



## Short Communication



### Storage behaviour of the pickle prepared from various cultivars of aonla (*Emblia officinalis* Gaertn.)

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#### ABSTRACT

The aonla (*Emblia officinalis* Gaertn.) is commonly referred to as a "Miracle Fruit for the Health", owing to the high nutritious and therapeutic value of its fruits. But the fresh fruits are not ingested freely due to the astringent taste caused by fruit tannins. In production and acreage under aonla cultivation Uttar Pradesh is the leading state in the country. The study aims to understand the storage behaviour of the pickle prepared from the aonla fruit. Pickle was prepared from the eight aonla cultivars viz - Kanchan, Banarasi, Krishna, Chakaiya, NA – 8, NA – 7, NA – 6, and NA – 9. Physicochemical characters (such vitamin 'C' (ascorbic acid), total soluble solids (T.S.S.), browning, and acidity), and sensory/organoleptic scores were recorded at the monthly interval during storage. The result showed that the aonla pickle is acceptable up to nine months thereafter, reduction was noted in the physicochemical and organoleptic scores. Among all cultivars tested, NA-7 was found to be ideal for pickle preparation.

**Keywords:** Aonla, Astringent, Pickle, Processed Products, Storage, Food Quality.

#### INTRODUCTION

The aonla (*Emblia officinalis* Gaertn.) is native to the Indian sub-continent. India occupies the first place in the production and acreage of aonla fruit crop in the world. The fruits are rich in vitamins, minerals, and pectin; and can be used for making preserve, pickles, etc. (Kishore, 1950 and Reddy, et.al.,2010). Large fruit size, small seeds, high concentration of vitamin "C" and phenol, low concentration of fibers are few desired characteristics for aonla fruit processing, especially pickle production. The NA-6 and NA-9 aonla varieties have low fiber and phenolic content but have an average concentration of vitamin C and minerals. (Singh et al., 1993). The aonla cultivar Chakaiya (Singh et al., 1993) and NA-9 (Singh and Kumar, 1995) are most suitable cultivars for pickle preparation. Deen (1992) reported that the pickle made from Chakaiya, Kanchan, Banarasi, Krishna, NA-9, NA-6, NA-8, NA-7 and NA-10 had better quality with higher acceptance rates than Francis cultivar. Among the cultivars taken NA-9 pickle noted the highest acceptability, followed by NA-6 and Banarasi (Deen, 1992). Singh and Kumar (1995) prescribed that 1.0 Kg aonla segments, 150 g salt, 10 g turmeric, 10 g red chilies powder, 30 g fenugreek, 10 g nigella seeds, and 300 ml mustard oil are a better combination for any pickle. An almost similar recipe was reported by Srivastava and Kumar (2002) who reported that 1 kg aonla fruit, 150 g salt, 10 g turmeric powder, 10 g nigella seeds, 10 g

chilies powder, 30 g fenugreek, 5 headless clove, and 350 ml mustard oil are added for the preparation of any pickle. The mustard oil is used as it reduces the spore resistance of *Bacillus subtilis* (Bose and Roy, 1960 and Yadav, et.al. 2019). One of the most important steps in pickle preparation is brining. Brining is commonly done using sodium salt (10%), acetic acid (0.3 - 0.5%), and turmeric powder (0.5%); it helps in the preservation of the material in sound condition (Anand and Johar, 1951). Pickles prepared from segmented aonla has a slightly higher flavour and overall acceptability rate than the whole aonla fruit (Premi et al. (2002).

The processing of fruit into pickles would be more nutritious than other products available in the market and are being sold in large quantities in our country. In order to ensure the aonla production of a profitable enterprise, there is a dire need to explore the possibility of utilizing the aonla fruits for process products preparation because high-quality processed aonla products can aonla be made from high-quality raw materials; therefore, the choice of variety/cultivars is one of the most significant factors that affect the fruit products' quality. Keeping in view this fact, an attempt has been made to understand the storage behavior of pickles, prepared from fruits of different aonla cultivars.

## MATERIALS AND METHODS

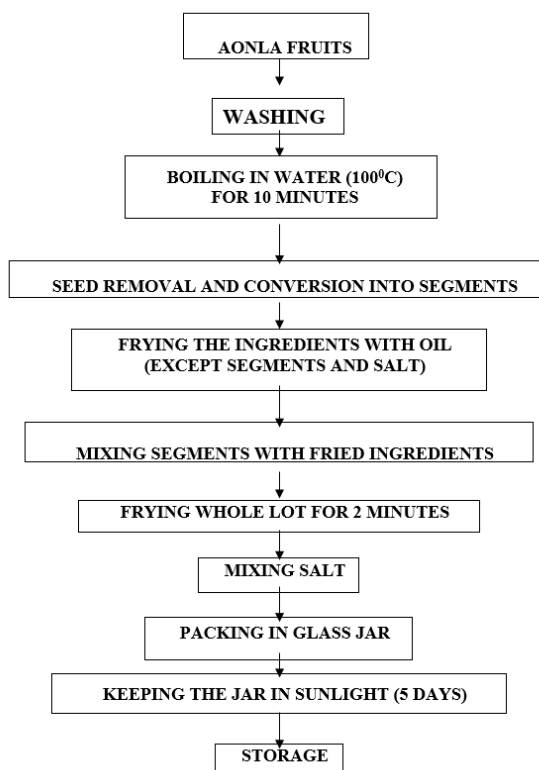
The study was carried out at the Department of Horticulture, Janta College, Bakewar, Etawah (U.P.). Matured, uniformly sized and disease-free varieties of eight cultivars of aonla fruits *viz.* Kanchan, Banarasi, Krishna, Chakaiya, NA – 8, NA – 7, NA – 6, and NA – 9 were selected and procured for pickle preparation from the experimental farm of Janta College, Bakewar, Etawah.

### Materials

1 kg aonla segments, 125 g salt, 10 g turmeric powder, 10 g red chilies powder, 25 g fenugreek, 10 g nigella seed, and 300 ml mustard oil (Srivastava and Kumar, 2002).

### Process of pickle preparation

1 kg aonla fruits thoroughly washed, were boiled in water for 10 minutes. The stones were then removed, and segments were kept for further processing. Other ingredients except salt were fried with oil and mixed with segments (Premi et al. 2002). The whole lot was again fried for 2 minutes. After mixing the salt, the pickle was packed in sterilized, wide-mouth bottles and kept in sunlight for 5 days and then stored for further studies. The process of pickle making is depicted in Flow chart 1.



### Organoleptic analysis

The organoleptic quality of the pickle was evaluated by a panel of ten judges who scored on a 9-point Hedonic scale (Amerine *et al.*, 1965). The recipe which has been found ideal for pickle preparation was used for the screening of cultivars (Srivastava and Kumar, 2002). The prepared pickle was filled into jars. The jars were

capped and kept in sunlight for 5 days and then stored at ambient temperature ( $20 \pm 7^{\circ}\text{C}$ ) for storage studies. Observations on vitamin 'C' (ascorbic acid), total soluble solids (T.S.S.), acidity, and browning were noted at the monthly interval. The periodical organoleptic assessment of pickle was also performed during storage.

## RESULTS AND DISCUSSION

### Evaluation of recipe

The fruit segments of Kanchan, Banarasi, Krishna, Chakaiya, NA – 8, NA – 7, NA – 6, and NA – 9 cultivars were used for pickle preparation. The recipe containing 1kg fruit segments, 125 g salt, 10 g turmeric powder, 10 g red chilies powder, 25 g fenugreek, 10 g nigella seed, and 300 ml mustard oil. Other ingredients except salt were fried with oil and mixed with segments. The whole lot was again fried for 2 minutes. After mixing the salt, the pickle was packed in sterilized, wide-mouth bottles and kept in sunlight for 5 days. Thereafter, the organoleptic or sensory quality of the product was analyzed based on color, appearance, texture and taste. From the data obtained (Table 1) and their statistical analysis (Table 2), it is evident that the organoleptic rating of pickles prepared from various cultivars varies from 7.0 to 9.0. The data also indicated that the rating of NA-7 was significantly higher as compared to other cultivars, it is recorded the highest score (9.0) followed by NA-9 (8.1) and NA-6 (8.0). The differences observed in the organoleptic score of pickle prepared from Banarasi (7.8), Chakaiya (7.0), Kanchan (7.2), Krishna (7.4), and NA-8 (7.4) cultivars were insignificant.

### 3.2 Qualitative changes during storage of aonla pickle

The data presented in Table 3 revealed qualitative changes during storage of aonla pickle as follows:

#### Vitamin 'C' (Ascorbic acid)

During the preparation, vitamin C content was recorded at 68.10 mg per 100g of product, with 100% retention. This content decreased during the storage period. After nine months of storage, this quantity was 26.50 mg and it registered retention of 38.91%. Results also indicate that the concentration of vitamin 'C' in the pickle decreased continuously with the increasing storage period. The result corroborates with the findings of Singh et al. (1993) who also recorded a reduction in the ascorbic acid content during storage of aonla. The decrease in vitamin "C" content is due to the oxidation of ascorbic acid resulting in formation of dehydroascorbic acid. The trapped oxygen in container is probably responsible for oxidizing ascorbic acid. A similar decline in concentration of ascorbic acid was also observed in previous studies by Pathak (1988) and Deen (1992).

#### Total Soluble Solids (T.S.S.)

The pickle showed a gradual decline in TSS content. At the time of preparation, the pickle was having 21.00 TSS which gradually decreased to 17.2. Thus, overall, - 18.10% decrement in TSS was recorded in pickle. The total soluble solids (TSS) value in pickle started declining after two months of storage. The findings of

Pathak (1988) also support present findings that total soluble solids increased up to two months after storage of aonla pickle and then started declining.

**Table 1.** Organoleptic quality of pickle prepared from aonla cultivars

Cultivars	Organoleptic quality	
	Score	Rating
Banarasi	7.8	Like moderately
Chakaiya	7.0	Like moderately
Kanchan	7.2	Like moderately
Krishna	7.4	Like moderately
NA-6	8.0	Like very much
NA-7	9.0	Like extremely
NA-8	7.4	Like moderately
NA-9	8.1	Like very much
C.D. at 5%	0.8	

### Acidity

During observation at the time of storage 1.60% acidity was seen which gradually decreased to 1.30 %. The acidity of pickle was also increased up to three months then it decreases continuously up to the remaining period of storage. The acidity content in pickle increased up to three months and declined towards the end of storage. The findings corroborate with the findings of Pathak,

(1988); and Deen, (1992) who also noted a similar trend of acidity in aonla pickle.

**Table 2.** Analysis of Variance of Pickle

source of variance	d.f.	Mean sum of squares	F Calculated
Replication	6	0.18	0.332
Treatment	7	3.35	6.036
Error	42	0.56	

### Browning

Browning in terms of O.D. increased continuously during the storage of pickle. The minimum browning (1.10) was seen in the initial period of storage and the maximum (1.50) during the last three months of storage. Browning increased by 36.36% during the storage period. A progressive increase in browning of pickle was noted with the increasing storage period in the present findings. This could be because of the formation of brown pigments as a result of non-enzymatic reactions between ascorbic acid and sugar or phenol oxidation (Athawale, *et al.*2017). The present findings get support with work on aonla pickle (Pathak, 1988 and Deen, 1992).

**Table 3.** Qualitative changes during storage of pickle

Storage Period (Month)	Qualitative Changes During Storage of Pickle									
	vitamin 'C'*		TSS*		Acidity (%) *		Browning*		Organoleptic**	
	Quantity (mg/100g)	Retention	Quantity (mg/100g)	Increase/Decrease (%)	Quantity (mg/100g)	Increase/Decrease (%)	Quantity (OD)	Increase/Decrease (%)	Score	Rating
0	68.10	100.00	21.0	00.00	1.60	00.00	1.10	00.00	9.0	LE
1	63.30	92.95	21.0	00.00	1.80	+12.50	1.20	09.09	9.0	LE
2	58.70	86.20	21.0	00.00	2.20	+37.50	1.20	09.09	8.8	LVM
3	55.30	81.20	20.5	-02.38	2.40	+50.00	1.30	18.18	8.4	LVM
4	51.10	75.04	20.0	-04.76	1.80	+12.50	1.30	18.18	8.4	LVM
5	47.90	70.34	20.0	-04.76	1.60	00.00	1.40	27.27	7.3	LM
6	44.70	65.64	19.5	-07.14	1.60	00.00	1.40	27.27	7.3	LM
7	41.30	60.65	19.0	-09.52	1.50	-06.35	1.50	36.36	7.2	LM
8	35.10	51.54	18.5	-11.90	1.40	-12.50	1.50	36.36	7.1	LM
9	26.50	38.91	17.2	-18.10	1.30	-18.75	1.50	36.36	7.0	LM

\*Quantity expressed in mg/100g; Retention expressed in %, \*\*Organoleptic score 7 and above acceptable  
LE = Like extremely; LVM = Like very much; LM = Like moderately.

### Organoleptic score

The organoleptic score of the aonla pickle declined continuously during storage. The highest score (9.0) was observed in the initial first month, while the lowest (7.0) was recorded in the ninth month of storage. Hence, the acceptable quality of aonla pickle was maintained for up to nine months. After a certain period, products lose their storage stability and organoleptic quality. This is due to various factors such as temperature. Temperature is significant in inducing specific changes of biochemical nature in processed products, which results in the emergence of off flavors' and discolouration, disguising the product's original colour and flavour. In aonla pickle also, a decrease in organoleptic quality was observed in previous studies as well (Singh and Kumar, 1995; Pathak, 1988; Deen, 1992 and Karapatiya, *et al.*, 2012).

### CONCLUSION

On the basis of observation recorded during the storage of pickle, a reduction in physicochemical properties was noticed. The concentration of acidity and vitamin "C" declined gradually. However, TSS first increased then decreased. The continuous increment was noted in the browning of aonla pickle, during storage. The organoleptic score of the aonla pickle also reduced gradually during storage. The acceptance rate in terms of quality of the aonla pickle was up to nine months. Overall, changes and reduction of quality were found in aonla pickle during storage. Among all the cultivars tested, the NA-7 cultivar was found ideal for making pickle.

## REFERENCES

- Amerine, M. A., Pangborn, R. M. and Roessler, E. B. 1965. Principle of sensory evaluation of food. Academic press, New York and London.
- Anand, J. C. and Johar, D. S. 1951. Note on the microbiology brined mango slices. *Indian J. Hort.*, 8: 45.
- Athawale, G.H. and Akbari, S.H. 2017. Aonla and its processing – A review. *International Journal of Green and Herbal Chemistry*. Vol.6, No.3, 62-73.
- Bose, A. N. and Roy, A. K. 1960. Studies on heat resistance of *Bacillus subtilis* spores II. Effect of different spices, *J. Sci. and Indus Res.* 19: 277.
- Deen, B. 1992. Studies on screening of aonla (*Emblica officinalis* Gaertn) genotypes for processing. M. Sc. *Thesis*. Narendra Dev University of Agriculture and Technology, Kumarganj, Faizabad.
- Karapatiya, B.A., Ray, N.A. Patel, A.D. and Patel, H.C. 2012. Standardization of techniques for aonla sour pickle with varietal difference. *International Journal of Processing and Post-Harvest Technology*. Volume 3(1),11-14.
- Pathak, S. 1988. Post-harvest technology of aonla (*Emblica officinalis* Gaertn) fruits. Ph. D. *Thesis*, Narendra Dev University of Agriculture and Technology, Faizabad (U. P.).
- Premi, B. R.; Sethi, V. and Bisaria, G. 2002. Preparation of instant oil less pickle from aonla (*Emblica officinalis* Gaertn). *Ind. Fd. Pack.*, 56(3): 72.
- Reddy, A. Harshvardhan and Chikkasubbanna, V. 2010. Quality and organoleptic evaluation of amla pickle. *The Asian Journal of Horticulture*, Vol. 4 No. 2: 271-274.
- Singh, I. S. and Kumar, S. 1995. Studies on processing of aonla fruits- II. Aonla products. *Prg. Hort.*, 27(1-2): 39-47.
- Singh, I. S.; Pathak, R. K.; Dwivedi, R. & Singh, H. K. (1993). Aonla production and post-harvest technology. *Tech. Bulletin*, Narendra Dev University of Agriculture and Technology, Kumarganj, Faizabad (U. P.).
- Srivastava, R. P. and Kumar, S. 2002. Fruit and vegetable preservation principles and practices. II ed. International Book Distributing Co., Lucknow.
- Yadav, A., Singh U. and Yadav, A. 2019. Aonla, physico-chemical and microbial quality during storage. *International Research of Chemistry* Vol. 18 (2): 14-21.

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