The Pharma Innovation Journal 2022; 11(7): 2037-2048

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(7): 2037-2048

www.thepharmajournal.com
Received: 14-05-2022
Accepted: 23-06-2022

Narendra Pratap Verma
Research Scholar, Department of Crop Physiology, Acharya Narendra Deva University of Agriculture & Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

RK Yadav
Associate Professor, Department of Crop Physiology, Acharya Narendra Deva University of Agriculture & Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

AK Singh
Associate Professor, Department of Crop Physiology, Acharya Narendra Deva University of Agriculture & Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

Shambhoo Prasad
Associate Professor, Department of PMB & GE, Acharya Narendra Deva University of Agriculture & Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

Pratibha Singh
Professor, Department of Agril. Biochemistry, Acharya Narendra Deva University of Agriculture & Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

Alok Kumar Singh
Assistant Professor, Department of Crop Physiology, Acharya Narendra Deva University of Agriculture & Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

Pradip Kumar Saini
Research Scholar, Department of Crop Physiology, Acharya Narendra Deva University of Agriculture & Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

Corresponding Author:
Narendra Pratap Verma
Research Scholar, Department of Crop Physiology, Acharya Narendra Deva University of Agriculture & Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

Identification and evaluation of rice (*Oryza sativa* L.) genotypes for drought and salinity tolerance: Growth and yield approach

Narendra Pratap Verma, RK Yadav, AK Singh, Shambhoo Prasad, Pratibha Singh, Alok Kumar Singh and Pradip Kumar Saini

Abstract
The investigation entitled Identification and evaluation of rice (*Oryza sativa* L.) genotypes for drought and salinity tolerance: growth and yield approach" was conducted during *Kharif* season, 2020-21 and 2021-22 at the field of Student's Instruction Farm, Acharya Narendra Deva University of Agriculture & Technology, Kumarganj, Ayodhya-224 229 (Uttar Pradesh). In same manner 72 rice genotypes/varieties were grown for phenotype screening for Salinity in Augumented Block Design in saline soil with four checks (two resistant check Narendra Usar Dhan 3 and CSR -10, two susceptible check Barani Deep and Jaya) and growth and yield parameters data were recorded. *i.e.*, Plant height at 65, 80 DAT (cm), Plant height at maturity (cm), Tiller number plant^{-1} (count), Flag leaf area (cm^2), Fresh weight plant^{-1} (g), Dry weight plant^{-1} (g), Panicle length (cm), Numbers of grains panicle^{-1} (count), Test weight (g), Grain Yield plant^{-1} (g). Reduction in growth parameters like, plant height, tiller number shoot fresh weight and dry weight was noted in all 40 genotypes under low moisture stress as well as in salinity stress. Drought tolerant variety Nagina-22 show minimal reduction in above said character under low moisture stress. While drought susceptible variety IR-64 show maximum reduction in these character under low moisture stress. In salinity stress salt tolerant variety CSR-10 & Narendra Usar -3 show less reduction with respect to susceptible varieties Jaya which show maximum reduction under salinity condition and Yield component like, Panicle length, total number of grains, test weight, and yield per plant of all verities decreased under both low moisture stress and salinity stress. However under drought condition, maximum reduction was noticed in IR-64 followed by Jaya while lowest reduction was seen in Nagina-22 followed by DRR-44, DRR-42 Sukha Dhan-5 & Sushk Samrat. In case of salinity stress minimum reduction in yield attributing traits was seen in tolerant varieties CSR-10, Narendra Usar-3, CSR-36, CSR-43 & Narendra Usar-2 while maximum reduction was found in susceptible varieties, Barani Deep, Jaya & IR-64.

Keywords: Rice, drought, salinity, growth and yield

Introduction
Rice (*Oryza sativa* L.) is a plant of Asian origin, belonging to the family of Graminae (Poaceae). Rice is the most widely cultivated food crop in the world and plays a very important role in providing essential nutrients to a large segment (approximately 90% of the Asian population) of the world's population as it is the staple food of more than half of the world's population and is considered as the backbone of food security in India, China, and other Southeast Asian countries (USDA 2020-21). Rice is cultivated on an area of 164.19 mha in the world with an annual production of 650.19 million tons (509.87 million tons of mild rice) Statista, 2022) and more than 142 mha in Asia. Rice occupies 43% of total food grain production and 46% of total cereal production. India ranks second among the top rice producers in the world after China. Within the country, rice occupies 1/3 of the total cropped area, contributes about 40 to 43% of total food grain production, and continues to play a key role in the national food and livelihood security system (Annual report 2021-2022 Dept. of agriculture & farmer welfare MA&FW India). India ranked first in the area having 45.07 million hectares and second in production 122.27 million tonnes. The productivity of rice in India is 2713 kg per hectare. The area and production of rice in the U.P. are 5.68 mha & 15.66 million tonnes per hectare respectively. Which is 12.60% of the total area in India & 12.81% of total production in India. The productivity of rice in UP is 2759 kg per hectare. UP has ranked first in the area and second in production **(**Agriculture statistics at a glance, 2021).

In India, nearly 6.7 mha of the rice-growing area is affected by salinity stress, or 15.76% of their total harvested area. Salt-affected soils are predicted to increase from the current 6.7 mha to 16.2 mha in 2050 due to planned expansion of irrigation networks, use of poor quality water in irrigation and climate change impacts. (Sharma and Singh 2015) [12]. Rice is cultivated in several agro-ecological regions. Rice farming is highly widespread and practiced under diversified soil and climatic conditions; hence there is wide variation in variety, method of cultivation, and soil & water management practices followed. Rice is a susceptible crop to moisture stress and the adverse impact of water shortage on rice crops is seen to a large extent. Drought or water shortage is a world spread problem, seriously influencing grain production and quality, and increasing population and global climatic change make this situation more serious. It is estimated that 50% of world rice production is affected more or less by drought (Yusuff *et al*., 2004). The effect of salinity on rice resulted in failed or inhibited germination, decreased growth, leaf area, dry matter production, and seed formation **(**Khatun and Flowers, 1995), and increased empty rice grain.

Moisture stress affects rice Morphological characteristics like germination, plant height, plant biomass, number of tillers and various root and leaf traits, physiological characteristics like reduced photosynthesis, transpiration, stomatal conductance, relative water content, chlorophyll content, photosystem II activity, membrane stability and permeability, and abscisic acid content, biochemical characters, like accumulation of various osmoprotectants (proline, sugar, polyamines, and antioxidants, etc. (Kumari *et al.*, 2019) [5].

Materials and Methods

The present investigation entitled "Identification and evaluation of rice (*Oryza sativa* L.) genotypes for drought and salinity tolerance: growth and yield approach" was conducted at Student Instructional farm at Acharya Narendra Deva University of Agriculture & Technology, Kumarganj, Ayodhya (U.P.), India during *Kharif* season of 2020-21 and 2021-22. The experimental site situated 42 km away from Ayodhya head quarter and 25 km from Jagdishpur. Ayodhya region comes under semi-arid zone with hot summer and cold winters. The details of the main climatological factors such as weekly distribution of maximum and minimum temperature, relative humidity, rainfall and sunshine record during 2020-21 and 2021-22 from June to November. Maximum temperature ranged from 27.2 to 41.2 °C and minimum temperature ranged from 12.5 to 27.9 °C in the year 2020 and Maximum temperature ranged from 24.5 to 36.1 °C and minimum temperature ranged from 10.2 to 28.5 °C in the year 2021. Similarly, maximum rainfall was in the July 2020 month at 28 week (250.9 mm) and maximum rainfall was in the August 2021 month at 33 week (114.8 mm). Experiments were laid out in the natural field condition (rainfed upland & saline field) with 72 rice genotypes/varieties which were grown for phenotype screening for low moisture stress in Augmented Block Design with four checks for drought (two resistant check Nagina-22 and DRR-44, two susceptible check IR-64 and Sarju-52). In same manner 72 rice genotypes/varieties were grown for phenotype screening for Salinity in Augumented Block Design in saline soil with four checks (two resistant check Narendra Usar Dhan 3 and CSR -10, two susceptible check Barani Deep and Jaya). The statistical analysis of data was done by the method described by Gomez and Gomez (1983), using complete Augumented block design experiment.

Result and Discussion

1. (a) Plant height at 65 DAT (cm)

Data pertaining to plant height of different rice genotypes under irrigated normal field condition at 65 DAT are presented in (Table 1). Obtained data revealing that the plant height ranged from 67.32cm to 93.24cm in which highest plant height was recorded in Nagina-22(93.24) cm followed by Sarjoo-52(92.60) cm. The minimum plant height was recorded in Narendra-97(67.32) cm followed by Sukha Dhan-5(68.00) cm. The data regarding plant height in low moisture stress condition at 65 DAT presented in (Table 2) revealed that the plant height at 65 DAT ranged from 64.58cm to 90.66cm in which highest plant height was recorded in Nagina-22 (90.66) cm followed by NDR-370133 (86.53) cm. The lowest plant height was recorded in Narendra-97 (64.58) cm followed by Sukha Dhan-5 (65.75) cm. Data regarding plant height under saline field condition at 65 DAT has been presented in (Table 3) revealed that plant height ranged from 64.97 cm to 90 cm in which highest plant height was recorded in Nagina-22 (90.00) cm followed by Sarjoo-52 (88.53) cm & NDR-370133 (88.42) cm. The minimum plant height was recorded in Narendra-97 (64.97) cm followed by Sukha Dhan-5 (65.56) cm & Jaya (72.60) cm.

2. (b) Plant height at 80 DAT (cm)

Data regarding plant height under irrigated normal field condition at 80 DAT has been presented in (Table 1). The data of plant height at 80 DAT ranged from 78.16cm to 110.43cm in which maximum plant height recorded in Nagin-22 (110.43) cm followed by NDR-370133(105.54) cm. The minimum plant height was recorded in Narendra-97 (78.16) cm followed by Sukha Dhan -5 (79.74) cm. Data regarding plant height in low moisture stress condition at 80 DAT given in (Table 2). It is clear from data, in general the plant height increased with increase of plant age. The data revealed that plant height at 80 DAT ranged from 75.36 cm to 107.52 cm in which highest plant height was recorded in Nagina-22 (107.52) cm followed by NDR-370133 (100.24) cm. The lowest plant height was recorded in Narendra-97 (75.36) cm followed by Sukha Dhan-5 (77.28) cm. Data regarding plant height under saline field condition at 80 DAT has been presented in (Table 3). It is evident from the data that plant height generally increased with increase of plant age. The data revealed that plant height ranged from 75.36 cm to 106 cm in which highest plant height was recorded in Nagina-22 (106.50) cm followed by NDR-370133 (101.04) cm, Savitri (100.62) cm, & Sarjoo-52 (100.03) cm whereas the minimum plant height was recorded in Narendra-97 (75.36) cm followed by Sukha Dhan-5 (76.80) cm & Jaya (82.22) cm.

3. (c) Plant height at maturity (cm)

Data regarding plant height of different rice genotypes under irrigated normal field condition at maturity are presented in (Table 1). Obtaining data of revealing that in general plant height increases with increase of plant age. Plant height at maturity ranging from 86.84cm to 124.50cm in which the maximum plant height was observed in Nagina-22 (124.50) cm fallowed by NDR- 370133 (115.46) cm& Savitri (115.45) cm. The minimum plant height was recorded in Narendra-97 (86.84) cm Fallowed by Sukha Dhan-5 (89.46) cm. Data

regarding plant height in low moisture stress condition at maturity given in (Table 2). It is clear from data, in general the plant height increased with increase of plant age. The data revealed that plant height at maturity ranged from 83.87 cm to 121.69 cm in which highest plant height was recorded in Nagina-22 (121.69) cm followed by Savitri (109.59) cm & NDR-370133 (109.50) cm. The lowest plant height was recorded in Narendra-97 (83.87) cm followed by Sukha Dhan-5 (86.72) cm. Data regarding plant height under saline field condition at maturity has been presented in (Table 3). It is evident from the data that plant height generally increased with increase of plant age. The data revealed that plant height ranged from 83.70 cm to 120.00 cm in which highest plant height was recorded in Nagina-22 (120.00) cm followed by Savitri (110.92) cm & NDR-370133 (110.48) cm whereas the minimum plant height was recorded in Narendra-97 (83.70) cm followed by Sukha Dhan-5 (86.12) cm & Jaya (89.57) cm. The data presented in (Table 1) revealed that in general plant height increases with the increase of plant age in all genotypes. The results indicated that the plant height was reduced in all 40 genotypes grown in rainfed condition exposed to low moisture stress and salinity stress condition at all stage of observation respectively over control condition (Table 1). At 65 DAT the percent of reduction in plant height under low moisture stress condition over control condition varied from 2.77% to 9.00%. The maximum reduction in plant height under low moisture stress was recorded in IR-64 (9.00%) followed by Sarjoo-52 (8.34%), & Jaya (7.96%). Whereas genotypes Nagina-22 (2.77%) followed by DRR-44 (3.11%), Sukha Dhan-5 (3.31%), Sushk Samrat (3.49%) & Narendra-97 (4.07%) recorded minimum plant height reduction and showed tolerant reaction. Similar trend was observed at 80 DAT and at maturity stage also. Sarvestani *et al.,* (2008) [10] also observed a significant decrease in plant height of rice under water deficit condition. Reduction in plant height may be probably due to inhibition of panicle exertion under drought stress. However in case of salinity at 65 DAT, percent of reduction in plant height over control condition (Table and Fig.4.1) varied from 1.48% to 5.58%. Barani Deep (5.58%) recorded maximum reduction followed by Jaya (4.91%), NDR-8002 (4.35%) & IR-64 (4.34%). The entries with minimum decrease in plant height were CSR-10 (1.48%) followed by Narendra Usar-3 (1.75%), CSR-36 (1.78%), CSR-43 (1.88%) & Narendra Usar-2 (2.03%) and selected as tolerant cultivar. Similar trend was observed at 80 DAT and at maturity stage also. Bhowmik *et al.,* (2009) [1] also observed differences in plant height probably results due to slow growth caused by osmotic stress imposed by a high concentration of salinity in rooting zone. Reported that salinity generally reduces shoot growth of crop more than root growth, based on dry weight rather than root growth. The reduction in rice plant height in proportion to increase salinity is due to the effect of osmosis stress in reduction of water and nutrient absorption including nitrogen which is necessary for plant height.

4. Tiller number plant^{-1} (count)

Data presented in (Table 1) shows that tiller number pant^{-1} in irrigated normal field condition at 80 DAT varied from 16 to 26 in which maximum tiller number was recorded in Sarjoo-52 (26.00) followed by Sahbhagidhan (24.00) & NDR-370133(24.00). The minimum tiller number plant^{-1} was recorded in Nagina-22 (16.00) & CSR-10 (16.00) followed by Jaya (17.00), Narendra Usar-2 (17.00) & Sushk Samrat (17.00). Data presented in (Table & Fig.4.6) shows that tiller number plant^{-1} at 80 DAT varied from 12.00 to 19.00 in which Sahbhagidhan has the highest tiller number (19.00) followed by NDR-370133 (18.00), Karjat-1 (18.00), Pooja (18.00), Barani Deep (18.00) PR-113(18.00) & STBN-50 (18.00). The lowest number of tillers was found in Jaya (12.00) followed by Narendra Usar-2 (13.00), CSR-43 (13.00) & CSR-10 (13.00). It is clear from the data presented in (Table 1) the numbers of tillers plant^{-1} under saline field condition at 80 DAT varied from 12.00 to 20.00 in which maximum numbers of tillers plant^{-1} was counted in STBN-50 (20.00), STBN-9 (20.00), Sarjoo-52 (20.00) & NDR-359 (20.00) followed by STBN-46 (19.00) & Sahbhagidhan (19.00). The minimum numbers of tillers plant^{-1} was counted in Jaya (12.00) Followed by Nagina-22 (13.00) & DRR-44 (13.00). The number of tillers plant^{-1} is also an important growth parameter because it determine the grain bearing panicles. The data presented in (Table 1) indicated that the number of tillers plant^{-1} reduced in all 40 genotypes grown in rainfed condition exposed to low moisture stress and salinity stress condition respectively over control condition (Table 1). At 80 DAT the percent of reduction in number of tillers plant^{-1} under low moisture stress condition over control condition (Table 2)varied from 6.25% to 28.57%.The maximum reduction in number of tillers plant^{-1} under low moisture stress was recorded in Jaya (29.41%) followed by IR-64 (28.57%) & Sarjoo-52 (26.92%). Whereas genotypes Nagina-22 (6.25%) followed by DRR-44 (11.76%), DRR-42 (11.11%) Sukha Dhan-5 (17.65%) & Sushk Samrat (17.65%) recorded minimum reduction in number of tillers plant^{-1} and showed tolerant reaction. Tiller reduction under water deficit may be due to death of side tillers for assimilate competition. Water deficit at vegetative stage of growth significantly reduced the tiller numbers plant^{-1}in both susceptible and tolerant genotypes of rice but the reduction in tiller number is more in susceptible than in tolerant genotypes. A slight decrease in tiller number due to flowering stage water deficit has been reported by Sarvestani *et al.*, (2008) [10]. However in case of salinity at 80 DAT, percent of reduction in number of tillers plant^{-1} over control condition (Table 3) varied from 5.56% to 30.43%. Barani Deep (30.43%) recorded maximum reduction in number of tillers plant^{-1} followed by Jaya (29.41%), & IR-64 (28.57%). The entries with minimum decrease in number of tillers plant^{-1} were Narendra Usar-3 (5.56%), & CSR-36 (5.56%), followed by CSR-43 (5.88%), Narendra Usar-2 (5.88%) & CSR-10 (6.25%) and selected as tolerant cultivar. A highly significant reduction in number of tillers plant^{-1} under saline soil was reported in rice. The decrease in tillering capacity is might be due to the toxic effect of salinity on plant growth. The development of more tillers in tolerant variety may be a mechanism of salt tolerance by dilution of salt in plants.

5. Flag leaf area (cm^2)

Data pertaining to flag leaf area at 100% flowering under irrigated normal field condition at hundred percent flowering stage has been given in (Table 1). Obtained data shows that flag leaf area varied from 23.94 cm^{2}to 47.60cm^2 in which NDR-370133 have highest flag leaf area (47.60)cm^2 followed by Savitri (46.12)cm^2 The minimum flag leaf area was found in MTU-1010 (23.94)cm^2 followed by Narendra -97 (27.40)cm^2. Data in concern with flag leaf area plant^{-1} under

low moisture stress condition at hundred percent flowering stage is presented in (Table 2) which ranged from 22.46 cm^2 to 43.37 cm^2. The maximum flag leaf area $plant^{-1}$ was recorded in NDR-370133 (43.37) cm^2 followed by Savitri (43.34) cm^2 whereas minimum flag leaf area was recorded in MTU-1010 (22.46) cm^2 followed by Narendra-97 (26.06) cm^2 & PR-113 (26.56) cm^2. Data pertaining to flag leaf area (cm^2) under saline field condition at hundred percent flowering stage has been given in (Table 3). Obtained data shows that flag leaf area (cm^2) varied from 22.67 $cm^2$to 43.72 cm^2 in which STBN-31 have highest flag leaf area (43.72) cm^2 followed by NDR-370133 (43.56) cm^2, NDR-2065 (43.24) cm^2, Savitri (43.15) cm^2, NDR-359 (43.10) cm^2& CSR-10 (43.00) cm^2. The minimum flag leaf area was found in MTU-1010 (22.67) cm^2 followed by Narendra -97 (26.00) cm^2. Flag leaf area is important functional factor for photosynthesis as simulation and transpiration along rice plant life. Flag leaf area is an important parameter for rice improvement programme because it showed positive correlation with panicle length thereby was correlated with the grain yield. Found that potential yield and spikelet number positively correlated with length width and area of flag leaf It is also noticed that when flag leaf length is high the panicle length is also high. The data in relation to flag leaf area at hundred percent flowering stage presented in (Table 1). It is evident from the data, the flag leaf area was reduced in all 40 genotypes grown in rainfed condition exposed to low moisture stress and salinity stress condition respectively over control condition (Table 1). The percent of reduction in flag leaf area under low moisture stress condition (Table 1) over control condition (Table 1) varied from 2.89% to 12.04%. The maximum reduction in flag leaf area under low moisture stress was recorded in susceptible genotypes *viz*. IR-64 (12.04%) followed by Sarjoo-52 (10.87%) &Jaya (10.09%). The minimum percent of reduction in flag leaf area recorded in tolerant genotypes *viz*. Nagina-22 (2.89%) followed by DRR-44 (3.43%), Sushk Samrat (4.31%), Sukha Dhan-5 (4.59%) &Narendra-97 (4.89%). Reported that the reduction in flag leaf area is a common drought and heat avoidance mechanism. The decrease in rice growth as a result of decreasing available soil moisture content may be attributed to inhibition of growth resulting massive and irreversible expansion of cell produced by meristematic cell divisions. Water stress causes losses in tissues, which reduces turgor pressure in the cell, thereby, inhibiting the enlargement and division of cell causing reduction of plant growth, stem elongation and leaf expansion. However in case of salinity condition (Table 3) percent of reduction in flag leaf area over control condition (Table 1) varied from 14.13%. The maximum reduction in flag leaf area under sat stress was recorded in susceptible genotypes *viz.* Barani Deep (14.13%) followed by Jaya (11.53%), NDR-8002 (9.99%) IR-64 (9.42%). Minimum reduction was found in tolerant genotypes *viz*. CSR-10 (1.56%) followed by Narendra Usar-3 (1.94%), CSR-36 (2.21%), CSR-43 (2.52%), Narendra Usar-2 (2.78%), NDR-2064 (2.85%) & NDR-2065 (2.92%). The reduction in leaf area under salinity stressed plant has been credited to subdued division of cell. The reduction in flag leaf area under saline conditions were also due to reduced growth as a results of decrease water uptake, toxicity of sodium and chloride in shoot cells as well as reduced photosynthesis Bibha & V. K. Sharma (2017) [2].

6. Fresh weight $plant^{-1}$ (g)

Data regarding shoot fresh weight $plant^{-1}$ in irrigated normal field condition at 80 DAT is presented in (Table 1) shows that shoot fresh weight$plant^{-1}$ varies from 60.44g to 90.00g in which highest shoot fresh weight $plant^{-1}$was found in NDR-370133 (90.00) g followed by Sarjoo-52 (89.75) g. The lowest shoot fresh weight$plant^{-1}$ was found in MTU-1010 (60.44) g followed by Nagina-22 (64.37) g. The finding on context of shoot fresh weight $plant^{-1}$ in rice genotypes under low moisture stress condition at 80 DAT are presented in (Table 2). It is clear from data showed that the range of shoot fresh weight $plant^{-1}$ varied from 50.25 g to 74.00 g. The highest shoot fresh weight $plant^{-1}$ was found in Pooja (74.00) g followed by STBN-72 (73.53) g & NDR-370133 (73.28) g while lowest shoot fresh weight $plant^{-1}$ was found in MTU-1010 (50.25) g followed by DRR-42 (55.48) g & PR-1113 (56.00) g. Data regarding shoot fresh weight $plant^{-1}$in saline field condition at 80 DAT is presented in (Table 3) shows that shoot fresh weight $plant^{-1}$ varied from 53.97 g to 79.80 g in which maximum shoot fresh weight $plant^{-1}$ was found in STBN-72 (79.80) g followed by STBN-34 (78.69) g & NDR-370133 (78.51) g. The minimum shoot fresh weight $plant^{-1}$ was found in MTU-1010 (53.97) g followed by DRR-42 (57.36) g & Nagina-22 (57.68) g. The data in relation to shoot fresh weight$plant^{-1}$under stress condition at 80 DAT is presented in (Table & Fig.4.6) & (Table & Fig.4.10). It is evident from the data, the fresh weight$plant^{-1}$was reduced in all 40 genotypes grown in rainfed condition exposed to low moisture stress and salinity stress condition respectively over control condition (Table 1). Shoot fresh weight$plant^{-1}$ of rice decreased under low moisture stress condition (Table 2) over control condition (Table 1). Magnitude of reduction percent shoot fresh weight $plant^{-1}$ ranged from 10.49% to 21.45%. It is clear from the result that under low moisture stress condition susceptible genotypes showed a maximum reduction in shoot fresh weight while the rate of reduction is lesser in tolerant genotypes. Maximum reduction was found in IR-64 (21.45%) followed by Sarjoo-52 (20.89%) & Jaya (20.50%) and minimum reduction was found in Nagina-22 (10.4 9%) followed by DRR-44 (12.05%), Sushk Samrat (12.57%), Sukha Dhan-5 (12.79%) & Narendra-97 (13.23%). Similar results about reduction in shoot fresh weight**.** Ability to maintain good fresh weight under low moisture stress provides more substrate to the plant after rehydration and hence good recovery and yield. However in case of salinity condition (Table & Fig.4.10) percent of reduction in shoot fresh weight $plant^{-1}$over control condition (Table 3) varied from 7.17% to 14.72%. The maximum reduction in shoot fresh weight $plant^{-1}$ under sat stress was recorded in susceptible genotypes while rate of reduction is lesser in tolerant genotypes. Maximum reduction was found in Barani Deep (14.72%) followed by Jaya (14.14%), NDR-8002 (13.46%) & IR-64 (13.27%). Minimum reduction was found in tolerant genotypes *viz*. CSR-10 (7.17%) followed by Narendra Usar-3 (7.51%), CSR-36 (7.79%), CSR-43 (8.02%), Narendra Usar-2 (8.20%), NDR-2064 (8.48%) & NDR-2065 (8.81%).

7. Dry weight $plant^{-1}$ (g)

Data regarding dry weight $plant^{-1}$ in irrigated normal field condition at 80 DAT was presented in (Table 1). Obtained data revealing that the dry weight $plant^{-1}$ ranges from 22.60g

to 34.53gin which highest dry weight plant^{-1} found in NDR-370133 (34.53) g followed by Sarjoo-52 (34.35) g. The lowest value of dry weight plant^{-1}was found in MTU- 1010 (22.60) g followed by Nagina-22(23.60) g. Data regarding dry weight plant^{-1} in low moisture stress condition at 80 DAT was presented in (Table 2). Obtained data revealing that the dry weight plant^{-1} ranges from 18.76 g to 28.17 g, in which highest dry weight plant^{-1} found in Pooja (28.17) g followed by NDR-370133 (28.14) g. The lowest value of dry weight plant^{-1} was found in MTU- 1010 (18.76) g followed by PR-113(20.87) g. & DRR-42 (20.94) g. Data regarding dry weight plant^{-1}in saline field condition at 80 DAT was presented in (Table 3). Obtained data revealing that the dry weight plant^{-1} ranges from 20.19 g to 30.47 g, in which maximum dry weight plant^{-1} found in STBN-72 (30.47) g followed by Sarjoo-52 (30.19) g & Pooja (30.04) g. The minimum dry weightplant^{-1} was found in MTU-1010 (20.19) g followed by Nagina-22 (21.37) g & DRR-42 (21.84) g. The data presented in (Table & Fig.4.6) & (Table 1) indicated that the shoot dry weight plant^{-1}reduced in all 40 genotypes grown in rainfed condition exposed to low moisture stress and salinity stress condition respectively over control condition (Table 1). At 80 DAT the percent of reduction in shoot dry weight plant^{-1} under low moisture stress condition (Table & 2) over control condition (Table 1) varied from 10.34% to 21.27%. The maximum reduction in shoot dry weight plant^{-1} under low moisture stress was recorded in susceptible genotypes IR-64 (21.27%) followed by Sarjoo-52 (20.76%) & Jaya (20.40%) over control condition. Whereas minimum reduction in shoot dry weight plant^{-1} showed in tolerant genotypes Nagina-22 (10.34%) followed by DRR-44 (11.80%), Sushk Samrat (12.55%) Sukha Dhan-5 (12.82%) & Narendra-97 (13.15%). Limitation of the Photosynthate due to reduced availability of soil water may be one of the major reasons for reduced biomass. Decrease in shoot dry matter under low soil moisture is might be due to reduction of leaf area and photosynthesis rate. At 80 DAT the percent of reduction in shoot dry weight plant^{-1} under salinity condition (Table 3) over control condition (Table 1) varied from 6.14% 13.73%. The maximum reduction in shoot dry weight plant^{-1} under salinity condition was recorded in susceptible genotypes in Barani Deep (13.73%) followed by Jaya (13.12%), NDR-8002 (12.47%) & IR-64 (12.25%). Minimum reduction in shoot dry weight plant^{-1} was showed in tolerant genotypes *viz*. CSR-10 (6.14%) followed by Narendra Usar-3 (6.55%), CSR-36 (6.77%), CSR-43 (7.06%), & Narendra Usar-2 (7.19%). Results of this investigation fall in line with those observed by Pandey and Shukla (2015).

8. Panicle length (cm)

Panicle length of all observed genotypes under irrigated normal field condition varied from 23.00 cm to 33.30 cm which is presented in (Table 1) that showed maximum panicle length in NDR-2065 (33.30) cm followed by STBN-72 (32.00) cm and shortest panicle length was noted in Nagina-22 (23.00) cm followed by NDR-8002 (24.54) cm. Panicle length (cm) of all observed genotypes under low moisture stress condition varied from 21.94 cm to 30.00 cm which is presented in (Table 2) that showed maximum length of panicle in NDR-2065 (30.00) cm followed by STBN-72 (29.00) cm & DRR-44 (29.00) cm whereas shorter panicle length was noted in NDR-8002 (21.94) followed by Nagina-22 (22.20) cm & Narendra Usar-2 (23.25) cm. Panicle length of all observed genotypes under saline condition varied from 21.05 cm to 31.23 cm which is presented in (Table 3) that showed maximum panicle length in NDR-2065 (31.23) cm followed by STBN-72 (29.72) cm, STBN-14 (28.32) cm& STBN-9 (28.17) cm whereas shortest panicle length was noted in Nagina-22 (21.05) cm followed by NDR-8002 (21.49) cm. In this investigation I found that the panicle length reduced under stress condition in relation to control condition. The data presented in (Table 1) revealed that in general the panicle length decreases in all 40 genotypes grown in rainfed condition exposed to low moisture stress and salinity stress condition respectively over control condition (Table 3). The magnitude of reduction in panicle length was very high in susceptible variety in relation to resistant variety. In case of low moisture stress, the magnitude of reduction in panicle length under low moisture stress condition (Table 2) over control condition (Table 1 varied from 3.48% to 14.09%. The maximum rate of reduction in panicle length under low moisture stress was recorded in susceptible cultivars, IR-64 (14.09%) followed by Sarjoo-52 (13.74%) & Jaya (13.23%). Whereas minimum reduction in panicle length was recorded in tolerant genotypes *viz*. Nagina-22 (3.48%) followed by DRR-44 (3.97%), Sukha Dhan-5 (4.21%) & Sushk Samrat (4.26%). Similar observation was also reported by Kumar *et al.*, (2020) [4]. However in case of salinity stress condition (Table and Fig.4.13) the percent of reduction in panicle length over control (Table and Fig.4.4) varied from 4.51% to 14.80%. The maximum percent of reduction in panicle length under salinity condition was found in susceptible varieties Barani Deep (14.80%) followed by Jaya (13.72%)& IR-64 (13.20%) whereas minimum percent of reduction in panicle length was seen in resistant variety *viz*. CSR-10 (4.51%) followed by Narendra Usar-3 (4.91%), CSR-36 (5.30%), CSR-43 (5.57%) & Narendra Usar-2 (5.76%). These findings are in agreement with Bibha and Sharma (2017) [2] who reported that salt sensitive genotypes show more reduction in panicle length over control condition.

9. Numbers of grains panicle^{-1} (count)

The Observation regarding numbers of grains panicle^{-1} under irrigated normal field condition at maturity are depicted in (Table 1) that's indicated the numbers of grains panicle^{-1} ranged from 124 to 190. The highest numbers of grains panicle^{-1} was counted in Sahbhagidhan (190) followed by Narendra Usar-3 (180) whereas lowest numbers of grain panicle^{-1} counted in Saroo-52 (124) followed by MTU-1010 (130). The Observation regarding numbers of grains panicle^{-1}under low moisture stress condition at maturity are depicted in (Table 2) that's indicated the numbers of grains panicle^{-1} ranged from 101 to 169. The highest number of grain panicle^{-1} was counted in Sahbhagidhan (169) followed by Nagina-22 (166). The lowest number of grain panicle^{-1} was counted in Sarjoo-52 (101) followed by Savitri (109), Narendra-3112-1 (110) & Jaya (112). The Observation regarding numbers of grains panicle^{-1}under saline field condition at maturity is depicted in (Table 3) that's indicated the numbers of grains panicle^{-1} ranged from 107 to 170. The highest numbers of grains panicle^{-1} was counted in Narendra Usar-3 (170) followed by Sahbhagidhan (167) & Narendra Usar-2 (164) whereas lowest numbers of grain panicle^{-1}was counted in Saroo-52 (107) followed by Savitri (109), Narendr-3112-1 (114), Lalat (114), Narendra Dhan-118 (14) & Jaya (115). In the present experiment, number of grains panicle^{-1}reduced

under stress condition in relation to control condition. The data presented in (Table & Fig.4.9) & (Table & Fig.4.13) revealed that in general number of grains panicle^{-1} decreases in all 40 genotypes grown in rainfed condition exposed to low moisture stress and salinity stress condition respectively over control condition (Table 1). The magnitude of reduction in number of grains panicle^{-1}was very high in susceptible variety in relation to resistant variety. In case of low moisture stress, the magnitude of reduction in number of grains panicle^{-1}under low moisture stress condition (Table 2) over control condition (Table 1) varied from 6.21% to 19.23%. The maximum rate of reduction in number of grains panicle^{-1}under low moisture stress was recorded in susceptible cultivars, IR-64 (19.23%) followed by Sarjoo-52 (18.55%) & Jaya (17.65%). Whereas minimum reduction in number of grains panicle^{-1}was recorded in tolerant genotypes *viz*. Nagina-22 (6.21%) followed by DRR-44 (7.87%), Sukha Dhan-5 (8.33%) & Sushk Samrat (8.33%). Similar observation was also corroborated with Sharifunnesa and Islam (2017) [11] reported that percentage of spikelet sterility increased under drought stress especially in the panicle initiation stage resulting low grain yield. However in case of salinity stress condition (Table 3) the percent of reduction in number of grains panicle^{-1}over control (Table 1) varied from 5.36% to 15.63%. The maximum percent of reduction in number of grains panicle^{-1}under salinity condition was found in susceptible varieties *viz*. Barani Deep (15.63%) followed by Jaya (15.44%) & IR-64 (14.74%) whereas minimum percent of reduction in number of grains panicle^{-1}was seen in resistant variety *viz*. CSR-10 (5.36%) followed by Narendra Usar-3 (5.56%), CSR-36 (6.00%), CSR-43 (6.25%) & Narendra Usar-2 (6.29 Reported that on increasing of salinity, the reduction in grain per panicle was mainly found responsible for reduction in grain yield.

10. Test weight (g)

Test weight of 40 rice genotypes under irrigated normal field condition varied from 23.15g to 28.12g which is presented in (Table 1) that showed the maximum value of test weight in Sarjoo-52 (28.12) g followed by Sahbhagidhan (27.44) g and minimum value of test weight was noted in STBN-46 (23.15) g followed by STBN-31 (23.34) g, HUR-105 (23.34) g, NDR-359 (23.65) g& Narendra Dhan-118 (23.66) g. Test weight of 40 rice genotypes under low moisture stress condition varied from 21.56 g to 26.47 g which is presented in (Table 2) that showed the maximum value of test weight in Sahbhagidhan (26.47) g Followed by Sarjoo-52 (25.74) g & Narendra Usar-2 (25.45) whereas minimum test weight was noted in STBN-46 (21.56) g followed by STBN -31 (21.68) g, Hur-105 (21.97) g & IR-64 (22.04) g. Test weight of 40 rice genotypes under saline field condition varied from 21.55 g to 25.76 g which is presented in (Table 3) that's showed the maximum value of test weight in Narendra Usar-2 (25.76) g followed by Sarjoo-52 (25.65)g, Sahbhagidhan (25.53)g & NDR-2065 (25.51) g. The minimum value of test weight was noted in Narendra Dhan-118 (21.55) g. followed by HUR-105 (21.68) g, STBN-46 (21.95) g & IR-64 (22.04) g. The present study showed that the test weight of rice decreased under stress condition in relation to control condition. The data presented in (Table 2) revealed that in general test weight decreases in all 40 genotypes grown in rainfed condition exposed to low moisture stress and salinity stress condition respectively over control condition (Table 1). The magnitude of reduction in test weight was high in susceptible variety in relation to resistant variety over control. In case of low moisture stress, the magnitude of reduction in test weight of rice under low moisture stress condition (Table 2) over control condition (Table 1) varied from 0.59% to 9.15%. The maximum rate of reduction in test weight under low moisture stress was recorded in susceptible cultivars, IR-64 (9.15%) followed by Sarjoo-52 (8.46%) & Jaya (8.23%). Whereas minimum reduction in test weight was recorded in tolerant genotypes *viz*. Nagina-22 (0.59%) followed by DRR-44 (2.35%), Sukha Dhan-5 (3.05%), Sushk Samrat (3.01%)& Narendra-97 (3.20) Similar observation was also reported by Singh *et al.*, (2018) which showed that the resistant genotypes have les percent of reduction in yield and yield attributing traits. However in case of salinity stress condition (Table 3) the percent of reduction in test weight over control (Table 1) varied from 1.59% to 9.83%. The maximum percent of reduction in test weight under salinity condition was found in susceptible varieties Barani Deep (9.83%) followed by Jaya (9.34%)& IR-64 (9.15%) whereas minimum percent of reduction in test weight was seen in resistant variety *viz*. CSR-10 (1.59%) followed by Narendra Usar-3 (2.09%), CSR-36 (2.28%), CSR-43 (2.54%) & Narendra Usar-2 (2.72%). These findings are in agreement with Nehal *et al.*, (2018) who reported that yield and yield parameter were higher eve at higher pH in all the salt tolerant varieties in comparison to susceptible varieties.

11. Grain Yield plant^{-1} (g)

Data concerned to grain yield plant^{-1} under irrigated normal field condition was depicted in (Table and Fig.4.4) which is ranged between 39.96g to 59.65g. Maximum Grain yield plant^{-1} was recorded in Sahbhagidhan (59.65) g followed by Narendra Usar-3 (58.46) g, NDR-2101 (57.53) g, Barani Deep (57.45) g & Nagina-22 (57.22) g whereas minimum grain yield plant^{-1} was recorded in Jaya (39.46) g followed by CSR-43 (39.57) g & Narendra Dhan-118 (39.96) g. Data concerned to grain yield plant^{-1} under low moisture stress condition was depicted in (Table 2) which is ranged between 25.43 g to 49.54 g. Maximum Grain yield plant^{-1} was found in Nagina-22 (49.54) g followed by DRR-44 (45.74) g, Sahbhagidhan (45.07) g & Narendra-97 (45.06) g. The minimum grain yield plant^{-1}was found in Jaya (25.43) g followed by NDR-8002 (26.93) g & Narendra Dhan-118 (27.36) g. Data concerned to grain yield plant^{-1} under saline field condition was depicted in (Table 3) which is ranged between 25.14 g to 50.37 g. Maximum Grain yield plant^{-1} was recorded in Narendra Usar-3 (50.37) g followed by NDR-2064 (45.89) g & NDR-359 (44.72) g whereas minimum grain yield plant^{-1} was recorded in Jaya (25.14) g followed by Narendra Dhan-118 (25.86) g & NDR-8002 (26.78) g. The present study showed that the grain yield plant^{-1}of rice decreased under stress condition in relation to control condition. The data presented in (Table 2) revealed that grain yield plant^{-1}decreases in all 40 genotypes grown in rainfed condition exposed to low moisture stress and salinity stress condition respectively over control condition (Table 1). The magnitude of reduction in grain yield plant^{-1}was high in susceptible variety in relation to resistant variety over control. Under low moisture stress, the magnitude of reduction in grain yield plant^{-1}of rice under low moisture stress condition (Table 2) over control condition (Table and Fig.4.4) varied from 16.35% to 37.85%. The maximum rate of reduction in grain yield plant^{-1}under low moisture stress was recorded in susceptible cultivars, IR-64 (37.85%) followed by Sarjoo-52 (36.33%) & Jaya (35.55%). Whereas minimum reduction in

grain yield plant^{-1}was recorded in tolerant genotypes *viz*. Nagina-22 (16.35%) followed by DRR-44 (17.92%), Sukha Dhan-5 (18.84%), Sushk Samrat (18.85%) & Narendra-97 (20.50%) Similar observation was also reported by Kumar *et al.*, (2020) [4] which showed that the resistant genotypes have les percent of reduction in yield and yield attributing traits. However in case of salinity stress condition (Table 3) the percent of reduction in grain yield plant^{-1}over control (Table 1) varied from 13.15% to 37.12%. The maximum percent of reduction in grain yield plant^{-1} under salinity condition was found in susceptible varieties Barani Deep (37.12%) followed by Jaya (36.29%) & IR-64 (35.87%) whereas minimum percent of reduction in grain yield plant^{-1}was seen in resistant variety *viz*. CSR-10 (13.15%) followed by Narendra Usar-3 (13.84%), CSR-36 (14.49%), CSR-43 (15.22%) & Narendra Usar-2 (15.88%). These findings are in agreement with Nasrudin *et al.*, (2022) [6] who reported that Grain yield positively co related with salt tolerance of genotypes. Tolerant varieties show less reduction in yield in comparison of susceptible varieties.

Table 1: Mean performances of genotypes under control condition for growth parameter

Sr. No.	Genotypes/ Varieties	Plant height (cm) at 65 DAT	Plant height (cm)at 80 DAT	Plant height (cm) at Maturity	TN	FLA (cm2)	DW(g)
1	Sushksamrat	80.46	94.26	105.62	17.00	42.65	30.45
2	IR 64	79.68	89.45	96.70	21.00	38.94	28.40
3	NDR 2064	85.24	98.34	108.20	20.00	39.00	27.76
4	NDR 2065	84.00	97.26	107.16	18.00	44.54	32.45
5	NDR 359	83.92	96.84	106.54	22.00	45.23	31.64
6	Naredndra 3112-1	90.12	102.76	112.42	23.00	38.68	28.37
7	NDR 370133	92.27	105.54	115.46	24.00	47.60	34.53
8	NDR 8002	83.64	96.25	105.42	19.00	43.04	31.12
9	NDR 2101 (Shivraj)	82.96	95.47	105.40	22.00	41.78	32.36
10	Narendra 97	67.32	78.16	86.84	21.00	27.40	24.56
11	Sukhadhan 5	68.00	79.74	89.46	17.00	28.32	24.80
12	Narendra USAR-3	80.65	94.25	105.33	18.00	30.43	26.26
13	Narendra Usar-2	81.78	95.18	106.00	17.00	32.76	25.02
14	Savitri	91.00	104.67	115.45	19.00	46.12	27.52
15	Lalat	86.14	98.45	108.46	20.00	42.54	29.60
16	Jaya Check	78.14	86.55	94.34	17.00	38.06	26.76
17	Karjat- 1	84.67	97.26	107.40	23.00	43.34	33.18
18	Sarju- 52	92.46	104.57	113.64	26.00	45.00	34.35
19	Nagina-22	93.24	110.43	124.50	16.00	39.13	23.60
20	DRR-42	82.56	96.18	107.25	18.00	34.00	24.47
21	DRR-44	78.89	92.84	103.84	17.00	28.31	25.08
22	MTU-1010	87.06	99.68	110.49	20.00	23.94	22.60
23	CSR-36	83.59	97.16	107.34	18.00	41.54	28.66
24	CSR- 43	76.25	87.74	97.30	17.00	38.17	27.35
25	CSR-10	75.56	88.49	98.49	16.00	43.68	29.30
26	Govind	78.28	89.36	98.70	21.00	31.83	26.25
27	Pooja	82.56	95.28	104.27	23.00	43.25	33.68
28	HUR-105	80.94	93.37	103.17	20.00	34.36	25.50
29	Barani Deep	85.00	97.65	107.61	23.00	37.45	27.96
30	Narendra Dhan-118	84.64	96.54	105.53	22.00	31.28	26.50
31	Sahbhagi Dhan	86.15	99.74	110.46	24.00	38.32	34.17
32	PR-113	90.30	103.45	113.29	23.00	28.67	25.32
33	STBN- 9	89.24	101.82	111.53	22.00	35.38	27.86
34	STBN-14	79.86	92.34	102.12	21.00	44.65	30.90
35	STBN-31	90.58	103.25	113.14	21.00	45.50	31.67
36	STBN-34	84.94	97.53	106.43	20.00	43.56	32.36
37	STBN-46	77.85	89.67	99.55	22.00	42.93	27.44
38	STBN-50	86.54	98.42	108.95	23.00	40.36	29.08
39	STBN-72	89.22	102.24	112.55	21.00	41.58	32.34
40	STBN-75	82.49	95.78	106.47	20.00	43.98	29.56
	Mean	83.45	96.10	106.07	20.30	38.68	28.77
	Min	67.32	78.16	86.84	16.00	23.94	22.60
	Max	93.24	110.43	124.50	26.00	47.60	34.53
	SEm±	3.77	4.85	3.82	0.96	1.63	1.45
	CD at 5%	12.31	15.85	12.48	3.15	5.32	4.74

Table 2: Mean performance of genotypes under control condition for yield and yield attributing parameters

S. No.	Genotypes/ Varieties	PL (cm)	NGP	Test WT (gm)	Grain Yield (gm)
1	Sushksamrat	27.26	144.00	24.62	48.75
2	IR 64	29.10	156.00	24.26	50.07
3	NDR 2064	28.60	152.00	25.22	56.16

4	NDR 2065	33.30	147.00	26.37	50.23
5	NDR 359	28.00	149.00	23.65	55.86
6	Naredndra 3112-1	30.15	132.00	26.73	53.89
7	NDR 370133	29.46	141.00	26.14	55.99
8	NDR 8002	24.54	139.00	24.45	40.39
9	NDR 2101 (Shivraj)	26.27	163.00	25.87	57.53
10	Narendra 97	25.36	167.00	23.78	56.68
11	Sukhadhan 5	26.58	132.00	25.24	45.81
12	Narendra USAR-3	25.64	180.00	24.36	58.46
13	Narendra Usar-2	25.00	175.00	26.48	56.35
14	Savitri	28.53	124.00	25.74	41.70
15	Lalat	30.35	131.00	23.97	46.45
16	Jaya	28.20	136.00	26.86	39.46
17	Karjat- 1	31.00	155.00	24.62	53.38
18	Sarju- 52	27.59	124.00	28.12	56.82
19	Nagina-22	23.00	177.00	25.33	59.22
20	DRR-42	30.25	173.00	23.76	54.89
21	DRR-44	30.20	178.00	24.27	55.72
22	MTU-1010	27.70	130.00	24.54	45.15
23	CSR-36	28.47	150.00	24.08	44.84
24	CSR- 43	28.21	144.00	23.97	39.57
25	CSR-10	29.06	168.00	24.56	48.53
26	Govind	27.22	145.00	24.37	49.13
27	Pooja	26.50	132.00	25.42	52.62
28	HUR-105	29.50	138.00	23.34	42.01
29	Barani Deep	30.00	160.00	26.75	57.45
30	Narendra Dhan-118	26.60	133.00	23.66	39.96
31	Sahbhagi Dhan	27.60	190.00	27.44	57.65
32	PR-113	28.00	145.00	24.63	55.86
33	STBN- 9	30.19	160.00	26.24	51.24
34	STBN-14	30.72	158.00	26.72	48.32
35	STBN-31	29.00	149.00	23.34	47.80
36	STBN-34	30.15	163.00	24.96	55.51
37	STBN-46	29.00	140.00	23.15	47.23
38	STBN-50	30.00	153.00	26.74	54.05
39	STBN-72	32.00	172.00	25.38	52.86
40	STBN-75	28.45	156.00	24.64	50.27
	Mean	28.42	151.53	25.09	50.85
	Min	23.00	124.00	23.15	39.46
	Max	33.30	190.00	28.12	59.22
	SEm±	1.51	7.60	1.17	2.67
	CD at 5%	4.95	24.81	3.83	8.71

Table 3: Mean performance of genotypes under low moisture stress condition for growth parameters

S. No.	Genotypes/ Varieties	Plant height (cm) at 65 DAT	Plant height (cm) at 80 DAT	Plant height (cm) at maturity	TN	FLA	FW (g)	DW (g)
1	Sushksamrat	77.65	91.14	102.40	14.00	40.81	68.42	26.63
2	IR 64	72.51	81.65	88.51	15.00	34.25	59.65	22.36
3	NDR 2064	80.80	93.42	103.00	16.00	36.07	60.26	23.04
4	NDR 2065	79.64	92.36	102.43	14.00	41.24	69.73	27.00
5	NDR 359	78.18	91.78	101.54	17.00	42.35	68.59	26.58
6	Naredndra 3112-1	83.70	96.56	106.51	17.00	35.14	60.50	22.95
7	NDR 370133	86.53	100.24	109.50	18.00	43.37	73.28	28.17
8	NDR 8002	78.46	91.62	100.07	14.00	39.28	67.11	25.48
9	NDR 2101	77.57	90.37	99.92	16.00	37.70	68.00	26.12
10	Narendra 97	64.58	75.36	83.87	17.00	26.06	56.72	21.33
11	Sukhadhan 5	65.75	77.28	86.72	14.00	27.02	57.80	21.62
12	Narendra USAR-3	77.32	90.85	100.81	14.00	28.90	60.95	22.78
13	Narendra Usar-2	78.00	91.44	101.21	13.00	30.88	57.53	21.32
14	Savitri	86.15	99.46	109.59	15.00	43.34	61.10	23.05
15	Lalat	81.32	93.67	103.63	16.00	39.45	63.74	24.46
16	Jaya	70.27	80.92	88.51	12.00	34.22	56.62	21.30
17	Karjat- 1	80.00	93.26	102.50	18.00	40.59	72.59	27.54
18	Sarju- 52	84.75	97.14	106.26	19.00	40.11	71.00	27.22
19	Nagina-22	90.66	107.52	121.69	15.00	38.00	57.62	21.16
20	DRR-42	79.00	92.35	103.53	16.00	32.16	55.48	20.94

21	DRR-44	76.44	90.15	100.77	15.00	27.34	59.03	22.12
22	MTU-1010	82.86	94.78	105.77	16.00	22.46	50.25	18.76
23	CSR-36	79.62	93.12	103.00	14.00	39.18	65.84	24.50
24	CSR- 43	72.34	83.48	92.41	13.00	35.75	61.47	23.00
25	CSR-10	72.27	85.46	94.79	13.00	41.30	67.36	25.27
26	Govind	74.82	85.14	94.03	17.00	29.72	58.12	21.98
27	Pooja	78.43	90.72	99.76	18.00	40.35	74.00	28.14
28	HUR-105	76.57	88.80	98.35	15.00	32.00	57.63	21.25
29	Barani Deep	80.00	92.63	103.11	18.00	34.69	62.00	23.07
30	Narendra Dhan-118	79.53	92.25	99.40	17.00	28.24	60.15	22.36
31	Sahbhagi Dhan	82.00	95.59	106.13	19.00	35.87	73.00	27.54
32	PR-113	85.38	98.22	107.80	18.00	26.56	56.00	20.87
33	STBN- 9	84.67	97.43	105.40	17.00	32.68	61.77	23.00
34	STBN-14	75.67	88.34	97.55	16.00	41.25	68.25	25.49
35	STBN-31	86.00	98.06	107.34	16.00	42.34	71.32	26.50
36	STBN-34	79.25	93.25	101.26	15.00	40.22	72.00	26.58
37	STBN-46	73.12	85.14	94.38	17.00	39.47	60.45	22.46
38	STBN-50	82.24	93.27	103.58	18.00	37.45	65.02	24.15
39	STBN-72	84.68	97.86	108.03	16.00	38.66	73.53	27.00
40	STBN-75	78.36	91.76	101.38	15.00	41.00	67.80	24.90
	Mean	78.93	91.60	101.16	15.83	35.94	63.79	24.00
	Min	64.58	75.36	83.87	12.00	22.46	50.25	18.76
	Max	90.66	107.52	121.69	19.00	43.37	74.00	28.17
	SEm±	1.72	2.37	4.04	0.45	0.60	1.34	0.40
	CD at 5%	5.62	7.74	13.20	1.47	1.95	4.36	1.32

Table 4: Mean performance of genotypes under low moisture stress condition for yield and yield attributing parameter

S.No.	Genotypes/ Varieties	PL (cm)	NGP	Test WT (g)	GY (g)
1	Sushksamrat	26.10	132.00	23.88	39.56
2	IR 64	25.00	126.00	22.04	31.12
3	NDR 2064	26.00	132.00	23.87	39.78
4	NDR 2065	30.00	127.00	24.93	35.44
5	NDR 359	25.53	130.00	22.42	39.76
6	Naredndra 3112-1	26.78	110.00	24.71	35.47
7	NDR 370133	26.00	119.00	24.13	36.54
8	NDR 8002	21.94	118.00	22.64	26.93
9	NDR 2101 (Shivraj)	23.47	136.00	23.83	38.11
10	Narendra 97	24.00	151.00	23.02	45.06
11	Sukhadhan 5	25.46	121.00	24.47	37.18
12	Narendra USAR-3	24.14	159.00	23.46	43.75
13	Narendra Usar-2	23.25	154.00	25.45	41.36
14	Savitri	26.42	109.00	24.67	30.35
15	Lalat	28.00	114.00	22.64	33.12
16	Jaya	24.47	112.00	24.65	25.43
17	Karjat- 1	28.12	136.00	23.21	38.25
18	Sarju- 52	23.80	101.00	25.74	36.18
19	Nagina-22	22.20	166.00	25.18	49.54
20	DRR-42	28.33	155.00	22.96	43.48
21	DRR-44	29.00	164.00	23.70	45.74
22	MTU-1010	25.79	116.00	23.42	34.53
23	CSR-36	26.40	132.00	23.14	33.52
24	CSR- 43	26.00	126.00	22.93	29.28
25	CSR-10	27.10	148.00	23.62	36.77
26	Govind	25.40	126.00	23.21	35.43
27	Pooja	24.38	114.00	24.18	37.67
28	HUR-105	27.42	120.00	21.97	29.84
29	Barani Deep	27.24	137.00	25.39	41.26
30	Narendra Dhan-118	24.00	112.00	22.14	27.36
31	Sahbhagi Dhan	25.76	169.00	26.47	45.07
32	PR-113	25.63	124.00	23.15	40.32
33	STBN- 9	28.00	137.00	24.53	35.42
34	STBN-14	27.85	135.00	24.86	32.86
35	STBN-31	26.57	126.00	21.68	32.84
36	STBN-34	27.69	138.00	23.14	37.55
37	STBN-46	26.85	120.00	21.56	31.73
38	STBN-50	27.40	132.00	25.04	36.92

39	STBN-72	29.00	147.00	23.67	36.64
40	STBN-75	26.48	135.00	23.12	35.04
	Mean	26.07	131.65	23.72	36.56
	Min	21.94	101.00	21.56	25.43
	Max	30.00	169.00	26.47	49.54
	SEm±	0.72	1.91	0.47	1.02
	CD at 5%	2.36	6.25	1.53	3.32

Table 5: Mean performance of genotypes under salinity condition for growth parameters

S. No.	Genotypes/ Varieties	Plant height (cm) (65 DAT)	Plant height (cm) (80 DAT)	Plant height at (cm) maturity	TN	FLA	FW (gm)	DW (gm)
1	Sushksamrat	77.55	90.76	101.65	14.00	40.32	69.48	27.34
2	IR 64	76.22	85.49	92.37	15.00	35.27	65.86	24.92
3	NDR 2064	83.08	95.77	105.32	18.00	37.89	66.47	25.68
4	NDR 2065	81.57	94.38	103.93	16.00	43.24	76.55	29.93
5	NDR 359	80.92	93.30	102.59	20.00	43.10	72.53	28.53
6	Naredndra 3112-1	86.30	98.32	107.50	17.00	35.28	65.14	25.00
7	NDR 370133	88.42	101.04	110.48	18.00	43.56	78.51	30.47
8	NDR 8002	80.00	91.98	100.69	14.00	38.74	71.00	27.24
9	NDR 2101 (Shivraj)	79.52	91.42	100.88	16.00	38.27	73.46	28.59
10	Narendra 97	64.97	75.36	83.70	17.00	26.00	58.40	22.18
11	Sukhadhan 5	65.56	76.80	86.12	14.00	26.73	59.00	22.34
12	Narendra USAR-3	79.24	92.52	103.34	17.00	29.84	65.04	24.54
13	Narendra Usar-2	80.12	93.17	103.72	16.00	31.85	62.00	23.22
14	Savitri	87.54	100.62	110.92	15.00	43.15	64.53	24.60
15	Lalat	82.62	94.33	103.87	16.00	39.04	67.56	26.18
16	Jaya	72.60	82.22	89.57	12.00	33.67	61.15	23.25
17	Karjat- 1	81.12	93.12	102.76	18.00	39.62	76.33	29.24
18	Sarju- 52	88.53	100.03	108.65	20.00	41.11	78.00	30.19
19	Nagina-22	90.00	106.50	120.00	13.00	37.20	57.68	21.37
20	DRR-42	79.37	92.37	102.95	14.00	31.72	57.36	21.84
21	DRR-44	76.00	89.36	99.88	13.00	26.56	59.45	22.46
22	MTU-1010	84.00	96.10	106.47	16.00	22.67	53.97	20.19
23	CSR-36	82.10	95.35	105.30	17.00	40.62	71.00	26.72
24	CSR- 43	74.82	86.00	95.32	16.00	37.21	67.22	25.42
25	CSR-10	74.44	87.12	96.90	15.00	43.00	72.54	27.50
26	Govind	75.11	85.66	94.56	16.00	29.38	61.00	23.30
27	Pooja	79.36	91.50	100.08	18.00	40.24	78.00	30.04
28	HUR-105	77.68	89.53	98.87	16.00	31.82	60.88	22.67
29	Barani Deep	80.26	92.10	101.42	16.00	32.16	64.25	24.12
30	Narendra Dhan-118	81.00	92.31	100.86	16.00	28.44	62.67	23.59
31	Sahbhagi Dhan	82.74	95.70	105.93	19.00	35.57	78.40	30.00
32	PR-113	86.62	99.14	108.50	18.00	26.38	59.66	22.42
33	STBN- 9	86.63	98.76	108.11	20.00	34.32	68.24	25.63
34	STBN-14	77.22	89.22	98.62	18.00	42.82	74.42	28.16
35	STBN-31	87.60	99.77	109.27	18.00	43.72	77.12	28.94
36	STBN-34	82.04	94.12	102.65	17.00	41.68	78.69	29.76
37	STBN-46	75.16	86.49	95.96	19.00	41.00	66.42	24.92
38	STBN-50	83.74	95.14	105.26	20.00	38.87	70.83	26.62
39	STBN-72	86.42	98.94	108.86	18.00	40.16	79.80	29.65
40	STBN-75	80.00	92.80	103.10	17.00	42.57	72.92	27.15
	Mean	80.45	92.62	102.17	16.58	36.37	68.09	25.90
	Min	64.97	75.36	83.70	12.00	22.67	53.97	20.19
	Max	90.00	106.50	120.00	20.00	43.72	79.80	30.47
	SE±	4.02	3.42	4.92	0.65	1.83	3.36	1.18
	CD at 5%	13.13	11.16	16.06	2.13	5.97	10.98	3.84

Table 6: Mean performance of genotypes under salinity condition for yield and yield attributing parameters

S.No.	Genotypes/ Varieties	PL (cm)	NGP	Test WT (g)	GY (g)
1	Sushksamrat	24.70	128.00	23.08	34.48
2	IR 64	25.26	133.00	22.04	32.11
3	NDR 2064	26.88	142.00	24.46	45.89
4	NDR 2065	31.23	137.00	25.51	40.67
5	NDR 359	26.19	138.00	22.82	44.72
6	Naredndra 3112-1	26.47	114.00	24.50	35.56
7	NDR 370133	25.93	122.00	24.01	36.63

8	NDR 8002	21.49	120.00	22.36	26.78
9	NDR 2101 (Shivraj)	23.18	141.00	23.81	38.32
10	Narendra 97	23.15	151.00	22.46	40.89
11	Sukhadhan 5	24.14	118.00	23.72	32.58
12	Narendra USAR-3	24.38	170.00	23.85	50.37
13	Narendra Usar-2	23.56	164.00	25.76	47.40
14	Savitri	25.67	109.00	24.02	29.44
15	Lalat	26.91	114.00	22.13	31.32
16	Jaya	24.33	115.00	24.35	25.14
17	Karjat- 1	27.42	135.00	22.69	35.76
18	Sarju- 52	24.10	107.00	25.65	37.04
19	Nagina-22	21.05	161.00	23.98	43.00
20	DRR-42	27.28	153.00	22.18	38.42
21	DRR-44	27.30	158.00	22.70	39.25
22	MTU-1010	25.22	117.00	23.11	32.36
23	CSR-36	26.96	141.00	23.53	38.34
24	CSR- 43	26.64	135.00	23.36	33.55
25	CSR-10	27.75	159.00	24.17	42.15
26	Govind	24.26	127.00	22.58	33.57
27	Pooja	23.78	116.00	23.69	36.62
28	HUR-105	26.35	121.00	21.68	28.93
29	Barani Deep	25.56	135.00	24.12	36.12
30	Narendra Dhan-118	23.16	114.00	21.55	25.86
31	Sahbhagi Dhan	24.71	167.00	25.53	39.95
32	PR-113	24.89	127.00	22.78	37.94
33	STBN- 9	28.17	148.00	25.27	39.45
34	STBN-14	28.32	145.00	25.44	35.60
35	STBN-31	26.80	137.00	22.26	34.91
36	STBN-34	27.73	150.00	23.72	41.12
37	STBN-46	26.61	128.00	21.95	35.24
38	STBN-50	27.79	141.00	25.56	40.59
39	STBN-72	29.72	159.00	24.32	39.97
40	STBN-75	26.48	144.00	23.67	38.32
	Mean	25.79	136.03	23.61	36.91
	Min	21.05	107.00	21.55	25.14
	Max	31.23	170.00	25.76	50.37
	SE±	1.20	6.00	1.27	1.47
	CD at 5%	3.92	19.60	4.15	4.79

Reference

1. Bhowmik SK, Titov S, Islam MM, Siddika A, Sultana S, Haque MS. Phenotypic and genotypic screening of rice genotypes at seedling stage for salt tolerance. African Journal of Biotechnology. 2009;8(23):121-130.
2. Bibha R, Sharma VK. Screening of rice genotypes for salt tolerance in relation to morphological traits and yield components under field condition. International Journal of Agriculture Sciences, ISSN, 2017, 0975-3710pp.
3. Khatun S, Flowers TJ. Effects of salinity on seed set in rice. Plant, Cell & Environment. [Online]. 1995;18(1):61-67. Available from: doi:10.1111/j.1365-3040.1995.tb00544.x.
4. Kumar A, Sengar RS, Yadav M, Gupta S, Singh R, Chand P. Impact of Flowering Stage Drought Stress on Yield and Yield Related Attributes on Rice (*Oryza sativa* L) Genotypes. Int. J Curr. Microbiol. App. Sci. 2020;9(12):1823-1836.
5. Kumari R, Choudhury D, Goswami S, Dey N. Physiological, biochemical, and molecular screening of selected upland rice (*Oryza sativa* L.) lines from eastern India. Bulletin of the Nat. Res. Cent. 2019;43:56.
6. Nasrudin N, Isnaeni S, Fahmi P. The Effect of High Salt Stress On The Agronomic, Chlorophyll Content, and Yield Characteristics Of Several Rice Varieties. In IOP Conference Series: Earth and Environmental Science. IOP Publishing. 2022;995(1):012028.
7. Nehal N, Khan AH, Sharma N, Mishra KK, Singh M, Tripathi SK. Effect of Sodicity on RWC, Proline and Yield of Different Rice (*Oryza sativa* L.) Genotypes. Int. J Curr. Microbiol. App. Sci. 2018;7(8):118-124.
8. Pandey V, Shukla A. Acclimation and tolerance strategies of rice under drought stress. Rice science. 2015;22(4):147-161.
9. Saha S, Begum HH, Nasrin S. Effects of drought stress on growth and accumulation of proline in five rice varieties (*Oryza sativa* L.). Journal of the Asiatic Society of Bangladesh, Science. 2019;45(2):241-247.
10. Sarvestani ZT, Pirdashti H, Sanavy SAMM, Balouchi H. Study of water stress effects in different growth stages on yield and yield components of different rice (*Oryza sativa* L.) cultivars. Pak. J Biol. Sci. 2008;11(10):1303-1309.
11. Sharifunnessa M, Islam MT. Effect of drought stress at different growth stages on yield and yield components of six rice (*Oryza sativa* L.) genotypes. Fundamental and Applied Agriculture. 2017;2(3):285-289.
12. Sharma DK, Singh A. Salinity research in India-achievements, challenges and future prospects, 2015.
13. Singh S, Prasad S, Yadav V, Kumar A, Jaiswal B, Kumar A, et al. Effect of drought stress on yield and yield components of rice (*Oryza sativa* L.) genotypes. Int J

Curr Microbiol Appl Sci. 2018;7:2752-2759.
14. Yousaf Ali, Aslam Z, Awan AR, Hussain F, Cheema AA. Screening rice (*Oryza sativa* L.) lines/cultivars against salinity in relation to morphological and physiological traits and yield components. International J. Agric. and Bio. 2004;1560-8530/06-3-572-575.
15. Zeng L, Shannon MC. Salinity Effects on Seedling Growth and Yield Components of Rice. Crop Science. [Online]. 2000;40(4):996. Available from: doi:10.2135/cropsci2000.404996x