PLANT PHYSIOLOGY

6. PLANT PHYSIOLOGY

CONTENTS

6. Plant Physiology

Summary

Physiological studies under All India Co-ordinated Rice Improvement Program were conducted at nine funded centres in Plant Physiology, (Coimbatore, Maruteru, Pantnagar, Pattambi, Rewa, Raipur, Karjat, Kaul and Titabar), two ICAR institutions (IIRR Hyderabad and NRRI Cuttack) and four voluntary centres (RARS Chinsurah, NDUAT Faizabad, PJNAR Karaikal and BAU Ranchi). The trials conducted during 2022 are given as below.

Star Chart of Plant Physiology Coordinated Studies for the Year Kharif 2022

Locations	Trials						Allotted	Conducted	Conducted (%)	Not conducted	Grand Total
	Silicon	Heat Tolerance	RFU	MAS	SUB	LLS					
CHN	√	-	-	-	-	-	1	1	100	-	1
CBT	√	-	-	√	√	-	3	3	100	-	3
NRRI	-	-	√	√	√	-	3	3	100	-	3
IIRR	√	√	-	-	-	√	3	3	100	-	3
FZB	-	-	-	√	-	-	1	-	-	1	1
KJT	√	-	-	√	-	√	3	3	100	-	3
KRK	√	-	-	√	-	-	2	2	100	-	2
MTU	√	√	-	√	-	√	4	4	100	-	4
PNR	√	√	-	-	-	√	3	3	100	-	3
PTB	√	√	√	√	√	-	5	5	100	-	5
REWA	√	√	√	-	-	-	3	3	100	-	3
TTB	√	√	√	√	√	√	6	6	100	-	6
RPUR	-	-	√	-	-	√	2	2	100	-	2
RANCHI	√	-	√	√	-	-	3	3	100	-	3
KAUL	-	√		√			2	2	100		2
Total	**11**	**7**	**6**	**10**	**4**	**6**	**44**	**43**		**1**	**44**

The salient findings of the experimental research are presented below:

6.1 Influence of Silicon on improving abiotic stress tolerance in rice genotypes

In view of the importance of silica in rice nutrition, a trial was conducted at eleven AICRIP locations spread across the country with nine entries with RBD/split plot design having four replications and led out with four silicon treatments control (without external application of silicon), silicic acid, silicic acid + water stress and water stress only. The results revealed that there was no significant effect of Si application on days to 50% flowering, days to maturity, tiller number/m^2, shoot weight (g/m^2), panicle number/$m^2$and HI, whereas it significantly affected the LAI, Grain number/panicle, Total dry matter, grain yield and panicle weight. However, on the basis of grain yield, the entry 27P63 was found to be most promising among all the entries followed by US-312.

6.2 Screening of elite rice cultures for drought tolerance

A trial to study the drought tolerance traits of rice cultures with respect to yield and other attributes under dry spells was conducted with 26 introgression lines derived from multi-parent inter-crosses in the background of Krishna Hamsa during kharif-2022 season. The treatments consisted of two irrigation regimes (a) Irrigated as per the recommended schedule and (b) totally rain fed condition without any supplementary irrigation. At TTB centre the trial was conducted during Rabi (dry) season with 36 entries. Results of Analysis of variance revealed that the mean Grain Yield (g/m2) (mean of all locations) show >35% reduction under rainfed condition in comparison with irrigated control. Maximum reduction in mean grain yield (mean of all genotypes) was observed at PTB centre (>60%) followed by RAIPUR (>50%) and NRRI. Minimum reduction in grain yield was observed in IET 29834, IL-19095 and IL-19100 in which the reduction in grain yield is < 30% under rainfed condition. These genotypes could be identified as relatively tolerant to drought and suitable for rainfed cultivation. Based on drought indices computed from grain yield recorded under both irrigated as well as rainfed conditions, the results revealed that Krishna Hamsa, IL-19075, IL-19079, IET 29834 and IL-19095 have high overall rank and may be considered as relatively drought tolerant. In order to simultaneously select genotypes with higher yield and stability of performance across locations under rainfed condition, a parametric model for simultaneous selection in yield and stability "Shukla's stability variance and Kang's" statistic was performed. Based on their performance across locations and YSi values, DRR Dhan-44, IET 29834, IET 29859, IET 30241, IL-19075, IL-19079, IL-19083, IL-19095, IL-19103, IL-19186, IL-19344, IL-19353, Krishna Hamsa and Sahabhagidhan could be identified as stable genotypes under rainfed condition.

At TTB centre, based on yield under rainfed condition the genotypes IL 19206, IL 19435, IL 19185 and IL 19198 showed minimum reduction in grain yield (< 10%) in comparison with irrigated control. Based on drought tolerance indices the genotypes IL 19206, IL 19208, IL 19096, Krishna Hamsa and IL 19279 could be identified as drought tolerant and are suitable for cultivation and rainfed conditions. Multiple correlation analysis between yield obtained under rainfed condition and the computed yield indices revealed a strong positive association between for DTI, GMP, MP, YI, DI, HM, K2STI and strong negative relation was observed for DSI, SDI and, these indices are useful for identification drought tolerant genotypes.

6.3. Evaluation of rice genotypes for heat tolerance suitable for future climate

Global warming has resulted in increase in atmospheric temperature. This has resulted in increasing events of the high temperatures stress to crops at various growth stages. The objectives of this trial is to phenotype rice cultivars for high temperature tolerance and to understand the impact of high temperature stress on rice. Therefore, a trial was conducted in 7 AICRIP centres with 25 entries from IVT-E-TP breeding trial. Among entries, entry N22 recorded the lowest mean grain yield (359 g/m^2) at all the centers followed by IET29421 (426 g/m^2) and entry IET29142 (672 g/m^2) recorded the highest followed by IET28959 (590 g/m^2) with a mean of all the centers 529 g/m^2 in control treatment. Significant Variation was observed amongst the genotypes for most of the indices. The genotypes were ranked for each index and overall rank for each genotype was calculated. The genotype with high overall rank was considered as heat tolerant genotype. **Based on the overall rank, IET29142, IET28950, MTU-1156, IET28959 and IET28964 can be identified as relatively heat tolerant genotype.** Results of correlation analysis indicate that the indices like HTI (Heat Tolerance Index), GMP (Geometric Mean Production), MP (Mean Production), HI (Heat Resistance Index), HM (Harmonic Mean), K1STI, K2STI (Modified Stress Tolerance Index), Yield index (YI) showed highly significant positive association with grain yield recorded under stress condition. These indices are useful in selecting suitable genotypes for heat tolerance. Based on their performance across locations and YSi values under elevated temperature conditions genotypes DRRH-4, IET 28950, IET 28954, IET 28959, IET 28960, IET 28964, IET 29140, IET 29142, IET 29177, MTU-1121, MTU-1153 and MTU-1156 can be selected as they produced relatively higher yield under heat stress condition and showed high stability.

6.4. Physiological Characterization of selected rice genotypes for multiple abiotic stress tolerance

Screening of 20 rice accessions for multiple abiotic stress tolerance (viz., for their anaerobic germination potential and tolerant against salinity (12 dS m^{-1}) and osmotic/dehydration (1 and 2% mannitol) stresses at seedling stage) was conducted at 7 AICRIP centers. All the genotypes including tolerant checks recorded reduction in key physiological traits *viz*. germination percentage, epicotyl length, shoot and root dry weight, shoot and root length, leaf chlorophyll content and shoot Na^+/K^+ ratio in response to different abiotic stresses. Based on the multi-locational performance (considering all studied traits) of these genotypes under AG stress, we found IC-256508, Pantara, AC847A, FL478, Vandana and CR4423-17 are tolerant to AG stress

besides. Hence, these genotypes may be recommended as suitable donors having high anaerobic germination potential. Similarly, genotypes *viz*., FL478, AC1125A, Vandana, Pantara, AC847A, CR4423-8, CR4423-107, CR4423-101, CR4423-1111, IC-256508, IC-256605 and CR-4411-B-1-10-S-1-Sub-B were found to be tolerant to seedling stage salinity stress with relatively less shoot Na^+/K^+ ratio and lower VSI score. Besides, genotypes *viz*., IC-256605, Pantara, IC-256508, CR3483-29-M-4-B-Sub-79-1, CR4423-17 and Vandana showed considerable osmotic stress tolerance under 1% and 2% mannitol stress in this multi-locational trial. Considering the performance of these 20 tested entries, three entries *viz*. Pantara, IC-256508, Vandana were tolerant to all the abiotic stresses (AG, salinity and osmotic), while another genotype CR4423-17 was found tolerant to both AG and osmotic stresses and two other genotypes (AC847A and FL478) were found tolerant to salinity and AG stresses **(Table 6.4.1)**.

6.5. Screening for submergence tolerance in Rice

Fifteen different rice genotypes were included in the trial, which was conducted at four different locations (NRRI, TTB, PTB and CBT). Out of 15 lines, some entries didn't germinate in CBT center which was not included in the final analysis. The survival under two weeks of complete submergence was found to be highest in FR13A (tolerant check) across different locations, while susceptible check Naveen and Nipponbare showed only 22% and 26% survival. The center wise mean survival rate (%) varied from 48.2% (PTB) to 81.0% (CBT) with mean of 61.0% for all genotypes across all the locations. Among the tested entries, three genotypes i.e., AC289 (83.9%), AC1017A (79.70%) and AC1303B (74.7%) were identified as highly tolerant to submergence stress with statistically at par survival rate in comparison to the tolerant check FR13A based on the multi-location data. Four other entries *viz*. AC39460, CR4423-17, CR 3483-29-M-4-B-Sub-79 and AC931 showed 60-70% survival rate and can be considered as tolerant to complete submergence. Four other entries *viz*., CR4423-8, CR 3483-1-M-4-B-Sub-21, CR 3477-1-M-1-B-Sub-48, CR4423-20 showed 40-50% survival rate and can be considered as moderately tolerant to submergence stress. It was observed that most of highly tolerant and tolerant entries showed very less underwater internode elongation and also could maintain leaf starch level to a higher extent after de-submergence. But there were two entries AC1017A and AC289, which showed relatively higher stem elongation along with ~80% survival rate. These genotypes may be used as potential donors for improving submergence tolerance trait in high yielding cultivars.

6.6 Screening of rice varieties for tolerance to low light stress

The present study was formulated during 51th AGRM of AICRIP to identify and understand low light tolerance. The trial was conducted at 7 locations with 14 entries including Swarnaprabha as the tolerant check and IR8 as the susceptible check. Result indicated low light stress resulted in significant loss in yield and its components. The entries IET-27530 CR Dhan 411 CR Dhan 801 IET-31288 recorded on par grain yield under low light stress when compared with the Swarnaprabha suggesting that these genotypes have better tolerance to lowlight stress.

Detailed results

6.1 Role of Silicon in inducing abiotic stress tolerance in rice

Locations: CHN, CBT, IIRR, KJT, KRK, MTU, PNR, PTB, REWA, TTB & RANCHI

Silicon (Si) is one of the most abundant elements in soil. It is recognized as quasi essential element. It is involved in various plant growth and development processes such as photosynthesis, fertilization, biotic and abiotic stress resistance, tolerance against mineral toxicity etc in various crops. Si has been reported to enhance tolerance to multiple abiotic stress and its deficiency reduces the metabolic processes as well as the plant's ability to withstand various stresses. Plants take up Si in the form of monosilicic acid and accumulate over the upper surface of the tissues especially on the epidermis layer making a polymer of amorphous silca. The Si content of plant sample may vary between 0.1 and 10% on dry weight basis. Rice accumulates about or more than 10% Si on dry weight basis and is mostly transported inside the plant through aquaporins. The leaves of rice plants grown in the presence of Si shows an erect growth thereby improving the light distribution within the canopy. Silicon can lower the electrolyte leakage from rice leaves and therefore, promote greater photosynthetic activity in plant grown under water deficit or heat stress. Several studies have shown that Si increases the accumulation of polysaccharide in rice leaves. It plays a very important role in water use efficiency in rice thereby enhancing the tolerance to drought stress. Si is also involved in maintaining the thermal stability of lipids in cell membranes. The foliar application of Si enhances the grain quality and the yield of the crop. External application of Si has been reported to benefit agriculturally important crops such as wheat, rice, and maize by improving biomass and carbon assimilation. Various forms of Si have been demonstrated to relieve stress in various crops. Si is also reported in regulation of the accumulation of secondary metabolites in various plants.

With this background an experiment was conducted at 11 locations, with nine entries with RBD/split plot design having four replications and led out with four silicon treatments. T1: control, T2: silicic acid (0.08% Ortho silicic acid) @ 40ppm silicon at 15 DAP, 30DAP, 45DAP and 60DAP, total 4 sprays (see the detailed protocol below), T3 silicic acid (0.08% Ortho silicic acid) @ 40ppm silicon at 15 DAP, 30DAP, 45DAP and 60DAP, total 4 sprays (see the detailed protocol below) + water stress (Water stress to be imposed by withholding irrigation 12 days before flowering and again 10 days after anthesis (Total duration of stress

will be 22 days) and T4: water stress only. The nine entries consist of hybrids and high yielding varieties.

The results revolved that, silicon had no influences on Days to 50% flowering and days to maturity (Tables 6.1.1 to 6.1.2). However, location x silicon x varieties were significantly showing that there was difference in 50% flowering and days to maturity varied from location to location and variety to variety. Si application slightly enhanced the Leaf area index (LAI) at tillering and flowering stage. The effect of interaction between location x Silicon and Location x Silicon x Variety was also found to be significant. However, the interaction between Silicon and Variety was observed to be non-significant at panicle initiation and flowering stage. Plant height also showed significant difference between treatments, varieties and locations. However, Table 6.1.6 shows that rather than treatment effect, the treatment response of the entries differed significantly due to location effect. Further, the grand mean value shows that there was no significant difference between T1, T2, T3 and T4. This is probably due to plant height is genetic trait in nature. Tiller no. per plant was not significantly influenced by Si application. However, a significant and positive difference was observed in terms of interaction between Location x Silicon, Location x Silicon x Variety and Variety. It seems that there seems to be varietal and location effects for the trait Tiller no. per plant.

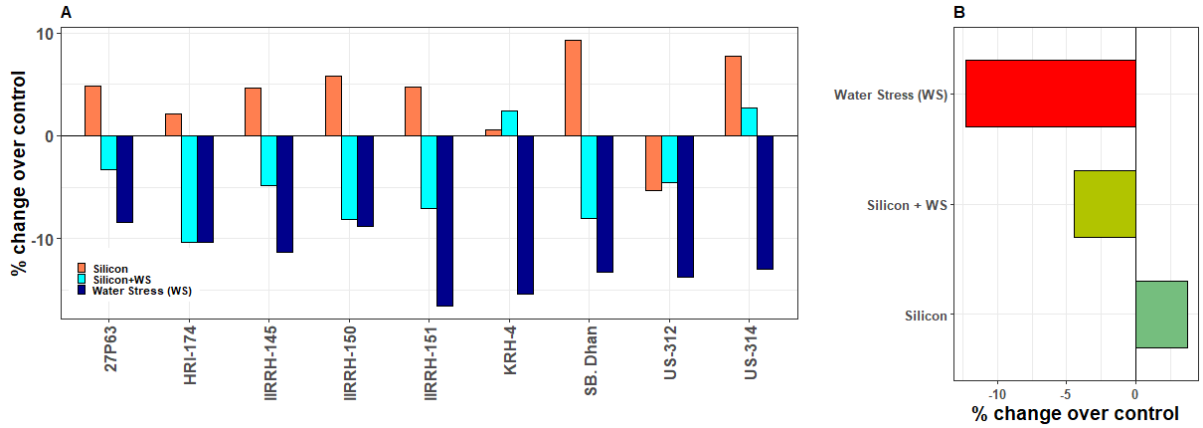


Fig 6.1.1: Percentage change in grain number per panicle with respect to control. (A) Mean of all varieties (B) Mean of all locations

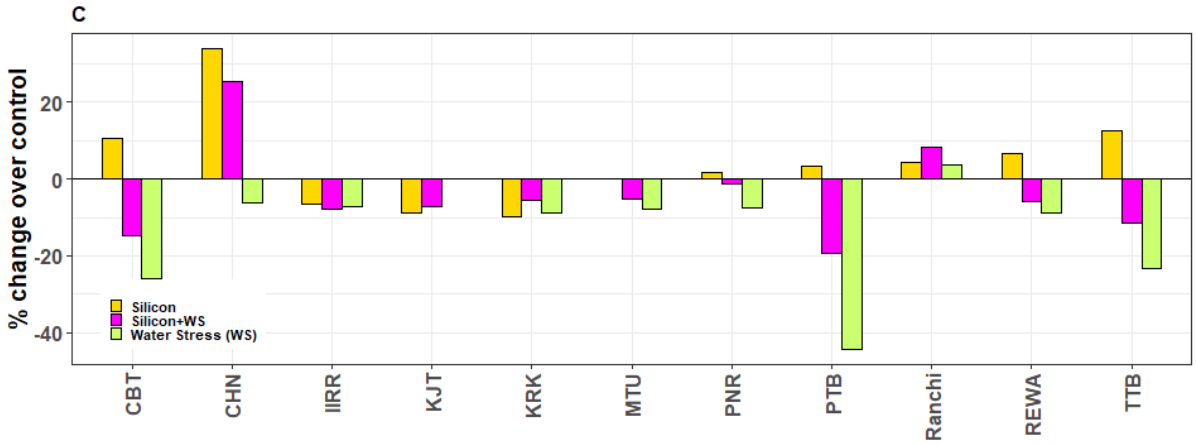


Fig 6.1.2: Percentage change in grain number per panicle with respect to control. Each value represent mean of all varieties.

Fig 6.1.1 shows % change in grain number per panicle with respect to control. (A) Mean of all varieties (B) Mean of all locations, Fig 6.1. 2 shows % change in grain number per panicle with respect to control. Table 6.1.11 shows that Si application significantly and positively affected grain number per panicle and the effect is significant irrespective of variety. However, the greatest effect in terms of % change over control was observed at the CHN center and varieties US-314, KRH-4.

Table 6.1.18 shows that Si application did not significantly affect the harvest index. Mean HI ranged from 22.0 % at Ranchi to 45.9% at IIRR center with an average of 35.5%. Highest HI was recorded by IIRR center (54.4 %) in Si application treatment (T2) in Sahabhagidhan (Table 6.1.18). Though Si application did not significantly affect the HI of entries, the entries differenced significantly in response at different locations. Only 3 centers (KRK, Ranchi and MTU) have shown the positive percentage change in HI with respect to control (Fig 6.1.3). All the entries show the negative percentage change in Harvest Index with respect to control (Fig 6.1.4B). However, in few entries Si applications seems to have reduced the percentage change in Harvest Index with respect to control compared to water stress alone. The entry Sahabhagidhan have shown the least reduction in terms of percentage change in HI with respect to control followed by US-312 (Fig 6.1.4A).

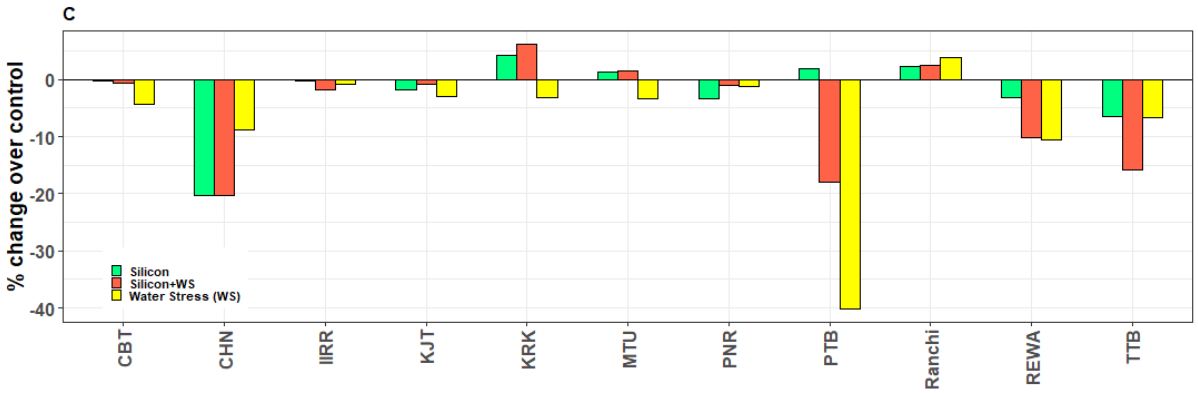


Fig 6.1.3: Percentage change in Harvest Index with respect to control. Each variety represent mean of all centres

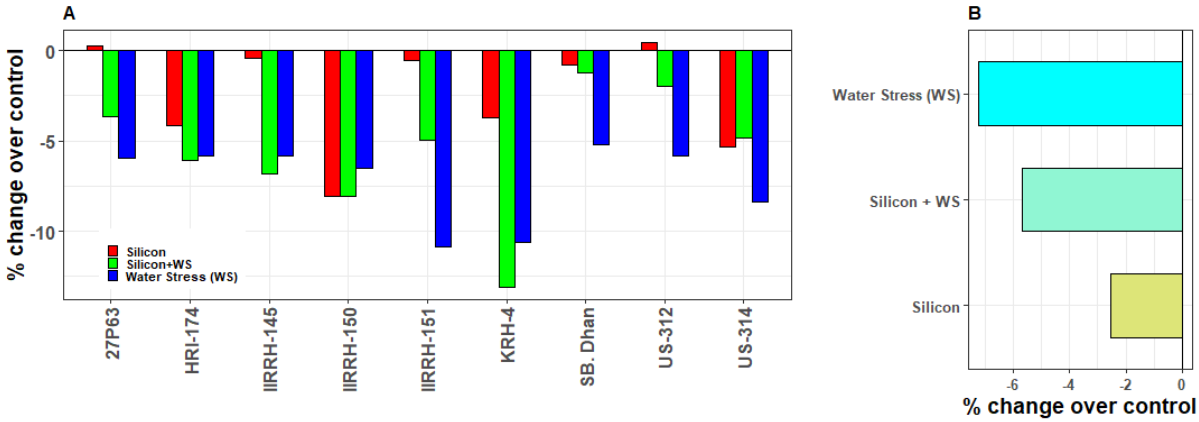


Fig 6.1.4 (A): Harvest Index mean of all varieties, (B) Mean of all locations.

Total dry matter (TDM) was significantly enhanced by Si application. The Table 6.1.16 presents the data regarding total dry matter (gm^{-2}). The interaction between Location X Si application and Variety has also shown the statistically significant effects meaning thereby all the varieties were significantly affected by Si application and environment has also significantly contributed in this interaction. The mean TDM ranged from 804 g/m^2 at PTB centre to 2244 g/m^2 at KRK center. The waters stress significantly reduced the TDM in all the genotypes and Si application has significantly reduced the impact of water stress thereby reducing the losses in terms of TDM. Overall CBT center has recorded the high TDM and the PTB has shown the low. Fig 6.1.5 shows CHN centre has shown the greatest % change of TDM over control followed by TTB and CBT. Here also variety KRH-4 and US-312 has shown better performance compared to other varieties in terms of % change of TDM over control (Fig 6.1.6A and 6.1.6B).

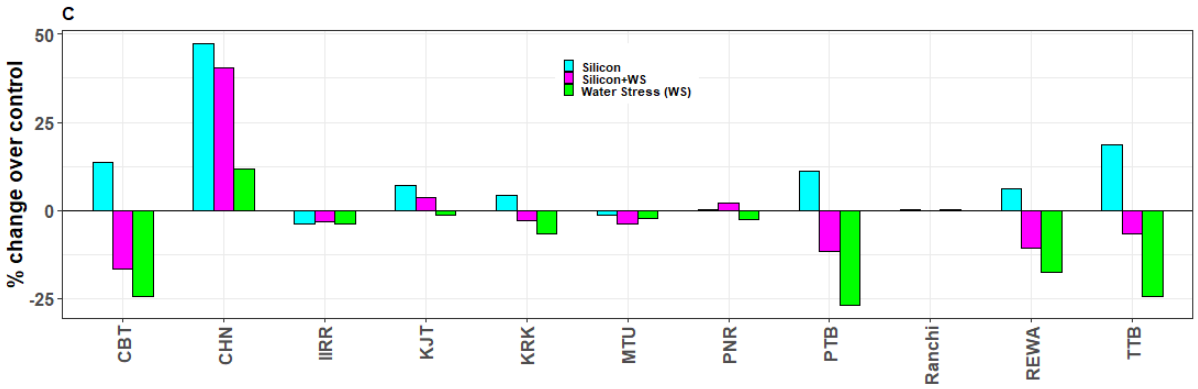


Fig 6.1.5: Percentage change in total dry matter (g/m2) with respect to control. Each value represent mean of all centres

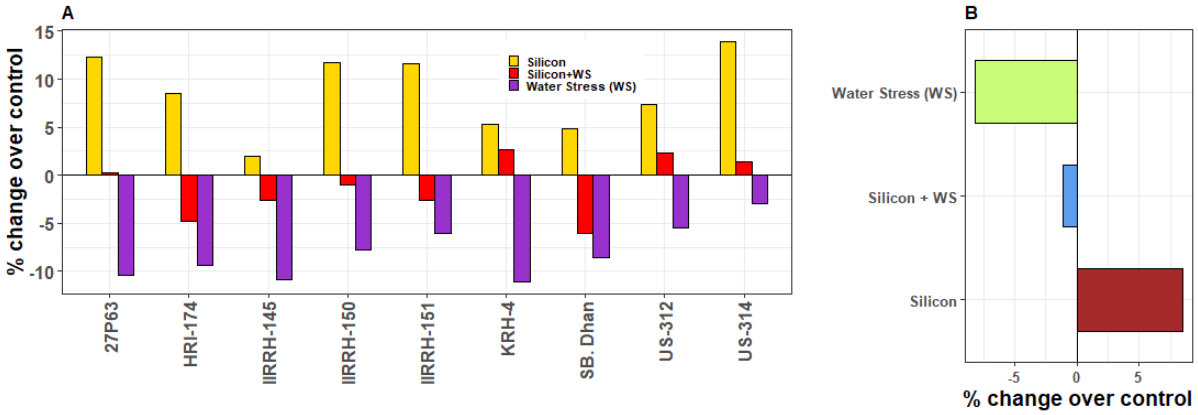


Fig 6.1.6: Percentage change in total dry matter (g/m2) with respect control. (A) Each value represent mean of all varieties. (B) Each value represents mean of all locations.

A statistically significant effect of Si application was observed for terms 1000 grain weight and the interaction effect between Location X Silicon was also significant. Though the interaction effect between Silicon X Variety and Location X Silicon X Variety was found non-significant (Table 6.1.15). However, mean 1000 grain weight varied from 16.2 gm to 30.4 gm with a mean of all the varieties at all the locations is 21.4 gm in T1. Whereas, in T3 it varied from 14.1 gm to 30.4 gm with a mean of all the entries at all the locations is 20.8. Grand mean 1000 grain weight varied from 15.6 gm to 30.6 gm with a grand mean of 21.1 gm. This means that though there is a statistically significant effect of Si application the response among entries at different location varied. Fig 6.1.7B shows the deleterious effects of water stress were reduced by Si application in all the genotypes except KRH-4. Entry KRH-4 Si application has in fact not just reduced the deleterious effects of stress but also enhanced the percentage change in 1000 grain weight with respect to control followed by US-314 (Fig 6.1.7A). Location wise effects of Si application on entries is shown by Fig 6.1.8. shows percentage change in 1000 grain weight with respect to control. Six centers (IIRR, KJT, KRK, Ranchi, TTB and PNR) show the

enhancement of the mitigation of stress effects by Si application as percentage change in 1000 grain weight with respect to control is in positive. The greatest enhancement in percentage change in 1000 grain weight with respect to control was recorded by KJT followed by KRK center.

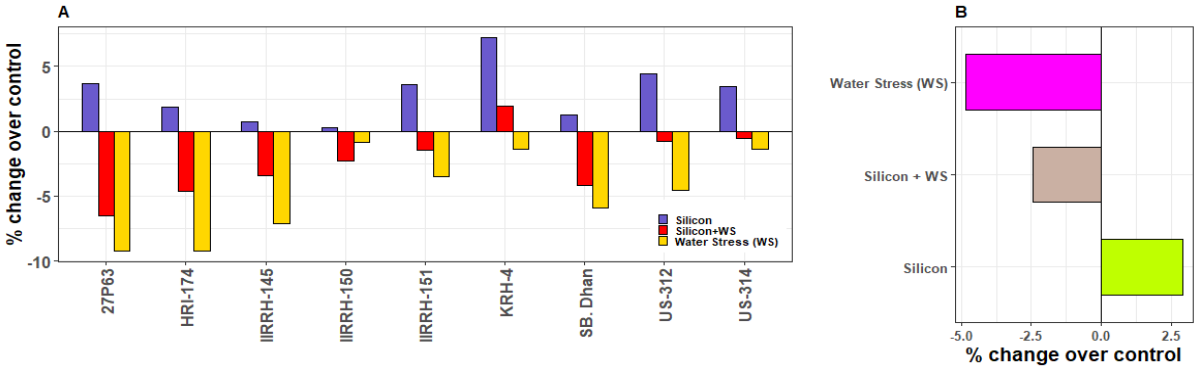


Fig 6.1.7: (A) 1000 grain weight mean of all locations, (B) 1000 grain weight mean of all varieties.

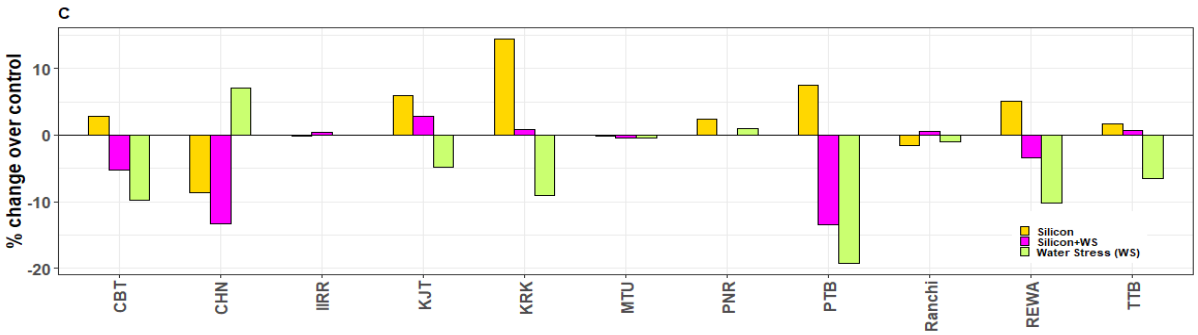


Fig 6.1.8: Percentage change in 1000 grain weight with respect to control. Each value represents mean of all locations.

The grand mean grain yield (g/m^2) varied from 229 g/m^2 at PTB to 835 g/m^2 IIRR with an average of 578 g/m^2. of The mean grain yield of Si application (T2) with respect to control (T1) increased by 4.65% and that of Si application and water stress (T3) and water stress only (T4) is -6.64 % and -13.62 % respectively (Table 6.1.17). There was a significant effect of Si application.

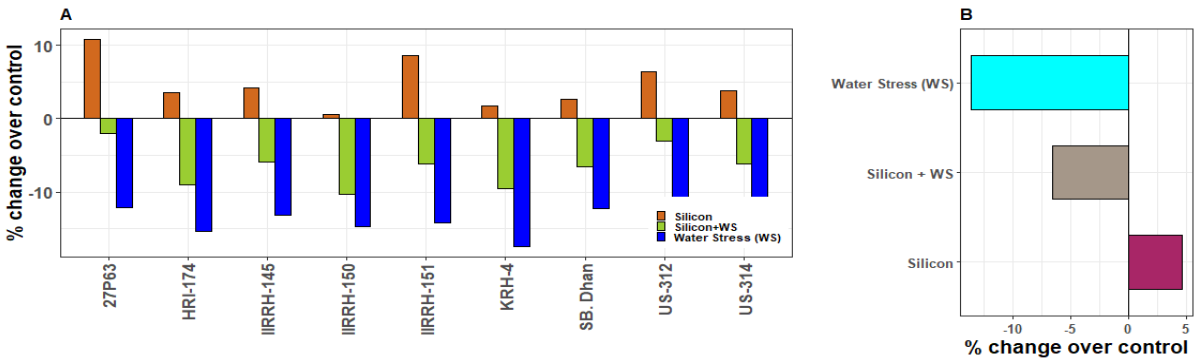


Fig 6.1.9: (A) Grain yield, mean of all Varieties, (B) Grain yield mean of all locations.

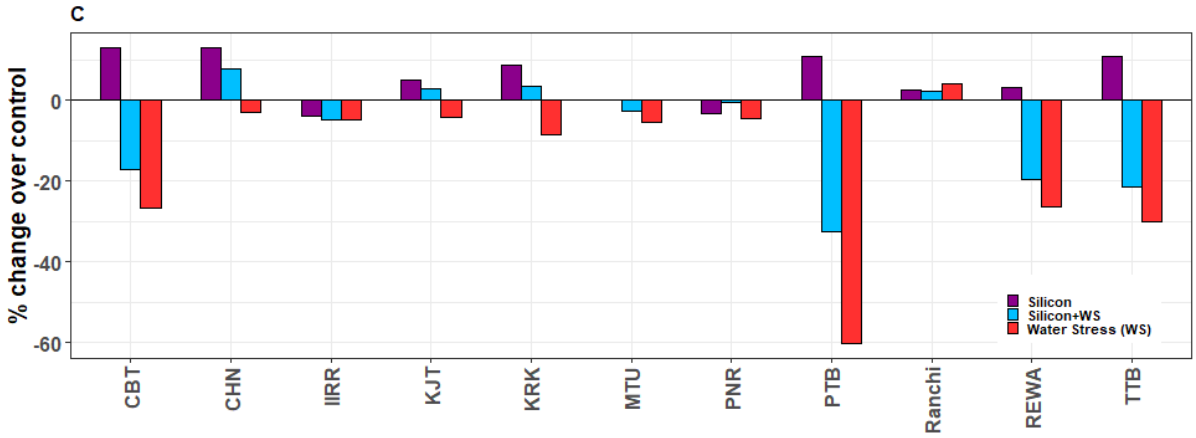


Fig 6.1.10: Percentage change in grain yield with respect to control. Each value represent mean of all locations.

The interaction effect of Si X Location and Si X Location X Variety was also found to be significant. However, varieties did not differ significantly as the interaction between Si X Variety was non-significant. Fig 6.1.9A and B shows water stress has indeed reduced the grain yield of all the entries, however the application of Si along with stress has reduced the impact of stress and therefore the reduction in grain yield is decreased compared with the control. The entry 27P63 has shown the least reduction in grain yield followed by US-312 in terms of percentage change in grain yield with respect to control. It can be observed from the Fig 6.1.10 that out of 11 centers 4 (CHN, KJT, KRK and Ranchi) have shown positive percentage change in grain yield with respect to control. Among them center CHN has shown the highest followed by KRK.

Summary and conclusion:

- In view of the importance of silica in rice nutrition, a trial was conducted at eleven AICRIP locations spread across the country with nine entries with RBD/split plot design having four replications and led out with four silicon treatments control, silicic acid, silicic acid + water stress and water stress.
- Silicon application significantly affected the LAI, Grain number/panicle, Total dry matter, grain yield and panicle weight.
- There was an increase in yield by more than 4% across the locations over the control when silicon was applied at the rate of 40ppm at three different growth stages of the rice crop.
- On the basis of grain yield, the entry 27P63 was found to be most promising among all the entries followed by US-312.

Table: 6.1.1 Influence of Silica Application days to flowering at different locations *Kharif* 2022

Treat	S.No.	Genotypes	CBT	CHN	IIRR	KJT	KRK	MTU	PNR	PTB	RANCHI	REWA	TTB	Grand Mean
T1 (Control)	1	27P63	97	96	98	106	107	96	100	98	99	93	104	99
	2	HRI-174	101	96	98	106	97	88	99	94	102	92	107	98
	3	IIRRH-145	97	94	101	107	96	85	99	92	97	89	105	96
	4	IIRRH-150	86	90	85	93	99	79	97	89	102	88	99	92
	5	IIRRH-151	86	91	83	93	99	77	95	83	101	85	103	91
	6	KRH-4	97	96	96	107	99	86	97	95	98	91	107	97
	7	SB. Dhan	90	91	85	92	99	82	99	84	98	88	96	91
	8	US-312	97	94	94	105	100	88	99	92	101	91	101	97
	9	US-314	83	91	86	94	103	86	95	84	96	90	98	91
		T1 Mean	**93**	**93**	**92**	**100**	**100**	**85**	**98**	**90**	**99**	**90**	**102**	**95**
T2 (0.08% Ortho silicic acid)	1	27P63	97	94	100	107	99	94	99	100	100	91	108	99
	2	HRI-174	101	92	100	106	102	88	99	98	102	89	110	99
	3	IIRRH-145	97	92	100	106	100	86	99	97	105	90	109	98
	4	IIRRH-150	86	89	85	95	100	78	98	87	101	92	102	92
	5	IIRRH-151	86	91	83	93	99	78	96	84	100	93	106	92
	6	KRH-4	97	95	97	106	104	87	96	92	98	94	112	98
	7	SB. Dhan	90	89	86	94	107	81	99	88	104	90	99	93
	8	US-312	97	92	90	107	99	86	99	92	103	95	104	97
	9	US-314	83	90	86	95	98	87	94	88	101	94	100	93
		T2 Mean	**93**	**91**	**92**	**101**	**101**	**85**	**98**	**92**	**102**	**92**	**106**	**96**
T3 (silicon+ water stress)	1	27P63	100	95	101	106	98	96	99	107	99	92	101	99
	2	HRI-174	101	95	101	106	100	87	97	107	98	88	107	99
	3	IIRRH-145	97	92	100	106	102	84	98	106	101	89	105	98
	4	IIRRH-150	86	89	84	96	100	78	97	91	99	91	99	92
	5	IIRRH-151	86	91	84	94	100	76	97	84	98	93	103	91
	6	KRH-4	97	96	96	103	99	88	98	105	102	93	107	99
	7	SB. Dhan	90	89	85	94	96	82	100	84	99	87	96	91
	8	US-312	97	93	94	107	102	87	99	91	97	91	101	96
	9	US-314	83	91	86	95	101	87	94	82	99	89	98	91
		T3 Mean	**93**	**92**	**92**	**101**	**100**	**85**	**98**	**95**	**99**	**91**	**102**	**95**
T4 (water stress)	1	27P63	100	95	111	106	107	94	100	89	102	95	104	100
	2	HRI-174	101	95	100	104	98	87	100	105	99	93	107	99
	3	IIRRH-145	97	91	99	103	99	85	99	105	100	93	105	98
	4	IIRRH-150	86	87	84	94	102	79	96	90	98	91	99	91
	5	IIRRH-151	86	91	84	91	101	78	96	85	97	91	103	91
	6	KRH-4	97	96	95	105	99	88	98	106	106	94	107	99
	7	SB. Dhan	90	89	86	92	99	81	100	83	100	92	96	92
	8	US-312	97	91	94	104	95	87	100	99	95	92	101	96
	9	US-314	83	91	86	96	103	87	98	84	96	91	98	92
		T4 Mean	**93**	**92**	**93**	**99**	**100**	**85**	**98**	**94**	**99**	**93**	**102**	**95**
		Grand Mean	**93**	**92**	**92**	**100**	**100**	**85**	**98**	**93**	**100**	**91**	**103**	**95**
		LSD (Silicon)				ns		LSD (Silicon x Variety)					ns	
		LSD (Location x Silicon)				2.26**		LSD (Location x Silicon x Variety)					6.27**	
		LSD (Variety)				0.94**		CV(Silicon) %					3.29	
		LSD (Location x Variety)				3.13**		CV(Residual) %					3.12	

Table: 6.1.2 Influence of Silica Application days to maturity at different locations *Kharif* 2022

Treat	S.No.	Genotypes	CBT	CHN	IIRR	KJT	KRK	MTU	PNR	PTB	Ranchi	REWA	TTB	Grand Mean
T1 (Control)	1	27P63	124	126	128	135	134	126	122	131	136	114	132	128
	2	HRI-174	124	125	131	135	134	117	121	131	137	121	137	129
	3	IIRRH-145	121	124	131	136	134	117	121	131	134	115	136	127
	4	IIRRH-150	145	120	117	122	134	110	119	123	138	116	127	125
	5	IIRRH-151	145	121	116	122	134	107	117	123	137	116	131	124
	6	KRH-4	121	126	125	136	134	114	119	131	135	118	135	127
	7	SB. Dhan	149	121	118	121	134	110	121	123	136	116	124	125
	8	US-312	121	124	125	134	134	118	121	131	136	118	129	126
	9	US-314	142	121	118	123	134	115	117	123	135	114	126	124
		T1 Mean	**132**	**123**	**123**	**129**	**134**	**115**	**120**	**127**	**136**	**116**	**131**	**126**
T2 (0.08% Ortho silicic acid)	1	27P63	122	124	131	136	134	126	121	131	136	121	136	129
	2	HRI-174	124	122	131	135	134	118	121	131	138	120	138	128
	3	IIRRH-145	121	122	130	135	134	115	121	131	139	119	137	128
	4	IIRRH-150	145	119	117	124	134	107	120	123	136	118	130	125
	5	IIRRH-151	145	121	115	122	134	107	118	123	136	118	134	125
	6	KRH-4	121	125	129	135	134	116	118	131	135	117	140	127
	7	SB. Dhan	149	119	119	123	134	109	121	123	138	117	127	125
	8	US-312	121	122	121	136	134	115	121	131	137	117	132	126
	9	US-314	142	120	119	124	134	115	116	123	138	117	128	125
		T2 Mean	**132**	**121**	**124**	**130**	**134**	**114**	**120**	**127**	**137**	**118**	**134**	**127**
T3 (silicon+ water stress)	1	27P63	124	125	132	135	134	127	121	144	137	121	129	130
	2	HRI-174	124	125	130	135	134	120	119	144	135	119	135	129
	3	IIRRH-145	121	122	131	135	134	116	120	144	137	119	133	128
	4	IIRRH-150	145	119	117	125	134	108	119	130	135	117	127	125
	5	IIRRH-151	145	121	115	123	134	107	119	130	135	117	131	125
	6	KRH-4	121	126	127	132	134	117	120	144	137	117	135	128
	7	SB. Dhan	149	119	117	123	134	111	122	130	135	117	124	126
	8	US-312	121	123	126	136	134	116	121	144	136	118	129	127
	9	US-314	142	121	118	124	134	114	116	130	135	117	126	125
		T3 Mean	**132**	**122**	**124**	**130**	**134**	**115**	**120**	**138**	**136**	**118**	**130**	**127**
T4 (water stress)	1	27P63	124	125	132	133	134	124	122	144	138	121	132	130
	2	HRI-174	124	125	131	134	134	117	122	144	136	118	135	129
	3	IIRRH-145	121	121	130	131	134	115	121	144	136	117	133	128
	4	IIRRH-150	145	117	117	123	134	106	118	130	136	119	127	125
	5	IIRRH-151	145	121	116	120	134	107	118	130	135	116	131	125
	6	KRH-4	121	126	126	134	134	119	120	144	138	118	135	129
	7	SB. Dhan	149	119	119	120	134	109	122	130	137	118	124	126
	8	US-312	121	121	125	133	134	116	122	144	134	119	129	127
	9	US-314	142	121	118	125	134	113	120	130	136	118	126	126
		T4 Mean	**132**	**122**	**124**	**128**	**134**	**114**	**120**	**138**	**136**	**118**	**130**	**127**
		Grand Mean	**132**	**122**	**124**	**129**	**134**	**115**	**120**	**133**	**136**	**118**	**131**	**127**
		LSD (Silicon)				ns		LSD (Silicon x Variety)					ns	
		LSD (Location x Silicon)				1.2**		LSD (Location x Silicon x Variety)					3.3**	
		LSD (Variety)				ns		CV(Silicon) %					1.33	
		LSD (Location x Variety)				1.6**		CV (Residual) %					1.23	

Table: 6.1.3 Influence of Silica Application Leaf area index at tillering, different locations *Kharif* 2022

Treat	S.No.	Genotypes	CBT	IIRR	KJT	KRK	PNR	PTB	REWA	Grand Mean
T1 (Control)	1	27P63	4.25	3.95	3.60	2.06	5.89	0.75	4.41	3.56
	2	HRI-174	4.17	3.87	3.32	2.23	4.89	0.88	3.86	3.32
	3	IIRRH-145	3.81	4.16	3.63	2.75	5.21	2.11	4.47	3.73
	4	IIRRH-150	3.77	3.75	3.44	2.25	4.84	1.05	3.32	3.20
	5	IIRRH-151	3.84	3.96	3.22	3.14	4.48	1.25	3.63	3.36
	6	KRH-4	3.73	4.02	3.93	3.63	5.56	0.99	4.57	3.78
	7	SB. Dhan	3.71	4.95	3.19	2.88	5.52	1.00	3.75	3.57
	8	US-312	3.66	3.46	3.55	2.40	4.64	1.27	3.48	3.21
	9	US-314	3.77	5.43	3.60	2.06	6.28	0.90	4.26	3.76
		T1 Mean	**3.86**	**4.17**	**3.50**	**2.60**	**5.26**	**1.13**	**3.97**	**3.50**
T2 (0.08% Ortho silicic acid)	1	27P63	4.30	4.37	3.85	1.47	5.07	1.99	3.57	3.52
	2	HRI-174	4.19	3.34	3.45	1.60	5.71	1.42	3.74	3.35
	3	IIRRH-145	4.13	4.04	3.60	2.38	5.25	1.60	4.56	3.65
	4	IIRRH-150	3.86	3.03	3.59	2.64	5.51	2.18	4.69	3.65
	5	IIRRH-151	3.91	3.95	3.53	1.71	3.67	1.32	4.33	3.20
	6	KRH-4	3.70	3.99	3.81	3.37	4.59	2.57	4.56	3.80
	7	SB. Dhan	3.82	2.83	3.13	1.71	5.11	1.66	3.58	3.12
	8	US-312	3.77	3.69	4.12	3.54	7.25	2.28	3.70	4.05
	9	US-314	3.90	3.56	3.86	3.03	6.44	2.69	3.93	3.92
		T2 Mean	**3.95**	**3.65**	**3.66**	**2.38**	**5.40**	**1.97**	**4.07**	**3.58**
T3 (silicon+ water stress)	1	27P63	4.20	3.52	4.09	1.79	4.61	0.81	3.56	3.23
	2	HRI-174	4.03	2.94	3.85	1.75	4.49	1.05	3.55	3.09
	3	IIRRH-145	3.63	3.38	4.65	2.44	6.43	1.02	3.96	3.64
	4	IIRRH-150	3.78	3.51	3.92	2.18	6.01	0.88	4.15	3.49
	5	IIRRH-151	3.68	2.74	3.69	1.72	4.33	1.02	3.86	3.01
	6	KRH-4	3.61	3.43	4.14	1.87	4.50	0.85	4.39	3.26
	7	SB. Dhan	3.56	4.58	3.90	2.92	4.33	0.99	3.35	3.37
	8	US-312	3.61	3.48	4.32	2.17	4.22	1.24	3.69	3.25
	9	US-314	3.67	4.32	3.82	1.56	5.05	1.17	4.32	3.42
		T3 Mean	**3.75**	**3.54**	**4.04**	**2.05**	**4.88**	**1.00**	**3.87**	**3.31**
T4 (water stress)	1	27P63	4.01	4.30	4.04	1.66	4.06	0.63	4.20	3.27
	2	HRI-174	3.97	3.38	3.57	1.46	5.12	1.02	2.88	3.06
	3	IIRRH-145	3.51	3.98	3.68	1.72	4.13	0.78	3.39	3.03
	4	IIRRH-150	3.61	4.11	3.95	2.42	5.34	0.98	3.45	3.41
	5	IIRRH-151	3.61	3.61	4.05	2.83	3.87	0.80	3.25	3.14
	6	KRH-4	3.28	4.39	4.07	2.34	4.72	1.52	3.50	3.40
	7	SB. Dhan	3.13	3.77	3.47	1.45	4.94	0.86	3.19	2.97
	8	US-312	3.51	4.78	4.14	1.96	3.93	1.09	3.22	3.23
	9	US-314	3.53	3.53	4.07	2.25	4.80	1.12	3.51	3.26
		T4 Mean	**3.57**	**3.98**	**3.89**	**2.01**	**4.55**	**0.98**	**3.40**	**3.20**
		Grand Mean	**3.78**	**3.84**	**3.77**	**2.26**	**5.02**	**1.27**	**3.83**	**3.40**
		LSD (Silicon)			ns	LSD (Silicon x Variety)				ns
		LSD (Location x Silicon)			0.59**	LSD (Location x Silicon x Variety)				1.18**
		LSD (Variety)			0.16*	CV (Silicon) %				24.01
		LSD (Location x Variety)			0.59**	CV (Residual) %				16.46

Table: 6.1.4 Influence of Silica Application Leaf area index of panicle initiation at different locations *Kharif* 2022

Treat	S.No.	Genotypes	CBT	IIRR	KJT	KRK	PNR	PTB	REWA	Grand Mean
T1 (Control)	1	27P63	4.42	6.19	4.78	4.92	8.82	1.80	8.35	5.61
	2	HRI-174	4.63	5.91	3.99	4.52	8.31	1.93	7.79	5.30
	3	IIRRH-145	3.99	6.41	4.51	3.87	7.10	3.16	8.66	5.39
	4	IIRRH-150	3.95	6.34	4.11	5.00	6.16	2.10	7.20	4.98
	5	IIRRH-151	3.80	6.23	3.85	3.80	6.21	2.30	7.72	4.84
	6	KRH-4	3.77	7.34	4.96	4.11	5.47	2.04	8.77	5.21
	7	SB. Dhan	3.86	6.25	3.64	3.10	6.26	2.05	7.59	4.68
	8	US-312	4.56	6.16	4.43	4.78	5.64	2.32	6.96	4.98
	9	US-314	4.16	5.19	4.82	5.75	7.32	1.95	9.32	5.50
		T1 Mean	**4.13**	**6.23**	**4.34**	**4.43**	**6.81**	**2.18**	**8.04**	**5.17**
T2 (0.08% Ortho silicic acid)	1	27P63	4.62	5.54	5.46	2.90	9.02	3.04	8.51	5.58
	2	HRI-174	4.87	5.48	4.52	3.93	8.99	2.47	7.92	5.45
	3	IIRRH-145	4.22	7.44	5.14	4.81	8.24	2.65	8.62	5.87
	4	IIRRH-150	4.08	5.79	4.50	5.65	6.79	3.23	7.13	5.31
	5	IIRRH-151	3.96	5.09	4.47	4.84	8.14	2.37	8.33	5.31
	6	KRH-4	3.94	6.44	5.18	5.19	6.62	3.62	8.92	5.70
	7	SB. Dhan	4.15	5.26	3.90	5.31	6.56	2.71	7.72	5.09
	8	US-312	4.72	7.70	5.24	4.98	6.27	3.33	7.08	5.62
	9	US-314	4.48	5.45	5.53	4.80	8.56	3.74	9.41	6.00
		T2 Mean	**4.34**	**6.02**	**4.88**	**4.71**	**7.69**	**3.02**	**8.18**	**5.55**
T3 (silicon+ water stress)	1	27P63	4.12	5.49	5.19	3.29	7.41	1.86	6.97	4.90
	2	HRI-174	3.82	6.28	4.37	3.86	5.91	2.10	6.66	4.71
	3	IIRRH-145	3.65	5.58	5.20	4.06	7.63	2.07	7.90	5.16
	4	IIRRH-150	3.70	6.61	4.55	5.76	5.93	1.93	8.13	5.23
	5	IIRRH-151	3.48	6.33	4.16	6.47	5.90	2.07	7.46	5.12
	6	KRH-4	3.50	7.16	5.19	4.40	6.09	1.90	8.48	5.25
	7	SB. Dhan	3.32	6.65	4.08	4.33	6.00	2.04	6.40	4.69
	8	US-312	3.64	7.05	4.88	5.28	5.28	2.29	6.79	5.03
	9	US-314	3.79	6.02	5.01	4.21	8.62	2.22	8.39	5.47
		T3 Mean	**3.67**	**6.35**	**4.74**	**4.63**	**6.53**	**2.05**	**7.46**	**5.06**
T4 (water stress)	1	27P63	3.88	6.18	4.85	3.94	6.76	1.68	7.02	4.90
	2	HRI-174	3.65	5.37	3.95	2.81	7.33	2.07	5.68	4.41
	3	IIRRH-145	3.49	5.45	4.42	4.61	6.71	1.83	6.47	4.71
	4	IIRRH-150	3.34	5.18	4.67	4.28	5.58	2.03	6.90	4.57
	5	IIRRH-151	3.09	5.33	4.27	5.00	4.53	1.85	6.30	4.34
	6	KRH-4	3.25	6.42	4.88	5.10	4.97	2.57	6.69	4.84
	7	SB. Dhan	3.14	5.81	3.96	3.48	5.48	1.91	6.36	4.31
	8	US-312	3.06	6.01	4.59	5.05	4.92	2.14	6.23	4.57
	9	US-314	3.48	6.85	4.85	4.55	6.53	2.17	7.52	5.13
		T4 Mean	**3.37**	**5.85**	**4.49**	**4.31**	**5.87**	**2.03**	**6.57**	**4.64**
		Grand Mean	**3.88**	**6.11**	**4.61**	**4.52**	**6.72**	**2.32**	**7.56**	**5.10**
		LSD (Silicon)			0.26**	LSD (Silicon x Variety)				ns
		LSD (Location x Silicon)			0.70**	LSD (Location x Silicon x Variety)				ns
		LSD (Variety)			ns	CV (Silicon) %				18.86
		LSD (Location x Variety)			0.83**	CV (Residual) %				15.49

Table: 6.1.5 Influence of Silica Application Leaf area index at flowering, different locations *Kharif* 2022

Treat	S.No.	Genotypes	CBT	IIRR	KJT	KRK	PNR	PTB	REWA	TTB	Grand Mean
T1 (Control)	1	27P63	4.81	6.93	6.08	6.43	9.11	2.53	8.35	3.46	5.96
	2	HRI-174	5.33	7.06	4.65	4.13	8.03	5.25	7.79	3.90	5.77
	3	IIRRH-145	5.03	7.26	5.55	6.83	8.81	3.90	8.66	3.93	6.25
	4	IIRRH-150	4.39	8.02	4.36	6.83	6.60	1.84	7.20	5.27	5.56
	5	IIRRH-151	4.28	6.89	4.47	5.48	6.94	2.36	7.72	5.66	5.48
	6	KRH-4	4.73	8.29	6.10	6.03	7.27	7.12	8.77	3.85	6.52
	7	SB. Dhan	4.65	7.22	4.17	4.76	6.52	1.56	7.59	4.67	5.14
	8	US-312	4.78	7.28	5.31	6.19	6.39	7.27	6.96	4.53	6.09
	9	US-314	4.83	6.54	6.04	5.16	7.20	2.50	9.32	4.64	5.78
		T1 Mean	**4.76**	**7.28**	**5.19**	**5.76**	**7.43**	**3.81**	**8.04**	**4.43**	**5.84**
T2 (0.08% Ortho silicic acid)	1	27P63	5.34	7.77	7.24	4.89	8.96	4.02	8.51	3.45	6.27
	2	HRI-174	5.45	7.64	5.65	4.05	9.02	3.23	7.92	3.97	5.86
	3	IIRRH-145	5.42	8.78	6.68	4.92	9.50	3.16	8.62	4.05	6.39
	4	IIRRH-150	4.72	8.49	4.78	4.92	9.09	2.96	7.13	5.36	5.93
	5	IIRRH-151	4.38	6.31	5.41	5.72	7.35	1.99	8.33	5.61	5.64
	6	KRH-4	4.98	7.98	7.27	5.30	8.83	5.09	8.92	3.31	6.46
	7	SB. Dhan	4.84	6.91	4.67	6.05	5.93	2.63	7.72	4.82	5.45
	8	US-312	4.90	7.71	6.42	5.40	6.99	2.46	7.08	5.33	5.79
	9	US-314	5.17	7.67	7.25	6.08	7.96	1.78	9.41	5.47	6.35
		T2 Mean	**5.02**	**7.69**	**6.15**	**5.26**	**8.18**	**3.04**	**8.18**	**4.60**	**6.02**
T3 (silicon+ water stress)	1	27P63	4.25	5.96	6.29	5.35	7.20	2.43	6.97	2.93	5.17
	2	HRI-174	4.29	5.44	4.87	6.19	8.33	1.93	6.66	3.60	5.16
	3	IIRRH-145	4.48	7.32	5.76	5.11	8.78	2.24	7.90	2.91	5.56
	4	IIRRH-150	3.87	6.67	4.63	5.17	6.91	1.76	8.13	4.40	5.19
	5	IIRRH-151	3.87	5.88	4.63	5.38	8.22	2.83	7.46	3.97	5.28
	6	KRH-4	3.99	6.86	6.24	6.03	6.87	2.19	8.48	3.00	5.46
	7	SB. Dhan	3.90	6.83	4.39	4.76	5.52	2.81	6.40	3.88	4.81
	8	US-312	3.91	5.94	5.45	6.03	6.74	2.82	6.79	3.80	5.19
	9	US-314	4.07	7.00	6.24	5.08	6.55	3.05	8.39	3.95	5.54
		T3 Mean	**4.07**	**6.43**	**5.39**	**5.46**	**7.23**	**2.45**	**7.46**	**3.60**	**5.26**
T4 (water stress)	1	27P63	3.91	6.94	5.66	7.18	5.98	2.31	7.02	2.65	5.21
	2	HRI-174	4.06	7.66	4.33	4.91	7.74	2.45	5.68	3.87	5.09
	3	IIRRH-145	4.05	7.72	5.17	5.64	8.25	2.82	6.47	2.45	5.32
	4	IIRRH-150	3.51	6.97	4.94	4.91	8.49	3.07	6.90	3.95	5.34
	5	IIRRH-151	3.50	6.72	4.66	6.48	7.20	2.11	6.30	3.35	5.04
	6	KRH-4	3.79	5.64	5.68	4.83	5.82	2.45	6.69	3.06	4.75
	7	SB. Dhan	3.69	6.54	4.32	4.64	6.19	2.44	6.36	3.60	4.72
	8	US-312	3.27	6.94	5.04	6.93	4.91	1.91	6.23	3.38	4.83
	9	US-314	3.80	7.37	5.62	6.44	6.62	2.76	7.52	3.44	5.45
		T4 Mean	**3.73**	**6.94**	**5.05**	**5.77**	**6.80**	**2.48**	**6.57**	**3.30**	**5.08**
		Grand Mean	**4.40**	**7.09**	**5.44**	**5.56**	**7.41**	**2.95**	**7.56**	**3.98**	**5.55**
		LSD (Silicon)			0.29**		LSD (Silicon x Variety)				ns
		LSD (Location x Silicon)			0.82**		LSD (Location x Silicon x Variety)				1.60**
		LSD (Variety)			ns		CV (Silicon) %				20.26
		LSD (Location x Variety)			0.80**		CV (Residual) %				13.67

Table: 6.1.6 Influence of Silica Application Plant height (cm) at flowering, different locations *Kharif* 2022

Treat	S.No.	Genotypes	CBT	CHN	IIRR	KJT	KRK	MTU	PNR	PTB	Ranchi	REWA	TTB	Grand Mean
T1 (Control)	1	27P63	98.3	104.7	118.2	111.4	108.3	128.3	136.7	120.9	99.3	113.4	113.5	113.9
	2	HRI-174	100.7	114.0	122.7	115.3	111.0	137.0	110.8	115.3	95.3	83.0	115.7	111.0
	3	IIRRH-145	105.7	120.0	130.2	119.3	128.7	146.3	123.3	123.4	96.0	78.3	110.3	116.5
	4	IIRRH-150	91.3	115.7	122.5	110.5	105.3	125.7	132.8	111.8	97.7	93.0	114.7	111.0
	5	IIRRH-151	97.7	100.7	122.2	95.7	106.7	105.7	119.7	98.7	96.0	89.1	119.0	104.6
	6	KRH-4	109.0	136.0	133.5	120.0	128.3	172.3	142.5	135.9	98.3	106.4	113.3	126.9
	7	SB. Dhan	104.0	110.0	118.8	106.3	119.7	135.7	135.0	105.0	98.0	98.7	107.0	112.6
	8	US-312	91.0	113.3	123.8	107.8	108.3	125.3	123.5	110.3	98.7	89.8	110.0	109.3
	9	US-314	96.3	112.0	115.8	113.3	101.3	128.7	134.0	95.0	97.3	88.6	110.0	108.4
		T1 Mean	**99.3**	**114.0**	**123.1**	**111.0**	**113.1**	**133.9**	**128.7**	**112.9**	**97.4**	**93.4**	**112.6**	**112.7**
T2 (0.08% Ortho silicic acid)	1	27P63	101.7	107.7	122.2	107.7	106.3	126.3	135.0	112.3	97.0	121.6	116.7	114.0
	2	HRI-174	101.3	112.3	126.3	113.1	113.0	136.3	135.2	112.9	99.7	90.7	117.0	114.3
	3	IIRRH-145	108.7	120.0	131.2	116.0	112.0	144.7	147.3	126.5	100.3	88.1	111.0	118.7
	4	IIRRH-150	95.3	112.0	124.7	106.7	112.0	124.7	112.3	114.7	93.7	96.7	113.3	109.6
	5	IIRRH-151	99.0	103.7	112.3	94.3	100.7	105.0	111.7	98.2	93.3	99.5	120.3	103.5
	6	KRH-4	109.7	133.3	125.8	116.5	132.0	173.3	134.3	128.0	101.3	113.7	117.3	125.9
	7	SB. Dhan	106.0	108.7	117.2	104.0	111.7	133.0	129.3	113.5	98.0	104.2	105.7	111.9
	8	US-312	93.3	114.7	121.2	105.9	109.7	126.7	115.0	116.5	99.0	97.8	112.0	110.2
	9	US-314	99.3	111.3	110.3	111.7	100.0	130.0	147.7	99.7	102.3	99.7	114.7	111.5
		T2 Mean	**101.6**	**113.7**	**121.2**	**108.4**	**110.8**	**133.3**	**129.8**	**113.6**	**98.3**	**101.3**	**114.2**	**113.3**
T3 (silicon+ water stress)	1	27P63	94.3	108.0	119.2	104.7	108.0	126.7	148.0	86.4	99.7	109.8	103.7	109.9
	2	HRI-174	94.7	110.0	121.5	108.7	111.3	136.0	128.3	94.0	98.3	77.3	105.0	107.7
	3	IIRRH-145	94.0	118.3	130.5	113.0	120.7	146.0	134.0	92.6	97.0	74.5	107.3	111.6
	4	IIRRH-150	88.7	116.7	123.2	104.7	110.7	124.3	129.7	97.0	98.3	80.1	113.0	107.8
	5	IIRRH-151	88.0	100.3	113.7	93.3	100.0	106.3	141.0	89.7	98.0	82.6	115.3	102.6
	6	KRH-4	102.7	134.3	123.5	114.0	123.3	171.0	113.7	99.3	97.3	101.4	112.3	117.5
	7	SB. Dhan	95.7	108.0	125.3	101.3	112.3	133.0	120.3	92.0	100.7	94.3	98.0	107.4
	8	US-312	88.0	114.3	109.3	103.7	108.3	125.0	113.0	89.0	96.0	87.8	101.0	103.2
	9	US-314	89.0	112.3	112.7	108.3	102.0	129.0	138.7	87.3	101.3	84.3	105.3	106.4
		T3 Mean	**92.8**	**113.6**	**119.9**	**105.7**	**110.7**	**133.0**	**129.6**	**91.9**	**98.5**	**88.0**	**106.8**	**108.2**
T4 (water stress)	1	27P63	90.3	110.0	121.0	104.0	108.0	127.3	128.3	86.0	98.0	104.9	87.7	106.0
	2	HRI-174	88.7	112.7	129.5	107.0	104.7	135.0	119.8	92.7	98.7	70.9	106.7	106.0
	3	IIRRH-145	85.3	118.0	133.5	110.7	115.3	145.3	148.0	90.3	99.3	73.9	104.0	111.2
	4	IIRRH-150	85.3	113.7	116.2	103.0	104.3	122.7	126.7	91.0	105.7	80.0	113.3	105.6
	5	IIRRH-151	87.3	101.3	112.8	91.7	100.7	107.3	129.5	88.3	100.0	76.6	112.7	100.8
	6	KRH-4	99.3	132.3	134.8	111.3	113.0	173.7	135.5	99.0	98.0	81.2	111.3	117.2
	7	SB. Dhan	94.7	109.0	107.2	100.0	102.7	134.0	115.7	94.0	98.7	88.5	97.3	103.8
	8	US-312	84.7	115.7	120.3	101.3	104.7	125.7	139.2	93.3	98.7	78.5	96.3	105.3
	9	US-314	88.0	111.3	117.0	107.0	100.7	129.7	124.5	85.3	97.7	67.2	110.0	103.5
		T4 Mean	**89.3**	**113.8**	**121.4**	**104.0**	**106.0**	**133.4**	**129.7**	**91.1**	**99.4**	**80.2**	**104.4**	**106.6**
		Grand Mean	**95.8**	**113.8**	**121.4**	**107.3**	**110.2**	**133.4**	**129.4**	**102.4**	**98.4**	**90.7**	**109.5**	**110.2**
		LSD (Silicon)				1.22**		LSD (Silicon x Variety)					ns	
		LSD (Location x Silicon)				4.05**		LSD (Location x Silicon x Variety)					11.20**	
		LSD (Variety)				1.68**		CV (Silicon) %					5.09	
		LSD (Location x Variety)				5.60**		CV (Residual) %					4.81	

Table: 6.1.7 Influence of Silica Application tiller number/m² at flowering, different locations *Kharif* 2022

Treat	S.No.	Genotypes	CBT	CHN	IIRR	KJT	KRK	MTU	PNR	PTB	Ranchi	REWA	TTB	Grand Mean
T1 (Control)	1	27P63	749	276	317	312	408	396	450	233	199	329	196	351
	2	HRI-174	715	275	392	344	300	385	500	250	198	342	178	353
	3	IIRRH-145	789	253	392	358	425	440	417	283	198	362	195	374
	4	IIRRH-150	599	287	400	332	358	418	567	383	198	343	207	372
	5	IIRRH-151	756	286	417	360	500	451	383	417	198	348	170	390
	6	KRH-4	732	297	400	335	383	407	417	267	199	328	150	356
	7	SB. Dhan	597	297	325	310	367	418	367	267	198	336	155	331
	8	US-312	715	297	308	304	433	429	283	267	199	326	163	339
	9	US-314	593	286	400	290	408	429	383	300	198	343	138	343
		T1 Mean	**694**	**284**	**372**	**327**	**398**	**419**	**419**	**296**	**198**	**340**	**172**	**356**
T2 (0.08% Ortho silicic acid)	1	27P63	774	264	425	334	475	407	450	233	198	336	229	375
	2	HRI-174	752	264	342	368	483	374	433	317	198	344	209	371
	3	IIRRH-145	821	267	383	383	558	429	467	283	198	358	220	397
	4	IIRRH-150	650	286	358	355	442	396	417	367	198	349	258	371
	5	IIRRH-151	792	286	433	385	583	440	467	400	199	362	274	420
	6	KRH-4	759	266	383	359	533	418	400	300	200	358	156	376
	7	SB. Dhan	629	275	350	332	375	407	417	267	198	326	184	342
	8	US-312	735	264	375	325	292	418	417	250	199	337	198	346
	9	US-314	621	264	417	310	292	407	367	250	198	326	270	338
		T2 Mean	**726**	**271**	**385**	**350**	**448**	**411**	**426**	**296**	**198**	**344**	**222**	**371**
T3 (silicon+ water stress)	1	27P63	647	286	325	321	383	385	417	333	199	276	196	342
	2	HRI-174	683	297	350	354	458	363	400	350	198	313	193	360
	3	IIRRH-145	618	253	358	367	383	418	483	400	197	326	200	364
	4	IIRRH-150	543	275	450	341	400	407	433	417	197	324	196	362
	5	IIRRH-151	729	286	375	369	400	396	400	533	199	343	205	385
	6	KRH-4	664	275	425	344	442	352	417	367	198	325	161	361
	7	SB. Dhan	552	286	392	318	425	407	400	683	197	267	149	371
	8	US-312	619	275	367	312	483	429	317	367	199	309	154	348
	9	US-314	556	297	350	298	433	396	417	650	198	293	142	366
		T3 Mean	**624**	**281**	**377**	**336**	**423**	**395**	**409**	**456**	**198**	**309**	**177**	**362**
T4 (water stress)	1	27P63	602	242	433	302	358	396	450	317	199	254	147	336
	2	HRI-174	591	264	450	332	350	352	483	317	198	300	144	344
	3	IIRRH-145	574	275	458	345	317	407	375	367	198	264	148	339
	4	IIRRH-150	510	297	408	321	642	396	400	450	199	284	170	371
	5	IIRRH-151	695	275	483	347	508	407	433	400	199	293	162	382
	6	KRH-4	615	286	383	324	275	418	433	333	200	309	144	338
	7	SB. Dhan	539	275	358	299	292	407	333	667	199	259	141	343
	8	US-312	549	286	400	293	475	418	317	267	198	250	143	327
	9	US-314	521	275	492	280	350	385	400	583	198	259	119	351
		T4 Mean	**577**	**275**	**430**	**316**	**396**	**398**	**403**	**411**	**199**	**275**	**146**	**348**
		Grand Mean	**655**	**278**	**391**	**332**	**416**	**406**	**414**	**365**	**198**	**317**	**180**	**359**
		LSD (Silicon)				ns		LSD (Silicon x Variety)					ns	
		LSD (Location x Silicon)				41.13**		LSD (Location x Silicon x Variety)					104.5**	
		LSD (Variety)				11.97*		CV (Silicon) %					15.86	
		LSD (Location x Variety)				52.25**		CV (Residual) %					13.79	

Table: 6.1.8 Influence of Silica Application shoot weight (g/m²) at maturity, different locations *Kharif* 2022

Treat	S.No.	Genotypes	CBT	CHN	IIRR	KJT	KRK	MTU	PNR	PTB	Ranchi	REWA	TTB	Grand Mean
T1 (Control)	1	27P63	1123	485	1011	967	1250	746	1063	493	769	727	574	837
	2	HRI-174	1083	642	1130	788	1411	777	1089	527	748	439	550	835
	3	IIRRH-145	1185	811	990	963	1729	776	1373	356	728	480	490	898
	4	IIRRH-150	997	689	661	582	1176	799	1156	400	730	533	550	752
	5	IIRRH-151	772	848	665	777	1245	759	741	370	748	557	555	731
	6	KRH-4	1439	380	989	628	1796	730	1392	387	737	560	650	881
	7	SB. Dhan	885	270	706	557	776	885	1007	587	759	585	446	678
	8	US-312	1022	380	1151	722	1509	769	666	287	739	537	584	760
	9	US-314	725	612	715	702	1012	789	1206	580	731	587	555	747
		T1 Mean	**1026**	**569**	**891**	**743**	**1323**	**781**	**1077**	**443**	**743**	**556**	**550**	**791**
T2 (0.08% Ortho silicic acid)	1	27P63	1248	1874	929	1056	1208	665	1245	622	752	726	637	997
	2	HRI-174	1005	973	1120	862	1758	729	1252	605	741	516	616	925
	3	IIRRH-145	1280	847	979	1055	1274	784	1185	545	745	536	608	894
	4	IIRRH-150	1288	1630	778	645	1303	781	913	518	738	621	706	902
	5	IIRRH-151	1067	1539	678	848	1308	776	687	420	758	614	607	846
	6	KRH-4	1568	1141	1011	692	1631	789	1246	473	736	591	722	964
	7	SB. Dhan	1033	784	550	611	847	823	977	637	751	652	505	743
	8	US-312	1075	1141	917	788	1541	761	639	428	757	679	707	858
	9	US-314	897	1543	624	769	1160	763	1473	455	760	600	754	891
		T2 Mean	**1162**	**1275**	**843**	**814**	**1337**	**763**	**1068**	**523**	**749**	**615**	**651**	**891**
T3 (silicon+ water stress)	1	27P63	935	1270	981	1025	1137	667	1177	370	759	651	507	862
	2	HRI-174	1003	630	1191	836	1406	737	1144	392	742	434	498	819
	3	IIRRH-145	946	950	935	1023	1472	786	1522	513	740	443	501	894
	4	IIRRH-150	655	1102	713	626	996	756	1109	372	737	567	512	740
	5	IIRRH-151	525	969	607	823	1080	746	836	510	759	516	456	712
	6	KRH-4	1052	1525	991	671	1680	722	1660	663	739	526	547	980
	7	SB. Dhan	907	675	639	593	768	834	691	403	754	538	469	661
	8	US-312	917	1525	831	765	1446	729	895	327	751	458	576	838
	9	US-314	517	1420	698	746	1049	717	1064	418	736	566	568	773
		T3 Mean	**828**	**1119**	**843**	**790**	**1226**	**744**	**1122**	**441**	**746**	**522**	**515**	**809**
T4 (water stress)	1	27P63	840	853	837	984	1067	739	1109	437	770	528	421	780
	2	HRI-174	1000	900	1077	803	1577	766	996	217	753	420	421	812
	3	IIRRH-145	1249	593	1023	984	1366	803	1354	350	726	375	395	838
	4	IIRRH-150	603	969	694	606	1062	767	1174	330	762	460	435	715
	5	IIRRH-151	638	1035	643	790	1139	763	878	367	753	471	382	714
	6	KRH-4	997	836	1148	647	1382	777	1278	347	746	422	446	821
	7	SB. Dhan	880	586	581	572	1003	867	1111	440	760	524	344	697
	8	US-312	995	836	980	735	1394	785	1083	397	738	418	440	800
	9	US-314	625	1022	604	718	1319	753	877	677	748	550	433	757
		T4 Mean	**870**	**848**	**843**	**760**	**1257**	**780**	**1095**	**396**	**750**	**463**	**413**	**770**
		Grand Mean	**972**	**952**	**855**	**777**	**1286**	**767**	**1091**	**451**	**747**	**539**	**532**	**815**
		LSD (Silicon)				ns		LSD (Silicon x Variety)					ns	
		LSD (Location x Silicon)				218.4**		LSD (Location x Silicon x Variety)					356.9**	
		LSD (Variety)				40.90*		CV (Silicon) %					37.12	
		LSD (Location x Variety)				178.4**		CV (Residual) %					20.76	

Table: 6.1.9 Influence of Silica Application panicle number/m² at maturity, different locations *Kharif* 2022

Treat	S.No.	Genotypes	CBT	CHN	IIRR	KJT	KRK	MTU	PNR	PTB	Ranchi	REWA	TTB	Grand Mean
T1 (Control)	1	27P63	612	273	317	398	550	374	383	243	264	320	179	356
	2	HRI-174	576	273	317	370	300	374	450	247	248	333	161	332
	3	IIRRH-145	684	251	330	385	567	429	375	247	255	357	165	368
	4	IIRRH-150	480	283	320	363	533	407	483	320	262	318	194	360
	5	IIRRH-151	805	283	330	328	542	440	358	360	271	326	151	381
	6	KRH-4	720	294	317	419	458	396	400	230	264	325	131	359
	7	SB. Dhan	528	293	357	357	342	407	308	237	265	333	138	324
	8	US-312	691	294	350	366	342	429	283	250	274	321	134	340
	9	US-314	444	282	323	358	317	429	283	287	262	337	126	314
		T1 Mean	**616**	**281**	**329**	**371**	**439**	**409**	**369**	**269**	**263**	**330**	**153**	**348**
T2 (0.08% Ortho silicic acid)	1	27P63	612	260	343	433	600	396	417	227	267	326	183	369
	2	HRI-174	612	260	350	393	458	385	417	287	272	339	178	359
	3	IIRRH-145	684	261	340	410	317	429	367	237	269	333	186	348
	4	IIRRH-150	480	283	337	402	458	363	367	317	266	341	209	347
	5	IIRRH-151	804	283	340	358	450	440	408	377	272	358	200	390
	6	KRH-4	720	261	350	455	742	407	383	273	257	357	145	395
	7	SB. Dhan	540	272	307	393	308	407	350	250	269	321	159	325
	8	US-312	684	261	343	393	542	418	383	253	257	335	151	365
	9	US-314	492	261	317	382	467	407	300	217	259	324	188	328
		T2 Mean	**625**	**267**	**336**	**402**	**482**	**406**	**377**	**271**	**265**	**337**	**178**	**359**
T3 (silicon+ water stress)	1	27P63	415	283	360	423	275	374	400	320	259	250	187	322
	2	HRI-174	444	294	340	378	467	352	350	277	253	302	170	330
	3	IIRRH-145	612	250	330	397	425	407	417	363	269	311	172	359
	4	IIRRH-150	456	272	337	395	417	363	400	377	262	290	187	341
	5	IIRRH-151	612	284	317	347	450	374	317	443	262	334	189	357
	6	KRH-4	648	273	337	430	450	363	392	337	260	294	148	357
	7	SB. Dhan	468	284	340	382	558	396	367	413	262	250	133	350
	8	US-312	648	273	353	381	458	407	300	313	271	295	129	348
	9	US-314	420	295	320	372	408	385	333	517	271	262	129	337
		T3 Mean	**525**	**278**	**337**	**389**	**434**	**380**	**364**	**373**	**263**	**288**	**160**	**345**
T4 (water stress)	1	27P63	372	240	363	390	342	363	400	350	263	237	135	314
	2	HRI-174	420	262	357	353	392	352	400	433	253	258	132	328
	3	IIRRH-145	612	273	333	372	400	418	367	407	285	249	138	350
	4	IIRRH-150	408	295	343	347	475	352	367	363	275	261	156	331
	5	IIRRH-151	612	273	340	307	467	363	400	353	256	280	145	345
	6	KRH-4	648	285	347	395	450	363	383	403	263	301	134	361
	7	SB. Dhan	468	274	323	350	417	396	267	420	262	247	124	323
	8	US-312	576	285	330	342	450	407	300	387	269	225	132	337
	9	US-314	420	274	290	337	383	374	367	423	272	231	111	317
		T4 Mean	**504**	**273**	**336**	**355**	**419**	**376**	**361**	**393**	**266**	**254**	**134**	**334**
		Grand Mean	**567**	**275**	**335**	**379**	**444**	**393**	**368**	**327**	**264**	**302**	**156**	**346**
		LSD (Silicon)				ns		LSD (Silicon x Variety)					ns	
		LSD (Location x Silicon)				46.50**		LSD (Location x Silicon x Variety)					99.54**	
		LSD (Variety)				ns		CV (Silicon) %					18.59	
		LSD (Location x Variety)				49.77**		CV (Residual) %					13.62	

Table: 6.1.10 Influence of Silica Application panicle weight (g/m²) at maturity, different locations *Kharif* 2022

Treat	S.No.	Genotypes	CBT	CHN	IIRR	KJT	KRK	MTU	PNR	PTB	Ranchi	REWA	TTB	Grand Mean
T1 (Control)	1	27P63	1257	909	1011	1093	732	693	1034	437	664	832	498	833
	2	HRI-174	1347	878	986	907	1098	810	907	501	709	861	495	863
	3	IIRRH-145	1225	802	1014	1205	1079	767	1352	346	681	832	443	886
	4	IIRRH-150	775	858	929	1138	982	728	1110	154	667	863	495	791
	5	IIRRH-151	1158	837	941	853	809	869	1034	292	665	935	503	809
	6	KRH-4	1212	1018	975	962	1233	741	1055	413	670	857	545	880
	7	SB. Dhan	1303	1002	1045	792	655	964	765	521	677	824	403	814
	8	US-312	1381	1018	1120	813	1017	906	995	247	661	903	527	872
	9	US-314	1098	829	1003	908	693	905	816	336	672	915	494	788
		T1 Mean	**1195**	**906**	**1003**	**964**	**922**	**820**	**1007**	**361**	**674**	**869**	**489**	**837**
T2 (0.08% Ortho silicic acid)	1	27P63	1365	790	1065	1148	886	756	1118	507	667	866	576	886
	2	HRI-174	1775	939	1032	952	1127	807	834	478	667	876	558	913
	3	IIRRH-145	1447	882	1007	1265	1098	724	1293	352	673	872	548	924
	4	IIRRH-150	728	934	971	1195	924	622	1151	190	679	905	635	812
	5	IIRRH-151	1268	925	981	896	1059	941	1107	293	669	937	547	875
	6	KRH-4	1488	857	874	1010	1175	736	1012	424	668	893	651	890
	7	SB. Dhan	1400	858	847	831	703	966	845	562	679	854	455	818
	8	US-312	1517	857	1049	854	1223	864	952	228	670	917	638	888
	9	US-314	1280	1030	985	954	819	907	879	300	666	899	674	854
		T2 Mean	**1363**	**897**	**979**	**1012**	**1001**	**814**	**1021**	**370**	**671**	**891**	**587**	**873**
T3 (silicon+ water stress)	1	27P63	1060	897	1092	1114	867	668	1111	262	682	809	456	820
	2	HRI-174	1088	1140	1009	923	1059	708	791	203	654	715	450	795
	3	IIRRH-145	1043	850	990	1227	1059	681	1304	320	664	672	451	842
	4	IIRRH-150	640	1107	921	1159	915	620	1141	180	671	726	459	776
	5	IIRRH-151	1085	829	974	869	934	724	999	250	672	791	411	776
	6	KRH-4	1078	935	983	979	1194	641	1098	270	656	739	494	824
	7	SB. Dhan	1033	826	907	806	616	890	807	373	668	728	423	734
	8	US-312	1107	935	1020	828	1213	795	944	292	660	735	522	823
	9	US-314	1070	1041	1015	925	713	762	863	265	689	707	513	779
		T3 Mean	**1023**	**951**	**990**	**981**	**952**	**721**	**1007**	**268**	**668**	**736**	**464**	**797**
T4 (water stress)	1	27P63	982	641	1027	1047	636	628	1013	153	673	490	380	697
	2	HRI-174	907	772	1036	868	1050	676	738	143	664	454	378	699
	3	IIRRH-145	489	716	1020	1154	1098	688	1250	200	677	666	355	756
	4	IIRRH-150	573	788	1006	1090	703	598	1056	143	669	690	395	701
	5	IIRRH-151	982	867	905	817	847	687	978	130	682	696	344	721
	6	KRH-4	843	844	1006	921	944	617	1048	143	666	705	402	740
	7	SB. Dhan	880	663	942	758	587	872	610	237	662	688	310	655
	8	US-312	798	844	964	779	1021	780	970	193	670	700	397	738
	9	US-314	853	1065	918	870	693	734	763	383	661	669	389	727
		T4 Mean	**812**	**800**	**981**	**922**	**842**	**698**	**936**	**192**	**669**	**640**	**372**	**715**
		Grand Mean	**1098**	**888**	**988**	**970**	**929**	**763**	**993**	**298**	**671**	**784**	**478**	**805**
		LSD (Silicon)				31.68**		LSD (Silicon x Variety)					ns	
		LSD (Location x Silicon)				105.0**		LSD (Location x Silicon x Variety)					203.5**	
		LSD (Variety)				ns		CV(Silicon) %					18.07	
		LSD (Location x Variety)				101.7**		CV(Residual) %					11.98	

Table: 6.1.11 Influence of Silica Application grains/panicle at maturity, different locations *Kharif* 2022

Treat	S.No.	Genotypes	CBT	CHN	IIRR	KJT	KRK	MTU	PNR	PTB	Ranchi	REWA	TTB	Grand Mean
T1 (Control)	1	27P63	146	114	173	90	235	159	208	149	106	165	119	151
	2	HRI-174	134	119	114	91	198	134	175	161	110	159	150	140
	3	IIRRH-145	171	118	138	112	218	142	277	122	139	161	116	156
	4	IIRRH-150	167	105	122	115	170	125	213	121	134	165	195	148
	5	IIRRH-151	151	103	111	104	228	136	140	139	132	165	174	144
	6	KRH-4	174	113	150	111	204	146	245	34	135	182	213	155
	7	SB. Dhan	122	109	110	105	178	155	136	120	134	153	95	129
	8	US-312	154	113	137	115	159	150	256	130	133	181	118	150
	9	US-314	163	114	123	97	159	142	225	94	136	187	128	143
		T1 Mean	**154**	**112**	**131**	**104**	**195**	**143**	**208**	**119**	**129**	**169**	**145**	**146**
T2 (0.08% Ortho silicic acid)	1	27P63	163	133	166	88	192	165	281	114	138	171	132	159
	2	HRI-174	150	161	111	138	142	130	171	113	126	168	168	143
	3	IIRRH-145	193	155	133	94	201	132	294	153	137	175	125	163
	4	IIRRH-150	175	166	113	70	162	123	221	159	135	175	228	157
	5	IIRRH-151	166	155	105	88	192	144	189	107	136	181	196	151
	6	KRH-4	189	137	110	94	156	141	226	79	149	195	240	156
	7	SB. Dhan	140	169	107	92	195	159	150	127	138	167	105	141
	8	US-312	177	137	132	84	166	147	146	123	125	188	132	142
	9	US-314	177	136	123	108	171	149	226	131	125	197	148	154
		T2 Mean	**170**	**150**	**122**	**95**	**175**	**143**	**211**	**123**	**134**	**180**	**164**	**152**
T3 (silicon+ water stress)	1	27P63	127	140	161	84	176	152	253	113	151	159	94	146
	2	HRI-174	115	144	104	98	192	126	143	44	146	141	133	126
	3	IIRRH-145	154	144	131	96	206	130	311	80	138	140	103	148
	4	IIRRH-150	126	153	105	82	165	120	166	116	146	155	164	136
	5	IIRRH-151	121	133	113	95	204	130	161	65	136	162	153	134
	6	KRH-4	154	138	134	86	211	138	287	120	125	169	185	159
	7	SB.Dhan	110	128	97	106	118	150	132	74	143	153	95	119
	8	US-312	137	138	113	102	184	141	209	131	136	171	108	143
	9	US-314	137	148	125	122	201	134	188	120	136	179	123	147
		T3 Mean	**131**	**141**	**120**	**97**	**184**	**136**	**206**	**96**	**140**	**159**	**129**	**140**
T4 (water stress)	1	27P63	101	109	152	107	241	145	250	57	132	151	79	138
	2	HRI-174	105	109	102	116	195	121	187	64	141	138	108	126
	3	IIRRH-145	131	107	135	112	215	127	260	64	135	141	93	138
	4	IIRRH-150	114	103	117	106	172	119	269	60	132	154	144	135
	5	IIRRH-151	104	109	96	89	191	126	140	45	137	154	131	120
	6	KRH-4	133	103	134	111	161	133	129	81	134	165	159	131
	7	SB. Dhan	96	100	112	107	114	147	141	62	120	146	86	112
	8	US-312	120	103	119	86	134	137	234	102	128	164	92	129
	9	US-314	119	101	124	103	170	135	126	60	144	173	109	124
		T4 Mean	**114**	**105**	**121**	**104**	**177**	**132**	**193**	**66**	**134**	**154**	**111**	**128**
		Grand Mean	**142**	**127**	**124**	**100**	**183**	**139**	**204**	**101**	**134**	**165**	**137**	**141**
		LSD (Silicon)				6.22**		LSD (Silicon x Variety)					ns	
		LSD (Location x Silicon)				20.63**		LSD (Location x Silicon x Variety)					50.44**	
		LSD (Variety)				ns		CV (Silicon) %					20.2	
		LSD (Location x Variety)				25.22**		CV (Residual) %					16.9	

Table: 6.1.12 Influence of Silica Application spikelet/panicle at maturity, different locations *Kharif* 2022

Treat	S.No.	Genotypes	CBT	CHN	IIRR	KJT	KRK	MTU	PNR	PTB	Ranchi	REWA	TTB	Grand Mean
T1 (Control)	1	27P63	222	124	214	147	255	174	240	169	123	177	135	180
	2	HRI-174	196	131	138	137	210	142	196	176	128	167	169	163
	3	IIRRH-145	186	128	199	133	237	152	307	142	158	175	133	177
	4	IIRRH-150	198	117	173	152	195	132	274	131	156	174	204	173
	5	IIRRH-151	197	114	144	127	246	143	202	148	144	179	199	168
	6	KRH-4	220	123	195	154	216	153	285	54	156	194	242	181
	7	SB. Dhan	154	120	132	130	201	163	149	162	148	169	107	149
	8	US-312	188	123	170	149	178	159	260	166	153	192	135	170
	9	US-314	199	125	166	131	173	150	250	118	155	196	147	165
		T1 Mean	**195**	**123**	**170**	**140**	**212**	**152**	**240**	**141**	**147**	**180**	**163**	**169**
T2 (0.08% Ortho silicic acid)	1	27P63	233	145	206	158	214	177	308	135	157	181	146	187
	2	HRI-174	208	174	137	148	161	140	250	156	145	176	187	171
	3	IIRRH-145	204	167	192	149	238	144	326	166	161	180	141	188
	4	IIRRH-150	210	179	200	162	194	130	258	202	155	183	257	194
	5	IIRRH-151	208	167	138	116	222	153	270	124	154	189	219	178
	6	KRH-4	227	150	163	179	171	148	255	101	169	204	267	185
	7	SB. Dhan	173	181	128	155	233	165	166	146	154	174	117	163
	8	US-312	197	150	167	159	188	158	171	135	146	197	147	165
	9	US-314	214	149	173	153	196	161	250	149	143	206	165	178
		T2 Mean	**208**	**162**	**167**	**153**	**202**	**153**	**250**	**146**	**154**	**188**	**183**	**179**
T3 (silicon+ water stress)	1	27P63	186	151	205	133	195	169	282	137	172	174	111	174
	2	HRI-174	173	156	134	126	210	138	219	65	163	151	155	154
	3	IIRRH-145	174	156	179	127	227	145	366	89	158	154	120	172
	4	IIRRH-150	184	166	177	136	194	133	246	151	161	170	196	174
	5	IIRRH-151	131	145	152	102	231	142	219	126	151	178	179	160
	6	KRH-4	193	151	184	137	239	148	323	172	141	184	217	190
	7	SB. Dhan	130	139	131	126	149	162	140	87	163	174	111	138
	8	US-312	178	151	154	152	197	156	223	160	152	181	128	167
	9	US-314	187	159	198	146	231	150	228	164	146	188	146	177
		T3 Mean	**170**	**153**	**168**	**132**	**208**	**149**	**249**	**128**	**156**	**173**	**152**	**167**
T4 (water stress)	1	27P63	164	119	187	142	262	170	290	68	151	166	98	165
	2	HRI-174	150	120	134	134	206	135	250	77	154	154	133	150
	3	IIRRH-145	138	118	185	178	242	147	313	83	152	158	114	166
	4	IIRRH-150	169	114	189	155	196	135	282	83	150	168	179	165
	5	IIRRH-151	129	120	139	166	210	141	188	64	156	172	160	150
	6	KRH-4	180	114	199	140	176	146	171	100	152	181	197	160
	7	SB. Dhan	116	110	142	174	132	161	151	95	136	161	111	135
	8	US-312	157	114	167	115	159	158	255	137	145	178	117	155
	9	US-314	166	113	180	190	190	156	161	129	165	188	139	161
		T4 Mean	**152**	**116**	**169**	**155**	**197**	**150**	**229**	**93**	**151**	**169**	**139**	**156**
		Grand Mean	**182**	**138**	**169**	**145**	**205**	**151**	**242**	**127**	**152**	**178**	**159**	**168**
		LSD (Silicon)				6.48**		LSD (Silicon x Variety)					ns	
		LSD (Location x Silicon)				21.51**		LSD (Location x Silicon x Variety)					52.73**	
		LSD (Variety)				6.04*		CV(Silicon) %					17.74	
		LSD (Location x Variety)				26.36**		CV(Residual) %					14.89	

Table: 6.1.13 Influence of Silica Application grain number/m² at maturity, different locations *Kharif* 2022

Treat	S.No.	Genotypes	CBT	CHN	IIRR	KJT	KRK	MTU	PNR	PTB	Ranchi	REWA	TTB	Grand Mean
T1 (Control)	1	27P63	89232	31223	54544	35708	128933	59433	79600	35693	28107	52086	21205	55979
	2	HRI-174	76992	32114	35756	33215	58408	50116	78733	39950	27378	52414	24178	46296
	3	IIRRH-145	117264	29553	45504	43310	124050	60357	103792	28913	35075	56926	19206	60359
	4	IIRRH-150	80100	29860	38846	41750	83667	50160	102817	38453	35138	51951	37730	53679
	5	IIRRH-151	121479	29042	35900	34362	107958	58949	50317	50010	35958	54339	26416	54975
	6	KRH-4	125604	32960	47066	46437	93108	57684	97800	7640	35440	58544	27800	57280
	7	SB. Dhan	64776	31895	38934	37516	61483	63459	41967	28650	35857	50626	13111	42570
	8	US-312	106587	32960	47966	41890	53833	64449	72483	33300	36757	57917	15739	51262
	9	US-314	72540	32161	39748	34479	50083	61061	63783	24477	35873	62480	16025	44792
		T1 Mean	**94953**	**31308**	**42696**	**38741**	**84614**	**58408**	**76810**	**31899**	**33954**	**55254**	**22379**	**51910**
T2 (0.08% Ortho silicic acid)	1	27P63	99840	34627	57156	38400	117167	65340	117250	25453	36927	55197	24261	61056
	2	HRI-174	91632	42409	38992	53880	64725	49698	71217	33460	34272	56577	29992	51532
	3	IIRRH-145	132648	40290	45293	38350	67217	56353	108000	39167	37084	57719	23359	58680
	4	IIRRH-150	83928	47183	37970	28190	74392	43758	80967	50683	36021	58859	47723	53607
	5	IIRRH-151	133536	43493	35392	31660	90550	63877	77150	40583	37209	64331	39196	59725
	6	KRH-4	136236	35806	38530	42830	117325	57420	86817	22467	38465	68305	34818	61729
	7	SB. Dhan	75648	45521	32735	36070	66517	64680	52583	32940	37144	53089	16775	46700
	8	US-312	120984	35806	45344	32815	98717	61061	56050	31420	31835	63197	19809	54276
	9	US-314	86940	35541	39101	40630	79867	60654	67700	28440	32089	63324	28041	51121
		T2 Mean	**106821**	**40075**	**41168**	**38092**	**86275**	**58093**	**79748**	**33846**	**35672**	**60067**	**29330**	**55381**
T3 (silicon+ water stress)	1	27P63	52321	39328	58003	35760	48350	56914	101083	36240	39043	39332	17351	47611
	2	HRI-174	50940	42191	35285	36740	89267	44110	50017	12403	36851	41923	22617	42031
	3	IIRRH-145	94284	36050	43206	38190	86492	53845	129400	29950	37185	43147	17747	55409
	4	IIRRH-150	57264	41364	35320	32530	66850	43450	66467	45010	38283	44408	30703	45605
	5	IIRRH-151	73980	37873	35693	33940	97867	48521	51250	28453	35900	53448	28735	47787
	6	KRH-4	99456	37697	44748	37000	91183	49918	112325	40860	32303	48621	27303	56492
	7	SB. Dhan	51888	36168	32955	40132	67233	59532	48333	30940	37344	37685	12635	41350
	8	US-312	88476	37697	40033	38810	91617	57156	62500	41473	36926	49849	13960	50772
	9	US-314	57612	43576	39831	45513	83075	51612	62517	61607	36820	46512	15739	49492
		T3 Mean	**69580**	**39105**	**40564**	**37624**	**80215**	**51673**	**75988**	**36326**	**36739**	**44992**	**20754**	**48506**
T4 (water stress)	1	27P63	37476	25953	55032	47430	85017	52657	100117	19697	34711	35382	10558	45821
	2	HRI-174	44064	28601	36269	41020	76692	42427	74833	28610	35553	34990	14186	41568
	3	IIRRH-145	80364	28695	44673	41652	85483	53339	95200	25917	38593	34729	12892	49231
	4	IIRRH-150	46500	30103	40260	36677	77275	42108	98883	20823	36118	39746	22512	44637
	5	IIRRH-151	63960	29726	32474	27387	101383	45771	55917	16040	34723	42802	18848	42639
	6	KRH-4	86184	29181	46580	44015	76933	48026	49500	32593	35727	48965	21233	47176
	7	SB. Dhan	44964	27467	36140	37478	47250	58212	37517	25119	31032	35659	10705	35595
	8	US-312	68772	29181	39201	29470	61317	56298	70100	39853	34385	36457	12136	43379
	9	US-314	50220	27699	35824	34797	69033	50490	46183	25448	39059	39486	12045	39117
		T4 Mean	**58056**	**28512**	**40717**	**37769**	**75598**	**49925**	**69806**	**26011**	**35544**	**38691**	**15013**	**43240**
		Grand Mean	**82353**	**34750**	**41286**	**38056**	**81675**	**54525**	**75588**	**32020**	**35477**	**49751**	**21869**	**49759**
		LSD (Silicon)				3868**		LSD (Silicon x Variety)					ns	
		LSD (Location x Silicon)				12831**		LSD (Location x Silicon x Variety)					26265**	
		LSD (Variety)				3009*		CV (Silicon) %					35.72	
		LSD (Location x Variety)				13132**		CV (Residual) %					25.03	

Table: 6.1.14 Influence of Silica Application spikelet number/m² at maturity, different locations *Kharif* 2022

Treat	S.No.	Genotypes	CBT	CHN	IIRR	KJT	KRK	MTU	PNR	PTB	Ranchi	REWA	TTB	Grand Mean
T1 (Control)	1	27P63	135985	33985	67423	58293	139325	64955	91933	40760	32568	55809	24101	67740
	2	HRI-174	113303	35276	43320	50613	61742	53218	88350	43483	31762	54318	27202	54781
	3	IIRRH-145	127231	32233	65623	51007	134500	64647	115275	33540	39766	61661	21952	67949
	4	IIRRH-150	95346	33076	55250	54998	95933	53218	132150	41433	40726	54809	38855	63254
	5	IIRRH-151	159130	32083	46982	41213	120375	62084	72342	53417	39190	57928	30174	64993
	6	KRH-4	159167	35903	61456	64527	98458	60588	113983	11717	40917	62045	31668	67312
	7	SB. Dhan	81406	35122	46594	46333	69633	66506	45817	38113	39391	55776	14776	49042
	8	US-312	130122	35903	59438	54175	60175	68277	73800	42697	42237	61308	17982	58738
	9	US-314	88392	35180	53486	46760	54492	64493	70733	32157	40910	65626	18375	51873
		T1 Mean	**121120**	**34307**	**55508**	**51991**	**92737**	**61998**	**89376**	**37480**	**38607**	**58809**	**25009**	**60631**
T2 (0.08% Ortho silicic acid)	1	27P63	142831	37664	70825	68458	131342	70224	128433	29760	42043	57933	26816	73303
	2	HRI-174	127526	45631	48017	58080	72100	53658	103750	45800	39517	58176	33278	62321
	3	IIRRH-145	139590	43494	65378	61248	78792	61501	119300	41760	43391	59374	26353	67289
	4	IIRRH-150	101056	50966	66983	65213	89292	46200	94483	64267	41287	61621	53747	66829
	5	IIRRH-151	167573	46983	46691	41615	104458	67815	110392	46483	42271	66818	43804	71355
	6	KRH-4	163911	39097	57135	81510	128150	60115	97817	28093	43625	71420	38689	73596
	7	SB. Dhan	93604	48694	39506	61187	78333	66946	58117	37060	41349	55304	18802	54446
	8	US-312	135373	39097	57138	62678	109408	65813	65367	34033	37335	65821	22113	63107
	9	US-314	105588	38843	54883	58377	91300	65472	75000	32280	36818	65538	31426	59593
		T2 Mean	**130784**	**43385**	**56284**	**62041**	**98131**	**61972**	**94740**	**39949**	**40848**	**62445**	**32781**	**65760**
T3 (silicon+ water stress)	1	27P63	77247	42633	73940	56250	53367	63305	113033	43160	44436	42394	20667	57312
	2	HRI-174	76883	45813	45438	47780	97167	48422	76667	18250	41157	45010	26402	51726
	3	IIRRH-145	106576	39035	58728	50195	94992	59950	152500	33773	42565	47363	20735	64219
	4	IIRRH-150	84015	44907	59496	53428	78800	48026	98292	58233	42019	48757	36618	59327
	5	IIRRH-151	80290	41190	47978	34288	110208	53119	69367	54767	39918	57504	33711	56576
	6	KRH-4	125369	41065	61359	58898	103367	53548	126475	52390	36569	52723	31958	67611
	7	SB. Dhan	61135	39484	44664	47730	84800	64152	51333	36390	42625	41616	14851	48071
	8	US-312	115863	41065	54506	57705	98150	63261	66750	49817	41265	52723	16466	59779
	9	US-314	78553	47014	63307	53740	94983	57717	75950	84673	39536	48833	18745	60277
		T3 Mean	**89548**	**42468**	**56602**	**51113**	**90648**	**56833**	**92263**	**47939**	**41121**	**48547**	**24461**	**58322**
T4 (water stress)	1	27P63	61270	28438	67915	49647	91942	61787	115708	23813	39725	38837	13216	53845
	2	HRI-174	63378	31304	47568	47290	81058	47344	100333	34620	38930	39075	17601	49864
	3	IIRRH-145	84584	31685	61436	66080	96350	61699	114650	33813	43243	38841	15778	58924
	4	IIRRH-150	69011	33431	64807	53783	89967	47762	103350	30000	40952	43344	28026	54948
	5	IIRRH-151	79509	32726	47292	50870	107558	51579	75200	22943	39499	47546	23079	52527
	6	KRH-4	117103	32415	69027	55480	84100	52580	65550	40567	40414	53693	26310	57931
	7	SB. Dhan	54673	30306	45555	61230	54417	63756	40058	38896	35267	39185	13797	43376
	8	US-312	90643	32415	54886	39210	73225	64570	76600	53027	38852	39560	15317	52573
	9	US-314	69983	30878	51769	63320	76167	58366	58850	54393	44826	42920	15380	51532
		T4 Mean	**76684**	**31511**	**56695**	**54101**	**83865**	**56605**	**83367**	**36897**	**40190**	**42556**	**18723**	**52836**
		Grand Mean	**104534**	**37918**	**56272**	**54811**	**91345**	**59352**	**89936**	**40566**	**40192**	**53089**	**25244**	**59387**
		LSD (Silicon)				4106**		LSD (Silicon x Variety)					ns	
		LSD (Location x Silicon)				13620**		LSD (Location x Silicon x Variety)					27989**	
		LSD (Variety)				4219**		CV(Silicon) %					31.77	
		LSD (Location x Variety)				13994**		CV(Residual) %					22.34	

Table: 6.1.15 Influence of Silica Application 1000 grain weight (g) at different locations *Kharif* 2022

Treat	S.No.	Genotypes	CBT	CHN	IIRR	KJT	KRK	MTU	PNR	PTB	Ranchi	REWA	TTB	Grand Mean
T1 (Control)	1	27P63	18.8	15.6	16.2	17.1	25.0	16.6	27.6	17.8	21.8	16.9	20.9	19.5
	2	HRI-174	25.3	16.7	24.2	24.8	28.3	23.1	34.7	23.3	22.2	23.1	22.4	24.4
	3	IIRRH-145	21.9	15.8	18.8	19.8	23.3	18.2	29.2	18.8	20.7	19.5	18.5	20.4
	4	IIRRH-150	20.8	15.6	20.8	22.6	18.3	20.7	30.3	21.5	20.5	22.7	17.8	21.1
	5	IIRRH-151	22.3	16.9	23.2	23.6	18.3	21.1	31.1	22.8	20.9	19.0	21.2	21.9
	6	KRH-4	20.5	16.0	18.0	21.8	15.0	18.4	28.4	17.5	21.4	18.6	22.3	19.8
	7	SB. Dhan	22.6	15.7	22.4	24.2	18.3	21.7	32.1	23.3	21.7	22.8	16.0	21.9
	8	US-312	21.1	16.0	19.9	21.1	21.7	20.1	29.2	21.2	21.5	20.1	21.1	21.2
	9	US-314	22.8	17.4	21.8	23.4	16.7	21.2	30.9	22.4	22.9	21.9	22.9	22.2
		T1 Mean	**21.8**	**16.2**	**20.6**	**22.0**	**20.6**	**20.1**	**30.4**	**21.0**	**21.5**	**20.5**	**20.3**	**21.4**
T2 (0.08% Ortho silicic acid)	1	27P63	19.1	15.6	16.0	18.7	26.7	16.5	25.5	22.8	21.9	18.5	21.0	20.2
	2	HRI-174	25.8	15.4	23.3	26.0	31.7	23.2	33.6	25.4	21.6	24.0	23.2	24.8
	3	IIRRH-145	21.8	14.1	18.6	21.7	20.0	18.3	30.0	22.4	20.3	20.1	18.8	20.6
	4	IIRRH-150	21.3	11.2	20.6	23.6	21.7	20.3	30.9	18.7	20.8	24.9	18.3	21.1
	5	IIRRH-151	23.6	13.3	23.9	24.1	25.0	21.0	33.5	23.1	20.4	19.3	21.9	22.6
	6	KRH-4	21.4	17.2	18.3	23.3	21.7	18.3	29.1	21.4	21.1	19.7	22.2	21.2
	7	SB. Dhan	23.1	11.6	23.2	25.3	21.7	21.3	33.3	23.5	21.8	22.9	16.1	22.2
	8	US-312	22.5	17.2	20.0	22.9	23.3	20.2	29.2	22.6	21.7	21.8	21.9	22.1
	9	US-314	23.4	17.7	21.1	24.6	20.0	21.4	35.0	22.7	21.1	22.7	22.9	23.0
		T2 Mean	**22.4**	**14.8**	**20.6**	**23.4**	**23.5**	**20.1**	**31.1**	**22.5**	**21.2**	**21.6**	**20.7**	**22.0**
T3 (silicon+ water stress)	1	27P63	18.1	13.0	16.3	18.1	18.3	16.8	25.3	14.3	22.8	16.2	21.0	18.2
	2	HRI-174	23.3	14.5	23.6	25.2	25.0	22.9	34.1	18.7	22.9	23.1	22.6	23.3
	3	IIRRH-145	20.5	13.9	19.4	21.1	18.3	18.1	28.0	17.6	22.1	19.3	18.6	19.7
	4	IIRRH-150	20.1	12.5	20.8	22.9	21.7	20.4	31.5	15.9	20.3	22.1	18.3	20.6
	5	IIRRH-151	20.6	13.7	23.4	23.4	20.0	21.4	32.2	21.3	21.4	17.7	21.8	21.5
	6	KRH-4	19.4	14.9	18.5	22.6	21.7	18.3	28.5	15.7	22.0	18.2	22.4	20.2
	7	SB. Dhan	21.7	14.4	23.2	24.5	18.3	21.3	32.3	19.6	21.6	18.6	15.3	21.0
	8	US-312	20.4	14.9	19.9	22.2	20.0	19.9	29.7	21.0	21.6	20.1	21.8	21.0
	9	US-314	21.7	14.8	21.1	23.8	23.3	21.1	31.9	19.1	20.2	23.0	22.8	22.1
		T3 Mean	**20.7**	**14.1**	**20.7**	**22.7**	**20.7**	**20.0**	**30.4**	**18.1**	**21.6**	**19.8**	**20.5**	**20.8**
T4 (water stress)	1	27P63	17.5	18.7	16.1	16.9	15.0	17.0	25.3	11.9	21.6	14.7	19.8	17.7
	2	HRI-174	22.5	18.3	23.4	23.4	18.3	22.8	35.5	16.7	20.8	21.7	20.0	22.1
	3	IIRRH-145	20.1	16.7	18.9	18.8	15.0	18.4	29.6	15.4	21.5	16.9	17.2	19.0
	4	IIRRH-150	19.2	16.4	20.5	21.3	25.0	20.3	30.4	16.4	21.3	21.9	17.0	20.9
	5	IIRRH-151	19.1	15.6	23.6	22.2	16.7	21.5	33.3	20.6	21.9	17.7	20.0	21.1
	6	KRH-4	18.4	16.7	17.8	20.7	18.3	18.4	29.2	15.3	22.0	16.4	21.7	19.5
	7	SB. Dhan	20.7	17.3	22.8	23.0	18.3	21.4	32.4	17.8	20.9	16.6	15.5	20.6
	8	US-312	19.1	16.7	20.5	20.3	16.7	19.8	29.7	19.1	21.1	19.4	20.0	20.2
	9	US-314	20.6	19.7	21.8	22.2	25.0	20.7	30.9	19.2	20.4	20.3	19.9	21.9
		T4 Mean	**19.7**	**17.4**	**20.6**	**21.0**	**18.7**	**20.0**	**30.7**	**16.9**	**21.3**	**18.4**	**19.0**	**20.3**
		Grand Mean	**21.1**	**15.6**	**20.6**	**22.3**	**20.9**	**20.1**	**30.6**	**19.6**	**21.4**	**20.1**	**20.1**	**21.1**
		LSD (Silicon)				0.49**		LSD (Silicon x Variety)					ns	
		LSD (Location x Silicon)				1.65**		LSD (Location x Silicon x Variety)					ns	
		LSD (Variety)				0.73**		CV(Silicon) %					10.85	
		LSD (Location x Variety)				2.44**		CV(Residual) %					10.95	

Table: 6.1.16 Influence of Silica Application Total dry matter (g/m²) at maturity, different locations *Kharif* 2022

Treat	S.No.	Genotypes	CBT	CHN	IIRR	KJT	KRK	MTU	PNR	PTB	Ranchi	REWA	TTB	Grand Mean
T1 (Control)	1	27P63	2380	1394	2022	2060	1982	1285	2097	931	1433	1974	1092	1695
	2	HRI-174	2430	1520	2116	1695	2509	1338	1995	1027	1456	1632	1046	1706
	3	IIRRH-145	2410	1612	2004	2168	2808	1383	2725	702	1409	1699	934	1805
	4	IIRRH-150	1772	1548	1590	1720	2158	1352	2266	554	1396	1778	1047	1562
	5	IIRRH-151	1930	1685	1606	1630	2054	1314	1775	662	1413	1808	1063	1540
	6	KRH-4	2652	1398	1964	1590	3028	1283	2447	800	1408	1802	1232	1782
	7	SB. Dhan	2188	1272	1751	1348	1431	1518	1772	1108	1436	1740	850	1492
	8	US-312	2403	1398	2271	1535	2526	1345	1660	534	1400	1818	1113	1637
	9	US-314	1823	1440	1719	1610	1705	1356	2022	916	1403	1915	1063	1543
		T1 Mean	**2221**	**1474**	**1894**	**1706**	**2244**	**1353**	**2084**	**804**	**1417**	**1796**	**1049**	**1640**
T2 (0.08% Ortho silicic acid)	1	27P63	2613	2664	1994	2204	2093	1211	2363	1129	1419	2025	1217	1903
	2	HRI-174	2780	1912	2151	1814	2885	1284	2085	1083	1409	1776	1178	1851
	3	IIRRH-145	2727	1728	1986	2320	2372	1374	2478	897	1417	1801	1157	1842
	4	IIRRH-150	2017	2564	1750	1840	2227	1343	2063	708	1417	1932	1342	1746
	5	IIRRH-151	2335	2464	1659	1744	2367	1328	1794	713	1427	1913	1157	1718
	6	KRH-4	3057	1999	1885	1701	2806	1347	2257	897	1404	1912	1374	1876
	7	SB. Dhan	2433	1641	1397	1443	1550	1470	1822	1198	1429	1858	961	1564
	8	US-312	2592	1999	1966	1642	2764	1340	1591	657	1426	2005	1347	1757
	9	US-314	2177	2572	1608	1723	1978	1323	2352	755	1426	1956	1461	1757
		T2 Mean	**2526**	**2171**	**1822**	**1826**	**2338**	**1336**	**2089**	**893**	**1419**	**1909**	**1244**	**1779**
T3 (silicon+ water stress)	1	27P63	1995	2168	2073	2138	2004	1197	2288	632	1441	1793	963	1699
	2	HRI-174	2092	1771	2199	1759	2466	1280	1935	595	1395	1432	950	1625
	3	IIRRH-145	1989	1800	1925	2251	2532	1369	2826	833	1404	1446	953	1757
	4	IIRRH-150	1295	2210	1633	1785	1911	1303	2250	552	1408	1690	970	1546
	5	IIRRH-151	1610	1798	1581	1692	2015	1271	1835	760	1431	1631	866	1499
	6	KRH-4	2130	2461	1974	1650	2874	1263	2758	933	1395	1656	1042	1830
	7	SB. Dhan	1940	1502	1546	1399	1384	1463	1498	777	1422	1592	895	1402
	8	US-312	2023	2461	1851	1593	2659	1281	1839	618	1411	1583	1103	1675
	9	US-314	1587	2461	1713	1671	1761	1270	1927	683	1424	1632	1084	1565
		T3 Mean	**1851**	**2070**	**1833**	**1771**	**2178**	**1300**	**2128**	**709**	**1415**	**1606**	**981**	**1622**
T4 (water stress)	1	27P63	1822	1494	1864	2031	1702	1265	2122	590	1442	1580	802	1519
	2	HRI-174	1907	1672	2113	1671	2627	1299	1733	360	1416	1398	798	1545
	3	IIRRH-145	1738	1309	2043	2138	2464	1358	2604	550	1403	1344	750	1609
	4	IIRRH-150	1177	1756	1700	1696	1765	1294	2230	473	1431	1499	834	1441
	5	IIRRH-151	1620	1902	1549	1607	1986	1270	1855	497	1435	1462	726	1446
	6	KRH-4	1840	1679	2154	1568	2326	1311	2326	490	1412	1471	849	1584
	7	SB. Dhan	1760	1249	1523	1329	1591	1481	1721	677	1422	1541	719	1365
	8	US-312	1793	1679	1944	1514	2415	1325	2053	590	1408	1464	838	1548
	9	US-314	1478	2087	1523	1587	2012	1278	1640	1060	1408	1583	822	1498
		T4 Mean	**1682**	**1647**	**1824**	**1682**	**2099**	**1320**	**2031**	**587**	**1420**	**1482**	**793**	**1506**
		Grand Mean	**2070**	**1841**	**1843**	**1746**	**2215**	**1327**	**2083**	**748**	**1418**	**1698**	**1017**	**1637**
		LSD (Silicon)				58.27**		LSD (Silicon x Variety)					ns	
		LSD (Location x Silicon)				193.2**		LSD (Location x Silicon x Variety)					313*8*	
		LSD (Variety)				47.30*		CV(Silicon) %					16.35	
		LSD (Location x Variety)				206.4**		CV(Residual) %					11.95	

Table: 6.1.17 Influence of Silica Application Grain yield (g/m²) at different locations *Kharif* 2022

Treat	S.No.	Genotypes	CBT	CHN	IIRR	KJT	KRK	MTU	PNR	PTB	Ranchi	REWA	TTB	Grand Mean
T1 (Control)	1	27P63	800	481	881	798	563	539	617	363	310	749	417	592
	2	HRI-174	873	532	866	716	844	560	883	412	318	725	423	650
	3	IIRRH-145	688	461	852	870	830	606	758	283	299	730	401	616
	4	IIRRH-150	695	466	810	727	756	553	967	138	313	757	472	605
	5	IIRRH-151	687	487	832	683	622	555	625	200	306	778	468	568
	6	KRH-4	812	529	849	705	948	553	750	359	299	745	520	643
	7	SB. Dhan	692	500	872	614	504	633	608	451	301	675	349	564
	8	US-312	723	529	956	619	782	576	692	134	297	782	495	599
	9	US-314	577	557	865	689	533	567	775	258	308	788	470	581
		T1 Mean	**727**	**505**	**865**	**713**	**709**	**571**	**742**	**289**	**306**	**748**	**446**	**602**
T2 (0.08% Ortho silicic acid)	1	27P63	890	537	916	838	681	546	825	458	309	760	461	656
	2	HRI-174	977	626	906	751	867	554	783	417	304	761	463	674
	3	IIRRH-145	793	559	842	914	844	590	700	308	300	758	453	642
	4	IIRRH-150	793	513	780	763	711	562	783	150	322	796	521	609
	5	IIRRH-151	788	572	845	718	815	552	617	248	325	788	514	616
	6	KRH-4	930	598	705	740	904	558	692	382	316	790	574	653
	7	SB. Dhan	790	500	760	645	541	648	625	464	313	698	384	579
	8	US-312	795	598	907	650	941	579	683	183	323	796	553	637
	9	US-314	637	627	822	723	630	560	750	270	307	782	523	603
		T2 Mean	**821**	**570**	**832**	**749**	**770**	**572**	**718**	**320**	**313**	**770**	**494**	**630**
T3 (silicon+ water stress)	1	27P63	698	508	944	821	667	530	725	154	317	646	374	580
	2	HRI-174	780	608	832	736	815	543	813	192	313	548	329	592
	3	IIRRH-145	527	494	838	896	815	583	842	204	300	536	347	580
	4	IIRRH-150	462	503	735	748	704	547	833	146	307	648	338	543
	5	IIRRH-151	557	514	837	703	719	526	617	163	307	641	281	533
	6	KRH-4	647	560	827	725	919	541	675	192	313	633	368	582
	7	SB. Dhan	637	516	763	632	474	628	650	221	322	588	366	527
	8	US-312	603	560	794	637	933	551	725	233	313	630	400	580
	9	US-314	510	629	838	709	548	553	758	246	325	534	350	545
		T3 Mean	**602**	**543**	**823**	**734**	**733**	**556**	**738**	**194**	**313**	**600**	**350**	**562**
T4 (water stress)	1	27P63	628	482	889	763	489	525	667	58	323	572	332	521
	2	HRI-174	687	522	849	685	807	533	717	117	312	532	296	551
	3	IIRRH-145	453	480	844	833	844	554	650	89	322	518	301	535
	4	IIRRH-150	410	485	825	695	541	527	867	113	323	585	302	516
	5	IIRRH-151	483	462	765	654	652	507	650	69	325	536	256	487
	6	KRH-4	570	487	825	674	726	533	667	121	326	579	327	530
	7	SB. Dhan	577	463	823	588	452	615	617	121	321	550	318	495
	8	US-312	540	487	802	593	785	540	750	146	302	569	355	534
	9	US-314	445	537	782	659	533	526	783	200	307	520	314	510
		T4 Mean	**533**	**489**	**823**	**683**	**648**	**540**	**707**	**115**	**318**	**551**	**311**	**520**
		Grand Mean	**671**	**527**	**835**	**720**	**715**	**560**	**726**	**229**	**312**	**667**	**400**	**578**
		LSD (Silicon)					15.33**	LSD (Silicon x Variety)					ns	
		LSD (Location x Silicon)					50.85**	LSD (Location x Silicon x Variety)					98.84*	
		LSD (Variety)					ns	CV(Silicon) %					12.17	
		LSD (Location x Variety)					65.01**	CV(Residual) %					10.65	

Table: 6.1.18 Influence of Silica Application Harvest Index (%) at different locations *Kharif* 2022

Treat	S.No.	Genotypes	CBT	CHN	IIRR	KJT	KRK	MTU	PNR	PTB	Ranchi	REWA	TTB	Grand Mean
T1 (Control)	1	27P63	33.3	35.7	44.3	38.7	29.8	41.7	29.4	39.0	21.6	37.9	38.2	35.4
	2	HRI-174	35.7	35.4	41.1	42.2	34.1	41.8	44.3	40.2	21.9	44.4	40.6	38.3
	3	IIRRH-145	28.3	28.8	42.6	40.1	29.7	43.7	27.8	40.1	21.2	43.0	43.1	35.3
	4	IIRRH-150	39.3	30.2	50.9	42.3	35.0	40.9	42.7	25.1	22.4	42.5	45.2	37.9
	5	IIRRH-151	35.7	29.5	51.7	41.9	30.0	42.1	35.2	30.7	21.6	43.0	44.1	36.9
	6	KRH-4	30.0	38.1	43.3	44.3	31.1	42.9	30.6	44.8	21.3	41.3	42.3	37.3
	7	SB. Dhan	31.3	39.3	49.8	45.5	33.6	41.5	34.4	41.0	21.0	38.8	41.2	37.9
	8	US-312	29.7	38.1	42.1	40.3	30.9	42.8	41.7	24.7	21.2	43.0	44.7	36.3
	9	US-314	31.0	38.9	50.4	42.8	31.4	41.8	38.3	28.6	22.0	41.1	44.4	37.3
		T1 Mean	**32.7**	**34.9**	**46.2**	**42.0**	**31.7**	**42.1**	**36.0**	**34.9**	**21.6**	**41.7**	**42.6**	**37.0**
T2 (0.08% Ortho silicic acid)	1	27P63	33.7	22.5	46.2	38.0	32.5	45.1	34.9	40.5	21.8	37.5	38.0	35.5
	2	HRI-174	34.3	33.8	42.2	41.4	29.5	43.0	37.6	38.5	21.6	42.9	39.4	36.8
	3	IIRRH-145	28.7	32.5	42.4	39.4	35.5	42.8	28.2	34.4	21.2	42.1	39.7	35.2
	4	IIRRH-150	39.0	20.4	44.6	41.5	31.7	41.5	38.0	23.6	22.7	41.2	38.8	34.8
	5	IIRRH-151	33.3	24.2	50.9	41.1	34.5	41.5	34.4	34.8	22.8	41.1	44.7	36.7
	6	KRH-4	30.3	30.6	37.4	43.5	32.8	41.4	30.6	42.7	22.5	41.3	41.8	35.9
	7	SB. Dhan	32.0	30.8	54.4	44.7	34.9	43.9	34.3	39.7	21.9	37.5	40.0	37.7
	8	US-312	30.7	30.6	46.2	39.6	34.2	43.3	43.1	29.7	22.7	39.8	41.1	36.4
	9	US-314	31.7	25.0	51.1	42.0	31.9	42.0	31.9	36.0	21.5	39.9	35.8	35.3
		T2 Mean	**32.6**	**27.8**	**46.2**	**41.2**	**33.1**	**42.7**	**34.8**	**35.5**	**22.1**	**40.4**	**39.9**	**36.0**
T3 (silicon+ water stress)	1	27P63	35.3	23.8	46.1	38.4	33.8	44.8	31.7	24.6	22.0	36.0	38.9	34.1
	2	HRI-174	37.3	35.8	37.8	41.9	31.9	42.1	41.9	31.9	22.4	38.2	34.9	36.0
	3	IIRRH-145	26.0	28.4	43.7	39.8	32.0	42.7	29.8	24.5	21.4	37.1	36.4	32.9
	4	IIRRH-150	36.0	23.1	45.1	41.9	36.8	41.8	37.1	26.2	21.8	38.4	34.8	34.8
	5	IIRRH-151	34.0	29.1	52.9	41.6	35.7	41.3	33.6	23.8	21.4	39.3	32.7	35.0
	6	KRH-4	30.0	23.9	42.0	43.9	32.4	43.0	24.5	20.6	22.4	38.2	35.4	32.4
	7	SB. Dhan	32.3	35.8	49.5	45.2	34.3	42.9	43.4	28.5	22.7	36.9	40.9	37.5
	8	US-312	29.7	23.9	42.9	40.0	35.2	43.0	39.4	38.6	22.2	39.8	36.4	35.6
	9	US-314	32.0	26.8	49.0	42.4	31.1	43.3	39.3	38.9	22.8	32.7	32.3	35.5
		T3 Mean	**32.5**	**27.8**	**45.4**	**41.7**	**33.7**	**42.8**	**35.6**	**28.6**	**22.1**	**37.4**	**35.9**	**34.9**
T4 (water stress)	1	27P63	34.3	35.3	47.7	37.6	28.6	41.5	31.4	9.7	22.4	36.2	41.5	33.3
	2	HRI-174	36.3	36.0	40.2	41.0	31.1	41.1	41.3	32.7	22.0	38.0	37.6	36.1
	3	IIRRH-145	25.7	40.9	41.3	39.0	34.3	40.8	25.0	16.0	22.9	38.5	41.3	33.3
	4	IIRRH-150	34.7	28.2	48.5	41.0	30.7	40.4	38.9	28.9	22.6	39.0	36.4	35.4
	5	IIRRH-151	29.7	24.5	49.4	40.7	33.0	39.7	35.1	13.8	22.7	36.7	36.3	32.9
	6	KRH-4	30.3	29.0	38.3	43.0	31.3	40.7	28.6	24.1	23.1	39.4	38.6	33.3
	7	SB. Dhan	32.0	37.1	54.1	44.2	28.4	41.1	35.8	19.1	22.6	35.7	45.6	36.0
	8	US-312	29.0	29.0	41.3	39.2	32.5	40.4	36.6	24.9	21.5	38.8	42.6	34.2
	9	US-314	29.7	26.4	51.6	41.5	26.6	41.0	47.7	18.7	21.8	32.9	38.4	34.2
		T4 Mean	**31.3**	**31.8**	**45.8**	**40.8**	**30.7**	**40.8**	**35.6**	**20.9**	**22.4**	**37.2**	**39.8**	**34.3**
		Grand Mean	**32.3**	**30.6**	**45.9**	**41.4**	**32.3**	**42.1**	**35.5**	**30.0**	**22.0**	**39.2**	**39.6**	**35.5**
		LSD (Silicon)				ns		LSD (Silicon x Variety)					ns	
		LSD (Location x Silicon)				3.58**		LSD (Location x Silicon x Variety)					7.84**	
		LSD (Variety)				ns		CV (Silicon) %					13.97	
		LSD (Location x Variety)				3.92**		CV (Residual) %					10.47	

6.2 Phenotyping of elite rice genotypes for Drought Tolerance

Locations: PTB, REWA, TTB, RPUR & RANCHI

Drought, a natural calamity affects each and every component of the ecosystem right from agriculture, forestry to socio-economic conditions of the population living in the drought affected area. Global climate change, propelled by the global warming, is further aggravating the situation. According to FAO, in last 40 years the percentage of people affected by drought has doubled and the stress has affected more people worldwide than any other natural hazard. Drought can lead to dire socio-economic and environmental impacts, famines, migration and natural recourse degradation. About 57% area of the agricultural land of India accounts for rainfed area and therefore it is very significant in terms of ecology and livelihood of millions. About 61 per cent of Indian farmers rely on rain-fed agriculture and 55 per cent of the gross cropped area is under rain-fed farming. Thus it is of utmost importance to study and understand the mechanism involved in the drought stress tolerance for development of drought tolerant rice varieties.

With this objective, a trial to study the drought tolerance traits of rice cultures with respect to yield and other attributes under dry spells was conducted with 26 introgression lines derived from multi-parent inter-crosses in the background of Krishna Hamsa (S. No. 1 to 14) and WGL14 (S.No. 15 to 34) with Sahabhagidhan as a check. These ILs were developed as part of DBT funded project on "Marker assisted introgression of different traits to develop new generation rice varieties". The seeds were obtained from Dr. Jyothi Badri, Plant Breeder & PI of the project (Appendix-II). The treatments consist of two irrigation regimes a) irrigated as per recommended schedule and b) totally rainfed conditions without any supplementary irrigation. The data was analysed as Factorial RCBD with irrigation regimes as first factor and genotypes as second factor.

At PTB centre, the trial was conducted during *Kharif* season with 26RUFs. Fig 6.2.1A shows PTB centre has received about 1653 mm rainfall with 76 rainy days from sowing to physiological maturity, there were few dry spells as well however the rainfall was quite well distributed. At Raipur centre, there were 56 rainy days with an overall rainfall of 1083mm from sowing to physiological maturity and the rainfall was also well distributed throughout the growing period. At Ranchi centre, 1782 mm rainfall was recorded with 62 rainy days from sowing to physiological maturity after which there was a long dry spell. Also the rainfall was fairly well distributed through the active growing period of the crop. At Rewa, 1064 mm rainfall was recorded with about 50 rainy days from sowing to physiological maturity after

which there was a long dry spell. The rainfall was not well distributed and on Oct 5th 2022, in a single day it rained about 250 mm that is about 24% of all the rainfall of the season and on the other-hand it rained average about 30-40 mm per day among the rainy days. At TTB centre, trial was conducted during *Rabi* season (Fig 6.2.1B). There were about 28 rainy days with an overall rainfall of 321 mm during the Jan to May 2022. The rainfall was quite well distributed through-out the growing season.

The mean tiller number per plant ranged from 6.9 (PTB) to 18.9 (Ranchi) with an overall mean of 11.1 in irrigated conditions whereas in drought stress it ranged from 6.4 (NRRI) to 19 (Ranchi) with an overall mean of 10.8 (Table 6.2.1). The mean Tiller number per plant was reduced by about 7% under rain fed condition (Fig. 6.2.2B), however it is negligible and therefore non-significant. Statistically also the treatment effect and genotype effect and the treatment X genotype effect are non-significant. Further the interaction effect between Location X treatment, Location X genotype and Location X treatment X genotype are significant. This may be due to different response of genotypes at different locations i.e. environment effect. Maximum reduction was observed at Raipur (>38%) followed by PTB (33%) and minimum reduction was observed at Ranchi centre 3.4% reduction in comparison with irrigated treatment. The effect was not uniform across locations. In terms of percent change of tiller number per plant over control all the entries show reduction in comparison to control except

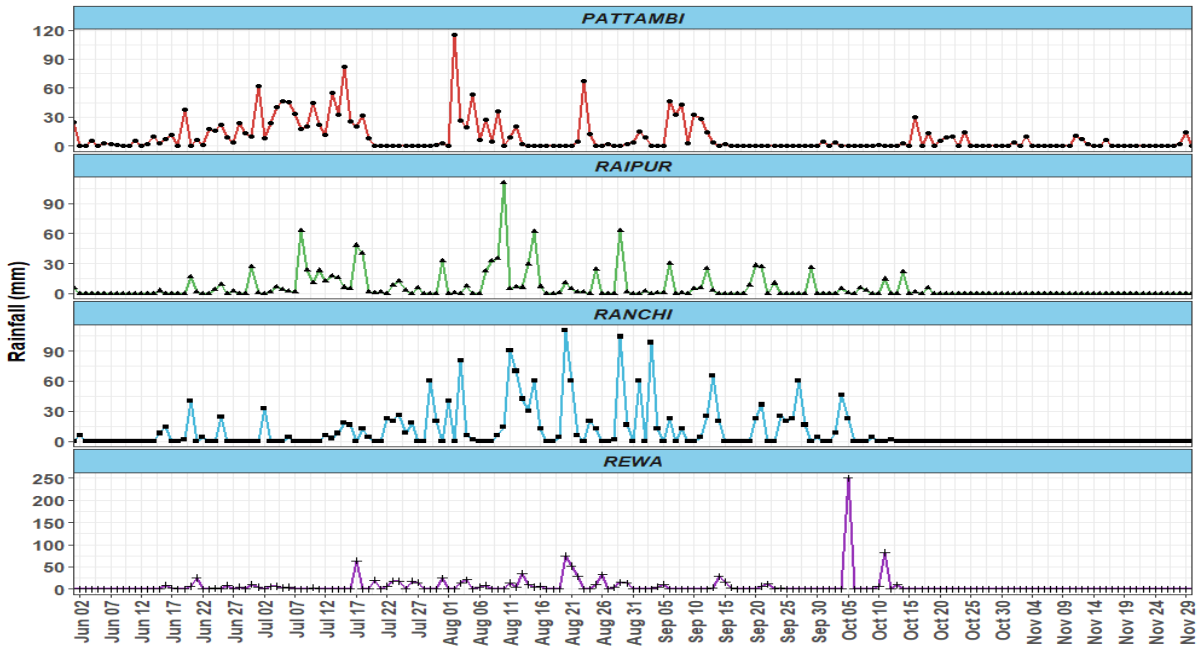


Fig 6.2.1A: Rainfall pattern under rainfed upland situation (drought) at different locations during Kharif 2022

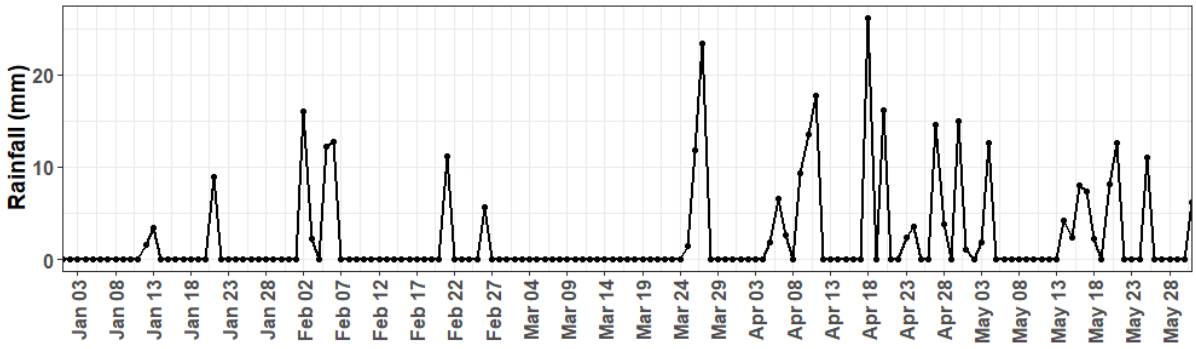


Fig 6.2.1B: Rainfall pattern under rainfed upland situation (drought) at Titabar during Rabi 2021-22

few namely IL19353, IL19083, IL19079, IL19103 and Sahabhagidhan. Sahabhagidhan has shown about 6% change of tiller number per plant over control which is the highest whereas IL19451 has shown the greatest percent change of tiller number per plant over control of about -22.5% followed by IET29859 (-18.5%) (Fig 6.2.2A). Among centres Ranchi has shown 0.2% change of tiller number per plant over control reaming all others centres has shown negative change of tiller number per plant over control. Raipur centres has shown the greatest percent change of tiller number per plant over control of about -16%.

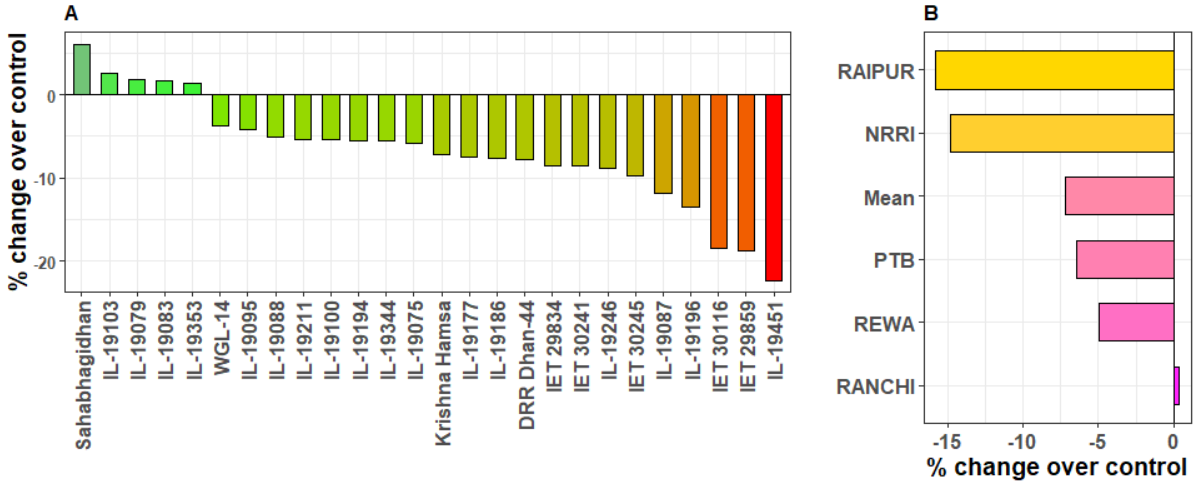


Fig 6.2.2: Influence of irrigation regimes on Tiller No/Plant recorded at flowering stage in different rice genotypes at different AICRIP centres during kharif-2022 season. [A] Mean of all locations [B] Mean of all genotypes. Each value represents % change under rainfed treatment in comparison with irrigated control.

Table 6.2.3 shows the data for mean panicle weight per m^2 (g/m^2). In irrigated treatment, mean panicle weight of all the entries ranged from 367 g/m^2 (NRRI) to 732 (RAIPUR) with an overall mean at all the centres 598 g/m^2. Whereas, it ranged from 204 g/m^2 (NRRI) to 685 g/m^2 (Ranchi) with an overall mean at all the centres is 464 g/m^2 in drought treatment. Among entries it ranged from 495 g/m^2 (WGL14) to 736 g/m^2 (IL19186) in irrigated treatment whereas in

rainfed it ranged from 380 g/m^2 (IL19246) to 544 g/m^2 (IL19186). Therefore, it is clear that there is a general reduction of mean panicle weight among all entries at all the centres. However, the reduction of mean panicle weight is statistically non-significant. The genotypic differences are also statistically non-significant. However, various interactions effects are significant which may be due to environment effect etc. Entry IL19246 has shown the greatest reduction (-36%) in percent change of panicle weight over control followed by IL19541 (-32%) whereas the entry WGL14 (-6.0%) has shown the least reduction in percent change of panicle weight over control followed by IL19095 (-6.5%) and the check entries Sahabhagidhan and Krishna Hamsa has shown -21% and -16% respectively. Among centres, all the centres have shown the reduction in percent change of panicle weight over control except RANCHI (Fig 6.2.3A). Percent change of mean panicle weight over control of among centres was -25%. The greatest among all was recorded by NRRI (-43%) followed by PTB (-41%). Ranchi centre has recorded a 0.3% percent change of panicle weight over control (Fig 6.2.3B).

No. of grains per panicle varied from 74 (PTB) to 160 (RAIPUR) in irrigated conditions with an overall mean of 108 whereas in drought conditions it varied from 30 (PTB) to 116 (RANCHI) with an overall mean of 73 (Table 6.2.5). Among entries it varied from 87 (IET30116) to 134 (IL19177) in irrigated condition whereas in rainfed condition it ranged from 64 (IL19083) to 84 (IL19353). It is evident from the Table 6.2.5, that there is about 26% reduction in the no. of grains per panicle in rainfed condition in comparison to irrigated condition. The treatment has significantly affected the entries and the entries have also significantly differed in their responses to the treatment. The interaction effect between Location X treatment, Location X genotype and Location X treatment X genotype are significant. Fig 6.2.4A shows that all the entries recorded a reduction in percent change of no. of grains per panicle over control, the greatest reduction was recorded by IET30241 (-43%)

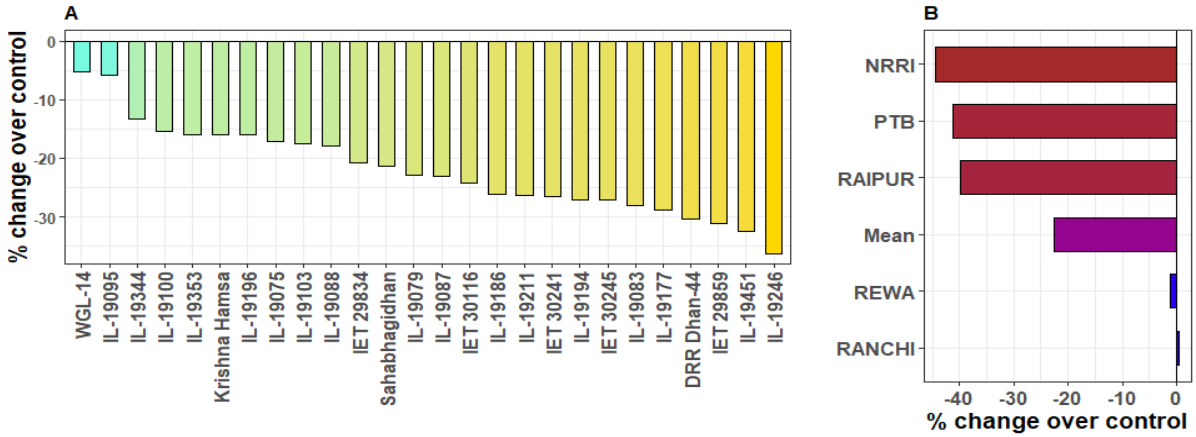


Fig. 6.2.3: Influence of irrigation regimes on panicle weight/m2 recorded at maturity stage in different rice genotypes at different AICRIP centres during kharif-2022 season. [A] Mean of all locations [B] Mean of all genotypes. Each value represents % change under rainfed treatment in comparison with irrigated control.

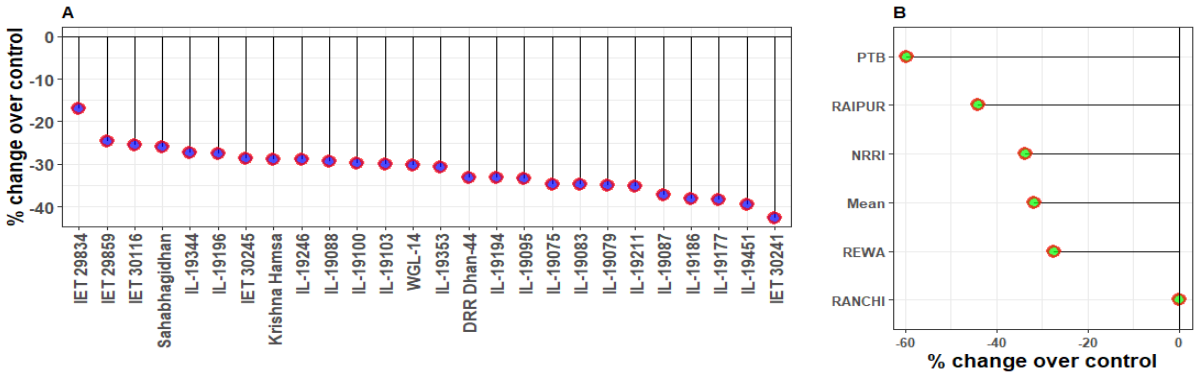


Fig. 6.2.4: Influence of irrigation regimes on No. Grains/Panicle in different rice genotypes at different AICRIP centres during kharif-2022 season. [A] Mean of all locations [B] Mean of all genotypes. Each value represents % change under rainfed treatment in comparison with irrigated control.

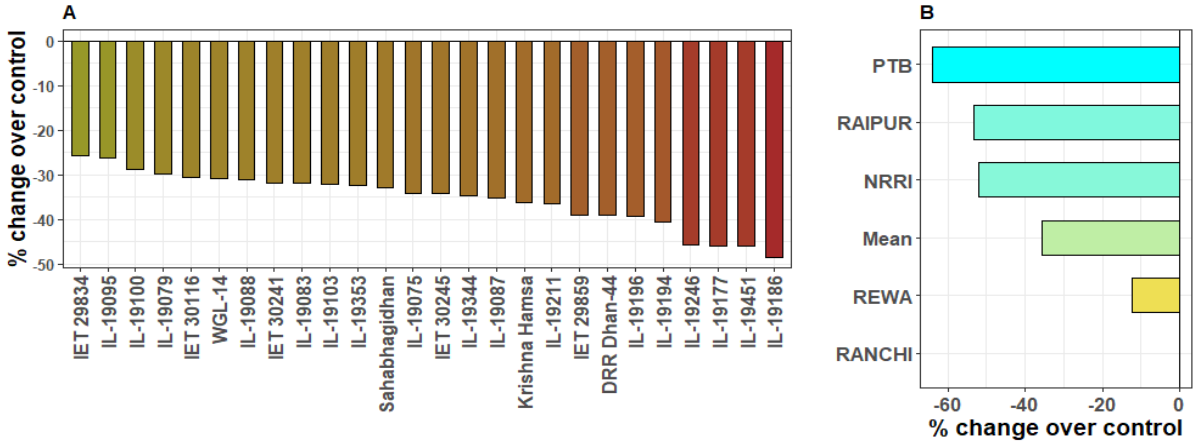


Fig 6.5: Influence of irrigation regimes on Grain Yield (g/m2) in different rice genotypes at different AICRIP centers during kharif-2022 season. [A] Mean of all locations [B] Mean of all genotypes. Each value represents % change under rainfed treatment in comparison with irrigated control.

followed by IL19451 (-39%). The least reduction was recorded by entry IET29834 (-17%) followed by IET29859 (-25%). Among carters, the mean percent change of no. of grains per panicle over control of all the centres was -31% (Fig 6.2.4B). PTB centre has recorded the greatest reduction of -60% and the RANCHI has recorded the least 0.0%.

The drought stress treatment has significantly affected the entries in terms of mean grain yield (g/m^2) (Table 6.2.9). Mean grain yield varied from 278 g/m^2 (NRRI) to 522 g/m^2 (REWA) with an overall mean of 387 g/m^2 in irrigated condition whereas it varied from 134 g/m^2 (NRRI) to 457 g/m^2 (REWA) with an overall mean of 249 g/m^2. The interaction effect between Location X treatment, Location X genotype and Location X treatment X genotype are also statistically significant. The entry IL19186 (-48%) has recorded the greatest reduction in terms of percent

change of grain yield over control followed by IL19451 (-46%) (Fig 6.2.5A). The least reduction in terms of percent change of grain yield over control was recorded by IET29834 (-26%) followed by IL19095 (-27%). Sahabhagidhan and Krishna Hamas has recorded -33% and -37% change of grain yield over control respectively (Fig 6.2.5B).

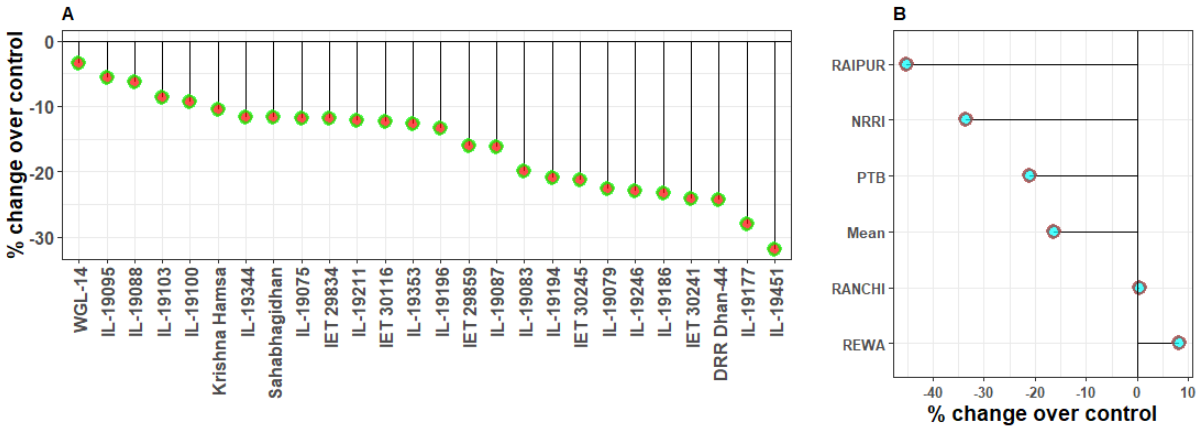


Fig 6.2.6: Influence of irrigation regimes on TDM (g/m2) in different rice genotypes at different AICRIP centres during kharif-2022 season. [A] Mean of all locations [B] Mean of all genotypes. Each value represents % change under rainfed treatment in comparison with irrigated control.

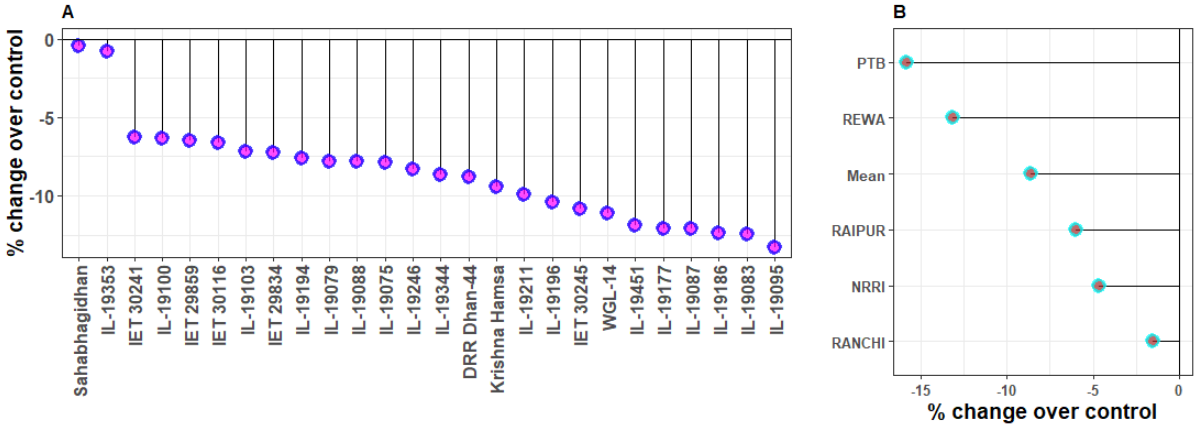


Fig 6.2.7: Influence of irrigation regimes on 1000 grain weight (g) in different rice genotypes at different AICRIP centres during kharif-2022 season. [A] Mean of all locations [B] Mean of all genotypes. Each value represents % change under rainfed treatment in comparison with irrigated control.

Table 6.2.12 shows the data for total dry matter (g/m^2) of all the entries. Centre-wise it ranged from 802 g/m^2 (NRRI) to 1448 g/m^2 (RANCHI) with an overall mean of 1173 g/m^2 in irrigated condition whereas it ranged from 533 g/m^2 (NRRI) to 1455 g/m^2 (RANCHI) with an overall mean of 982 g/m^2 in rainfed condition. It can be seen from the Table 6.2.12 that there are no significant differences among treatments i.e. treatments do not differ significantly for TDM. In terms of percent change of TDM over control the entry WGL14 has recorded the least reduction

of -3.5% followed by IL19095 (-6%) and the entry IL19451 (-32%) followed by IL19177 (-28%) has shown the greatest (Fig 6.2.6A). the mean percent change of TDM over control of all the centres was -16% had the greatest reduction was recorded by RAIPUR centre and the lowest by REWA which is 8% (Fig 6.2.6B).

1000 grain weight (g) varied from 17.9 g (NRRI) to 28.1 g (REWA) with an overall mean of 20.3 g in irrigated condition whereas in drought stress treatment it varied from 17 g (NRRI) to 24.4 g (REWA) with an overall mean of 20.3 g. Table 6.2.10 shows that the entries in the drought treatment carried significantly than the one in the irrigated treatment. That means the drought treatment has statistically significantly affected the entries. 1000 grain weight is a stable parameter, ideally it will not change but only under stress conditions. Various interaction effects have also significantly affected by the drought stress treatment. Entry Sahabhagidhan has recorded 0.1% percent change of 1000 grain weight over control which is the least followed by IL19353 (-1.5%) and the entry IL19095 has recorded the highest (-13%) followed by IL19083 (-10%) (Fig 6.2.7A). Among centres, PTB (-16%) has recorded the greatest reduction of percent change of 1000 grain weight over control followed by REWA (-13%) and the least was recorded by RANCHI (-2%) centre (Fig 6.2.7B).

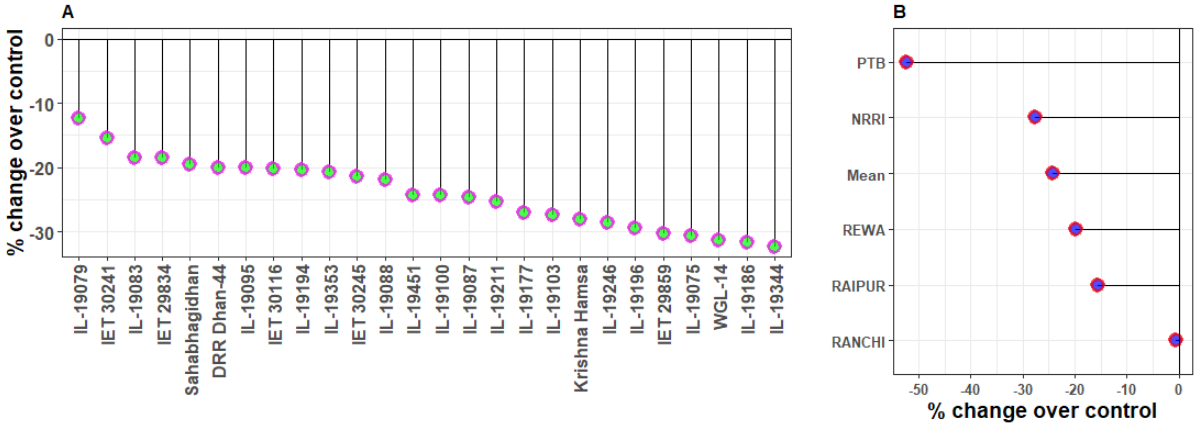


Fig. 6.2.8: Influence of irrigation regimes Harvest Index (%) in different rice genotypes at different AICRIP centres during kharif-2022 season. [A] Mean of all locations [B] Mean of all genotypes. Each value represents % change under rainfed treatment in comparison with irrigated control.

The mean harvest index (HI) among centres varied from 21.1 % to 42.8 % with an overall mean of 33.6% in irrigated condition whereas in rainfed condition it ranged from 15.1 % to 34.4 % with an overall mean of 25.5% (Table 6.2.11). The drought treatment has significantly affected the entries and various interaction effects as well. Drought treatment has significantly reduced the HI. Fig 6.2.8A shows the entry IL19079 has shown the least (-12%) percent change of HI over control followed by IET30241 (-21%) and the entry IL19344 followed by IL19186 has

recorded the greatest reduction of -33% and -31% percent change of HI over control respectively. Among centres RANCHI has shown the least percent change of HI over control 0.0% whereas the PTB has shown -53% and the mean was recorded -25% (Fig 6.2.8B).

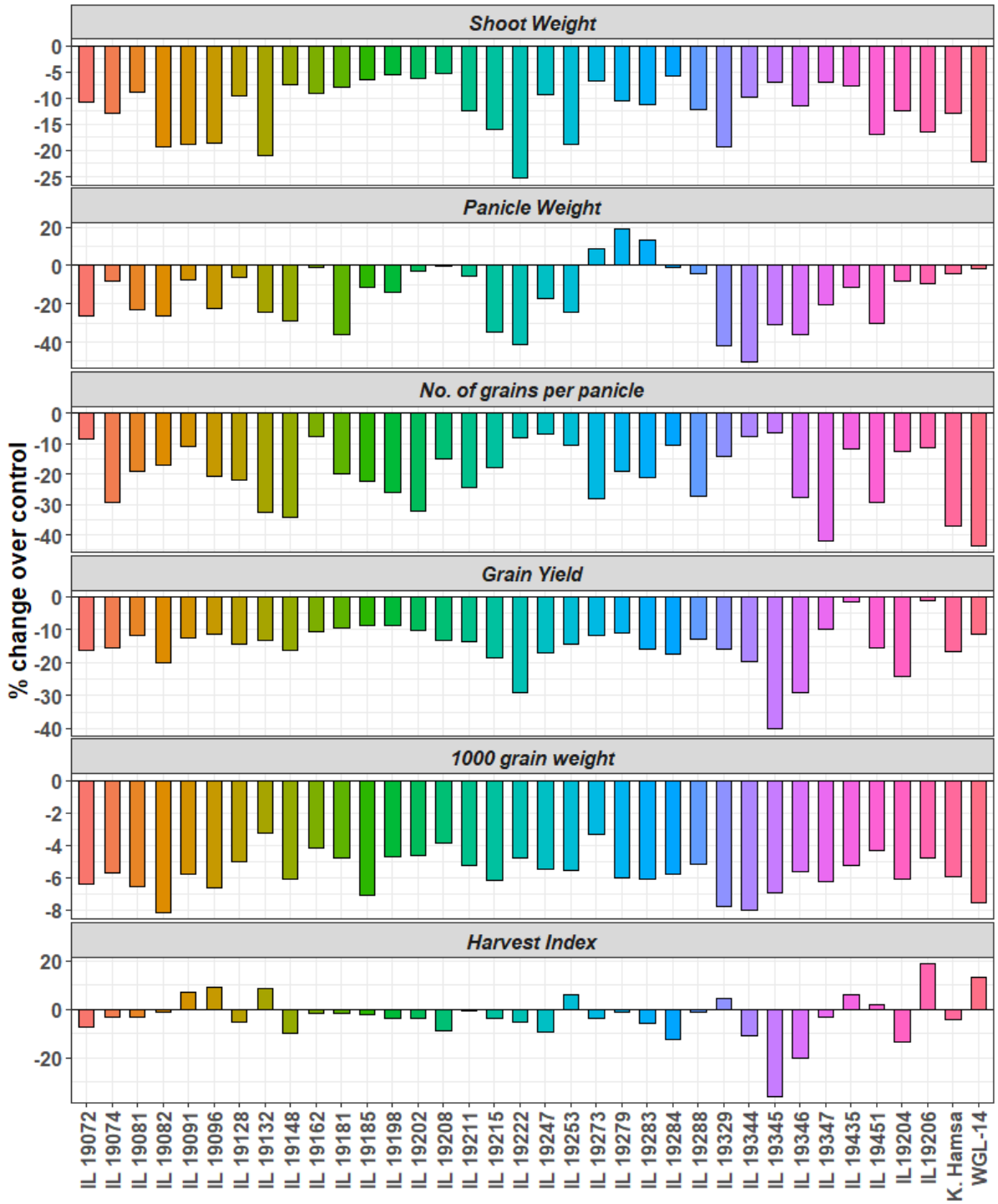


Fig 6.2.9: Influence of irrigation regimes on important physiological traits in selected rice genotypes at TTB centre during Rabi season. Each bar represents % change under rainfed condition in relation to irrigated control treatment.

Identification of Drought Tolerant genotypes using yield based drought Indices:

In order to identify genotypes tolerant to drought, different indices were computed based on the grain yield recorded under irrigated control and rainfed (drought) treatment. Different Drought tolerance indices including Drought susceptibility index (DSI), Relative Drought index (RDI), Drought tolerance index (DTI), Geometric mean productivity (GMP), Tolerance (TOL), Mean production (MP), Yield index (YI), Heat resistance index (HI), Yield stability index (YSI), Modified stress tolerance index (K1STI), were calculated using the relationships of (Fischer and Maurer, 1978; Fischer et al., 1998; Fernandez, 1992; Rosielle and Hamblin, 1981; Bouslama and Schapaugh, 1984; Blum, 1988; Moosavi et al., 2008; Farshadfar and Sutka, 2002). For calculating different drought indices, the means of all locations were used.

The results of Drought tolerance indices were presented in Table 6.2.13. Based on different drought indices individual entries were ranked. The overall rank for each entry was computed based on ranks for different indices. The genotype having highest overall rank was considered as most suitable for rain fed conditions as they have relative tolerance to water stressed conditions. The ranking of genotypes based on drought indices was presented in Table. 6.2.14. The data revealed that genotypes Krishna Hamsa, IL-19075, IL-19079, IET 29834 and IL-19095 have high Overall Rank and they may be considered as relatively drought tolerant and are suitable for rain fed cultivation.

In order to identify most suitable index for drought phenotyping, multiple correlation was performed between yield measured under rain fed condition (Ys) and drought tolerance indices. The correlation analysis between grain yield and tolerance indices can be a good criterion for screening the best cultivars and indices used. A suitable index must have a significant association with yield recorded under stress condition. The results of correlation analysis indicated that the indices like DI (Drought Resistance Index), GMP (Geometric Mean Production), MP (Mean Production), DTI (Drought Tolerance Index, HM (Hormonic Mean), K2STI (Modified Stress Tolerance Index), YI (Yield index) showed highly significant positive association with grain yield recorded under stress condition. These indices are useful in selecting suitable genotypes for drought tolerance. Some of these indices show strong association with the yield recorded under control conditions also.

Selection for high yield and stability of performance under rainfed conditions

In order to simultaneously select genotypes with higher yield and stability of performance across locations under elevated temperature conditions, a parametric model for simultaneous

selection in yield and stability "Shukla's stability variance and Kang's" statistic was performed and the results were presented. Based on their performance across locations and YSi values, DRR Dhan-44, IET 29834, IET 29859, IET 30241, IL-19075, IL-19079, IL-19083, IL-19095, IL-19103, IL-19186, IL-19344, IL-19353, Krishna Hamsa and Sahabhagidhan could be identified as stable genotypes under rainfed condition.

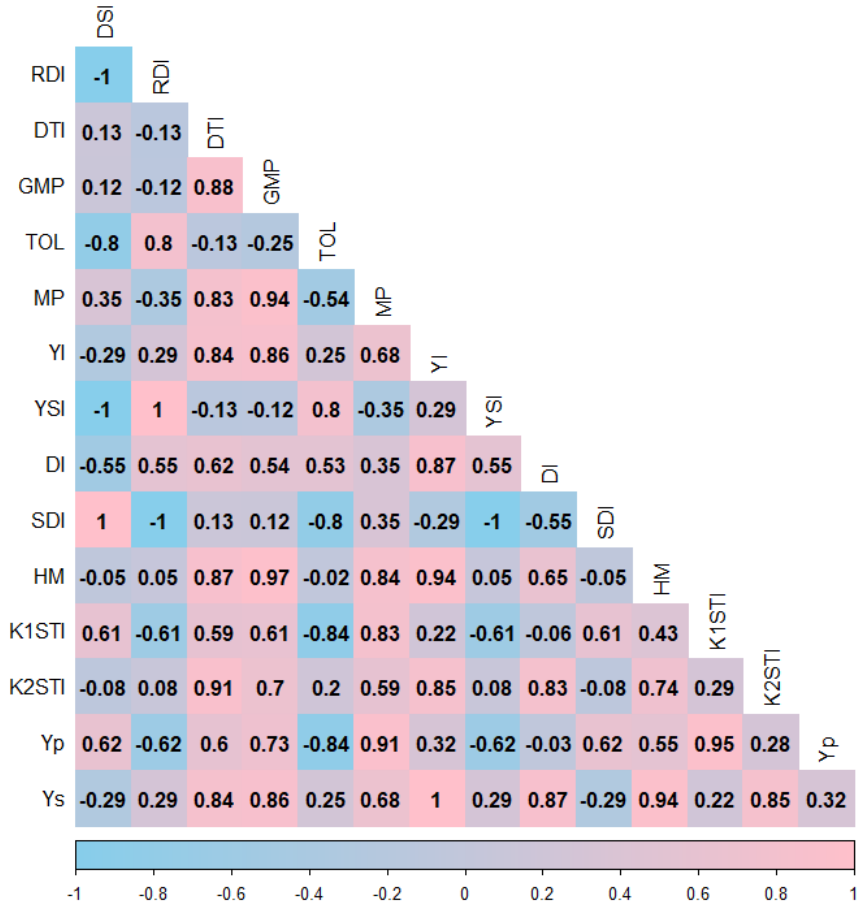


Fig. 6.2.10: Relationship between grain yield recorded under irrigated and rain fed condition and drought tolerant indices. For computing indices mean yield values for all the locations were used.

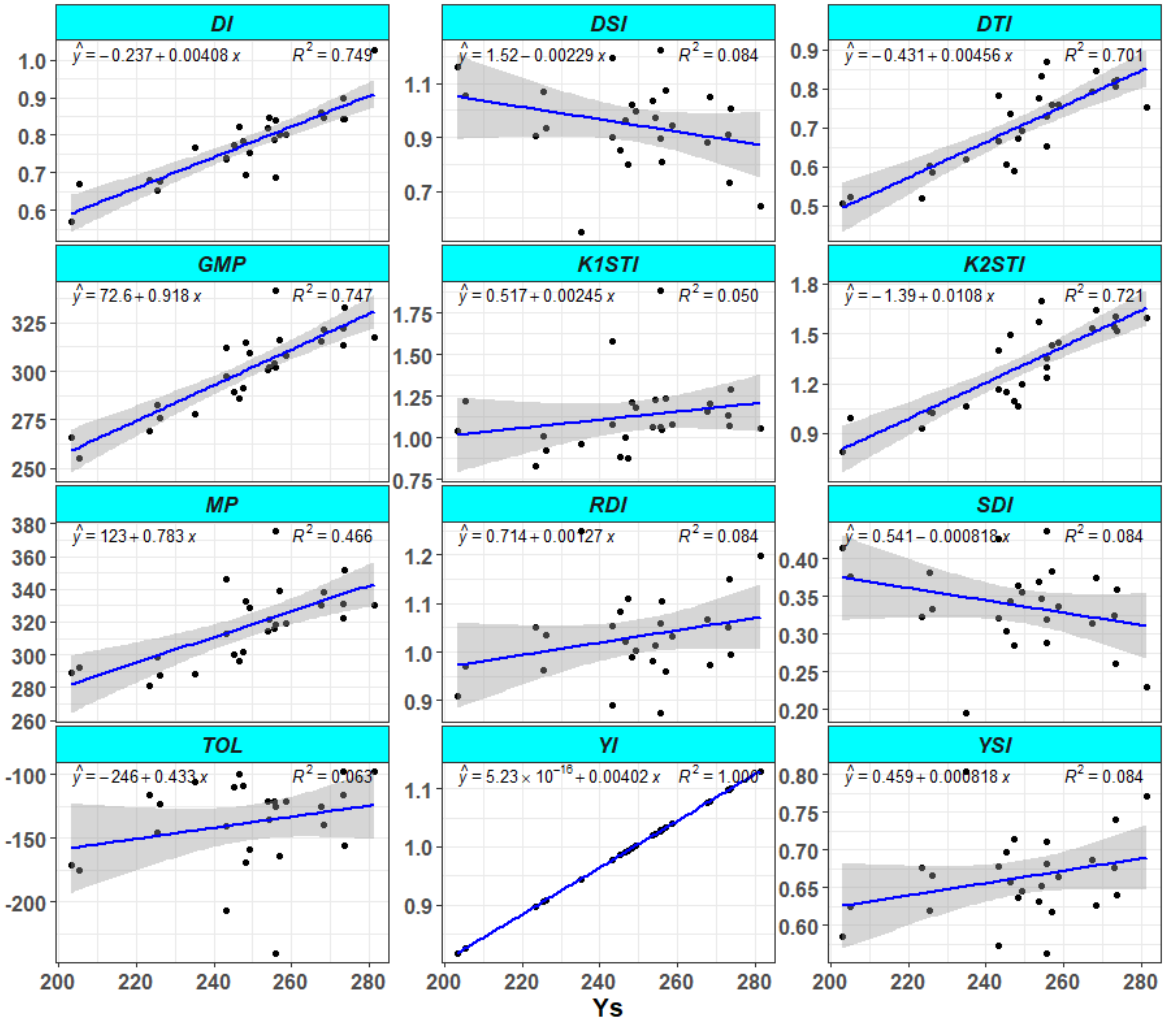


Fig 6.2.11: Relationship between grain yield recorded under rainfed condition (drought) and different drought tolerance indices computed from grain yield recorded under both rainfed and irrigated conditions.

Screening of elite rice genotypes for drought tolerance during Rabi 2021-22 season at TTB

At TTB centre the trail was conducted during *Rabi* season of 2022. Table 6.2.15 show data for physiological parameters recorded at TTB centre. The mean tiller no. per plant was 9.2 in irrigated condition whereas it was 7.7 in draught with 8.5 as mean of both. There is no significant effect of treatment on tiller no. per plant, however entries varied significantly. Both shoot weight per m^2 and panicle weight per m^2 varied significantly. There was a reduction in shoot weight per m^2 and panicle weight per m^2 drought treatment. The percent change of shoot weight over control was recorded greatest in entry IL19222 (-25%) and least in IL19208 (-5%) (Fig 12). The percent change of panicle weight over control recorded in IL19279, IL19283 and IL19273 was 18%, 12% and 9% respectively. The greatest reduction of percent change of

panicle weight over control was observed in IL19344 (-51%) followed by IL19329(-41%). Mean grain no. per panicle was 103 in irrigated condition whereas in rainfed condition it was 81 with 92 being the mean of both (Table 6.2.16). there is statistically significant treatment effect and under rainfed condition the grain no. per panicle was significantly reduced. All the entries have recorded the negative percent change of grain no. per panicle over control. The greatest was WGL14 (-48%) followed by IL19347 (-42%) and the least was recorded by IL19345 (-6%) followed by IL19247 (-8%). Mean grain yield (g/m^2) was recorded 338 in irrigated condition whereas in rainfed condition it was 286 with 312 being the mean of both (Table 6.2.18). Mean 1000 grain weight (g) was recorded 18.5 in irrigated condition whereas in rainfed condition it was 17.4 with 18.0 being the mean of both. Both the parameters were significantly affected by treatment. The mean grain yield was reduced by 15.3% in rainfed condition in comparison with the irrigated condition. However, few entries have shown the tolerance by maintaining the grain yield under drought treatment at par with that of irrigated condition such as IL19206 and IL19435 -2% and -3% respectively. Therefore, these two entries have also recorded least reduction of percent change of grain yield over control. The greatest was recorded by IL19345 (-39%) followed by IL19222 (-28%) (Fig 12). All the entries have recorded reduction in 1000 grain weight in the range of -4% to -8%. Mean HI was recorded 36.0 in irrigated condition whereas in rainfed condition it was 34.9 with 35.4 being the mean. HI was not significantly affected by the treatment. However, few entries have shown positive percent change of HI over control such as IL19206, IL19096 and IL19132 18%, 8% and 7% respectively (Fig 6.2.9).

Different Drought tolerance indices including Drought susceptibility index (DSI), Relative Drought index (RDI), Drought tolerance index (DTI), Geometric mean productivity (GMP), Tolerance (TOL), Mean production (MP), Yield index (YI), Heat resistance index (HI), Yield stability index (YSI), Modified stress tolerance index (K1STI), were calculated. The data on the indices was presented in table 6.2.19. Genotypes were ranked for each index and the overall rank was computed. Drought tolerant genotypes were identified based on the high overall rank. The entries IL 19206, IL 19208, IL 19096, Krishna Hamsa and IL 19279 could be identified as drought tolerant and are suitable for cultivation and rainfed conditions. Multiple correlation analysis between yield obtained under rainfed condition and the computed yield indices revealed a strong positive association between yield for DTI, GMP, MP, YI, DI, HM, K2STI and strong negative relation was observed for DSI, SDI and, these indices are useful for identification drought tolerant genotypes.

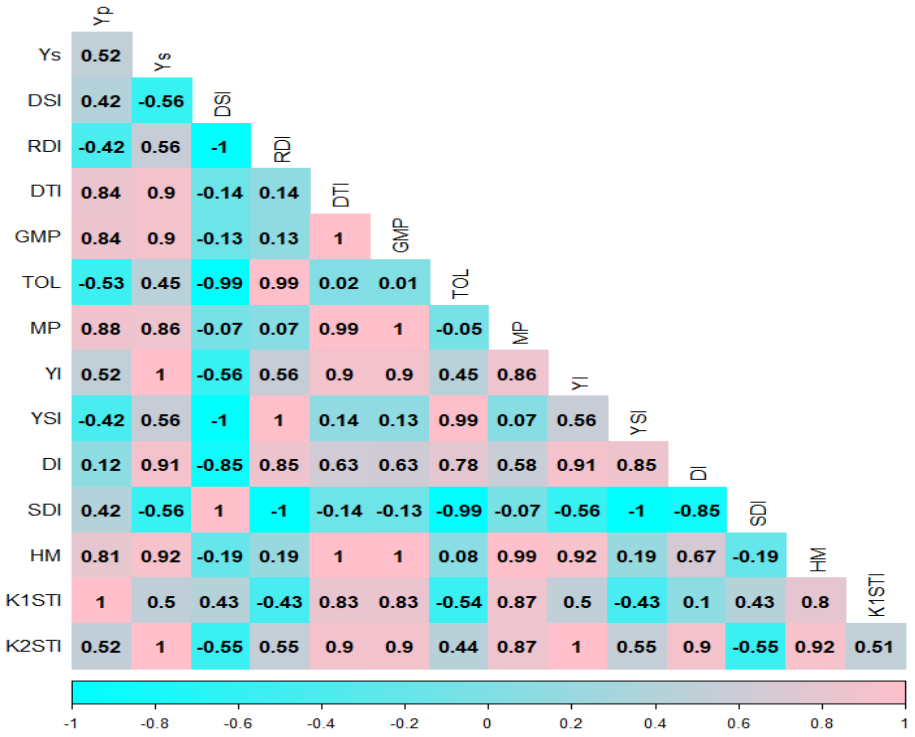


Fig. 6.2.12: Relationship between different drought tolerance indices and grain yield recorded under Rainfed (Ys) and Irrigated control (Yp) at TTB centre during Rabi season

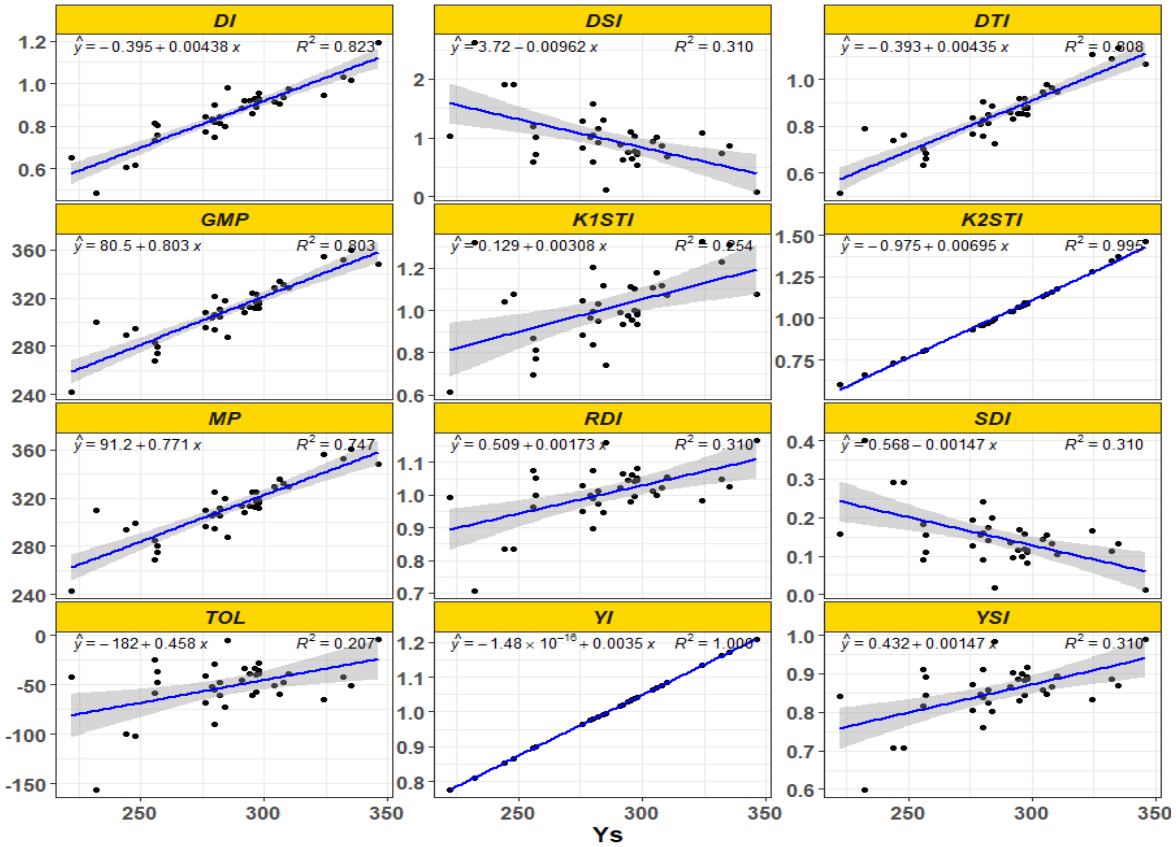


Fig 6.2.13: Relationship between grain yield recorded under rainfed condition (drought) and different drought tolerance indices computed from grain yield recorded under both rainfed and irrigated conditions at TTB centre during Rabi season

Summary & Conclusions

- A trial to study the drought tolerance traits of rice cultures with respect to yield and other attributes under dry spells was conducted with 26 introgression lines derived from multi-parent inter-crosses in the background of Krishna Hamsa during kharif-2022 season.
- The treatments consist of two irrigation regimes (a) Irrigated as per the recommended schedule and (b) totally rain fed condition without any supplementary irrigation.
- ANOVA revealed that the mean Grain Yield (g/m2) (mean of all locations) show >35% reduction under rainfed condition in comparison with irrigated control.
- The following entries IET 29834, IL-19095 and IL-19100 noted < 30% reduction in grain yield and could be used as donors for rainfed upland situations.
- Based on drought indices computed from grain yield recorded under both irrigated as well as rainfed conditions, the results revealed that Krishna Hamsa, IL-19075, IL-19079, IET 29834 and IL-19095 have high overall rank and may be considered as relatively drought tolerant.
- Parametric model for simultaneous selection in yield and stability across locations and YSi values identified DRR Dhan-44, IET 29834, IET 29859, IET 30241, IL-19075, IL-19079, IL-19083, IL-19095, IL-19103, IL-19186, IL-19344, IL-19353, Krishna Hamsa and Sahabhagidhan as stable genotypes under rainfed condition.
- At Titabar centre the trial was conducted during Rabi (dry) season with 36 entries. The entries IL 19206, IL 19435, IL 19185 and IL 19198 showed minimum reduction in grain yield (< 10%) in comparison with irrigated control. Based on drought tolerance indices the genotypes IL 19206, IL 19208, IL 19096, Krishna Hamsa and IL 19279 could be identified as drought tolerant and are suitable for cultivation and rainfed conditions.
- Multiple correlation analysis between yield obtained under rainfed condition and the computed yield indices revealed a strong positive association between for DTI, GMP, MP, YI, DI, HM, K2STI and strong negative relation was observed for DSI, SDI and, these indices are useful for identification drought tolerant genotypes.

Table 6.2.1 Screening for elite rice culture for drought tolerance on tiller number/plant at different centers Kharif 2022

S.No	Genotypes	Drought					Grand Mean	Irrigated					Grand Mean
		NRRI	PTB	RANCHI	REWA	RPUR		NRRI	PTB	RANCHI	REWA	RPUR	
1	DRR Dhan-44	6.7	6.9	18.0	9.3	9.7	**10.1**	6.7	6.2	19.7	11.4	11.0	**11.0**
2	IET 29834	7.1	8.9	19.0	8.8	12.0	**11.2**	7.3	6.2	19.0	9.5	19.0	**12.2**
3	IET 29859	6.9	6.1	18.3	8.1	12.7	**10.4**	7.0	6.8	19.0	9.5	22.0	**12.8**
4	IET 30116	7.3	6.3	18.7	6.6	12.3	**10.2**	8.3	7.2	19.3	8.0	20.0	**12.6**
5	IET 30241	6.2	6.3	18.3	7.7	11.3	**10.0**	7.8	8.7	17.3	8.7	12.0	**10.9**
6	IET 30245	5.5	7.8	19.7	6.2	9.3	**9.7**	8.1	8.3	17.7	7.4	12.3	**10.7**
7	IL-19075	5.5	6.6	16.7	8.8	9.3	**9.4**	7.2	4.8	19.0	7.3	11.3	**9.9**
8	IL-19079	6.8	8.2	21.3	8.3	11.3	**11.2**	7.9	6.2	20.7	8.3	12.0	**11.0**
9	IL-19083	6.1	7.8	18.3	8.4	11.7	**10.5**	7.7	7.1	16.0	10.0	10.7	**10.3**
10	IL-19087	6.1	4.3	15.7	10.7	10.7	**9.5**	8.1	5.0	17.7	10.3	12.7	**10.8**
11	IL-19088	7.3	5.6	17.7	8.9	10.7	**10.0**	6.9	6.8	17.7	10.4	11.0	**10.6**
12	IL-19095	6.1	7.0	20.0	10.5	11.0	**10.9**	9.1	5.9	18.0	12.0	12.0	**11.4**
13	IL-19100	6.9	5.3	19.7	9.7	11.3	**10.6**	8.7	5.9	20.0	9.0	12.3	**11.2**
14	IL-19103	6.9	5.4	21.0	9.4	11.0	**10.7**	7.8	4.7	19.3	9.9	10.7	**10.5**
15	IL-19177	6.1	4.1	20.3	10.5	11.3	**10.5**	7.7	5.7	20.0	11.2	12.0	**11.3**
16	IL-19186	5.7	5.9	20.3	10.2	11.3	**10.7**	6.2	10.2	19.7	9.9	12.0	**11.6**
17	IL-19194	8.1	9.7	18.3	10.8	11.0	**11.6**	6.9	14.1	18.3	10.0	12.0	**12.3**
18	IL-19196	4.6	4.5	21.0	6.7	10.7	**9.5**	7.4	6.2	21.0	8.3	12.0	**11.0**
19	IL-19211	5.5	8.6	20.7	10.1	9.7	**10.9**	8.2	7.8	18.3	11.0	12.3	**11.5**
20	IL-19246	6.8	6.7	18.0	9.9	10.0	**10.3**	8.1	5.9	19.3	9.8	13.3	**11.3**
21	IL-19344	5.1	4.0	17.7	9.7	9.7	**9.2**	5.5	4.7	16.0	10.6	12.0	**9.8**
22	IL-19353	6.0	7.9	18.0	6.6	9.7	**9.6**	6.7	6.5	17.0	5.3	12.0	**9.5**
23	IL-19451	6.3	3.6	19.3	6.6	10.7	**9.3**	8.5	12.1	19.7	6.9	12.7	**12.0**
24	K. Hamsa	8.8	6.8	18.7	9.8	11.3	**11.1**	9.6	7.0	21.7	9.5	12.0	**12.0**
25	SB.Dhan	5.1	7.9	18.7	10.7	10.3	**10.5**	5.0	4.7	19.0	10.2	10.7	**9.9**
26	WGL-14	6.4	6.8	20.3	7.3	10.3	**10.2**	7.0	6.0	21.3	7.8	11.0	**10.6**
	Mean	**6.4**	**6.5**	**19.0**	**8.9**	**10.8**	**10.3**	**7.5**	**6.9**	**18.9**	**9.3**	**12.8**	**11.1**
	LSD (Treat)				ns			LSD (Treat x Genotype)					ns
	LSD (Location x Treat)				0.84**			LSD (Location x Treat x Genotype)					3.11**
	LSD (Genotype)				ns			CV (%) Treat					15.56
	LSD (Location x Genotype)				2.20**								

Table 6.2.2 Screening for elite rice culture for drought tolerance on shoot weight (g/m²) maturity at different centers Kharif 2022

S.No.	Genotypes	Drought					Grand Mean	Irrigated					Grand Mean
		NRRI	PTB	RANCHI	REWA	RPUR		NRRI	PTB	RANCHI	REWA	RPUR	
1	DRR Dhan-44	319	740	771	651	501	**596**	604	823	750	547	782	**701**
2	IET 29834	417	697	782	693	694	**656**	500	831	770	502	1009	**723**
3	IET 29859	459	662	759	556	886	**664**	585	548	781	527	1032	**695**
4	IET 30116	347	830	776	515	799	**653**	515	720	781	386	1090	**698**
5	IET 30241	389	389	768	676	739	**592**	390	933	776	562	983	**729**
6	IET 30245	333	627	754	411	755	**576**	356	1033	763	336	1022	**702**
7	IL-19075	300	578	766	722	713	**616**	470	503	771	618	953	**663**
8	IL-19079	228	583	833	688	692	**605**	370	1009	765	578	963	**737**
9	IL-19083	417	455	755	713	557	**579**	465	617	751	594	984	**682**
10	IL-19087	299	483	757	590	535	**533**	333	460	758	499	1022	**614**
11	IL-19088	267	737	776	704	635	**624**	411	397	779	593	612	**558**
12	IL-19095	284	822	769	690	732	**659**	413	483	773	604	1010	**657**
13	IL-19100	253	460	767	705	742	**585**	276	533	750	591	1022	**634**
14	IL-19103	404	547	769	658	611	**598**	452	530	753	567	1195	**700**
15	IL-19177	354	567	783	719	680	**621**	450	1008	765	579	996	**759**
16	IL-19186	241	775	771	671	606	**613**	511	883	787	554	635	**674**
17	IL-19194	304	790	763	512	517	**577**	361	791	751	387	674	**593**
18	IL-19196	387	560	763	578	684	**594**	507	543	768	497	1114	**686**
19	IL-19211	296	793	769	634	609	**620**	281	498	777	541	1039	**627**
20	IL-19246	322	735	771	524	664	**603**	441	673	808	398	1041	**672**
21	IL-19344	316	442	755	756	709	**596**	450	376	756	651	1147	**676**
22	IL-19353	303	882	756	740	639	**664**	504	793	749	617	986	**730**
23	IL-19451	249	382	761	576	605	**514**	362	1033	771	473	905	**709**
24	K. Hamsa	288	692	764	661	646	**610**	498	424	754	533	1000	**642**
25	SB.Dhan	361	797	791	544	540	**607**	376	560	759	449	828	**595**
26	WGL-14	411	594	770	570	506	**570**	424	563	785	458	861	**618**
	Mean	**329**	**639**	**770**	**633**	**654**	**605**	**435**	**676**	**767**	**525**	**958**	**672**
	LSD (Treat)				ns			LSD (Treat x Genotype)				ns	
	LSD (Location x Treat)				147.0**			LSD (Location x Treat x Genotype)				185.7**	
	LSD (Genotype)				ns			CV (%) Treat				45.37	
	LSD (Location x Genotype)				131.3**								

Table 6.2.3 Screening for elite rice culture for drought tolerance on panicle weight (g/m²) maturity at different centers Kharif 2022

S.No.	Genotypes	Drought					Grand Mean	Irrigated					Grand Mean
		NRRI	PTB	RANCHI	REWA	RPUR		NRRI	PTB	RANCHI	REWA	RPUR	
1	DRR Dhan-44	280	206	689	739	329	**448**	554	448	677	814	729	**644**
2	IET 29834	223	284	684	747	398	**467**	392	596	682	630	649	**590**
3	IET 29859	233	396	677	618	443	**473**	542	431	677	700	1090	**688**
4	IET 30116	250	199	679	579	339	**409**	333	620	677	546	521	**539**
5	IET 30241	211	140	689	744	568	**471**	290	701	681	684	844	**640**
6	IET 30245	157	177	680	542	593	**430**	286	584	691	419	970	**590**
7	IL-19075	235	190	687	772	613	**499**	390	424	689	674	836	**603**
8	IL-19079	151	226	684	725	484	**454**	341	580	682	676	667	**589**
9	IL-19083	196	159	685	747	252	**408**	376	568	666	655	567	**566**
10	IL-19087	146	284	690	642	250	**403**	279	324	679	732	604	**524**
11	IL-19088	172	202	690	618	422	**421**	302	216	683	657	705	**512**
12	IL-19095	171	345	693	798	372	**476**	286	268	687	684	602	**505**
13	IL-19100	119	292	689	749	543	**478**	251	257	676	663	979	**565**
14	IL-19103	211	295	690	733	331	**452**	313	340	676	838	574	**548**
15	IL-19177	129	208	683	739	739	**500**	244	770	682	854	961	**702**
16	IL-19186	194	425	684	670	748	**544**	441	932	678	627	1002	**736**
17	IL-19194	268	352	690	520	648	**496**	532	494	668	812	893	**680**
18	IL-19196	212	552	685	647	286	**476**	473	564	673	540	589	**568**
19	IL-19211	280	346	684	667	321	**459**	510	570	691	799	549	**624**
20	IL-19246	185	244	682	500	290	**380**	340	691	687	717	543	**596**
21	IL-19344	147	499	684	842	498	**534**	227	569	685	736	866	**616**
22	IL-19353	203	358	683	794	514	**511**	419	283	677	716	941	**607**
23	IL-19451	134	259	688	652	374	**421**	221	868	685	714	631	**624**
24	K. Hamsa	265	469	674	715	387	**502**	463	474	687	809	560	**598**
25	SB.Dhan	317	368	682	643	346	**471**	354	504	678	743	719	**600**
26	WGL-14	220	447	675	644	363	**470**	384	399	687	566	440	**495**
	Mean	**204**	**305**	**685**	**684**	**440**	**464**	**367**	**518**	**681**	**693**	**732**	**598**
	LSD (Treat)				ns			LSD (Treat x Genotype)				ns	
	LSD (Location x Treat)				35.57**			LSD (Location x Treat x Genotype)				147.2**	
	LSD (Genotype)				ns			CV (%) Treat				13.21	
	LSD (Location x Genotype)				104.1**								

Table 6.2.4 Screening for elite rice culture for drought tolerance on panicle number/m² maturity at different centers Kharif 2022

S.No.	Genotypes	Drought					Grand Mean	Irrigated					Grand Mean
		NRRI	PTB	RANCHI	REWA	RPUR		NRRI	PTB	RANCHI	REWA	RPUR	
1	DRR Dhan-44	196	353	258	144	62	**203**	259	317	249	176	233	**247**
2	IET 29834	189	457	259	153	155	**242**	314	274	242	131	290	**250**
3	IET 29859	200	463	250	64	186	**232**	229	287	241	163	356	**255**
4	IET 30116	262	360	250	21	204	**219**	319	326	249	56	239	**238**
5	IET 30241	245	391	254	149	189	**246**	280	420	257	191	272	**284**
6	IET 30245	211	417	249	26	156	**212**	243	420	247	42	257	**242**
7	IL-19075	215	370	244	44	163	**207**	255	284	255	63	254	**222**
8	IL-19079	201	463	242	94	166	**233**	287	397	253	118	247	**260**
9	IL-19083	236	449	256	112	123	**235**	264	443	247	139	243	**267**
10	IL-19087	199	257	244	164	117	**196**	224	207	244	187	261	**225**
11	IL-19088	226	363	246	154	109	**220**	293	227	263	184	238	**241**
12	IL-19095	208	434	249	130	155	**235**	243	243	253	163	223	**225**
13	IL-19100	209	307	256	128	195	**219**	231	243	245	165	345	**246**
14	IL-19103	274	323	244	111	160	**222**	283	283	252	139	230	**237**
15	IL-19177	194	263	238	138	111	**189**	226	343	241	166	234	**242**
16	IL-19186	214	333	261	133	142	**217**	289	497	249	152	258	**289**
17	IL-19194	261	570	248	147	139	**273**	367	697	243	168	243	**344**
18	IL-19196	184	237	256	53	112	**168**	235	310	252	80	243	**224**
19	IL-19211	199	631	252	170	121	**275**	291	390	257	198	240	**275**
20	IL-19246	199	413	236	124	97	**214**	264	318	250	156	237	**245**
21	IL-19344	140	179	240	106	125	**158**	249	233	247	144	240	**223**
22	IL-19353	155	380	247	43	87	**182**	242	227	259	56	240	**205**
23	IL-19451	195	437	253	44	124	**211**	228	510	251	71	272	**266**
24	K. Hamsa	291	400	261	123	176	**250**	405	343	252	169	261	**286**
25	SB.Dhan	205	417	253	139	89	**221**	245	280	249	172	218	**233**
26	WGL-14	186	303	245	44	133	**182**	306	241	233	66	250	**219**
	Mean	**211**	**383**	**250**	**106**	**138**	**218**	**272**	**337**	**249**	**135**	**255**	**250**
	LSD (Treat)				ns			LSD (Treat x Genotype)				ns	
	LSD (Location x Treat)				36.27**			LSD (Location x Treat x Genotype)				92.92**	
	LSD (Genotype)				ns			CV (%) Treat				30.58	
	LSD (Location x Genotype)				65.70**								

Table 6.2.5 Screening for elite rice culture for drought tolerance on grains/panicle maturity at different centers Kharif 2022

S.No.	Genotypes	Drought					Grand Mean	Irrigated					Grand Mean
		NRRI	PTB	RANCHI	REWA	RPUR		NRRI	PTB	RANCHI	REWA	RPUR	
1	DRR Dhan-44	55	37	120	89	104	**81**	120	72	118	121	175	**121**
2	IET 29834	52	40	114	93	87	**77**	86	56	112	99	111	**93**
3	IET 29859	64	47	124	24	82	**68**	84	38	107	108	114	**91**
4	IET 30116	57	19	118	43	89	**65**	62	73	118	71	113	**87**
5	IET 30241	43	22	110	71	91	**67**	95	75	108	108	199	**117**
6	IET 30245	68	20	114	79	117	**80**	83	73	108	94	201	**112**
7	IL-19075	66	30	120	70	66	**70**	91	78	112	88	169	**108**
8	IL-19079	65	26	119	96	90	**79**	78	98	118	119	196	**122**
9	IL-19083	35	22	108	68	87	**64**	60	58	124	93	155	**98**
10	IL-19087	55	31	113	82	78	**72**	81	63	123	119	187	**115**
11	IL-19088	49	20	125	62	116	**74**	86	59	123	90	167	**105**
12	IL-19095	63	22	119	83	73	**72**	87	76	112	115	151	**108**
13	IL-19100	36	30	114	69	86	**67**	59	62	117	105	134	**96**
14	IL-19103	48	20	111	104	69	**70**	67	49	112	130	142	**100**
15	IL-19177	52	29	118	102	110	**82**	80	147	119	130	192	**134**
16	IL-19186	52	27	109	74	82	**69**	78	91	120	92	175	**111**
17	IL-19194	52	16	117	69	73	**65**	70	32	125	88	173	**98**
18	IL-19196	50	22	107	92	87	**71**	88	45	108	118	134	**99**
19	IL-19211	72	24	113	64	90	**72**	107	79	113	90	170	**112**
20	IL-19246	48	35	117	99	80	**76**	70	107	108	129	120	**107**
21	IL-19344	60	82	113	46	78	**76**	63	102	113	82	162	**104**
22	IL-19353	94	23	112	87	103	**84**	118	71	114	101	200	**121**
23	IL-19451	33	30	124	91	84	**73**	80	107	116	117	178	**120**
24	K. Hamsa	44	28	116	56	100	**69**	90	64	114	101	116	**97**
25	SB. Dhan	98	32	118	71	88	**81**	115	43	120	103	168	**110**
26	WGL-14	50	40	117	88	115	**82**	108	98	123	109	149	**117**
	Mean	**56**	**30**	**116**	**76**	**89**	**73**	**85**	**74**	**116**	**105**	**160**	**108**
	LSD (Treat)				3.39*			LSD (Treat x Genotype)				ns	
	LSD (Location x Treat)				10.81**			LSD (Location x Treat x Genotype)				29.42**	
	LSD (Genotype)				7.07*			CV (%) Treat				23.52	
	LSD (Location x Genotype)				20.80**								

Table 6.2.6 Screening for elite rice culture for drought tolerance on spikelet/panicle maturity at different centers Kharif 2022

S.No.	Genotypes	Drought					Grand Mean	Irrigated					Grand Mean
		NRRI	PTB	RANCHI	REWA	RPUR		NRRI	PTB	RANCHI	REWA	RPUR	
1	DRR Dhan-44	113	61	124	127	115	**108**	164	86	123	196	183	**150**
2	IET 29834	86	67	118	135	106	**102**	122	83	117	114	121	**112**
3	IET 29859	124	64	129	65	162	**109**	127	58	113	121	120	**108**
4	IET 30116	83	44	122	97	119	**93**	83	83	124	107	120	**103**
5	IET 30241	95	49	115	110	151	**104**	120	99	113	150	205	**138**
6	IET 30245	114	42	119	142	170	**117**	121	92	113	122	212	**132**
7	IL-19075	120	60	125	134	113	**111**	151	111	117	128	176	**137**
8	IL-19079	110	63	124	156	128	**116**	117	120	122	146	208	**143**
9	IL-19083	93	70	113	111	107	**99**	113	67	129	120	165	**119**
10	IL-19087	114	59	119	180	100	**115**	118	104	128	152	194	**139**
11	IL-19088	85	48	129	107	137	**102**	115	87	128	129	173	**126**
12	IL-19095	107	51	124	117	121	**104**	113	98	117	174	159	**132**
13	IL-19100	73	36	119	102	118	**90**	113	91	122	162	142	**126**
14	IL-19103	71	33	115	143	97	**92**	87	58	117	174	148	**117**
15	IL-19177	119	48	123	145	126	**112**	121	163	125	184	199	**158**
16	IL-19186	106	62	113	103	120	**101**	117	91	125	148	184	**133**
17	IL-19194	85	36	123	98	96	**88**	88	49	130	153	180	**120**
18	IL-19196	108	43	112	138	106	**101**	123	62	114	167	146	**122**
19	IL-19211	117	40	118	112	124	**102**	140	92	117	129	180	**132**
20	IL-19246	106	58	122	139	98	**105**	118	125	113	173	134	**132**
21	IL-19344	119	119	118	76	116	**110**	106	149	118	109	176	**132**
22	IL-19353	153	46	117	115	122	**111**	161	83	118	118	214	**139**
23	IL-19451	78	72	129	124	104	**101**	143	142	121	136	187	**146**
24	K. Hamsa	90	42	120	84	118	**91**	121	79	119	114	124	**112**
25	SB.Dhan	125	47	123	106	105	**101**	137	61	126	137	178	**128**
26	WGL-14	111	54	121	111	140	**107**	160	116	128	125	155	**137**
	Mean	**104**	**54**	**121**	**118**	**120**	**104**	**123**	**94**	**121**	**142**	**169**	**130**
	LSD (Treat)				3.45*			LSD (Treat x Genotype)				ns	
	LSD (Location x Treat)				10.99**			LSD (Location x Treat x Genotype)				33.31**	
	LSD (Genotype)				8.00*			CV (%) Treat				18.58	
	LSD (Location x Genotype)				23.55**								

Table 6.2.7 Screening for elite rice culture for drought tolerance on grain number/m² maturity at different centers Kharif 2022

S.No.	Genotypes	Drought					Grand Mean	Irrigated					Grand Mean
		NRRI	PTB	RANCHI	REWA	RPUR		NRRI	PTB	RANCHI	REWA	RPUR	
1	DRR Dhan-44	10629	13489	30800	16715	4432	**15213**	31311	23698	29333	24454	40571	**29873**
2	IET 29834	8946	17885	29467	18329	10756	**17077**	27345	15633	27200	16495	30105	**23356**
3	IET 29859	13008	21778	31033	3048	18208	**17415**	18623	11103	25900	21518	39368	**23302**
4	IET 30116	15018	6713	29467	1955	15588	**13748**	19918	23503	29467	6655	24931	**20895**
5	IET 30241	10607	8397	28067	14079	11465	**14523**	26633	31479	27867	24144	53979	**32820**
6	IET 30245	14794	8075	28367	3939	14302	**13895**	20069	31764	26667	5453	51112	**27013**
7	IL-19075	14596	10663	29067	4908	7534	**13354**	23432	22222	28600	7415	42772	**24888**
8	IL-19079	13235	12234	28700	11930	10673	**15355**	22278	38297	29800	16862	47934	**31034**
9	IL-19083	8394	9578	27600	10557	7280	**12682**	15833	24767	30633	15561	37411	**24841**
10	IL-19087	10757	7867	27567	17329	5961	**13896**	17959	12827	30167	22725	48588	**26453**
11	IL-19088	11473	7249	30633	13071	9864	**14458**	25457	13253	32433	19718	39523	**26077**
12	IL-19095	13231	9814	29567	14425	6087	**14625**	20776	18574	28433	21632	33015	**24486**
13	IL-19100	7744	9557	29300	11789	14180	**14514**	13958	15396	28700	20750	46474	**25056**
14	IL-19103	12983	6613	27000	14902	7790	**13858**	19010	14067	28267	21236	32460	**23008**
15	IL-19177	10200	7293	28167	18093	6981	**14147**	17749	49497	28833	24766	44513	**33072**
16	IL-19186	11194	9040	28400	13077	6765	**13695**	23071	45460	29767	17021	44597	**31983**
17	IL-19194	13913	8711	29033	13345	6799	**14360**	25859	22475	30333	17903	41468	**27608**
18	IL-19196	9511	5167	27400	7268	6713	**11212**	20454	13973	27367	11553	31860	**21041**
19	IL-19211	14234	15043	28567	14457	6908	**15842**	30963	31033	28933	21184	40059	**30435**
20	IL-19246	10360	14316	27533	15894	5158	**14652**	18364	34400	27100	23375	27082	**26064**
21	IL-19344	8235	14732	27100	7534	5256	**12571**	15359	23657	28067	14090	37987	**23832**
22	IL-19353	14629	9000	27600	5765	6178	**12634**	28684	16562	29433	7706	47391	**25955**
23	IL-19451	6325	13829	31400	6131	7677	**13072**	16350	55856	29200	10615	47771	**31958**
24	K. Hamsa	13021	11620	30300	9659	15702	**16060**	36311	22445	28633	20341	30008	**27548**
25	SB.Dhan	20005	13259	29867	13100	5005	**16247**	27997	12227	29900	21050	36179	**25471**
26	WGL-14	9361	11956	28500	6132	12007	**13591**	36208	23495	28633	9165	37185	**26937**
	Mean	**11785**	**10918**	**28865**	**11055**	**9049**	**14335**	**23076**	**24910**	**28833**	**17053**	**39782**	**26731**
	LSD (Treat)				ns			LSD (Treat x Genotype)				ns	
	LSD (Location x Treat)				3972**			LSD (Location x Treat x Genotype)				9781**	
	LSD (Genotype)				ns			CV (%) Treat				38.12	
	LSD (Location x Genotype)				6916**								

Table 6.2.8 Screening for elite rice culture for drought tolerance on spikelet number/m² maturity at different centers Kharif 2022

S.No.	Genotypes	Drought					Grand Mean	Irrigated					Grand Mean
		NRRI	PTB	RANCHI	REWA	RPUR		NRRI	PTB	RANCHI	REWA	RPUR	
1	DRR Dhan-44	21984	20299	31975	22777	7140	**20835**	42784	27866	30594	38564	42676	**36497**
2	IET 29834	15201	30655	30628	25379	16443	**23661**	38581	22849	28377	18097	35228	**28627**
3	IET 29859	24820	29603	32151	6295	30264	**24627**	28369	16847	27213	23496	42880	**27761**
4	IET 30116	21868	15791	30580	3829	24386	**19291**	26304	26744	30813	8049	28865	**24155**
5	IET 30241	23233	19008	29283	20400	28535	**24092**	33606	42243	29112	32635	55860	**38691**
6	IET 30245	24612	16571	29673	6591	26557	**20801**	29203	38573	27855	6889	54498	**31404**
7	IL-19075	26536	22210	30351	8644	18456	**21239**	39127	31389	29757	10446	44779	**31099**
8	IL-19079	22692	28940	29917	18394	21233	**24235**	33401	46993	30959	20373	51355	**36616**
9	IL-19083	22409	30942	28938	15914	13243	**22289**	29908	29013	31808	19514	40046	**30058**
10	IL-19087	22610	14980	28891	34828	11758	**22613**	26381	21270	31421	28980	50632	**31737**
11	IL-19088	19323	17479	31777	20693	15290	**20912**	33622	19389	33529	27308	41119	**30993**
12	IL-19095	22458	22753	30827	19369	18934	**22868**	27353	23953	29470	31826	35496	**29619**
13	IL-19100	15582	11501	30451	16462	23356	**19470**	26369	22378	29736	30865	49059	**31681**
14	IL-19103	19242	10724	28071	19800	15327	**18633**	24597	16620	29488	27777	33906	**26478**
15	IL-19177	23069	12526	29297	24709	14334	**20787**	27147	54902	30182	34393	46493	**38623**
16	IL-19186	22697	19932	29610	16360	17265	**21173**	34290	45020	31168	26124	47459	**36812**
17	IL-19194	22590	20189	30461	18025	13573	**20968**	32297	33115	31682	29674	43819	**34117**
18	IL-19196	20200	10253	28632	10380	11694	**16232**	28773	19172	28658	16056	35520	**25636**
19	IL-19211	23410	25639	29823	23344	14874	**23418**	40429	36163	29978	29474	43136	**35836**
20	IL-19246	21461	23970	28691	21479	9500	**21020**	31071	39676	28251	30584	31845	**32285**
21	IL-19344	17164	20674	28295	11200	14529	**18372**	25951	34488	29292	18278	42387	**30079**
22	IL-19353	23846	17569	28806	7273	10721	**17643**	38953	19012	30573	8873	51417	**29766**
23	IL-19451	14882	30293	32632	8070	12872	**19750**	29324	74894	30285	11657	50738	**39380**
24	K. Hamsa	25963	17294	31429	13528	20736	**21790**	49396	27523	29835	22076	32348	**32235**
25	SB.Dhan	25656	19306	31134	18481	9463	**20808**	33427	17109	31227	27226	38727	**29543**
26	WGL-14	20650	16375	29574	7501	18541	**18528**	52013	27634	29859	10379	38717	**31720**
	Mean	**21698**	**20211**	**30073**	**16143**	**16886**	**21002**	**33180**	**31340**	**30043**	**22677**	**42654**	**31979**
	LSD (Treat)				ns			LSD (Treat x Genotype)				ns	
	LSD (Location x Treat)				4632**			LSD (Location x Treat x Genotype)				11341**	
	LSD (Genotype)				ns			CV (%) Treat				34.46	
	LSD (Location x Genotype)				8019**								

Table 6.2.9 Screening for elite rice culture for drought tolerance on grain yield (g/m²) maturity at different centers Kharif 2022

S.No.	Genotypes	Drought					Grand Mean	Irrigated					Grand Mean
		NRRI	PTB	RANCHI	REWA	RPUR		NRRI	PTB	RANCHI	REWA	RPUR	
1	DRR Dhan-44	195	154	322	510	103	**257**	432	371	317	547	440	**421**
2	IET 29834	152	158	296	523	278	**281**	286	393	290	441	485	**379**
3	IET 29859	145	133	318	401	248	**249**	399	388	284	517	454	**408**
4	IET 30116	189	146	301	352	249	**247**	289	388	304	386	416	**356**
5	IET 30241	140	92	299	517	290	**268**	209	375	305	562	512	**393**
6	IET 30245	109	133	299	304	271	**223**	216	388	307	336	452	**340**
7	IL-19075	108	104	309	564	257	**268**	319	354	314	618	432	**407**
8	IL-19079	76	208	305	504	272	**273**	206	355	313	578	493	**389**
9	IL-19083	123	146	299	532	194	**259**	254	297	305	594	449	**380**
10	IL-19087	102	150	297	395	187	**226**	244	230	293	499	480	**349**
11	IL-19088	126	163	314	389	183	**235**	231	113	326	593	444	**341**
12	IL-19095	128	158	307	557	216	**273**	244	204	323	604	479	**371**
13	IL-19100	57	88	302	531	254	**246**	154	191	308	591	486	**346**
14	IL-19103	155	104	293	491	233	**256**	220	333	303	567	461	**377**
15	IL-19177	74	121	302	530	190	**243**	188	700	315	579	466	**450**
16	IL-19186	101	188	301	448	242	**256**	321	808	313	554	484	**496**
17	IL-19194	178	233	314	302	214	**248**	430	408	313	387	549	**417**
18	IL-19196	153	92	295	403	184	**225**	370	233	291	497	466	**371**
19	IL-19211	199	117	310	425	165	**243**	366	300	287	541	422	**383**
20	IL-19246	94	150	302	291	178	**203**	254	546	284	398	390	**374**
21	IL-19344	86	134	304	620	126	**254**	129	463	297	651	408	**389**
22	IL-19353	142	100	300	581	146	**254**	294	246	305	617	414	**375**
23	IL-19451	88	67	324	408	139	**205**	141	638	308	473	339	**380**
24	K. Hamsa	175	100	318	497	278	**274**	412	404	312	533	485	**429**
25	SB.Dhan	270	158	317	402	132	**256**	293	417	317	449	431	**381**
26	WGL-14	119	171	297	405	235	**245**	336	313	313	458	354	**355**
	Mean	**134**	**137**	**306**	**457**	**210**	**249**	**278**	**379**	**306**	**522**	**450**	**387**
	LSD (Treat)				8.91*			LSD (Treat x Genotype)				ns	
	LSD (Location x Treat)				28.34**			LSD (Location x Treat x Genotype)				116.7**	
	LSD (Genotype)				ns			CV (%) Treat				17.57	
	LSD (Location x Genotype)				82.53**								

Table 6.2.10 Screening for elite rice culture for drought tolerance on 1000 grain weight (g) maturity at different centers Kharif 2022

S.No.	Genotypes	Drought					Grand Mean	Irrigated					Grand Mean
		NRRI	PTB	RANCHI	REWA	RPUR		NRRI	PTB	RANCHI	REWA	RPUR	
1	DRR Dhan-44	21.7	20.6	21.2	25.7	21.7	**22.2**	21.4	23.8	21.7	30.7	24.2	**24.3**
2	IET 29834	19.7	22.7	21.0	25.9	24.3	**22.7**	21.4	24.9	20.9	28.9	26.3	**24.5**
3	IET 29859	21.0	24.6	21.3	24.7	25.0	**23.3**	22.3	26.8	22.0	30.7	23.0	**24.9**
4	IET 30116	19.2	23.0	20.6	25.7	22.0	**22.1**	19.0	24.5	23.6	27.3	23.8	**23.7**
5	IET 30241	14.4	15.5	20.9	25.0	18.9	**18.9**	14.7	18.9	21.2	27.7	18.6	**20.2**
6	IET 30245	15.7	16.0	22.6	19.1	20.9	**18.9**	16.5	18.9	21.4	25.4	23.7	**21.2**
7	IL-19075	18.8	18.5	22.0	19.7	18.3	**19.5**	19.0	21.4	22.0	22.1	21.3	**21.2**
8	IL-19079	16.7	17.4	21.1	25.4	19.5	**20.0**	17.0	20.8	21.6	30.1	19.0	**21.7**
9	IL-19083	20.6	17.0	21.6	26.9	23.0	**21.8**	21.4	23.7	21.1	32.9	25.6	**24.9**
10	IL-19087	13.6	17.6	22.3	26.9	16.5	**19.4**	15.5	18.5	22.7	29.6	24.0	**22.1**
11	IL-19088	13.6	15.0	22.0	20.9	20.4	**18.4**	15.4	18.0	22.2	25.9	18.3	**19.9**
12	IL-19095	14.4	12.6	20.1	20.2	18.4	**17.2**	15.2	17.7	21.6	26.1	18.3	**19.8**
13	IL-19100	12.4	12.1	22.6	26.2	15.6	**17.8**	13.3	15.8	21.3	27.7	16.8	**19.0**
14	IL-19103	17.9	17.5	22.6	33.5	23.6	**23.0**	17.6	22.6	22.0	37.7	24.1	**24.8**
15	IL-19177	13.4	12.9	21.0	25.1	14.5	**17.4**	13.6	18.5	21.6	29.3	15.9	**19.8**
16	IL-19186	17.7	17.1	19.9	25.2	21.9	**20.4**	18.5	23.0	20.9	28.9	25.0	**23.3**
17	IL-19194	20.6	19.8	21.1	25.9	31.2	**23.7**	22.6	22.8	21.9	28.5	32.6	**25.7**
18	IL-19196	20.4	21.7	21.0	25.3	25.7	**22.8**	21.9	23.8	22.6	31.6	27.5	**25.5**
19	IL-19211	15.2	16.5	21.6	19.5	21.8	**18.9**	17.3	18.8	21.9	24.5	22.5	**21.0**
20	IL-19246	15.2	19.4	22.2	28.1	23.8	**21.7**	16.6	22.7	23.0	32.1	24.2	**23.7**
21	IL-19344	15.3	14.4	21.7	16.7	16.2	**16.9**	15.8	17.4	22.0	20.4	16.8	**18.5**
22	IL-19353	16.4	21.3	22.0	28.3	18.6	**21.3**	17.5	22.8	21.5	29.6	16.1	**21.5**
23	IL-19451	16.1	14.7	22.1	24.0	15.2	**18.4**	17.1	18.5	22.8	26.9	19.2	**20.9**
24	K.Hamsa	18.8	15.9	21.8	17.5	21.6	**19.1**	19.9	20.5	21.7	17.8	25.7	**21.1**
25	SB.Dhan	21.7	23.8	21.3	26.7	24.4	**23.6**	20.4	24.8	21.1	27.9	24.4	**23.7**
26	WGL-14	12.1	12.0	20.3	27.2	15.4	**17.4**	13.6	16.1	20.4	31.5	16.3	**19.6**
	Mean	**17.0**	**17.7**	**21.5**	**24.4**	**20.7**	**20.3**	**17.9**	**21.0**	**21.8**	**28.1**	**22.0**	**22.2**
	LSD (Treat)				0.22*			LSD (Treat x Genotype)				ns	
	LSD (Location x Treat)				0.70**			LSD (Location x Treat x Genotype)				3.18**	
	LSD (Genotype)				1.00**			CV (%) Treat				6.57	
	LSD (Location x Genotype)				2.25**								

Table 6.2.11 Screening for elite rice culture for drought tolerance on harvest index (%) maturity at different centres Kharif 2022

S.No.	Genotypes	Drought					Grand Mean	Irrigated					Grand Mean
		NRRI	PTB	RANCHI	REWA	RPUR		NRRI	PTB	RANCHI	REWA	RPUR	
1	DRR Dhan-44	32.4	17.3	22.1	36.6	26.3	**27.0**	37.4	29.0	22.2	40.1	39.6	**33.7**
2	IET 29834	23.5	16.2	20.2	36.3	28.8	**25.0**	31.9	26.7	20.0	38.2	36.7	**30.7**
3	IET 29859	20.7	12.6	22.2	34.2	26.4	**23.2**	35.3	39.8	19.5	41.9	30.3	**33.3**
4	IET 30116	31.7	14.2	20.7	32.1	30.8	**25.9**	34.1	29.7	20.9	41.3	36.5	**32.5**
5	IET 30241	23.3	17.5	20.5	36.4	36.9	**26.9**	30.6	23.5	20.9	45.1	39.1	**31.9**
6	IET 30245	22.3	16.3	20.9	31.9	35.6	**25.4**	33.3	23.8	21.1	44.4	38.9	**32.3**
7	IL-19075	20.1	14.2	21.2	37.7	32.8	**25.2**	37.1	37.9	21.5	47.9	37.4	**36.3**
8	IL-19079	20.2	26.1	20.1	35.7	36.7	**27.8**	28.7	22.2	21.7	46.1	39.6	**31.7**
9	IL-19083	19.8	23.6	20.8	36.4	31.8	**26.5**	30.2	26.4	21.5	47.6	36.8	**32.5**
10	IL-19087	22.9	21.8	20.5	31.9	34.1	**26.2**	39.8	34.6	20.4	40.5	38.9	**34.9**
11	IL-19088	28.7	17.1	21.4	29.4	31.3	**25.6**	32.5	18.5	22.3	47.5	43.0	**32.7**
12	IL-19095	27.8	13.6	21.0	37.5	34.3	**26.8**	34.8	26.8	22.2	46.9	37.1	**33.6**
13	IL-19100	15.5	12.1	20.7	36.5	38.7	**24.7**	29.2	24.2	21.6	47.2	41.0	**32.6**
14	IL-19103	25.3	12.3	20.1	35.3	32.9	**25.2**	28.8	37.7	21.2	40.3	45.3	**34.7**
15	IL-19177	15.3	16.3	20.6	36.3	32.9	**24.3**	27.1	39.7	21.8	40.3	37.2	**33.2**
16	IL-19186	23.2	15.5	20.7	33.4	33.0	**25.1**	33.8	44.7	21.4	47.0	37.1	**36.8**
17	IL-19194	30.9	20.4	21.6	29.2	42.4	**28.9**	48.2	31.8	22.0	32.3	47.1	**36.3**
18	IL-19196	25.4	8.2	20.4	32.9	30.4	**23.5**	37.7	20.8	20.2	47.9	39.5	**33.2**
19	IL-19211	34.5	10.4	21.3	32.6	32.1	**26.2**	46.2	27.8	19.6	40.3	41.5	**35.1**
20	IL-19246	18.6	15.5	20.8	28.4	31.3	**22.9**	32.4	39.3	19.0	35.7	33.9	**32.1**
21	IL-19344	18.7	14.1	21.1	38.8	23.3	**23.2**	19.0	48.7	20.6	46.9	36.0	**34.3**
22	IL-19353	28.2	8.2	20.8	37.8	28.9	**24.8**	32.0	22.8	21.4	46.3	34.0	**31.3**
23	IL-19451	23.0	10.6	22.4	33.2	25.0	**22.8**	24.1	32.8	21.2	40.0	32.6	**30.1**
24	K.Hamsa	31.7	8.5	22.1	36.1	34.8	**26.7**	42.9	44.1	21.6	39.7	37.0	**37.1**
25	SB.Dhan	39.7	13.8	21.5	33.8	32.5	**28.3**	40.2	38.1	22.0	37.7	37.8	**35.2**
26	WGL-14	18.9	16.9	20.5	33.3	31.6	**24.2**	41.6	32.6	21.3	44.6	36.4	**35.3**
	Mean	**24.7**	**15.1**	**21.0**	**34.4**	**32.1**	**25.5**	**34.2**	**31.7**	**21.1**	**42.8**	**38.1**	**33.6**
	LSD (Treat)				0.57*			LSD (Treat x Genotype)				ns	
	LSD (Location x Treat)				1.81**			LSD (Location x Treat x Genotype)				9.53**	
	LSD (Genotype)				ns			CV (%) Treat				12.13	
	LSD (Location x Genotype)				6.74**								

Table 6.2.12 Screening for elite rice culture for drought tolerance on total dry matter (g/m²) maturity at different centres Kharif 2022

S.No.	Genotypes	Drought					Grand Mean	Irrigated					Grand Mean
		NRRI	PTB	RANCHI	REWA	RPUR		NRRI	PTB	RANCHI	REWA	RPUR	
1	DRR Dhan-44	599	946	1460	1389	400	**959**	1158	1271	1427	1361	1117	**1267**
2	IET 29834	639	981	1467	1440	967	**1099**	893	1427	1452	1132	1333	**1247**
3	IET 29859	692	1058	1436	1173	942	**1060**	1128	979	1458	1227	1525	**1263**
4	IET 30116	597	1029	1455	1094	842	**1003**	848	1340	1458	932	1150	**1145**
5	IET 30241	600	529	1457	1420	800	**961**	680	1634	1458	1246	1317	**1267**
6	IET 30245	490	804	1434	953	783	**893**	642	1617	1454	755	1208	**1135**
7	IL-19075	535	768	1453	1493	783	**1007**	860	927	1459	1293	1167	**1141**
8	IL-19079	379	809	1517	1412	733	**970**	711	1589	1446	1254	1267	**1253**
9	IL-19083	613	614	1440	1460	633	**952**	841	1185	1416	1249	1250	**1188**
10	IL-19087	445	767	1447	1232	550	**888**	612	784	1437	1231	1233	**1060**
11	IL-19088	439	939	1466	1322	583	**950**	712	613	1462	1249	1033	**1014**
12	IL-19095	455	1167	1463	1488	633	**1041**	699	751	1460	1287	1317	**1103**
13	IL-19100	372	752	1456	1454	675	**942**	527	790	1426	1254	1192	**1038**
14	IL-19103	615	842	1459	1391	708	**1003**	764	870	1429	1406	1017	**1097**
15	IL-19177	483	775	1466	1458	567	**950**	694	1778	1447	1433	1250	**1320**
16	IL-19186	435	1200	1455	1341	767	**1040**	953	1815	1465	1181	1358	**1354**
17	IL-19194	572	1142	1454	1032	517	**943**	894	1285	1420	1199	1167	**1193**
18	IL-19196	599	1112	1448	1225	617	**1000**	979	1107	1441	1037	1208	**1155**
19	IL-19211	575	1139	1453	1301	517	**997**	791	1068	1468	1339	1017	**1136**
20	IL-19246	507	979	1453	1024	600	**912**	782	1364	1496	1115	1167	**1185**
21	IL-19344	463	941	1440	1597	550	**998**	677	944	1441	1387	1200	**1130**
22	IL-19353	507	1240	1440	1534	500	**1044**	923	1076	1426	1332	1217	**1195**
23	IL-19451	383	641	1449	1228	558	**852**	583	1901	1456	1188	1117	**1249**
24	K. Hamsa	554	1161	1439	1375	800	**1066**	960	898	1441	1341	1317	**1191**
25	SB.Dhan	678	1165	1473	1186	417	**984**	730	1064	1437	1193	1150	**1115**
26	WGL-14	631	1041	1445	1214	742	**1015**	808	963	1472	1024	983	**1050**
	Mean	**533**	**944**	**1455**	**1317**	**661**	**982**	**802**	**1194**	**1448**	**1217**	**1203**	**1173**
	LSD (Treat)				ns			LSD (Treat x Genotype)				ns	
	LSD (Location x Treat)				60.20**			LSD (Location x Treat x Genotype)				247.2**	
	LSD (Genotype)				ns			CV(%) Treat				11.01	
	LSD (Location x Genotype)				174.8**								

Table 6.2.13 Screening for elite rice culture for drought tolerance INDICES of different genotypes across locations Kharif 2022

S.No.	Genotypes	DSI	RDI	DTI	GMP	TOL	MP	YI	YSI	DI	SDI	HM	K1STI	K2STI
1	DRR Dhan-44	1.07	0.96	0.76	316.3	-164.3	339.1	1.03	0.62	0.80	0.38	297.9	1.24	1.43
2	IET 29834	0.64	1.20	0.75	317.5	-97.5	330.1	1.13	0.77	1.03	0.23	306.1	1.06	1.59
3	IET 29859	1.00	1.00	0.69	309.3	-159.2	328.7	1.00	0.64	0.75	0.36	292.8	1.18	1.19
4	IET 30116	0.80	1.11	0.59	291.5	-109.1	301.9	0.99	0.71	0.78	0.29	282.2	0.88	1.10
5	IET 30241	0.88	1.07	0.79	315.4	-125.2	330.1	1.08	0.69	0.86	0.31	303.2	1.15	1.53
6	IET 30245	0.91	1.05	0.52	269.1	-116.3	281.5	0.90	0.68	0.68	0.32	258.7	0.83	0.93
7	IL-19075	1.05	0.97	0.84	321.5	-139.0	337.9	1.08	0.63	0.85	0.37	307.7	1.20	1.64
8	IL-19079	0.91	1.05	0.82	321.8	-115.7	331.1	1.10	0.68	0.84	0.32	313.3	1.14	1.54
9	IL-19083	0.94	1.03	0.76	307.9	-121.1	319.2	1.04	0.66	0.80	0.34	297.6	1.08	1.45
10	IL-19087	0.94	1.04	0.58	275.6	-123.0	287.6	0.91	0.67	0.68	0.33	264.8	0.92	1.03
11	IL-19088	0.55	1.25	0.62	277.8	-106.2	288.1	0.94	0.80	0.77	0.20	268.3	0.97	1.06
12	IL-19095	0.73	1.15	0.81	313.5	-97.6	322.1	1.10	0.74	0.90	0.26	305.5	1.07	1.60
13	IL-19100	0.96	1.02	0.73	285.9	-99.6	296.2	0.99	0.66	0.82	0.34	276.5	1.00	1.49
14	IL-19103	0.89	1.06	0.73	304.3	-121.4	316.2	1.03	0.68	0.79	0.32	293.9	1.06	1.35
15	IL-19177	1.20	0.89	0.78	312.0	-206.4	346.4	0.98	0.57	0.74	0.43	286.8	1.58	1.40
16	IL-19186	1.23	0.87	0.87	341.9	-240.2	375.9	1.03	0.56	0.69	0.44	315.2	1.89	1.30
17	IL-19194	1.02	0.99	0.67	314.9	-169.1	332.8	1.00	0.64	0.69	0.36	299.3	1.21	1.06
18	IL-19196	1.07	0.96	0.60	282.5	-146.0	298.3	0.91	0.62	0.65	0.38	268.5	1.01	1.03
19	IL-19211	0.90	1.05	0.66	297.7	-140.0	313.2	0.98	0.68	0.74	0.32	284.1	1.08	1.16
20	IL-19246	1.16	0.91	0.51	265.9	-171.1	288.7	0.82	0.59	0.57	0.41	247.0	1.04	0.79
21	IL-19344	0.98	1.01	0.83	302.4	-135.2	321.8	1.02	0.65	0.85	0.35	286.6	1.23	1.70
22	IL-19353	1.03	0.98	0.77	300.6	-121.4	314.4	1.02	0.63	0.82	0.37	288.5	1.06	1.57
23	IL-19451	1.05	0.97	0.52	255.0	-174.7	292.5	0.82	0.62	0.67	0.38	233.7	1.22	0.99
24	Krishna Hamsa	1.01	1.00	0.82	333.0	-155.5	351.4	1.10	0.64	0.84	0.36	317.3	1.29	1.51
25	Sahabhagidhan	0.81	1.11	0.65	302.4	-125.5	318.5	1.03	0.71	0.84	0.29	288.9	1.05	1.24
26	WGL-14	0.85	1.08	0.61	289.5	-109.6	300.0	0.99	0.70	0.77	0.30	280.1	0.88	1.15
	Mean	**0.95**	**1.03**	**0.70**	**300.96**	**-138.07**	**317.83**	**1.00**	**0.66**	**0.78**	**0.34**	**287.09**	**1.13**	**1.30**

Table 6.2.14 Screening for elite rice culture for drought tolerance on INDICES RANKING of different genotypes across locations Kharif 2022

S.No.	Genotypes	DSI	RDI	DTI	GMP	TOL	MP	YI	YSI	DI	SDI	HM	K1STI	K2STI	Overall Rank
1	DRR Dhan-44	4	23	10	6	21	4	8	23	11	4	9	4	11	9
2	IET 29834	25	2	12	5	1	9	1	2	1	25	5	17	4	4
3	IET 29859	11	16	15	11	20	10	14	16	17	11	12	9	16	15
4	IET 30116	23	4	22	18	5	18	16	4	14	23	18	25	19	18
5	IET 30241	20	7	7	7	13	8	6	7	3	20	7	10	7	6
6	IET 30245	17	10	25	24	8	26	24	10	22	17	24	26	25	24
7	IL-19075	7	20	2	4	16	5	5	20	5	7	4	8	2	2
8	IL-19079	16	11	5	3	7	7	4	11	6	16	3	11	6	3
9	IL-19083	14	13	11	12	9	13	7	13	12	14	10	13	10	10
10	IL-19087	15	12	23	23	12	25	22	12	23	15	23	23	23	22
11	IL-19088	26	1	19	22	4	24	21	1	16	26	22	22	20	20
12	IL-19095	24	3	6	9	2	11	3	3	2	24	6	14	3	5
13	IL-19100	13	14	13	20	3	21	17	14	9	13	20	21	9	16
14	IL-19103	19	8	14	13	10	15	11	8	13	19	11	16	13	13
15	IL-19177	2	25	8	10	25	3	20	25	19	2	15	2	12	12
16	IL-19186	1	26	1	1	26	1	10	26	21	1	2	1	14	7
17	IL-19194	9	18	16	8	22	6	15	18	20	9	8	7	21	14
18	IL-19196	5	22	21	21	18	20	23	22	25	5	21	20	22	21
19	IL-19211	18	9	17	17	17	17	19	9	18	18	17	12	17	17
20	IL-19246	3	24	26	25	23	23	26	24	26	3	25	19	26	25
21	IL-19344	12	15	3	15	15	12	12	15	4	12	16	5	1	8
22	IL-19353	8	19	9	16	11	16	13	19	10	8	14	15	5	11
23	IL-19451	6	21	24	26	24	22	25	21	24	6	26	6	24	23
24	Krishna Hamsa	10	17	4	2	19	2	2	17	7	10	1	3	8	1
25	Sahabhagidhan	22	5	18	14	14	14	9	5	8	22	13	18	15	14
26	WGL-14	21	6	20	19	6	19	18	6	15	21	19	24	18	19

Selection for high yield and stability of performance under rainfed conditions during Kh 2022

S.No.	Genotypes	Mean Yield (g/m2)	Yield Rank (Yn)	Adj. rank	Adjustment to Yield Rank (Yn)	Stability Variance (σi2)	Stability Rating (S)	YSi = (Y+S)	
1	DRR Dhan-44	256.9	19	3	22	14334**	-8	14	+
2	IET 29834	281.3	26	3	29	3250**	-8	21	+
3	IET 29859	249.2	13	1	14	3487**	-8	6	+
4	IET 30116	247.4	11	-2	9	12359**	-8	1	
5	IET 30241	267.5	21	3	24	8072**	-8	16	+
6	IET 30245	223.3	3	-3	0	19544**	-8	-8	
7	IL-19075	268.4	22	3	25	10539**	-8	17	+
8	IL-19079	273.2	23	3	26	8885**	-8	18	+
9	IL-19083	258.6	20	3	23	4149**	-8	15	+
10	IL-19087	226.1	5	-3	2	2113**	-8	-6	
11	IL-19088	235.0	6	-3	3	3792**	-8	-5	
12	IL-19095	273.3	24	3	27	5770**	-8	19	+
13	IL-19100	246.4	10	-3	7	12400**	-8	-1	
14	IL-19103	255.5	16	3	19	2180**	-8	11	+
15	IL-19177	243.2	7	-3	4	7235**	-8	-4	
16	IL-19186	255.7	17	3	20	3249**	-8	12	+
17	IL-19194	248.3	12	-1	11	28189**	-8	3	
18	IL-19196	225.3	4	-3	1	2322**	-8	-7	
19	IL-19211	243.2	8	-3	5	5738**	-8	-3	
20	IL-19246	203.1	1	-3	-2	15674**	-8	-10	
21	IL-19344	254.2	15	3	18	28619**	-8	10	+
22	IL-19353	253.7	14	3	17	16463**	-8	9	+
23	IL-19451	205.1	2	-3	-1	3956**	-8	-9	
24	Krishna Hamsa	273.7	25	3	28	4785**	-8	20	+
25	Sahabhagidhan	255.8	18	3	21	22284**	-8	13	+
26	WGL-14	245.2	9	-3	6	3386**	-8	-2	
	Yield Mean	248.8			**+ Selected Genotypes**				
	YS Mean	5.77	LSD (0.05): 0.808		**Kang, M.S. 1993. Agronomy Journal. 85:754-757**				

Table 6.2.15 Influence of irrigation regimes on important physiological traits of rice genotypes at TTB centre during Rabi (dry) season 2021-22

S.No.	Genotypes	Tiller number/Plant			Shoot weight (g/m²)			Panicle weight (g/m²)		
		Drought	Irrigated	Mean	Drought	Irrigated	Mean	Drought	Irrigated	Mean
1	IL 19072	5.3	6.7	**6.0**	370	415	**392**	245	333	**289**
2	IL 19074	7.0	9.7	**8.3**	419	480	**449**	390	425	**408**
3	IL 19081	7.3	9.3	**8.3**	425	466	**446**	307	398	**353**
4	IL 19082	7.7	10.0	**8.8**	401	497	**449**	336	457	**397**
5	IL 19091	8.0	10.7	**9.3**	345	425	**385**	313	340	**327**
6	IL 19096	8.0	9.7	**8.8**	376	461	**419**	316	409	**362**
7	IL 19128	6.3	7.7	**7.0**	429	475	**452**	271	289	**280**
8	IL 19132	6.3	6.7	**6.5**	384	485	**435**	288	380	**334**
9	IL 19148	6.7	8.3	**7.5**	432	467	**450**	249	350	**299**
10	IL 19162	7.7	8.0	**7.8**	458	503	**480**	316	320	**318**
11	IL 19181	8.0	9.0	**8.5**	459	497	**478**	295	462	**379**
12	IL 19185	7.7	9.7	**8.7**	455	486	**471**	348	394	**371**
13	IL 19198	7.7	9.0	**8.3**	432	457	**445**	337	392	**364**
14	IL 19202	8.7	11.3	**10.0**	412	439	**426**	369	379	**374**
15	IL 19204	8.3	8.7	**8.5**	472	539	**506**	433	471	**452**
16	IL 19206	7.7	8.3	**8.0**	380	456	**418**	368	408	**388**
17	IL 19208	7.7	8.0	**7.8**	476	502	**489**	420	422	**421**
18	IL 19211	7.3	10.7	**9.0**	406	463	**435**	365	387	**376**
19	IL 19215	7.7	9.0	**8.3**	341	405	**373**	283	432	**357**
20	IL 19222	8.0	10.3	**9.2**	371	497	**434**	254	432	**343**
21	IL 19247	7.7	10.7	**9.2**	430	474	**452**	291	351	**321**
22	IL 19253	7.3	8.0	**7.7**	448	552	**500**	223	295	**259**
23	IL 19273	7.7	8.3	**8.0**	506	543	**524**	412	379	**396**
24	IL 19279	7.3	9.3	**8.3**	391	436	**413**	281	237	**259**
25	IL 19283	11.0	12.0	**11.5**	373	420	**397**	376	332	**354**
26	IL 19284	10.7	11.0	**10.8**	405	430	**418**	365	368	**367**
27	IL 19288	5.3	9.7	**7.5**	406	463	**435**	250	262	**256**
28	IL 19329	6.7	7.7	**7.2**	451	560	**506**	172	296	**234**
29	IL 19344	8.3	9.7	**9.0**	441	488	**464**	170	342	**256**
30	IL 19345	8.7	9.7	**9.2**	449	483	**466**	193	281	**237**
31	IL 19346	8.3	9.0	**8.7**	403	455	**429**	190	298	**244**
32	IL 19347	7.3	8.3	**7.8**	412	443	**428**	185	232	**209**
33	IL 19435	6.3	7.0	**6.7**	425	460	**443**	243	274	**259**
34	IL 19451	9.3	10.7	**10.0**	366	441	**404**	275	395	**335**
35	K. Hamsa	9.3	10.7	**10.0**	388	446	**417**	306	321	**313**
36	WGL-14	7.7	9.0	**8.3**	390	501	**446**	415	422	**418**
	Mean	**7.7**	**9.2**	**8.5**	**415**	**473**	**444**	**301**	**360**	**331**
	LSD (Treat)		ns			17.83**			4.42**	
	LSD (Genotype)		2.61**			39.72**			34.47**	
	LSD (Treat x Genotype)		ns			42.53*			48.75**	
	CV (%)		48.64			2.97			0.99	

Table 6.2.16 Influence of irrigation regimes on important physiological traits of rice genotypes at TTB centre during Rabi (dry) season 2021-22

S.No.	Genotypes	Panicle number/m²		Mean	Number of grains/panicle		Mean	Number of spikelets/panicle		Mean
		Drought	Irrigated		Drought	Irrigated		Drought	Irrigated	
1	IL 19072	189	243	**216**	112	123	**117**	154	176	**165**
2	IL 19074	204	231	**218**	102	144	**123**	142	183	**163**
3	IL 19081	244	284	**264**	64	79	**72**	145	153	**149**
4	IL 19082	212	314	**263**	68	82	**75**	143	161	**152**
5	IL 19091	260	284	**272**	65	73	**69**	143	143	**143**
6	IL 19096	226	261	**243**	107	135	**121**	140	158	**149**
7	IL 19128	169	231	**200**	106	137	**122**	153	167	**160**
8	IL 19132	195	235	**215**	98	146	**122**	160	185	**173**
9	IL 19148	233	255	**244**	73	111	**92**	141	169	**155**
10	IL 19162	224	259	**242**	145	157	**151**	160	170	**165**
11	IL 19181	195	246	**220**	79	99	**89**	123	136	**130**
12	IL 19185	230	314	**272**	66	85	**76**	136	138	**137**
13	IL 19198	243	271	**257**	48	65	**57**	120	119	**120**
14	IL 19202	265	223	**244**	58	86	**72**	120	151	**135**
15	IL 19204	253	300	**277**	81	93	**87**	139	147	**143**
16	IL 19206	251	270	**261**	77	87	**82**	150	162	**156**
17	IL 19208	241	224	**232**	74	87	**81**	155	160	**158**
18	IL 19211	236	269	**252**	63	83	**73**	129	135	**132**
19	IL 19215	249	260	**255**	68	83	**76**	130	139	**135**
20	IL 19222	194	289	**241**	82	89	**86**	132	138	**135**
21	IL 19247	260	270	**265**	67	72	**70**	149	154	**152**
22	IL 19253	234	234	**234**	65	73	**69**	117	160	**139**
23	IL 19273	237	227	**232**	69	96	**83**	142	151	**147**
24	IL 19279	239	195	**217**	75	92	**84**	146	156	**151**
25	IL 19283	317	281	**299**	73	93	**83**	135	150	**143**
26	IL 19284	320	297	**309**	95	106	**100**	151	153	**152**
27	IL 19288	181	200	**190**	109	149	**129**	142	181	**162**
28	IL 19329	185	225	**205**	98	114	**106**	140	153	**147**
29	IL 19344	210	286	**248**	76	82	**79**	141	166	**154**
30	IL 19345	236	223	**230**	72	77	**75**	139	158	**149**
31	IL 19346	211	251	**231**	92	127	**109**	143	164	**154**
32	IL 19347	215	203	**209**	69	119	**94**	177	182	**180**
33	IL 19435	185	182	**184**	84	95	**90**	156	169	**163**
34	IL 19451	260	346	**303**	81	115	**98**	148	150	**149**
35	K. Hamsa	287	355	**321**	66	105	**86**	149	158	**154**
36	WGL-14	222	264	**243**	94	166	**130**	150	200	**175**
	Mean	**231**	**258**	**245**	**81**	**103**	**92**	**143**	**158**	**150**
	LSD (Treat)		14.76*			10.45**			10.04*	
	LSD (Genotype)		19.51**			14.06**			23.50**	
	LSD (Treat x Genotype)		27.60**			19.89**			ns	
	CV (%)		10.31			8.38			11.41	

Table 6.2.17 Influence of irrigation regimes on important physiological traits of rice genotypes at TTB centre during Rabi (dry) season 2021-22

S.No.	Genotypes	Number of grains/m²		Mean	Number of spikelets/m²		Mean	Total dry matter (g/m²)		Mean
		Drought	Irrigated		Drought	Irrigated		Drought	Irrigated	
1	IL 19072	20971	29851	**25411**	29341	42616	**35979**	739	829	**784**
2	IL 19074	20847	33242	**27045**	29138	42152	**35645**	837	960	**899**
3	IL 19081	15612	22468	**19040**	35455	43335	**39395**	849	933	**891**
4	IL 19082	14556	25860	**20208**	30570	50498	**40534**	802	993	**898**
5	IL 19091	16955	20797	**18876**	37081	40467	**38774**	690	849	**770**
6	IL 19096	24090	35345	**29718**	31560	41315	**36438**	752	923	**837**
7	IL 19128	17940	31631	**24785**	25691	38757	**32224**	859	950	**904**
8	IL 19132	19212	34340	**26776**	31222	43500	**37361**	767	971	**869**
9	IL 19148	16961	28195	**22578**	32737	43015	**37876**	865	935	**900**
10	IL 19162	32487	40711	**36599**	35817	44103	**39960**	915	1006	**961**
11	IL 19181	15394	24315	**19854**	23980	33595	**28787**	917	995	**956**
12	IL 19185	15154	26760	**20957**	30973	43467	**37220**	911	973	**942**
13	IL 19198	11627	17633	**14630**	29260	32319	**30789**	865	914	**889**
14	IL 19202	15341	19008	**17174**	31768	33372	**32570**	823	879	**851**
15	IL 19204	20473	27827	**24150**	35240	44160	**39700**	944	1079	**1011**
16	IL 19206	19378	23530	**21454**	37577	43793	**40685**	761	911	**836**
17	IL 19208	17833	19549	**18691**	37431	35840	**36635**	951	1005	**978**
18	IL 19211	14882	22408	**18645**	30468	36146	**33307**	811	927	**869**
19	IL 19215	16988	21477	**19232**	32459	36063	**34261**	682	811	**746**
20	IL 19222	15865	25861	**20863**	25479	39948	**32713**	742	993	**868**
21	IL 19247	17471	19457	**18464**	38837	41640	**40239**	860	947	**904**
22	IL 19253	15210	16953	**16081**	27358	37484	**32421**	897	1103	**1000**
23	IL 19273	16300	21762	**19031**	33550	34203	**33877**	1012	1085	**1049**
24	IL 19279	17824	17994	**17909**	34867	30420	**32644**	781	872	**827**
25	IL 19283	23105	26019	**24562**	42723	42159	**42441**	746	841	**793**
26	IL 19284	30280	31442	**30861**	48247	45478	**46862**	811	860	**835**
27	IL 19288	19698	29709	**24704**	25729	36211	**30970**	813	926	**869**
28	IL 19329	18103	25931	**22017**	25867	34308	**30087**	903	1119	**1011**
29	IL 19344	15940	23648	**19794**	29550	47577	**38563**	881	976	**929**
30	IL 19345	17072	17123	**17098**	32741	35273	**34007**	899	966	**932**
31	IL 19346	19378	31868	**25623**	30078	41267	**35672**	806	911	**858**
32	IL 19347	14885	24197	**19541**	38105	37057	**37581**	825	886	**855**
33	IL 19435	15560	17411	**16485**	28810	30859	**29834**	851	920	**885**
34	IL 19451	21119	39742	**30430**	38321	51885	**45103**	732	882	**807**
35	K. Hamsa	18974	37375	**28175**	42836	56060	**49448**	777	893	**835**
36	WGL-14	20900	43842	**32371**	33240	52861	**43050**	781	1001	**891**
	Mean	**18455**	**26536**	**22495**	**32892**	**40645**	**36768**	**829**	**945**	**887**
	LSD (Treat)		1446**			3583*			35.66**	
	LSD (Genotype)		4180**			6383**			79.44**	
	LSD (Treat x Genotype)		5912**			9027**			85.06*	
	CV (%)		4.76			16.64			2.97	

Table 6.2.18 Influence of irrigation regimes on important physiological traits of rice genotypes at TTB centre during Rabi (dry) season 2021-22

S.No.	Genotypes	Grain yield (g/m²)		Mean	1000 grain weight (g)		Mean	Harvest Index (%)		Mean
		Drought	Irrigated		Drought	Irrigated		Drought	Irrigated	
1	IL 19072	280	335	**308**	17.4	18.6	**18.0**	37.9	40.8	**39.3**
2	IL 19074	279	331	**305**	19.1	20.3	**19.7**	33.4	34.6	**34.0**
3	IL 19081	294	333	**314**	17.4	18.6	**18.0**	34.9	36.0	**35.5**
4	IL 19082	284	356	**320**	18.2	19.8	**19.0**	35.5	35.9	**35.7**
5	IL 19091	257	294	**276**	20.4	21.6	**21.0**	37.4	35.0	**36.2**
6	IL 19096	332	374	**353**	16.0	17.1	**16.6**	44.3	40.6	**42.5**
7	IL 19128	304	355	**330**	18.3	19.3	**18.8**	35.5	37.4	**36.5**
8	IL 19132	291	336	**314**	17.5	18.0	**17.7**	37.9	34.8	**36.4**
9	IL 19148	306	365	**336**	17.9	19.1	**18.5**	35.4	39.2	**37.3**
10	IL 19162	298	334	**316**	17.1	17.8	**17.4**	32.8	33.3	**33.1**
11	IL 19181	280	309	**295**	19.5	20.4	**19.9**	30.6	31.1	**30.8**
12	IL 19185	298	326	**312**	17.7	19.0	**18.3**	32.8	33.5	**33.1**
13	IL 19198	256	281	**269**	17.8	18.6	**18.2**	29.7	30.8	**30.2**
14	IL 19202	292	325	**309**	17.1	17.9	**17.5**	35.6	37.0	**36.3**
15	IL 19204	280	370	**325**	16.9	18.0	**17.5**	29.6	34.3	**32.0**
16	IL 19206	346	350	**348**	19.6	20.5	**20.0**	45.6	38.4	**42.0**
17	IL 19208	335	386	**361**	19.6	20.3	**19.9**	35.2	38.5	**36.9**
18	IL 19211	308	356	**332**	20.1	21.2	**20.6**	38.2	38.4	**38.3**
19	IL 19215	256	314	**285**	18.2	19.4	**18.8**	37.5	38.9	**38.2**
20	IL 19222	244	344	**294**	16.9	17.7	**17.3**	33.1	34.9	**34.0**
21	IL 19247	295	356	**326**	17.8	18.8	**18.3**	34.3	37.7	**36.0**
22	IL 19253	282	329	**306**	18.3	19.3	**18.8**	31.6	29.8	**30.7**
23	IL 19273	297	337	**317**	21.2	21.9	**21.6**	29.9	31.1	**30.5**
24	IL 19279	310	349	**330**	19.8	21.1	**20.4**	39.7	40.2	**39.9**
25	IL 19283	297	354	**326**	15.3	16.3	**15.8**	39.7	42.1	**40.9**
26	IL 19284	282	342	**312**	16.0	16.9	**16.4**	34.9	39.9	**37.4**
27	IL 19288	276	317	**297**	18.6	19.6	**19.1**	34.0	34.4	**34.2**
28	IL 19329	222	264	**243**	14.4	15.6	**15.0**	24.6	23.6	**24.1**
29	IL 19344	276	344	**310**	14.0	15.2	**14.6**	31.4	35.3	**33.3**
30	IL 19345	232	388	**310**	15.5	16.6	**16.0**	25.8	40.2	**33.0**
31	IL 19346	248	350	**299**	14.4	15.3	**14.8**	30.8	38.6	**34.7**
32	IL 19347	296	329	**313**	15.2	16.2	**15.7**	35.9	37.1	**36.5**
33	IL 19435	285	290	**288**	17.4	18.4	**17.9**	33.5	31.6	**32.5**
34	IL 19451	257	304	**281**	16.3	17.0	**16.7**	35.3	34.6	**34.9**
35	K. Hamsa	324	389	**357**	17.6	18.7	**18.1**	41.8	43.6	**42.7**
36	WGL-14	298	337	**318**	14.2	15.4	**14.8**	38.3	33.8	**36.0**
	Mean	**286**	**338**	**312**	**17.4**	**18.5**	**18.0**	**34.9**	**36.0**	**35.4**
	LSD (Treat)		33.37**			0.69*			ns	
	LSD (Genotype)		30.01**			0.31**			4.44**	
	LSD (Treat x Genotype)		42.45**			ns			6.28**	
	CV (%)		7.92			6.59			6.23	

Table 6.2.19 Influence of irrigation regimes on important physiological traits (drought indices) of rice genotypes at TTB centre during Rabi (dry) season 2021-22

S.No.	Genotypes	DSI	RDI	DTI	GMP	TOL	MP	YI	YSI	DI	SDI	HM	K1STI	K2STI
1	IL 19072	1.05	0.99	0.83	306.2	-55.0	307.5	0.98	0.84	0.82	0.16	304.9	0.99	0.96
2	IL 19074	1.01	1.00	0.81	303.4	-52.0	305.0	0.98	0.85	0.83	0.15	301.8	0.96	0.96
3	IL 19081	0.75	1.05	0.86	312.2	-39.0	313.5	1.03	0.89	0.92	0.11	310.9	0.97	1.07
4	IL 19082	1.30	0.95	0.89	317.7	-72.0	320.0	0.99	0.80	0.80	0.20	315.5	1.12	0.99
5	IL 19091	0.71	1.05	0.66	274.0	-37.0	275.5	0.90	0.89	0.80	0.11	272.5	0.77	0.81
6	IL 19096	0.74	1.05	1.09	352.3	-42.0	353.0	1.16	0.89	1.03	0.11	351.6	1.23	1.35
7	IL 19128	0.93	1.01	0.95	328.4	-51.0	329.5	1.06	0.86	0.91	0.14	327.2	1.11	1.13
8	IL 19132	0.88	1.02	0.86	312.5	-45.0	313.5	1.02	0.87	0.89	0.13	311.5	0.99	1.04
9	IL 19148	1.01	1.00	0.98	333.7	-59.0	335.5	1.07	0.85	0.91	0.15	332.0	1.18	1.15
10	IL 19162	0.71	1.05	0.88	315.4	-36.0	316.0	1.04	0.89	0.93	0.11	314.9	0.98	1.09
11	IL 19181	0.59	1.07	0.76	293.6	-29.0	294.5	0.98	0.91	0.90	0.09	292.6	0.84	0.97
12	IL 19185	0.55	1.08	0.85	311.5	-28.0	312.0	1.04	0.92	0.96	0.08	311.0	0.93	1.09
13	IL 19198	0.59	1.07	0.63	268.2	-25.0	268.5	0.90	0.91	0.82	0.09	267.9	0.69	0.80
14	IL 19202	0.64	1.07	0.83	307.9	-33.0	308.5	1.02	0.90	0.92	0.10	307.3	0.93	1.04
15	IL 19204	1.57	0.90	0.91	321.5	-90.0	325.0	0.98	0.76	0.75	0.24	318.1	1.20	0.96
16	IL 19206	0.08	1.17	1.07	348.0	-4.0	348.0	1.21	0.99	1.20	0.01	348.0	1.08	1.47
17	IL 19208	0.87	1.02	1.14	359.6	-51.0	360.5	1.17	0.87	1.02	0.13	358.6	1.31	1.37
18	IL 19211	0.87	1.02	0.96	331.0	-48.0	332.0	1.08	0.87	0.93	0.13	330.1	1.12	1.16
19	IL 19215	1.20	0.96	0.70	283.3	-58.0	285.0	0.90	0.82	0.73	0.18	281.6	0.87	0.80
20	IL 19222	1.91	0.84	0.74	289.7	-100.0	294.0	0.85	0.71	0.61	0.29	285.4	1.04	0.73
21	IL 19247	1.11	0.98	0.92	323.8	-61.0	325.5	1.03	0.83	0.86	0.17	322.2	1.11	1.07
22	IL 19253	0.93	1.01	0.81	304.6	-47.0	305.5	0.99	0.86	0.85	0.14	303.6	0.95	0.97
23	IL 19273	0.77	1.04	0.88	316.2	-40.0	317.0	1.04	0.88	0.92	0.12	315.5	1.00	1.08
24	IL 19279	0.68	1.06	0.95	328.3	-39.0	329.5	1.08	0.90	0.98	0.10	327.2	1.07	1.18
25	IL 19283	1.02	1.00	0.92	323.3	-57.0	325.5	1.04	0.84	0.89	0.16	321.0	1.10	1.09
26	IL 19284	1.15	0.97	0.85	310.6	-60.0	312.0	0.99	0.82	0.81	0.18	309.1	1.03	0.97
27	IL 19288	0.83	1.03	0.77	295.6	-41.0	296.5	0.96	0.87	0.84	0.13	294.7	0.88	0.93
28	IL 19329	1.03	0.99	0.51	242.0	-42.0	243.0	0.78	0.84	0.65	0.16	241.0	0.61	0.60
29	IL 19344	1.28	0.95	0.83	308.0	-68.0	310.0	0.96	0.81	0.78	0.19	306.1	1.04	0.93
30	IL 19345	2.63	0.71	0.79	299.9	-156.0	310.0	0.81	0.60	0.49	0.40	290.2	1.32	0.66
31	IL 19346	1.91	0.84	0.76	294.6	-102.0	299.0	0.87	0.71	0.61	0.29	290.2	1.08	0.75
32	IL 19347	0.65	1.06	0.86	312.0	-33.0	312.5	1.03	0.90	0.93	0.10	311.6	0.95	1.07
33	IL 19435	0.11	1.16	0.73	287.4	-5.0	287.5	1.00	0.98	0.98	0.02	287.4	0.74	0.99
34	IL 19451	1.01	1.00	0.69	279.5	-47.0	280.5	0.90	0.85	0.76	0.15	278.5	0.81	0.81
35	K. Hamsa	1.09	0.98	1.11	355.0	-65.0	356.5	1.13	0.83	0.94	0.17	353.5	1.33	1.28
36	WGL-14	0.75	1.04	0.88	316.7	-39.0	317.5	1.04	0.89	0.92	0.11	316.0	1.00	1.09
	Mean	**0.97**	**1.01**	**0.85**	**310.2**	**-51.6**	**311.8**	**1.00**	**0.85**	**0.86**	**0.15**	**308.6**	**1.01**	**1.01**

Table 6.2.20 Influence of irrigation regimes on important physiological traits drought indices Overall Rank of rice genotypes at TTB centre during Rabi (dry) season 2021-22

S.No.	Genotypes	DSI	RDI	DTI	GMP	TOL	MP	YI	YSI	DI	SDI	HM	K1STI	K2STI	Overall Rank
1	IL 19072	11	26	23	23	24	24	25	26	24	11	23	20	25	24
2	IL 19074	15	22	25	25	23	26	26	22	23	15	25	24	26	27
3	IL 19081	25	12	17	17	10	16	16	12	12	25	19	23	15	16
4	IL 19082	5	32	12	12	32	12	20	32	28	5	14	8	20	18
5	IL 19091	28	9	34	34	9	34	29	9	27	28	34	33	30	31
6	IL 19096	26	11	3	3	15	3	3	11	2	26	3	4	3	3
7	IL 19128	17	20	7	7	21	7	8	20	15	17	7	10	8	8
8	IL 19132	19	18	16	16	17	16	18	18	19	19	17	21	17	17
9	IL 19148	16	21	5	5	27	5	7	21	16	16	5	6	7	7
10	IL 19162	27	10	15	15	8	15	9	10	10	27	15	22	10	11
11	IL 19181	32	5	29	29	5	29	23	5	17	32	27	31	23	25
12	IL 19185	34	3	19	19	4	19	9	3	6	34	18	27	12	14
13	IL 19198	33	4	35	35	3	35	31	4	25	33	35	35	31	32
14	IL 19451	14	23	33	33	18	33	29	23	30	14	33	32	29	33
15	IL 19204	4	33	11	11	33	11	23	33	31	4	11	5	24	19
16	IL 19202	31	6	22	22	6	23	17	6	13	31	21	28	18	20
17	IL 19208	21	16	1	1	21	1	2	16	3	21	1	3	2	2
18	IL 19211	20	17	6	6	20	6	6	17	8	20	6	7	6	6
19	IL 19215	7	30	32	32	26	32	31	30	32	7	32	30	31	35
20	IL 19222	3	34	30	30	34	30	34	34	35	3	31	16	34	34
21	IL 19247	9	28	9	9	29	9	15	28	20	9	9	9	16	12
22	IL 19253	18	19	24	24	18	25	21	19	21	18	24	26	22	23
23	IL 19273	23	14	14	14	13	14	13	14	14	23	13	18	13	13
24	IL 19279	29	8	8	8	10	7	5	8	5	29	8	14	5	5
25	IL 19283	13	24	10	10	25	9	12	24	18	13	10	11	9	10
26	IL 19284	8	29	20	20	28	19	21	29	26	8	20	17	21	21
27	IL 19288	22	15	27	27	14	28	27	15	22	22	26	29	27	28
28	IL 19329	12	25	36	36	15	36	36	25	33	12	36	36	36	36
29	IL 19344	6	31	21	21	31	21	27	31	29	6	22	15	28	26
30	IL 19345	1	36	26	26	36	21	35	36	36	1	29	2	35	29
31	IL 19346	2	35	28	28	35	27	33	35	34	2	28	13	33	30
32	IL 19347	30	7	18	18	6	18	14	7	9	30	16	25	14	15
33	IL 19435	35	2	31	31	2	31	19	2	4	35	30	34	19	22
34	IL19206	36	1	4	4	1	4	1	1	1	36	4	12	1	1
35	K. Hamsa	10	27	2	2	30	2	4	27	7	10	2	1	4	4
36	WGL-14	24	13	13	13	10	13	11	13	11	24	12	19	11	9

6.3 Screening for high temperature tolerance in rice genotypes

Locations: IIRR, MTU, PNR, PTB, REWA, TTB & KAUL

Global warming has resulted in increase in atmospheric temperature. This has resulted in increasing events of the high temperatures stress to crops at various growth stages. Rice in particular is vulnerable to high temperatures stress at various stages especially at flowering stage. Therefore, high temperatures stress results in the serious adverse effects on rice production. Thus, understanding morpho-physiological parameters/mechanisms involved in mitigation/tolerance of high temperatures stress in rice is the way forward. The objectives of this trial is to phenotype rice cultivars for high temperature tolerance and to understand the impact of high temperature stress on rice. Therefore, a trial was conducted in 7 AICRIP centres with 25 entries from IVT-E-TP breeding trial. Heat stress was imposed by enclosing the field grown crop with transparent polyethylene sheet supported by metal or bamboo frame. Enclosing the field crop during reproductive phase with polythene sheet had resulted in significant increase in temperature. The temperature inside the polythene tunnel was recorded until the crop was harvested.

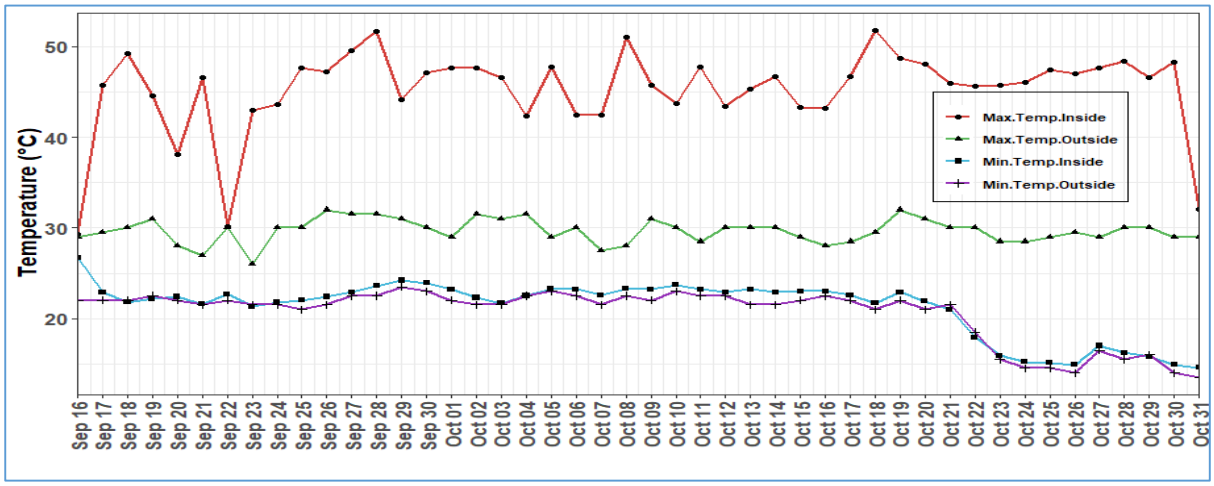


Fig 6.3.1: Maximum and minimum temperatures recorded between PI and maturity stages of rice crop inside and outside of the polythene tunnel at IIRR, Hyderabad during Kharif 2022.

The mean max temperature recorded at IIRR center during reproductive stage is in the range of 10-20 °C higher inside the polytunnel than ambient temperature recorded during the same period. The mean minimum temperature was almost similar inside the polytunnel to the ambient temperature with polytunnel temperature slightly higher than the ambient (Fig 6.3.1). The mean maximum temperature during day time has reached 35-50°C during PI and maturity stagesat IIRR center.

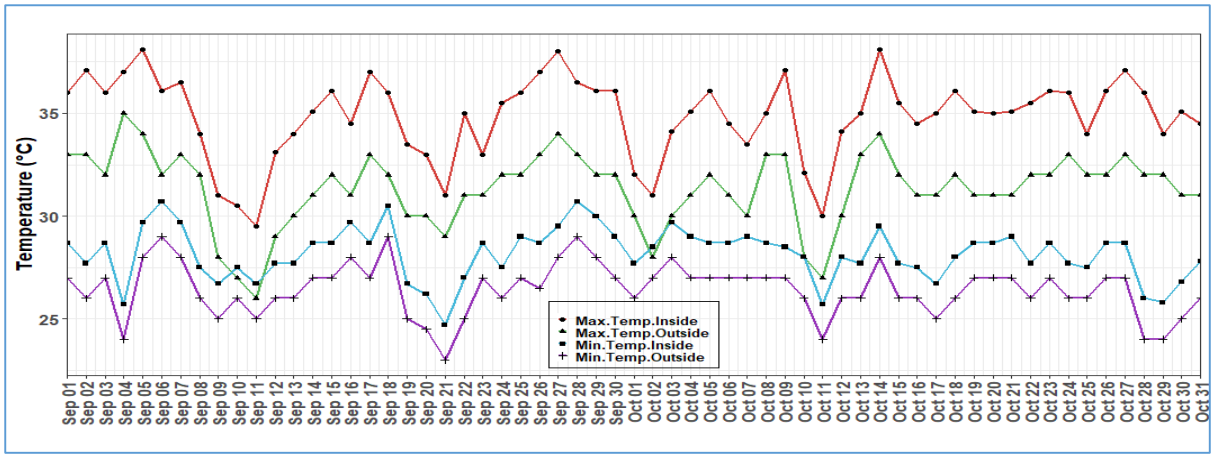


Fig 6.3.2: Maximum and minimum temperatures recorded between PI and maturity stages of rice crop inside and outside of the polythene tunnel at MTU, Maruteru during Kharif 2022

At MTU center, the mean maximum temperature inside the polytunnel was higher than mean maximum temperature outside the polytunnel by the range of 2 - 5°C and the mean minimum temperature inside the polytunnel was higher than mean maximum temperature outside the polytunnel almost by 1°C (Fig 6.3.2). The maximum temperature during day time has reached 30-37.5°C during PI and maturity stagesat MTU center barring for few days.

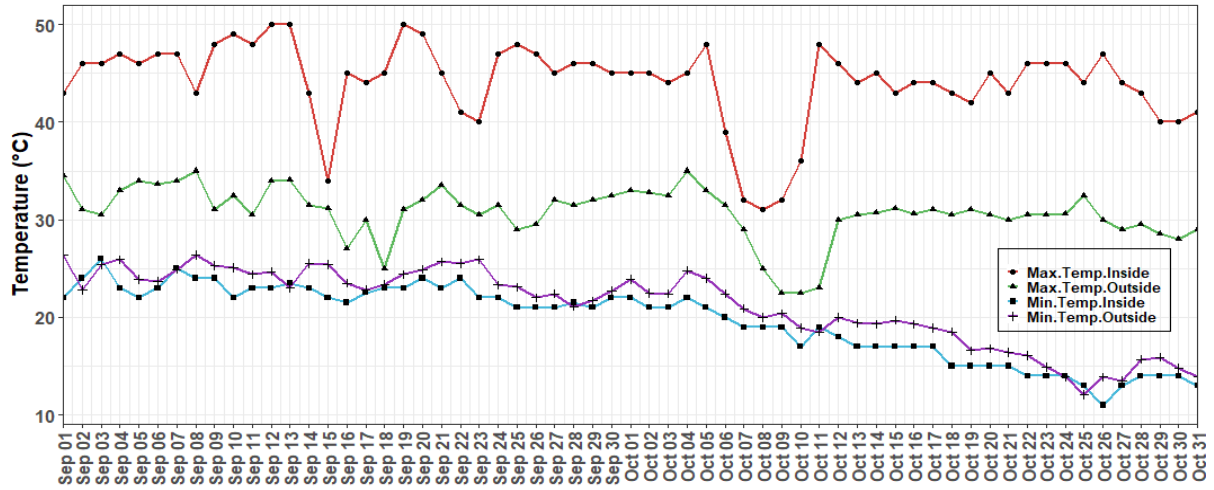


Fig 6.3.3: Maximum and minimum temperatures recorded between PI and maturity stages of rice crop inside and outside of the polythene tunnel at Pantnagar during Kh 2022

At PNR center the mean maximum temperature inside the polytunnel was higher than mean maximum ambient temperature by about 5-7°C and the mean minimum temperature inside the polytunnel was lower than mean maximum ambient temperature by about 1°C (Fig 6.3.3). Barring few days, the maximum temperature during day time has reached 40-50°C during PI and maturity stagesat PNR center. At PTB center the mean maximum temperature inside the polytunnel was higher than the ambient mean maximum temperature by 5-7°C and the mean

minimum temperature inside the polytunnel was almost equal to the ambient mean minimum temperature baring few data-points (Fig 6.3.4). Barring one day the maximum temperature during day time has reached 35.5-42.5°C during PI and maturity stagesat PTB center.

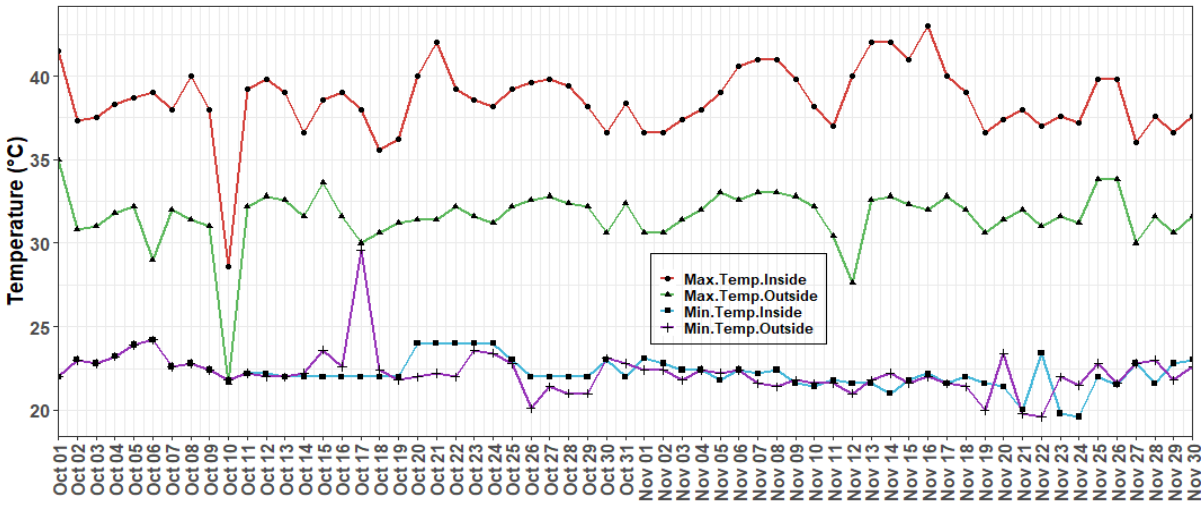


Fig 6.3.4: Maximum and minimum temperatures recorded between PI and maturity stages of rice crop inside and outside of the polythene tunnel at Pattambi, Kerala during Kh 2022

The mean maximum temperature recorded at Rewa center inside the polytunnel was higher than mean maximum ambient temperature by about 1-3°C and the mean minimum temperature inside the polytunnel was higher than the mean minimum ambient temperature by about 1°C (Fig 6.3.5). The maximum temperature during day time has reached 35-37 °C during PI and maturity stagesat PTB center except few days.

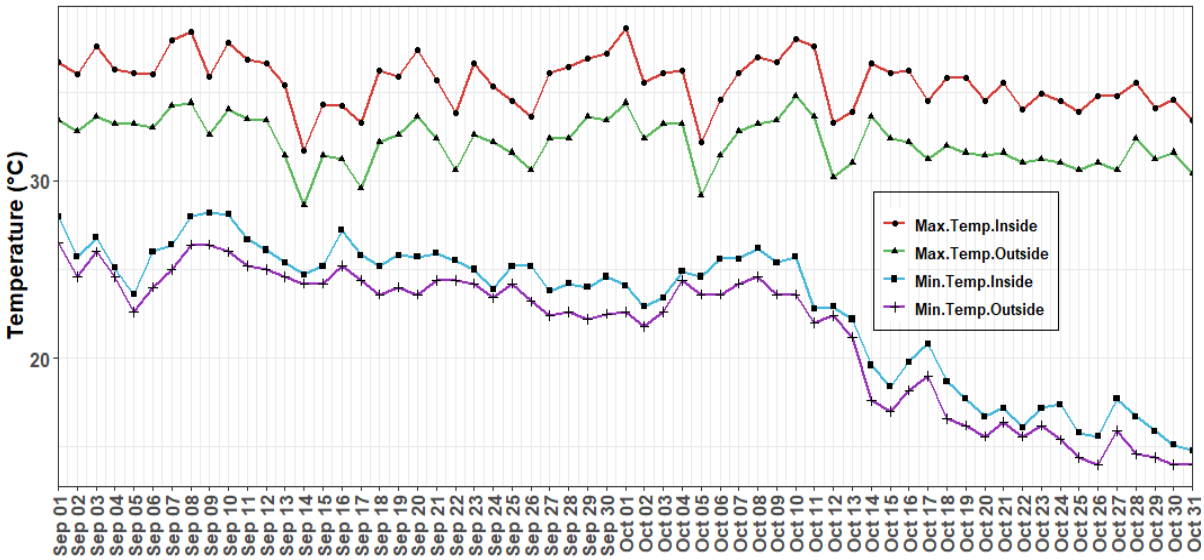


Fig 6.3.5: Maximum and minimum temperatures recorded between PI and maturity stages of rice crop inside and outside of the polythene tunnel at REWA during Kh 2022

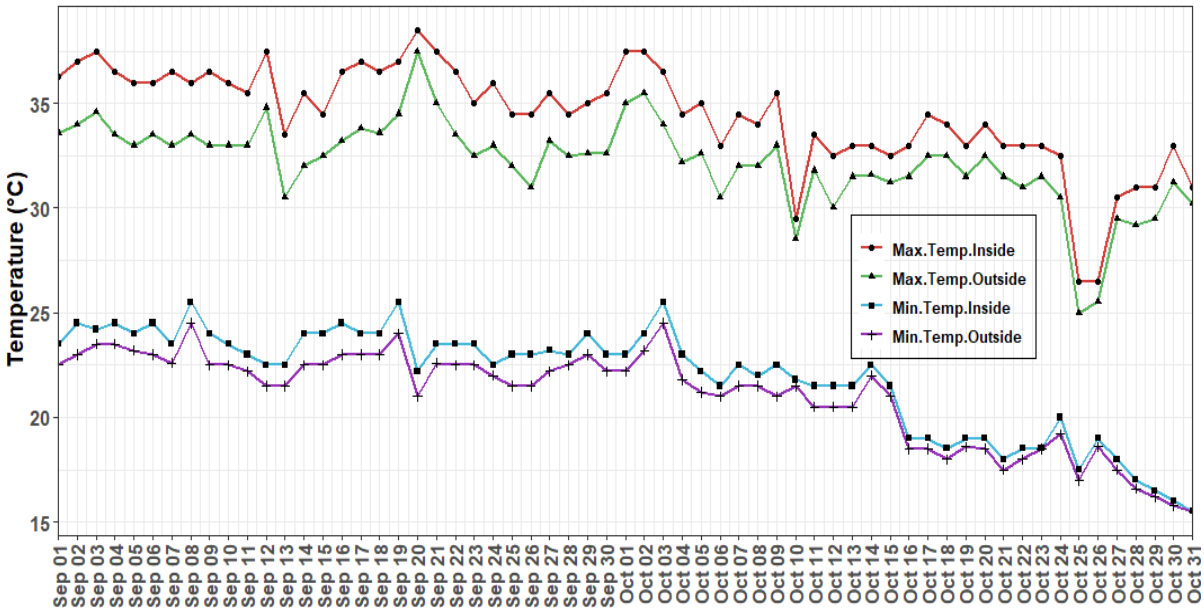


Fig 6.3.6: Maximum and minimum temperatures recorded between PI and maturity stages of rice crop inside and outside of the polythene tunnel at Titabar Assam during Kh 2022

The mean maximum temperature recorded at TTB center inside the polytunnel was higher than mean maximum ambient temperature by about 1-3°C and the mean minimum temperature inside the polytunnel was higher than the mean minimum ambient temperature by about 1°C (Fig 6.3.6). At TTB center the maximum temperature during day time has reached 32-37.5 °C during PI and maturity stagesat except few days.

High temperature stress had significantly affected the entries at both flowering and maturity stage. Table 6.3.1 shows statistically significant differences for treatment effect, varietal effects, interaction effects between treatment X location, location X variety and treatment X Location X variety. However, interaction effects between treatment X variety is non-significant. Table 6.3.2 also shows almost similar trend for days to maturity as well. Thus, high temperature stress did reduce the number of days required to flowering and maturity, although marginally, but it is statistically significant. As treatment was imposed at PI stage, where the entries have already attained significant duration of the lifecycle, the number of days remaining to finish the remaining lifecycle is less thus the marginal reduction in duration.

Table 6.3.3 and 6.3.4 shows the data for chlorophyll content at flowering stage and at maturity stage. The grand mean values show that the chlorophyll content at flowering stage and at maturity stage was reduced in the treatment as compared with control. At flowering stage, the high temperature stress treatment significantly affected the entries whereas the interaction effect between treatment X variety, treatment X location and variety X treatment X location

was non-significant. At maturity the high temperature stress treatment did not significantly affected the entries and the interaction effect between treatment X variety whereas the interaction effect between treatment X location and variety X treatment X location was significant. The chlorophyll content is generally maximum during flowering and thereafter it gradually reduces due to senescence effect at maturity. Therefore, at flowering stage the significant effect of treatment on various entries was observed. However, at maturity stage, the chlorophyll content is gradually reduced therefore the treatment effect is non-significant. Even though some entries may differ in chlorophyll retention at this stage, therefore a significant effect of the interaction effect between treatment X location and variety X treatment X location was significant. The LAI at flowering stage was reduced due to the high temperature stress treatment, although the reduction was non-significant. The interaction effect between treatment X variety and varietal effect was also non-significant (Table 6.3.5). In case of plant height (Table 6.3.6) varieties differ and they also differ under the influence of stress treatment also. Some varieties show increase in plant height under stress treatment whereas others reduce. Therefore, there is significant effect of stress treatment on plant height and few interaction effects are also significant.

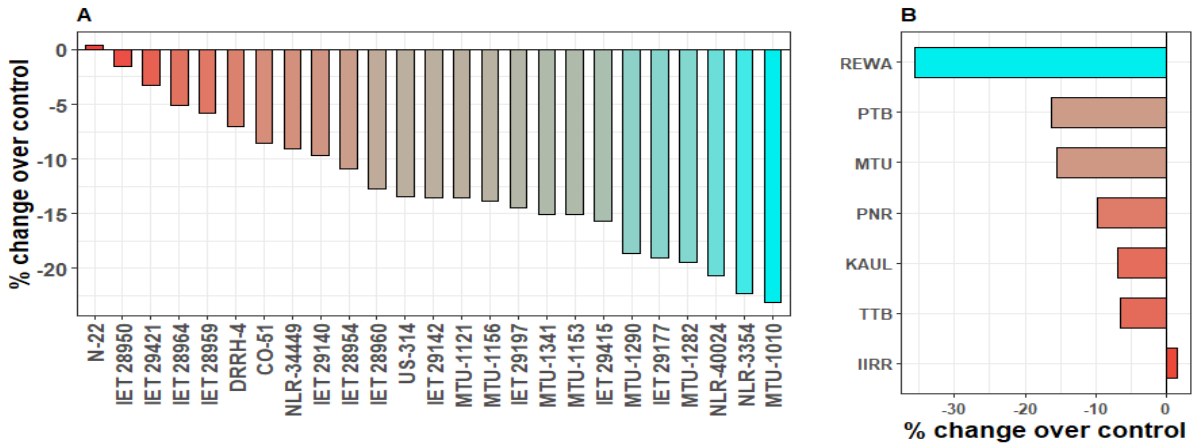


Fig 6.3.7. Influence of elevated temperature on total dry matter (g/m2) recorded at maturity each bar represents percent change in total dry matter under elevated temperature in comparison with control (A) mean of all varieties, (B) mean of all locations.

Mean total dry matter (g/m^2) at flowering stage varied from 808 g/m^2 in MTU1010 to 1061 g/m^2 in IET28959 with a mean of 1008 g/m^2 in control whereas it ranged from 732 g/m^2 in IET29140 to 919 g/m^2 in DRRH4 with a mean of 829 g/m^2 in stress treatment (Table 6.3.10). The highest mean grain yield was recorded at 1051 g/m^2 at IIRR center followed by 1022 g/m^2 at PNR center and the least 725 g/m^2 at PTB followed by 875 g/m^2 at MTU center with the mean of all the centers 941 g/m^2 in control treatment. In stress treatment the highest was at

1049 g/m^2 at IIRR followed by 844 g/m^2 at PNR and the least 647 g/m^2 at PTB followed by 768 g/m^2 at REWA center with the mean of all the centers 829 g/m^2. High temperature stress treatment has significantly affected the entries. The interaction effects between treatment X location, location X variety and treatment X Location X variety are also significant. However, the interaction effects between treatment X variety is non-significant. At maturity stage (Table 6.3.19), mean TDM of all the entries ranged from 1081 g/m^2 (N22) followed by 1205 g/m^2 (CO51) to 1587 g/m^2 (IET29142) followed by 1478 (IET29177) with a mean of all the entries 1364 g/m^2 in control. In stress treatment, it ranged from 943 g/m^2 (MTU1010) followed by 1046 g/m^2 (NLR3354) to 1383 g/m^2 (IET28964) followed by 1372 g/m^2 (IET29142) with a mean of all the entries 1193 g/m^2. High temperature stress treatment has significantly affected the entries. The interaction effects between treatment X location, location X variety and treatment X Location X variety are also significant. However, the interaction effects between treatment X variety is non-significant. In terms of percent change over control entry N22 has recorded the least reduction (1%) and entry MTU1010 has the highest (-26%) (Fig 6.3.7A). Among the centers the greatest reduction of percent TDM change over control was recorded at REWA center and the least at IIRR center (Fig 6.3.7B).

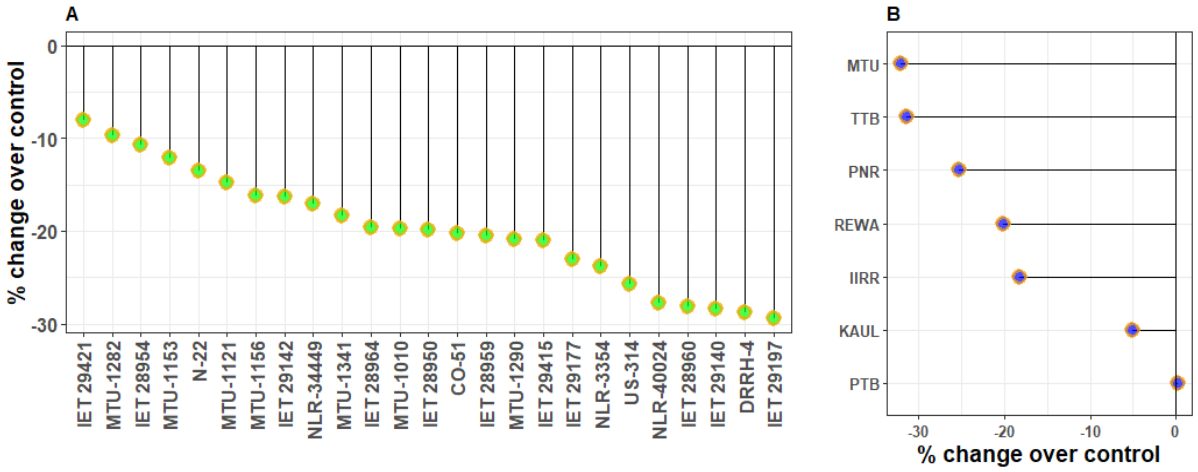


Fig 6.3.8. Influence of elevated temperature on number filled grains per/panicle recorded at maturity each bar represents percent change in grain number under elevated temperature in comparison with control (A) mean of all varieties, (B) mean of all locations.

Percent change of filled grain per panicle over control (Fig 6.3.8A) shows that IET29421 has shown the least reduction (-8%) followed by MTU1282 (-10%) and entry IET29197 has shown the highest reduction of -28%. The highest reduction of percent change of grain number per panicle over control was recorded in at MTU center (-32%) followed by TTB center (-31%) and least percent change of grain number per panicle over control was recorded at PTB center (0.5%) followed by KAUL (-5%) (Fig 6.3.8B).

Mean shoot weight varied from 609 g/m^2 (REWA) followed by 700 g/m^2 (MTU) to 901 g/m^2 (PNR) followed by 760 g/m^2 (IIRR) with an overall mean of 738 g/m^2 in control whereas in stress it ranged from 473 g/m^2 (REWA) followed by 548 g/m^2 (PTB) with an overall mean of 684 g/m^2 (Table 6.3.11). Entry N22 has recorded about 10% shoot weight change over control followed by IET28950 (about 6%) whereas entry MTU1010 has recorded about -21% shoot weight change over control followed by NLR3354 (-16%) (Fig 6.3.9A). Among centers, TTB has recorded about 11% shoot weight change over control followed by IIRR (about 8%) whereas PTB has recorded about -28% shoot weight change over control followed by REWA (-18%) (Fig 6.3.9B).

Table 6.3.13 shows data for panicle number per m^2. Mean panicle number per m^2 ranged from 211 per m^2 at TTB followed by REWA per m^2 to 528 per m^2 at PTB followed by MTU (462 per m^2) with the

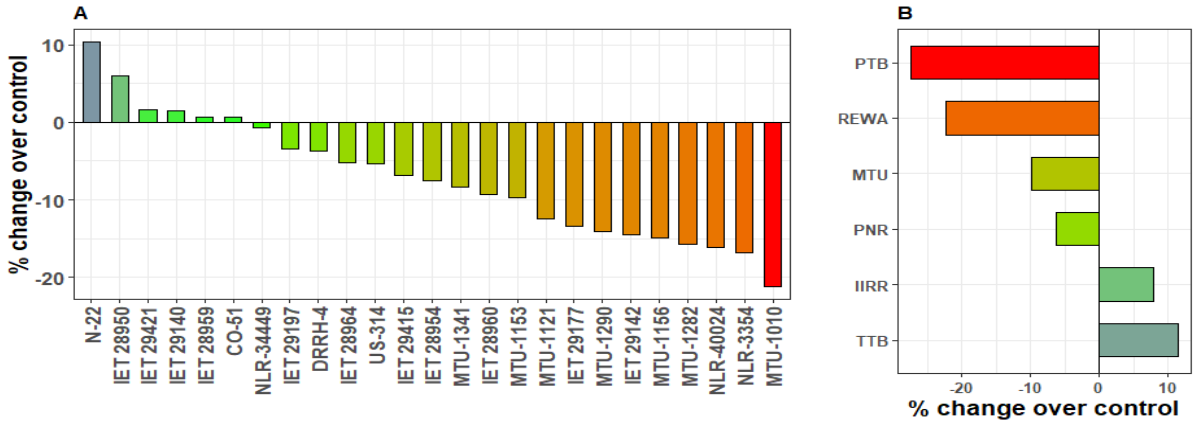


Fig 6.3.9. Influence of elevated temperature on shoot weight (g/m^2) recorded at maturity each bar represents percent change in shoot weight under elevated temperature in comparison with control (A) mean of all varieties, (B) mean of all locations.

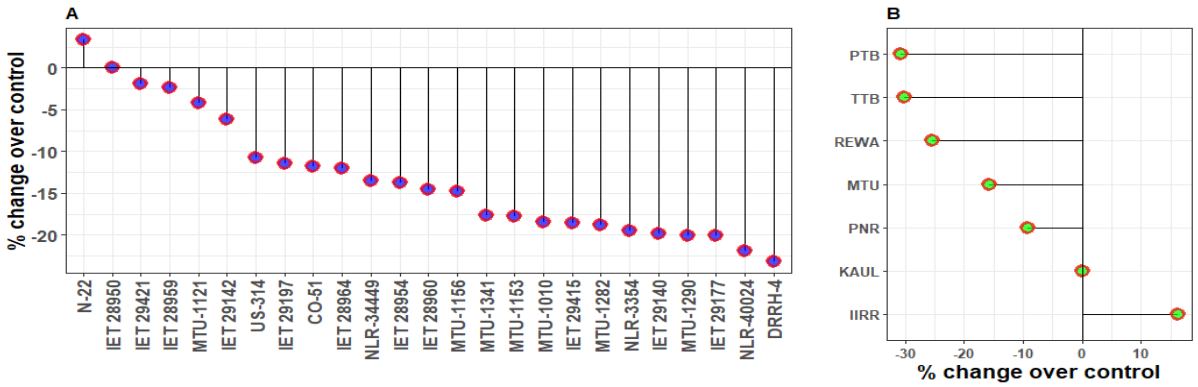


Fig 6.3.10. Influence of elevated temperature on panicle number/m2 recorded at maturity each bar represents percent change in panicle number under elevated temperature in comparison with control (A) mean of all varieties, (B) mean of all locations.

mean of all the centers 347 per m^2 in control whereas in stress treatment it ranged from 147 per m^2 at TTB followed by 160 per m^2 at REWA to 399 per m^2 at IIRR followed by PNR 389 per m^2 with a mean of all the centers 300 per m^2. Among entries, entry IET28960 recorded the lowest mean panicle number per m^2 (279 per m^2) followed by IET28950 (299 per m^2) and entry NLR34449 (391 per m^2) recorded the highest followed by NLR40024 (387 per m^2) with a mean of all the centers 300 per m^2 in control treatment. In stress treatment, panicle number per m^2 ranged from entry 238 per m^2 (IET28960) followed by MTU1010 (270 per m^2) to NLR34449 (339 per m^2) followed by IET29142 (337 per m^2) with a mean of all the centers 300 per m^2. The stress treatment was non-significant and reduced the mean panicle number per m^2 in stress treatment. Also the interaction effect between treatment X variety was non- significant. However, the interaction effect between treatment X location, location X variety and treatment X Location X variety was significant. Further varieties also significantly differ in their responses to the stress treatment, which may be due to varietal differences. The percent panicle number per m^2 change over control was observed in N22 is 5% followed by IET28950 0.1% and DRRH has recorded the highest (-26%) followed by NLR40024 (-24%) (Fig 6.3.10A). Among centers, IIRR has shown 16% panicle number per m^2 change over control followed by KAUL (0.1 %) whereas PTB (-32%) followed by TTB (-31%) has recorded the greatest reduction in percent panicle number per m^2 change over control (Fig 6.3.10B).

Mean grain number per panicle varied from 102 in N22 to 179 in IET29140 with a mean of 150 in control whereas in stress treatment it varied from 89 in N22 to 144 in MTU1282 with a mean of 120 (Table 6.3.14). The treatment has significantly affected the entries. Various other interactions are also statistically significant. Stress treatment reduced the grain number per panicle in all the entries in a non-uniform manner.

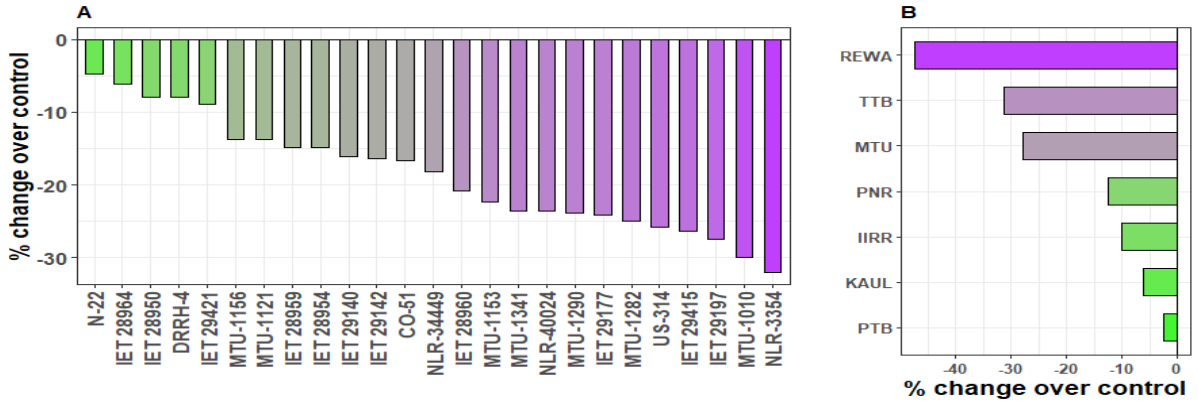


Fig 6.3.11. Influence of elevated temperature on grain yield (g/m^2) recorded at maturity each bar represents percent change in grain yield under elevated temperature in comparison with control (A) mean of all varieties, (B) mean of all locations.

Table 6.3.18 shows data for grain yield (g/m^2). Mean grain yield ranged from 389 g/m^2 at KAUL followed by TTB (454 g/m^2) to 637 g/m^2 at IIRR followed by PTB (584 g/m^2) with the mean of all the centers 529 g/m^2 in control whereas in stress treatment it ranged from 602 g/m^2 at PNR followed by 572 g/m^2 at IIRR to 253 g/m^2 at REWA followed by TTB 322 g/m^2 with a mean of all the centers 430 g/m^2. Among entries, entry N22 recorded the lowest mean grain yield (359 g/m^2) at all the centers followed by IET29421 (426 g/m^2) and entry IET29142 (672 g/m^2) recorded the highest followed by IET28959 (590 g/m^2) with a mean of all the centers 529 g/m^2 in control treatment. In stress treatment, mean grain yield ranged from entry IET29142 has recorded 561 g/m^2 followed by IET28950 (530 g/m^2) to MTU1010 (326 g/m^2) followed by NLR3354 (334g/m^2) with a mean of all the centers 430 g/m^2. The stress treatment has significantly affected the entries, also the interaction effect between treatment X location, location X variety and treatment X Location X variety are also significant. Further varieties also significantly differ in their responses to the stress treatment. The least percent grain yield change over control was observed in N22 and the highest was in NLR3354 (Fig 6.3.11A). Among centers, REWA center has recorded the highest reduction in percent grain yield change over control followed by TTB and the least reduction showed by PTB center followed by KAUL (Fig 6.3.11B).

Table 6.3.20 shows the data for 1000 grain weight. Center-wise mean 1000 grain weight ranged from 17 g (TTB) followed by 20.1 g (MTU) to 28.6 g (REWA) followed by 25.3 g (PNR) with an overall mean of 23.1 g in control. In stress it ranged from 15.8 g (MTU) followed by 16.1 g (TTB) to 25.6 g (REWA) followed by 24.7 g (KAUL) an overall mean of 21.6 g. Entry-wise mean 1000 grain weight ranged from 17 g (NLR34449) followed by 18.3 g (CO51) to 28.7 g (IET28964) followed by 27.4 g (MTU1290) whereas in stress it ranged from 16.2 g (NLR34449) followed by 16.4 g (NLR3354) to 26.5 g (IET28954) followed by 25.8 g (MTU1290). The stress treatment has significantly affected the entries. The interaction effect between treatment X location, location X variety and treatment X Location X variety are also significant. Varieties also significantly differ in their responses to the stress treatment. However, the interaction effect between treatment X variety is non-significant.

The data for Harvest index is shown in table. 6.3.21. Center-wise mean HI ranged from 35.8 (MTU) followed by 37.7 (REWA) to 41.8 (IIRR) followed by 41 (KAUL) in control with an overall mean of 38.8. In stress it ranged from 28.1 (TTB) followed by 30.4 (MTU) with an overall mean of 35.5. Entry-wise it ranged from 33.4 (N22) followed by 35.4 (NLR40024) to 42.6 (IET28950) followed by 42.4 (IET29142) in control whereas in stress, 28.1 (TTB)

followed by 30.4 (MTU) to 43.7 (PTB) followed by 41.6 (KAUL). The stress treatment did not significantly affect the entries, however, the interaction effect between treatment X location, location X variety and treatment X Location X variety are significant. Varieties also significantly differ in their responses to the stress treatment. The interaction effect between treatment X variety is also statistically non-significant. 1000 grain weight is a stable parameter and that must be the reason for statistically non-significant effect. The interaction effects may differ due to the genotypic and/or location differences. In terms of percent change of HI over control entry MTU1121 followed by MTU1156 has recorded the least reduction whereas entry IET29415 followed by IET29197 has recorded the highest reduction of HI over control (Fig 6.3.12A). Among centers, PTB followed by KAUL has recorded the 10% and 1% change of HI over control respectively whereas TTB followed by REWA has recorded -27% and -20% change of HI over control respectively (Fig 6.3.12B).

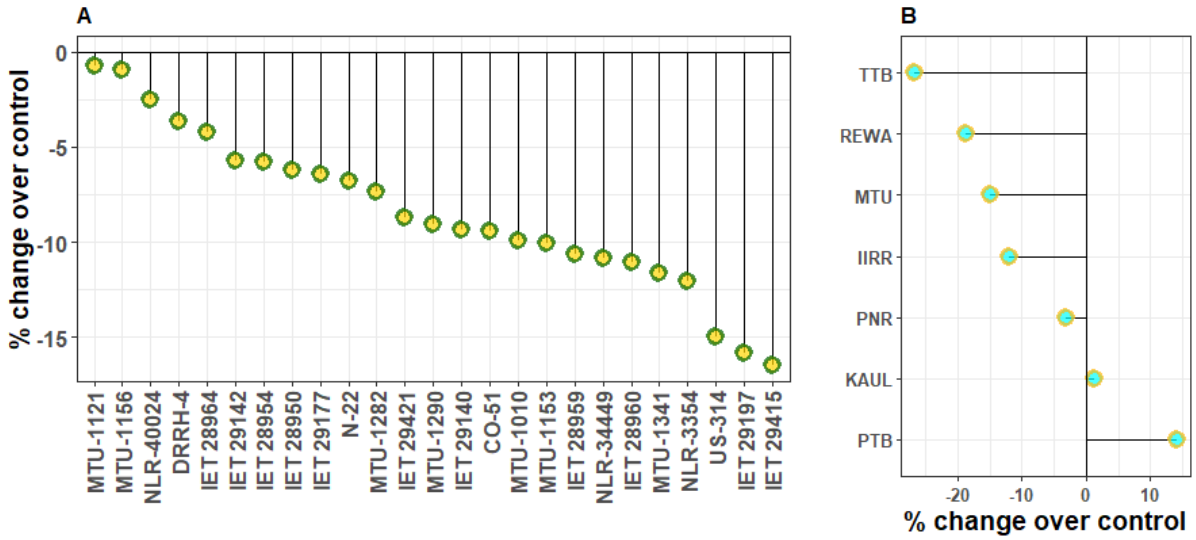


Fig 6.3.12. Influence of elevated temperature on harvest index (%) recorded at maturity each bar represents percent change in harvest index under elevated temperature in comparison with control (A) mean of all varieties, (B) mean of all locations.

Identification of high temperature tolerant genotypes using yield based indices

To identify genotypes tolerant to high temperature, various indices were computed based on the grain yield recorded under ambient (control) and high temperature conditions. Different heat indices such as Heat susceptibility index (HSI), Relative Heat index (RHI), Heat tolerance index (HTI), Geometric mean productivity (GMP), Tolerance (TOL), Mean production (MP), Yield index (YI), Heat resistance index (HI), Yield stability index (YSI), Sensitivity Heat Index (SHI), Harmonic Mean (HM), Modified stress tolerance index (K1STI), were calculated

following the equations published (Fischer and Maurer, 1978; Fischer et al., 1998; Fernandez, 1992; Rosielle and Hamblin, 1981; Bouslama and Schapaugh, 1984; Blum, 1988; Moosavi et al., 2008; Farshadfar and Sutka, 2002). The results are presented in Table (6.3.22). Significant Variation was observed amongst the genotypes for most of the indices. The genotypes were ranked for each index and overall rank for each genotype was calculated. The genotype with high overall rank was considered as heat tolerant genotype. Based on the overall rank IET29142, IET28950, MTU-1156, IET28959 and IET28964 can be identified as relatively heat tolerant genotype (Table 6.3.23).

In order to determine the most desirable heat stress tolerant criteria, the correlation coefficients between Ys, and other quantitative indices of heat tolerance were calculated. The correlation analysis between grain yield and heat tolerance indices can be a good criterion for screening the best cultivars and indices used. A suitable index must have a significant association with yield recorded under stress condition. Fig. 6.3.14 represents the results of correlation analysis which indicate that the indices like HTI (Heat Tolerance Index), GMP (Geometric Mean Production), MP (Mean Production), HI (Heat Resistance Index), HM (Harmonic Mean), K1STI, K2STI (Modified Stress Tolerance Index), Yield index (YI) showed highly significant positive association with grain yield recorded under stress condition. These indices are useful in selecting suitable genotypes for heat tolerance.

Selection for high yield and stability of performance under elevated temperature:

In order to simultaneously select genotypes with higher yield and stability of performance across locations under elevated temperature conditions, a parametric model for simultaneous selection in yield and stability "Shukla's stability variance and Kang's" statistic was performed and the results were presented in (Table 6.3.24). Based on their performance across locations and YSi values under elevated temperature conditions genotypes DRRH-4, IET 28950, IET 28954, IET 28959, IET 28960, IET 28964, IET 29140, IET 29142, IET 29177, MTU-1121, MTU-1153 and MTU-1156 can be selected as they produced relatively higher yield under heat stress condition and showed a lower variation.

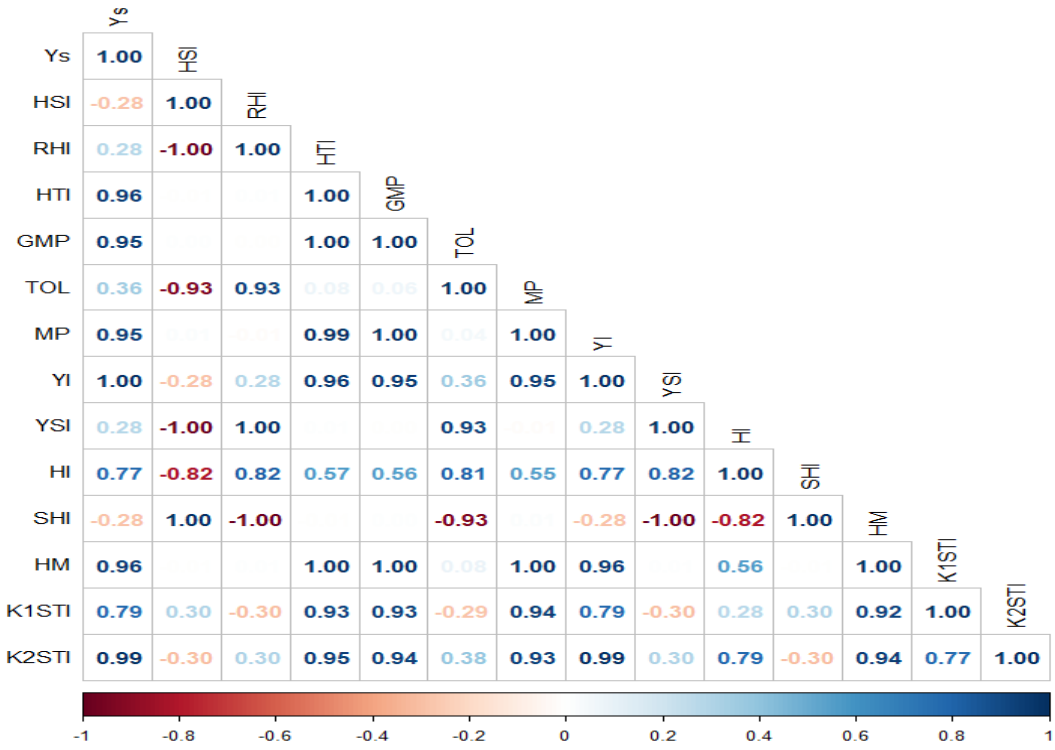


Fig 6.3.13. Correlation between yield recorded under elevated temperature condition and heat indices computed from yield recorded under both stressed and non-stressed condition. Mean yield data from all locations was used for computing the correlation coefficients. Statistically significant coefficients were shown in dark colors, light colored and blank numbers represents non significance.

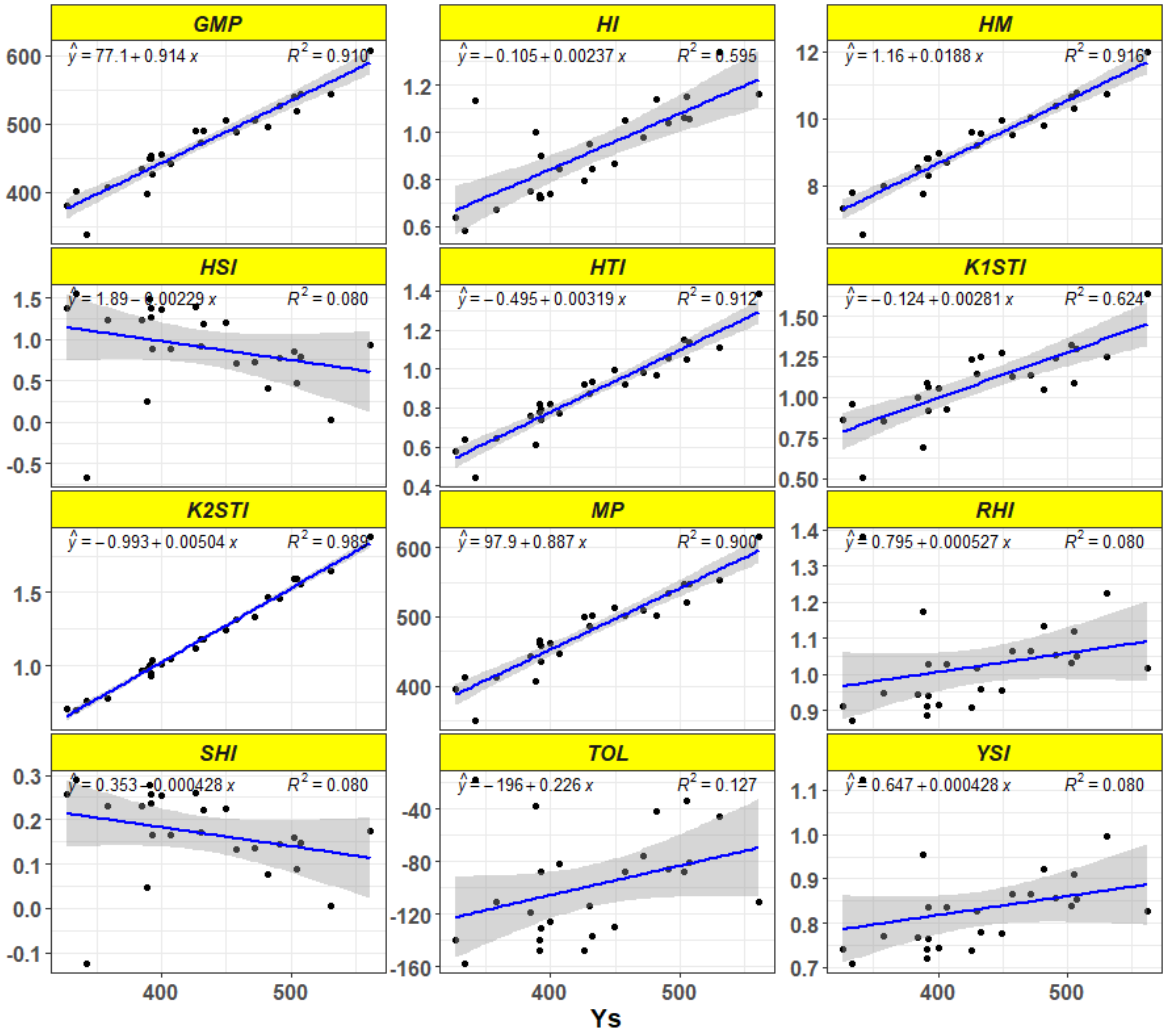


Fig 6.3.14. Relationship between heat stress indices and grain yield recorded under stressed condition (Ys). Mean of grain yield recorded at different locations was used for regression analysis.

Summary and Conclusions:

- Global warming has resulted in increase in atmospheric temperature which in-turn increased events of high temperatures stress to crops at various growth stages. Hence, a trial was conducted in 7 AICRIP centres with 25 entries from IVT-E-TP breeding trial.
- Significant variation was observed amongst the genotypes for most of the heat indices. **Based on the overall rank IET29142, IET28950, MTU-1156, IET28959 and IET28964 were identified as relatively heat tolerant genotypes.**
- Multiple correlation analysis indicates highly significant positive association between grain yield and the heat indices- HTI (Heat Tolerance Index), GMP (Geometric Mean Production), MP (Mean Production), HI (Heat Resistance Index), HM (Harmonic Mean), K1STI, K2STI (Modified Stress Tolerance Index) and Yield index (YI).

- Based on the performance across locations and YSi values under elevated temperature conditions, genotypes DRRH-4, IET 28950, IET 28954, IET 28959, IET 28960, IET 28964, IET 29140, IET 29142, IET 29177, MTU-1121, MTU-1153 and MTU-1156 were selected promising entries as they produced relatively higher yield under heat stress condition and showed high stability.

Table 6.3.1 Influence of Heat Stress on Days to flowering at different AICRIP centres *Kharif* 2022

S.No.	Genotypes	Control							Grand Mean	Heat Stress							Grand Mean
		IIRR	KAUL	MTU	PNR	PTB	REWA	TTB		IIRR	KAUL	MTU	PNR	PTB	REWA	TTB	
1	CO-51	93	87	77	82	85	99	104	90	91	86	76	80	72	99	100	86
2	DRRH-4	90	103	92	98	80	109	101	96	95	102	91	97	75	107	101	96
3	IET 28950	101	93	85	82	83	109	89	92	97	92	84	82	78	107	91	90
4	IET 28954	91	92	81	89	78	112	90	90	89	91	81	86	75	111	90	89
5	IET 28959	98	93	83	88	84	104	89	91	96	92	81	87	83	103	88	90
6	IET 28960	97	91	87	91	80	113	83	92	96	90	86	89	79	110	85	91
7	IET 28964	98	93	84	91	82	109	95	93	96	92	83	90	72	107	94	91
8	IET 29140	88	87	91	84	85	101	83	88	86	86	87	83	72	99	84	85
9	IET 29142	102	98	93	94	92	100	74	93	98	97	91	92	79	99	74	90
10	IET 29177	101	117	103	103	91	104	103	103	96	116	103	101	78	101	105	100
11	IET 29197	92	96	82	88	84	98	92	90	90	95	81	87	81	98	93	89
12	IET 29415	90	96	82	100	85	101	100	93	97	95	81	87	74	99	97	90
13	IET 29421	94	87	89	82	84	99	97	90	96	86	88	82	87	100	97	91
14	MTU-1010	90	93	81	86	90	107	89	91	88	92	80	83	85	102	88	88
15	MTU-1121	89	124	103	121	87	107	116	107	89	122	101	120	85	104	115	105
16	MTU-1153	102	96	88	92	88	108	96	96	99	95	88	86	80	106	95	93
17	MTU-1156	101	97	88	91	102	104	99	97	100	96	87	89	82	103	99	94
18	MTU-1282	102	119	79	120	91	100	119	104	98	118	78	115	100	100	119	104
19	MTU-1290	95	93	80	88	88	98	92	91	96	92	78	87	92	99	90	90
20	MTU-1341	101	99	93	89	83	111	100	97	96	98	92	89	91	109	101	97
21	N-22	89	84	83	77	66	99	97	85	96	83	83	77	65	98	93	85
22	NLR-3354	103	99	86	95	82	108	104	97	96	98	85	97	92	108	105	97
23	NLR-34449	101	98	91	94	80	107	101	96	95	97	90	91	78	106	101	94
24	NLR-40024	95	94	93	92	86	108	94	95	96	93	92	86	90	106	90	93
25	US-314	98	94	82	84	83	115	79	91	97	93	82	81	80	113	78	89
	Mean	**96**	**97**	**87**	**92**	**85**	**105**	**95**	**94**	**95**	**96**	**86**	**90**	**81**	**104**	**95**	**92**
	LSD (Treat)						0.20**			*LSD (Treat x Variety)*						ns	
	LSD (Location x Treat)						0.53**			*LSD (Location x Treat x Variety)*						4.06**	
	LSD (Variety)						1.08**			*CV (%) Treat*						1.17	
	LSD (Location x Variety)						2.87**										

Table 6.3.2 Influence of Heat Stress on Days to maturity at different AICRIP centres *Kharif* 2022

S.No.	Genotypes	Control							Grand Mean	Heat Stress							Grand Mean
		IIRR	KAUL	MTU	PNR	PTB	REWA	TTB		IIRR	KAUL	MTU	PNR	PTB	REWA	TTB	
1	CO-51	123	117	107	111	119	124	131	119	121	116	103	109	116	125	126	117
2	DRRH-4	121	133	120	135	117	130	129	127	126	132	116	134	115	128	128	126
3	IET 28950	133	123	115	112	120	129	117	121	127	122	114	111	121	129	117	120
4	IET 28954	123	122	110	119	118	130	118	120	119	121	109	118	118	128	116	118
5	IET 28959	130	123	115	128	122	125	117	123	127	122	110	126	122	125	113	121
6	IET 28960	128	121	119	118	119	132	113	121	127	120	115	117	118	131	112	120
7	IET 28964	128	123	115	122	118	124	124	122	126	122	110	122	117	127	119	120
8	IET 29140	119	117	122	117	121	124	111	119	116	116	114	114	118	121	111	116
9	IET 29142	132	128	122	125	125	124	103	123	129	127	118	123	118	124	103	120
10	IET 29177	134	148	132	134	124	122	131	132	127	147	130	133	120	120	126	129
11	IET 29197	124	126	110	119	126	123	121	121	120	125	106	119	117	120	119	118
12	IET 29415	122	126	111	120	119	125	128	121	129	125	109	120	116	121	125	121
13	IET 29421	125	117	121	115	126	122	123	121	126	116	117	115	125	119	127	121
14	MTU-1010	122	123	112	121	122	130	118	121	119	122	108	118	122	127	113	119
15	MTU-1121	121	154	133	140	125	130	115	131	118	151	126	140	122	128	142	132
16	MTU-1153	134	126	120	128	119	130	124	126	129	125	117	122	118	128	122	123
17	MTU-1156	131	127	116	129	121	126	127	125	130	126	114	129	119	122	126	124
18	MTU-1282	134	150	110	139	132	124	147	134	129	149	105	139	132	124	146	132
19	MTU-1290	128	123	110	129	118	124	121	122	128	122	107	124	123	127	118	121
20	MTU-1341	133	129	124	129	123	131	130	128	127	128	122	129	124	131	126	127
21	N-22	122	114	115	112	115	124	123	118	125	113	111	112	115	123	121	117
22	NLR-3354	135	129	116	134	118	125	132	127	127	128	113	134	122	125	130	126
23	NLR-34449	133	128	120	131	116	130	130	127	125	127	116	130	116	127	127	124
24	NLR-40024	129	124	123	128	123	125	124	125	128	123	118	127	121	125	117	123
25	US-314	129	124	112	112	118	132	107	119	126	123	110	111	119	129	105	118
	Mean	**128**	**127**	**117**	**124**	**121**	**127**	**123**	**124**	**125**	**126**	**114**	**123**	**120**	**125**	**121**	**122**
	LSD (Treat)						0.41**			*LSD (Treat x Variety)*						ns	
	LSD (Location x Treat)						1.09**			*LSD (Location x Treat x Variety)*						3.20**	
	LSD (Variety)						0.85**			*CV(%) Treat*						1.83	
	LSD (Location x Variety)						2.26**										

Table 6.3.3 Influence of Heat Stress on Chlorophyll (Spad) flowering at different AICRIP centres *Kharif* 2022

S.No.	Genotypes	Control			Grand Mean	Heat Stress			Grand Mean
		IIRR	KAUL	REWA		IIRR	KAUL	REWA	
1	CO-51	41.8	37.8	30.9	36.8	37.2	35.6	27.2	33.3
2	DRRH-4	40.1	35.0	35.5	36.9	36.4	33.5	31.8	33.9
3	IET 28950	39.5	39.2	31.8	36.9	39.3	36.4	28.2	34.6
4	IET 28954	40.0	41.0	33.8	38.3	32.0	38.1	30.8	33.6
5	IET 28959	43.3	35.6	35.1	38.0	38.1	34.0	31.6	34.5
6	IET 28960	42.1	36.0	34.8	37.7	36.0	34.7	30.8	33.8
7	IET 28964	40.2	46.1	29.6	38.6	43.4	44.9	26.5	38.3
8	IET 29140	44.3	45.6	38.7	42.9	37.6	43.0	35.5	38.7
9	IET 29142	43.5	38.0	31.7	37.7	36.9	35.5	28.4	33.6
10	IET 29177	39.7	41.9	34.6	38.7	39.9	39.5	31.0	36.8
11	IET 29197	39.2	38.8	30.3	36.1	33.7	36.3	27.5	32.5
12	IET 29415	41.3	33.8	35.7	36.9	36.5	31.9	31.9	33.5
13	IET 29421	42.9	31.3	32.7	35.6	35.5	29.6	29.8	31.6
14	MTU-1010	41.8	36.4	36.7	38.3	45.4	34.0	32.6	37.3
15	MTU-1121	42.9	36.6	33.9	37.8	36.1	34.5	29.5	33.4
16	MTU-1153	37.9	36.8	34.9	36.5	36.6	34.9	31.2	34.3
17	MTU-1156	34.8	33.5	33.4	33.9	35.8	31.4	30.1	32.4
18	MTU-1282	37.3	36.1	31.0	34.8	34.7	33.2	28.0	32.0
19	MTU-1290	38.2	36.4	36.4	37.0	38.8	34.4	33.0	35.4
20	MTU-1341	37.7	34.1	33.8	35.2	39.9	32.1	30.3	34.1
21	N-22	42.5	36.4	35.9	38.2	37.6	34.5	32.2	34.8
22	NLR-3354	40.0	40.6	34.9	38.5	41.1	38.6	31.9	37.2
23	NLR-34449	42.3	37.7	33.2	37.7	42.9	35.4	30.2	36.2
24	NLR-40024	37.7	39.5	38.0	38.4	40.4	37.9	34.7	37.7
25	US-314	40.7	35.1	41.4	39.1	40.1	32.7	38.5	37.1
	Mean	**40.5**	**37.6**	**34.3**	**37.5**	**38.1**	**35.5**	**30.9**	**34.8**
	LSD (Treat)			0.45*		*LSD (Treat x Variety)*			ns
	LSD (Location x Treat)			ns		*LSD (Location x Treat x Variety)*			ns
	LSD (Variety)			ns		*CV (%) Treat*			5.44
	LSD (Location x Variety)			4.06**					

Table 6.3.4 Influence of Heat Stress on Chlorophyll Content flowering at different AICRIP centres *Kharif* 2022

S.No.	Genotypes	Control				Grand Mean	Heat Stress				Grand Mean
		MTU	PNR	PTB	TTB		MTU	PNR	PTB	TTB	
1	CO-51	2.90	3.79	4.62	2.73	3.51	2.53	3.74	2.88	3.05	3.05
2	DRRH-4	2.75	1.62	4.11	3.24	2.93	2.14	2.37	1.61	2.23	2.09
3	IET 28950	2.97	3.45	3.09	2.91	3.10	2.10	3.90	2.54	2.35	2.72
4	IET 28954	3.25	5.69	3.67	2.96	3.89	2.83	4.74	3.30	2.56	3.36
5	IET 28959	3.03	3.38	2.91	2.91	3.06	2.27	4.13	2.61	2.65	2.91
6	IET 28960	3.00	6.17	3.10	2.94	3.80	2.34	5.46	3.14	2.17	3.28
7	IET 28964	2.83	4.23	3.59	2.71	3.34	2.23	3.76	4.20	2.11	3.08
8	IET 29140	2.80	5.34	2.49	2.98	3.40	2.13	5.18	3.44	2.91	3.41
9	IET 29142	3.15	4.07	2.20	2.72	3.04	2.72	3.65	1.72	1.71	2.45
10	IET 29177	3.00	3.98	0.97	2.70	2.66	2.47	3.11	3.60	2.62	2.95
11	IET 29197	3.17	6.14	4.19	2.97	4.11	2.37	5.72	3.95	2.98	3.75
12	IET 29415	3.37	2.69	2.95	3.06	3.02	2.22	2.71	3.39	2.21	2.63
13	IET 29421	3.15	2.55	2.07	3.00	2.69	2.36	2.53	1.59	2.49	2.24
14	MTU-1010	2.77	2.87	2.32	2.61	2.64	1.97	2.72	3.01	1.65	2.34
15	MTU-1121	2.77	2.16	1.82	2.67	2.35	2.00	2.59	1.77	2.50	2.22
16	MTU-1153	3.43	4.04	2.22	2.80	3.12	2.47	2.75	3.58	1.98	2.69
17	MTU-1156	3.28	3.45	1.79	3.06	2.90	2.42	3.28	2.73	2.43	2.71
18	MTU-1282	2.87	2.55	3.10	2.82	2.84	2.47	2.73	2.54	2.35	2.52
19	MTU-1290	3.35	3.23	3.66	2.55	3.20	2.55	3.31	1.69	2.25	2.45
20	MTU-1341	3.17	2.82	2.64	2.32	2.74	2.46	3.18	2.56	2.28	2.62
21	N-22	3.23	1.73	6.38	3.22	3.64	2.37	2.66	4.92	2.52	3.12
22	NLR-3354	3.06	2.37	2.98	2.66	2.77	2.26	2.10	2.97	1.97	2.33
23	NLR-34449	3.16	2.49	3.84	3.19	3.17	2.12	3.23	4.07	2.15	2.89
24	NLR-40024	3.15	2.52	3.66	2.65	3.00	2.44	2.58	1.99	2.55	2.39
25	US-314	3.30	3.33	3.43	3.06	3.28	2.36	3.49	4.62	2.30	3.19
	Mean	**3.08**	**3.46**	**3.11**	**2.86**	**3.13**	**2.34**	**3.42**	**2.98**	**2.36**	**2.78**
	LSD (Treat)			ns			*LSD (Treat x Variety)*				ns
	LSD (Location x Treat)			0.32**			*LSD (Location x Treat x Variety)*				0.87**
	LSD (Variety)			ns			*CV (%) Treat*				19.9
	LSD (Location x Variety)			0.61**							

Table 6.3.5 Influence of Heat Stress on Leaf Area Index flowering at different AICRIP centres *Kharif* 2022

S.No.	Genotypes	Control				Grand Mean	Heat Stress				Grand Mean
		IIRR	PNR	PTB	REWA		IIRR	PNR	PTB	REWA	
1	CO-51	5.22	3.56	3.10	6.70	4.65	4.64	3.33	2.61	6.06	4.16
2	DRRH-4	7.20	7.20	6.45	6.44	6.83	6.72	5.99	4.05	5.31	5.52
3	IET 28950	5.36	4.21	2.64	5.86	4.52	6.88	3.14	3.60	4.45	4.52
4	IET 28954	6.61	4.12	3.55	6.06	5.09	6.33	4.43	4.12	4.42	4.82
5	IET 28959	6.57	4.66	5.81	7.25	6.07	7.10	3.85	4.50	6.34	5.45
6	IET 28960	5.49	3.84	4.21	7.50	5.26	7.59	3.02	5.90	6.96	5.87
7	IET 28964	6.44	4.74	5.17	7.39	5.93	7.10	4.44	2.68	5.69	4.98
8	IET 29140	6.43	4.13	5.03	7.26	5.71	4.82	4.37	2.46	5.64	4.32
9	IET 29142	3.17	5.04	3.17	7.11	4.62	6.28	3.23	2.64	5.42	4.40
10	IET 29177	4.78	4.45	5.81	7.46	5.62	6.57	3.59	4.14	6.75	5.27
11	IET 29197	7.49	3.64	2.40	7.27	5.20	5.13	2.76	2.46	6.27	4.16
12	IET 29415	6.39	5.67	4.81	7.09	5.99	6.44	4.91	2.42	6.18	4.99
13	IET 29421	5.42	3.16	4.37	7.39	5.08	7.02	3.18	2.48	6.44	4.78
14	MTU-1010	5.16	4.66	4.49	7.26	5.39	6.51	4.38	3.40	6.41	5.18
15	MTU-1121	6.45	5.55	3.51	6.31	5.45	6.56	5.63	3.00	5.44	5.16
16	MTU-1153	7.50	4.29	5.31	6.32	5.85	5.06	3.45	3.22	5.34	4.26
17	MTU-1156	5.59	6.20	5.51	7.13	6.11	4.04	4.08	5.01	6.14	4.82
18	MTU-1282	7.14	7.49	3.23	5.81	5.92	6.76	6.03	2.33	4.27	4.85
19	MTU-1290	6.05	4.55	3.57	5.46	4.91	7.20	4.41	3.66	3.57	4.71
20	MTU-1341	4.85	5.57	5.29	6.71	5.60	6.68	5.29	2.78	5.25	5.00
21	N-22	3.98	5.16	3.13	7.31	4.89	3.89	3.29	4.72	6.42	4.58
22	NLR-3354	4.66	6.09	3.45	6.88	5.27	6.12	3.55	2.47	5.53	4.42
23	NLR-34449	6.35	5.68	4.07	6.86	5.74	7.53	3.47	5.28	5.56	5.46
24	NLR-40024	7.50	4.68	4.99	7.59	6.19	6.25	2.43	2.38	6.24	4.32
25	US-314	6.65	6.02	4.97	7.24	6.22	5.67	3.79	6.26	5.74	5.37
	Mean	**5.94**	**4.97**	**4.32**	**6.87**	**5.53**	**6.20**	**4.00**	**3.54**	**5.67**	**4.85**
	LSD (Treat)				ns		*LSD (Treat x Variety)*				ns
	LSD (Location x Treat)				0.41**		*LSD (Location x Treat x Variety)*				1.07**
	LSD (Variety)				ns		*CV (%) Treat*				21.14
	LSD (Location x Variety)				0.76**						

Table 6.3.6 Influence of Heat Stress on Plant height (cm) flowering at different AICRIP centres *Kharif* 2022

S.No.	Genotypes	Control							Grand Mean	Heat Stress							Grand Mean
		IIRR	KAUL	MTU	PNR	PTB	REWA	TTB		IIRR	KAUL	MTU	PNR	PTB	REWA	TTB	
1	CO-51	104.3	109.0	118.0	96.7	91.2	125.3	102.0	106.6	111.3	111.3	120.7	107.3	89.3	127.0	101.0	109.7
2	DRRH-4	125.0	130.0	125.3	111.0	117.6	107.7	122.0	119.8	125.5	132.3	128.3	115.7	101.8	111.3	125.7	120.1
3	IET 28950	108.7	113.3	111.0	107.7	90.8	120.0	100.7	107.4	115.7	115.3	112.7	111.8	106.0	123.3	102.7	112.5
4	IET 28954	96.5	108.7	119.7	106.7	89.4	112.0	105.7	105.5	104.0	109.7	121.7	102.5	101.1	114.0	107.0	108.6
5	IET 28959	112.0	118.0	143.0	102.7	107.9	123.0	108.0	116.4	125.3	120.0	145.7	108.3	123.3	125.3	118.3	123.8
6	IET 28960	105.8	120.3	115.3	119.8	106.5	125.0	116.3	115.6	113.8	121.7	118.0	120.8	124.2	127.7	114.0	120.0
7	IET 28964	97.0	112.3	126.0	111.7	104.3	105.0	109.3	109.4	99.8	115.3	126.7	106.5	100.8	106.7	110.7	109.5
8	IET 29140	102.5	110.0	123.3	108.3	98.3	130.7	101.7	110.7	100.8	111.7	126.3	111.3	97.0	133.3	106.3	112.4
9	IET 29142	87.8	110.7	120.7	100.7	97.6	125.0	111.3	107.7	97.0	113.3	123.0	110.7	98.6	125.0	112.0	111.4
10	IET 29177	96.8	114.7	132.7	116.2	110.6	115.3	122.7	115.6	112.3	116.3	133.7	120.0	107.4	113.3	124.0	118.2
11	IET 29197	112.2	122.3	123.3	112.3	92.8	123.7	107.0	113.4	109.8	123.3	124.3	106.2	97.8	126.3	122.0	115.7
12	IET 29415	122.7	117.7	131.0	112.3	110.8	106.3	99.3	114.3	128.0	121.0	133.3	115.0	83.5	107.3	108.3	113.8
13	IET 29421	115.5	119.3	129.7	106.3	116.3	103.0	114.0	114.9	121.3	120.7	133.0	108.0	133.5	101.7	120.0	119.7
14	MTU-1010	99.3	110.3	116.3	82.0	93.9	115.0	102.7	102.8	108.8	110.3	119.0	97.0	85.8	115.7	103.3	105.7
15	MTU-1121	108.8	96.0	120.3	106.0	103.4	106.3	106.0	106.7	106.8	99.0	122.7	110.7	110.3	109.0	114.3	110.4
16	MTU-1153	99.5	112.0	114.7	102.0	107.7	110.0	103.0	107.0	109.7	113.3	117.3	104.3	101.8	110.0	109.7	109.4
17	MTU-1156	113.7	114.3	123.7	100.3	106.6	123.3	108.0	112.8	111.3	117.3	124.7	104.0	107.4	125.7	111.7	114.6
18	MTU-1282	97.8	93.3	114.3	107.7	78.1	100.7	102.3	99.2	118.3	95.7	117.0	108.7	94.0	105.0	106.0	106.4
19	MTU-1290	102.5	116.7	118.7	98.7	98.7	103.7	101.0	105.7	116.0	116.7	121.7	98.7	98.8	106.7	106.0	109.2
20	MTU-1341	114.7	113.7	121.7	101.0	95.7	116.3	105.0	109.7	117.0	116.3	125.0	111.3	91.5	117.7	111.7	112.9
21	N-22	122.0	124.0	140.7	124.0	114.4	104.3	100.0	118.5	122.3	127.0	143.7	119.0	109.5	106.7	124.0	121.7
22	NLR-3354	107.0	97.7	107.3	98.0	82.1	104.7	110.0	101.0	99.2	98.0	107.0	102.0	74.9	107.3	110.0	99.8
23	NLR-34449	89.8	97.3	83.0	96.0	89.7	116.7	99.3	96.0	98.2	97.7	84.7	95.0	87.7	122.0	107.0	98.9
24	NLR-40024	92.8	104.7	108.3	100.3	81.5	114.3	100.3	100.3	93.8	108.3	110.3	93.0	81.4	115.7	102.3	100.7
25	US-314	104.2	118.7	118.7	105.6	96.2	118.3	108.7	110.0	113.2	123.3	122.0	106.7	104.6	118.3	118.7	115.2
	Mean	**105.6**	**112.2**	**120.3**	**105.4**	**99.3**	**114.2**	**106.7**	**109.1**	**111.2**	**114.2**	**122.5**	**107.8**	**100.5**	**116.1**	**111.9**	**112.0**
	LSD (Treat)						1.00**			*LSD (Treat x Variety)*						ns	
	LSD (Location x Treat)						1.92*			*LSD (Location x Treat x Variety)*						9.90**	
	LSD (Variety)						2.65**			*CV (%) Treat*						4.96	
	LSD (Location x Variety)						7.01**										

Table 6.3.7 Influence of Heat Stress on Leaf dry weight (g/m²) flowering at different AICRIP centres *Kharif* 2022

S.No.	Genotypes	Control						Grand Mean	Heat Stress						Grand Mean
		IIRR	MTU	PNR	PTB	REWA	TTB		IIRR	MTU	PNR	PTB	REWA	TTB	
1	CO-51	257	162	197	143	324	140	204	234	158	202	143	291	250	213
2	DRRH-4	311	169	348	245	237	148	243	318	163	322	176	205	352	256
3	IET 28950	256	157	199	183	224	205	204	315	140	152	156	186	323	212
4	IET 28954	339	178	225	140	326	233	240	325	167	195	140	270	195	215
5	IET 28959	299	162	278	220	268	300	255	355	158	166	207	253	320	243
6	IET 28960	282	165	210	187	293	240	229	300	166	236	180	268	280	238
7	IET 28964	290	165	257	207	352	270	257	286	161	242	169	282	215	226
8	IET 29140	311	142	190	190	293	178	217	203	123	182	160	282	210	193
9	IET 29142	177	163	304	154	372	158	221	268	161	189	153	319	225	219
10	IET 29177	230	163	221	173	286	325	233	301	155	198	167	278	305	234
11	IET 29197	322	174	177	177	293	243	231	236	150	161	165	263	295	212
12	IET 29415	314	181	273	230	218	238	242	268	176	276	165	209	295	231
13	IET 29421	248	175	191	237	244	180	212	310	163	166	137	222	270	211
14	MTU-1010	224	161	139	160	242	260	198	327	156	181	144	212	353	229
15	MTU-1121	306	182	213	197	276	205	230	263	159	149	163	262	330	221
16	MTU-1153	349	149	198	176	176	243	215	299	146	173	147	170	345	213
17	MTU-1156	278	184	226	260	251	143	224	196	149	231	224	232	342	229
18	MTU-1282	231	162	215	137	237	223	201	246	160	168	153	211	230	195
19	MTU-1290	274	160	196	134	236	280	213	289	146	197	177	228	170	201
20	MTU-1341	214	166	233	253	282	220	228	278	154	241	162	221	218	212
21	N-22	195	145	244	135	198	295	202	163	144	152	170	191	350	195
22	NLR-3354	201	154	242	156	269	308	221	311	147	183	166	243	322	229
23	NLR-34449	286	153	290	160	302	268	243	321	141	182	194	297	195	222
24	NLR-40024	337	155	207	193	330	230	242	242	133	140	163	238	313	205
25	US-314	311	172	202	163	279	195	220	328	163	168	197	243	265	227
	Mean	**274**	**164**	**227**	**184**	**272**	**229**	**225**	**279**	**154**	**194**	**167**	**243**	**279**	**219**
	LSD (Treat)					ns			*LSD (Treat x Variety)*					ns	
	LSD (Location x Treat)					35.51**			*LSD (Location x Treat x Variety)*					77.88**	
	LSD (Variety)					ns			*CV (%) Treat*					32.05	
	LSD (Location x Variety					55.07**									

Table 6.3.8 Influence of Heat Stress on Stem dry weight (g/m²) flowering at different AICRIP centres *Kharif* 2022

S.No.	Genotypes	Control						Grand Mean	Heat Stress						Grand Mean
		IIRR	MTU	PNR	PTB	REWA	TTB		IIRR	MTU	PNR	PTB	REWA	TTB	
1	CO-51	463	504	495	284	379	498	437	413	509	378	303	324	343	378
2	DRRH-4	551	484	842	430	392	588	548	669	496	763	233	305	269	456
3	IET 28950	577	469	491	266	535	408	457	616	453	361	427	330	398	431
4	IET 28954	691	490	722	404	540	413	543	578	470	354	331	277	318	388
5	IET 28959	665	477	764	430	463	720	586	673	439	403	387	328	510	457
6	IET 28960	536	467	596	460	694	510	544	592	448	585	547	387	465	504
7	IET 28964	699	504	717	413	604	653	598	515	497	538	270	443	503	461
8	IET 29140	627	461	481	327	565	560	504	317	363	411	240	413	298	340
9	IET 29142	428	486	758	317	571	341	483	550	477	542	333	427	292	437
10	IET 29177	426	501	621	387	464	864	544	516	447	414	380	311	718	464
11	IET 29197	581	493	486	283	446	660	492	481	455	422	270	356	478	410
12	IET 29415	642	483	765	364	539	503	549	673	467	680	250	469	368	484
13	IET 29421	454	459	349	376	572	418	438	611	426	355	327	397	367	414
14	MTU-1010	487	474	260	337	337	760	442	628	437	472	320	252	500	435
15	MTU-1121	629	482	575	497	438	668	548	414	460	489	460	306	418	425
16	MTU-1153	784	433	598	410	446	500	529	623	420	536	350	418	478	471
17	MTU-1156	722	519	562	377	484	570	539	428	460	499	400	274	281	390
18	MTU-1282	658	474	601	377	484	458	509	455	449	405	357	386	298	392
19	MTU-1290	528	474	533	336	352	623	474	627	458	476	283	323	435	434
20	MTU-1341	477	473	600	560	565	558	539	590	406	649	260	381	405	449
21	N-22	347	418	701	275	419	725	481	331	425	477	295	496	493	419
22	NLR-3354	512	426	643	313	529	541	494	511	388	469	261	412	526	428
23	NLR-34449	576	456	569	400	566	660	538	534	412	437	280	345	353	393
24	NLR-40024	469	471	491	320	655	603	501	504	383	237	354	475	383	389
25	US-314	498	476	520	377	438	457	461	537	477	443	374	319	371	420
	Mean	**561**	**474**	**589**	**373**	**499**	**570**	**511**	**535**	**445**	**472**	**332**	**366**	**411**	**427**
	LSD (Treat)					18.90*			*LSD (Treat x Variety)*					ns	
	LSD (Location x Treat)					64.91**			*LSD (Location x Treat x Variety)*					133.4**	
	LSD (Variety)					ns			*CV (%) Treat*					27.75	
	LSD (Location x Variety)					94.37**									

Table 6.3.9 Influence of Heat Stress on Panicle weight (g/m²) flowering at different AICRIP centres *Kharif* 2022

S.No.	Genotypes	Control						Grand Mean	Heat Stress						Grand Mean
		IIRR	MTU	PNR	PTB	REWA	TTB		IIRR	MTU	PNR	PTB	REWA	TTB	
1	CO-51	279	242	125	137	205	182	195	221	239	231	184	189	116	196
2	DRRH-4	209	216	303	118	162	260	211	283	213	234	210	145	157	207
3	IET 28950	225	242	251	124	182	213	206	243	238	174	137	186	189	194
4	IET 28954	235	244	236	147	212	205	213	255	237	147	164	148	176	188
5	IET 28959	214	241	266	180	202	217	220	254	233	135	167	145	164	183
6	IET 28960	206	242	186	130	210	181	192	207	233	169	120	173	118	170
7	IET 28964	214	249	190	163	205	202	204	212	239	159	125	179	163	180
8	IET 29140	259	226	163	286	182	250	228	313	220	189	120	179	168	198
9	IET 29142	171	244	269	136	202	263	214	273	239	184	129	122	159	184
10	IET 29177	195	243	208	248	141	224	210	203	234	335	124	118	119	189
11	IET 29197	185	243	155	147	201	212	191	183	235	156	117	138	170	167
12	IET 29415	269	241	258	210	226	210	236	333	230	190	135	143	129	193
13	IET 29421	165	236	155	184	245	218	200	248	226	150	153	159	129	178
14	MTU-1010	183	232	126	137	190	142	168	236	225	162	130	145	159	176
15	MTU-1121	186	230	173	163	175	241	195	115	224	180	176	164	209	178
16	MTU-1153	283	228	206	277	130	206	222	213	224	160	153	181	181	185
17	MTU-1156	260	248	192	300	163	200	227	294	234	164	170	173	151	198
18	MTU-1282	196	230	150	137	151	225	181	168	223	146	187	118	147	165
19	MTU-1290	205	246	216	140	277	210	216	317	237	176	119	188	138	196
20	MTU-1341	218	231	180	177	160	195	193	203	220	204	119	143	118	168
21	N-22	278	233	156	115	246	146	196	286	225	155	160	189	141	193
22	NLR-3354	168	222	268	126	204	226	202	172	217	174	153	168	119	167
23	NLR-34449	172	239	227	170	177	206	198	198	231	162	154	163	131	173
24	NLR-40024	229	232	197	127	207	165	193	195	225	154	137	187	127	171
25	US-314	214	235	290	130	156	211	206	226	225	179	170	114	137	175
	Mean	**217**	**237**	**206**	**168**	**192**	**208**	**205**	**234**	**229**	**179**	**148**	**158**	**149**	**183**
	LSD (Treat)					ns			*LSD (Treat x Variety)*					ns	
	LSD (Location x Treat)					17.78**			*LSD (Location x Treat x Variety)*					59.7**	
	LSD (Variety)					ns			*CV (%) Treat*					18.4	
	LSD (Location x Variety)					42.24**									

Table 6.3.10 Influence of Heat Stress on Total Dry Matter (g/m²) flowering at different AICRIP centres *Kharif* 2022

S.No.	Genotypes	Control						Grand Mean	Heat Stress						Grand Mean
		IIRR	MTU	PNR	PTB	REWA	TTB		IIRR	MTU	PNR	PTB	REWA	TTB	
1	CO-51	999	908	817	564	908	820	836	868	906	810	630	805	709	788
2	DRRH-4	1071	869	1494	792	791	995	1002	1270	872	1319	620	656	777	919
3	IET 28950	1058	868	940	573	941	826	868	1174	831	687	719	702	909	837
4	IET 28954	1265	912	1183	690	1078	851	996	1157	875	695	634	695	690	791
5	IET 28959	1178	880	1308	830	933	1237	1061	1282	830	703	760	726	994	883
6	IET 28960	1024	874	991	777	1197	931	966	1098	847	989	847	828	863	912
7	IET 28964	1203	918	1163	783	1161	1125	1059	1013	898	939	564	905	880	866
8	IET 29140	1197	829	834	803	1040	987	948	833	706	782	520	874	675	732
9	IET 29142	776	893	1330	606	1145	761	919	1091	877	915	616	867	675	840
10	IET 29177	851	908	1049	807	891	1413	987	1020	836	947	670	707	1142	887
11	IET 29197	1087	910	817	606	941	1115	913	900	840	740	552	757	943	789
12	IET 29415	1225	905	1296	804	984	950	1027	1274	873	1146	550	821	791	909
13	IET 29421	868	869	694	797	1062	816	851	1169	815	670	617	779	766	803
14	MTU-1010	894	866	525	633	769	1162	808	1191	818	814	593	609	1012	840
15	MTU-1121	1121	893	961	857	889	1114	972	792	843	818	799	732	956	824
16	MTU-1153	1416	810	1001	863	752	949	965	1135	789	869	650	769	1004	869
17	MTU-1156	1260	951	980	937	898	912	990	918	844	894	793	678	774	817
18	MTU-1282	1084	866	967	650	872	905	891	869	832	719	697	716	674	751
19	MTU-1290	1007	881	944	610	865	1113	903	1232	841	849	579	738	743	830
20	MTU-1341	908	869	1012	990	1007	973	960	1070	780	1094	541	745	740	828
21	N-22	819	796	1100	525	863	1166	878	780	794	784	625	876	984	807
22	NLR-3354	880	802	1152	596	1002	1075	918	993	751	827	580	824	966	824
23	NLR-34449	1034	848	1085	730	1046	1134	979	1053	783	781	627	805	679	788
24	NLR-40024	1035	858	895	640	1192	998	936	941	741	531	654	900	822	765
25	US-314	1023	883	1012	670	873	862	887	1091	866	789	740	676	773	822
	Mean	**1051**	**875**	**1022**	**725**	**964**	**1008**	**941**	**1049**	**828**	**844**	**647**	**768**	**838**	**829**
	LSD (Treat)					27.91*			*LSD (Treat x Variety)*					ns	
	LSD (Location x Treat)					95.87**			*LSD (Location x Treat x Variety)*					201.7**	
	LSD (Variety)					ns			*CV (%) Treat*					21.72	
	LSD (Location x Variety)					142.6**									

Table 6.3.11 Influence of Heat Stress on Shoot weight (g/m²) maturity at different AICRIP centres *Kharif* 2022

S.No.	Genotypes	Control						Grand Mean	Heat Stress						Grand Mean
		IIRR	MTU	PNR	PTB	REWA	TTB		IIRR	MTU	PNR	PTB	REWA	TTB	
1	CO-51	745	760	525	600	486	659	629	703	766	715	476	437	704	634
2	DRRH-4	772	705	941	733	504	701	726	794	704	921	603	412	763	699
3	IET 28950	667	704	782	539	645	550	648	938	656	825	583	440	676	686
4	IET 28954	712	768	975	656	653	622	731	606	725	940	642	387	753	675
5	IET 28959	814	691	921	711	575	676	731	948	596	939	722	435	779	736
6	IET 28960	772	734	967	850	806	650	796	874	581	1002	667	499	712	723
7	IET 28964	722	777	964	928	714	648	792	923	752	982	467	555	827	751
8	IET 29140	633	614	935	697	672	754	718	956	492	908	550	520	941	728
9	IET 29142	791	737	857	950	681	827	807	893	730	710	550	538	718	690
10	IET 29177	859	738	931	881	575	918	817	959	632	952	394	418	891	708
11	IET 29197	662	772	964	478	553	688	686	837	671	790	375	433	871	663
12	IET 29415	683	777	821	800	649	542	712	734	740	738	383	580	808	664
13	IET 29421	977	567	859	731	679	661	746	958	520	891	789	505	886	758
14	MTU-1010	729	673	973	761	447	755	723	604	663	741	439	363	607	569
15	MTU-1121	885	752	817	970	545	800	795	934	681	691	711	414	746	696
16	MTU-1153	832	638	797	981	557	763	761	889	622	763	481	525	845	687
17	MTU-1156	858	794	952	794	591	609	766	719	630	719	694	386	767	653
18	MTU-1282	770	674	952	850	591	733	762	732	671	776	472	496	700	641
19	MTU-1290	751	692	912	617	465	687	687	650	610	650	467	433	734	591
20	MTU-1341	731	678	886	689	675	651	718	632	558	915	556	493	796	658
21	N-22	680	623	981	545	530	543	650	753	575	960	678	569	773	718
22	NLR-3354	785	598	963	756	639	809	758	882	481	820	354	522	724	631
23	NLR-34449	778	663	960	592	678	760	738	875	563	933	625	457	944	733
24	NLR-40024	660	664	948	831	765	748	769	784	492	803	353	585	856	645
25	US-314	732	719	944	939	548	884	794	907	659	1018	661	429	837	752
	Mean	**760**	**700**	**901**	**755**	**609**	**705**	**738**	**819**	**631**	**844**	**548**	**473**	**786**	**684**
	LSD (Treat)					ns			*LSD (Treat x Variety)*					ns	
	LSD (Location x Treat)					42.20**			*LSD (Location x Treat x Variety*					189.17**	
	LSD (Variety)					41.50*			*CV (%) Treat*					11.89	
	LSD (Location x Variety)					133.7**									

Table 6.3.12 Influence of Heat Stress on Panicle weight (g/m²) maturity at different AICRIP centres *Kharif* 2022

S.No.	Genotypes	Control						Grand Mean	Heat Stress						Grand Mean
		IIRR	MTU	PNR	PTB	REWA	TTB		IIRR	MTU	PNR	PTB	REWA	TTB	
1	CO-51	747	655	586	872	566	449	646	800	593	579	617	375	273	539
2	DRRH-4	814	561	1072	614	567	650	713	823	456	1074	733	284	392	627
3	IET 28950	781	568	1014	642	787	531	721	851	451	807	1044	453	472	680
4	IET 28954	750	640	833	881	843	509	743	669	554	798	913	323	441	616
5	IET 28959	882	507	1047	922	795	542	782	903	398	973	1111	364	411	693
6	IET 28960	827	551	995	997	685	451	751	770	417	636	1239	339	278	613
7	IET 28964	741	573	819	1011	598	508	708	831	423	931	1017	421	407	672
8	IET 29140	749	483	947	1008	753	622	760	866	365	770	818	248	420	581
9	IET 29142	884	611	917	903	810	662	798	909	517	868	889	409	396	665
10	IET 29177	728	620	1147	1056	562	561	779	764	455	896	428	527	299	561
11	IET 29197	686	653	904	672	775	533	704	466	478	791	578	263	426	500
12	IET 29415	908	620	856	564	588	525	677	870	477	722	254	288	322	489
13	IET 29421	623	498	711	486	704	546	595	770	344	662	836	309	322	540
14	MTU-1010	705	523	678	722	730	353	618	531	408	804	372	288	255	443
15	MTU-1121	682	621	803	1011	651	603	729	731	466	656	844	472	522	615
16	MTU-1153	808	534	954	986	595	516	732	850	422	654	786	252	453	570
17	MTU-1156	766	624	938	967	512	499	718	737	457	912	967	481	377	655
18	MTU-1282	604	542	940	711	639	562	666	512	483	795	494	306	366	493
19	MTU-1290	836	533	902	750	672	526	703	794	407	754	600	253	344	525
20	MTU-1341	806	544	892	783	487	488	667	530	407	837	672	335	294	513
21	N-22	603	486	550	294	703	364	500	519	447	605	422	431	245	445
22	NLR-3354	759	487	967	475	697	566	658	651	323	597	381	324	289	427
23	NLR-34449	760	501	973	533	558	515	640	628	361	694	933	260	329	534
24	NLR-40024	732	484	850	672	579	411	622	662	379	670	492	281	300	464
25	US-314	880	643	851	878	717	526	749	728	427	700	894	366	342	576
	Mean	**763**	**562**	**886**	**776**	**663**	**521**	**695**	**726**	**437**	**767**	**733**	**346**	**359**	**561**
	LSD (Treat)					15.00*			*LSD (Treat x Variety)*					ns	
	LSD (Location x Treat)					51.53**			*LSD (Location x Treat x Variety)*					159.4**	
	LSD (Variety)					46.01**			*CV (%) Treat*					16.44	
	LSD (Location x Variety)					112.7**									

Table 6.3.13 Influence of Heat Stress on Panicle number/m² maturity at different AICRIP centres *Kharif* 2022

S.No.	Genotypes	Control							Grand Mean	Heat Stress							Grand Mean
		IIRR	KAUL	MTU	PNR	PTB	REWA	TTB		IIRR	KAUL	MTU	PNR	PTB	REWA	TTB	
1	CO-51	363	341	484	333	530	176	182	344	467	340	462	283	339	125	110	304
2	DRRH-4	323	338	517	383	639	218	263	383	383	336	407	333	297	144	159	294
3	IET 28950	280	326	473	283	347	169	215	299	437	328	374	233	389	143	191	299
4	IET 28954	280	328	517	300	528	202	207	337	293	328	429	267	408	133	179	291
5	IET 28959	293	306	506	333	439	276	220	339	390	300	429	367	456	209	167	331
6	IET 28960	283	275	352	250	422	185	183	279	293	270	341	233	283	133	113	238
7	IET 28964	330	316	451	433	583	219	206	363	440	317	429	383	339	159	165	319
8	IET 29140	317	346	473	383	597	175	252	363	403	352	396	250	368	100	170	291
9	IET 29142	320	406	363	383	556	218	268	359	403	407	330	350	533	175	161	337
10	IET 29177	377	345	462	383	661	150	228	372	483	343	374	233	367	160	121	297
11	IET 29197	333	378	495	383	339	209	216	336	337	380	429	333	292	142	173	298
12	IET 29415	343	347	451	283	533	260	213	347	410	354	374	267	233	209	131	283
13	IET 29421	390	345	495	283	381	210	221	332	490	344	363	333	461	158	131	326
14	MTU-1010	333	318	429	333	492	267	143	331	320	312	363	317	267	192	117	270
15	MTU-1121	220	322	473	200	506	234	245	314	403	323	385	267	333	185	212	301
16	MTU-1153	353	337	429	283	603	216	209	347	357	337	374	233	347	168	184	286
17	MTU-1156	303	334	495	317	522	242	202	345	340	338	407	267	358	194	153	294
18	MTU-1282	380	353	451	267	597	200	228	354	320	346	418	317	333	127	149	287
19	MTU-1290	367	334	462	333	650	216	213	368	393	339	374	333	335	144	140	294
20	MTU-1341	410	332	506	283	567	176	198	353	397	336	429	267	363	127	119	291
21	N-22	427	315	407	333	356	268	148	322	470	316	352	367	522	184	119	333
22	NLR-3354	347	364	462	400	606	226	229	376	477	361	396	283	311	177	117	303
23	NLR-34449	503	365	462	400	567	234	209	391	470	364	352	383	450	218	133	339
24	NLR-40024	373	352	528	383	661	242	167	387	423	348	418	367	256	168	135	302
25	US-314	333	271	407	317	517	185	213	320	380	273	330	233	511	135	139	286
	Mean	**343**	**336**	**462**	**331**	**528**	**215**	**211**	**347**	**399**	**336**	**389**	**300**	**366**	**160**	**147**	**300**
	LSD (Treat)						ns			*LSD (Treat x Variety)*						ns	
	LSD (Location x Treat						30.64**			*LSD (Location x Treat x Variety)*						100.78**	
	LSD (Variety)						26.93**			*CV (%) Treat*						19.51	
	LSD (Location x Variety						71.26**										

Table 6.3.14 Influence of Heat Stress on Grain number/Panicle maturity at different AICRIP centres *Kharif* 2022

S.No.	Genotypes	Control							Grand Mean	Heat Stress							Grand Mean
		IIRR	KAUL	MTU	PNR	PTB	REWA	TTB		IIRR	KAUL	MTU	PNR	PTB	REWA	TTB	
1	CO-51	134	170	113	153	91	180	150	142	111	156	94	104	105	130	91	113
2	DRRH-4	106	141	124	336	129	133	217	169	92	143	96	202	70	110	131	121
3	IET 28950	129	202	140	280	127	183	176	177	88	203	97	203	129	113	157	142
4	IET 28954	100	102	98	143	91	195	170	128	87	98	79	152	101	138	147	115
5	IET 28959	121	133	164	269	134	203	181	172	93	133	100	199	125	170	137	137
6	IET 28960	115	123	185	255	150	164	151	163	102	124	91	113	161	138	93	117
7	IET 28964	84	149	106	223	95	171	170	143	70	146	46	173	86	145	136	115
8	IET 29140	147	190	81	330	119	179	207	179	125	187	35	190	115	105	140	128
9	IET 29142	128	211	161	172	124	209	221	175	112	209	146	168	79	180	132	147
10	IET 29177	90	100	110	158	98	155	187	128	65	102	65	141	63	156	100	99
11	IET 29197	100	104	137	241	97	199	178	151	66	106	85	98	101	146	142	106
12	IET 29415	127	183	117	219	89	176	175	155	109	162	83	211	39	146	107	122
13	IET 29421	78	108	68	139	84	206	182	124	87	109	30	159	141	163	107	114
14	MTU-1010	108	88	88	219	81	169	118	124	83	88	64	170	67	153	74	100
15	MTU-1121	173	112	153	213	146	161	201	166	104	113	111	191	148	147	174	141
16	MTU-1153	110	150	120	185	136	129	172	143	109	134	78	158	113	138	151	126
17	MTU-1156	117	184	118	207	145	157	166	156	103	128	91	133	189	146	126	131
18	MTU-1282	115	139	170	257	68	181	188	160	135	138	151	225	109	130	122	144
19	MTU-1290	91	119	106	169	83	181	176	132	87	116	90	112	65	146	115	104
20	MTU-1341	93	107	96	221	94	176	163	136	73	99	44	215	117	130	98	111
21	N-22	76	96	64	108	79	171	122	102	68	85	61	110	93	121	82	89
22	NLR-3354	178	152	125	157	78	140	189	145	111	154	76	89	99	150	96	111
23	NLR-34449	120	131	130	281	107	148	172	156	108	109	95	232	125	125	110	129
24	NLR-40024	146	189	111	193	93	180	137	150	106	174	49	122	103	105	100	108
25	US-314	126	194	142	261	106	188	176	170	88	178	100	160	107	138	114	126
	Mean	**117**	**143**	**121**	**216**	**106**	**173**	**174**	**150**	**95**	**136**	**82**	**161**	**106**	**139**	**119**	**120**
	LSD (Treat)						2.89*			*LSD (Treat x Variety)*						ns	
	LSD (Location x Treat)						10.61**			*LSD (Location x Treat x Variety)*						33.84**	
	LSD (Variety						9.04**			*CV(%) Treat*						16.2	
	LSD (Location x Variety)						23.92**										

Table 6.3.15 Influence of Heat Stress on Spikelet number/Panicle maturity at different AICRIP centres *Kharif* 2022

S.No.	Genotypes	Control						Grand Mean	Heat Stress						Grand Mean
		IIRR	MTU	PNR	PTB	REWA	TTB		IIRR	MTU	PNR	PTB	REWA	TTB	
1	CO-51	153	126	163	109	190	174	152	155	124	132	111	153	105	130
2	DRRH-4	171	134	363	158	148	248	204	155	130	223	114	130	150	150
3	IET 28950	191	150	295	134	213	205	198	150	146	251	134	185	181	174
4	IET 28954	141	106	162	113	205	195	154	135	105	174	112	202	169	149
5	IET 28959	167	172	286	134	222	208	198	177	173	232	136	198	159	179
6	IET 28960	225	199	292	198	194	173	213	198	204	241	196	190	106	189
7	IET 28964	97	112	252	99	182	197	156	113	110	193	95	175	157	141
8	IET 29140	234	112	357	120	188	237	208	250	99	238	128	183	162	177
9	IET 29142	166	178	202	144	216	254	193	171	173	190	100	210	153	166
10	IET 29177	106	121	181	108	192	215	154	96	115	166	73	194	116	126
11	IET 29197	136	146	281	100	212	205	180	128	143	139	118	204	164	149
12	IET 29415	173	131	243	105	194	202	175	146	130	243	52	191	124	147
13	IET 29421	188	75	147	129	242	209	165	137	73	170	149	240	123	149
14	MTU-1010	123	107	255	82	186	136	148	135	104	204	73	186	87	132
15	MTU-1121	223	177	233	158	180	231	200	172	175	223	150	180	201	183
16	MTU-1153	125	138	202	141	167	200	162	157	135	195	118	164	174	157
17	MTU-1156	140	138	221	176	173	193	174	174	133	170	198	167	145	164
18	MTU-1282	155	179	279	109	198	216	189	164	167	256	156	197	140	180
19	MTU-1290	117	121	188	102	193	203	154	146	120	170	73	190	132	138
20	MTU-1341	109	109	229	123	187	188	157	111	108	244	137	181	114	149
21	N-22	86	70	114	89	179	138	113	73	69	114	102	164	95	103
22	NLR-3354	190	138	179	96	152	216	162	147	131	129	107	155	110	130
23	NLR-34449	133	143	304	114	172	199	177	149	144	266	137	148	126	162
24	NLR-40024	181	127	213	100	194	158	162	172	121	146	121	142	117	136
25	US-314	176	154	283	125	196	202	190	174	147	238	126	178	131	166
	Mean	**156**	**135**	**237**	**123**	**191**	**200**	**174**	**151**	**131**	**198**	**121**	**180**	**138**	**153**
	LSD (Treat)					ns			*LSD (Treat x Variety)*					ns	
	LSD (Location x Treat)					7.54**			*LSD (Location x Treat x Variety)*					34.7**	
	LSD (Variety)					10.02**			*CV (%) Treat*					9.26	
	LSD (Location x Variety)					24.55**									

Table 6.3.16 Influence of Heat Stress on Grain number/m² maturity at different AICRIP centres *Kharif* 2022

S.No.	Genotypes	Control							Grand Mean	Heat Stress							Grand Mean
		IIRR	KAUL	MTU	PNR	PTB	REWA	TTB		IIRR	KAUL	MTU	PNR	PTB	REWA	TTB	
1	CO-51	48761	58067	54032	50683	48819	31763	27358	45640	51506	53047	43285	29283	37420	16358	12456	34765
2	DRRH-4	33093	47614	63822	72017	72505	29559	57294	53701	35150	47993	39105	67317	20746	15445	20781	35219
3	IET 28950	36008	65829	66209	72600	44750	31234	38051	50669	38311	66085	36520	47667	50584	15655	30116	40705
4	IET 28954	28010	33215	50666	42817	47622	39533	35127	39570	25523	32265	33594	41000	41546	18309	26326	31223
5	IET 28959	35541	40525	74128	72917	58844	56101	39913	53996	36349	40098	43065	69817	56574	35047	22954	43415
6	IET 28960	31463	33816	65285	63367	61044	30913	27569	44780	29663	33437	30635	26283	45474	18738	11771	28000
7	IET 28964	27611	47314	48213	73200	54889	37525	34916	46238	30808	46062	19899	65967	28844	22943	22531	33865
8	IET 29140	45379	65290	38093	73067	67850	31454	52319	53350	49960	66008	13728	47467	42641	13289	23842	36705
9	IET 29142	40852	85459	58256	65900	60116	45471	59289	59335	44688	85180	48180	58883	43133	31529	21375	47567
10	IET 29177	33738	34785	50721	61000	57075	23263	42628	43316	31166	35042	24321	32933	23202	25985	12075	26389
11	IET 29197	33135	39253	64845	72083	32456	41827	38419	46003	21768	40316	36432	32650	29913	20914	24596	29513
12	IET 29415	43020	63525	53031	62083	40386	45933	37291	49324	44057	57163	31020	56383	12533	30238	14073	35067
13	IET 29421	30420	37184	34023	39600	32561	43562	40360	36816	42555	37414	12234	53050	64943	26276	14082	35793
14	MTU-1010	34846	28162	37290	73042	40017	45211	16907	39353	26389	27744	23232	53783	17652	29594	12582	27282
15	MTU-1121	37190	36058	72226	42500	72841	37761	49273	49693	42035	36364	43065	50942	47403	26680	36838	40475
16	MTU-1153	38147	50355	51447	52333	68945	27821	36412	46494	38624	45054	28820	36800	38868	23074	27964	34172
17	MTU-1156	35376	61312	58608	65567	63658	38154	33692	50910	34765	43237	36696	35450	62036	28144	19332	37094
18	MTU-1282	42775	49322	73480	68517	40216	36282	43306	50557	43270	47612	63250	71183	39059	16627	18253	42750
19	MTU-1290	33451	39423	49005	56242	52540	39032	37461	43879	34335	39372	33616	37100	21530	21622	16065	29092
20	MTU-1341	38268	35459	48565	62567	53408	31166	32392	43118	27988	33355	18810	57400	42089	16586	11745	29710
21	N-22	32427	30190	26147	35900	28289	46069	18183	31029	32656	26946	21538	40117	49256	22647	11085	29178
22	NLR-3354	58213	55098	57618	62600	47931	31488	43399	50907	52425	55335	29964	25417	30770	26730	11298	33134
23	NLR-34449	60114	47989	59796	75733	60468	34712	35899	53530	47959	39683	33517	75467	57233	27289	14652	42257
24	NLR-40024	54405	66319	58608	73917	58287	43042	22930	53930	42231	60604	20372	44517	26165	17064	13507	32066
25	US-314	42036	52315	58036	72650	54897	35156	37503	50370	33300	48529	33110	37300	53565	18960	15841	34372
	Mean	**38971**	**48155**	**54886**	**62516**	**52817**	**37361**	**37516**	**47460**	**37499**	**45758**	**31920**	**47767**	**39327**	**22630**	**18646**	**34792**
	LSD (Treat)						1427**			*LSD (Treat x Variety)*						ns	
	LSD (Location x Treat)						3777**			*LSD (Location x Treat x Variety)*						14789**	
	LSD (Variety						3952**			*CV (%) Treat*						18.89	
	LSD (Location x Variety)						10457**										

Table 6.3.17 Influence of Heat Stress on Spikelet number/m² maturity at different AICRIP centres *Kharif* 2022

S.No.	Genotypes	Control						Grand Mean	Heat Stress						Grand Mean
		IIRR	MTU	PNR	PTB	REWA	TTB		IIRR	MTU	PNR	PTB	REWA	TTB	
1	CO-51	55625	60324	54000	58473	33584	31741	48958	72373	57057	37183	38963	19117	14391	39847
2	DRRH-4	52820	69036	82400	100488	32739	65626	67185	59130	53097	74250	33265	18633	23894	43711
3	IET 28950	53377	70620	83717	46639	36035	44154	55757	65230	54670	58483	52406	24868	34693	48392
4	IET 28954	39349	54703	48350	59620	41511	40363	47316	39935	44517	46900	46028	26801	30258	39073
5	IET 28959	48895	84337	82167	59294	61094	45864	63608	69036	74415	81667	61674	41409	26571	59129
6	IET 28960	62387	70125	72367	76411	36065	31733	58181	57824	69157	56150	55556	25259	13654	46267
7	IET 28964	31898	50710	86317	56602	39706	40576	50968	49847	46926	74017	32048	27921	26023	42797
8	IET 29140	72492	52800	86850	71864	32919	59889	62802	100587	38896	59517	46831	18349	27531	48618
9	IET 29142	53026	64548	77417	80603	46971	68184	65125	68986	57090	66550	54172	36594	24685	51346
10	IET 29177	39554	56133	69467	71332	28654	48851	52332	46479	42647	38467	26907	30837	14016	33225
11	IET 29197	45107	72237	83967	33783	44341	44325	53960	42373	61413	46600	34961	28934	28421	40450
12	IET 29415	58866	59345	68950	55683	50341	43011	56033	59854	48642	64667	17100	39939	16203	41067
13	IET 29421	73228	37510	41800	48183	50721	46288	49622	67263	26279	56733	68472	37909	16169	45471
14	MTU-1010	39521	45276	84942	40436	49655	19486	46553	42902	37862	64667	19328	35763	11804	35387
15	MTU-1121	47959	83545	46500	79278	42259	56609	59358	69093	64207	59275	46481	33179	42540	52463
16	MTU-1153	43629	59037	57267	80017	36103	42192	53041	55375	50138	45383	40682	27542	32273	41899
17	MTU-1156	42419	69168	69983	76739	42064	39054	56571	58318	53449	45183	67481	32257	22212	46483
18	MTU-1282	58775	80839	74267	64760	39733	49720	61349	52132	69784	81017	53856	25054	20956	50466
19	MTU-1290	43102	56430	62425	65419	41713	43314	52067	57595	44836	56500	24177	27311	18469	38148
20	MTU-1341	44893	54989	64917	69800	33004	37298	50817	43146	46442	65067	49609	22939	13634	40139
21	N-22	36747	28578	37717	31328	48140	20709	33870	35288	24068	41733	54315	29980	13380	33127
22	NLR-3354	62425	64086	71600	57467	34332	49742	56609	70059	52008	36567	33181	27327	12945	38681
23	NLR-34449	66605	66264	84733	65063	40163	41498	60721	68728	50435	85233	62754	32124	16837	52685
24	NLR-40024	67509	67122	81567	66286	46486	26332	59217	67397	50336	53350	30926	23517	15721	40208
25	US-314	58755	63052	82950	64722	36750	43139	58228	65803	48400	55617	63465	24064	18192	45923
	Mean	**51958**	**61633**	**70265**	**63212**	**41003**	**43188**	**55210**	**59390**	**50671**	**58031**	**44585**	**28705**	**21419**	**43800**
	LSD (Treat)					1017*			*LSD (Treat x Variety)*					ns	
	LSD (Location x Treat)					3493**			*LSD (Location x Treat x Variety)*					17478**	
	LSD (Variety)					5045**			*CV (%) Treat*					14.14	
	LSD (Location x Variety)					12359**									

Table 6.3.18 Influence of Heat Stress on Grain yield (g/m²) maturity at different AICRIP centres *Kharif* 2022

S.No.	Genotypes	Control							Grand Mean	Heat Stress							Grand Mean
		IIRR	KAUL	MTU	PNR	PTB	REWA	TTB		IIRR	KAUL	MTU	PNR	PTB	REWA	TTB	
1	CO-51	664	320	540	434	708	348	405	488	650	275	478	423	504	273	246	407
2	DRRH-4	625	386	461	779	433	392	585	523	650	382	356	784	644	202	353	482
3	IET 28950	624	561	458	762	522	625	479	576	669	534	341	651	739	354	425	530
4	IET 28954	642	378	545	674	722	618	459	577	549	372	459	642	757	262	397	491
5	IET 28959	706	427	412	757	762	580	489	590	684	426	303	747	750	239	370	503
6	IET 28960	639	411	436	772	589	552	407	544	591	402	302	484	744	238	250	430
7	IET 28964	653	466	473	663	672	380	458	538	675	454	323	738	733	242	367	505
8	IET 29140	606	427	383	720	562	559	560	545	630	441	255	614	692	192	378	457
9	IET 29142	742	719	516	741	716	671	596	672	736	716	422	716	683	299	357	561
10	IET 29177	647	290	510	758	769	508	506	570	616	288	345	736	322	452	269	433
11	IET 29197	580	386	533	748	489	560	480	540	330	388	358	639	464	179	384	392
12	IET 29415	754	473	510	700	458	349	473	531	702	427	367	562	157	232	290	391
13	IET 29421	410	274	383	559	419	446	492	426	611	253	222	506	600	237	290	388
14	MTU-1010	629	229	423	526	608	527	318	466	403	223	308	648	306	197	200	326
15	MTU-1121	557	276	511	647	734	564	544	547	570	256	356	504	753	395	470	472
16	MTU-1153	713	498	419	756	741	459	465	579	658	452	307	498	636	185	408	449
17	MTU-1156	674	550	504	748	756	436	450	588	583	395	337	752	750	395	340	507
18	MTU-1282	487	276	447	739	728	475	507	523	424	266	388	639	467	231	330	392
19	MTU-1290	673	380	433	712	622	382	474	525	623	366	307	602	415	176	310	400
20	MTU-1341	705	276	434	732	553	380	440	503	409	253	291	681	579	213	265	384
21	N-22	517	262	366	393	199	444	328	359	429	233	327	457	494	229	221	341
22	NLR-3354	677	324	372	745	333	480	510	492	569	336	208	438	263	265	260	334
23	NLR-34449	670	271	381	755	450	368	464	480	503	217	241	538	750	200	296	392
24	NLR-40024	615	460	389	694	392	359	371	469	518	401	278	518	328	192	271	358
25	US-314	705	404	523	691	672	548	474	574	523	368	307	544	692	239	308	426
	Mean	**637**	**389**	**454**	**688**	**584**	**480**	**469**	**529**	**572**	**365**	**327**	**602**	**569**	**253**	**322**	**430**
	LSD (Treat)						12.45*			*LSD (Treat x Variety)*						ns	
	LSD (Location x Treat)						45.72**			*LSD (Location x Treat x Variety)*						140.9**	
	LSD (Variety)						37.65**			*CV (%) Treat*						19.61	
	LSD (Location x Variety)						99.63**										

Table 6.3.19 Influence of Heat Stress on Total Dry Matter (g/m²) maturity at different AICRIP centres *Kharif* 2022

S.No.	Genotypes	Control							Grand Mean	Heat Stress							Grand Mean
		IIRR	KAUL	MTU	PNR	PTB	REWA	TTB		IIRR	KAUL	MTU	PNR	PTB	REWA	TTB	
1	CO-51	1492	786	1416	1111	1472	1052	1108	1205	1503	682	1359	1294	1093	812	977	1103
2	DRRH-4	1585	1088	1266	2013	1347	1071	1351	1389	1616	1074	1161	1995	1336	696	1155	1291
3	IET 28950	1448	1204	1272	1796	1181	1432	1082	1345	1789	1075	1108	1632	1628	893	1147	1324
4	IET 28954	1462	1079	1408	1808	1536	1496	1131	1417	1275	1095	1280	1738	1554	710	1194	1263
5	IET 28959	1696	937	1198	1967	1633	1370	1218	1431	1851	858	994	1912	1833	799	1190	1348
6	IET 28960	1599	934	1285	1961	1847	1491	1101	1460	1644	900	998	1638	1906	838	990	1273
7	IET 28964	1463	1200	1350	1782	1939	1312	1156	1458	1753	1143	1175	1913	1483	976	1234	1383
8	IET 29140	1382	1045	1097	1882	1706	1426	1376	1416	1822	1096	857	1678	1368	768	1361	1279
9	IET 29142	1675	1475	1348	1774	1853	1491	1489	1587	1802	1475	1247	1577	1439	947	1114	1372
10	IET 29177	1587	771	1358	2078	1936	1138	1479	1478	1724	762	1087	1848	822	945	1189	1197
11	IET 29197	1348	1071	1425	1868	1150	1328	1221	1344	1303	1070	1149	1580	953	696	1297	1150
12	IET 29415	1591	1187	1398	1677	1364	1237	1067	1360	1604	1109	1217	1460	637	869	1129	1146
13	IET 29421	1600	612	1065	1570	1217	1383	1207	1236	1728	580	864	1553	1624	814	1208	1196
14	MTU-1010	1434	542	1196	1652	1483	1177	1107	1227	1135	528	1070	1545	811	651	863	943
15	MTU-1121	1567	879	1372	1620	1981	1196	1403	1431	1664	795	1147	1347	1556	886	1267	1237
16	MTU-1153	1640	1216	1172	1750	1966	1152	1279	1453	1739	1102	1044	1417	1267	778	1298	1235
17	MTU-1156	1624	1277	1418	1890	1761	1103	1108	1454	1456	925	1087	1631	1661	868	1144	1253
18	MTU-1282	1374	758	1215	1891	1561	1230	1295	1332	1245	710	1153	1571	967	802	1066	1074
19	MTU-1290	1587	783	1225	1813	1367	1137	1213	1304	1444	732	1017	1404	1067	686	1078	1061
20	MTU-1341	1537	649	1222	1777	1472	1162	1139	1280	1161	588	965	1752	1228	828	1090	1088
21	N-22	1283	664	1110	1531	839	1233	907	1081	1272	622	1022	1565	1100	1000	1018	1086
22	NLR-3354	1544	925	1085	1931	1231	1336	1374	1347	1532	975	804	1417	735	847	1013	1046
23	NLR-34449	1538	638	1163	1933	1125	1236	1275	1273	1503	499	924	1627	1558	717	1273	1157
24	NLR-40024	1392	985	1148	1797	1503	1344	1160	1333	1446	744	872	1472	844	866	1156	1057
25	US-314	1612	996	1362	1795	1817	1265	1410	1465	1635	905	1086	1718	1556	795	1179	1268
	Mean	**1522**	**948**	**1263**	**1787**	**1531**	**1272**	**1226**	**1364**	**1546**	**882**	**1067**	**1611**	**1281**	**819**	**1145**	**1193**
	LSD (Treat						19.64*			*LSD (Treat x Variety)*						ns	
	LSD (Location x Treat)						72.14**			*LSD (Location x Treat x Variety)*						272.8**	
	LSD (Variety)						72.91**			*CV (%) Treat*						11.6	
	LSD (Location x Variety)						192.9**										

Table 6.3.20 Influence of Heat Stress on 1000 grain weight (g) maturity at different AICRIP centres *Kharif* 2022

S.No.	Genotypes	Control							Grand Mean	Heat Stress							Grand Mean
		IIRR	KAUL	MTU	PNR	PTB	REWA	TTB		IIRR	KAUL	MTU	PNR	PTB	REWA	TTB	
1	CO-51	17.7	16.6	15.1	18.0	16.0	28.4	16.2	18.3	16.5	15.7	15.0	18.3	16.4	28.0	14.8	17.8
2	DRRH-4	24.9	24.6	22.2	29.5	32.3	25.6	20.3	25.6	24.2	24.1	19.5	29.0	22.6	20.5	19.3	22.8
3	IET 28950	23.0	25.8	23.0	23.3	20.4	29.7	17.1	23.2	22.7	24.5	17.0	22.0	22.4	22.2	16.4	21.0
4	IET 28954	30.1	34.7	23.0	29.3	26.0	29.0	16.5	26.9	29.4	34.9	19.7	28.8	31.8	25.4	15.4	26.5
5	IET 28959	25.5	31.9	18.1	28.5	21.9	24.1	17.5	23.9	24.3	32.3	15.8	29.8	22.6	21.4	16.0	23.2
6	IET 28960	26.6	36.7	24.5	28.1	24.2	27.5	14.2	26.0	26.5	36.5	16.1	26.6	26.5	26.5	13.4	24.6
7	IET 28964	30.9	29.8	21.1	32.5	37.3	33.1	16.1	28.7	28.4	29.7	15.2	29.8	30.0	31.0	14.8	25.6
8	IET 29140	17.8	19.8	16.5	16.6	14.5	29.1	20.0	19.2	16.6	20.2	13.3	15.2	16.3	24.6	19.2	17.9
9	IET 29142	23.1	25.5	15.0	22.5	32.7	32.3	21.5	24.7	21.0	25.5	14.2	20.2	38.8	26.3	20.1	23.7
10	IET 29177	25.1	25.3	23.2	22.4	22.9	31.1	17.9	24.0	26.4	25.2	15.3	22.1	36.1	29.5	17.1	24.5
11	IET 29197	23.5	30.1	21.7	26.7	23.5	28.2	17.4	24.5	24.4	29.2	15.9	26.3	21.5	19.9	16.5	22.0
12	IET 29415	22.2	22.6	22.1	24.6	19.1	27.3	17.0	22.1	20.5	22.7	15.9	26.4	18.3	26.6	15.7	20.9
13	IET 29421	20.0	22.4	22.3	25.5	21.9	31.0	17.6	23.0	19.0	20.5	13.3	25.4	18.3	31.2	17.0	20.7
14	MTU-1010	23.8	24.7	20.6	20.3	35.4	22.3	13.9	23.0	22.9	24.4	17.2	23.7	34.3	19.7	13.2	22.2
15	MTU-1121	20.4	23.2	19.3	27.4	16.4	28.7	19.8	22.2	18.4	21.2	16.0	24.8	16.9	23.7	19.5	20.1
16	MTU-1153	23.9	29.9	23.2	26.0	20.8	32.7	15.8	24.6	22.2	30.5	16.2	26.9	21.2	30.5	15.6	23.3
17	MTU-1156	24.7	27.1	22.8	29.0	37.4	26.7	16.4	26.3	22.5	27.7	16.2	27.1	21.6	25.1	15.5	22.2
18	MTU-1282	16.0	17.0	16.9	25.4	11.5	27.3	17.5	18.8	14.4	16.9	16.7	20.9	14.7	24.7	16.3	17.8
19	MTU-1290	26.1	29.2	23.7	29.2	37.7	29.0	17.1	27.4	24.0	28.2	20.7	27.8	37.2	26.4	16.0	25.8
20	MTU-1341	23.7	23.6	22.3	29.0	21.2	33.0	16.0	24.1	21.8	23.0	18.2	27.1	20.6	31.6	15.4	22.5
21	N-22	22.3	26.3	20.1	24.9	17.4	29.4	14.3	22.1	19.4	26.3	19.0	25.6	18.0	27.2	13.2	21.2
22	NLR-3354	15.1	17.8	14.1	29.5	11.4	23.3	18.4	18.5	14.7	18.4	10.2	19.6	12.8	21.7	17.2	16.4
23	NLR-34449	14.5	17.1	13.3	18.7	13.0	25.5	16.7	17.0	14.7	16.6	12.3	15.2	14.5	24.3	16.1	16.2
24	NLR-40024	15.0	21.0	14.2	25.7	13.8	28.3	13.9	18.8	17.0	20.3	12.4	21.5	16.4	20.6	13.4	17.4
25	US-314	21.5	23.5	24.3	21.2	30.3	31.5	16.9	24.2	21.7	23.0	12.9	19.6	38.8	30.2	16.0	23.2
	Mean	**22.3**	**25.1**	**20.1**	**25.3**	**23.2**	**28.6**	**17.0**	**23.1**	**21.3**	**24.7**	**15.8**	**24.0**	**23.5**	**25.6**	**16.1**	**21.6**
	LSD (Treat)						0.12*			*LSD (Treat x Variety)*						ns	
	LSD (Location x Treat)						0.46**			*LSD (Location x Treat x Variety)*						2.30**	
	LSD (Variety)						0.61**			*CV (%) Treat*						4.29	
	LSD (Location x Variety)						1.62**										

Table 6.3.21 Influence of Heat Stress on Harvest Index (%) at different AICRIP centres *Kharif* 2022

S.No.	Genotypes	Control							Grand Mean	Heat Stress							Grand Mean
		IIRR	KAUL	MTU	PNR	PTB	REWA	TTB		IIRR	KAUL	MTU	PNR	PTB	REWA	TTB	
1	CO-51	44.5	40.9	38.2	39.0	48.1	33.2	36.5	40.1	43.2	40.4	35.0	32.7	43.8	33.6	25.3	36.3
2	DRRH-4	39.5	35.6	36.3	38.7	33.3	36.5	43.3	37.6	40.2	35.6	30.4	39.4	48.3	29.0	30.6	36.2
3	IET 28950	43.0	46.6	35.8	42.5	42.2	44.1	44.2	42.6	37.4	49.7	30.7	39.8	45.5	39.6	37.1	40.0
4	IET 28954	43.7	35.1	38.7	37.2	48.3	41.3	40.6	40.7	42.9	34.1	35.7	36.9	48.7	36.8	33.4	38.4
5	IET 28959	41.6	45.5	34.1	38.5	46.9	42.4	40.4	41.3	37.0	49.7	30.4	39.1	41.2	30.1	31.2	36.9
6	IET 28960	39.7	44.1	33.8	39.4	31.3	36.8	36.9	37.4	35.5	44.7	30.5	29.6	39.2	28.4	25.3	33.3
7	IET 28964	44.6	38.9	35.5	37.2	34.6	28.9	39.6	37.0	38.3	39.8	27.5	38.6	49.5	24.8	29.8	35.5
8	IET 29140	43.7	40.9	34.7	38.4	32.4	39.3	40.7	38.6	34.6	40.3	29.6	36.6	51.0	25.0	27.8	35.0
9	IET 29142	44.3	48.7	38.3	41.8	38.6	45.0	40.1	42.4	40.8	48.6	33.8	45.4	47.5	31.6	32.1	40.0
10	IET 29177	40.9	37.7	37.6	36.5	40.0	44.7	34.2	38.8	35.6	37.8	31.6	39.8	38.8	47.9	22.6	36.3
11	IET 29197	43.1	36.1	37.4	40.0	43.3	42.2	39.4	40.2	25.2	36.3	31.1	40.3	48.8	25.5	29.6	33.8
12	IET 29415	47.4	39.9	36.4	41.8	34.6	28.2	44.3	38.9	43.8	38.6	30.2	38.4	24.3	26.7	25.7	32.5
13	IET 29421	25.6	44.9	36.0	35.8	34.7	32.2	40.7	35.7	35.2	43.6	26.5	32.6	37.0	29.1	24.1	32.6
14	MTU-1010	43.6	42.4	35.1	31.8	40.7	44.8	28.7	38.1	35.3	42.4	28.5	42.0	38.0	30.1	24.1	34.3
15	MTU-1121	35.6	31.4	37.1	39.9	37.0	47.1	38.7	38.1	34.2	32.2	30.9	37.4	48.4	44.6	37.2	37.8
16	MTU-1153	43.5	41.0	35.6	43.2	37.7	39.9	36.3	39.6	38.0	41.1	29.4	35.1	50.6	23.8	31.5	35.6
17	MTU-1156	41.6	43.1	35.4	39.6	44.1	39.4	40.6	40.5	39.8	42.7	30.9	46.2	46.2	45.6	29.7	40.2
18	MTU-1282	35.6	36.5	36.7	39.0	47.1	38.7	39.0	38.9	33.7	37.5	33.5	40.7	47.3	28.9	30.9	36.1
19	MTU-1290	42.4	48.6	35.3	39.3	45.8	33.6	39.2	40.6	43.1	50.1	30.1	42.8	38.0	25.5	28.8	36.9
20	MTU-1341	46.0	42.6	35.2	41.2	40.6	32.7	38.6	39.6	35.2	43.1	30.3	38.9	47.0	25.7	24.4	35.0
21	N-22	39.9	39.6	33.0	25.6	23.9	36.1	36.1	33.4	32.0	37.6	32.0	29.0	43.2	22.8	21.7	31.2
22	NLR-3354	43.9	35.1	33.8	38.7	26.9	35.8	37.1	35.9	36.5	34.5	25.9	30.9	36.1	31.3	25.7	31.6
23	NLR-34449	43.6	42.7	32.7	39.0	40.0	29.8	36.4	37.7	33.5	43.6	26.0	32.9	48.1	27.9	23.3	33.6
24	NLR-40024	44.1	46.8	33.5	38.5	26.0	26.7	32.0	35.4	35.8	54.0	31.7	35.1	39.4	22.2	23.4	34.5
25	US-314	43.7	40.6	38.3	38.5	37.7	43.3	33.6	39.4	31.8	40.8	27.9	31.6	45.6	30.1	26.4	33.5
	Mean	**41.8**	**41.0**	**35.8**	**38.4**	**38.2**	**37.7**	**38.3**	**38.8**	**36.8**	**41.6**	**30.4**	**37.3**	**43.7**	**30.7**	**28.1**	**35.5**
	LSD (Treat)						ns			*LSD (Treat x Variety)*						ns	
	LSD (Location x Treat)						2.20**			*LSD (Location x Treat x Variety)*						7.86**	
	LSD (Variety)						2.10**			*CV (%) Treat*						12.21	
	LSD (Location x Variety)						5.56**										

Table 6.3.22 Screening for elite rice culture for heat tolerance INDICES of different genotypes across locations *Kharif* 2022

Genotypes	HSI	RHI	HTI	GMP	TOL	MP	YI	YSI	HI	SHI	HM	K1STI	K2STI
CO-51	0.88	1.03	0.77	441.16	-81.55	447.60	0.95	0.83	0.84	0.17	8.71	0.93	1.04
DRRH-4	0.41	1.13	0.97	495.61	-41.43	502.47	1.12	0.92	1.14	0.08	9.78	1.05	1.47
IET 28950	0.02	1.22	1.11	544.30	-45.42	553.15	1.23	1.00	1.34	0.00	10.72	1.25	1.65
IET 28954	0.77	1.05	1.05	526.69	-85.69	534.01	1.14	0.86	1.04	0.14	10.40	1.24	1.45
IET 28959	0.86	1.03	1.15	539.37	-87.56	546.53	1.17	0.84	1.06	0.16	10.66	1.33	1.59
IET 28960	0.92	1.02	0.87	473.25	-113.44	486.90	1.00	0.83	0.95	0.17	9.21	1.15	1.18
IET 28964	0.48	1.12	1.05	517.85	-33.18	521.34	1.17	0.91	1.15	0.09	10.29	1.09	1.59
IET 29140	0.71	1.07	0.92	488.28	-87.90	501.37	1.06	0.87	1.05	0.13	9.53	1.13	1.32
IET 29142	0.93	1.02	1.39	608.19	-110.20	616.43	1.31	0.83	1.16	0.17	12.01	1.64	1.88
IET 29177	1.18	0.96	0.94	489.08	-137.17	501.11	1.01	0.78	0.84	0.22	9.56	1.25	1.18
IET 29197	1.38	0.91	0.78	452.74	-147.90	465.62	0.91	0.74	0.73	0.26	8.82	1.08	0.93
IET 29415	1.49	0.89	0.82	450.05	-139.98	461.04	0.91	0.72	0.72	0.28	8.81	1.09	1.00
IET 29421	0.25	1.17	0.61	397.10	-37.70	407.32	0.90	0.95	1.00	0.05	7.75	0.69	0.97
MTU-1010	1.38	0.91	0.57	380.41	-139.41	396.03	0.76	0.74	0.64	0.26	7.32	0.86	0.70
MTU-1121	0.73	1.06	0.98	505.95	-75.50	509.64	1.10	0.86	0.98	0.14	10.05	1.14	1.33
MTU-1153	1.20	0.95	0.99	505.00	-129.23	513.96	1.04	0.78	0.87	0.22	9.93	1.27	1.24
MTU-1156	0.78	1.05	1.14	543.39	-80.85	547.84	1.18	0.85	1.06	0.15	10.78	1.30	1.56
MTU-1282	1.26	0.94	0.79	448.85	-130.62	457.29	0.91	0.76	0.72	0.24	8.82	1.07	0.95
MTU-1290	1.37	0.92	0.82	455.40	-125.33	462.60	0.93	0.74	0.74	0.26	8.97	1.06	1.01
MTU-1341	1.24	0.94	0.76	434.72	-118.55	443.59	0.89	0.77	0.75	0.23	8.52	1.00	0.96
N-22	-0.67	1.38	0.44	337.64	-17.09	350.01	0.79	1.12	1.13	-0.12	6.54	0.51	0.76
NLR-3354	1.56	0.87	0.64	400.53	-157.65	412.72	0.78	0.71	0.58	0.29	7.78	0.96	0.70
NLR-34449	0.88	1.03	0.74	425.61	-87.50	436.02	0.91	0.84	0.90	0.16	8.31	0.92	1.04
NLR-40024	1.23	0.95	0.65	406.55	-110.61	413.21	0.83	0.77	0.67	0.23	8.00	0.85	0.78
US-314	1.39	0.91	0.92	489.11	-147.94	499.85	0.99	0.74	0.79	0.26	9.58	1.23	1.12
Mean	0.91	1.02	0.88	470.27	-98.78	479.51	1.00	0.83	0.92	0.17	9.23	1.08	1.18

Table 6.3.23 Screening for elite rice culture for heat tolerance on INDICES RANKING of different genotypes across locations *Kharif* 2022

Genotypes	HSI	RHI	HTI	GMP	TOL	MP	YI	YSI	HI	SHI	HM	K1STI	K2STI	Overall Rank
CO-51	14	12	18	18	8	18	14	12	15	14	18	20	14	15
DRRH-4	22	4	9	9	4	9	7	4	4	22	9	17	6	8
IET 28950	24	2	4	2	5	2	2	2	1	24	3	6	2	2
IET 28954	18	8	5	5	9	5	6	8	9	18	5	7	7	6
IET 28959	16	10	2	4	11	4	5	10	6	16	4	2	3	4
IET 28960	13	13	13	13	15	13	12	13	12	13	13	9	11	12
IET 28964	21	5	6	6	2	6	4	5	3	21	6	12	4	5
IET 29140	20	6	11	12	12	10	9	6	8	20	12	11	9	10
IET 29142	12	14	1	1	13	1	1	14	2	12	1	1	1	1
IET 29177	11	15	10	11	20	11	11	15	16	11	11	5	12	11
IET 29197	4	22	17	15	23	14	18	22	20	4	15	14	21	17
IET 29415	2	24	15	16	22	16	19	24	22	2	17	13	17	17
IET 29421	23	3	23	23	3	23	20	3	10	23	23	24	18	19
MTU-1010	5	21	24	24	21	24	25	21	24	5	24	22	24	24
MTU-1121	19	7	8	7	6	8	8	7	11	19	7	10	8	7
MTU-1153	10	16	7	8	18	7	10	16	14	10	8	4	10	9
MTU-1156	17	9	3	3	7	3	3	9	7	17	2	3	5	3
MTU-1282	7	19	16	17	19	17	17	19	21	7	16	15	20	18
MTU-1290	6	20	14	14	17	15	15	20	19	6	14	16	16	14
MTU-1341	8	18	19	19	16	19	21	18	18	8	19	18	19	20
N-22	25	1	25	25	1	25	23	1	5	25	25	25	23	21
NLR-3354	1	25	22	22	25	22	24	25	25	1	22	19	25	23
NLR-34449	15	11	20	20	10	20	16	11	13	15	20	21	15	16
NLR-40024	9	17	21	21	14	21	22	17	23	9	21	23	22	22
US-314	3	23	12	10	24	12	13	23	17	3	10	8	13	13

Table 6.3.24 Selection for high yield and stability of performance under heat stress during Kh 2022

S.No.	Genotypes	Mean Yield (g/m2)	Yield Rank (Yn)	Adj.rank	Adjustment to Yield Rank (Yn)	Stability Variance (σi2)	Stability Rating (S)	YSi = (Y+S)	
1	CO-51	406.8	12	-3	9	39909**	-8	1	
2	DRRH-4	481.7	19	3	22	15557**	-8	14	+
3	IET 28950	530.4	24	3	27	9506**	-8	19	+
4	IET 28954	491.1	20	3	23	17517**	-8	15	+
5	IET 28959	502.7	21	3	24	18401**	-8	16	+
6	IET 28960	430.1	14	1	15	27418**	-8	7	+
7	IET 28964	504.7	22	3	25	13546**	-8	17	+
8	IET 29140	457.4	17	3	20	15742**	-8	12	+
9	IET 29142	561.3	25	3	28	35624**	-8	20	+
10	IET 29177	432.5	15	3	18	69104**	-8	10	+
11	IET 29197	391.6	8	-3	5	37523**	-8	-3	
12	IET 29415	391.0	7	-3	4	99136**	-8	-4	
13	IET 29421	388.4	6	-3	3	12168**	-8	-5	
14	MTU-1010	326.3	1	-3	-2	33207**	-8	-10	
15	MTU-1121	471.8	18	3	21	45654**	-8	13	+
16	MTU-1153	449.3	16	3	19	20644**	-8	11	+
17	MTU-1156	507.4	23	3	26	17883**	-8	18	+
18	MTU-1282	391.9	9	-3	6	19270**	-8	-2	
19	MTU-1290	399.9	11	-3	8	13050**	-8	0	
20	MTU-1341	384.3	5	-3	2	18963**	-8	-6	
21	N-22	341.4	3	-3	0	9876**	-8	-8	
22	NLR-3354	333.8	2	-3	-1	39764**	-8	-9	
23	NLR-34449	392.2	10	-3	7	33799**	-8	-1	
24	NLR-40024	357.9	4	-3	1	21544**	-8	-7	
25	US-314	425.8	13	-3	10	10520**	-8	2	
	Yield Mean	430.1			**+ Selected Genotypes**				
	YS Mean	4.80	LSD (0.05): 0.682		**Kang, M.S. 1993. Agronomy Journal. 85:754-757**				

6.4 Physiological characterization of selected rice genotypes for multiple abiotic stress tolerance

Locations: NRRI, CBT, MTU, PTB, TTB, KAUL and KJT

The increasing occurrence of adverse weather events is continuously challenging agricultural production globally. Rice is grown in a diverse range of ecosystems, and under changing climatic conditions it gets exposed to different environmental stresses reducing grain yield. Under recent climate change scenarios drought, flood, and other extreme weather conditions becoming more common. These abiotic stresses impose major challenges to achieving global food security. The wide genetic base of rice and the availability of a diverse set of germplasm can be explored to identify multiple abiotic stress-tolerant donors for rice improvement. With this view, we formulated an experiment to physiologically characterize rice genotypes or tolerance to multiple abiotic stresses. For this, the same set of rice genotypes are subjected to three different stresses *viz*. (i) salinity (equivalent to 12 dS m^{-1} of NaCl) and (ii) osmotic or dehydration stress (1 and 2% mannitol solution equivalent to -3.0 to -5.0 bars osmotic potential) at early seedling stage along with (iii) evaluation of their anaerobic germination potential by imposing 8-10 cm of standing water above the soil surface after direct sowing of the seeds. For salinity and osmotic stress, the seedlings were initially grown in Yoshida's solution as per the hydroponic assay protocol provided by Gregory et al. (1997) and when the plants reached 3-4 leaf stages they were subjected to salinity and osmotic stresses separately by adding required quantity of NaCl and mannitol, respectively. One set of plants were maintained as control for comparison by keeping under normal Yoshida's solution. Anaerobic germination potential was tested by sowing the seeds in soil filled (5 cm soil depth) plastic trays and filling the trays with 10 cm of water just after sowing. The seeds were allowed to germinate under water and final observations were recorded after 21 days. One set of trays were kept without adding water to record their germination potential under aerobic condition. A total of 20 rice entries were tested at different locations for their tolerance potential against three different stresses. The results obtained for various traits are presented subsequently.

Anaerobic Germination:

Evaluation of genotypes for anaerobic germination potential (AGP) was conducted at seven locations NRRI, KJT, CBT, TTB, PTB, KAUL and KRK centres. The AGP of each genotype was worked out as anaerobic germination index (AGI) by dividing the germination percent (GP) of a genotype under anaerobic condition by the GP of the same genotype under aerobic condition. The mean AGI of all genotypes across all locations varied from 33.0% (KJT) to

70.6% (KRK) with an overall experimental CV of 18.02% **(Table 6.4.2)**. The tolerant check Vandana recorded an overall mean AGI of 65.7% across all locations. One entry IC-256508 recorded highest AGI of 73.5% based on multi-location mean, whereas four other entries, viz., Pantara (66.1%), AC847A (65.1%), FL478 (64.8%) and CR4423-17 (60.6%) also recorded an AGI of 60-70% and were at par with Vandana. All these entries can be considered as highly tolerant to anaerobic germination **(Fig. 6.4.1)**. There were six more accessions *viz*. CR4423-101 (54.6), AC1125A (54.1%), IC-256605 (53.3%), CR4423-8 (51.9%), CR 4111-B-1-10-S-1-Sub-B (51.0%) and CR 4111-B-1-4-S-1-Sub-B (50.8%), which showed an AGI of 50-55% and can be considered as tolerant to anaerobic germination. Rest of the genotypes showed less than 50% germination under anaerobic conditions including the susceptible checks Naveen and IR20 showing 16.9% and 22.2% AGI across locations.

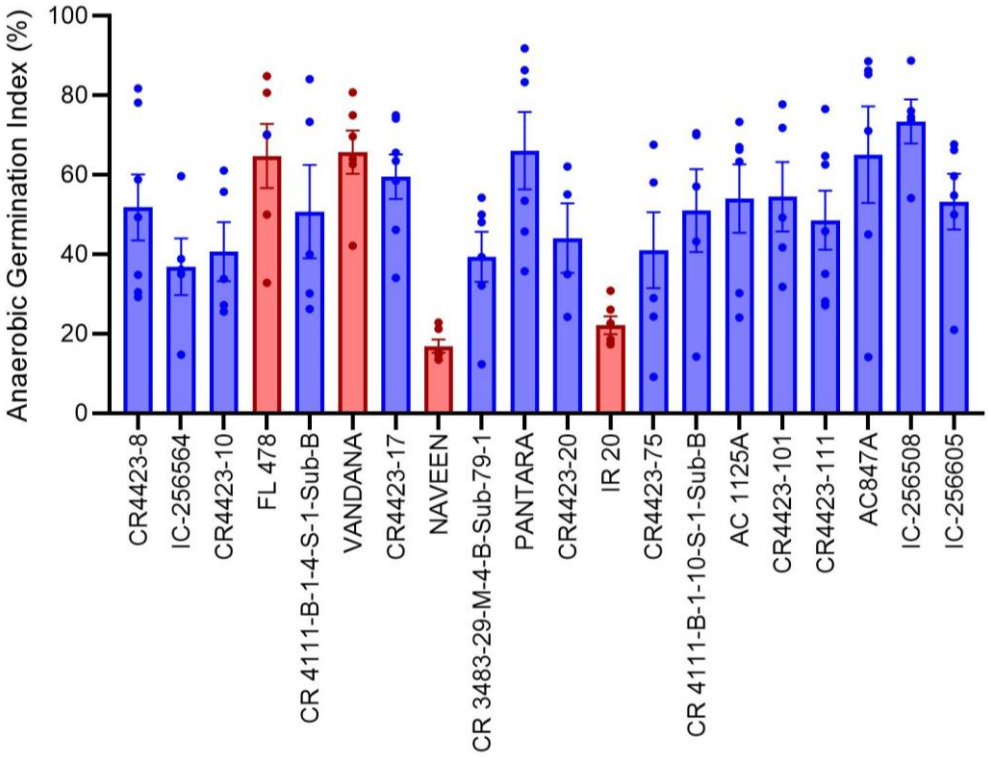


Fig. 6.4.1 *Mean AGI (%) of rice genotypes recorded after under 21 days of germination stage submergence stress tested at three different locations. Error bars representing SE (mean) of all locations and scattered dots are representing mean of individual location.*

Besides AGP, underwater elongation of epicotyl is an important determinant for tolerance to AG stress in rice. The length of the epicotyl was recorded after 21 days of sowing for the germinated seedlings under anaerobic conditions. The data showed significant variation between the genotypes at the average epicotyl length (of all genotypes) varied from 7.0 cm at KJT to 25.2 cm at KRK with an overall experimental mean of 16.2 cm and CV of 18.43%

across all locations **(Table 6.5.3)**. The mean epicotyl length was highest in AC874A (24.9 cm), followed by FL478 (22.3 cm), Vandana (21.3 cm), AC1125A (20.4 cm) and IC-256605 (20.0 cm) after 21 days of AG treatment **(Fig. 6.4.2)**. But the epicotyl length was found significantly low in some genotypes like CR4423-20 (9.6 cm), CR4423-10 (11.2 cm), CR 4111-B-1-4-S-1-Sub-B (12.0 cm). We found a significant correlation (R^2 = 0.3991) between AGI and length of epicotyl measured after 21 days of stress, which signifies greater the epicotyl elongation under AG condition, more is anaerobic germination potential of that particular genotypes **(Fig. 6.4.3)**. Interestingly, the genotype IC-256508, which showed highest AGI of 73.5% showed moderate epicotyl elongation of 16.9 cm based the mean data of different centres.

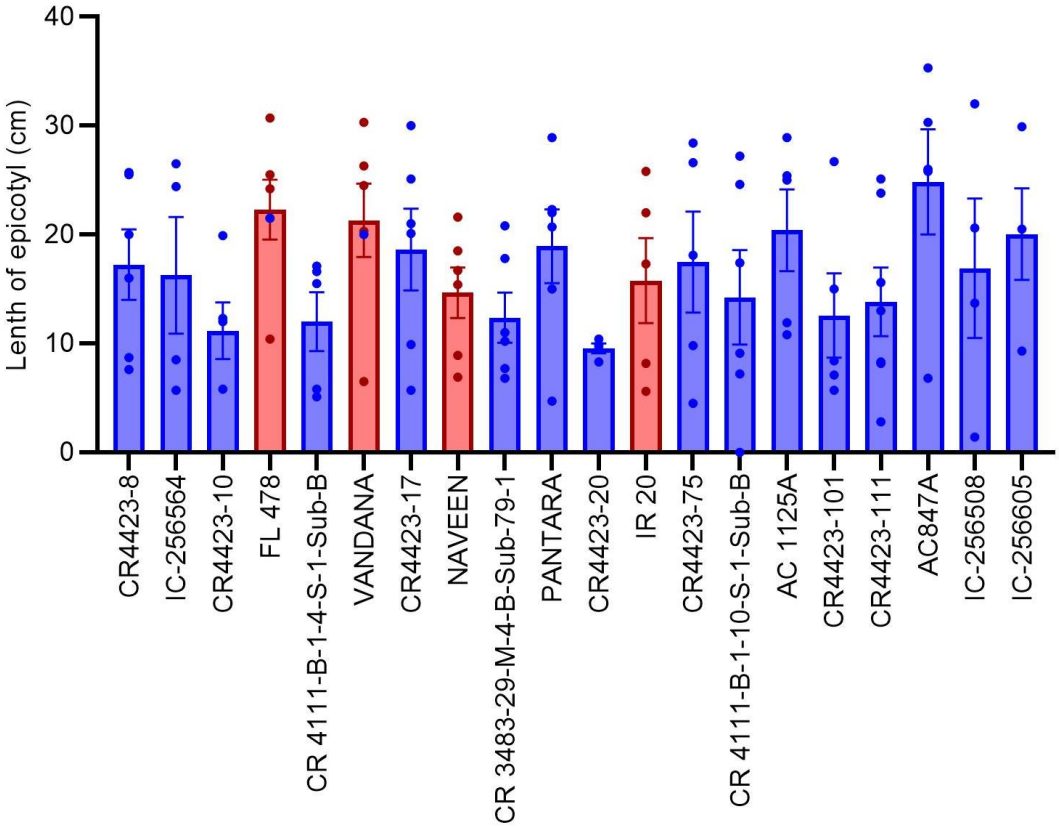


Fig. 6.4.2 *Mean length of epicotyl (cm) of rice genotypes recorded after under 21 days of germination stage submergence stress tested at three different locations. Error bars representing SE (mean) of all locations and scattered dots are representing mean of individual location.*

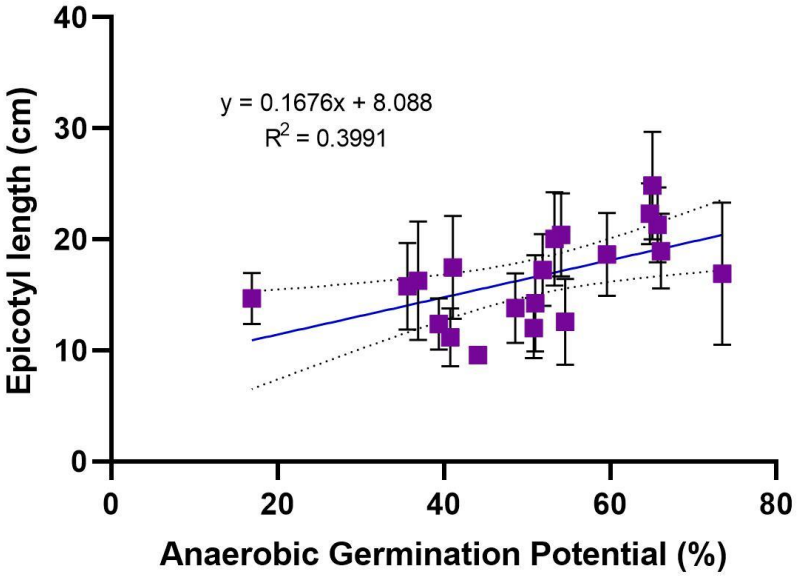


Fig. 6.4.3 *An XY-scatter plot showing simple linear regression between anaerobic germination potential and epicotyl length of rice genotypes under 14 days of complete submergence tested at three different locations. Error bars representing SE (mean) of all locations.*

Salinity Stress:

Screening for salinity tolerance was conducted at NRRI, KJT, PTB and MTU centres. Root and shoot dry biomass and visual salt injury score important physiological traits in rice for tolerance to salinity stress at seedling stage. Salinity stress significantly reduced the mean (average of all locations) root and shoot dry weight of all studied genotypes **(Fig. 6.4.4, Table 6.4.4 & 6.4.5)**. Mean root dry weight in control and salinity stress was 25.9 and 10.6 mg, respectively. The mean root dry weight showed ~60% reduction under stress as compared to the control for all genotypes across locations. The highest reduction was recorded in CR 4111-B-1-10-S-1-Sub-B (70%) followed by IR20 (65 %) over control, whereas CR4423-8 (21.8%) has recorded the lowest reduction followed by IC-256605 (39%) and CR4423-10 (41%). Mean shoot dry weight in control and salinity tolerance was 34.1 and 14.6 mg, respectively. All the genotypes had shown the mean reduction of >50% in shoot dry weight under stress as compared to the control. The highest reduction in shoot dry weight was observed in IC-256508 (60%), followed by CR 4111-B-1-4-S-1-Sub-B (53%), and CR4423-17 (51%) whereas the genotype, CR4423-8 showed the lowest reduction of 35.8% over control, followed by FL478 and CR4423-101 (38.5%).

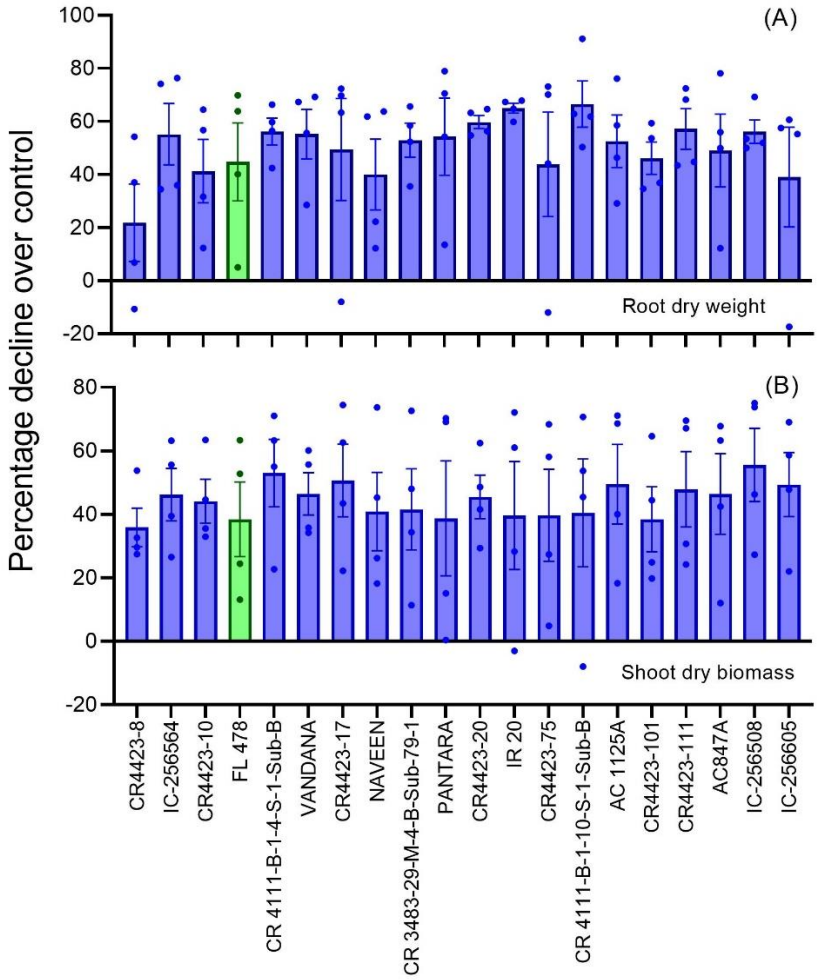


Fig. 6.4.4 *Changes in root dry weight (A) and shoot dry weight (B) of 20 rice entries (mean of all locations) in response to 12 dS m^{-1} salinity stress imposed at seedling stage tested at four different locations. Error bars representing SE (mean) of all locations and scattered dots are representing mean of individual location.*

Salinity stress considerably reduced the total chlorophyll content of the leaves in all the genotypes across locations **(Fig. 6.4.5)**. Salt stress reduced the mean plant dry biomass by 32.12% (average of all the genotypes at all the locations). The mean (of all genotypes and all locations) chlorophyll content of the leaf was found to 1.7 mg g^{-1} leaf dry weight in control conditions, which reduced to 0.7 mg g^{-1} leaf dry weight under stress. The highest reduction over control was recorded in CR4423-10 (69%), followed by CR4423-101 (67%) and CR4423-20 (63%), while the least reduction was observed in IC-256508 (39%), followed by Pantara (44%), CR4423-75 (47%) and CR-4411-B-1-10-S-1-Sub-B (47%) **(Table 6.4.6)**.

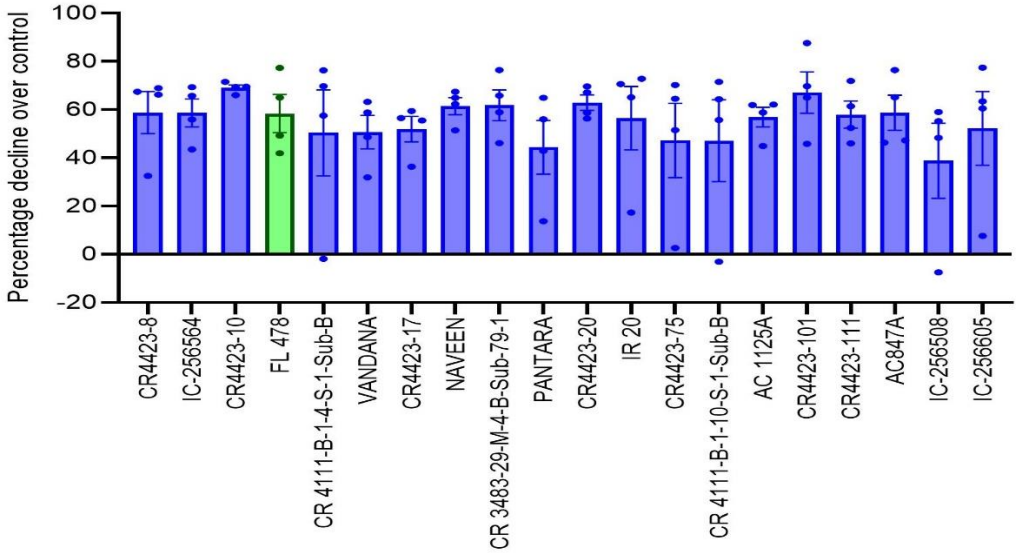


Fig. 6.4.5 *Changes in total chlorophyll content of the leaf of 20 rice entries (mean of all locations) in response to 12 dS m^{-1} salinity stress imposed at seedling stage tested at four different locations. Error bars representing SE (mean) of all locations and scattered dots are representing mean of individual location.*

The visual salt injury score (SES score) taken at four studied locations suggested a wide variability of these genotypes towards salt stress. The highest SES score of '9' was recorded in susceptible check IR20 and CR4423-10, while it was least in tolerant check FL478 (3) **(Fig. 6.4.6)**. Besides FL478, an average score of '3' was received by two other genotypes, AC1125A and Vandana. Based on standard evaluation system these genotypes may be considered as tolerant to seedling stage salinity stress. Nine other genotypes *viz.* Pantara, AC847A, CR4423-8, CR4423-107, CR4423-101, CR4423-1111, IC-256508, IC-256605 and CR-4411-B-1-10-S-1-Sub-B.

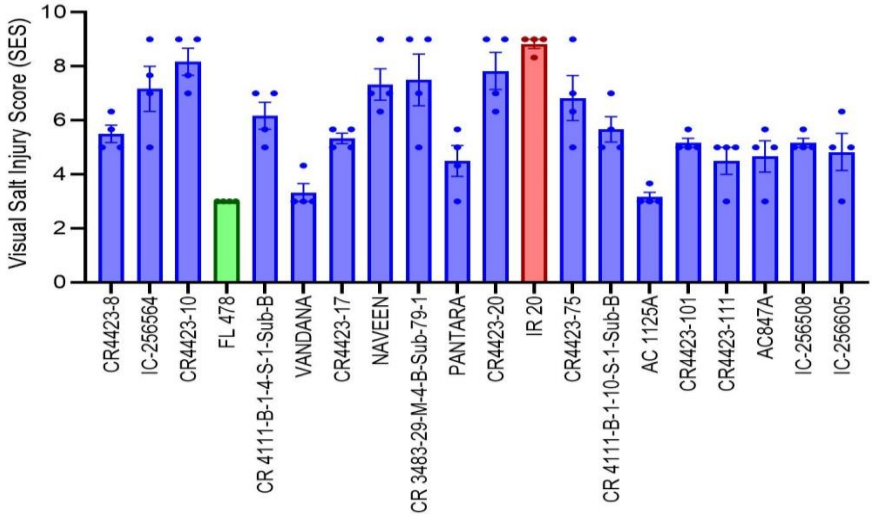


Fig. 6.4.7 *Visual salt injury (VSI) score (mean of all locations) in response to 12 dS m^{-1} salinity stress imposed at seedling stage tested at four different locations. Error bars representing SE (mean) of all biological replicates. Error bars representing SE (mean) of all locations and scattered dots are representing mean of individual location.*

The shoot Na^+/K^+ ratio under salt stress and visual salt injury (VSI) scores are two associated traits for salt tolerance in rice. The Na^+/K^+ ratio was fond to be highly correlated (0.6929**) with VSI for all genotypes across four studied locations **(Fig. 6.4.7, Table 6.4.7)**. The shoot Na^+/K^+ ratio was varied between 0.787 – 2.533 in the studied genotypes. Besides the tolerant check FL478 (0.787), the lowest shoot Na^+/K^+ ratio was observed in AC1125A (0.867). Few other genotypes like Vandana (1.000), CR4423-8 (1.333) and CR4423-101 (1.333) also showed relatively lower Na^+/K^+ ratio in the leaf tissue suggesting tolerance nature of these genotypes under seedling stage salt stress. After dissecting different adaptive traits, it was found that FL478, AC1125Ab and Vandana were good ion excluder and tolerant to seedling stage salt stress, while genotypes like Pantara, CR4423-8, CR4423-101, AC847A, CR4423-17, IC-256508 were moderately tolerant to salt stress with relatively higher mesophyll Na^+ load.

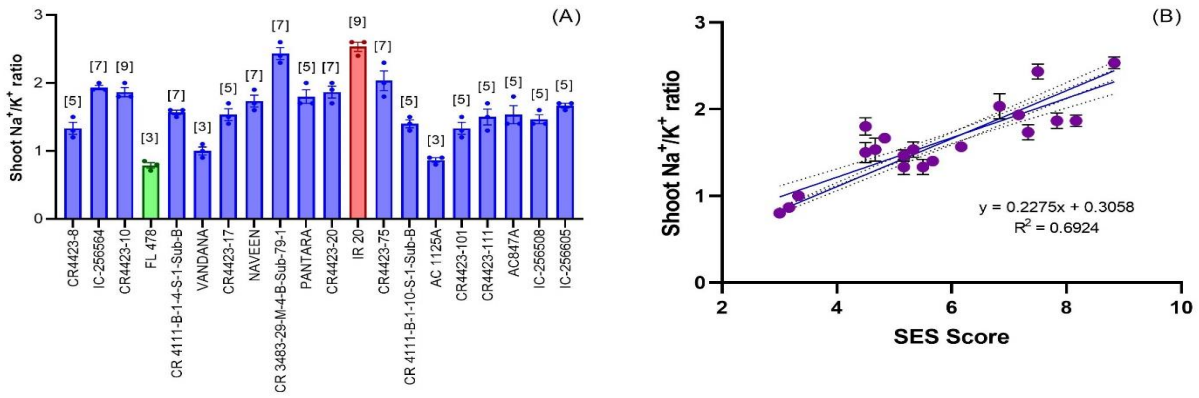


Fig. 6.4.7 *Changes in shoot Na^+/K^+ ratio and visual salt injury (VSI) score (A) and XY-scatter plot showing simple linear regression between shoot Na^+/K^+ ratio and visual salt injury (VSI) score (B) of 25 rice entries (mean of all locations) in response to 12 dS m^{-1} salinity stress imposed at seedling stage tested at NRRI center. Error bars representing SE (mean) of all biological replicates.*

Osmotic/dehydration Stress:

Screening for osmotic/dehydration stress were conducted at NRRI, KJT, MTU, TTB, PTB, CBT, and KRK centres. Osmotic/dehydration stress was imposed by using the 1% and 2% mannitol solution in the hydroponic media. Mannitol @ 1% and 2% caused overall reduction in the root and shoot dry weight across the genotypes and centres under study. Significant difference in different studied traits were observed between 1% and 2% mannitol treatment across different locations. The mean root dry weight was reduced by 20.3% in 1% mannitol treatment, whereas in 2% mannitol treatment it was reduced by 28.1% as compared to that of control **(Fig. 6.4.8)**. Mean root dry weight in control, 1% mannitol and 2% mannitol was

0.11752 g, 0.09225 g and 0.08162 g, respectively. Highest and least reduction in root dry weight was recorded in Naveen and IC-256605, respectively under both 1% and 2% mannitol treatment. Compared to mean root dry weight, mean shoot dry weight was less affected by osmotic stress by mannitol treatment (16.2% and 20.8% reduction was observed in 1% and 2% mannitol treatment, respectively). All the genotypes recorded significant reduction in shoot dry weight over control under 1% mannitol treatment except Vandana, Pantara, IC-256508 and IC-256605 **(Fig. 6.4.9)**.

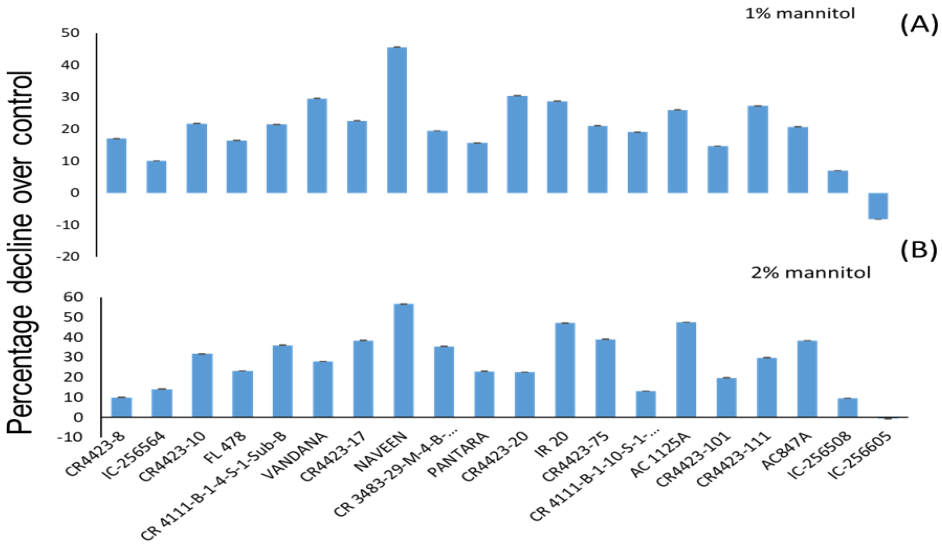


Fig. 6.4.8. *Changes in root dry weight of 20 rice entries (mean of all locations) in response to 1% (**A**) and 2% (**B**) mannitol induced osmotic stress imposed at seedling stage tested at seven different locations. Error bars representing SE (mean) of all locations.*

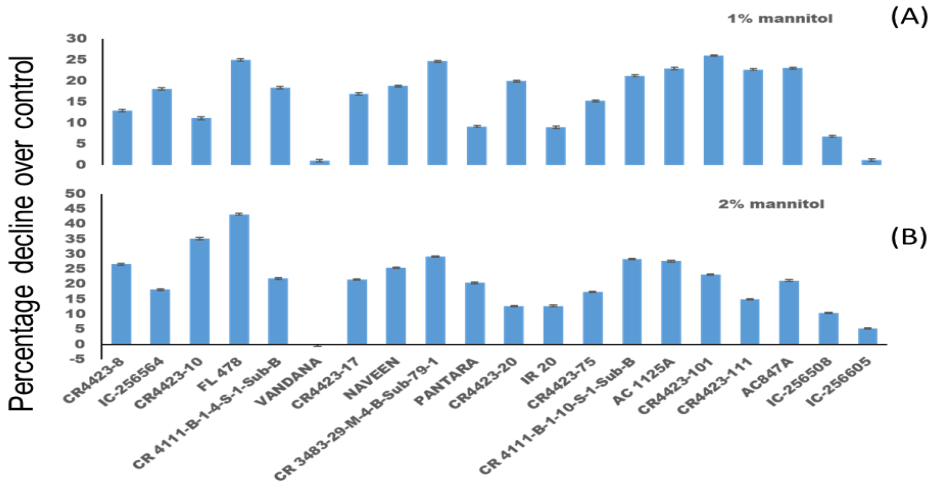


Fig. 6.4.9. *Changes in Shoot dry weight of 20 rice entries (mean of all locations) in response to 1%(**A**) and 2% (**B**) mannitol induced osmotic stress imposed at seedling stage tested at seven different locations. Error bars representing SE (mean) of all locations.*

The effect of stress levels (1% and 2% mannitol) on shoot length was found significant in the present study. In 1% mannitol treatment, shoot length was reduced by 10.3%, whereas in 2% mannitol it was reduced by 20.7% as compared to that of control **(Fig. 6.4.10, Table 6.4.8)**. Mean shoot length in control, 1% mannitol and 2% mannitol was 13.10, 11.72 and 10.36 cm, respectively. In 1% mannitol highest reduction in shoot length was observed in CR4423-111 (25.1%), whereas the least reduction was observed in Pantara (0.8%). In 2% mannitol the greatest reduction was exhibited by CR4423-10 (36.7) and least reduction by Pantara **(Fig. 6.4.10, Table 6.4.9)**. Root length was more affected by both the levels of water stress treatments than the shoot length. The genotypes, IC-256605, Pantara, IC-256508 and CR3483-29-M-4-B-Sub-79-1 were least affected by 1% mannitol treatments as compared to control plants **(Fig. 6.4.11)**. A similar kind of response was observed in total chlorophyll content, which reduced significantly under both 1% (23.7%) and 2% mannitol (38.6%) treatment as compared to control. The highest reduction was observed in CR4423-111 (44.1%), followed by IR-20 (32.8%) over control while the least reduction was shown by Vandana (9.3%), followed by CR4423-20 (12.4%) and IC-256605 (15%) over control **(Fig. 6.4.12, Table 6.4.10)**.

Screening of 20 rice accessions for multiple abiotic stress tolerance was conducted at 7 AICRIP centers for their osmotic/dehydration (1 and 2% mannitol) stress tolerance at seedling stage. All the genotypes including tolerant checks recorded reduction in key physiological traits viz. Root and shoot lengths, root and shoot dry weights and total chlorophyll content. Based on the data obtained from all the centres, we could able to conclude that, some of the genotypes performed better than the checks and some of the entries like IC-256605 found to be tolerant and IC-256508, Pantara, CR4423-101 and IC-256564 were moderately tolerant when percent reduction in Root Dry Weight trait at both 1% and 2% stress level is considered. When percent reduction in Shoot Dry Weight trait is considered, IC-256605 was tolerant and CR4423-75, IC-256508, CR4423-20 and Pantara were found to be moderately tolerant.

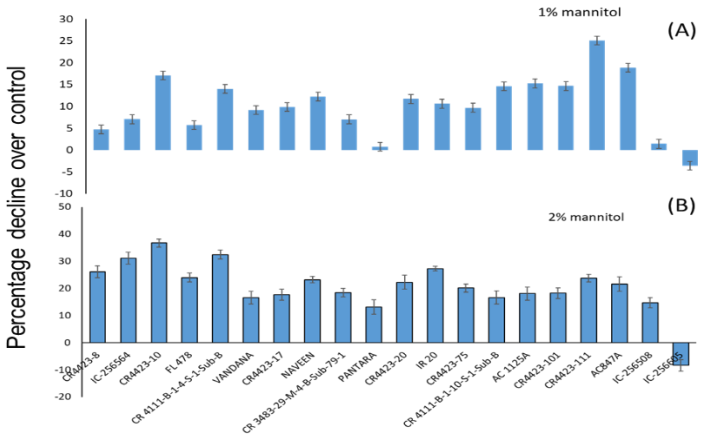


Fig. 6.4.10. *Changes in Shoot length(cm) of 20 rice entries (mean of all locations) in response to 1%(**A**) and 2% (**B**) mannitol induced osmotic stress imposed at seedling stage tested at seven different locations. Error bars representing SE (mean) of all locations.*

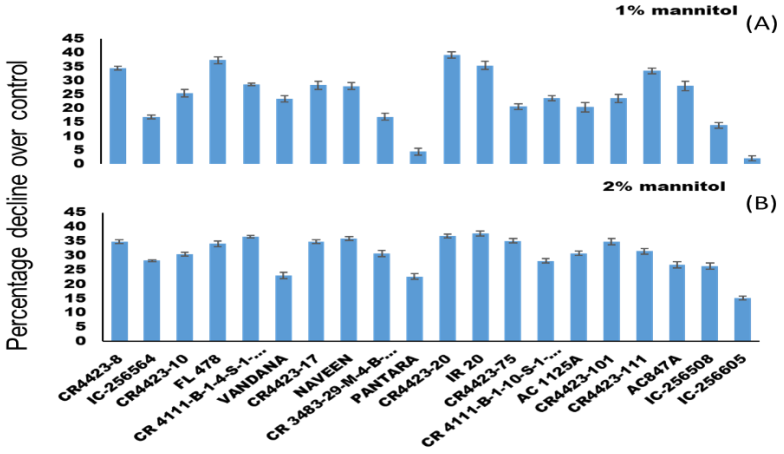


Fig. 6.4.11. *Changes in Root length(cm) of 20 rice entries (mean of all locations) in response to 1%(**A**) and 2% (**B**) mannitol induced osmotic stress imposed at seedling stage tested at seven different locations. Error bars representing SE (mean) of all locations.*

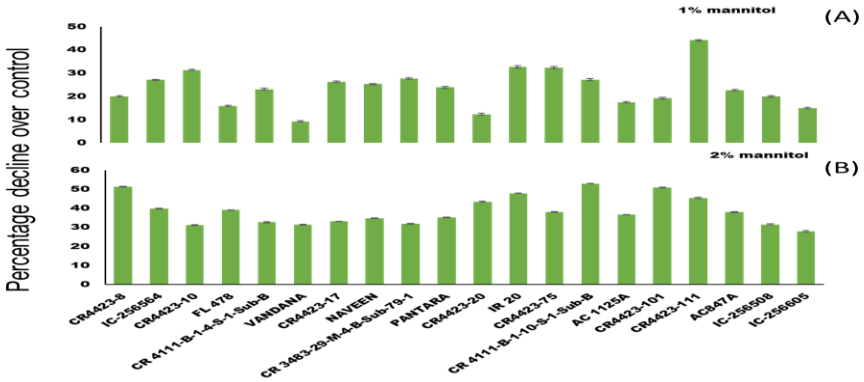


Fig. 6.4.12. *Changes in Chlorophyll content (mg/FW) of 20 rice entries (mean of all locations) in response to 1%(**A**) and 2% (**B**) mannitol induced osmotic stress imposed at seedling stage tested at seven different locations. Error bars representing SE (mean) of all locations.*

Summary and Conclusion:

- Screening of 20 rice accessions for multiple abiotic stress tolerance was conducted at 7 AICRIP centers for their anaerobic germination potential and tolerant against salinity (12 dS m^{-1}) and osmotic/dehydration (1 and 2% mannitol) stresses at seedling stage.
- All the genotypes including tolerant checks recorded reduction in key physiological traits *viz*. germination percentage, epicotyl length, shoot and root dry weight, shoot and root length, leaf chlorophyll content and shoot Na^+/K^+ ratio in response to different abiotic stresses.
- Based on the multi-locational performance under AG stress, IC-256508, Pantara, AC847A, FL478, Vandana and CR4423-17 were found tolerant.
- Similarly, genotypes *viz*., FL478, AC1125A, Vandana, Pantara, AC847A, CR4423-8, CR4423-107, CR4423-101, CR4423-1111, IC-256508, IC-256605 and CR-4411-B-1-10-S-1-Sub-B were found tolerant to seedling stage salinity stress.
- Similarly, genotypes *viz*., IC-256605, Pantara, IC-256508, CR3483-29-M-4-B-Sub-79-1, CR4423-17 and Vandana showed considerable osmotic stress tolerance.
- Three entries *viz*. Pantara, IC-256508, Vandana were tolerant to all the abiotic stresses (AG, salinity and osmotic), while another genotype CR4423-17 was found tolerant to both AG and osmotic stresses and two other genotypes (AC847A and FL478) were found tolerant to salinity and AG stresses.

Table 6.4.1 List of genotypes identified as tolerant to individual and combination of multiple abiotic stresses based on the data obtained from multi-locational screening

S.No.	Nature of Stress	Tolerant genotypes identified
1	Anaerobic germination (AG)	IC-256508, Pantara, AC847A, FL478, Vandana, CR4423-17
2	Salinity stress (SS)	FL478, AC1125A, Vandana, Pantara, AC847A, CR4423-8, CR4423-107, CR4423-101, CR4423-1111, IC-256508, IC-256605, CR-4411-B-1-10-S-1-Sub-B.
3	Osmotic stress (OS)	IC-256605, Pantara, IC-256508, CR3483-29-M-4-B-Sub-79-1, CR4423-17, Vandana
4	AG + SS	IC-256508, Pantara, FL478, Vandana, AC847A
5	AG + OS	IC-256508, Pantara, CR4423-17, Vandana
6	SS + OS	Pantara, IC-256508, Vandana
7	AG + SS+ OS	Pantara, IC-256508, Vandana

Table 6.4.2 Effect of 21 days of submergence stress on anaerobic germination index (%) of 20 rice genotypes during *Kharif* 2022 at different locations.

S.No.	Genotypes	CTC	KJT	CBT	TTB	PTB	KAUL	KRK	Mean
1	CR4423-8	29.3	34.9	81.8	78.2	30.5	58.9	49.4	**51.9**
2	IC-256564	14.8	36.2	59.7	.	35.0	38.9	.	**36.9**
3	CR4423-10	33.9	27.3	61.1	.	55.8	25.6	.	**40.8**
4	FL 478	32.9	.	80.7	84.9	70.0	50.0	70.2	**64.8**
5	CR 4111-B-1-4-S-1-Sub-B	30.2	.	40.0	.	73.4	26.3	84.1	**50.8**
6	VANDANA	42.2	.	64.0	75.0	80.8	62.7	69.7	**65.7**
7	CR4423-17	38.1	46.2	75.0	63.5	65.6	58.5	74.2	**59.6**
8	NAVEEN	14.8	13.6	15.6	21.3	13.5	22.9	.	**16.9**
9	CR 3483-29-M-4-B-Sub-79-1	12.4	54.3	50.0	48.1	32.2	39.4	.	**39.4**
10	PANTARA	53.5	35.8	83.4	91.9	86.4	45.8	.	**66.1**
11	CR4423-20	35.0	.	62.1	.	55.1	24.3	.	**44.1**
12	IR 20	17.4	22.7	17.6	.	26.1	18.6	30.9	**22.2**
13	CR4423-75	24.4	.	58.1	29.0	58.2	9.2	67.6	**41.1**
14	CR 4111-B-1-10-S-1-Sub-B	43.3	.	57.1	.	70.0	14.3	70.5	**51.0**
15	AC 1125A	30.3	.	63.4	73.4	66.4	24.1	67.0	**54.1**
16	CR4423-101	49.3	31.9	71.9	.	77.8	41.8	.	**54.6**
17	CR4423-111	28.2	27.2	45.9	76.6	62.6	35.1	64.8	**48.6**
18	AC847A	45.0	.	86.3	85.4	71.1	14.2	88.6	**65.1**
19	IC-256508	76.1	.	73.7	.	88.8	54.2	74.6	**73.5**
20	IC-256605	50.0	.	59.7	67.7	54.9	21.0	66.3	**53.3**
	Mean	**34.9**	**33.0**	**62.3**	**66.2**	**58.7**	**34.3**	**70.6**	**50.8**
	LSD (Genotype)						**5.579**		
	LSD (Location × Genotype)						**14.761**		
	CV (Residual) %						**18.015**		

Table 6.4.3 Effect of 21 days of submergence stress on epicotyl growth (cm) of 20 rice genotypes during *Kharif* 2022 at different locations.

S.No.	Genotypes	CTC	KJT	CBT	TTB	PTB	KAUL	KRK	Mean
1	CR4423-8	8.7	7.6	25.7	20.0	25.5	16.0	--	**17.2**
2	IC-256564	5.7	8.5	26.5	--	24.4	--	--	**16.3**
3	CR4423-10	5.8	5.9	12.3	--	19.9	12.0		**11.2**
4	FL 478	10.4	--	30.7	21.5	24.2	21.5	25.5	**22.3**
5	CR 4111-B-1-4-S-1-Sub-B	5.8	--	15.5	--	16.6	5.1	17.1	**12.0**
6	VANDANA	6.5	--	30.3	20.3	24.5	20.0	26.3	**21.3**
7	CR4423-17	9.9	5.7	25.1	21.0	30.0	20.1	--	**18.6**
8	NAVEEN	6.9	8.9	21.6	16.7	18.5	15.4	--	**14.7**
9	CR 3483-29-M-4-B-Sub-79-1	7.7	6.8	20.8	11.0	17.8	10.2	--	**12.4**
10	PANTARA	22.3	4.7	28.9	22.0	20.7	15.0	--	**18.9**
11	CR4423-20	9.9	--	10.4	--	9.7	8.3	--	**9.6**
12	IR 20	8.2	5.6	22.0	--	17.3	--	25.8	**15.8**
13	CR4423-75	9.8	--	26.6	4.5	18.1	--	28.4	**17.5**
14	CR 4111-B-1-10-S-1-Sub-B	9.1	--	17.4	0.0	24.6	7.2	27.2	**14.3**
15	AC 1125A	11.9	--	28.9	10.8	25.0	--	25.4	**20.4**
16	CR4423-101	7.1	8.4	26.7	--	15.0	5.7	--	**12.6**
17	CR4423-111	8.3	8.2	23.8	13.0	15.6	2.8	25.1	**13.8**
18	AC847A	26.0	--	35.3	6.8	30.3	--	25.8	**24.9**
19	IC-256508	13.7	--	32.0	--	20.6	1.4	--	**16.9**
20	IC-256605	20.5	--	29.9	9.3	20.5	--	--	**20.0**
	Mean	**10.7**	**7.0**	**24.5**	**13.6**	**20.9**	**11.5**	**25.2**	**16.6**
	LSD (Genotype)						**1.178**		
	LSD (Location × Genotype)						**3.117**		
	CV (Residual) %						**18.429**		

Table 6.4.4 Effect of salinity stress (12 dS m^{-1}) on root dry weight (mg) of 20 rice genotypes during *Kharif* 2022 at different locations.

S.No.	Genotypes	CTC	KJT	PTB	MTU	Mean	CTC	KJT	PTB	MTU	Mean
1	CR4423-8	31.9	28.6	3.6	34.3	**24.6**	8.7	8.0	3.6	32.0	**13.1**
2	IC-256564	28.3	27.5	3.9	41.7	**25.3**	6.7	7.1	2.5	27.3	**10.9**
3	CR4423-10	13.4	21.8	4.3	46.3	**21.5**	5.8	7.8	3.8	31.7	**12.3**
4	FL 478	32.3	30.2	5.9	50.7	**29.8**	9.8	10.9	5.6	30.3	**14.1**
5	CR 4111-B-1-4-S-1-Sub-B	13.6	26.4	2.5	52.7	**23.8**	5.9	8.9	2.4	30.3	**11.9**
6	VANDANA	23.7	34.3	5.8	81.7	**36.4**	10.5	10.5	4.2	26.7	**13.0**
7	CR4423-17	27.0	29.1	5.5	54.3	**29.0**	8.2	10.7	5.9	15.0	**9.9**
8	NAVEEN	16.5	32.6	6.0	51.0	**26.5**	6.3	11.8	5.3	39.7	**15.8**
9	CR 3483-29-M-4-B-Sub-79-1	12.2	22.8	4.6	40.3	**20.0**	4.2	9.5	2.2	26.0	**10.5**
10	PANTARA	20.7	39.3	7.1	49.3	**29.1**	4.3	11.6	3.2	42.7	**15.4**
11	CR4423-20	13.1	24.1	5.0	48.7	**22.7**	5.7	8.9	1.8	22.0	**9.6**
12	IR 20	12.8	25.2	9.1	62.3	**27.4**	4.5	10.1	2.9	20.3	**9.5**
13	CR4423-75	15.2	30.5	3.9	65.7	**28.8**	4.1	9.1	4.4	36.7	**13.6**
14	CR 4111-B-1-10-S-1-Sub-B	17.6	23.4	3.0	45.0	**22.2**	6.7	8.7	0.3	22.3	**9.5**
15	AC 1125A	19.7	36.4	5.0	46.0	**26.8**	8.1	8.7	3.6	24.7	**11.3**
16	CR4423-101	16.9	25.5	3.7	40.7	**21.7**	7.8	10.4	4.5	25.7	**12.1**
17	CR4423-111	15.6	26.8	5.1	59.3	**26.7**	8.8	8.5	2.8	16.3	**9.1**
18	AC847A	16.4	27.8	5.7	50.3	**25.1**	8.2	12.3	5.0	11.0	**9.1**
19	IC-256508	17.2	31.4	4.4	52.0	**26.2**	8.3	9.7	2.0	26.0	**11.5**
20	IC-256605	18.3	24.3	3.9	48.7	**23.8**	7.2	10.9	3.6	20.7	**10.6**
	Mean	**19.1**	**28.4**	**4.9**	**51.1**	**25.9**	**7.0**	**9.7**	**3.5**	**26.4**	**11.6**
	LSD (Treatment)	**0.87**		LSD (Location X Genotype)			**3.23**	CV (Treatment) %			**22.05**
	LSD (Location X Treatment)	**1.74**		LSD (Treatment X Genotype)			**2.29**	CV (Residual) %			**15.18**
	LSD (Genotype)	**1.62**		LSD (L X G X T)			**4.57**				

Table 6.4.5 Effect of salinity stress (12 dS m^{-1}) on shoot dry weight (mg) of 20 rice genotypes during *Kharif* 2022 at different locations.

S.No.	Genotypes	CTC	KJT	PTB	MTU	Mean	CTC	KJT	PTB	MTU	Mean
1	CR4423-8	92.4	48.1	9.4	17.2	**41.8**	42.7	14.9	6.3	12.1	**19.0**
2	IC-256564	85.1	37.4	7.7	19.2	**37.3**	31.3	16.6	5.6	11.6	**16.3**
3	CR4423-10	48.6	34.8	8.2	19.5	**27.8**	26.9	12.7	5.3	13.1	**14.5**
4	FL 478	87.7	51.0	9.8	16.5	**41.3**	41.4	18.7	7.4	14.3	**20.4**
5	CR 4111-B-1-4-S-1-Sub-B	53.0	40.3	7.1	15.8	**29.1**	19.5	11.7	5.9	12.2	**12.3**
6	VANDANA	78.4	55.3	9.6	15.9	**39.8**	31.3	24.5	6.2	10.4	**18.1**
7	CR4423-17	65.3	48.0	8.0	16.2	**34.4**	16.7	18.0	6.2	9.2	**12.5**
8	NAVEEN	68.1	54.6	7.5	15.9	**36.5**	17.9	29.9	5.5	13.0	**16.6**
9	CR 3483-29-M-4-B-Sub-79-1	54.7	40.2	6.3	13.3	**28.6**	15.0	20.9	5.2	8.7	**12.4**
10	PANTARA	71.8	65.9	8.7	15.4	**40.5**	22.2	19.6	8.2	13.1	**15.8**
11	CR4423-20	51.4	40.3	10.1	15.6	**29.3**	19.3	20.7	7.1	9.1	**14.1**
12	IR 20	46.3	50.4	7.2	15.3	**29.8**	12.9	19.6	6.2	11.0	**12.4**
13	CR4423-75	55.1	40.5	5.7	14.2	**28.9**	17.4	17.0	5.1	10.3	**12.4**
14	CR 4111-B-1-10-S-1-Sub-B	57.2	38.6	5.3	16.1	**29.3**	16.8	17.9	5.1	8.8	**12.1**
15	AC 1125A	66.7	59.3	11.3	17.8	**38.8**	19.3	18.6	9.2	10.7	**14.5**
16	CR4423-101	54.5	47.8	9.2	10.6	**30.5**	19.3	26.6	6.9	8.5	**15.3**
17	CR4423-111	57.3	51.8	9.0	15.4	**33.4**	17.5	17.0	7.5	11.7	**13.4**
18	AC847A	58.3	54.0	10.0	15.5	**34.4**	18.8	19.8	8.8	8.9	**14.1**
19	IC-256508	66.1	60.6	7.6	15.6	**37.5**	17.3	15.2	7.7	8.4	**12.1**
20	IC-256605	57.9	50.4	10.0	16.5	**33.7**	17.9	20.8	7.8	8.6	**13.8**
	Mean	**63.8**	**48.5**	**8.4**	**15.9**	**34.1**	**22.1**	**19.0**	**6.7**	**10.7**	**14.6**
	LSD (Treatment)	**0.77**		LSD (Location X Genotype)			**3.31**	CV (Treatment) %			**14.95**
	LSD (Location X Treatment)	**1.53**		LSD (Treatment X Genotype)			**2.34**	CV (Residual) %			**11.97**
	LSD (Genotype)	**1.66**		LSD (L X G X T)			**4.69**				

Table 6.4.6 Effect of salinity stress (12 dS m^{-1}) on total chlorophyll content (mg/g DW) of 20 rice genotypes during *Kharif* 2022 at different locations.

S.No.	Genotypes	CTC	KJT	PTB	MTU	Mean	CTC	KJT	PTB	MTU	Mean
1	CR4423-8	3.9	1.5	0.5	1.8	**1.9**	1.3	0.4	0.3	0.6	**0.7**
2	IC-256564	2.7	1.3	0.5	2.1	**1.7**	1.2	0.4	0.3	0.7	**0.6**
3	CR4423-10	3.0	1.2	0.6	2.1	**1.7**	1.0	0.3	0.2	0.6	**0.5**
4	FL 478	3.0	1.6	1.0	1.8	**1.9**	1.7	0.6	0.2	0.9	**0.9**
5	CR 4111-B-1-4-S-1-Sub-B	3.2	1.2	0.2	2.1	**1.7**	1.4	0.4	0.2	0.5	**0.6**
6	VANDANA	2.5	1.6	0.7	2.2	**1.8**	1.7	0.6	0.4	0.9	**0.9**
7	CR4423-17	2.6	1.5	0.5	2.2	**1.7**	1.1	0.6	0.3	1.0	**0.8**
8	NAVEEN	2.8	1.6	0.5	1.9	**1.7**	0.9	0.6	0.2	0.9	**0.6**
9	CR 3483-29-M-4-B-Sub-79-1	2.8	1.3	0.5	2.0	**1.6**	0.6	0.5	0.3	0.8	**0.5**
10	PANTARA	2.9	1.7	0.9	2.0	**1.9**	1.3	0.6	0.8	1.1	**0.9**
11	CR4423-20	3.0	1.1	0.4	1.7	**1.6**	1.2	0.4	0.1	0.8	**0.6**
12	IR 20	2.9	1.5	0.3	2.2	**1.7**	0.8	0.4	0.2	0.8	**0.6**
13	CR4423-75	2.9	1.2	0.5	2.1	**1.7**	1.0	0.3	0.5	1.0	**0.7**
14	CR 4111-B-1-10-S-1-Sub-B	2.7	1.2	0.2	2.3	**1.6**	1.2	0.4	0.2	0.6	**0.6**
15	AC 1125A	2.9	1.7	0.6	2.0	**1.8**	1.6	0.6	0.3	0.8	**0.8**
16	CR4423-101	3.0	1.4	0.6	2.1	**1.8**	1.1	0.4	0.3	0.3	**0.5**
17	CR4423-111	2.4	1.5	0.4	1.8	**1.5**	1.3	0.4	0.2	0.7	**0.7**
18	AC847A	2.5	1.5	0.5	2.1	**1.6**	1.3	0.5	0.3	0.5	**0.6**
19	IC-256508	2.8	1.7	0.7	2.1	**1.8**	1.2	0.7	0.7	1.1	**0.9**
20	IC-256605	3.5	1.3	0.4	2.2	**1.8**	1.4	0.3	0.3	0.8	**0.7**
	Mean	**2.9**	**1.4**	**0.5**	**2.0**	**1.7**	**1.2**	**0.5**	**0.3**	**0.8**	**0.7**
	LSD (Treatment)	**0.06**		LSD (Location X Genotype)			**0.17**	CV (Treatment) %			**25.37**
	LSD (Location X Treatment)	**0.13**		LSD (Treatment X Genotype)			**0.12**	CV (Residual) %			**12.33**
	LSD (Genotype)	**0.08**		LSD (L X G X T)			**0.24**				

Table 6.4.7 Effect of salinity stress (12 dS m^{-1}) on tissue Na^+ and K^+ content (mg/g DW) of 20 rice genotypes during *Kharif* 2022 at different locations.

S.No.	Genotypes	Na^+ Content				K^+ Content			
		Shoot		Root		Shoot		Root	
		Control	Stress	Control	Stress	Control	Stress	Control	Stress
1	CR4423-8	11.3	90.7	29.3	123.3	81.3	68.0	76.0	50.0
2	IC-256564	22.7	117.3	28.7	112.0	70.7	60.0	70.0	36.0
3	CR4423-10	66.0	111.3	27.3	119.3	63.3	59.3	54.7	46.0
4	FL 478	32.0	63.3	27.3	125.3	95.3	78.7	72.7	64.0
5	CR 4111-B-1-4-S-1-Sub-B	26.0	102.7	28.0	116.7	84.7	66.0	65.3	56.0
6	VANDANA	28.0	70.0	34.0	116.7	98.0	70.7	70.0	62.7
7	CR4423-17	13.3	93.3	31.3	136.0	84.7	62.0	71.3	55.3
8	NAVEEN	24.0	106.0	37.3	130.7	91.3	62.0	76.0	54.0
9	CR 3483-29-M-4-B-Sub-79-1	26.7	126.0	29.3	144.7	78.7	51.3	64.7	36.0
10	PANTARA	30.0	107.3	29.3	133.3	83.3	60.0	50.0	41.3
11	CR4423-20	24.0	109.3	33.3	131.3	80.0	58.0	64.0	43.3
12	IR 20	25.3	126.0	42.0	92.7	84.0	50.0	74.7	36.0
13	CR4423-75	16.0	108.7	28.7	118.0	87.3	54.0	52.0	45.3
14	CR 4111-B-1-10-S-1-Sub-B	13.3	90.0	32.0	120.0	86.7	66.0	63.3	32.0
15	AC 1125A	20.0	62.7	30.0	122.0	84.7	71.3	66.0	57.3
16	CR4423-101	14.0	88.0	26.0	120.7	97.3	64.7	68.0	50.0
17	CR4423-111	11.3	100.7	28.0	127.3	76.0	67.3	72.7	59.3
18	AC847A	20.7	94.0	30.7	117.3	78.7	61.3	69.3	44.7
19	IC-256508	18.7	88.7	34.7	124.0	73.3	61.3	61.3	43.3
20	IC-256605	26.7	106.0	27.3	135.3	86.7	63.3	69.3	50.0
	Grand Mean	**23.5**	**98.1**	**30.7**	**123.3**	**83.3**	**62.8**	**66.6**	**48.1**
	LSD (Treatment)	16.60		5.10		1.17		1.12	
	LSD (Genotype)	18.49		4.61		4.77		6.44	
	LSD (Treatment X Genotype)	26.15		6.52		6.74		9.10	
	CV (Residual) %	26.45		5.20		5.68		9.76	

Table 6.4.8 Effect of osmotic stress on root length (cm) of 20 rice genotypes during *Kharif* 2022 at different locations.

S.No.	Genotypes	Control						1% Mannitol						2% Mannitol					
		CTC	KJT	MTU	TTB	PTB	Mean	CTC	KJT	MTU	TTB	PTB	Mean	CTC	KJT	MTU	TTB	PTB	Mean
1	CR4423-8	5.02	3.87	7.36	6.00	9.57	**6.21**	6.78	2.81	7.13	7.67	9.83	**6.08**	3.08	2.60	4.84	4.50	6.46	**4.05**
2	IC-256564	4.88	3.93	4.50	7.17	8.42	**5.52**	6.02	3.26	4.38	8.33	7.73	**5.51**	3.06	2.56	4.28	.	5.22	**3.46**
3	CR4423-10	4.76	2.86	9.58	1.50	11.39	**5.62**	4.27	2.16	6.19	.	6.60	**4.19**	3.36	1.89	5.16	.	5.68	**3.91**
4	FL 478	5.77	4.80	7.73	5.67	13.11	**7.16**	4.59	3.07	7.39	6.33	8.41	**6.07**	3.91	2.48	7.34	5.17	9.10	**4.72**
5	CR 4111-B-1-4-S-1-Sub-B	6.51	4.20	5.71	6.00	6.44	**5.91**	5.12	2.62	5.10	3.33	4.38	**4.22**	4.86	2.26	5.25	2.00	2.90	**3.75**
6	VANDANA	5.54	5.53	6.90	10.50	13.98	**8.45**	6.94	4.72	5.76	5.67	9.34	**6.47**	3.42	3.45	5.20	6.17	11.68	**5.51**
7	CR4423-17	4.07	4.63	5.45	9.50	15.02	**7.33**	5.16	3.18	5.25	3.67	10.38	**5.25**	4.09	2.95	5.04	6.00	7.26	**4.78**
8	NAVEEN	4.26	5.17	6.74	4.67	12.64	**7.01**	4.02	2.43	5.81	5.33	7.66	**5.05**	3.24	2.21	5.70	5.67	5.73	**4.49**
9	CR 3483-29-M-4-B-Sub-79-1	3.79	3.62	6.75	13.00	10.33	**7.48**	4.54	3.60	5.14	5.50	6.11	**4.89**	2.81	2.26	4.65	9.00	9.44	**5.18**
10	PANTARA	5.64	6.24	8.95	8.17	14.79	**8.21**	7.09	4.49	8.69	11.50	12.23	**7.85**	3.41	3.10	7.85	7.00	9.18	**6.35**
11	CR4423-20	5.66	3.55	4.91	13.33	8.23	**6.92**	5.84	3.80	4.73	1.50	5.93	**4.21**	3.08	2.22	4.45	.	6.91	**4.37**
12	IR 20	4.52	4.01	7.20	6.67	13.90	**6.23**	4.54	2.51	6.86	6.17	7.43	**5.17**	1.87	2.06	6.06	6.25	7.64	**4.48**
13	CR4423-75	4.01	4.84	7.75	8.17	11.94	**6.77**	3.70	4.01	7.45	4.67	8.13	**5.37**	2.37	2.71	6.15	3.33	8.05	**4.39**
14	CR 4111-B-1-10-S-1-Sub-B	6.38	3.71	8.20	9.83	9.55	**6.76**	6.21	2.68	7.81	7.83	7.00	**5.16**	3.83	2.41	7.50	.	6.44	**4.21**
15	AC 1125A	6.59	6.02	6.18	9.00	17.47	**8.10**	4.32	3.69	5.59	5.50	12.81	**6.44**	3.70	3.28	5.39	4.00	9.47	**5.61**
16	CR4423-101	5.80	4.06	5.13	4.67	14.66	**6.75**	3.83	3.34	4.75	5.17	10.63	**5.81**	3.44	2.41	4.73	6.67	11.39	**5.20**
17	CR4423-111	6.73	4.26	6.49	10.67	9.40	**7.98**	4.10	3.82	6.11	1.83	8.64	**5.31**	3.24	3.39	5.94	.	10.64	**5.46**
18	AC847A	6.99	4.49	7.48	8.50	18.36	**8.70**	4.10	3.06	7.21	7.50	10.34	**6.25**	3.91	2.84	6.83	6.83	12.25	**6.37**
19	IC-256508	7.93	5.62	6.51	10.17	12.76	**8.02**	4.66	4.12	6.23	8.00	10.34	**6.66**	3.37	3.27	5.68	8.75	10.23	**5.91**
20	IC-256605	4.36	4.59	5.13	7.67	10.97	**6.63**	3.36	3.88	4.58	5.83	3.35	**4.76**	2.53	2.38	4.80	4.50	4.26	**4.28**
	Grand Mean	**5.46**	**4.50**	**6.73**	**8.04**	**12.15**	**7.09**	**4.96**	**3.36**	**6.11**	**5.86**	**8.36**	**5.55**	**3.33**	**2.64**	**5.64**	**5.72**	**8.00**	**4.84**
	LSD (Treatment)	0.19			LSD (Location X Genotype)			1.12			CV (Treatment) %			23.10					
	LSD (Location X Treatment)	0.50			LSD (Treatment X Genotype)			0.74			CV (Residual) %			20.79					
	LSD (Genotype)	0.42			LSD (L X G X T)			1.95											

Table 6.4.9 Effect of osmotic stress on shoot length (cm) of 20 rice genotypes during *Kharif* 2022 at different locations.

S.No.	Genotypes	Control						1% Mannitol						2% Mannitol					
		CTC	KJT	MTU	TTB	PTB	Mean	CTC	KJT	MTU	TTB	PTB	Mean	CTC	KJT	MTU	TTB	PTB	Mean
1	CR4423-8	18.28	8.19	18.54	10.83	11.45	**13.88**	19.90	7.26	16.33	11.33	12.56	**13.23**	12.33	6.95	9.39	7.50	13.67	**10.25**
2	IC-256564	23.22	6.35	19.65	11.33	13.29	**14.80**	20.13	5.92	14.39	13.33	13.67	**13.75**	14.64	4.29	12.00	.	9.54	**10.18**
3	CR4423-10	16.10	5.92	16.71	7.50	9.33	**10.56**	15.87	5.18	12.71	.	6.05	**8.76**	11.07	3.09	10.89	.	8.87	**6.68**
4	FL 478	20.13	8.68	14.24	8.33	13.91	**13.23**	16.49	7.06	14.14	8.50	11.76	**12.47**	11.06	6.52	12.29	7.83	12.82	**10.05**
5	CR 4111-B-1-4-S-1-Sub-B	17.41	6.85	15.20	8.17	8.47	**12.28**	16.38	6.20	10.08	6.83	7.37	**10.56**	15.41	5.61	9.69	3.33	8.82	**8.29**
6	VANDANA	17.28	9.41	23.54	12.67	17.02	**15.61**	20.23	8.56	17.49	10.50	15.97	**14.17**	19.09	7.73	14.74	9.67	20.59	**13.03**
7	CR4423-17	11.50	8.17	14.38	13.17	10.70	**11.26**	16.26	7.34	11.00	8.17	14.26	**10.16**	11.46	6.79	9.99	3.00	11.13	**9.27**
8	NAVEEN	9.68	9.28	14.03	6.00	11.92	**10.25**	13.37	5.48	11.06	7.33	10.52	**10.10**	9.18	4.63	10.33	7.33	9.50	**8.38**
9	CR 3483-29-M-4-B-Sub-79-1	13.42	6.83	14.36	10.50	10.24	**11.20**	16.90	5.73	11.54	9.33	9.24	**10.42**	11.96	4.71	10.14	5.50	13.13	**9.13**
10	PANTARA	13.69	11.21	21.31	11.00	16.38	**15.14**	20.20	10.05	19.55	11.67	15.36	**15.02**	15.58	6.31	19.16	5.50	16.52	**13.15**
11	CR4423-20	15.51	6.85	11.64	9.83	8.77	**10.01**	16.66	6.18	10.44	3.83	10.25	**10.37**	11.99	5.37	10.11	.	10.28	**10.85**
12	IR 20	14.50	8.56	13.31	7.83	9.02	**10.05**	11.09	5.40	12.34	9.17	9.63	**8.98**	7.62	4.47	11.08	6.75	8.98	**7.30**
13	CR4423-75	18.29	6.89	13.79	8.17	9.99	**11.94**	11.82	6.64	13.16	9.50	9.33	**10.78**	9.58	6.40	12.69	6.00	12.26	**9.53**
14	CR 4111-B-1-10-S-1-Sub-B	20.14	6.57	13.61	9.67	9.62	**11.54**	13.00	5.33	12.41	10.17	7.97	**9.86**	14.30	3.12	12.24	.	9.71	**9.62**
15	AC 1125A	21.50	10.09	19.60	13.50	18.08	**15.99**	15.16	9.70	15.95	9.33	13.03	**13.55**	13.07	6.55	12.80	10.17	18.04	**13.09**
16	CR4423-101	17.26	8.13	17.63	8.50	13.98	**12.29**	11.40	5.51	11.98	8.33	14.33	**10.49**	10.47	4.88	11.60	6.67	14.90	**10.48**
17	CR4423-111	20.33	8.81	20.76	5.17	10.16	**12.27**	12.71	6.74	11.79	4.67	11.04	**9.19**	11.46	6.21	10.44	.	15.23	**9.35**
18	AC847A	23.69	9.19	24.53	13.17	20.50	**18.33**	18.57	6.27	17.65	11.50	17.34	**14.88**	17.98	5.33	16.40	10.00	16.84	**14.38**
19	IC-256508	22.19	10.31	21.00	12.50	18.18	**15.71**	20.46	6.21	15.81	10.00	14.45	**13.79**	15.17	3.34	13.63	11.00	16.12	**12.06**
20	IC-256605	20.42	8.56	23.93	13.83	12.63	**15.64**	19.81	6.04	12.36	11.83	15.53	**13.81**	12.28	5.61	12.18	9.00	18.10	**12.16**
	Grand Mean	**17.73**	**8.24**	**17.59**	**10.08**	**12.68**	**13.10**	**16.32**	**6.64**	**13.61**	**9.23**	**11.98**	**11.74**	**12.78**	**5.40**	**12.09**	**7.28**	**13.25**	**10.40**
	LSD (Treatment)	0.33			LSD (Location X Genotype)			2.08			CV (Treatment) %			19.97					
	LSD (Location X Treatment)	0.88			LSD (Treatment X Genotype)			1.36			CV (Residual) %			19.03					
	LSD (Genotype)	0.78			LSD (L X G X T)			3.60											

Table 6.4.10 Effect of osmotic stress on total chlorophyll content (mg/g DW) of 20 rice genotypes during *Kharif* 2022 at different locations.

S.No.	Genotypes	Control						1% Mannitol						2% Mannitol					
		CTC	KJT	MTU	TTB	PTB	Mean	CTC	KJT	MTU	TTB	PTB	Mean	CTC	KJT	MTU	TTB	PTB	Mean
1	CR4423-8	2.501	1.460	1.750	2.575	0.346	**1.726**	1.953	0.825	1.407	2.160	0.554	**1.380**	0.692	0.590	1.297	1.395	0.220	**0.839**
2	IC-256564	2.399	1.277	2.103	2.535	0.306	**1.724**	1.600	0.705	1.703	1.850	0.423	**1.256**	1.605	0.519	1.457	-	0.574	**1.039**
3	CR4423-10	2.415	1.190	2.123	1.900	0.189	**1.563**	2.037	0.677	1.410	1.088	0.155	**1.073**	1.830	0.467	1.230	-	0.777	**1.076**
4	FL 478	2.491	1.580	1.807	2.525	0.233	**1.727**	1.875	0.870	1.573	2.170	0.769	**1.452**	1.080	0.691	1.380	1.400	0.708	**1.052**
5	CR 4111-B-1-4-S-1-Sub-B	2.530	1.207	2.113	2.760	0.239	**1.770**	2.570	0.671	1.150	2.125	0.287	**1.361**	2.307	0.543	1.173	1.550	0.493	**1.213**
6	VANDANA	2.744	1.623	2.220	2.125	0.378	**1.818**	1.458	0.959	1.450	1.840	0.404	**1.222**	1.086	0.708	1.237	1.325	0.382	**0.948**
7	CR4423-17	2.342	1.460	2.217	1.900	0.311	**1.646**	2.397	0.713	1.340	1.400	0.215	**1.213**	1.391	0.675	1.187	1.340	0.912	**1.101**
8	NAVEEN	2.461	1.590	1.900	2.760	0.170	**1.776**	2.027	1.083	1.340	1.850	0.333	**1.327**	1.915	0.697	1.197	1.490	0.504	**1.161**
9	CR 3483-29-M-4-B-Sub-79-1	2.561	1.330	1.997	1.920	0.254	**1.612**	2.211	0.692	1.283	1.535	0.112	**1.167**	1.883	0.581	1.143	1.425	0.461	**1.099**
10	PANTARA	2.072	1.713	1.970	2.730	0.791	**1.855**	2.709	0.959	1.583	2.250	0.387	**1.578**	1.529	0.724	1.390	2.160	0.878	**1.336**
11	CR4423-20	2.427	1.137	1.717	2.380	0.129	**1.558**	2.777	0.631	1.190	1.925	0.304	**1.365**	1.738	0.491	1.043	-	0.252	**0.881**
12	IR 20	2.015	1.523	2.207	2.340	0.218	**1.661**	3.282	0.768	1.263	1.850	0.371	**1.507**	1.507	0.737	1.180	1.660	0.609	**1.139**
13	CR4423-75	2.357	1.170	2.090	2.160	0.489	**1.653**	2.440	0.643	1.527	1.845	0.162	**1.323**	1.751	0.475	1.253	1.665	0.424	**1.114**
14	CR 4111-B-1-10-S-1-Sub-B	3.610	1.153	2.260	2.115	0.177	**1.863**	2.573	0.591	1.427	1.790	0.395	**1.355**	1.443	0.490	0.900	-	0.672	**0.877**
15	AC 1125A	2.943	1.650	2.037	2.560	0.253	**1.888**	2.505	0.994	1.393	2.270	0.634	**1.559**	1.386	0.838	1.137	1.530	1.090	**1.196**
16	CR4423-101	2.761	1.360	2.140	2.180	0.314	**1.751**	2.518	0.719	1.513	1.990	0.327	**1.414**	1.170	0.560	0.910	1.440	0.226	**0.861**
17	CR4423-111	2.997	1.463	1.840	2.130	0.195	**1.725**	1.226	0.785	1.110	1.505	0.192	**0.964**	1.935	0.779	0.963	-	0.091	**0.942**
18	AC847A	2.646	1.450	2.077	2.490	0.251	**1.783**	1.777	0.789	1.480	2.445	0.398	**1.378**	2.173	0.686	1.177	1.240	0.250	**1.105**
19	IC-256508	2.394	1.707	2.137	2.120	0.748	**1.821**	2.577	1.001	1.430	1.485	0.439	**1.386**	2.232	0.874	1.250	1.375	0.172	**1.180**
20	IC-256605	2.583	1.303	2.227	3.120	0.330	**1.913**	2.233	0.659	1.517	1.680	0.370	**1.292**	2.608	0.624	1.263	1.350	0.075	**1.184**
	Grand Mean	**2.562**	**1.417**	**2.047**	**2.366**	**0.316**	**1.742**	**2.237**	**0.787**	**1.405**	**1.853**	**0.362**	**1.329**	**1.663**	**0.638**	**1.188**	**1.490**	**0.488**	**1.073**
	LSD (Treatment)	0.205290			LSD (Location X Genotype)			0.295647			CV (Treatment) %			86.96					
	LSD (Location X Treatment)	0.459042			LSD (Treatment X Genotype)			0.229007			CV (Residual) %			23.03					
	LSD (Genotype)	0.132217			LSD (L X G X T)			0.512075											

6.5 Screening of Rice Genotypes for Submergence Tolerance

Locations: NRRI, TTB, PTB and CBT

In the era of global climate change, rice cultivation and production can be challenged by the incidence of multiple abiotic stresses. Depending on the level of water it can be categorised into submergence, waterlogging and stagnant flooding. As these stresses severely cut down the overall rice production, therefore, recent research progresses are trying to identify the new avenues for global food security. In case of complete submergence stress, the plant canopy is fully immersed under water, while in waterlogging or stagnant flooding stress a portion of the plant canopy is maintained above the surface of water. Under these conditions, plants can experience different type of additional stresses, which comes in simultaneously or sequentially causing severe plant growth retardation. Plants generally followed different strategies to overcome these adversities. Among them, quiescence is an important survival adaptation to withstand complete submergence, while escape strategy facilitates the plant's stem and leaf elongation to overcome waterlogging or stagnant flooding stress. Keeping this in view, during *Kharif* 2022, a trial was formulated to evaluate promising rice genotypes for their tolerance to two weeks of complete submergence.

The trial was conducted at four different AICRIP centres i.e., Titabar (TTB), Assam; NRRI (CTC), Odisha; Patambi (PTB), Kerala and Coimbatore (CBT), T.N. Fifteen promising rice genotypes (including tolerant and susceptible checks) were tested for 14 days of complete submergence and the key tolerance traits were recorded across the locations. Among them a few lines were not germinated at CBT centre. The mean data of all four locations showed significant variability between the studied genotypes for all four studied traits *viz*., survival rate (%), elongation ability (%), final plant height (cm) and leaf starch concentration after de-submergence. The tolerant check FR13A recoded the highest survival rate of 93.8% (mean of all locations), while it was only 22% and 26.5% in susceptible checks Naveen and Nipponbare, respectively. Among the tested lines, highest survival rate was observed in AC289 (83.9%), followed by AC1017A (79.8%), AC1303B (78.9%), AC39460 (66.7%), CR4423-17 (65.5%), CR 3477-1-M-1-B-Sub-44 (62.2%), AC931 (59.5%) **(Fig. 6.5.1; Table 6.5.1)**. Out 15 tested entries, a total of 8 accessions showed survival rate of >60% in the present multi-location testing. Four other entries (CR4423-8, CR 3477-1-M-1-B-Sub-48, CR 3483-1-M-4-B-Sub-21, CR4423-20) showed moderate level of tolerance ranging from 42 – 46% survival rate. Among different locations, on an average highest survival rate was observed at CBT location (81%), followed by TTB (70%), CTC (49%) and PTB (48%).

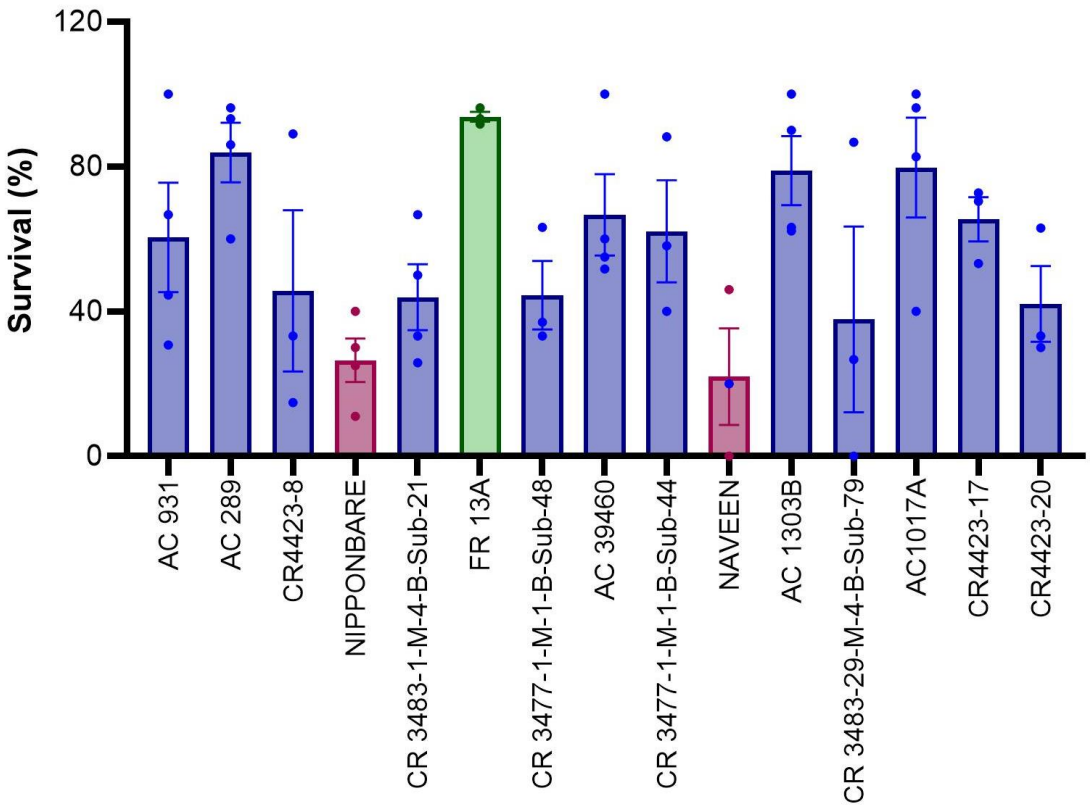


Fig. 6.5.1 *Mean survival rate (%) of rice genotypes under 14 days of complete submergence tested at three different locations. Error bars representing SE (mean) of all locations and scattered dots are representing mean of individual location.*

Underwater elongation of internodes and subsequent increase in plant height is a key feature of submergence tolerance ability of a genotype governed by *SUB1A* gene action. True submergence tolerant lines usually adopt a quiescence strategy and limits its underwater elongation and thereby preserve energy and carbohydrate reserve that are essential for post submergence recovery and survival. Based on the data from all locations, a significant increase in plant height was observed as a result of submergence stress, although the extent of increase varied significantly between the tested lines **(Fig. 6.5.2; Table 6.5.2)**. The mean plant height after de-submergence ranged from 53.0 – 71.8 cm in the tested lines. The least plant height after stress was observed in CR4423-20, while the highest was observed in AC1017A. The tolerant check FR13A recorded 58.0 cm plant height after submergence, while it was 67.9 cm in susceptible check Nipponbare. Location wise highest average plant height was observed at PTB centre (85.5 cm), followed by NRRI (77.0 cm), CBT (73.6 cm) and TTB (51.0 cm). The multi-location results suggest the tested genotypes followed quiescence strategy and remained under water for the complete period of submergence stress, which might be due to *SUB1A* gene action.

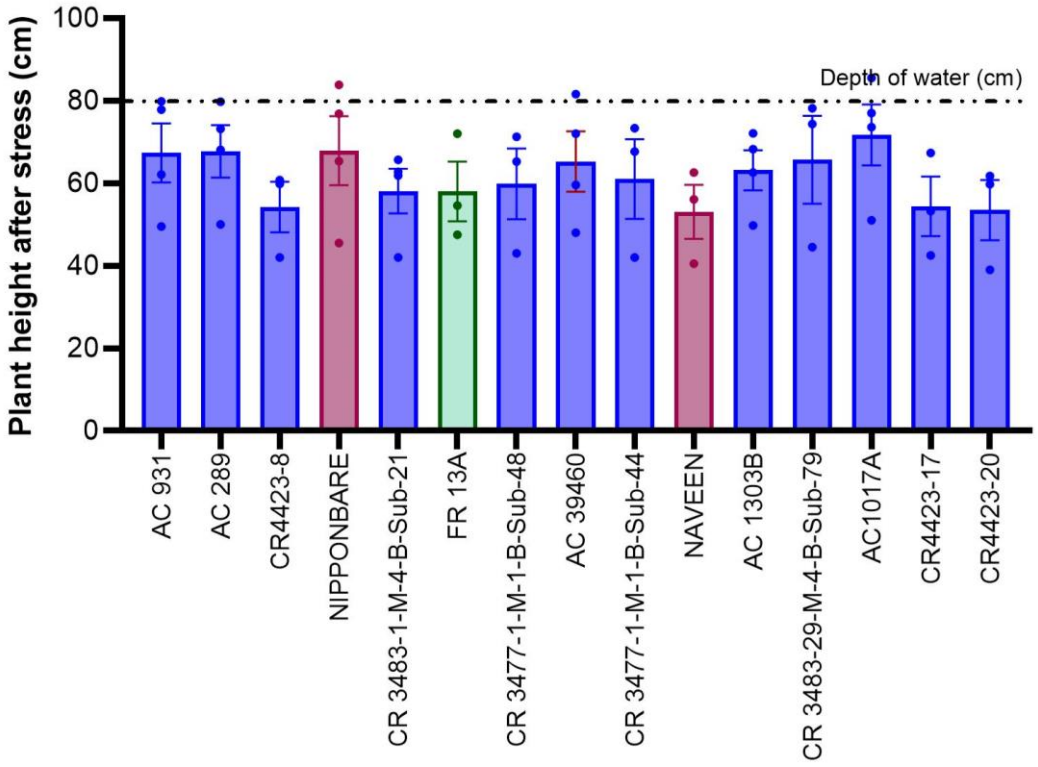


Fig. 6.5.2 *Mean plant height (cm) of rice genotypes under 14 days of complete submergence tested at three different locations. Error bars representing SE (mean) of all locations and scattered dots are representing mean of individual location.*

Similarly, the elongation ability (EA) of these genotypes were also varied significantly. The mean EA of all 5 lines was 41%, while the EA of FR13A, the tolerant check was found to be (25.2%) and ~38% in susceptible checks Naveen and Nipponbare (**Fig. 6.5.3; Table 6.5.3)**. Interestingly, one entry CR4423-20 showed even less internode elongation (EA of 24.2%) than FR13A in our multi-location testing, although its survival was moderate (42.1%). Although most of the promising lines (showing >60% survival rate) showed an EA of 25-40%, but two prominent entries AC1017A and AC289 showed 50.1 and 64.6% EA with 79.7 and 83.9% survival, respectively under two weeks of complete submergence. It suggests that these genotypes may possess both SUB1 and SNORKEL QTLs or some other QTLs and hence they showed relatively higher internode elongation under stress. Nonetheless, as the final plant height of these two genotypes were still less the height of the water maintained to impose submergence stress, so they may still be considered as true submergence tolerant lines.

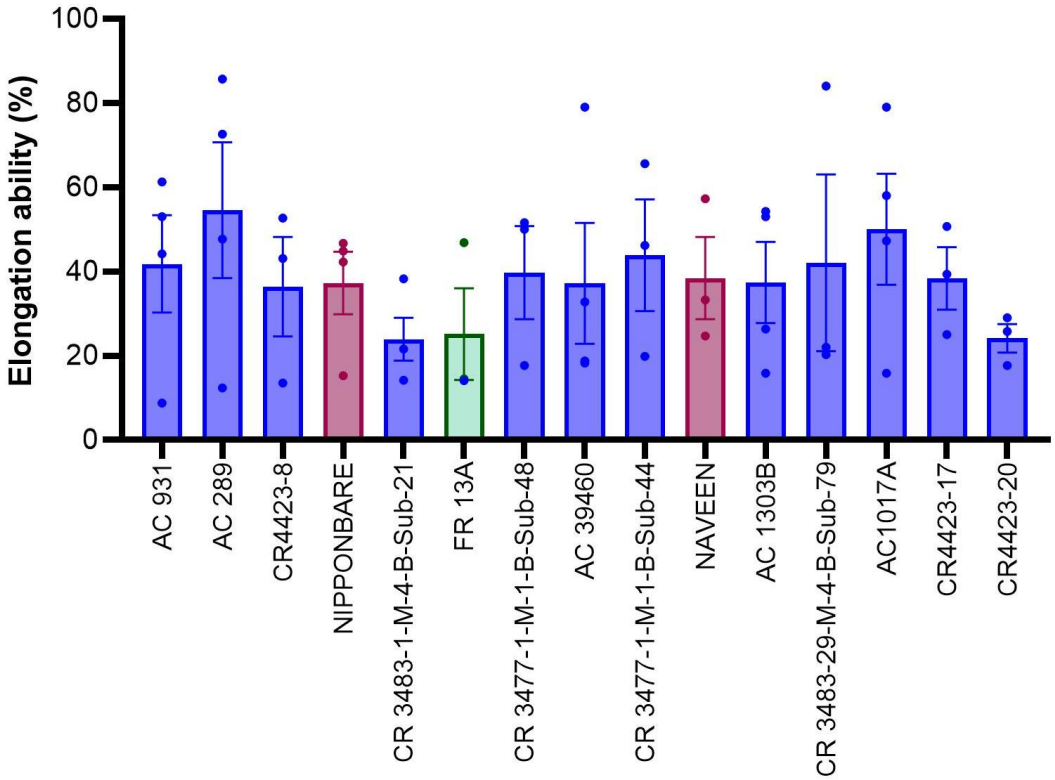


Fig. 6.5.3 *Mean elongation ability (%) of rice genotypes under 14 days of complete submergence tested at three different locations. Error bars representing SE (mean) of all locations and scattered dots are representing mean of individual location.*

The carbohydrate reserve of the leaf and its underwater depletion during the course of submergence plays a key role in submergence tolerance in rice. Usually, the *SUB1* containing submergence tolerant genotypes possess a greater initial leaf starch content and also can its prevent its depletion to certain extent, thereby reserving enough energy for regeneration when the flood water recedes. In the present study, we had estimated the leaf starch concentrations of all the 15 entries before and after submergence at two locations PTB and CTC. We found that FR13A and AC1017A was not only having the highest leaf starch conc. (~60 mg g^{-1} leaf DW) before submergence, but also could maintain highest level of leaf starch conc. after submergence (46.5 and 38.1 mg g^{-1} leaf DW, respectively) (**Fig. 6.5.4; Table 6.5.4)**. On the contrary Naveen was having least leaf starch concentration (10.5 mg g^{-1} leaf DW), followed by CR 3483-29-M-4-B-Sub-79, CR 3477-1-M-1-B-Sub-48, AC931 etc. In general, we observed a significant correlation (R^2 = 0.4989) between survival rate of leaf starch concentration (after stress) of the tested lines taking into consideration of the data of all the genotypes across two locations **(Fig. 6.5.5)**.

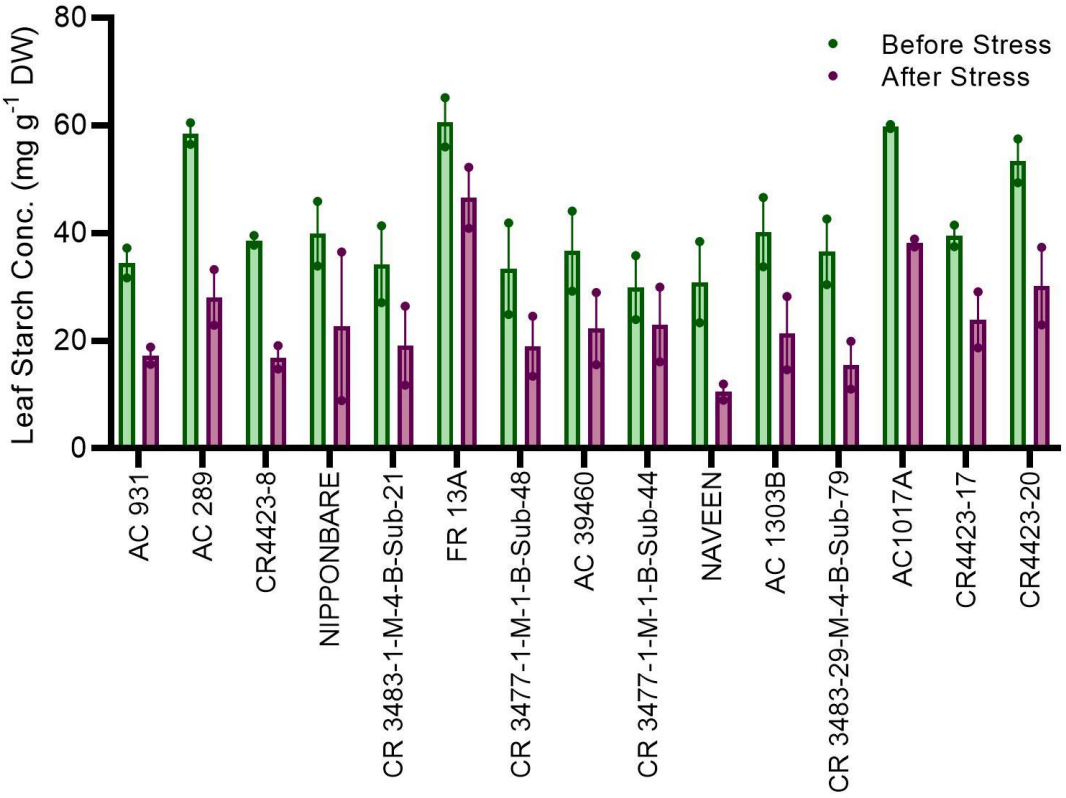


Fig. 6.5.3 *Mean elongation ability (%) of rice genotypes under 14 days of complete submergence tested at three different locations. Error bars representing SE (mean) of all locations and scattered dots are representing mean of individual location.*

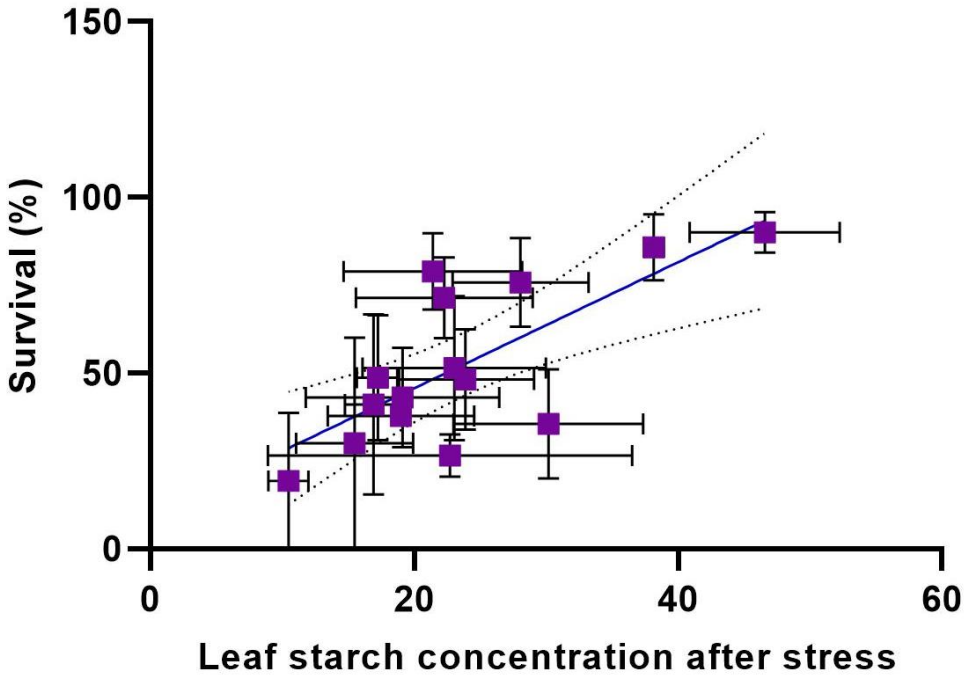


Fig. 6.5.5 *An XY-scatter plot showing simple linear regression between survival rate and elongation ability of rice genotypes under 14 days of complete submergence tested at three different locations. Error bars representing SE (mean) of all locations.*

Summary & Conclusion:

- Fifteen different rice genotypes were tested in the trial conducted at four different locations (NRRI, TTB, PTB and CBT).
- The center wise mean survival rate (%) varied from 48.2% (PTB) to 81.0% (CBT) with mean of 61.0% for all genotypes across all the locations.
- Among the tested entries, three genotypes i.e., AC289 (83.9%), AC1017A (79.70%) and AC1303B (74.7%) were identified as highly tolerant to submergence stress on par to the tolerant check FR13A.
- Four other entries *viz*. AC39460, CR4423-17, CR 3483-29-M-4-B-Sub-79 and AC931 showed 60-70% survival rate and can be considered as tolerant to complete submergence.
- These entries *viz*., CR4423-8, CR 3483-1-M-4-B-Sub-21, CR 3477-1-M-1-B-Sub-48, CR4423-20 showed 40-50% survival rate and can be considered as moderately tolerant to submergence stress.
- It was observed that most of highly tolerant and tolerant entries showed very less underwater internode elongation and also could maintain leaf starch level to a higher extent after de-submergence. But, there were two entries AC1017A and AC289, which showed relatively higher stem elongation along with ~80% survival rate. These genotypes may be used as potential donors for improving submergence tolerance trait in high yielding cultivars.

Table 6.5.1 Effect of 14 days of submergence stress on survival rate (%) on rice genotypes during *Kharif* 2022 at different locations. NG: Not Germinated

S.No.	Genotypes	NRRI	CBT	PTB	TTB	Grand Mean
1	AC 931	44.5	100.0	30.7	66.7	**60.5**
2	AC 289	96.3	93.3	60.0	86.0	**83.9**
3	CR4423-8	14.8	NG	33.3	89.0	**45.7**
4	NIPPONBARE	11.1	40.0	30.0	25.0	**26.5**
5	CR 3483-1-M-4-B-Sub-21	25.9	33.3	66.7	50.0	**44.0**
6	FR 13A	96.3	NG	93.3	91.7	**93.8**
7	CR 3477-1-M-1-B-Sub-48	37.0	NG	33.3	63.3	**44.6**
8	AC 39460	51.8	100.0	60.0	55.0	**66.7**
9	CR 3477-1-M-1-B-Sub-44	58.1	NG	40.0	88.3	**62.2**
10	NAVEEN	0.0	NG	20.0	46.0	**22.0**
11	AC 1303B	62.2	100.0	63.3	90.0	**78.9**
12	CR 3483-29-M-4-B-Sub-79	0.0	NG	26.7	86.7	**37.8**
13	AC1017A	96.3	100.0	40.0	82.7	**79.7**
14	CR4423-17	70.4	NG	53.3	72.7	**65.5**
15	CR4423-20	63.0	NG	33.3	30.0	**42.1**
	Mean	**48.8**	**81.0**	**47.8**	**69.8**	**58.9**
	LSD (Genotype)					**10.91**
	LSD (Location × Genotype)					**21.82**
	CV (Residual) %					**22.88**

Table 6.5.2 Effect of 14 days of submergence stress on plant height (in cm after stress) on rice genotypes during *Kharif* 2022 at different locations. NG: Not germinated

S.No.	Genotypes	NRRI	CBT	PTB	TTB	Grand Mean
1	AC 931	79.9	62.1	77.9	49.5	**67.3**
2	AC 289	73.2	68.1	79.8	50.0	**67.8**
3	CR4423-8	59.9	NG	60.8	42.0	**54.2**
4	NIPPONBARE	76.9	65.4	83.9	45.5	**67.9**
5	CR 3483-1-M-4-B-Sub-21	61.9	65.7	62.8	42.0	**58.1**
6	FR 13A	54.6	NG	72.0	47.5	**58.0**
7	CR 3477-1-M-1-B-Sub-48	65.3	NG	71.3	43.0	**59.9**
8	AC 39460	81.6	59.6	72.0	48.0	**65.3**
9	CR 3477-1-M-1-B-Sub-44	73.4	NG	67.7	42.0	**61.0**
10	NAVEEN	62.6	NG	56.1	43.5	**54.0**
11	AC 1303B	62.6	68.3	72.1	49.8	**63.2**
12	CR 3483-29-M-4-B-Sub-79	78.2	NG	74.4	44.5	**65.7**
13	AC1017A	77.0	73.6	85.5	51.0	**71.8**
14	CR4423-17	67.4	NG	53.3	42.5	**54.4**
15	CR4423-20	59.8	NG	61.8	39.0	**53.5**
	Mean	**79.9**	**62.1**	**77.9**	**49.5**	**67.3**
	LSD (Genotype)					**8.95**
	LSD (Location × Genotype)					**17.91**
	CV (Residual) %					**26.92**

Table 6.5.3 Effect of 14 days of submergence stress on elongation ability (%) on rice genotypes during *Kharif* 2022 at different locations. NG: Not germinated

S.No.	Genotypes	NRRI	CBT	PTB	TTB	Grand Mean
1	AC 931	53.0	44.2	61.3	8.8	**41.8**
2	AC 289	47.7	112.6	85.7	12.4	**64.6**
3	CR4423-8	52.7	NG	43.1	13.5	**36.5**
4	NIPPONBARE	46.7	42.3	44.9	15.3	**37.3**
5	CR 3483-1-M-4-B-Sub-21	14.2	138.3	21.6	21.7	**48.9**
6	FR 13A	14.1	NG	46.9	14.5	**25.2**
7	CR 3477-1-M-1-B-Sub-48	51.6	NG	50.0	17.7	**39.8**
8	AC 39460	79.0	32.8	18.3	18.8	**37.2**
9	CR 3477-1-M-1-B-Sub-44	65.6	NG	46.2	19.9	**43.9**
10	NAVEEN	57.3	NG	33.3	24.7	**38.5**
11	AC 1303B	54.3	53.0	26.4	15.9	**37.4**
12	CR 3483-29-M-4-B-Sub-79	84.0	NG	22.0	20.3	**42.1**
13	AC1017A	47.3	58.0	79.0	15.9	**50.1**
14	CR4423-17	50.7	NG	39.4	25.0	**38.4**
15	CR4423-20	29.0	NG	17.7	25.8	**24.2**
	Mean	**49.8**	**68.7**	**42.4**	**18.0**	**41.0**
	LSD (Genotype)					**3.90**
	LSD (Location × Genotype)					**7.80**
	CV (Residual) %					**7.76**

Table 6.5.4 Effect of 14 days of submergence stress on leaf starch concentration (mg g^{-1} leaf dry weight) on rice genotypes during *Kharif* 2022 at different locations.

S.No.	Genotypes	Before Stress			After Stress		
		NRRI	PTB	Mean	CTC	PTB	Mean
1	AC 931	31.71	37.20	34.45	15.66	18.85	17.26
2	AC 289	56.53	60.49	58.51	33.23	22.90	28.06
3	CR4423-8	37.74	39.55	38.64	14.76	19.09	16.92
4	NIPPONBARE	33.90	45.93	39.92	8.91	36.52	22.71
5	CR 3483-1-M-4-B-Sub-21	27.12	41.35	34.23	11.77	26.44	19.11
6	FR 13A	56.03	65.18	60.61	40.89	52.26	46.57
7	CR 3477-1-M-1-B-Sub-48	24.93	41.89	33.41	13.45	24.55	19.00
8	AC 39460	29.26	44.07	36.67	15.58	28.98	22.28
9	CR 3477-1-M-1-B-Sub-44	23.96	35.84	29.90	16.08	29.99	23.04
10	NAVEEN	23.37	38.40	30.89	8.94	11.99	10.47
11	AC 1303B	33.74	46.62	40.18	14.65	28.20	21.43
12	CR 3483-29-M-4-B-Sub-79	30.44	42.65	36.55	11.05	19.90	15.48
13	AC1017A	59.44	60.14	59.79	37.40	38.90	38.15
14	CR4423-17	41.52	37.47	39.49	18.72	29.07	23.89
15	CR4423-20	49.38	57.49	53.44	22.99	37.36	30.18
	Mean	**37.27**	**46.28**	**41.78**	**18.94**	**28.33**	**23.64**
	LSD (Treatment)				2.44		
	LSD (Genotype)				2.99		
	LSD (Location X Treatment)				3.46		
	LSD (Location X Genotype)				4.23		
	LSD (Treatment X Genotype)				4.23		
	LSD (Location X Treatment X Genotype)				5.98		
	CV (Treatment) %				18.06		
	CV (Residual) %				11.30		

6.6 Screening of rice genotypes for tolerance to low light stress

Locations: IIRR, KJT, MTU, PNR, TTB, RPUR and NRRI

Agriculture is nothing but the utilization of solar radiation with soil moisture and nutrients. Light is the single most important environmental factors regulating various plant growth and development processes. Therefore, duration, intensity and type of light are equally important in respect of various processes of plant such as photosynthesis and thus determine the crop yield. Rice gain yield and quality are regulated by light intensity. Low light reduces tillering, panicle and spikelet numbers, and grain weight and quality. Low light during the grain-filling stage decreased the starch synthase activity in grains, which directly inhibits grain filling and enhances the occurrence of chalky rice. Thus, low light intensity is a critical abiotic stress that reduces rice yield and quality. Rice yield is comparatively low during the *kharif* season in eastern and north eastern regions of India; primarily due to cloudy days with inadequate light intensity. It is reported that grain yield correlates positively with solar radiation especially during the reproductive stage. It is estimated that accumulative solar radiation of 200 hours and bright sunshine during 30 days before harvest could be optimum for grain yield. But low light intensity (200-300 cal cm^{-2} day^{-1}) for few hours of bright sun shine (mean about 4 hrs day^{-1}) prevailing during *kharif* season is a major limitation for rice production.

The west coast and major parts of eastern and north eastern India receive very low sunshine during monsoon period, where in the yield of rice crops are greatly reduced due to low sunshine. Keeping the above points in view, and low productivity levels of rice eastern and north eastern India a trial was constituted in the 51^{th} ARGM to screen elite germplasm from AICRIP trials for low light stress tolerance and identify donors to improve the breeding program in low light stress tolerance environment. It is also established that poor grain yield during wet season is attributed to low incidental light, which reduces grain number per panicle in short duration rice varieties, increase spikelet sterility in medium duration varieties and decreases panicle number in long duration varieties. Low light stress at anthesis leads to high spikelet sterility and low harvest index because of poor grain filling in rice attributed to unbalanced source sink relationship. The trial was conducted at 7 locations with 14 entries from AVT-2 (RSL) including Swarnaprabha as tolerant and IR8 as susceptible checks. The trial was conducted with split plot (RCBD) design with 3 replications with light regimes as main plot treatment and genotypes as sub plot treatments. Low light was imposed immediately after transplanting by enclosed the plants in shade net (50% transmittance). The shade net was supported by metal rods/bamboo poles.

Table No. 6.6.1 shows that low light stress did not result in significant variations in days to flowering in the tested genotypes. There was no variation in mean days to 50% flowering under controlled low light stress condition. Days to 50% flowering was more at TTB and IIRR followed by KJT and PNR. The mean day to 50% flowering varied from 84-112 days under control condition and 84-118 days under low light stress condition. Table No. 6.6.2 shows days to maturity which also varied in similar manner to days to 50% flowering. Days to maturity ranged from 124-148 and 124-145 days under control and low light stress respectively.

Table No. 6.6.3 and 6.6.4 represents the influence of low light stress on the chlorophyll content at panicle initiation and flowering stages respectively at different locations. Chlorophyll content increased under low light stress in all the genotypes and mean chlorophyll content was more in low light stress conditions than the control (Figure 6.6.1a). IR-8 recorded highest percent increase in total chlorophyll content followed by Swarna sub1, IET 31288 and IET 30356 (Figure 6.6.1b). When compared to all locations KJT location recorded highest chlorophyll content under low light stress at flowering stage. Mean chlorophyll content varied from 1.25 to 4.16 mg/g fw under control conditions and from 1.42 to 5.56 under low light stress.

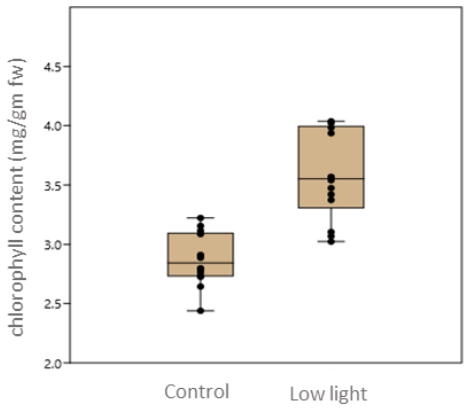


Figure 6.6.1a: Variation in mean chlorophyll content under control and low light stress conditions in the tested genotypes.

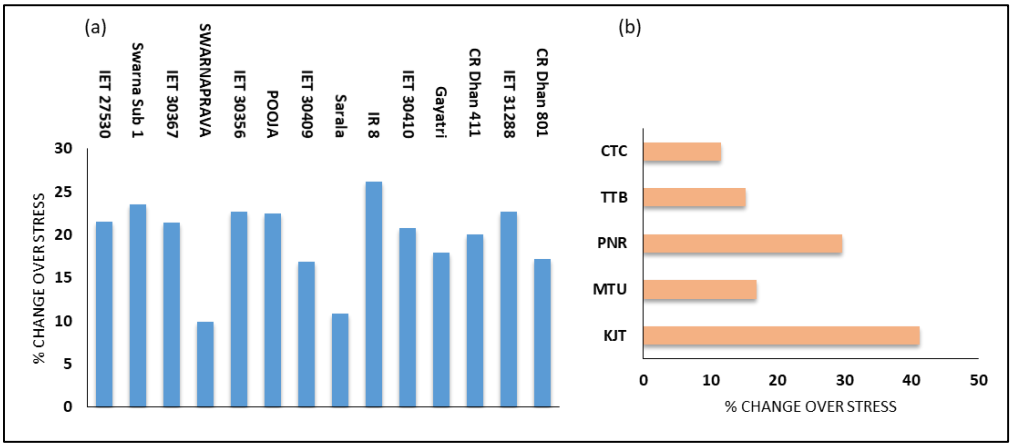


Figure 6.6.1b: Influence of Low-Light Stress on total chlorophyll content: a) mean of all the genotypes b) mean of all the locations.

The mean plant height under control conditions was 113 cm while under lowlight stress, it was 118 cm (Table 6.6.5). Table No. 6.6.6 presents, the effects of low light stress on shoot weight (g/m2) in different rice genotypes. It was found that the mean shoot weight under control was 890 g/m2 and 1076 g/m2 under low light stress. Low light stress affected panicle weight at flowering stage (Table 6.6.7). Under low light conditions, significant reduction in panicle weight across the locations and all entries under the study was observed. Table No. 6.6.8 presents the data pertaining to panicle number/m^2. The mean value of panicle number per m2 greatly reduced under low light. It ranged from 209-501 in control situation and under low light, it ranged from 160-425.

Table No. 6.6.9 presents grain number per panicle under low light and control conditions. The mean grain number per panicle was 121 and 108 under control and low light stressed genotypes respectively. Table No. 6.6.13 represent the mean grain yield under control and low light stress. The mean values ranged from 471-869 g/m^2 under control condition and highest grain yield was obtained at IIRR and lowest was obtained at NRRI under control conditions. While under lowlight stress, the grain yield ranged from 224-495 g/m^2. The percent decrease in grain yield over control was highest in IR 8 followed by IET-30409 while CR Dhan 411 recorded the lowest decrease in grain yield even in comparison to the tolerant check Swarnaprabha (Figure 6.6.2). RPR center recorded highest percent decrease in the grain yield followed by PNR. While the performance of IET-31288 was at par with the tolerant check Swarnaprabha.

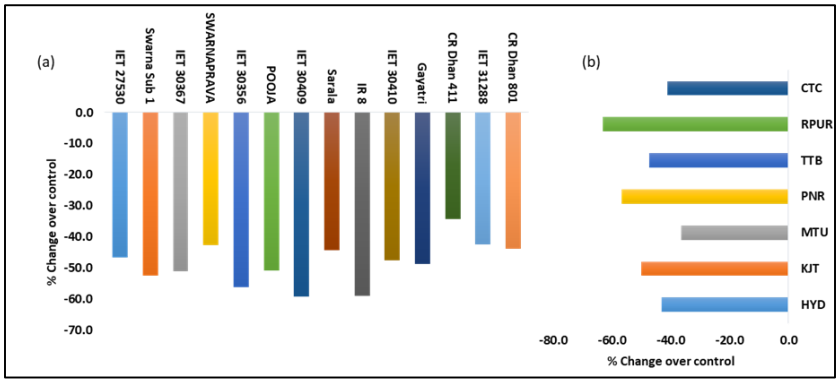


Figure 6.6.2: Influence of Low-Light Stress on grain yield g/m^2: a) mean of all the genotypes b) mean of all the locations.

Table No. 6.6.14 represent the effect of low light stress on Total Dry Matter (TDM). The mean TDM under control conditions was 1679 g/m^2 while it decreased to 1202 g/m^2 under low light stress. Under low light conditions, Swarnaprabha recorded lowest percent decrease over control in TDM followed by CR Chan 411 and CR Dhan 801 (Figure 6.6.3).

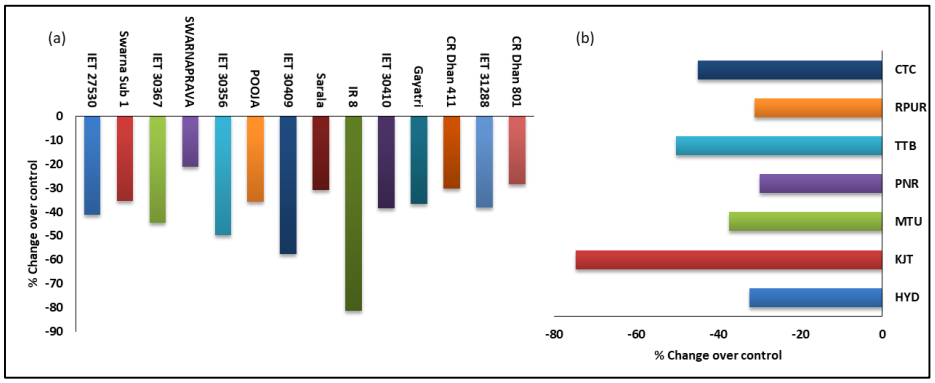


Figure 6.6.3: Influence of Low-Light Stress on total dry matter (g/m^2): a) mean of all the genotypes b) mean of all the locations.

The 1000 grain weight/test weight is represented in Table. 6.6.15. The mean value of test weight under control condition was 21 g and 19 g under low light. Table. 6.6.16 represents the harvest index (HI) under low light stress and control conditions. HI under control condition was 36% which decreased to 28% under low light stress which shows that there was a significant drop in harvest index when genotypes were exposed to low light conditions. The values were highly significant for location into treatments, genotypes and location into genotypes. CR Dhan 411 recorded lowest decrease over control which was much better when compared to tolerant check Swarnaprabha. IET 30356, IET 30367 and Swarna-Sub1 maintained HI at par with Swarnaprabha (Fig: 6.6.4).

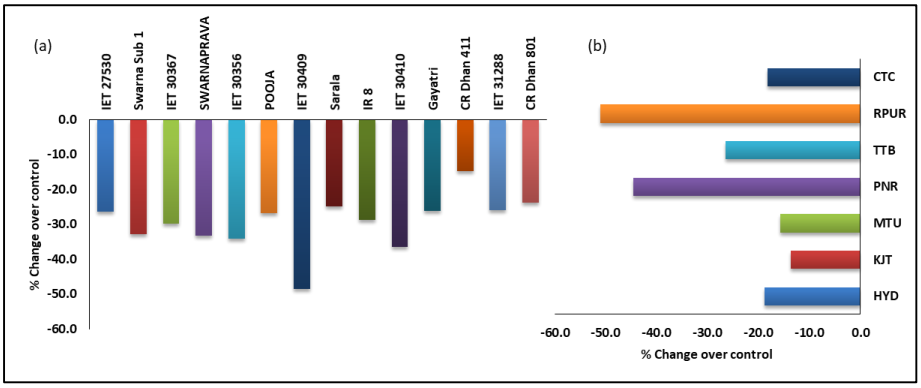


Figure 6.6.4: Influence of Low-Light Stress on harvest index: a) mean of all the genotypes b) mean of all the locations.

Summary and conclusions

- The present study was formulated during 51st AGRM of AICRIP to identify and understand low light tolerance. The trial was conducted at 7 locations with 14 entries including Swarnaprabha as the tolerant check and IR8 as the susceptible check.
- Low light stress resulted in significant loss in yield (30 to 60% in entries) and its components.
- The entries IET-27530 CR Dhan 411 CR Dhan 801 IET-31288 recorded on par grain yield under low light stress when compared with the Swarnaprabha suggesting that these genotypes have better tolerance to lowlight stress.

Table 6.6.1 Influence of Low-Light Stress on Days to flowering in different rice varieties during Kharif 2022 at different centers

S.No.	Genotypes	Treated (Low light)							Grand Mean	Control							Grand Mean
		IIRR	KJT	MTU	PNR	TTB	RPUR	NRRI		IIRR	KJT	MTU	PNR	TTB	RPUR	NRRI	
1	IET 27530	114	112	91	98	134	90	85	103	112	116	86	93	121	90	85	100
2	Swarna Sub 1	125	109	101	95	115	88	80	102	113	112	98	95	108	88	80	99
3	IET 30367	120	116	114	96	124	93	85	107	118	118	110	95	114	93	85	105
4	SWARNAPRABHA	110	92	80	88	103	72	62	87	90	93	76	86	94	72	62	82
5	IET 30356	114	109	111	99	116	88	85	103	112	112	108	95	98	88	85	100
6	POOJA	117	109	84	99	117	93	95	102	114	112	81	95	100	93	95	99
7	IET 30409	121	112	92	99	116	96	95	105	118	115	88	96	109	96	95	102
8	Sarala	119	105	98	98	141	104	99	109	114	107	95	96	120	104	99	105
9	IR 8	112	96	94	93	108	78	71	93	104	98	92	88	103	78	71	91
10	IET 30410	119	111	115	98	108	99	95	107	115	113	111	96	98	99	95	104
11	Gayatri	120	104	91	99	131	104	85	105	114	107	86	99	115	104	85	102
12	CR Dhan 411	116	107	102	93	108	88	78	99	113	112	100	88	100	88	78	97
13	IET 31288	116	109	95	99	115	82	78	99	113	112	88	98	109	82	78	97
14	CR Dhan 801	126	106	92	90	117	78	78	98	113	107	86	88	107	78	78	94
	Mean	118	107	97	96	118	90	84	101	112	110	93	94	107	90	84	98
	LSD (Treatment)			0.40						LSD (Treatment)			1.41				
	LSD (Location X Treatment)			1.07						LSD (Location X Treatment)			3.73				
	LSD (Genotype)			1.00						CV (Treatment) %			2.29				
	LSD (Location X Genotype)			2.64						CV (Residual) %			2.33				

Table 6.6.2 Influence of Low-Light Stress on Days to maturity in different rice varieties during Kharif 2022 at different centers

S.No.	Genotypes	Treated (Low light)							Grand Mean	Control							Grand Mean
		IIRR	KJT	MTU	PNR	TTB	RPUR	NRRI		IIRR	KJT	MTU	PNR	TTB	RPUR	NRRI	
1	IET 27530	145	141	120	134	167	127	147	140	140	145	115	131	149	127	143	136
2	Swarna Sub 1	145	138	130	131	149	125	147	138	141	141	127	130	137	124	143	135
3	IET 30367	150	145	145	132	159	130	127	141	146	147	140	131	144	130	130	138
4	SWARNAPRABHA	131	120	112	127	139	109	127	124	150	121	105	126	123	109	130	123
5	IET 30356	146	142	141	135	149	125	145	140	145	145	139	131	127	125	141	136
6	POOJA	149	138	117	135	153	130	145	138	146	141	112	131	129	130	141	133
7	IET 30409	151	141	123	135	152	134	130	138	149	144	120	132	139	134	123	134
8	Sarala	151	134	132	134	174	135	130	142	146	136	126	132	148	135	123	135
9	IR 8	153	125	125	129	147	109	134	132	138	127	122	127	132	109	136	127
10	IET 30410	149	140	147	134	146	136	134	141	144	142	141	132	127	136	136	137
11	Gayatri	152	133	125	135	164	134	139	140	147	136	117	135	145	134	142	137
12	CR Dhan 411	149	136	133	130	148	112	139	135	145	141	129	128	129	112	142	132
13	IET 31288	148	138	136	135	150	112	131	136	145	141	119	134	139	112	142	133
14	CR Dhan 801	148	135	133	128	151	112	131	134	146	136	115	127	138	112	142	131
	Mean	148	136	130	132	153	124	136	137	145	139	123	131	136	124	137	133
	LSD (Treatment)				0.41					LSD (Treatment)				2.43			
	LSD (Location X Treatment)				1.09					LSD (Location X Treatment)				6.44			
	LSD (Genotype)				1.72					CV (Treatment) %				1.72			
	LSD (Location X Genotype)				4.55					CV (Residual) %				2.96			

Table 6.6.3 Influence of Low-Light Stress on total chlorophyll (mg/gm FW) at panicle initiation in different rice varieties during Kharif 2022 at different centers

S.No.	Genotypes	Treated (Low light)							Grand Mean	Control							Grand Mean
		IIRR	KJT	MTU	PNR	TTB	RPUR	NRRI		IIRR	KJT	MTU	PNR	TTB	RPUR	NRRI	
1	IET 27530	0	3.62	5.38	4.68	2.82	0	1.69	3.64	0	2.71	4.79	4.38	2.53	0	1.57	3.20
2	Swarna Sub 1	0	4.00	5.23	5.86	2.49	0	1.57	3.83	0	2.53	4.05	5.14	2.79	0	1.34	3.17
3	IET 30367	0	3.20	4.98	5.51	1.34	0	1.76	3.36	0	2.46	3.84	3.90	1.61	0	1.39	2.64
4	SWARNAPRABHA	0	3.78	5.09	4.71	0.86	0	2.12	3.31	0	2.17	4.11	4.25	1.77	0	1.25	2.71
5	IET 30356	0	3.62	3.95	4.69	2.32	0	1.60	3.24	0	2.03	3.65	4.44	2.51	0	1.22	2.77
6	POOJA	0	3.49	5.29	5.88	1.65	0	1.36	3.53	0	2.22	4.33	3.52	2.39	0	1.72	2.84
7	IET 30409	0	3.78	4.34	5.27	2.11	0	1.54	3.41	0	2.45	4.30	4.61	2.64	0	1.28	3.06
8	Sarala	0	3.69	5.24	5.11	0.97	0	1.46	3.30	0	2.52	4.74	4.57	1.29	0	1.26	2.88
9	IR 8	0	3.47	4.59	5.80	2.16	0	1.81	3.56	0	2.82	4.65	4.50	2.08	0	1.38	3.09
10	IET 30410	0	4.00	6.41	5.24	2.87	0	1.57	4.02	0	2.65	5.26	3.63	2.86	0	1.18	3.12
11	Gayatri	0	3.46	5.27	5.13	2.04	0	1.63	3.51	0	2.47	4.09	4.22	2.40	0	1.27	2.89
12	CR Dhan 411	0	3.74	4.92	5.73	3.03	0	2.02	3.89	0	1.96	3.68	4.28	3.29	0	1.44	2.93
13	IET 31288	0	3.04	4.84	5.55	2.78	0	1.55	3.55	0	2.19	3.41	4.40	2.91	0	1.71	2.92
14	CR Dhan 801	0	3.93	4.66	4.88	1.90	0	1.81	3.44	0	1.76	3.40	4.27	1.55	0	1.71	2.54
	Mean	0	3.63	5.01	5.29	2.09	0	1.68	3.54	0	2.35	4.16	4.29	2.33	0	1.41	2.91
	LSD (Treatment)				0.05					LSD (Treatment)				0.24			
	LSD (Location X Treatment)				0.12					LSD (Location X Treatment)				0.54			
	LSD (Genotype)				0.17					CV (Treatment) %				7.83			
	LSD (Location X Genotype)				0.38					CV (Residual) %				10.42			

Table 6.6.4 Influence of Low-Light Stress on total chlorophyll (mg/gm FW) at flowering in different rice varieties during Kharif 2022 at different centers

S.No.	Genotypes	Treated (Low light)							Grand Mean	Control							Grand Mean
		IIRR	KJT	MTU	PNR	TTB	RPUR	NRRI		IIRR	KJT	MTU	PNR	TTB	RPUR	NRRI	
1	IET 27530	0	5.26	5.38	2.19	3.98	0	1.02	3.57	0	3.47	4.79	1.13	4.08	0	0.52	2.80
2	Swarna Sub 1	0	6.04	5.23	3.37	3.24	0	2.30	4.04	0	2.72	4.05	2.46	4.37	0	1.84	3.09
3	IET 30367	0	4.42	4.98	3.59	1.62	0	0.91	3.10	0	3.32	3.84	1.42	3.01	0	0.60	2.44
4	SWARNAPRABHA	0	4.88	5.09	2.44	1.27	0	1.42	3.02	0	3.42	4.11	2.06	3.18	0	0.85	2.73
5	IET 30356	0	5.20	3.95	2.77	3.89	0	1.30	3.42	0	2.99	3.65	1.81	3.87	0	0.89	2.64
6	POOJA	0	5.80	5.29	3.30	2.32	0	1.14	3.57	0	3.44	4.33	1.43	3.54	0	1.10	2.77
7	IET 30409	0	5.53	4.34	2.90	3.21	0	1.38	3.47	0	3.06	4.30	1.84	4.19	0	1.04	2.89
8	Sarala	0	5.45	5.24	2.15	1.75	0	0.75	3.07	0	3.46	4.74	2.37	2.43	0	0.68	2.74
9	IR 8	0	5.84	4.59	2.84	4.52	0	1.91	3.94	0	3.06	4.65	2.10	2.85	0	1.89	2.91
10	IET 30410	0	5.77	6.41	2.69	3.81	0	1.23	3.98	0	2.71	5.26	1.93	5.01	0	0.87	3.16
11	Gayatri	0	5.15	5.27	2.30	3.93	0	1.05	3.54	0	3.69	4.09	2.22	3.72	0	0.81	2.91
12	CR Dhan 411	0	6.28	4.92	2.67	4.29	0	1.98	4.03	0	3.18	3.68	2.27	4.82	0	2.15	3.22
13	IET 31288	0	6.17	4.84	3.17	3.92	0	2.03	4.03	0	3.21	3.41	1.97	4.95	0	2.04	3.11
14	CR Dhan 801	0	6.01	4.66	2.49	2.32	0	1.39	3.37	0	4.01	3.40	2.33	1.99	0	2.23	2.79
	Mean	0	5.56	5.01	2.78	3.15	0	1.42	3.58	0	3.27	4.16	1.95	3.72	0	1.25	2.87
	LSD (Treatment)				0.14					LSD (Treatment)				0.35			
	LSD (Location X Treatment)				0.31					LSD (Location X Treatment)				0.79			
	LSD (Genotype)				0.25					CV (Treatment) %				19.89			
	LSD (Location X Genotype)				0.56					CV (Residual) %				15.24			

Table 6.6.5 Influence of Low-Light Stress on plant height (cm) at flowering in different rice varieties during Kharif 2022 at different centers

S.No.	Genotypes	Treated (Low light)							Grand Mean	Control							Grand Mean
		IIRR	KJT	MTU	PNR	TTB	RPUR	NRRI		IIRR	KJT	MTU	PNR	TTB	RPUR	NRRI	
1	IET 27530	104	107	95	118	114	123	113	110	104	102	94	126	114	121	109	110
2	Swarna Sub 1	97	96	125	126	102	110	103	108	97	93	120	97	98	110	100	102
3	IET 30367	103	111	111	130	118	125	107	115	103	103	101	114	105	120	103	107
4	SWARNAPRABHA	145	121	160	161	125	173	121	144	145	116	152	143	126	158	119	137
5	IET 30356	105	124	122	127	124	145	111	123	105	115	121	114	109	128	104	114
6	POOJA	104	117	112	134	120	135	96	117	104	110	107	122	102	123	100	110
7	IET 30409	108	117	112	135	119	148	115	122	108	112	109	146	106	115	110	115
8	Sarala	118	110	118	133	127	137	116	123	118	104	111	104	107	126	112	112
9	IR 8	94	93	152	119	103	126	101	113	94	90	149	244	101	105	92	125
10	IET 30410	116	130	141	139	131	138	118	130	116	126	140	110	120	138	109	123
11	Gayatri	116	120	124	143	121	112	111	121	116	116	119	141	93	105	102	113
12	CR Dhan 411	102	107	124	121	104	113	98	110	102	104	121	96	105	104	97	104
13	IET 31288	88	116	125	105	100	106	104	106	88	105	123	100	101	96	99	102
14	CR Dhan 801	98	116	124	114	110	107	106	111	98	106	122	110	101	104	100	106
	Mean	107	113	125	129	116	128	109	118	107	107	121	126	106	118	104	113
	LSD (Treatment)				2.12					LSD (Treatment)				10.88			
	LSD (Location X Treatment)				5.61					LSD (Location X Treatment)				28.80			
	LSD (Genotype)				7.70					CV (Treatment) %				10.39			
	LSD (Location X Genotype)				20.36					CV (Residual) %				15.54			

Table 6.6.6 Influence of Low-Light Stress on shoot weight (g/m²) in different rice varieties during Kharif 2022 at different centers

S.No.	Genotypes	Treated (Low light)							Grand Mean	Control							Grand Mean
		IIRR	KJT	MTU	PNR	TTB	RPUR	NRRI		IIRR	KJT	MTU	PNR	TTB	RPUR	NRRI	
1	IET 27530	847	881	614	0	410	870	505	688	1222	1247	644	0	726	981	584	901
2	Swarna Sub 1	550	641	556	0	430	912	411	583	848	1154	636	0	645	1732	562	930
3	IET 30367	716	583	482	0	367	1067	555	628	1233	1005	613	0	590	1294	668	900
4	SWARNAPRABHA	3635	528	448	0	348	922	323	1034	874	1042	526	0	623	1574	424	844
5	IET 30356	715	881	482	0	517	1103	487	697	1211	1506	730	0	639	1133	715	989
6	POOJA	821	846	374	0	353	757	421	595	1032	1717	590	0	479	859	661	890
7	IET 30409	813	674	533	0	425	496	269	535	1180	1336	593	0	557	1021	635	887
8	Sarala	1019	904	730	0	468	933	527	763	1229	1319	811	0	696	973	820	975
9	IR 8	553	692	352	0	478	967	362	567	942	831	704	0	767	1599	655	916
10	IET 30410	1111	901	659	0	454	564	719	735	1518	1340	748	0	626	609	586	905
11	Gayatri	1089	823	522	0	496	578	417	654	1164	1512	715	0	591	761	635	896
12	CR Dhan 411	584	801	604	0	480	587	584	607	962	923	633	0	666	777	804	794
13	IET 31288	583	611	436	0	500	567	419	519	835	1014	521	0	600	1507	537	836
14	CR Dhan 801	618	601	460	0	435	1078	437	605	814	1024	600	0	707	1160	519	804
	Mean	975	740	518	0	440	814	460	658	1076	1212	647	0	637	1141	629	890
	LSD (Treatment)				52.52					LSD (Treatment)				207.45			
	LSD (Location X Treatment)				128.66					LSD (Location X Treatment)				508.16			
	LSD (Genotype)				146.69					CV (Treatment) %				34.95			
	LSD (Location X Genotype)				359.32					CV (Residual) %				40.86			

Table 6.6.7 Influence of Low-Light Stress on Panicle weight (g/m²) at flowering in different rice varieties during Kharif 2022 at different centers

S.No.	Genotypes	Treated (Low light)							Grand Mean	Control							Grand Mean
		IIRR	KJT	MTU	PNR	TTB	RPUR	NRRI		IIRR	KJT	MTU	PNR	TTB	RPUR	NRRI	
1	IET 27530	188	329	71	204	93	244	143	182	188	407	95	206	189	229	178	213
2	Swarna Sub 1	153	150	70	128	94	454	53	157	153	217	76	139	182	794	145	244
3	IET 30367	177	222	51	111	71	502	143	182	177	301	76	188	186	320	130	197
4	SWARNAPRABHA	238	283	41	169	83	390	94	186	238	380	74	185	184	950	68	297
5	IET 30356	182	210	57	59	156	487	142	185	182	269	86	272	205	366	153	219
6	POOJA	198	201	44	127	80	678	151	211	198	257	73	115	160	681	129	230
7	IET 30409	171	236	55	61	86	373	132	159	171	301	67	257	221	407	105	218
8	Sarala	139	172	87	19	113	569	103	172	139	229	98	97	244	358	120	184
9	IR 8	260	178	37	196	140	526	133	210	260	278	79	219	254	398	184	239
10	IET 30410	179	163	69	44	78	476	82	156	179	272	95	126	178	312	140	186
11	Gayatri	348	178	59	126	157	432	114	202	348	260	85	119	187	338	159	214
12	CR Dhan 411	212	270	79	196	127	340	94	188	212	390	84	286	159	500	103	248
13	IET 31288	168	215	59	154	134	392	91	173	168	250	72	149	184	677	115	231
14	CR Dhan 801	268	280	49	106	79	508	80	196	268	404	76	267	176	728	101	289
	Mean	206	220	59	121	106	455	111	183	206	301	81	187	193	504	131	229
	LSD (Treatment)				4.60					LSD (Treatment)				19.35			
	LSD (Location X Treatment)				12.17					LSD (Location X Treatment)				51.18			
	LSD (Genotype)				13.68					CV (Treatment) %				12.63			
	LSD (Location X Genotype)				36.19					CV (Residual) %				15.48			

Table 6.6.8 Influence of Low-Light Stress on panicle number/m² in different rice varieties during Kharif 2022 at different centers

S.No.	Genotypes	Treated (Low light)							Grand Mean	Control							Grand Mean
		IIRR	KJT	MTU	PNR	TTB	RPUR	NRRI		IIRR	KJT	MTU	PNR	TTB	RPUR	NRRI	
1	IET 27530	293	216	506	233	127	102	162	234	407	310	583	283	258	188	181	316
2	Swarna Sub 1	347	240	308	267	129	181	167	234	430	278	429	283	249	205	203	297
3	IET 30367	330	231	462	283	96	116	181	243	373	256	539	300	254	185	185	299
4	SWARNAPRABHA	537	234	374	233	114	134	122	250	370	283	462	417	252	160	191	305
5	IET 30356	317	248	451	217	203	97	195	247	343	275	528	283	280	175	235	303
6	POOJA	327	263	517	233	109	203	188	263	460	306	583	283	218	232	215	328
7	IET 30409	377	276	418	217	118	93	110	230	410	273	506	200	302	215	226	305
8	Sarala	247	253	484	233	155	64	118	222	263	328	517	233	333	199	195	296
9	IR 8	383	248	319	300	201	185	188	261	473	268	462	483	347	204	265	358
10	IET 30410	200	217	495	150	107	128	168	209	410	245	517	283	243	157	200	294
11	Gayatri	267	195	407	133	207	93	107	201	337	246	484	183	256	187	185	268
12	CR Dhan 411	433	247	396	217	173	175	181	260	350	309	451	283	218	214	228	293
13	IET 31288	367	253	429	217	124	169	173	247	347	385	473	300	252	216	206	311
14	CR Dhan 801	383	223	385	350	107	189	186	261	407	260	473	400	241	206	208	314
	Mean	343	239	425	235	141	138	160	240	384	287	501	301	264	196	209	306
	LSD (Treatment)				6.84					LSD (Treatment)				20.27			
	LSD (Location X Treatment)				18.09					LSD (Location X Treatment)				53.63			
	LSD (Genotype)				14.33					CV (Treatment) %				14.16			
	LSD (Location X Genotype)				37.92					CV (Residual) %				12.23			

Table 6.6.9 Influence of Low-Light Stress on grain number/panicle in different rice varieties during Kharif 2022 at different centers

S.No.	Genotypes	Treated (Low light)							Grand Mean	Control							Grand Mean
		IIRR	KJT	MTU	PNR	TTB	RPUR	NRRI		IIRR	KJT	MTU	PNR	TTB	RPUR	NRRI	
1	IET 27530	107	70	120	154	135	126	152	123	121	64	141	159	173	156	196	144
2	Swarna Sub 1	61	30	62	151	149	127	116	99	100	24	79	184	113	145	140	112
3	IET 30367	75	46	78	156	137	105	131	104	115	32	96	140	102	130	161	111
4	SWARNAPRABHA	71	43	84	165	130	100	92	98	106	26	127	176	130	129	105	114
5	IET 30356	65	94	107	66	149	117	150	107	121	31	126	175	130	133	147	123
6	POOJA	55	141	90	20	110	111	123	93	85	84	115	24	115	128	136	98
7	IET 30409	74	134	110	28	157	65	146	102	100	46	132	38	145	131	129	103
8	Sarala	113	156	101	12	169	67	184	115	130	42	114	14	167	132	191	113
9	IR 8	85	43	102	154	155	115	152	115	143	58	155	180	210	142	163	150
10	IET 30410	97	118	123	11	133	94	151	104	111	35	135	19	151	135	153	105
11	Gayatri	83	125	109	50	160	91	141	108	130	50	149	68	147	132	125	114
12	CR Dhan 411	87	66	97	161	169	127	121	118	109	28	142	230	155	161	159	140
13	IET 31288	74	34	89	136	186	132	130	112	113	32	126	139	197	148	157	130
14	CR Dhan 801	80	51	136	208	104	121	121	117	105	40	197	197	159	161	130	141
	Mean	81	82	100	105	146	107	136	108	113	42	131	124	149	140	149	121
	LSD (Treatment)				2.78					LSD (Treatment)				9.86			
	LSD (Location X Treatment)				7.36					LSD (Location X Treatment)				26.08			
	LSD (Genotype)				6.97					CV (Treatment) %				13.69			
	LSD (Location X Genotype)				18.44					CV (Residual) %				14.15			

Table 6.6.10 Influence of Low-Light Stress on spikelet number/panicle in different rice varieties during Kharif 2022 at different centers

S.No.	Genotypes	Treated (Low light)							Grand Mean	Control							Grand Mean
		IIRR	KJT	MTU	PNR	TTB	RPUR	NRRI		IIRR	KJT	MTU	PNR	TTB	RPUR	NRRI	
1	IET 27530	152	117	148	171	172	141	181	155	167	171	157	187	210	170	217	183
2	Swarna Sub 1	102	108	79	208	186	141	132	137	144	131	84	233	128	159	149	147
3	IET 30367	110	108	109	240	172	118	161	145	166	135	112	174	120	142	178	147
4	SWARNAPRABHA	155	90	114	180	153	116	123	133	149	100	140	207	148	146	127	145
5	IET 30356	81	78	125	166	172	129	188	134	152	126	137	228	147	147	174	159
6	POOJA	96	28	120	169	136	126	150	118	125	114	133	176	123	145	151	138
7	IET 30409	117	28	137	171	178	77	196	129	140	119	148	157	160	143	164	147
8	Sarala	218	24	120	106	199	75	223	138	184	161	124	308	181	145	189	185
9	IR 8	116	119	133	307	177	130	189	167	210	198	167	221	231	155	205	198
10	IET 30410	138	51	138	153	172	112	179	135	145	127	145	206	180	148	181	162
11	Gayatri	128	39	143	123	180	107	180	128	174	138	160	174	180	147	165	162
12	CR Dhan 411	110	120	128	242	217	142	172	161	136	150	155	278	212	174	166	182
13	IET 31288	102	131	128	187	220	148	156	153	172	120	143	184	231	163	174	170
14	CR Dhan 801	100	99	187	263	128	132	161	153	126	171	207	208	172	171	155	173
	Mean	123	82	129	192	176	121	171	142	156	140	144	210	173	154	171	164
	LSD (Treatment)				2.83					LSD (Treatment)				11.55			
	LSD (Location X Treatment)				7.50					LSD (Location X Treatment)				30.56			
	LSD (Genotype)				8.17					CV (Treatment) %				10.47			
	LSD (Location X Genotype)				21.61					CV (Residual) %				12.44			

Table 6.6.11 Influence of Low-Light Stress on grain number/m² in different rice varieties during Kharif 2022 at different centers

S.No.	Genotypes	Treated (Low light)							Grand Mean	Control							Grand Mean
		IIRR	KJT	MTU	PNR	TTB	RPUR	NRRI		IIRR	KJT	MTU	PNR	TTB	RPUR	NRRI	
1	IET 27530	30527	15050	60940	36467	16941	13059	24424	28201	48929	19903	83534	45100	44695	29223	35666	43864
2	Swarna Sub 1	21295	7181	18920	39117	19395	22949	19187	21149	42857	6516	33660	51950	28217	30220	28534	31708
3	IET 30367	24658	10576	36135	43967	13092	12140	23682	23464	42857	8102	51513	41333	25905	24592	29878	32026
4	SWARNAPRABHA	37816	9978	31317	38383	14660	13507	11240	22415	39071	7162	59136	72983	32782	20899	20398	36062
5	IET 30356	20418	16330	48048	14433	30313	11317	29058	24274	41586	8597	65835	49983	36398	24023	34376	37257
6	POOJA	18184	7331	46398	4586	11905	22610	22920	19133	39130	25071	66473	6833	24985	29738	29604	31691
7	IET 30409	27651	7828	46002	5933	18882	5762	15929	18284	40732	12610	67375	7783	43586	28437	28866	32770
8	Sarala	27383	6143	49115	2822	26332	4266	21680	19677	33919	13856	58575	3301	55666	26249	37946	32788
9	IR 8	32173	10682	32362	45867	31208	21403	28575	28895	67734	15731	71302	86933	72879	29189	43368	55305
10	IET 30410	19490	11201	60830	1667	14239	12003	25337	20681	44933	8601	69905	5364	36637	21044	30659	31020
11	Gayatri	21760	7641	44154	6667	33156	8467	15847	19670	44093	12190	72292	12683	37568	24981	22209	32288
12	CR Dhan 411	37256	12811	38126	34633	29278	22351	24653	28444	38007	8585	64493	65300	33546	34476	35898	40044
13	IET 31288	27033	8514	38258	29617	22822	22377	22345	24424	39005	12331	59807	41725	49426	32081	32335	38101
14	CR Dhan 801	30612	11364	52360	72200	11121	22890	22115	31809	42312	10487	93192	78617	38312	33103	27239	46180
	Mean	26875	10188	43069	26883	20953	15364	21928	23609	43226	12124	65507	40706	40043	27733	31213	37222
	LSD (Treatment)				1383.12					LSD (Treatment)				3589.04			
	LSD (Location X Treatment)				3659.39					LSD (Location X Treatment)				9495.69			
	LSD (Genotype)				2537.83					CV (Treatment) %				25.71			
	LSD (Location X Genotype)				6714.47					CV (Residual) %				19.44			

Table 6.6.12 Influence of Low-Light Stress on spikelet number/m² in different rice varieties during Kharif 2022 at different centers

S.No.	Genotypes	Treated (Low light)							Grand Mean	Control							Grand Mean
		IIRR	KJT	MTU	PNR	TTB	RPUR	NRRI		IIRR	KJT	MTU	PNR	TTB	RPUR	NRRI	
1	IET 27530	43129	25384	74965	39783	21639	14551	145178	52090	67953	52816	93049	53683	54188	31911	197640	78749
2	Swarna Sub 1	35332	26021	24200	54350	24150	25459	109669	42740	61784	36357	35508	65875	31904	32999	151025	59350
3	IET 30367	36128	24999	50589	67733	16337	13697	145125	50658	61968	34468	59873	52067	30499	26558	165046	61497
4	SWARNAPRABHA	82809	20990	42746	41800	17369	15590	75176	42354	55121	28181	65175	86217	37228	23658	122201	59683
5	IET 30356	25517	26557	56276	35917	35051	12382	181983	53383	51856	34656	72105	64458	41343	26317	204574	70758
6	POOJA	31312	37128	61963	39717	14724	25672	139977	50070	57582	35897	77198	49483	26793	33699	164032	63526
7	IET 30409	43486	37019	56892	37233	21061	6764	106986	44206	57004	32416	75339	31125	48327	30936	178924	64867
8	Sarala	52510	39395	58509	24458	31001	4777	131638	48898	48380	52836	63712	71867	60344	28965	216838	77563
9	IR 8	43917	29473	42438	92567	35641	24176	178326	63791	99322	53418	76901	106100	80267	31761	257600	100767
10	IET 30410	27672	25425	68090	24250	18436	14435	150668	46996	59211	31115	75295	58225	43785	23162	172627	66203
11	Gayatri	34049	24248	58146	16400	37309	9969	99788	39987	58563	34094	77451	31250	45999	27960	133378	58385
12	CR Dhan 411	47249	32946	50754	52433	37647	24827	155086	57277	47764	46474	70048	78483	46010	37366	202784	75561
13	IET 31288	37225	32997	55055	40617	26865	24991	133631	50197	59540	46310	67804	55133	58068	35440	187822	72874
14	CR Dhan 801	38113	22062	72204	90950	13714	25018	147865	58561	51047	44432	97922	83150	41470	34983	152785	72256
	Mean	41318	28903	55202	47015	25067	17308	135793	50086	59792	40248	71956	63365	46159	30408	179091	70146
	LSD (Treatment)				2509.87					LSD (Treatment)				5820.49			
	LSD (Location X Treatment)				6640.50					LSD (Location X Treatment)				15399.56			
	LSD (Genotype)				4115.71					CV (Treatment) %				23.60			
	LSD (Location X Genotype)				10889.13					CV (Residual) %				15.95			

Table 6.6.13 Influence of Low-Light Stress on grain yield (g/m²) in different rice varieties during Kharif 2022 at different centers

S.No.	Genotypes	Treated (Low light)							Grand Mean	Control							Grand Mean
		IIRR	KJT	MTU	PNR	TTB	RPUR	NRRI		IIRR	KJT	MTU	PNR	TTB	RPUR	NRRI	
1	IET 27530	567	398	455	450	231	306	377	398	1028	822	566	949	469	909	474	745
2	Swarna Sub 1	377	333	318	174	234	376	246	294	828	876	438	568	453	736	420	617
3	IET 30367	478	388	281	302	175	135	372	304	902	634	486	596	462	759	513	622
4	SWARNAPRABHA	870	185	226	438	207	239	135	329	963	556	400	615	458	700	324	574
5	IET 30356	436	289	311	165	347	162	322	290	1020	521	547	630	509	796	607	661
6	POOJA	312	302	236	68	198	410	297	260	712	620	432	117	397	921	511	530
7	IET 30409	507	184	344	75	214	75	157	222	828	405	526	295	548	745	469	545
8	Sarala	398	260	489	53	281	79	266	261	565	419	609	65	606	507	504	468
9	IR 8	495	269	188	258	347	287	216	294	1148	707	533	881	631	636	478	716
10	IET 30410	354	290	450	47	194	125	355	259	937	486	573	89	443	488	448	495
11	Gayatri	493	174	319	100	377	61	286	258	922	310	527	178	465	632	490	503
12	CR Dhan 411	639	319	323	316	315	490	309	387	779	484	488	744	396	677	548	588
13	IET 31288	454	366	247	310	226	495	276	339	720	627	419	663	458	771	464	589
14	CR Dhan 801	547	332	252	385	195	442	275	347	818	735	451	865	438	671	347	618
	Mean	495	292	317	224	253	263	278	303	869	586	500	518	481	710	471	591
	LSD (Treatment)				43.02					LSD (Treatment)				45.45			
	LSD (Location X Treatment)				113.83					LSD (Location X Treatment)				120.25			
	LSD (Genotype)				32.14					CV (Treatment) %				54.41			
	LSD (Location X Genotype)				85.03					CV (Residual) %				16.76			

Table 6.6.14 Influence of Low-Light Stress on total dry matter (g/m²) in different rice varieties during Kharif 2022 at different centers

S.No.	Genotypes	Treated (Low light)							Grand Mean	Control							Grand Mean
		IIRR	KJT	MTU	PNR	TTB	RPUR	NRRI		IIRR	KJT	MTU	PNR	TTB	RPUR	NRRI	
1	IET 27530	1495	974	1069	1478	912	1893	957	1254	2382	1755	1211	2121	1612	2225	1101	1772
2	Swarna Sub 1	1007	784	874	1677	955	2928	714	1277	1793	1857	1074	1685	1433	3265	1006	1730
3	IET 30367	1280	1074	762	1731	816	2095	1002	1251	2258	1763	1098	2255	1310	2717	1252	1808
4	SWARNAPRABHA	4748	874	674	1306	774	1961	557	1556	1980	1616	926	2721	1385	3766	805	1886
5	IET 30356	1195	1080	792	1428	940	2039	868	1192	2369	1559	1277	2223	1419	2280	1360	1784
6	POOJA	1217	733	610	1325	784	2368	773	1116	1917	1460	1022	1246	1065	2645	1259	1516
7	IET 30409	1447	719	877	978	945	1427	483	982	2169	1405	1119	1264	1238	2446	1205	1550
8	Sarala	1560	849	1219	1024	1039	2062	873	1232	1895	1455	1419	1144	1547	2420	1415	1614
9	IR 8	1138	858	540	1384	988	1897	667	1067	2261	1525	1237	2539	1705	3060	1222	1936
10	IET 30410	1543	886	1109	1423	1009	1431	1130	1219	2625	1414	1320	2041	1392	1960	1071	1689
11	Gayatri	1731	796	841	1285	863	1307	762	1084	2232	1229	1242	1211	1312	1943	1195	1481
12	CR Dhan 411	1293	743	927	1435	1066	1664	947	1153	1821	1010	1121	1809	1481	1809	1473	1503
13	IET 31288	1095	839	683	1278	1111	1953	772	1104	1678	1341	940	1401	1333	2928	1053	1525
14	CR Dhan 801	1215	766	711	2268	966	2659	780	1338	1714	1533	1051	2349	1570	2856	950	1717
	Mean	1569	855	835	1430	941	1977	806	1202	2078	1494	1147	1858	1415	2594	1169	1679
	LSD (Treatment)				58.25					LSD (Treatment)				181.27			
	LSD (Location X Treatment)				154.12					LSD (Location X Treatment)				479.59			
	LSD (Genotype)				128.18					CV (Treatment) %				22.86			
	LSD (Location X Genotype)				339.12					CV (Residual) %				20.73			

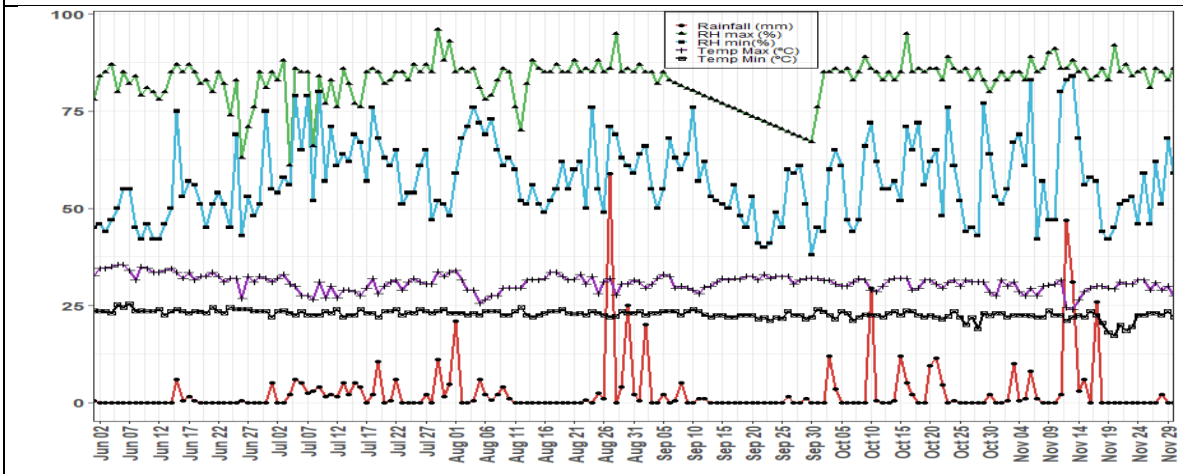
Table 6.6.15 Influence of Low-Light Stress on 1000 grain weight (g) in different rice varieties during Kharif 2022 at different centers

S.No.	Genotypes	Treated (Low light)							Grand Mean	Control							Grand Mean
		IIRR	KJT	MTU	PNR	TTB	RPUR	NRRI		IIRR	KJT	MTU	PNR	TTB	RPUR	NRRI	
1	IET 27530	19	21	18	18	18	23	21	20	21	20	20	22	19	23	20	21
2	Swarna Sub 1	18	19	18	18	19	18	19	18	19	20	20	21	25	20	19	21
3	IET 30367	19	22	18	20	22	20	20	20	21	21	20	22	23	21	20	21
4	SWARNAPRABHA	23	27	13	26	19	28	23	23	25	27	15	27	21	28	23	24
5	IET 30356	21	24	19	19	21	24	25	22	25	25	22	27	23	25	23	24
6	POOJA	17	18	19	22	19	20	20	19	18	19	21	24	24	25	18	21
7	IET 30409	18	19	17	19	24	19	21	20	20	20	19	20	29	21	21	21
8	Sarala	15	19	20	13	19	16	18	17	17	17	22	22	20	18	16	19
9	IR 8	15	18	13	19	19	18	17	17	17	18	21	20	24	19	16	19
10	IET 30410	18	16	14	22	20	18	21	19	21	16	15	24	22	20	20	20
11	Gayatri	23	24	16	26	17	17	24	21	21	24	18	28	20	21	24	22
12	CR Dhan 411	17	20	17	18	21	19	19	19	21	20	22	19	26	20	18	21
13	IET 31288	17	19	15	19	24	17	17	18	18	21	17	21	27	18	18	20
14	CR Dhan 801	18	19	18	21	18	19	19	19	19	20	20	22	24	21	20	21
	Mean	18	20	17	20	20	20	20	19	20	21	19	23	23	21	20	21
	LSD (Treatment)				0.14					LSD (Treatment)				0.64			
	LSD (Location X Treatment)				0.38					LSD (Location X Treatment)				1.71			
	LSD (Genotype)				0.46					CV (Treatment) %				3.97			
	LSD (Location X Genotype)				1.21					CV (Residual) %				5.26			

Table 6.6.16 Influence of Low-Light Stress on Harvest Index (%) in different rice varieties during Kharif 2022 at different centers

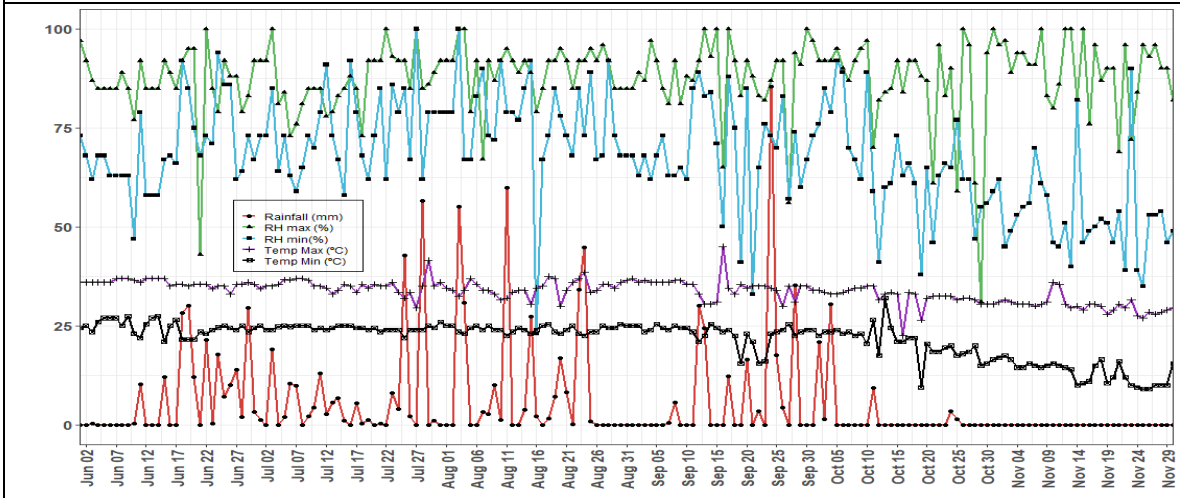
S.No.	Genotypes	Treated (Low light)							Grand Mean	Control							Grand Mean
		IIRR	KJT	MTU	PNR	TTB	RPUR	NRRI		IIRR	KJT	MTU	PNR	TTB	RPUR	NRRI	
1	IET 27530	38	41	42	30	25	16	40	33	43	47	47	45	29	40	43	42
2	Swarna Sub 1	37	42	36	10	24	13	34	28	46	47	41	34	32	23	42	38
3	IET 30367	37	36	37	18	21	6	37	28	40	36	44	26	35	28	41	36
4	SWARNAPRABHA	28	21	34	34	27	12	24	26	49	34	43	23	33	18	40	34
5	IET 30356	36	27	39	12	37	8	37	28	43	33	43	28	36	34	45	38
6	POOJA	26	41	38	5	25	17	38	27	37	42	42	9	37	34	41	35
7	IET 30409	35	26	39	8	23	5	32	24	38	29	47	23	44	28	39	36
8	Sarala	25	31	40	5	27	4	30	23	30	29	43	6	39	20	36	29
9	IR 8	44	31	35	19	35	15	32	30	51	46	43	35	37	21	39	39
10	IET 30410	23	33	40	3	19	9	31	23	36	34	43	4	32	25	42	31
11	Gayatri	29	22	38	8	44	5	37	26	41	25	42	15	35	31	41	33
12	CR Dhan 411	49	43	35	22	30	29	33	34	43	48	43	41	27	37	37	39
13	IET 31288	42	44	36	24	20	25	36	32	43	47	45	47	34	26	44	41
14	CR Dhan 801	45	43	35	17	20	17	35	30	48	48	43	37	28	23	37	38
	Mean	35	34	38	15	27	13	34	28	42	39	43	27	34	28	40	36
	LSD (Treatment)				1.31					LSD (Treatment)				2.25			
	LSD (Location X Treatment)				3.46					LSD (Location X Treatment)				5.96			
	LSD (Genotype)				1.59					CV (Treatment) %				22.97			
	LSD (Location X Genotype)				4.21					CV (Residual) %				11.54			

CBT



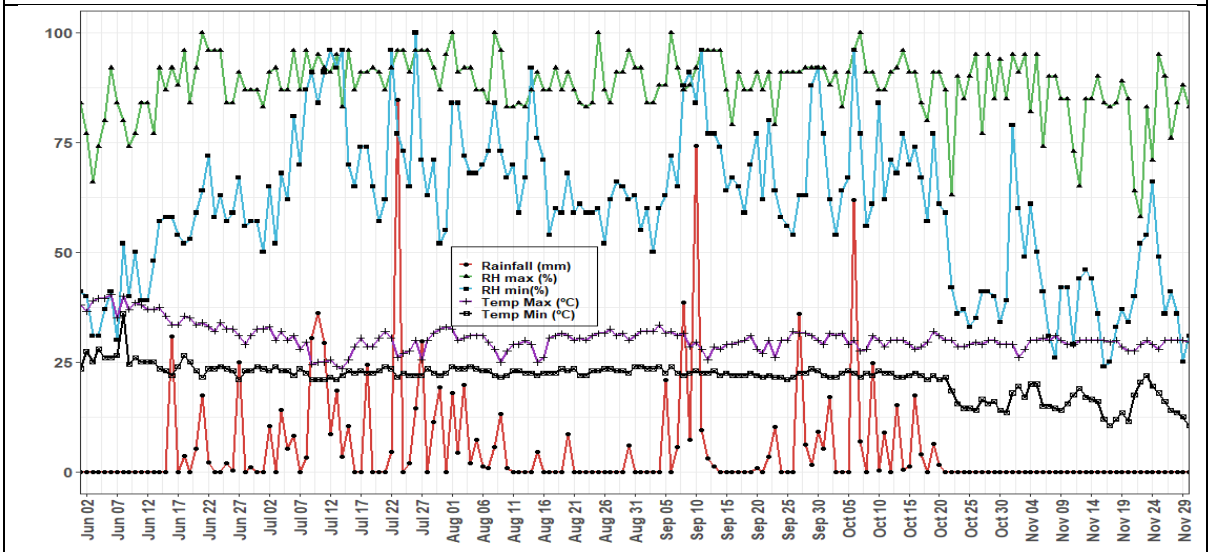
Temperature and Humidity and Rainfall recorded at Coimbatore (CBT) centre during 2022

CHN



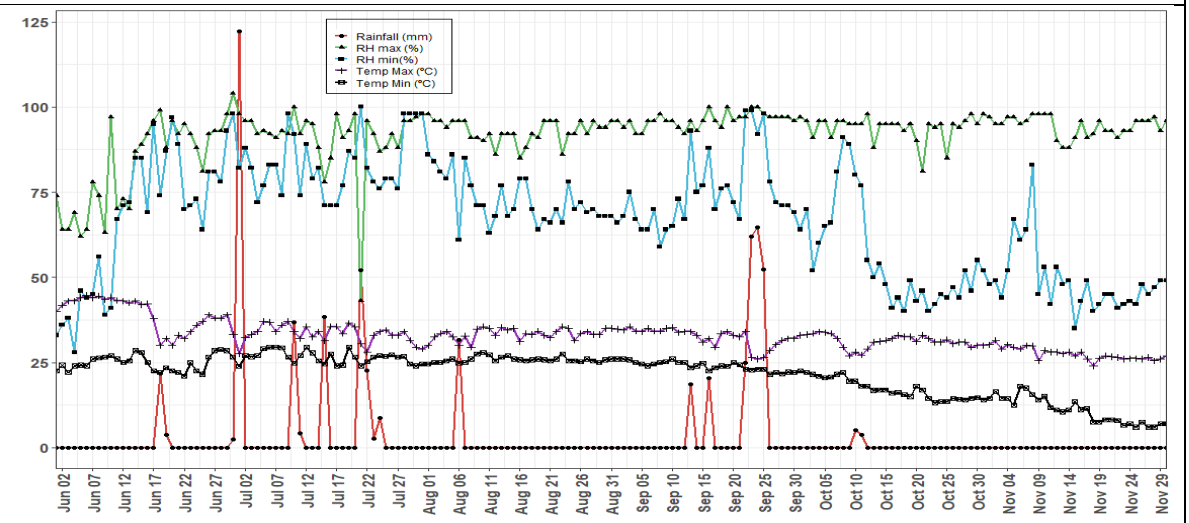
Temperature and Humidity and Rainfall recorded at Chinsura (CHN) centre during 2022

IIRR



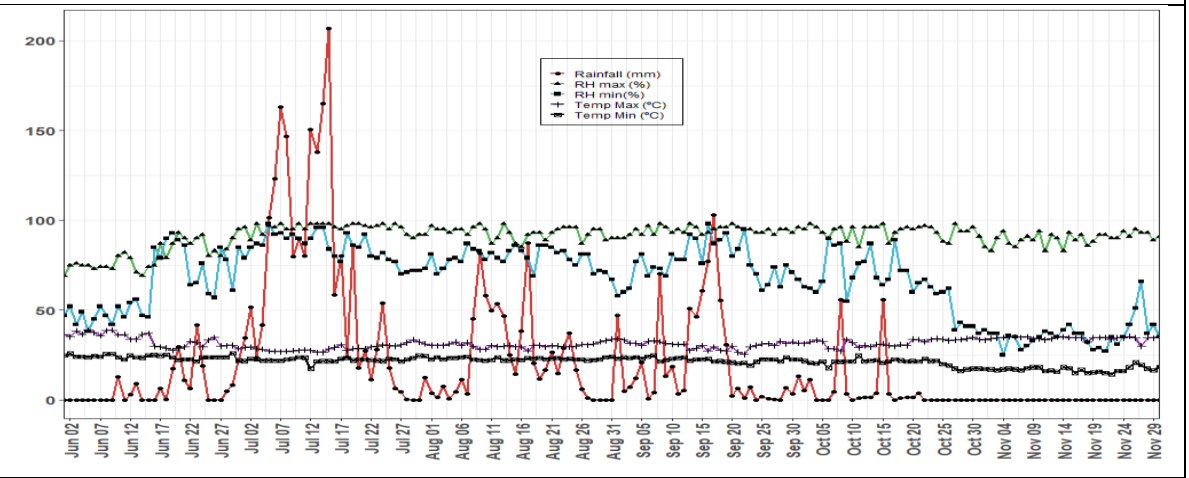
Temperature and Humidity and Rainfall recorded at IIRR, Hyderabad centre during 2022

KAUL



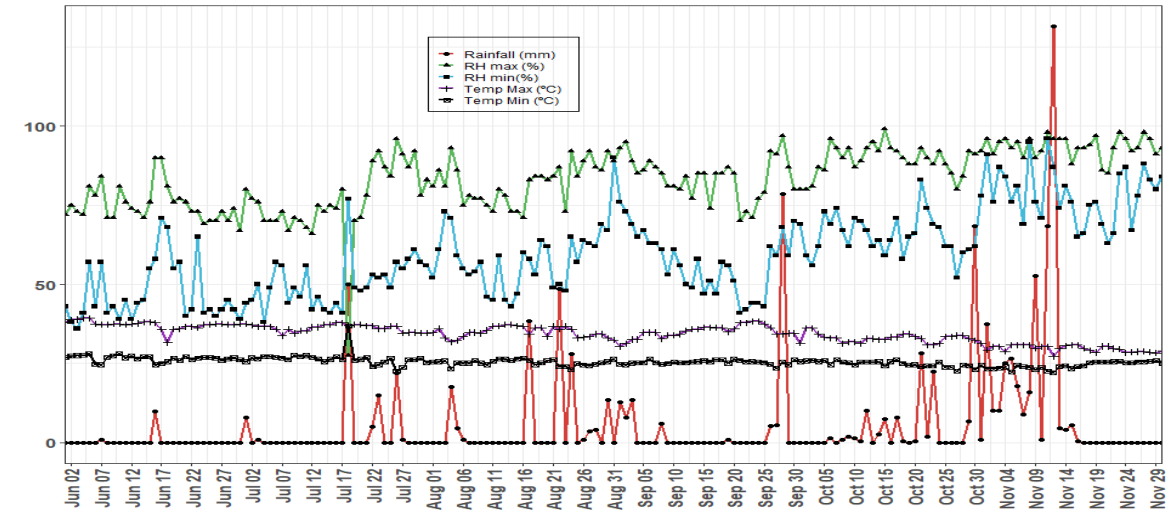
Temperature and Humidity and Rainfall recorded at KAUL centre during 2022

KJT



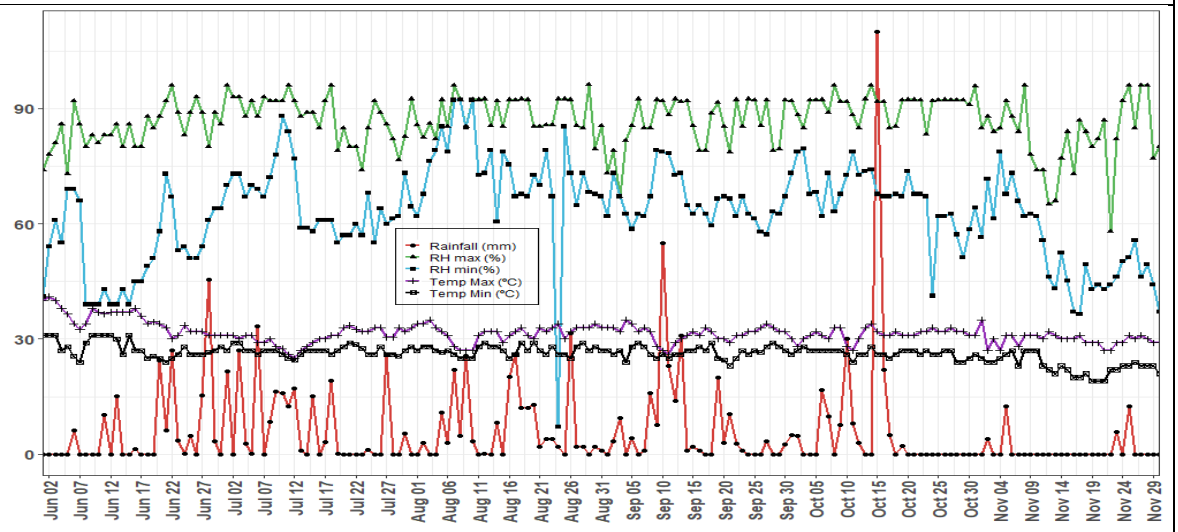
Temperature and Humidity and Rainfall recorded at Karjat (KJT) centre during 2022

KRK



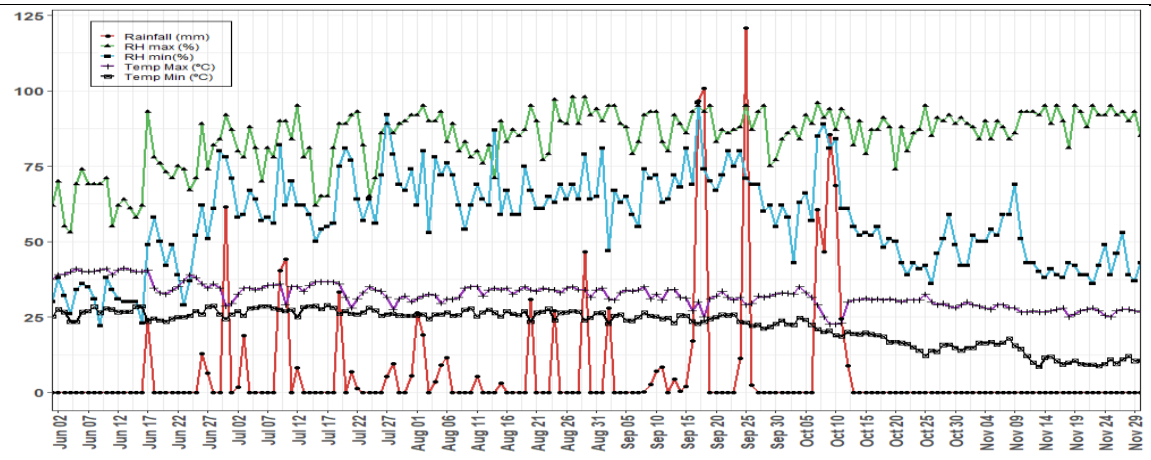
Temperature and Humidity and Rainfall recorded at Karaikal (KRK) centre during 2022

MTU



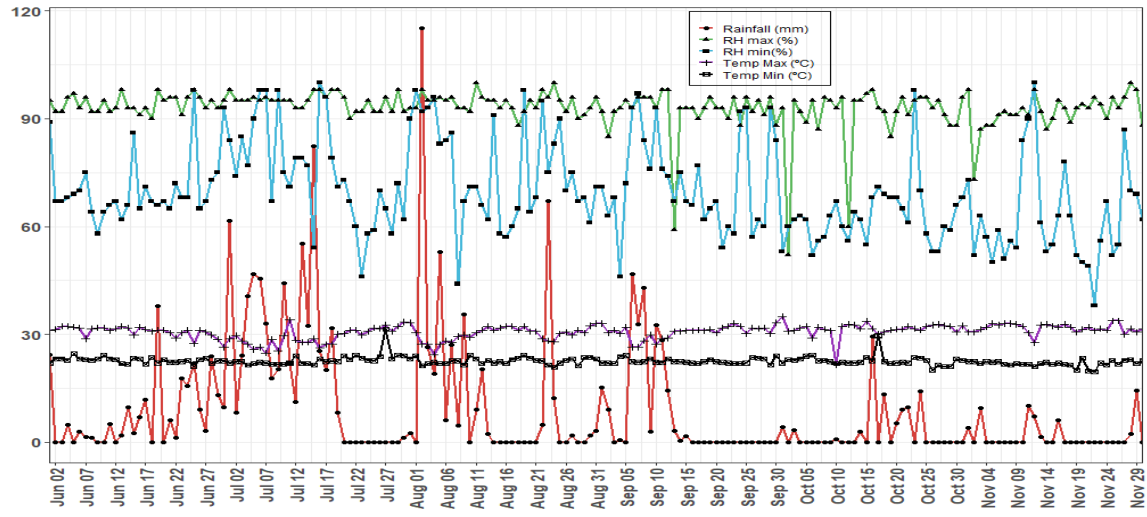
Temperature and Humidity and Rainfall recorded at Maruteru (MTU) centre during 2022

PNR



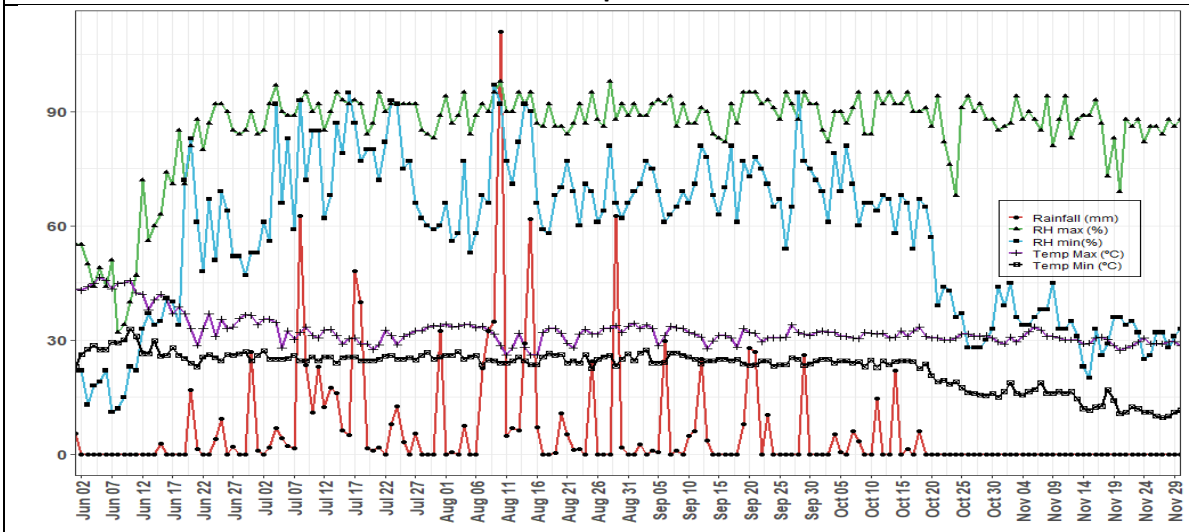
Temperature and Humidity and Rainfall recorded at Pantnagar (PNR) centre during 2022

PTB



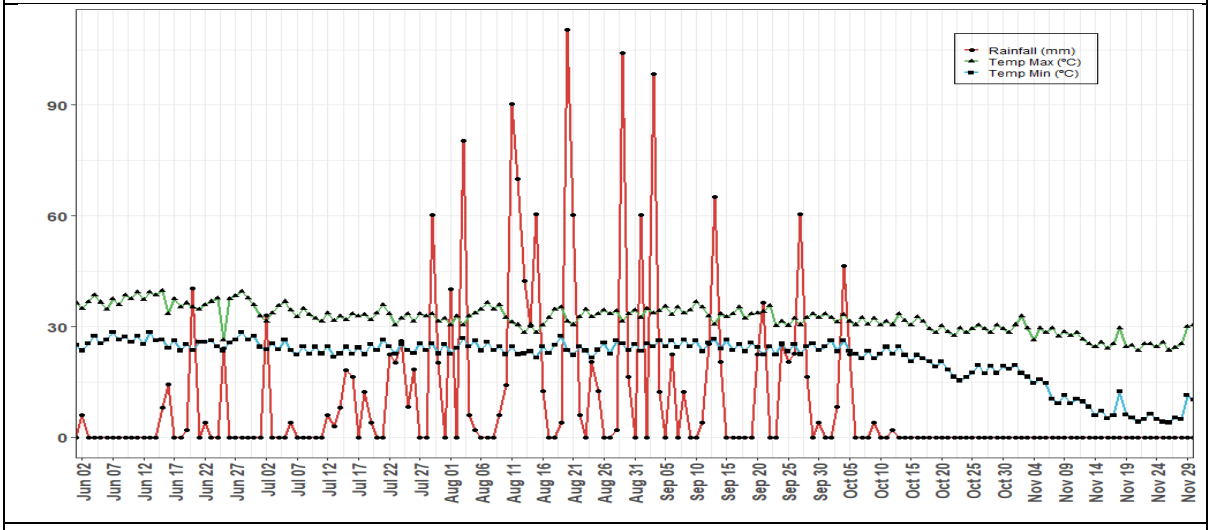
Temperature and Humidity and Rainfall recorded at Pattambi (PTB) centre during 2022

Raipur



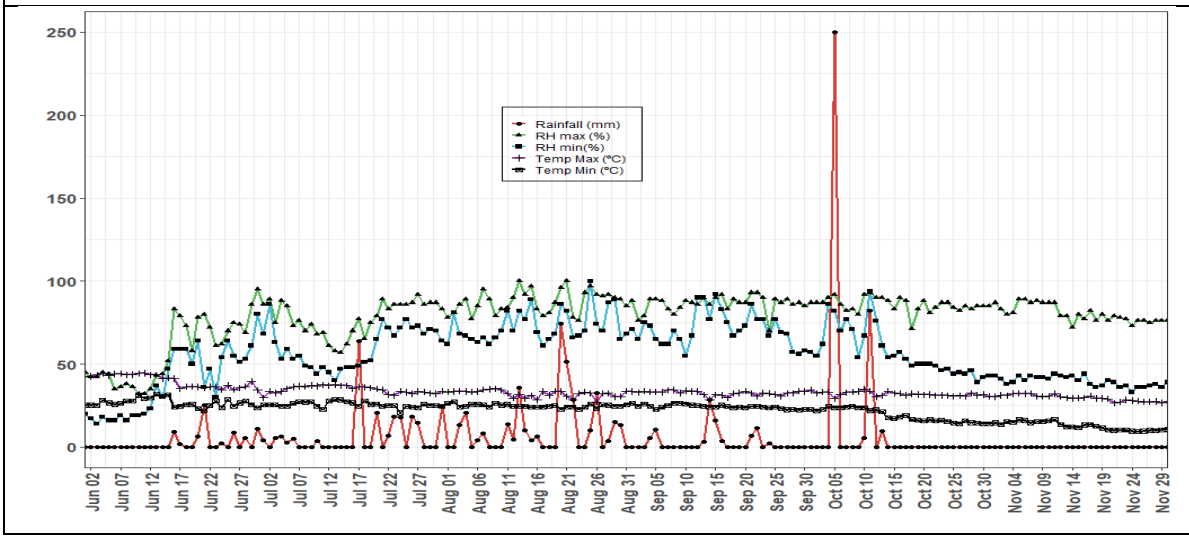
Temperature and Humidity and Rainfall recorded at IGKV, Raipur centre during 2022

Ranchi



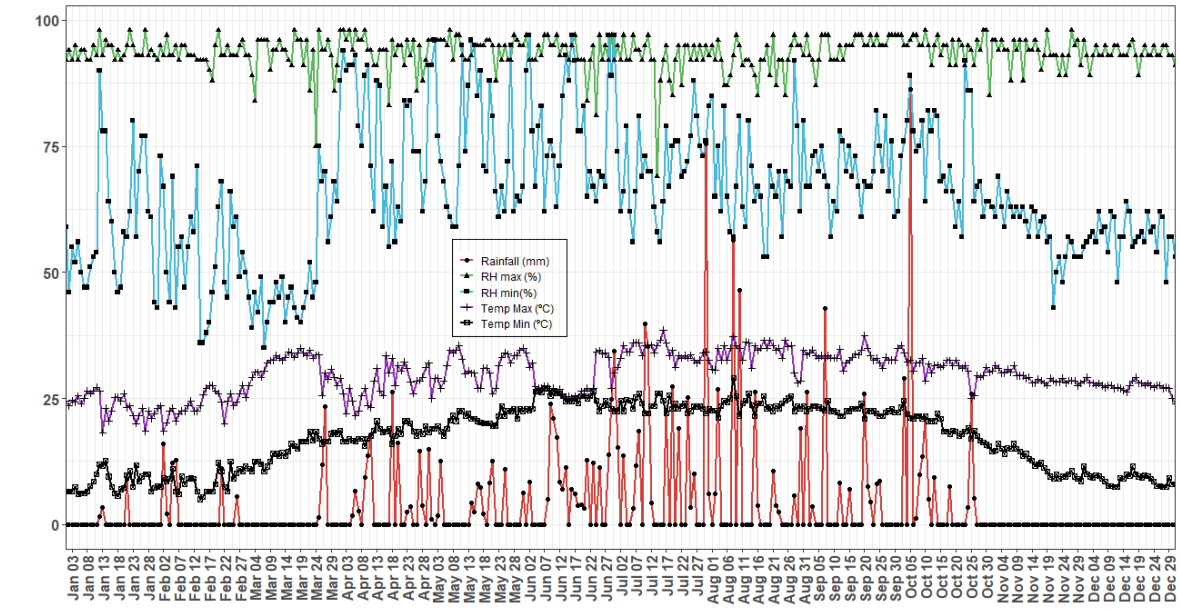
Temperature and Humidity and Rainfall recorded at BAU, Ranchi centre during 2022

REWA



Temperature and Humidity and Rainfall recorded at Rewa centre during 2022

TTB



Temperature and Humidity and Rainfall recorded at AAU, Titabar centre during 2022

A P P E N D I X - II
Rice cultures of Physiology

S.No	SILICON	S.No	RFU	S.No	HT		S.No	LLS (AVT-2 (RSL)	S.No.	MAS	S.No	SUB
	Entries		Entries		Entries			Entries		Entries		Entries
1	27P63	19	IL 19215	1	CO-51		1	IET 27530	1	CR4423-8	1	AC 931
2	HRI-174	20	IL 19222	2	DRRH-4		2	Swarna Sub 1	2	IC-256564	2	AC 289
3	IIRRH-145	21	IL 19247	3	IET 28950	AVT- 2E-TP	3	IET 30367	3	CR4423-10	3	CR4423-8
4	IIRRH-150	22	IL 19253	4	IET 28954	AVT- 2E-TP	4	Swarnaprabha	4	FL 478	4	NIPPONBARE
5	IIRRH-151	23	IL 19273	5	IET 28959	AVT- 2E-TP	5	IET 30356	5	CR 4111-B-1-4-S-1-Sub-B	5	CR 3483-1-M-4-B-Sub-21
6	KRH-4	24	IL 19279	6	IET 28960	AVT- 2E-TP	6	POOJA	6	Vandana	6	FR 13A
7	SB. Dhan	25	IL 19283	7	IET 28964	AVT- 2E-TP	7	IET 30409	7	CR4423-17	7	CR 3477-1-M-1-B-Sub-48
8	US-312	26	IL 19284	8	IET 29140	AVT- 2E-TP	8	Sarala	8	Naveen	8	AC 39460
9	US-314	27	IL 19288	9	IET 29142	AVT- 2E-TP	9	IR 8	9	CR 3483-29-M-4-B-Sub-79-1	9	CR 3477-1-M-1-B-Sub-44
	RFU	28	IL 19329	10	IET 29177	AVT- 2E-TP	10	IET 30410	10	Pantara	10	Naveen
1	IL 19072	29	IL 19344	11	IET 29197	AVT- 2E-TP	11	Gayatri	11	CR4423-20	11	AC 1303B
2	IL 19074	30	IL 19345	12	IET 29415	AVT- 2E-TP	12	CR Dhan 411	12	IR 20	12	CR 3483-29-M-4-B-Sub-79
3	IL 19081	31	IL 19346	13	IET 29421	AVT- 2E-TP	13	IET 31288	13	CR4423-75	13	AC1017A
4	IL 19082	32	IL 19347	14	MTU-1010		14	CR Dhan 801	14	CR 4111-B-1-10-S-1-Sub-B	14	CR4423-17
5	IL 19091	33	IL 19435	15	MTU-1121				15	AC 1125A	15	CR4423-20
6	IL 19096	34	IL19206	16	MTU-1153				16	CR4423-101		
7	IL 19128	35	K. Hamsa	17	MTU-1156				17	CR4423-111		
8	IL 19132	36	WGL-14	18	MTU-1282				18	AC847A		
9	IL 19148			19	MTU-1290				19	IC-256508		
10	IL 19162			20	MTU-1341				20	IC-256605		
11	IL 19181			21	N-22							
12	IL 19185			22	NLR-3354							
13	IL 19198			23	NLR-34449							
14	IL 19451			24	NLR-40024							
15	IL 19204			25	US-314							
16	IL 19202											
17	IL 19208											
18	IL 19211											

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