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Pallavi Parmar

Department of Biochemistry & Physiology, Anand Agricultural University, Anand, Gujarat, India

JJ Dhruv

Department of Biochemistry & Physiology, Anand Agricultural University, Anand, Gujarat, India

NJ Patel

Department of Biochemistry & Physiology, Anand Agricultural University, Anand, Gujarat, India

Screening of genotypes under water deficit condition

Pallavi Parmar¹, JJ Dhruv², NJ Patel³

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ABSTRACT

Rice (*Oryza sativa* L.), a major cereal crop belonging to the family Poaceae, is highly sensitive to water deficit and drought stress is one of the major environmental constraints limiting plant growth, productivity and grain quality. Water availability during critical stages of crop development plays a crucial role in determining crop performance under drought conditions. Screening rice genotypes under drought stress is an important approach for identifying genotypes with superior drought tolerance and for selecting suitable genetic resources for breeding programmes. In the present study, twenty rice genotypes were evaluated for their response to drought stress based on germination percentage, germination index, shoot length, shoot weight, root length, root weight, relative water content (RWC) and membrane injury. Significant variability was observed among the genotypes for all the evaluated parameters, indicating substantial genetic variation in drought response. Among the genotypes, R 2307-73-1-38-1 exhibited superior performance under drought stress, recording the highest germination percentage (96.67 %), germination index (14.23) and relative water content (97.78 %), along with lower membrane injury. In contrast, R-RF-212 exhibited comparatively poor performance across the evaluated parameters and was identified as the most drought-susceptible genotype. The results demonstrate considerable genetic variability among rice genotypes for drought tolerance and identify R 2307-73-1-38-1 as a promising genotype for further physiological, biochemical and molecular investigations aimed at improving drought tolerance in rice.

Keywords: Rice, Drought, Relative water content, Membrane injury

1. Introduction

Rice (*Oryza sativa* L.) is one of the most important cereal crops and serves as a major source of food and nutritional energy for a large proportion of the world's population, particularly in Asia. Rice production is highly dependent on adequate water availability, and water scarcity has become an increasingly important constraint to sustainable rice production. Among the various abiotic stresses, drought is considered one of the major factors limiting rice growth, productivity and yield, particularly in rainfed and poorly irrigated ecosystems. Approximately 45% of the world's rice-growing area is under rainfed conditions, where intermittent and unpredictable water shortages frequently occur during the crop growth period (Verulkar *et al.*, 2010) [1]. Drought stress occurs when the availability of water in the soil becomes insufficient to meet the water requirements of plants. Rice is particularly vulnerable to water deficit because its productivity is strongly influenced by water availability throughout the crop growth cycle. Drought can occur at different developmental stages, including germination, seedling establishment, vegetative growth, flowering and grain filling, with the magnitude of damage depending on the severity and duration of stress and the developmental stage of the crop. Water deficit can result in reduced cell expansion and division, stomatal closure, impaired photosynthesis, reduced biomass accumulation and premature leaf senescence. Consequently, prolonged or severe drought stress can cause substantial reductions in grain yield and yield components (Nahar *et al.*, 2018; Panda *et al.*, 2021) [2, 3].

At the seedling stage, several morphological and physiological traits can be effectively used for preliminary screening of rice genotypes. Germination percentage, germination index, root length, shoot length, fresh weight, dry weight, relative water content (RWC), and membrane injury are among the commonly evaluated traits. Nahar *et al.* (2018) [2] demonstrated that these morpho-physiological parameters could effectively differentiate drought resistant and drought-sensitive rice cultivars under PEG-induced water stress. Relative water content (RWC) is an important indicator of the plant's water status and provides an estimate of the ability of a genotype to maintain tissue hydration under drought conditions. Genotypes capable of maintaining comparatively higher RWC under water deficit are generally better able to sustain cellular functions and physiological activity. Similarly, membrane injury or membrane stability can provide an indication of drought-induced cellular damage (Kumar *et al.*, 2015) [4]. Screening at the early seedling stage provides a relatively rapid and economical approach for identifying contrasting genotypes before undertaking detailed physiological, biochemical, molecular and field-level investigations. Controlled screening methods, includ

Corresponding Author:

Pallavi Parmar

Department of Biochemistry & Physiology, Anand Agricultural University, Anand, Gujarat, India

ing PEG-induced osmotic stress allow genotypes to be exposed to relatively uniform stress conditions. Therefore, screening of rice genotypes under drought stress is an essential step for identifying drought-tolerant genetic resources and understanding the physiological basis of drought adaptation. Evaluation of germination, seedling growth, relative water content, membrane stability and other stress-responsive traits can help distinguish tolerant and susceptible genotypes. The identification of contrasting genotypes can subsequently facilitate their utilization in physiological and biochemical studies as well as in breeding programmes aimed at developing high-yielding rice cultivars adapted to drought-prone environment.

2. Materials and Methods

Twenty rice genotypes were used for the initial screening of drought resistance. Seeds were soaked in distilled water for 12 h and subsequently surface-dried under room temperature for 2 h. The seeds were then placed in petri plates for germination. Three days after germination, drought stress was imposed by applying polyethylene glycol (PEG-6000) solution with an osmotic potential of -10 bar to simulate water deficit conditions. The seedlings were maintained under these stress conditions until 10 DAG. At 10 DAG various seedling growth parameters were recorded.

Germination (%)

The germination percentage was calculated as described in the Association of Official Seed Analysts (Firoozeh *et al.*, 2012) [5] by following formula.

$$\text{Germination \%} = \frac{\text{No. of germinated seed}}{\text{Total No. of seed}} \times 100$$

Germination index

The germination index (GI) was calculated as described in the Association of Official Seed Analysts (Firoozeh *et al.*, 2012) [5] by following formula.

$$\text{GI} = \frac{\text{No. of germinated seed}}{\text{Days of first count}} + \dots + \frac{\text{No. of germinated seed}}{\text{Days of first count}}$$

Shoot length (cm)

Five randomly selected seedlings were taken from each growing treatment to calculate the length of shoot. They were measured with a measuring scale and expressed in centimeters.

Shoot weight (mg)

Five randomly selected seedlings were taken from each growing treatment to calculate the weight of shoot. Weight of shoots were measured by balance and expressed in milligram.

Root length (cm)

Five randomly selected seedlings were taken from each growing treatment to calculate the length of root. They were measured with a measuring scale and expressed in centimeters.

Root weight (mg)

Five randomly selected seedlings were taken from each growing treatment to calculate the weight of root. Weight of roots were measured by balance and expressed in milligram.

Relative water content (%)

The method described by Weatherley (1950) [6] was used for the determination of relative water content of rice genotypes under control as well as water deficit stress conditions. Pre-weighed leaf samples of rice were transferred in a petri dish filled with at least 100 mL distilled water so that leaves remain submerged for six hours. Then the leaves were taken out, dried by blotting paper and measured the turgid weight. After that, turgid leaf samples were kept in oven at 80 °C overnight and weighed until constant weight was obtained. RWC was calculated using the following formula:

$$\text{RWC \%} = \frac{\text{Fresh weight} - \text{Dry weight}}{\text{Turgid weight} - \text{Dry weight}} \times 100$$

Membrane injury (%)

Membrane injury (MI) was determined by using the method of Suvillan (1971) [7] with some modification. Fresh leaf tissues i.e. 0.1 g were taken and placed in beaker containing 100 ml of distilled water. They were kept in hot water bath at 40 °C for 30 minutes. After 30 minutes samples were cooled to room temperature and electrical conductivity (EC) was recorded for both control (C_1) and treatment (T_1). Then the tubes were kept in boiling water bath at 100 °C for 15 minutes. After cooling, again electrical conductivity was measured in control i.e. C_2 and in treatment i.e. T_2 . Membrane injury was calculated by using the following formula:

$$\text{MI \%} = \frac{1 - T_1/T_2}{1 - C_1/C_2} \times 100$$

3. Results and Discussion

Total 20 genotypes were assessed for drought resistance using germination percent, germination index, relative water content (RWC), membrane injury (MI), shoot length, root length, shoot weight and root weight.

Germination (%)

Germination percentage is a key parameter in stress physiology, especially when studying drought tolerance. Germination percentage is an important indicator used to screen and identify drought-tolerant genotypes at the early growth stage, helping select crops that can establish successfully under limited water conditions.

The genotypes exhibited significant variability in germination percentage are measured and presented in Table 4.1. The germination percentage was varied from 56.67 % to 96.67 %. The maximum germination percentage was recorded in genotype R 2307-73-1-38-1 (96.67 %), followed by RCPR 104-IR 161 1499 (95.00 %) and R2272-515-2-287-1 (93.33 %), indicating superior seed vigor. The significantly minimum germination percentage was recorded in genotype R-RF-212 (56.67 %).

Our results are accordance with various scientists, Govindaraj *et al.* (2010) [8], Kim *et al.* (2001) [9], Radhouane (2007) [10] and Xu *et al.* (2015) [11]. They have suggested that PEG-induced drought stress reduced germination percentage.

Sabesan *et al.* (2016) [12] studied an in vitro study utilizing polyethylene glycol to screen *Indica* rice genotypes for drought resistance. They observed germination percentage varied from 54.50 % to 100 %. They have also reported that PEG-induced osmotic stress can cause hydrolysis of storage compounds that further lower the internal osmotic potentials of the seed. Similar finding was observed by Vibhuti *et al.* (2015) [13] and Akte *et al.* (2016) [14].

Our findings suggest the genotype R 2307-73-1-38-1 possess better germination quality, while genotype R-RF-212 having poor germination quality, consistent with the findings of Bewley *et al.* (2012) [15] who emphasized that rapid and uniform germination is linked to improved seed vigor and early seedling establishment.

Germination index (GI)

Germination Index (GI) is a measure that evaluates both the speed and the uniformity of seed germination. It gives more weight to seeds that germinate earlier, so it reflects seed vigor and germination performance under stress conditions. In most drought stress experimental studies, the germination index is important character due to measure of germination speed and extent of seed germination, which may help to researchers to identify genotypes that can germinate quickly and survive under drought stress conditions.

The germination index of 20 genotypes of rice was analyzed at vegetative stage and the data are depicted in Table 4.1. The germination index was found significantly differed among the rice genotypes and it was varied between 6.13 to 14.23. However, significantly maximum germination index was found in genotype R 2307-73-1-38-1, which was at par with R 2272-515-2-287-1 and AAUDR-1. Significantly minimum germination index was found in genotype R-RF-212.

Shoot length (cm)

Shoot length is an important, rapid and reliable screening parameter in vitro drought study of rice. It helps identify genotypes that can sustain growth under water deficit.

Shoot length was found significantly differed among the rice genotypes (Table 4.1). However, the shoot length of all genotypes of rice was recorded between 1.33 to 7.42 cm. Significantly the highest and the lowest shoot length was found in genotype R 2307-73-1-38-1 (7.42 cm) and genotype R-RF-212 (1.33 cm), respectively.

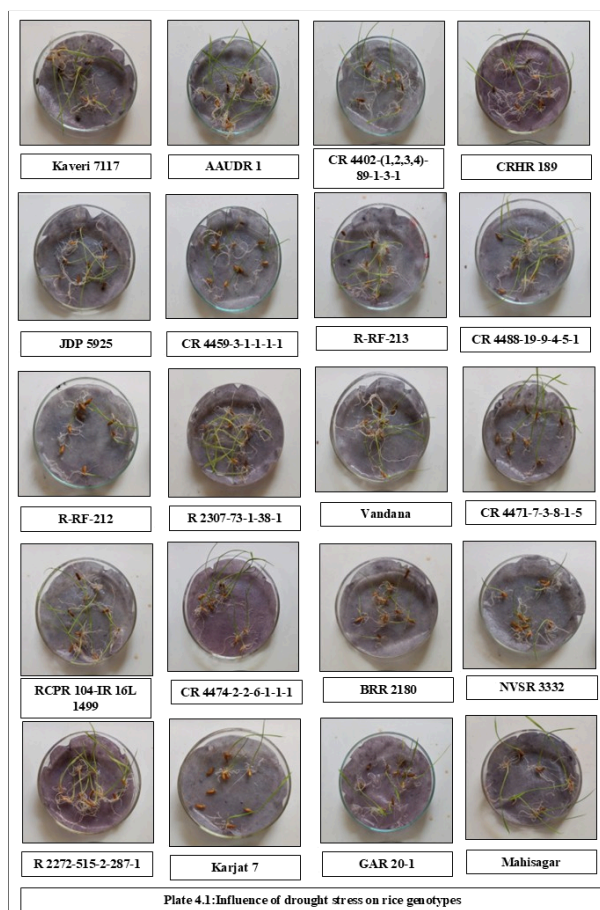


Figure 1. Rice genotypes used for experiment

Shovon *et al.* (2019) [16] studied identification of *in-vitro* PEG mediated drought tolerance genotype in rice (*Oryza sativa* L.). They have recorded that the shoot lengths were reduced under PEG stress (4.05-10.65 cm) as compared to control condition (5.60-13.65 cm).

Shoot weight (mg)

Under drought stress condition the shoot weight of rice is a key physiological and screening character in vitro study. The shoot weight of rice genotypes was measured at vegetative stage and data presented in Table 4.1. Significantly the highest and the lowest shoot length was found in genotype R 2307-73-1-38-1 (23.1 mg) and genotype R-RF-212 (3.9 mg), respectively.

Our results are accordance with various scientists, Saddique *et al.* (2020) [17], Liu *et al.* (2017) [18], Pirdashti *et al.* (2003), Garg *et al.* (2017) [19] and Xu *et al.* (2020) [20]. They have indicated that generally drought stress damages rice plants which can reflects on shoot weight.

Root length (cm)

Root length is a most important character in screening of rice genotypes under drought stress condition. Roots are directly responsible for water uptake and plant survival under water-deficit conditions. Longer root systems are often associated with greater drought tolerance, as they enable plants to extract water from deeper soil layers.

The data presented in Table 4.1 indicated that root length was significantly differed among the rice genotypes. Maximum and minimum root length observed in genotype R 2307-73-1-38-1 (10.14 cm) and in genotype R-RF-212 (3.30 cm), respectively.

Our finding is accordance with Shovon *et al.* (2020). They have found that the maximum value of root length was found in BRRI Dhan-28 (6.80 cm) followed by Dular and the lowest was recorded in Begunbichi (2.28 cm). For drought effect root length for most of the plants were decreased compared to the control conditions which is a common adverse effect of drought. Thus, the reduction of root length may occur due to decreased cell division under the stress condition.

4.1.6 Root weight (mg)

Root weight is an important parameter for in vitro screening of rice genotypes under drought stress. Roots are the first organs responsible for sensing and responding to water deficit.

Root weight was observed significantly differed among the rice genotypes (Table 4.1). However, the root weight of all rice genotypes was recorded between 4.8 to 22.4 mg. Significantly the maximum and minimum root weight was found in genotype R 2307-73-1-38-1 (22.37 mg) and genotype R-RF-212 (4.8 mg), respectively.

Our results are accordance with various scientists, Rajput *et al.* (2022), Sokoto and Muhammad (2014), Akte *et al.* (2016) [14] and Islam *et al.* (2018). They have suggested that PEG-induced drought stress reduced root weight.

4.1.7 Relative water content (%)

Relative water content provides a direct, quantitative measure of plant water status which helping identify rice genotypes that can maintain hydration, sustain physiological activity and tolerate drought stress

under in vitro conditions.

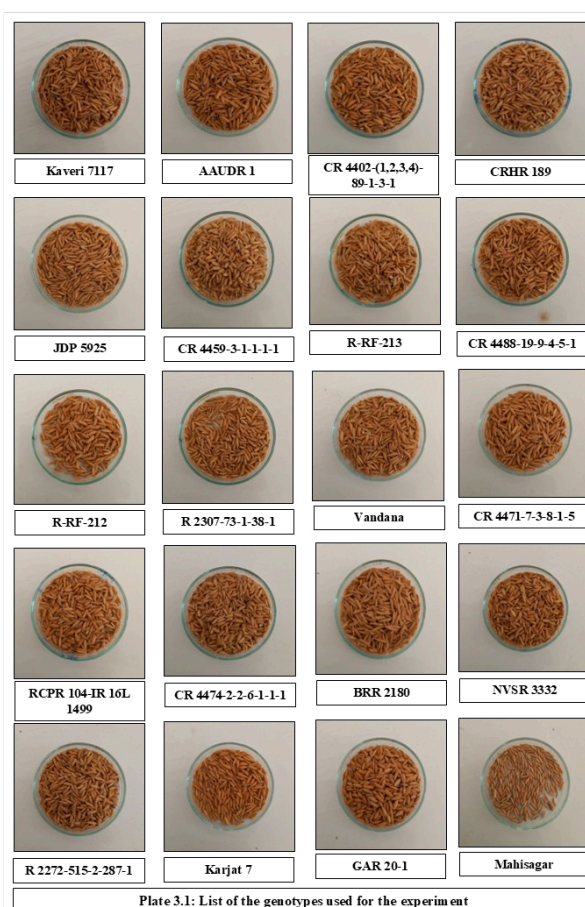


Figure 2. Influence of drought stress on rice genotypes

Table 4.1. Morpho-physiological characters of rice genotypes

No.	Genotypes	Germination %	Germination index	Shoot length (cm)	Shoot weight (mg)	Root length (cm)	Root weight (mg)	RWC (%)	MI (%)
1	KAVERI 7117	76.67	11.40	4.47	12.10	6.09	13.67	83.92	19.12
2	AAUDR-1	91.67	13.20	6.43	17.47	7.52	17.33	80.38	25.67
3	CR-4402-(1,2,3,4)-89-1-3-1	70.00	7.90	2.54	10.87	4.64	11.77	79.00	31.79
4	CRHR 189	86.67	11.67	3.31	12.47	4.36	12.90	71.27	47.78
5	JDP-5925	75.00	7.10	3.36	6.97	6.85	6.70	64.02	52.47
6	CR 4459-3-1-1-1-1	90.00	12.73	2.74	5.53	4.74	5.60	83.75	19.34
7	R-RF-213	68.33	9.13	3.84	12.17	5.14	13.10	91.42	6.44
8	CR 4488-19-9-4-5-1	73.33	9.67	5.09	14.30	3.74	14.30	81.79	22.46
9	R-RF-212	56.67	6.13	1.33	3.90	3.30	4.77	17.90	77.57
10	R 2307-73-1-38-1	96.67	14.23	7.42	23.07	10.14	22.37	97.78	1.40
11	Vandana	68.33	8.47	3.89	9.30	5.87	11.37	85.43	23.78
12	CR 4471-7-3-8-1-5	76.67	9.97	4.28	13.80	8.20	13.43	78.45	33.55
13	RCPR 104-IR 16L 1499	95.00	14.00	6.84	18.83	6.45	18.07	96.38	2.62
14	CR 4474-2-2-6-1-1-1	75.00	10.30	4.10	14.67	5.61	14.57	77.37	42.57
15	BRR 2180	85.00	12.40	3.74	6.80	4.82	7.97	87.44	12.49
16	NVSR 3332	83.33	11.97	3.63	9.10	4.68	10.63	95.61	3.73
17	R2272-515-2-287-1	93.33	13.37	5.23	15.60	6.56	16.27	94.66	4.69
18	Karjat-7	78.33	10.90	4.16	8.13	5.94	9.37	85.09	14.55
19	GAR-201	76.00	7.00	2.04	4.67	4.32	5.27	50.56	58.57

(continued on next page)

No.	Genotypes	Germination %	Germination index	Shoot length (cm)	Shoot weight (mg)	Root length (cm)	Root weight (mg)	RWC (%)	MI (%)
20	Mahisagar	81.67	12.67	2.55	8.13	7.16	9.27	81.66	20.85
	S. Em.	3.42	0.10	0.09	0.38	0.09	0.401	0.57	0.54
	CD at 5%	9.77	0.29	0.28	1.07	0.26	1.15	1.56	1.55
	CV %	7.41	1.67	4.20	5.70	2.66	5.82	1.19	3.60

The relative water content of all rice genotypes was analyzed and the data are depicted in Table 4.1. The relative water content was found significantly varied from 17.90 % to 97.78 %. Significantly higher RWC was found in genotype R 2307-73-1-38-1 (97.78 %), which was at par with genotype R2272-515-2-287-1 (94.66 %) and NVSR 3332 (95.61 %). Significantly the lowest RWC was recorded for genotype R- RF-212 (17.90 %).

Various researchers indicated that relative water content was severely decreased with duration of stress (Basu *et al.* 2017, Uyprasert *et al.* 2004 and Pirdashti *et al.* 2009) [21].

4.1.8 Membrane injury (%)

In specifically drought condition the membrane injury character serves as a reliable and rapid screening criterion for identifying drought tolerant/susceptible genotypes. Drought-induced oxidative stress causes damage to cellular membranes, resulting in increased electrolyte leakage. Genotypes exhibiting lower membrane injury maintain better membrane integrity, cellular function and water status under stress conditions.

The membrane injury of rice genotypes was analyzed and the data are depicted in Table 4.1. The membrane injury was found significantly varied between 1.40 % to 77.57 %. Significantly higher and lower membrane injury was found in genotype R 2307-73-1-38-1 (77.57 %) and genotype R-RF-212 (17.90 %), respectively.

Our results are agreement with Mehta *et al.* (2023) [22]. They have indicated that the membrane injury enhanced during water stress condition.

Conclusion

The screening study demonstrated significant variation among the rice genotypes in their response to water-deficit conditions. Genotype R 2307-73-1-38-1 exhibited superior performance, as evidenced by higher germination percentage, better seedling growth, and greater relative water content, coupled with lower membrane injury. In contrast, genotype R-RF-212 showed comparatively poor germination and seedling growth, lower relative water content, and higher membrane injury under water-deficit conditions. Based on the combined physiological and morphological responses, R 2307-73-1-38-1 was identified as the drought-resistant genotype, whereas R-RF-212 was identified as the drought-susceptible genotype. The results indicate that early-stage traits such as germination, seedling growth, relative water content, and membrane injury can serve as useful and reliable indicators for the preliminary screening and identification of contrasting rice genotypes for drought tolerance.

References

- Verulkar SB, Mandal NP, Dwivedi JL, Singh BN, Sinha PK, Mahato RN, Dongre P, Singh ON, Bose LK, Swain P, Robin S, Chandrababu R, Senthil S, Jain A, Shashidhar HE, Hittalmani S, Vera Cruz C, Paris T, Raman AK, Haeefe SM, Serraj R, Atlin GN, Kumar A. Breeding resilient and productive genotypes adapted to drought-prone rainfed ecosystem of India. *Field Crops Research*. 2010;117(2-3):197-208.
- Nahar S, Sahoo L, Tanti B. Screening of drought tolerant rice through morpho-physiological and biochemical approaches. *Biocatalysis and Agricultural Biotechnology*. 2018;15:150-159.
- Panda D, Mishra SS, Behera PK. Drought tolerance in rice: Focus on recent mechanisms and approaches. *Rice Science*. 2021;28(2):119-132.
- Kumar S, Dwivedi SK, Haris AA, Prakash V, Mondal S, Singh SK. Screening and identification of rice genotypes for drought tolerance at reproductive stage under rainfed lowland condition. *Journal of AgriSearch*. 2015;2(2):105-111.
- Firoozeh T, Ahmad M, Shekoofeh E. Effect of exogenous silicon on germination and seedling establishment in *Borago officinalis* L. *Journal of Medicinal Plants Research*. 2012;6(10):1896-1901.
- Weatherley PE. Studies in the water relations on the cotton plant. I. The field measurement of water deficits in leaves. *New Phytologist*. 1950;49:81-87.
- Suvillan CY. Techniques for measuring plant drought stress. *Drought Injury and Resistance in Crops*. 1971;2:1-18.
- Govindaraj M, Shanmugasundaram P, Sumathi P, Muthiah AR. Simple, rapid and cost effective screening method for drought resistant breeding in pearl millet. *Electronic Journal of Plant Breeding*. 2010;1(4):590-599.
- Kim YJ, Shanmugasundaram S, Yun SJ, Park HK, Park MS. A simple method of seedling screening for drought tolerance in soybean. *Korean Journal of Crop Sciences*. 2001;46(4):284-288.
- Radhouane L. Response of Tunisian autochthonous pearl millet (*Pennisetum glaucum* (L.)) to drought stress induced by polyethylene glycol (PEG) 6000. *African Journal of Biotechnology*. 2007;6(9).
- Xu W, Cui K, Xu A, Nie L, Huang J, Peng S. Drought stress condition increases root to shoot ratio via alteration of carbohydrate partitioning and enzymatic activity in rice seedlings. *Acta Physiologiae Plantarum*. 2015;37(2):9.
- Sabesan T, Saravanan K. In vitro screening of *Indica* rice genotypes for drought tolerance using polyethylene glycol. *International Journal of Advances in Agricultural & Environmental Engineering*. 2016;3(2):375-380.
- Vibhuti CS, Bargali K, Bargali SS. Seed germination and seedling growth parameters of rice (*Oryza sativa* L.) varieties as affected by salt and water stress. *Indian Journal of Agricultural Sciences*. 2015;85(1):102-108.
- Akte J, Yasmin S, Bhuiyan MJH, Khatun F, Roy J, Goswami K. In vitro screening of rice genotypes using polyethylene glycol under drought stress. *Progressive Agriculture*. 2016;27(2):128-135.
- Bewley JD, Bradford KJ, Hilhorst HW, Nonogaki H. Dormancy and the control of germination. In *Seeds: Physiology of Development, Germination and Dormancy*, 3rd Edition. New York, NY: Springer New York; 2012:247-297.
- Shovon SR, Arifuzzaman M, Haque MF, Biswas BK, Pervin MM. Identification of in-vitro PEG Mediated Drought Tolerance Genotype in Rice (*Oryza sativa* L.). *Journal of Advances in Biology and Biotechnology*. 2019;22:1-10.
- Saddique MAB, Ali Z, Sher MA, Farid B, Ikram RM, Ahmad MS. Proline, total antioxidant capacity, and OsP5CS gene activity in radical and plumule of rice are efficient drought tolerance indicator traits. *International Journal of Agronomy*. 2020;Article 8862792.
- Liu J, Yang H, Gosling SN, Kumm M, Flörke M, Pfister S, Hanasaki N, Wada Y, Zhang X, Zheng C, Alcamo J, Oki T. Water scarcity assessments in the past, present, and future. *Earth's Future*. 2017;5(6):545-559.

19. Garg HS, Bhattacharya C. Drought tolerance indices for screening some of rice genotypes. *International Journal of Advanced Biological Research*. 2017;7(4):671-674.
20. Xu W, Tang W, Wang C, Ge L, Sun J, Qi X, He Z, Zhou Y, Chen J, Xu Z, Ma YZ, Chen M. SiMYB56 confers drought stress tolerance in transgenic rice by regulating lignin biosynthesis and ABA signaling pathway. *Frontiers in Plant Science*. 2020;11:785.
21. Basu S, Giri RK, Benazir I, Kumar S, Rajwanshi R, Dwivedi SK, Kumar G. Comprehensive physiological analyses and reactive oxygen species profiling in drought tolerant rice genotypes under salinity stress. *Physiology and Molecular Biology of Plants*. 2017;23(4):837-850.
22. Mehta A, Dhruv JJ, Bambhaneeya SM. Morpho-physiological and biochemical attributes as tools to screen tolerance and susceptible rice cultivars for drought stress. *Environment Conservation Journal*. 2023;24(2):200-207.
23. Pirdashti H, Sarvestani ZT, Bahmanyar MA. Comparison of physiological responses among four contrast rice cultivars under drought stress conditions. *World Academy of Science, Engineering and Technology*. 2009;49:52-54.
24. Pirdashti H, Sarvestani ZT, Nematzadeh G, Ismail A. Effect of water stress on seed germination and seedling growth of rice (*Oryza sativa* L.) genotypes. *Journal of Agronomy*. 2003;2(4):217-222.
25. Uyprasert S, Toojinda T, Udomprasert N, Tragoonrung S, Vanavichit A. Proline accumulation and rooting patterns in rice in response to water deficit under rainfed lowlands. *Science Asia*. 2004;30:301-311.

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