value 162.62 and 282.99 for Ashok and Piple-Pokhara CF respectively. It was more abundantly observed in Ashok (26.3) than Piple-Pokhara CF (18.2). *Cycas pectinata*, *Dalbergia latifolia* and *Gnetum montanum* are protected species in the Ashok CF. *Ageratina adenophora*, *Lantana camera*, *Micania micrantha* were the major invasive species in the study area. The CFUGs need to apply appropriate silviculture system and control invasive species to provide regeneration for the species and biodiversity conservation.

Keywords: Plant diversity, Importance Value Index, Species richness, *Shorea robusta*, Invasive species

SPATIAL-TEMPORAL PATTERNS OF LEOPARD (*PANTHERA PARDUS*) ATTACKS ON LIVESTOCK IN BUFFER ZONE OF BARDIA NATIONAL PARK, NEPAL

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ABSTRACT

Livestock predation may be a stronghold for the endangerment of leopard (*Panther pardus*) across its range. Leopard attacks on livestock are a primary driver of human-leopard conflict and are a reason in declining their population globally. This research on in-growth and underlying patterns of leopard-livestock interaction plays a vital role in developing and implementing effective conservation and conflict mitigation strategies. This research aims to examine space-time variation of leopard attacks on livestock in the buffer zone of Bardia

National Park over five consecutive years (2016 to 2020) and risk zonation mapping, using on-site assessment and field verification. Pearson χ^2 test was used to compare frequency of livestock depredation by leopard over the years, seasons, months and time with 95% of confidence interval. A total of 700 conflict incident about livestock depredation by the leopard were recorded. The annual loss of livestock attributable to leopard was 0.74 animal per year per household. The average economic loss was Rs.2873 (USD 23.758) per year per household. A significantly higher number of goat/sheep (66.6%) followed by 26.6% pig losses per year in study sites (Pearson $X^2_{df=16}=55.754$, $p<0.05$). A significant increase in the trend of livestock attack was observed over the year (Pearson $X^2_{df=44}=76.089$, $p<0.05$ and $SD=0.1.307$, $SE=0.049$). Livestock Depredation was found to be completely dependent in year and season of livestock loss (Pearson $X^2_{df=12}=27.986$, $P=0.006$). Majority of the Leopard attacks occurred during night time (80.29%) (Likelihood ratio $X^2_{df=4}=14.331$, $P=0.006$), and 89.29% of the livestock killing occurred within the coral house and close to (<250m) to the forest edge which was found to be 60.71%. We recommend using the risk zonation map developed in the report to prioritize preventive measures, strategies to reduce conflict, and further improve the coral houses.

Keywords: buffer zone area, improvement of coral house, livestock depredation, on-site assessment, relief payments, risk zonation, spatial-temporal patterns

PREDATOR-PREY SPACE RACE IN RESPONSE TO HUMAN PRESENCE

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ABSTRACT

The pattern of prey-predator population dynamics is determined by animal space usage decisions. The relationship between predator and prey is inverse in nature, with prey attempting to decrease the spatial gap and predator attempting to enhance the spatial gap, resulting in a space race. The Non-Consumptive Effect refers to a change in prey behavior to avoid predation risk (NCE). Human interference has an impact on predator-prey population dynamics by displacing wild species, particularly predators, resulting in a trophic cascade. Humans also provide as safe havens for prey species avoiding predators. The indirect effect of humans on wild species, which is mediated by behaviors, could have implications for wild species conservation and management. The implications of NCE on prey-population dynamics must be understood. As a result, the study's purpose was to test the theory that human disturbance mediates the trophic cascade effect by depressing predators and favoring prey species. The study's major purpose is to learn more about the NCEs that affect prey-predator population dynamics in response to human presence. From October to March 2021, the research was conducted in Parsa National Park (PNP). Camera trapping was used to capture data (1 moth deployment and previous 5 months data was used) in collaboration with PNP and ZSL, which was then analyzed using the Relative Abundance Index (RAI), evaluating species co-occurrence, and temporal activity analysis.

My research found that the relationship between prey and predator is advantageous in nature. As the number of preys grows, so does the number of predators. Preys, on the other hand, appeared to be avoiding the predators. Because prey use human-shields to defend themselves from predation risk, human interference can have a negative impact on prey-predator dynamics, resulting in a trophic cascade. Hence, human presence in forest areas should be kept to a minimum in order to safeguard predator-population dynamics.

Key words: Camera trapping, Non-Consumptive Effect, Population dynamics, Predation risk, Trophic cascade