International Journal of Agricultural and Applied Sciences, December 2025, 6(2): 88-93
https://www.agetds.com/ijaas
ISSN: 2582-8053
https://doi.org/10.52804/ijaas2025.6213

Research Article

OPEN ACCESS

PEG Induced Drought Stress Effects on Germination and Seedling Traits of Tossa Jute (*Corchorus olitorius*)

N. Tasnime[1], M. Hasan[2], K. Fatema[1], S.S.U. Ahmed[1], S.A.K. Hemel[3], S. Sarmin[4], M.J. Alam[1] and M.M. Mukul[1*]

[1]*Breeding Division, Bangladesh Jute Research Institute, Manik Mia Avenue, Dhaka, Bangladesh*
[2]*Physiology Department, Bangladesh Jute Research Institute, Manik Mia Avenue, Dhaka, Bangladesh*
[3]*Planning Department, Bangladesh Jute Research Institute, Manik Mia Avenue, Dhaka, Bangladesh*
[4]*Pathology Department, Bangladesh Jute Research Institute, Manik Mia Avenue, Dhaka, Bangladesh*
**Corresponding author e-mail: mukulbjribreeding@gmail.com*
(Received: 28/08/2025; Revised: 15/11/2025; Accepted: 25/11/2025; Published: 20/12/2025)

ABSTRACT

This study investigated the effects of polyethylene glycol (PEG)-induced osmotic stress on the germination and seedling growth of five tossa jute varieties under three treatment conditions: control, PEG 5%, and PEG 10%. Significant reductions were observed in germination percentage (GP), seedling length and fresh and dry weight of root and shoot under PEG treatments. Total length (TL), root length (RL) and shoot length (SL) were reduced under PEG stress, particularly in varieties Acc. 1148(V_2) and Acc.6099(V_3). PEG reduced mean GP from 94.4% (control) to 87.1% (PEG 5%) and 88.8% (PEG 10%), and reduced mean shoot length by 16–24%, while root length was largely maintained or increased, indicating a shift in early biomass allocation under osmotic stress. BJRI Tossa pat 5(V_4) consistently showed the highest tolerance to PEG stress, maintaining relatively better germination, seedling growth, root length and biomass compared to other varieties. Correlation study revealed that, early seedling vigor in tossa jute is strongly influenced by root length, root biomass and total dry matter accumulation. The positive associations between GP, TL and RW highlight their importance as selection indices for drought tolerance while negative correlations of shoot weight with root traits indicate an adaptive balance between root and shoot under water deficit. BJRI Tossa pat 5 was identified as a promising genotype for early-stage drought tolerance but subsequent validation is needed under field water-deficit conditions.
Keywords: PEG screening, Abiotic stress; root architecture; Seedling vigor; Drought stress breeding

INTRODUCTION

Jute (*Corchorus spp.*) is the world's second most important natural fiber crop after cotton, with Bangladesh as a major producer and exporter (Ghosh et al., 2017; Mukul et al., 2020b). Tossa jute (*C. olitorius*) accounts for 80–85% of national jute and allied fiber production, valued for its superior fiber quality despite lower yield stability compared to white jute (*C. capsularis*) (Mukul et al., 2020a; Mukul et al., 2021; Islam et al., 2017). Erratic rainfall and early-season drought increasingly threaten jute establishment by reducing germination, seedling vigour and stand uniformity, which can translate into lower fibre yield. (Zandalinas et al., 2021; Rahman et al., 2021). Early drought in jute growing season reduces seedling vigor and limits canopy development with long-term consequences for fiber yield. Tossa jute exhibits adaptive responses under drought including different osmolyte accumulation, deeper rooting and reduced leaf area (Yakoub et al., 2016; Dhar et al., 2018). Polyethylene glycol (PEG) is widely used to simulate drought in controlled experiments due to its high molecular weight, non-toxicity and ability to lower water potential without entering cells (Verslues et al., 2006). PEG-induced osmotic stress enables precise screening of germination and early growth responses in various crops, including sugarcane (Reyes et al., 2023), wheat (Hameed et al., 2025), lentil (Muscolo et al., 2013), kenaf (Tang et al., 2019), and jute (Yao et al., 2013; Liu et al., 2011). In jute, drought tolerance is closely linked to seedling vigor, root architecture and biomass partitioning (Comas et al., 2013; Ahmed et al., 2020). Seedling traits such as germination percentage, root length, shoot length, fresh and dry biomass, and root diameter have proven effective for identifying stress-resilient genotypes (Wang et al., 2018; Liu et al., 2022). However, comprehensive assessments of multiple tossa jute varieties under PEG stress remain limited, especially regarding trait interrelationships and genotypeenvironment interactions. The objectives of this study were to quantify the effects of PEG 5% and PEG 10% on germination and early seedling traits in five tossa jute genotypes and to identify genotypes with superior performance under osmotic stress and to determine which traits are most strongly associated with early drought tolerance. Therefore, this study will provide insights for breeding climate-resilient jute cultivars.

MATERIALS AND METHODS

Plant materials

There are five Tossa jute genotypes including accessions, advanced lines and pre-released varieties were used in this study to observe their yield and yield attributing traits contributing to fiber and stick production followed by identifying superior genotype(s) for further waterlog tolerant Tossa jute variety development (Table 1).

Experimental design, seeding and plants growing

The experiment was conducted under laboratory conditions following completely randomized design (CRD) with three treatments of Polyethylene Glycol-6000 (T1: Control, T2: PEG 5% and T3: PEG 10%) which is equivalent to two osmotic potential levels including −0.006 and −0.013 MPa (Michel & Kaufmann, 1973). Three replicates of 40 sterilized (with 5% sodium hypochlorite) seeds were germinated in Petri dishes. The 6 ml treatment solution or distilled water was poured on the filter paper and afterwards the PEG solution or distilled water was given according to the needs. Seeds were incubated at 28 ± 2°C and 16:8hour light dark period for 8 days. Seed germination percentage was observed every 24 hours for 8 days and then seed germination percentage was computed.

Data collection and data analysis

The growth parameters were measured eight days after germination, including germination percentage (GP), total length (TL), root length (RL), shoot length (SL), fresh weight per seedling (TW), root fresh weight (RW), shoot fresh weight (SW), root dry weight (RDW), shoot dry weight (SDW), primary root diameter (PRD), and secondary root diameter (SRD). The morphological data were collected and compiled carefully using Microsoft Excel (Windows 10 Pro, MS Office 2016) and analyzed in Minitab 19 statistical analysis software (Minitab, 2019). A two-way ANOVA was performed with treatment, variety and their interaction as fixed effects. Prior to ANOVA, model residuals were inspected for approximate normality and homogeneity of variance; no data transformation was applied. Mean separation was performed using Tukey's HSD at $\alpha = 0.05$. Pearson correlation coefficients were calculated using pooled observations, and correlation strength was interpreted based on $|r|$ (weak < 0.30, moderate 0.30–0.59, strong ≥ 0.60).

Table 1. List of plant materials, plant species and nation of origin

Genotypes	Origins or the process of development	Plant type	Country of origin
V_1- O-0411-10-4R	JRO-524 × A-4311	True Breeding line	Bangladesh
V_2- Acc. 1148	Pure line selection	Accession	Bangladesh
V_3- Acc. 6099	Pure line selection	Accession	Bangladesh
V_4- BJRI Tossa pat 5	Uganda red × O-4	Pre-released variety	Bangladesh
V_5- BJRI Tossa pat 9	JRO-524× Acc. 1749	Pre-released variety	Bangladesh

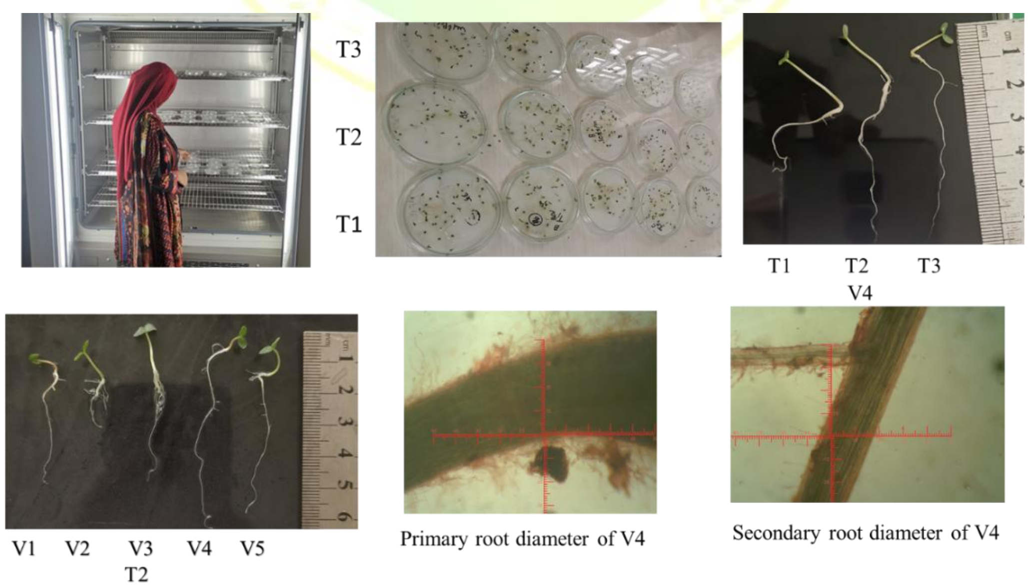

Fig. 1. Growing of five tossa jute genotypes under PEG induced drought stress and its effect on seedling traits

RESULTS AND DISCUSSION

The two-way ANOVA revealed significant interactions between treatment (PEG concentration) and variety for most measured traits, indicating that both factors contributed to variations in seedling growth parameters. Significant effects of PEG concentration and variety were evident across multiple traits, confirming that osmotic stress influences early growth and that tossa jute genotypes differ in their responses (Table 2).

Table 2. Analysis of variance (MS) for seedling characters of five tossa jute genotypes under PEG treatments.

Source of Variation	Treatment (A)	Variety (B)	A×B	Error
d.f.	2	4	8	30
GP	220.35***	240.35***	81.35***	5.15
TL	1.00***	8.12***	0.64***	0.12
RL	1.26***	7.71***	1.07***	0.04
SL	3.03***	0.04^{ns}	0.42***	0.05
TW	21.38***	2.26***	1.68***	0.28
RW	15.37***	4.24***	0.70***	0.10
SW	5.33***	2.17***	2.60***	0.20
RDW	0.002^{ns}	0.001^{ns}	0.003***	0.001
SDW	0.01**	0.04***	0.02***	0.003
PRD	0.053***	0.077***	0.027***	0.007
SRD	0.008***	0.0023***	0.001***	0.0001

(d.f.=Degree of Freedom, *, **, and *** indicate significant at 0.05, 0.01, and 0.001 levels of probability; ns indicate non- significant., GP=Germination percentage, TL=Total length(cm), RL=Root length(cm), SL=Shoot length(cm), TW= Fresh weight per seedling(mg), RW= Root fresh weight per seedling(mg), SW= Shoot fresh weight per seedling(mg), RDW= Root dry weight per seedling(mg), SDW= Shoot dry weight per seedling(mg), PRD= Primary root diameter(mm), SRD= Secondary root diameter(mm))

Germination percentage

Germination percentage (GP) declined significantly under PEG-induced drought stress. Across genotypes, mean GP decreased from 94.4% in the control to 87.1% under PEG 5% and 88.8% under PEG 10%. Relative to the control, GP reduction ranged from 0.7–21.2% under PEG 5% and 1.5–10.1% under PEG 10% across genotypes. The highest GP (98.67%) was recorded in V_4 under control conditions, whereas the most pronounced reduction occurred in V_3 under PEG 10% (72.00%). Both PEG treatments (5% and 10%) caused notable GP reductions, particularly in V_2 and V_3, while V_4 maintained relatively stable GP even under severe stress (Table 3). This superior germination performance suggests inherent seed vigor and early-stage drought adaptability, consistent with findings in other crops (Yakoub et al., 2016; Dhar et al., 2018).

Seedling length traits

PEG stress reduced seedling elongation, particularly shoot growth (Table 3). Mean total length decreased by 5.6% (PEG 5%) and 4.0% (PEG 10%) relative to the control, while mean shoot length decreased by 15.6% and 24.3%, respectively. In contrast, mean root length was maintained or increased under PEG 10% (+10.1% relative to the control), suggesting altered early allocation towards rooting under osmotic stress. Higher osmotic stress restricted cell elongation and water uptake, leading to shorter seedlings (Olaru et al., 2024; Khan et al, 2022). Among the varieties, V_4 showed the least reduction in TL and RL, indicating adaptive growth plasticity and enhanced water-uptaking potential (Comas et al., 2013).

Biomass accumulation and partitioning

Fresh and dry biomass (TW, RW, SW, RDW, SDW) followed a similar declining trend with PEG stress. Mean total fresh weight (TW) decreased by 14.2% at PEG 5% and 25.9% at PEG 10% compared with the control. Root fresh weight showed a pronounced reduction at PEG 10% (−40.9% relative to the control), while shoot fresh weight decreased strongly at PEG 5% (−24.9%). The highest total fresh weight (9.87 mg) was recorded in T_1×V_4, while the lowest (6.30 mg) occurred in T_3×V_3. V_4 and V_5 retained higher biomass under both PEG levels, implying better osmotic adjustment and carbon assimilation capacity (Muscolo et al., 2013; Ahmed et al., 2020).

Root diameter traits

Primary and secondary root diameters were influenced by PEG concentration and genotype (Table 2–3). Overall, PRD tended to decrease under PEG treatments, while SRD showed smaller changes, suggesting that osmotic stress affected root thickening less consistently than elongation.

Root diameter traits (PRD, SRD) were also reduced under PEG stress, but V_4 maintained comparatively thicker roots, which may enhance anchorage and water uptake efficiency (Tang et al., 2019).

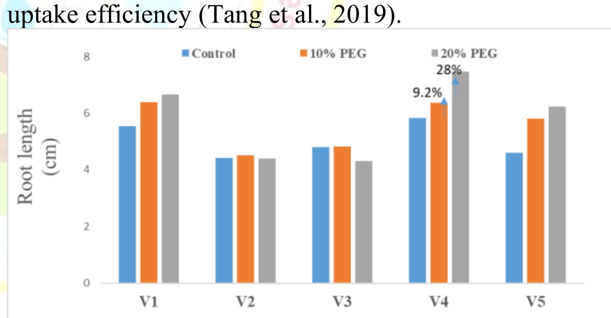

Fig. 2. Mean performance of treatment and variety for root length(cm) of five tossa jute genotypes under control, 5% and 10% treatments.

The correlation study revealed that out of 55 associations, 23 were significant and 33 were non-significant. Ten associations had strong positive correlation (GP, TL); (GP, RW); (TL, RL); (SL, TW); (TW, RW); (TW, SW); (TW, RDW); (SDW, SRD); (PRD, SRD) and three had negative correlation (RL, SL); (RL, SW); (RW, SW) (Table 4). Germination percentage (GP) showed strong positive associations with total length (TL), root weight (RW) and root length (RL), indicating that better germination enhances early root development and biomass accumulation. TL exhibited the closest association with RL, while also maintaining positive relationships with shoot length (SL) and RW, suggesting that vigorous elongation of seedlings supports root–shoot balance. Root–shoot biomass traits were closely linked, as total weight (TW) correlated positively with shoot length, RW, and root dry weight (RDW). Similarly, RW was positively associated with SL, TW and RDW, reflecting the role of root biomass in maintaining overall plant vigor under osmotic stress. Shoot weight (SW) was negatively correlated with RL and RW, suggesting a trade-off between shoot and root investment under stress. Dry matter partitioning was also evident as RDW showed positive associations with SL, TW and SW, highlighting the contribution of root biomass to total seedling growth (Okeke et al, 2023). Additionally, shoot dry weight correlated strongly with shoot length depression, and PRD correlated with SRD, suggesting their potential utility as drought sensitivity indicators. These relationships underscore coordinated root–shoot allocation under water deficit (Yao et al., 2013; Reyes et al., 2023).

Table 3. Mean performance for seedling traits of five tossa jute genotypes under PEG treatments.

TRT × VAR	GP (%)	TL (cm)	RL (cm)	SL (cm)	TW (mg)	RW (mg)	SW (mg)	RDW (mg)	SDW (mg)	SRD (mm)	PRD (mm)
T1×V_1	94.67a-c	9.33ab	5.53d	3.80a	10.03a	4.61bc	5.42a	0.22ab	0.60abc	0.123b-d	0.595a-c
T1×V_2	92.67a-d	7.85c-e	4.43e	3.41a-c	7.87d-g	3.44d	4.42a-e	0.17ab	0.63abc	0.107d-e	0.487a-c
T1×V_3	91.33b-d	8.50b-d	4.80e	3.70a	8.42b-e	4.58bc	3.84b-f	0.17ab	0.52bc	0.128a-d	0.708a
T1×V_4	98.67a	9.63a	5.83cd	3.80a	9.87ab	4.77ab	5.10a-c	0.20ab	0.69ab	0.149ab	0.733a
T1×V_5	94.67abc	9.35ab	5.81cd	3.53ab	9.80a-c	4.63b	5.17ab	0.18ab	0.52bc	0.123b-d	0.594a-c
T_2×V_1	92.0a-d	9.56a	6.40bc	3.16a-d	8.13d-f	4.47bc	3.67d-g	0.17ab	0.58abc	0.123b-d	0.415bc
T_2×V_2	81.33f	7.39e	4.52e	2.86bcd	6.83e-g	2.73d-f	4.10a-e	0.16ab	0.52bc	0.107a-e	0.589a-c
T_2×V_3	72.00g	7.57de	4.83e	2.73c-e	9.00a-d	3.66cd	5.34a	0.21ab	0.64abc	0.128a-d	0.626ab
T_2×V_4	98.00ab	9.90a	6.37bc	3.53ab	8.26c-f	5.71a	2.54fg	0.24a	0.72a	0.117c-e	0.508a-c
T_2×V_5	92.00a-d	7.72de	4.60e	3.11a-d	7.23e-g	4.90ab	2.33g	0.20ab	0.49c	0.091e	0.415bc
T_3×V_1	86.67d-f	9.52ab	6.66b	2.87b-d	6.97e-g	2.13ef	4.83a-d	0.19ab	0.59abc	0.09e	0.328c
T_3×V_2	83.33ef	7.58de	4.40e	3.19a-d	6.67fg	1.97f	4.70a-d	0.19ab	0.46c	0.093e	0.631ab
T_3×V_3	90.00c-e	7.31e	4.31e	3.00b-d	7.40d-g	2.77d-f	4.63a-d	0.21ab	0.69ab	0.154a	0.723a
T_3×V_4	95.33a-c	9.58a	7.47a	2.10e	6.30g	3.17d	3.13e-g	0.14b	0.74a	0.154a	0.692a
T_3×V_5	88.67c-e	8.88a-c	6.23bc	2.65de	6.73fg	2.97de	3.77c-f	0.15b	0.73a	0.138a-c	0.631ab
CV	7.86	11.48	8.08	5.97	6.26	10.05	8.48	8.46	6.9	8.8	8.11

(GP=Germination percentage, TL=Total length(cm), RL=Root length(cm), SL=Shoot length(cm), TW= Fresh weight per seedling(mg), RW= Root fresh weight per seedling(mg), SW= Shoot fresh weight per seedling(mg), RDW= Root dry weight per seedling(mg), SDW= Shoot dry weight per seedling(mg), PRD= Primary root diameter(mm), SRD= Secondary root diameter(mm))

Table 4. Correlation coefficient of seedling characteristics of five tossa jute germplasms

Traits	GP	TL	RL	SL	TW	RW	SW	RDW	SDW	PRD
TL	0.581^{***}									
RL	0.390^{*}	0.87^{***}								
SL	0.375^{*}	0.257	-0.321^{*}							
TW	0.225	0.287^{*}	-0.218	0.668^{***}						
RW	0.512^{***}	0.415^{**}	0.155	0.550^{**}	0.649^{***}					
SW	-0.280	-0.096	-0.446^{**}	0.236	0.546^{***}	-0.284^{*}				
RDW	0.018	0.035	0.157	0.435^{**}	0.542^{***}	0.369^{**}	0.277^{*}			
SDW	0.237	0.386^{**}	0.447^{**}	-0.167	-0.002	0.052	-0.059	0.052		
PRD	0.019	-0.168	-0.270	-0.010	0.164	-0.004	0.211	-0.010	0.155	
SRD	0.255	0.223	0.155	-0.093	0.201	0.150	0.088	-0.051	0.616^{***}	0.648^{***}

(GP=Germination percentage, TL=Total length(cm), RL=Root length(cm), SL=Shoot length(cm), TW= Fresh weight per seedling(mg), RW= Root fresh weight per seedling(mg), SW= Shoot fresh weight per seedling(mg), RDW= Root dry weight per seedling(mg), SDW= Shoot dry weight per seedling(mg), PRD= Primary root diameter(mm), SRD= Secondary root diameter(mm))

V_4's consistent performance minimal GP reduction, longer roots and shoots, higher biomass retention and thicker roots positions it as a promising candidate for breeding drought-resilient jute varieties suitable for water-limited environments. Such traits are crucial for sustaining fiber production under the increasing frequency of drought events projected in climate change scenarios (Zandalinas et al., 2021).

CONCLUSION

PEG-induced osmotic stress significantly impacts germination and seedling development, with higher concentrations causing greater reductions in shoot growth and biomass parameters. Root-related traits (root length and root biomass) remained comparatively stable and were strongly associated with seedling vigor and can serve as reliable selection criteria in early drought tolerance breeding programs. Among the evaluated genotypes, BJRI Tossa pat 5 (V_4) showed superior tolerance under both 5% and 10% PEG treatments and is a promising candidate for further drought tolerance evaluation and breeding. Future work should validate these laboratory screening results under soil-based and field water-deficit conditions.

CONFLICT OF INTEREST

The author here declares there is no conflict of interest in the publication of this article.

ACKNOWLEDGEMENTS

The authors expressed sincere gratitude to the Bangladesh Jute Research Institute for providing the research facilities and all the technical personnel who helped during this study.

AUTHORS' CONTRIBUTIONS

NT[1] conceived, designed and performed the experiment; MH[2] helped in analysis and interpretation of data; wrote the manuscript. SSUAH[1] and MJA supervised the experiment and guided the study; KF[1], SAKH[3] & SS[4] helped in data collection; NT[1] and MH[2] reviewed the article for publication, prepared manuscript; MMM[1] submitted it to the journal and communicated for publication. All authors contributed to the article and approved the submitted version for publication.

REFERENCES

Ahmed F, et al. 2020. Response of fiber crops to drought and osmotic stress. *Agric Stress Biol.* **12**(3):221–234.

Comas LH, et al. 2013. Root traits contributing to plant productivity under drought. *Front Plant Sci.* **4**:442.

Dhar P, Ojha D, Kar CS, Mitra J. 2018. Differential response of tossa jute (*Corchorus olitorius* L.) submitted to water deficit stress. *Ind Crops Prod.* **112**:141–150. https://doi.org/10.1016/j.indcrop.2017.10.044

Ghosh S, Meena K, Sinha MK, et al. 2017. Genetic diversity in *Corchorus olitorius* genotypes using jute SSRs. *Proc Natl Acad Sci India B Biol Sci.* 87:917–926.

Hameed A, Zahid M, Hameed A, Noreen R, Ibrahim M, Farooq T, Bajaber MA, Khalid N, Kanwal P. 2025. Curcumin-based priming agent confers drought tolerance in wheat seedlings: A climate-smart approach. *Ind Crops Prod.* 1:119451. https://doi.org/10.1016/j.indcrop.2024.119451

Islam MS, Saito JA, Emdad EM, Ahmed B, Islam MM, Halim A, Hossen QMM, Hossain MZ, Ahmed R, Hossain MS, et al. 2017. Comparative genomics of two jute species and insight into fiber biogenesis. *Nat Plants.* **3:**16223.

Liu Y, Jiang D, Yan J, Wang K, Lin S, Zhang W. 2022. ABA-insensitivity of alfalfa (*Medicago sativa* L.) during seed germination associated with plant drought tolerance. *Environ Exp Bot.* **203**:105069. https://doi.org/10.1016/j.envexpbot.2022.105069

Liu Y, Liu Y, Zhou R, Yang J. 2011. Effect of PEG induced drought stress on the germination indices of different varieties of *Corchorus capsularis* L. *J South Agric.* **42**(7):715–718. Available from: https://www.cabidigitallibrary.org/doi/full/10.5555/20113327536

Michel BE, Kaufmann MR. 1973. The osmotic potential of polyethylene glycol 6000. *Plant Physiol.* 51:914–916. https://doi.org/10.1104/pp.51.5.914

Minitab. 2019. Minitab Statistical Software, version 19.1.1.0. Karnataka (India): Cubic Computing (P) Ltd. Available from: http://www.minitab.com

Mukul MM, Akter N, Ahmed SSU, et al. 2020. Genetic diversity analyses of twelve tossa jute (*Corchorus olitorius* L.) genotypes based on variability, heritability and genetic advance for yield and yield attributing morphological traits. *Int J Plant Breed Genet.* **14**:9–16.

Mukul MM, Akter N, Islam MM, Bhuiyan MSH, Mostofa MG, Ghosh RK, Saha CK, Ali MA. 2021. Morpho-phenetical study of high yielding tossa jute variety BJRI Tossa Pat 7 (MG-1) for bast fibre yield and qualities. *Heliyon.* **7**(10):e08129. https://doi.org/10.1016/j.heliyon.2021.e08129

Mukul MM, Akter N, Mostofa MG, Rahman MS, Hossain MA, Roy DC, Jui SA, Karim MM, Ferdush J, Hoque MM, Mollah MAF. 2020. Analyses of variability, Euclidean clustering and principal components for genetic diversity of eight tossa jute (*Corchorus olitorius* L.) genotypes. *Plant Sci Today.* **7**(4):564–576.

Muscolo A, Sidari M, Anastasi U, Santonoceto C, Maggio A. 2013. Effect of PEG-induced drought stress on seed germination of four lentil genotypes. *J Plant Interact.* **9**(1):354–363. https://doi.org/10.1080/17429145.2013.835880

Rahman K, Ahmed N, Raihan MRH, Nowroz F, Jannat F, Rahman M, Hasanuzzaman M. 2021. Jute responses and tolerance to abiotic stress: Mechanisms and approaches. *Plants (Basel).* **10**(8):1595.

Reyes JAO, Casas DE, Gandia JL, Parducho MJL, Renovalles EM, Quilloy EP, et al. 2023. Polyethylene glycol-induced drought stress screening of selected Philippine high-yielding sugarcane varieties. *J Agric Food Res.* **14**:100676. https://doi.org/10.1016/j.jafr.2023.100676

Tang D, Wei F, Qin S, Khan AH, Kashif MH, Zhou R. 2019. Polyethylene glycol induced drought stress strongly influences seed germination, root morphology and cytoplasm of different kenaf genotypes. *Ind Crops Prod.* **137**:180–186. https://doi.org/10.1016/j.indcrop.2019.01.019

Verslues PE, et al. 2006. Osmotic stress in plants: New insights and challenges. *Plant Physiol.* **140**(2):399–410.

Wang C, Zhou L, Zhang G, Xu Y, Gao X, Jiang N, Zhang L, Shao M. 2018. Effects of drought stress simulated by polyethylene glycol on seed germination, root and seedling growth, and seedling antioxidant characteristics in Job's tears. *Agric Sci.* **9**:991–1006. https://doi.org/10.4236/as.2018.98069

Yakoub ARB, Benabderrahim MA, Ferchichi A. 2016. Physiological and agro-morphological responses of tossa jute to drought stress. *J Plant Physiol Pathol.* **4**:3.

Yao Y, Hong J, Ceng R, Yang Y. 2013. Drought resistance of various jutes (*Corchorus* L.) in seedling under PEG stress. *Fujian J Agric Sci.* **28**(5):457–462. https://doi.org/10.19303/j.issn.1008-0384.2013.05.010

Zandalinas SI, Fritschi FB, Mittler R. 2021. Global warming, climate change and environmental pollution: Recipe for a multifactorial stress combination disaster. *Trends Plant Sci.* **26**(6):588–599.

Citation: N. Tasnime, M. Hasan, K. Fatema, S.S.U. Ahmed, S.A.K. Hemel, S. Sarmin, M.J. Alam and M.M. Mukul 2025. PEG Induced Drought Stress Effects on Germination and Seedling Traits of Tossa Jute (*Corchorus olitorius*)**.** *International Journal of Agricultural and Applied Sciences,* 6(2): 88-93. https://doi.org/10.52804/ijaas2025.6213