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PROGRESS REPORT 2023

CROP PRODUCTION

AGRONOMY

ALL INDIA CO-ORDINATED RESEARCH PROJECT ON RICE (AICRPR)

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PREFACE

AICRIP experiments conducted by Agronomists at different locations during *rabi* 2022-23 and *Kharif* 2023 for understanding the response of rice crop to management practices, resource conservation and climatic variations for developing efficient crop and resource management technologies that maximize the productivity and ensure high profitability to double the farmer's income on a sustainable basis are compiled in this report. Agronomists conducted 300 experiments at 50 locations (Funded and Voluntary) consisting of an evaluation of promising cultivars (100 cultures) belonging to 17 groups *viz.*, Medium Hill (MH), early (TP and DS), IME, IM, Late, CSTVT, AL& ISTVT, Aerobic, MS, LPT, LNT, Boro, BT, RSL, SDW, NIL (HT- herbicide - resistant mutant, Nitrogen and Phosphorous use efficiency) trials in transplanted situation, for their response to integrated nutrient management at 50 and 100 % Recommended dose of fertilizer(RDF). Also, six trials on resource conservation technologies, five trials on rice based crop diversification system, five inter disciplinary collaborative trials (Soil science, Entomology, Pathology and Economics) were conducted to develop cost-effective technologies in rice and rice-based cropping systems to develop cost effective and sustainable technologies across India.

The coordinated program in soil science addressed the issues related to sustaining productivity of soil and crop systems on a long-term basis, soil quality and productivity assessment for bridging the gap in farmers' fields, management of sodic and acid soils and their management using different formulations, residue management in rice-based cropping systems, collaborative trials such as nano fertilisers for increasing nutrient use efficiency and yield maximization in different zones with Agronomy, organic rice cultivation and assessment of bio fortified genotypes to Zn applications. A total of nine trials were conducted during *kharif* 2023 and *rabi* 2023-24 in 18 locations (9 funded as well as 9 voluntary centers) representing typical soil and crop systems and important rice-growing regions.

Physiological studies under All India Co-Ordinated Rice Improvement Program were conducted at nine funded centers, (Coimbatore, Maruteru, Pantnagar, Pattambi, Rewa, Raipur, Karjat, Titabar and Kaul), two ICAR institutions (IIRR Hyderabad and NRRI Cuttack) and four voluntary centers (RARS Chinsurah, NDUAT Faizabad, PJNAR Karaikal, and BAU Ranchi).

I congratulate and compliment the Cooperating Scientists, technical staff and Principal Investigators of the program in Agronomy, Soil Science and Physiology Sections for their excellent effort in conducting the trials, monitoring, data collection and compilation, analysis and preparation of this voluminous report, which will benefit to develop suitable technologies.

(R.M. SUNDARAM),
Director

AGRONOMY

4. AGRONOMY

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4. AGRONOMY

SUMMARY

Crop production experiments under All India Coordinated Research Project on Rice (AICRPR) were conducted by Agronomists, Soil scientists and Physiologists at different locations during *rabi* 2022-23 and *kharif* 2023 for understanding the response of rice crop to management practices, resource conservation and climatic variations for developing efficient crop and resource management technologies that maximize the productivity and ensure high profitability to double the farmers income on a sustainable basis are compiled in this report.

A total of 250 experiments were conducted at 50 (39 funded and 11 voluntary centers) locations consisting of evaluation of promising cultivars (108 cultures) belonging to 17 groups *viz.,* Medium Hill (MH), early (TP and DS), IME, IM, Late, CSTVT, AL& ISTVT, Aerobic, MS, LPT, LNT, Basmati, Boro, BT, RSL, SDW, NIL (HT- herbicide - resistant mutant, Nitrogen and Phosphorous use efficiency) in the transplanted situation, for their response to integrated nutrient management at 50 and 100% Recommended Dose of Fertilizer (RDF). In addition, four trials each on Resource Conservation, rice based cropping systems and four collaborative trials with Soil science (2), Entomology (1), and Pathology (1). All nutrient management trials were in collaboration with Plant Breeding to develop superior and cost effective, resource efficient cultivars and technologies in rice and rice based cropping systems.

4.1. AGRONOMIC EVALUATION TRIALS (AETs)

The development of high- yielding and improved varieties and hybrids is one of the major components of rice production technology. In rice growing regions, nutrient management is also the most important yield limiting factor for production. Adaptation of cultivars with high Nutrient use efficiency is a potential strategy for optimizing nutrient requirements, lowering cost of cultivation and reducing the environmental pollution. Optimization of nutrient use not only enhances grain yield through better nutrient use efficiency but also reduces the cost of cultivation. In order to find out the production potential of promising cultivars and their response to varying levels of nutrients and to identify the optimum dose, the effect on late planted rice situations and efficient N and P cultivars, Nutrient management trials (NMTs) were constituted and conducted during *kharif* 2023. A total of 100 AVT-2 entries belonging to 17 categories were evaluated at different locations under two levels of nutrient application, i.e., 50 and 100 % of the recommended dose of nutrients along with standard and local cultivars to identify stable, high yielding and efficient genotypes.

4.1(a) AVT 2 - MH (Irrigated)

Cultivars IET 29654, IET 28906 and IET 30503 were evaluated in comparison with local checks at three locations (**Almora**, **Khudwani** and **Malan**). Nutrient response (kg grain / kg N) and grain yield were higher at 100% RDF. Among the cultures, **IET 30503** and **IET 29654** were found to be promising in terms of higher grain yield efficiency index.

4.1(b) AVT 2 - Early (Transplanted)

Eleven AVT-2 entries (IET 29947, IET 29940, IET 29939, IET 29694, IET 29689, IET 29692, IET 28123, IET 29691, IET 29690, IET 29696, IET 29700, IET 29975, IET 28965, IET 28956 and IET 29142(R)) were evaluated for their response to 50% and 100% dose of RDF at fourteen viz., **Coimbatore (150:50:50), Dhangain (80:40:20), Faizabad (80:40:40), Ghaghraghat (120:60:40), Jagdalpur (120:60:40), Karjat (100:50:50), Mandya (100:50:50), Maruteru (90:60:60), Nagaina (120:60:40), Nawagam (100:25:0), Puducherry (120:40:40), Ranchi (80:40:30), Sabour (100:40:20) and Varanasi (100:50:50)**. In this trial, recommended input of nutrients (100% RDF) was found to be promising with 19% higher grain yield and also exhibited higher nutrient efficiency. **IET 29696, IET 29947** and **IET 29694** recorded higher grain yield among the cultures (4.95 to 5.04 t/ha respectively) were found to be promising entries as compared to standard and local checks.

4.1(c) AVT 2 - Irrigated Medium Early

AVT-2 IME cultures (IET 29738, IET 29734, IET 29726, IET 29708, IET 29717, IET 29720, IET 29820, IET 29808, IET 29822, IET 29188, IET 29304, IET 30282, IET 29203 and IET 30697) were evaluated at 17 locations *viz.,* **Aduthurai (150:60:60), Chinsurah (70:35:35), Dhangain (120:60:40), Faizabad (120:60:40), Gangavathi (150:75:75), Ghaghraghat (120:60:60), Kanpur (120:60:60), Karjat (100:50:50), Kota (120:60:40), Mandya (100:50:50), Maruteru (90:60:60), Nagina (120:60:40), Navsari (100:30:0), Nawagam (100:25:0), Puducherry (120:40:40), Varanasi (120:60:40)** and **Warangal (120:60:40)**. Nutrient management with 100% RDF application recorded better yield over 50% RDF at all the locations with 21% higher grain yield. Among the cultures, **IET 29726, IET 29822, IET 29808, IET 29734** and **IET 29738** (5.15 to 5.40 t/ha) performed better and recorded higher mean grain yield across the locations as compared to other test entries and checks.

4.1(d) AVT 2 - Irrigated Medium

Thirteen AVT-2 entries IET 29743, IET 29741, IET 29833, IET 28523, IET 29742, IET 29290(R), IET 29301(R), IET 29257(R), IET 29284(R), IET 29014(R), IET 29002(R), IET 30757 and IET 29859 eighteen different locations viz., **Chinsurah (80:40:40), Coimbatore (150:50:50), Dhangain (120:60:40), Faizabad (120:60:60), Jagdalpur (120:60:30), Karjat (100:50:50), Kaul (150:60:60), Maruteru (90:60:60), Nagina (120:60:40), Navsari (100:30:0), Nawagam (100:25:0), Pantnagar (120:60:40), Puducherry (120:40:40), Pusa (120:60:40), ARI-Rajendranagar (120:60:40), Titabar (60:20:20), Varanasi (120:60:40)** and **Warangal (120:60:40)** indicated that cultures, **IET 29741** (5.02 t/ha) followed by **IET 29743** (4.95 t/ha), **IET 29833** (4.81 t/ha) and **IET 29742** (4.78 t/ha) were found promising on the basis of overall mean grain yield across the locations. Application of 100% RDF of the location (28% higher) found significantly superior to 50% RDF application at all the locations.

4.1(e) AVT 2 - Late (Irrigated)

Five AVT-2 Late entries (IET 28524, IET 29891, IET 29935, IET 30826 and IET 30829) were evaluated for its response to graded levels nutrients on grain yield and yield attributes at eight locations viz., **Aduthurai (150:50:50), Chinsurah (80:40:40), Chiplima (120:60:60), Dhangain (120:60:40), Karjat (100:50:50), Mandya (100:50:50), Maruteru (90:60:60), Nawagam (120:25:0)** and **Rajendranagar (120:60:40)** indicated that application of 100% RDF was found to be promising with 19 % increased grain yield and also exhibited higher nutrient recovery efficiency. IET cultures were found to be promising in terms of higher grain yield at most of the locations with **IET 28525** (5.36 t/ha) recording the higher mean yields.

4.1(f) AVT 2 - CSTVT

One culture viz., IET 30201 was evaluated in comparison with standard varieties (Pusa 44 and BPT 5204) at **Gangavathi (150:75:75), Maruteru (90:60:60), Nagina (120:60:40)** and **Navsari (120:30:0)** indicated 100% RDF was found to be promising and also exhibited higher nutrient response (6.63 to 16.23). AVT-2 entry **IET 30201** was found to be on promising higher mean grain yield of (4.63 t/ha).

4.1(g) AVT 2 - AL & ISTVT

Saline tolerant cultures (seven) viz., IET 30162, IET 30164, IET 30165, IET 30176, IET 30178, IET 30827 and IET 30830 at **Navsari (120:30:0)** location indicated superiority of local checks (**GNR-5; CSR 10 and CSR 36**) which recorded higher mean grain yield.

4.1(h) AVT 2 - Aerobic

Eight AVT-2 entries (IET 30051, IET 30024, IET 30004, IET 30029, IET 30021, IET 30041, IET 29405(R) and IET 28636) were evaluated for their response to two fertilizer levels on grain yield at six locations viz., **Jagdalpur (120:60:40), Kota (120:60:40), Ludhiana (150:30:30), Nawagam (80:25:0), Pantnagar (120:60:40)** and **Raipur (100:60:40)** showed the application of 100% RDF was found to be promising (27% higher grain yield) and also exhibited higher nutrient response. **IET 30004** and **IET 30029** were found to be promising with higher grain yield (3.82 and 3.77 t/ha) across the locations.

4.1(i) AVT 2 - Medium Slender

Four entries (IET 30083, IET 30078, IET 30107 and IET 29536(R)) of medium slender group were evaluated for their response to two levels of nutrients (50% and 100% RDF) on grain yield at nine different locations i.e., **Faizabad (120:60:40), Dhangain, (120:60:40), Karjat (100:50:50), Mandya (100:50:50), Maruteru (90:60:60), Nagina (120:60:40), Nawagam (100:25:0), Raipur (120:60:40)** and **Rajendranagar (120:60:40)**showed the application of 100% RDF was found to be promising (19% higher yield) and also exhibited higher nutrient response. Entries viz., **IET 29536(R)** and **IET 30078** (5.61 and 5.44 t/ha respectively) were found to be promising with better yields over other test entries and checks at 100% of RDF application at respective locations.

4.1(j) AVT 2 - Phosphorous efficient cultivars (LPT)

The trial was conducted at seven locations viz., **Gangavathi, Karjat, Mandya, Maruteru, Raipur, Ranchi and Varanasi** with IET entries IET 29549, IET 30240, IET 30252, IET 30235, IET 30233, IET 30230 and IET 30242 at graded levels of the Phosphorus application. Mean over the locations, the cultures **IET 30252** (4.76 t/ha) and IET 30230 (4.71 t/ha) found promising and gave better yields over other cultures and checks at most of the locations.

4.1(k) AVT 2 - Nitrogen efficient cultivars (LNT)

A total of 6 IET cultures viz., IET 29578, IET 29577, IET 30270, IET 30261, IET 29581 and IET 30273 were evaluated at nine locations (**Gangavathi**, **Karjat, Kaul, Mandya, Maruteru, Pusa, Raipur, Ranchi and Varanasi**) at graded levels of the Nitrogen application. Mean over the locations and 'N' doses, the IET cultures viz., IET 29578, IET 30261, IET 29577, IET 29581 (4.11 to 4.41 t/ha) were found promising and gave better yield over the checks.

4.1(l) AVT 2 - Boro

The grain yield performance of boro cultures IET 29624 and its response to nutrient levels was evaluated at **Chinsurah** indicated the on par performance of IET culture **IET 29624** as that of high yielding (4.35 to 4.57 t/ha) found promising over standard checks (Gowtam and IR 64)at 100% RDF application.

4.1(m) AVT 1 - NIL - HT (Herbicide Tolerant Genotypes)

The herbicide tolerance in elite genotypes for their efficacy was taken up at four centers (**Cuttack, Bikramganj, Coimbatore** and **Nagina)** out of which the data of three centers was rejected due to recording of high yield with the susceptible entries**.** The results indicated the superiority of the Bispyribac-sodium (3.55 t/ha) followed by Imazethapyr (2.68 t/ha) considering the zero yield in susceptible lines (G9, G10, G11 and G12) by Imazethapyr. However, significantly higher mean grain yield (4.37 t/ha) was observed with weed free check. In case of imazethapyr treatment, the lines G5 (5.10 t/ha) and G7 (5.10 t/ha) exhibited significantly superior grain yield which was comparable with G6 (4.80 t/ha) with no or low phytotoxicity to Imazethapyr which might have contributed to higher crop growth and grain yield.

4.1(n) AVT 2 - BT

Five AVT-2 BT cultures (1808, 1815, 1827, 1828 and 1827) were evaluated for their response on grain yield at four locations viz., **Kaul (90:30:0), Ludhiana (40:30:30), Nagina (120:60:40)** and **Pantnagar (120:60:40)** indicated 100% RDF was found to be promising (35%) and also exhibited higher nutrient recovery efficiency. Among IET entries tested, **IET 1828** followed by **IET 1808** found promising with higher grain yield (3.98 to 4.34 t/ha) and nutrient response.

4.1(o) AVT 2 - Early (Direct Seeded)

Seven AVT-2 entries (IET 29036, IET 30330, IET 30328, IET 29052, IET 30351, IET 30334 and IET 30336) were evaluated for their response to low and optimum level of nutrients application (50 and 100% RDF) on grain yield at five locations viz., **Coimbatore (100:50:50), Jagdalpur (100:60:30), Raipur (120:60:60), Ranchi (60:40:30)** and **Rewa (50:30:20)**indicated application of 100% of RDF was found promising across the locations with 22% higher grain yield and **IET 30334** followed by **IET 30336** and **IET 30351** (4. were found promising with higher grain yield of (4.06 to 4.22 t/ha) across the locations among the tested cultures.

4.1(p) AVT 2 - Rainfed Shallow Lowland

Three AVT-2cultures (IET 30409, IET 30410 and IET 30367) of rainfed shallow land were evaluated at **Chinsurah (80:40:40), Dhangain (120:60:40), Ghaghraghat (120:60:60), Maruteru (90:60:60)** and **Titabar (60:20:40)** recorded the application of 100% RDF was found to be promising and also exhibited higher nutrient recovery efficiency. Among the IET cultures, **IET 30409** (4.53 t/ha) followed by **IET 30367** (4.37 t/ha) were found promising in terms of higher mean grain yield and nutrient response also on par with Swarna Sub 1 (4.38 t/ha).

4.1(q) AVT 2 - Semi-Deep Water

The grain yield performance of SDW cultures and response to nutrient levels of two selected IET cultures (IET 29026 and IET 29031) were evaluated at **Chinsurah, Ghaghraghat** and **Pusa** against two standard checks indicated that **IET 29031** (4.41 t/ha) was promising followed by **IET 29026** (3.95 t/ha) and promising at 100% of RDF.

4.2 RESOURCE CONSERVATION TECHNOLOGIES TRIALS (RCTs)

4.2.1 Water management for enhancing water use efficiency and productivity of mechanical transplanted rice

In order to evaluate the promising irrigation management practices in different crop establishment methods a trial was formulated and conducted at 7 locations (**Aduthurai, Ranchi Warangal, Karaikal, Khudwani, Ludhiana and Mandya**). Overall, across the 7 locations, among crop establishment methods, the highest mean grain yield was recorded under direct wet seeding (5.55 t/ha). Similarly, among irrigation management practices, alternate wetting and drying method recorded the highest mean grain yield of 5.97 t/ha across all locations.

4.2.2a. Identification of suitable sowing method of dry DSR for higher productivity in different zones

The trial was conducted at 13 locations (**Chatha, Gangavathi, Jagdalpur, Ludhiana, Mandya, Nagina, Nawagam, Pantnagar, Pusa, Raipur, Rewa, Vadgaon, and Varanasi**). The trial was laid out in RBD with 7 treatments and replicated thrice. Across the 13 locations locatioin specific high yielding dry DSR system was found to be the best among all dry DSR establishment methods with mean grain yield of 4.79 t/ha.

4.2.2b. Identification of suitable varieties for dry DSR system

The trial was conducted at 8 locations (**Gangavathi, Kota, Ludhiana, Mandya, Maruteru, Nawagam, Rajendranagar and Ranchi**).

Location	**Grain yield (t/ha) of varieties**		
	1st rank	**2nd rank**	**3rd rank**
Gangavathi	IRRI 1 (5.34)	DRR Dhan 44 (4.26)	IRRI 2 (4.16)
Kota	IRRI 1 (4.75)	IRRI 2 (4.46)	DRR Dhan 44 (4.12)
Ludhiana	LC 2 (8.46)	LC 3 (8.46)	LC 1 (8.36)
Mandya	Varalu (7.69)	IRRI 2 (7.60)	LC 1 (7.06)
Maruteru	IRRI 1 (8.28)	DRR Dhan 42 (7.24)	IRRI 3 (6.42)
Nawagam	Sahbhagidhan (5.03)	IRRI 1 (4.58)	IRRI 2 (4.54)
Rajendranagar	DRR Dhan 44 (4.73)	LC 3 (4.30)	IRRI 3 (4.13)
Ranchi	LC 1 (4.20)	DRR Dhan 42 (4.12)	Sahbhagidhan (3.85)

4.2.2c. Seed priming in Dry DSR for proper establishment and productivity

The trial was initiated in kharif 2023, with the objectives of evaluating different seed invigoraters in crop establishment, growth and yield of dry DSR and to identify the suitable, cost effective and promising seed invigoration in dry DSR; the trial was conducted at six locations viz., **Chatha**, **Coimbatore**, **Jagdalpur**, **ICAR-IIRR, Ludhaina** and **Mandya** with six priming treatments and control viz., hydro-priming, hardening, priming with NaCl @1%, seed treatment with CPB-1 (Chitinolytic bacterium), seed treatment with Trichoderma asperellum, seed treatment with Bacillus and control in replicated Randomized Block Design. The data analyses showed that Seedling Vigor Index at three locations reported was significantly superior with seed hardening and seed treatment with Chitinolytic Bacterium at 14 and 21 DAS. At five locations, priming treatments have resulted in significantly higher yield attributes, grain yield and straw yield over control. The trial has to continue for 2/3 seasons to arrive meaningful conclusions.

4.2.3a. Identification of suitable sowing method of wet DSR for higher productivity in different zones

The trial was conducted at 13 locations (**Chatha, Chiplima, Coimbatore, Mandya, Moncompu, Navasari, Nawagam, Pattambi, Pusa, Titabar, Rewa, Vadagaon and Warangal**). The trial was conducted in RBD and replicated thrice. The treatments were S_1: Broadcasting of seeds and S_2: Manual line sowing, S_3: Mechanized line sowing of seeds (Dribbler, Happy seeder of any Drum seeder, spacing as per the equipment specifications) S_4: Raised bed sowing, S_5: Any improved system in that particular location and S_6: Location specific high yielding wet DSR method, and S_7: Farmers' practice of the wet DSR method of the region. Across 13 locations mechanized line sowing resulted in the highest grain yield (4.04 t/ha).

4.2.3b. Identification of suitable varieties for wet DSR system

The trial was conducted at 8 locations (**Kota, Mandya, Nawagam, Puducherry, Bankura and Pattambi)**.

Location	**Grain yield (t/ha) of varieties**		
	1st rank	**2nd rank**	**3rd rank**
Kota	Sahbhagidhan (6.00)	DRR Dhan 42 (5.74)	DRR Dhan 44 (5.69)
Mandya	IRRI 1 (7.15)	IRRI 2 (7.04)	DRR Dhan 42 (6.73)
Nawagam	Sahbhagidhan (5.40)	IRRI 2 (5.22)	DRR Dhan 42 (5.06)
Puducherry	DRR Dhan 42 (5.81)	Varalu (5.61)	IRRI 2 (5.59)
Bankura	Dhiren (6.48)	Dhruba (6.04)	IET 23135 (5.73)
Pattambi	Uma (3.84)	Aiswarya (2.63)	Sreyas (2.53)

4.3 RICE BASED CROP DIVERSIFICATION SYSTEM TRIALS (RBCDTs)

4.3.1 Conservation Agriculture / System based Management Practices in rice and rice-based cropping systems (crop diversification) for higher profitability

The system productivity analysis (Kharif and rabi) indicated the superiority of transplanting at **Karjat** (7.66 t/ha) and **Vadagaon** (7.81 t/ha). The tillage system S-1 conventional tillage found promising at **Karjat**. The REY of the system productivity indicated superiority of the conventional tillage system with transplanting at both **Karjat** and **Vadagaon** with higher rice equivalent system (7.66 and 7.81 t/ha).

4.3.2 Assessing the performance and yielding ability of Sorghum hybrids in Rice fallows

Kharif data was reported by only one center **Jagdalpur**, none of the centers reported the soughum hybrids data. Since, the trial is about the sorghum hybrids in rice fallows the report could not be made.

4.3.3 Long term trial on weed dynamics in rice based cropping systems under different establishment methods

Weeds are endemic in crops and a constant problem in crop production because of their dynamic nature. Despite modern control practices aimed at weed elimination, weed continues to be a ubiquitous and recurrent threat for crop production due to its ability to shift in response to management practices and environmental conditions. Further, long term continuous use of selective herbicides in rice may cause a shift in weed flora, from annuals to perennials, which are difficult to control. With these aspects in view, a long term trial (semi permanent) plot has been continued during *Kharif* season 2023 with the objective of assessing the weed dynamics in different establishment methods, the 4th year study was conducted at 16 locations viz., **Aduthurai, Chatha, Chiplima, Ghaghraghat, Jagdalpur, Karaikal, Malan, Moncompu, Nagina, Nawagam, Pantnagar, Pusa, Puducherry, ARI-Rajendranagar, Titabar and Varanasi** during ***Kharif*** season, and at **Puducherry** during ***Rabi*** season in split plot design. The Genus and Species wise weed population reported by 12 locations showed that at all the test locations, the direct seeding system recorded higher weed population (group wise and total) and biomass compared to mechanical transplanting; and dry direct seeding system recorded higher weed population (species wise, groupwise and total) and biomass compared to wet DSR system. The weed dry biomass was significantly low with chemical weed control treatments.

The 4^{th} year results are clearly showing the shift was noticed in species within the weed groups. In all establishment methods, among the grasses, *Echinochloa colona* and *Leptochloa chinensis* were reported dominant rather than usual *Echinochloa crusgalli* and *Leptochloa chinensis* was reported as difficult weed to control; among sedges, Cyperus iria and Cyperus rotundus have increased than usual *Cyperus difformis*. Among BLW, no commonality in dominating genus and/ spp, but increase in BLW population

The mean grain yield over the locations ranged from 1.25t/ha at **Moncompu** to 5.32 & 5.15 t/ha at **Puducherry** and **Varanasi.** The method of establishment had no significant difference at **Chiplima, Nawagam, Pusa and Varanasi**. At 11 locations the transplanting systems recorded significantly higher yields and at two locations viz; **Moncompu** and **Pantnagar** dry DSR was proved superior and at one location transplanting and wet DSR were on par Similar trend was recorded with straw yield. The growth and yield attributes also showed similar trend as that of grain yield.

4.3.4 Weed Survey in different Rice systems in different zones

With the objective of obtaining information on changes in weed flora, data on the level of infestation, herbicide effectivity or resistance etc. through surveys of weeds in representative fields of different establishment systems like transplanted rice, Wet Direct Sown Rice, Dry Direct Sown Rice, the trial was initiated in *kharif* 2023. The Survey was conducted by ten locations viz., **ICAR-IIRR, Karaikal, Kaul, Ludhiana, Moncompu, Navsari, Pantnagar, Raipur, Titabar, Vytilla** in *kharif* 2023. No weed information was received from 29 locations. The results of the survey of 25 farmers under each location revealed that in Assam, Gujarat, Pokkali system of Kerala, farmers are practicing manual weeding only. In, Andhra Pradesh, Punjab, Haryana, Kerala, UT of Puduchhery, UtterPradesh two times herbicide application (pre and post-emergence) is in practice. In Chattisgarh, farmers are applying single time poste-mergence herbicides. On an average, farmers are spending Rs 800 to 16,200 per ha towards total weed control cost.

4.4 INTER DISCIPLINARY TRIALS

4.4.1. Yield maximization of rice in different zones

The trial consisted of 8 treatments and laid out in RBD design with 3 replications. Treatments are T_1: RDF as per site-specific nutrient management; T_2: T_1 + FYM @ 5 t/ha; T_3: T_1 + sampoorna (KAU) @ 10g/L (250 L/ha/application); T_4: 125% RDF of T_1; T_5: 125% RDF of T_1 + FYM @ 5 t/ha; T_6: T_1 + application of micronutrient; T_7: T_1 + Geoxol @ 40 kg/ha and T_8: Optional (location specific). The trial was conducted at 21 locations (**Bankura, Gangavathi, Khudwani, Malan, Mandya, Pantnagar, Pattambi, Raipur, Ranchi, Titabar, Kota, Chinsurah, Chiplima, Faizabad, Kanpur, Kaul, Karaikal, Maruteru, Moncompu, Puducherry and Pusa).** Across 21 locations, 125% RDF of T_1 + FYM @ 5 t/ha resulted in the highest mean grain yield (6.09 t/ha).

4.4.2 Assessment of yield gap analysis (Agronomy & Economics)

4.4.3 Evaluation of Organic fertilizers and Natural farming practices for enhancing the productivity and soil heath

The trial was conducted at 7 locations (**Chatha, Gangavathi, Ghaghraghat, Khudwani, Pattambi, Raipur and Titabar**). There were five treatments T_1: Control (No addition of any inputs except labours for operations including weeding) T_2: Complete NF, T_3: AI-NPOF package, T_4: Integrated Crop Management (50% nutrient through organic and 50% nutrient through inorganic source) and T_5: Integrated Crop Management (50% nutrient through organic and 50% nutrient through inorganic source with application of need based pest management). Across the 7 locations, T_5 (50% nutrient through organic and 50% nutrient through inorganic source with application of need based pest management) resulted the highest mean grain yield (4.55 t/ha).

4.4.4 Nano-fertilizers for increasing nutrient use efficiency, yield and economic returns in transplanted rice

The trial on "Nano-fertilizers for increasing nutrient use efficiency, yield and economic returns in transplanted rice" was continued in the second year at 24 locations with seven treatments (in collaboration with Agronomy). The results indicated that additional application of nano urea with 100% RDN improved the yield, yield parameters and N uptake at **Jagdalpur, Kaul, Kanpur, Coimbatore, Khudwani, NRRI and Sabour**. At **Bankura, Khudwani** and **Karaikal**, the higher NUE was observed with 75% RDN + two sprays of nano urea treatment, but 100% RDN + two sprays of nano urea treatment registered a higher NUE at the rest of the locations. Replacement of 25 and 50% of RDN with nano urea spray at two intervals recorded a declining trend in the grain yield to the tune of -2 to 25.9% at the majority of the locations. While two sprays of nano urea in addition to 100% RDN, improved the grain yield to the tune of 0.7% (**Ludhiana**) to 33.5% (**Khudwani**). However, nano urea treatment alone registered, a yield decline to -10.6% (**Chiplima**), -20.0% (**NRRI-Cuttack**), -13.6% (**Karaikal**), -36.2 (**Ludhiana**) and -28.8% (**Gangavati**).

4.4.5 Integrated Pest Management– on farm management of insects, diseases and weeds IPMs (Entomology, Pathology and Agronomy) Special interdisciplinary trial

The Integrated Pest Management special (IPMs) trial was conducted at 15 locations viz., **Malan, Kaul, Ludhiana, Chiplima, Masodha Pusa, Titabar, Jagdalpur, Navasari, Nawagam, Vadagaon, Aduthurai, Gangavathi, Mandya, Puducherry in** *Kharif* 2023 with an objective of managing all pests i.e., weeds, insects, diseases in a holistic way in farmer's fields involving them in a participatory mode The data on weed population and weed dry biomass in critical period of crop weed competition (Active Tillering and Panicle Initiation stage) and grain yields were reported, and the results of analysed data are summarized. Across the locations, weeds, insect pests and disease incidence were significantly low in IPM plots. IPM implemented plots resulted mean grain yield advantage was 49.07%, 4.36%, 25.50%, 20.65%, 18.77%,21.04% and 14.53% respectively in Zone-I, II, III, IV, V, VI and VII over the farmer practices. In IPM adopted fields, the mean weed population reduction over the Zones ranged from 4.65 % in Zone-I (Hills) to 80.45% in Zone-VII (Southern) at Active Tillering stage and from 9.70 % in Zone-III (Eastern) to 69.24% in Zone-VI (Western) at Panicle Initiation stage respectively. The dry weed biomass reported by 10 locations showed that, both Active Tillering and Panicle Initiation stages were significantly reduced by 18.19% in Zone III (Eastern) to 80.07% in Zone-VII (Southern); 13.29% in Zone III (Eastern) to 89.70% in Zone-VII (Southern) respectively.

Overall, the incidence of insect pests was high in aerobic rice followed by direct seeding and semi-dry rice while the incidence was low in normal transplanting and mechanical transplanting methods of crop establishment.

AGRONOMIC EVALUATION TRIALS

AGRONOMY- 4

4.1 AGRONOMIC EVALUATION TRIALS (AETs)

The development of high- yielding and improved varieties and hybrids is one of the major components of rice production technology. In rice growing regions, nutrient management is also the most important yield limiting factor for production. Adaptation of cultivars with high Nutrient use efficiency in two different planting situations and nutrient management is a potential strategy for optimizing nutrient requirements, lowering cost of cultivation and reducing the environmental pollution. Optimization of nutrient use not only enhances grain yield through better nutrient use efficiency but also reduces the cost of cultivation. In order to find out the production potential of promising cultivars and their response to varying levels of nutrients and to identify the optimum dose, the effect on late planted rice situations and efficient N and P cultivars, Nutrient management trials (NMTs) were constituted and conducted during *kharif* 2023. A total of 108 AVT-2 entries belonging to 17 categories were evaluated at different locations under two levels of nutrient application, i.e., 50 and 100 % of the recommended dose of nutrients along with standard and local cultivars to identify stable and efficient genotypes.

4.1(a) AVT 2 - Medium Hill MH (Irrigated)

Cultivars IET 29654, IET 28906 and IET 30503 were evaluated in comparison with local checks at three locations (**Almora**, **Khudwani** and **Malan**) under two fertilizer doses (50% RFD & 100% RFD) under medium hill conditions. The data received from four locations was summarized and presented in **Table 4.1(a).**

The application of 100% RFD gave significantly higher grain yield at **Almora** (4.90 t/ha), **Khudwani** (4.53 t/ha) and **Malan** (4.76 t/ha) over 50% RDF. Interaction effect of varieties and fertilizer levels are non-significant at all the centers except **Almora**. Nutrient response (kg grain/kg fertilizer) was higher at 100% RDF as compared to 50% RDF at all locations (5.51 to 11.06 kg grain/kg nutrient).

The mean grain yield of the locations ranged from 4.21 to 4.53 t/ha at **Khudwani** and **Malan** respectively. Among the cultivars tested, IET 29654 at **Almora** (5.56 t/ha) and IET 28906 at **Khudwani** (5.45 t/ha) were found promising. Mean over the locations, RC Maniphace 1, HPR 2143 were found to be promising over tested cultures.

In this trial, application with 100% RFD was found to be promising (18% higher) and also exhibited higher nutrient recovery. Among the cultures, IET 30503 and IET 29654 were found to be promising in terms of higher grain yield.

Table 4.1(a): Summary of data on grain yield and ancillary character of selected AET- medium hill (irrigated) cultures grown under transplanted conditions at graded levels of recommended nurtrient(NPK) doses, kharif 2023.

Fertilizer-levels	Varieties	ALMORA						
		Grain Yield (t/ha)	***Rank***	Panicle/m^2 (No.)	Panicle Weight (g)	Test Wt(g)	Days to 50% flowering	Nutrient res. (kg grain/kg Nutrient) (Base level 50% RDF)
F1 - 50% RFD	V1	4.64	*4*	69	2.70	2.27	64	
	V2	2.70	*9*	74	2.40	2.40	51	
	V3	3.22	*8*	80	2.30	2.33	57	
	V4	-	-	-	-	-	-	
	V5	4.10	*7*	59	3.23	2.37	64	
	V6	4.32	*6*	76	3.20	2.35	61	
	V7	-	-	-	-	-	-	
	V8	-	-	-	-	-	-	
F2 - 100% RFD	V1	6.48	*1*	74	3.00	2.25	60	18.40
	V2	2.70	*9*	74	2.40	2.40	51	0.00
	V3	4.40	*5*	80	2.27	2.33	57	11.80
	V4	-	-	-	-	-	-	-
	V5	5.69	*2*	63	3.40	2.39	60	15.90
	V6	5.24	*3*	74	3.23	2.26	63	9.20
	V7	-	-	-	-	-	-	-
	V8	-	-	-	-	-	-	-
Interaction								
N at same V		0.61		NS	NS	NS	NS	
V at same N		0.74		NS	NS	NS	NS	
Means of N levels:								
F1		3.80	*2*	71	2.77	2.34	59	
F2		4.90	*1*	73	2.86	2.33	58	11.06
C.D.(0.05)		0.64		NS	NS	NS	NS	
C.V.(%)		9.34		5.57	3.95	2.83	1.64	
Mean of varieties:								
V1		5.56	*1*	71	2.85	2.26	62	18.40
V2		2.70	*5*	74	2.40	2.40	51	0.00
V3		3.81	*4*	80	2.29	2.33	57	11.80
V4		-	-	-	-	-	-	-
V5		4.90	*2*	61	3.32	2.38	62	15.90
V6		4.78	*3*	75	3.22	2.31	62	9.20
V7		-	-	-	-	-	-	-
V8		-	-	-	-	-	-	-
C.D.(0.05)		0.43		5.45	0.49	NS	2.99	
C.V.(%)		8.14		6.15	14.11	5.30	4.15	
Expt. Mean		4.35		72	2.81	2.34		
Soil type		Silty clay loam						
pH		6.70						
Fertilizer levels (kg/ha)								
F1		50:30:20						
F2		100:60:40						
Varieties								
V1		IET 29654						
V2		IET 28906						
V3		IET 30503						
V4		-						
V5		Vivekdhan 62						
V6		V L Dhan 65(N) *						
V7		-						
V8		-						
Available NPK in Soil		213:14:253						

Table 4.1(a): Cntd.

Fertilizer-levels	Varieties	KHUDWANI					
		Grain Yield (t/ha)	***Rank***	Panicle/m^2 (No.)	Panicle Weight (g)	Test Wt(g)	Nutrient res. (kg grain/kg Nutrient) (Base level 50% RDF)
F1 - 50% RFD	V1	1.81	*14*	141	1.69	23.5	
	V2	5.1	*5*	406	2.14	28.8	
	V3	4.03	*8*	404	2.05	27.3	
	V4	-	-	-	-	-	
	V5	3.16	*10*	406	1.66	24.57	
	V6	2.18	*12*	155	1.31	23.73	
	V7	4.59	*7*	417	1.75	27.4	
	V8	6.41	*2*	484	2.47	29.63	
F2 - 100% RFD	V1	2.21	*11*	133	1.37	24.43	3.81
	V2	5.8	*3*	434	2.27	28.97	6.67
	V3	5.46	*4*	428	2.2	27.67	13.62
	V4	-	-	-	-	-	-
	V5	3.62	*9*	429	1.75	24.73	4.38
	V6	2.04	*13*	136	1.35	23.83	-1.33
	V7	5.05	*6*	440	1.73	27.71	4.38
	V8	7.51	*1*	518	2.63	30.47	10.48
Interaction							
N at same V		NS		NS	NS	NS	
V at same N		NS		NS	NS	NS	
Means of N levels:							
F1		3.90	*2*	345	1.87	26.42	
F2		4.53	*1*	360	1.90	26.83	6.00
C.D.(0.05)		0.3		NS	NS	0.27	
C.V.(%)		5.42		12.24	12.17	0.75	
Mean of varieties:							
V1		2.01	*7*	137	1.53	23.97	3.81
V2		5.45	*2*	420	2.21	28.89	6.67
V3		4.75	*4*	416	2.13	27.49	13.62
V4		-	-	-	-	-	-
V5		3.39	*5*	417	1.71	24.65	4.38
V6		2.11	*6*	145	1.33	23.78	-1.33
V7		4.82	*3*	428	1.74	27.56	4.38
V8		6.96	*1*	501	2.55	30.05	10.48
C.D.(0.05)		0.81		65.21	0.25	1.04	
C.V.(%)		16.12		15.54	11.18	3.29	
Expt. Mean		4.21		352	1.88	26.62	
Soil type		Silty clay loam					
pH		6.70					
Fertilizer levels (kg/ha)							
F1		60:30:15					
F2		120:60:30					
Varieties							
V1		IET 29654					
V2		IET 28906					
V3		IET 30503					
V4		-					
V5		Vivekdhan 62					
V6		V L Dhan 65(N) *					
V7		K 343					
V8		Local Check - Shalimar Rice-4 (135-138 days)					
Available NPK in Soil		213:14:253					

Table 4.1(a): Cntd..

Fertilizer-levels	Varieties	MALAN						Over All Mean	***Rank***
		Grain Yield (t/ha)	***Rank***	Panicle/m^2 (No.)	Panicle Weight (g)	Test Wt(g)	Nutrient res. (kg grain/kg Nutrient) (Base level 50% RDF)		
F1 - 50% RFD	V1	4.44	*8*	256	14.53	34.57		3.63	*16*
	V2	3.27	*13*	251	15.73	35.15		3.69	*15*
	V3	3.86	*10*	243	14.73	36.35		3.70	*14*
	V4	4.83	*7*	211	11.71	22.8		4.83	*6*
	V5	5.53	*3*	150	15.11	25.6		4.26	*10*
	V6	4.85	*6*	157	11.75	24.38		3.78	*13*
	V7	-	-	-	-	-		4.59	*9*
	V8	3.27	*13*	238	15.06	33.11		4.84	*5*
F2 - 100% RFD	V1	5.08	*5*	356	16.53	34.72	7.53	4.59	*8*
	V2	3.5	*12*	271	18.18	36.21	2.71	4.00	*12*
	V3	4.16	*9*	273	17.08	37.55	3.53	4.67	*7*
	V4	5.73	*2*	232	13.43	24.84	10.59	5.73	*1*
	V5	5.95	*1*	184	18.55	28.79	4.94	5.09	*3*
	V6	5.25	*4*	212	15	24.57	4.71	4.18	*11*
	V7	-	-	-	-	-	-	5.05	*4*
	V8	3.66	*11*	274	15.42	33.49	4.59	5.59	*2*
Interaction									
N at same V		NS		24.57	0.86	NS			
V at same N		NS		23.6	1.05	NS			
Means of N levels:									
F1		4.29	*2*	215	14.09	30.28		4.00	*2*
F2		4.76	*1*	257	16.31	31.45	5.51	4.73	*1*
C.D.(0.05)		0.13		7.99	0.88	NS			
C.V.(%)		2.16		2.55	4.35	6.22			
Mean of varieties:									
V1		4.76	*4*	306	15.53	34.65	7.53	4.11	*6*
V2		3.39	*7*	261	16.96	35.68	2.71	3.85	*8*
V3		4.01	*5*	258	15.91	36.95	3.53	4.19	*5*
V4		5.28	*2*	222	12.57	23.82	10.59	5.28	*1*
V5		5.74	*1*	167	16.83	27.20	4.94	4.68	*4*
V6		5.05	*3*	184	13.38	24.48	4.71	3.98	*7*
V7		-	-	-	-	-	-	4.82	*3*
V8		3.47	*6*	256	15.24	33.30	4.59	5.21	*2*
C.D.(0.05)		0.23		17.38	0.61	1.48			
C.V.(%)		4.23		6.17	3.35	4.01			
Expt. Mean		4.53		236	15.20	30.87			
Soil type		Clay Loam							
pH		5.90							
Fertilizer levels (kg/ha)									
F1		45:20:20							
F2		90:40:40							
Varieties									
V1		IET 29654							
V2		IET 28906							
V3		IET 30503							
V4		RC Maniphace 1(NE)							
V5		Vivekdhan 62							
V6		V L Dhan 65(N) *							
V7		-							
V8		Local Check - HPR 2143							
Available NPK in Soil		301:45:223							

4.1(b) AVT 2 - Early (Transplanted)

Fifteen AVT-2 entries (IET 29947, IET 29940, IET 29939, IET 29694, IET 29689, IET 29692, IET 28123, IET 29691, IET 29690, IET 29696, IET 29700, IET 29975, IET 28965, IET 28956 and IET 29142(R)) were evaluated for their response to 50% and 100% dose of RDF on grain yield in comparison to standard varieties i.e. MTU 1153, NDR 97 and CO 51 as well as respective local checks at fourteen viz., **Coimbatore (150:50:50), Dhangain (80:40:20), Faizabad (80:40:40), Ghaghraghat (120:60:40), Jagdalpur (120:60:40), Karjat (100:50:50), Mandya (100:50:50), Maruteru (90:60:60), Nagaina (120:60:40), Nawagam (100:25:0), Puducherry (120:40:40), Ranchi (80:40:30), Sabour (100:40:20) and Varanasi (100:50:50)**. The experiments were conducted in a split plot design at all the locations**.** The treatments were two levels of fertilizer input (50% and 100% RDF) as main plot and varieties assigned to sub plots. The data received from these locations are summarized and presented in **Table 4.1(b)**.

Different doses of RDF (50% and 100%) exhibited significant differences on grain yield at most of the locations except **Jagdalpur** and **Mandya**. Grain yield increased significantly with increasing level of input from 50 to 100% RFD at all the locations. Application of 100% NPK recorded significantly higher yield at **Coimbatore** (6.43 t/ha), **Dhangain** (3.91 t/ha), **Faizabad** (4.30 t/ha), **Ghaghraghat** (3.89 t/h), **Karjat** (5.08 t/ha), **Maruteru** (5.50 t/ha), **Nagina** (4.48 t/ha), **Nawagam** (5.84 t/ha), **Puducherry** (6.92 t/ha), **Ranchi** (3.83 t/ha), **Sabour** (5.53 t/ha) and **Varanasi** (4.36 t/ha). Nutrient response (kg grain / kg nutrient) was higher at application of 100 % RDF at **Nagina** (17.42), **Coimbatore** (15.28), **Faizabad** (12.15), **Nawagam** (10.76), **Karjat** (9.86), **Dhangain** (9.75), **Puducherry** (8.49) **Mandya** (7.57) and **Ranchi** (6.05) and while a nominal increase was reported in **Ghaghraghat** (3.35), **Maruteru** (2.51) and **Varanasi** (1.37).

Grain yield differences among the tested genotypes were significant at all the locations and found significantly superior over checks are performed well at higher RDF. Significant higher mean maximum yield was recorded by IET 28123 (6.21 t/ha) followed by IET 29696 (6.04 t/ha) at **Coimbatore;** IET 29947 at **Dhangain** (4.47 t/ha); IET 29556 at **Faizabad** (4.45 t/ha); IET 29939 **Ghagharaghat** (4.76 t/ha) at and **Jagdalpur** (5.41 t/ha); IET 29689 at **Karjat** (5.44 t/ha) and **Mandya** (6.65 t/ha); IET 29690 at **Maruteru** (7.05 t/ha); IET 28965 (3.94 t/ha) and IET 29689 at **Nawagam** (5.93 t/ha); IET 29292 (7.22 t/ha) at **Puducherry**; IET 29975 (4.09 t/ha) at **Ranchi**; IET 28965 (5.75 t/ha) at **Sabour** and IET 29947 (6.08 t/ha) at **Varanasi** were found promising. Mean over the locations, the performance of IET 29696 (5.04 t/ha) followed by IET 29947 (5.01 t/ha), IET 29694 (4.95 t/ha) were promising over MTU 1153 (4.55 t/ha). Interaction effects of nutrient levels x cultivars on grain yield was non-significant at seven out of fourteen locations.

In this trial, recommended input of nutrients (100% RDF) was found to be promising with 19% higher grain yield and also exhibited higher nutrient efficiency. IET 29696 and IET 29947 and IET 29694 recorded higher grain yield (4.95 to 5.04 t/ha) among the cultures and found to be promising entries as compared to standard and local checks.

Table 4.1(b): Summary of data on grain yield and ancillary characters of selected NMT Early (TP) cultures grown under transplanted conditions at low and optimum recommended fertilizer doses, kharif 2023.

F-levels	Varieties	COIMBATORE				
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: Low input (50% NPK)	V1	4.54	27	272	1.86	
	V2	4.45	29	264	1.80	
	V3	4.38	31	259	1.78	
	V4	4.65	24	281	2.14	
	V5	4.80	21	284	2.26	
	V6	4.28	32	231	1.62	
	V7	4.94	19	294	2.48	
	V8	4.64	25	283	2.27	
	V9	4.17	35	229	1.67	
	V10	4.83	20	288	2.45	
	V11	4.15	36	220	1.56	
	V12	4.52	28	280	2.02	
	V13	4.41	30	269	1.93	
	V14	4.59	26	280	2.18	
	V15	4.23	33	236	1.69	
	V16	4.21	34	264	2.86	
	V17	4.80	21	291	2.25	
	V18	4.74	23	290	2.28	
F2: Optimum input (100% NPK)	V1	6.40	10	367	2.82	14.88
	V2	6.33	11	362	2.72	15.04
	V3	6.22	13	354	2.68	14.72
	V4	6.56	7	375	3.09	15.28
	V5	6.70	4	382	3.20	15.20
	V6	5.76	17	325	2.54	11.84
	V7	7.47	1	405	3.38	20.24
	V8	6.57	6	379	3.13	15.44
	V9	5.90	15	335	2.52	13.84
	V10	7.25	2	391	3.32	19.36
	V11	5.47	18	314	2.41	10.56
	V12	6.47	9	370	2.96	15.60
	V13	6.29	12	361	2.82	15.04
	V14	6.55	8	374	3.06	15.68
	V15	5.85	16	328	2.57	12.96
	V16	6.12	14	355	2.73	15.28
	V17	7.16	3	385	3.12	18.88
	V18	6.64	5	381	3.15	15.20
Interaction						
F at same V		0.12		NS	0.09	
V at same F		0.13		NS	0.09	
F1		4.52	2	268	2.06	
F2		6.43	1	363	2.90	15.28
C.D.(0.05)		0.06		8.04	0.04	
C.V.(%)		1.37		3.08	2.12	

Table 4.1(b): Contd.

N-levels	Varieties	COIMBATORE				
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Mean of varieties:						
V1		5.47	10	320	2.34	14.88
V2		5.39	11	313	2.26	15.04
V3		5.30	13	307	2.23	14.72
V4		5.61	6	328	2.62	15.28
V5		5.75	4	333	2.73	15.20
V6		5.02	17	278	2.08	11.84
V7		6.21	1	350	2.93	20.24
V8		5.61	6	331	2.70	15.44
V9		5.04	16	282	2.10	13.84
V10		6.04	2	339	2.89	19.36
V11		4.81	18	267	1.99	10.56
V12		5.50	9	325	2.49	15.60
V13		5.35	12	315	2.38	15.04
V14		5.57	8	327	2.62	15.68
V15		5.04	15	282	2.13	12.96
V16		5.17	14	309	2.80	15.28
V17		5.98	3	338	2.69	18.88
V18		5.69	5	335	2.72	15.20
C.D.(0.05)		0.09		8.44	0.06	
C.V. (%)		1.41		2.34	2.23	
Expt. Mean		5.47		315	2.48	
Soil type		Clay loam				
pH		8.10				
N - levels (kg/ha)						
F1		75:25:25				
F2		150:50:50				
Recommended N:P:K (kg/ha)		150:50:50				
Varieties						
V1		IET 29947				
V2		IET 29940				
V3		IET 29939				
V4		IET 29694				
V5		IET 29689				
V6		IET 29692				
V7		IET 28123				
V8		IET 29691				
V9		IET 29690				
V10		IET 29696				
V11		IET 29700				
V12		IET 29975				
V13		IET 28965				
V14		IET 28956				
V15		IET 29142(R)				
V16		CO-51 (NC)				
V17		MTU 1153 (S)				
V18		Local Check - CO 51 (115 days)				
Available N:P:K of soil (kg/ha)		217:23:462				

Table 4.1(b): Contd.

F-levels	Varieties	DHANGAIN Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test weight (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: Low input (50% NPK)	V1	4.02	8	265	5.88	27.47	83	
	V2	3.97	10	257	5.66	27.20	81	
	V3	3.22	28	230	4.33	23.87	79	
	V4	3.53	18	251	5.22	25.60	78	
	V5	3.50	20	251	5.22	26.40	81	
	V6	3.17	30	230	5.22	23.33	78	
	V7	3.23	27	234	4.44	23.73	83	
	V8	3.64	16	256	5.33	27.00	80	
	V9	3.35	24	238	4.77	24.80	83	
	V10	3.41	22	245	5.11	24.33	84	
	V11	2.67	34	213	3.55	22.00	73	
	V12	2.74	32	223	4.22	22.80	78	
	V13	3.40	23	240	5.00	25.20	81	
	V14	3.47	21	247	5.22	25.40	80	
	V15	2.58	35	209	3.77	21.20	78	
	V16	2.14	36	199	3.66	19.33	74	
	V17	3.30	26	234	4.55	23.87	78	
	V18	2.73	33	220	4.00	22.53	82	
F2: Optimum input (100% NPK)	V1	4.91	1	266	6.44	27.80	84	12.71
	V2	4.58	2	264	6.22	27.40	82	8.71
	V3	3.92	11	246	5.11	25.33	80	10.00
	V4	4.06	7	256	5.11	26.93	80	7.57
	V5	4.40	3	263	5.44	27.47	82	12.86
	V6	3.88	12	245	5.00	25.07	79	10.14
	V7	3.70	14	240	4.44	24.67	84	6.71
	V8	4.22	5	259	5.22	27.33	81	8.29
	V9	4.15	6	258	5.22	26.00	84	11.43
	V10	3.76	13	246	4.77	25.73	85	5.00
	V11	3.33	25	228	3.99	22.27	75	9.43
	V12	3.51	19	228	4.00	23.60	80	11.00
	V13	4.25	4	262	5.33	27.27	83	12.14
	V14	4.01	9	250	5.11	25.73	81	7.71
	V15	3.21	29	226	3.77	21.53	79	9.00
	V16	3.17	30	221	3.66	20.33	75	14.71
	V17	3.67	15	239	4.33	24.67	80	5.29
	V18	3.63	17	233	4.33	23.87	83	12.86
Interaction								
F at same V		NS		NS	NS	NS	NS	
V at same F		NS		NS	NS	NS	NS	
F1		3.23	2	236	4.73	24.23	80	
F2		3.91	1	246	4.86	25.17	81	9.75
C.D.(0.05)		0.15		NS	NS	0.57	0.48	
C.V.(%)		5.19		7.78	15.31	2.79	0.72	

Table 4.1(b): Contd.

N-levels	Varieties	DHANGAIN Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test weight (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Mean of varieties:								
	V1	4.47	1	266	6.16	27.64	83	12.71
	V2	4.28	2	261	5.94	27.30	81	8.71
	V3	3.57	10	238	4.72	24.60	79	10.00
	V4	3.80	6	254	5.17	26.27	79	7.57
	V5	3.95	3	257	5.33	26.94	81	12.86
	V6	3.53	11	238	5.11	24.20	79	10.14
	V7	3.47	13	237	4.44	24.20	84	6.71
	V8	3.93	4	258	5.28	27.17	81	8.29
	V9	3.75	7	248	5.00	25.40	83	11.43
	V10	3.59	9	246	4.94	25.03	85	5.00
	V11	3.00	16	221	3.77	22.14	74	9.43
	V12	3.13	15	226	4.11	23.20	79	11.00
	V13	3.83	5	251	5.17	26.24	82	12.14
	V14	3.74	8	248	5.17	25.57	80	7.71
	V15	2.90	17	217	3.77	21.37	78	9.00
	V16	2.66	18	210	3.66	19.83	74	14.71
	V17	3.49	12	237	4.44	24.27	79	5.29
	V18	3.18	14	227	4.17	23.20	82	12.86
C.D.(0.05)		0.37		20.07	0.87	1.48	0.46	
C.V. (%)		9.16		7.29	15.88	5.26	0.5	
Expt. Mean		3.57		241	4.80	24.70	80	9.57
Soil type		Clay loam						
pH		6.35						
N - levels (kg/ha)								
F1		40:20:10						
F2		80:40:20						
Recommended N:P:K (kg/ha)		80:40:20						
Varieties								
V1		IET 29947						
V2		IET 29940						
V3		IET 29939						
V4		IET 29694						
V5		IET 29689						
V6		IET 29692						
V7		IET 28123						
V8		IET 29691						
V9		IET 29690						
V10		IET 29696						
V11		IET 29700						
V12		IET 29975						
V13		IET 28965						
V14		IET 28956						
V15		IET 29142(R)						
V16		CO-51 (NC)						
V17		MTU 1153 (S)						
V18		Local Check - R. Bhagwati(110-115 Days)						
Available N:P:K of soil (kg/ha)		282:42.4:162.2						

Table 4.1(b): Contd.

F-levels	Varieties	FAIZABAD Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test weight (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: Low input (50% NPK)	V1	3.33	27	203	3.21	24.73	74	
	V2	3.53	22	174	2.63	24.20	78	
	V3	3.62	20	184	3.07	22.20	81	
	V4	3.30	28	207	2.20	21.53	77	
	V5	3.34	26	207	2.80	27.27	77	
	V6	3.52	23	209	2.41	24.30	72	
	V7	3.62	20	212	2.29	24.97	72	
	V8	3.28	29	208	3.18	23.20	74	
	V9	3.50	24	190	2.69	24.30	72	
	V10	2.67	36	222	3.10	23.33	73	
	V11	3.70	18	195	3.31	18.53	67	
	V12	3.20	31	203	4.57	21.53	70	
	V13	3.40	25	180	4.23	25.10	68	
	V14	4.23	13	194	3.40	25.13	71	
	V15	2.80	34	203	3.43	20.00	66	
	V16	2.78	35	162	4.23	23.70	74	
	V17	2.92	33	160	3.93	23.53	66	
	V18	3.20	31	153	3.07	23.20	67	
F2: Optimum input (100% NPK)	V1	4.24	12	243	4.26	19.60	71	11.38
	V2	4.33	9	245	5.23	26.47	72	10.00
	V3	4.61	4	230	5.60	29.13	74	12.38
	V4	4.59	5	243	3.93	26.10	73	16.13
	V5	4.71	2	192	4.23	21.20	74	17.13
	V6	4.45	8	274	5.10	26.17	73	11.63
	V7	4.83	1	296	4.43	28.40	76	15.13
	V8	4.17	16	245	4.27	16.53	73	11.13
	V9	4.26	11	216	3.87	25.23	79	9.50
	V10	4.23	13	243	3.20	24.53	82	19.50
	V11	4.46	7	242	3.83	26.97	85	9.50
	V12	4.23	13	263	2.60	28.13	79	12.88
	V13	3.28	29	234	3.13	28.73	79	-1.50
	V14	4.67	3	244	2.97	24.70	77	5.50
	V15	4.50	6	224	3.37	26.07	83	21.25
	V16	3.68	19	231	2.84	24.30	74	11.25
	V17	3.88	17	220	4.60	24.07	78	12.00
	V18	4.32	10	243	3.63	24.40	71	14.00
Interaction								
F at same V		0.23		34.51	0.28	0.88	1.68	
V at same F		0.28		35.27	0.34	1.2	2.26	
F1		3.33	2	192	3.21	23.38	72	
F2		4.30	1	241	3.95	25.04	76	12.15
C.D.(0.05)		0.22		14.06	0.25	1.1	2.01	
C.V.(%)		6.83		7.84	8.31	5.47	3.27	

Table 4.1(b): Contd.

N-levels	Varieties	FAIZABAD						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test weight (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Mean of varieties:								
V1		3.79	10	223	3.74	22.17	73	11.38
V2		3.93	8	210	3.93	25.34	75	10.00
V3		4.12	3	207	4.34	25.67	77	12.38
V4		3.95	7	225	3.07	23.82	75	16.13
V5		4.03	5	200	3.52	24.24	75	17.13
V6		3.99	6	242	3.76	25.24	73	11.63
V7		4.23	2	254	3.36	26.69	74	15.13
V8		3.73	12	227	3.73	19.87	74	11.13
V9		3.88	9	203	3.28	24.77	75	9.50
V10		3.45	15	233	3.15	23.93	77	19.50
V11		4.08	4	218	3.57	22.75	76	9.50
V12		3.72	13	233	3.59	24.83	75	12.88
V13		3.34	17	207	3.68	26.92	73	-1.50
V14		4.45	1	219	3.19	24.92	74	5.50
V15		3.65	14	214	3.40	23.04	75	21.25
V16		3.23	18	197	3.54	24.00	74	11.25
V17		3.40	16	190	4.27	23.80	72	12.00
V18		3.76	11	198	3.35	23.80	69	14.00
C.D.(0.05)		0.16		24.4	0.2	0.62	1.19	
C.V. (%)		3.69		9.86	4.9	2.24	1.4	
Expt. Mean		3.82		217	3.58	24.21	74	
Soil type		Sand 32.2,Silt 48.6 & Clay 16.2						
pH		7.40						
N - levels (kg/ha)								
F1		40:20:20						
F2		80:40:40						
Recommended N:P:K (kg/ha)		80:40:40						
Varieties								
V1		IET 29947						
V2		IET 29940						
V3		IET 29939						
V4		IET 29694						
V5		IET 29689						
V6		IET 29692						
V7		IET 28123						
V8		IET 29691						
V9		IET 29690						
V10		IET 29696						
V11		IET 29700						
V12		IET 29975						
V13		IET 28965						
V14		IET 28956						
V15		IET 29142(R)						
V16		CO-51 (NC)						
V17		MTU 1153 (S)						
V18		Local Check - NDR 97 (103 days)						
Available N:P:K of soil (kg/ha)		205.4:23.5:232.5						

Table 4.1(b): Contd.

F-levels	Varieties	GHAGHRAGHAT						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test weight (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: Low input (50% NPK)	V1	4.53	5	102	3.83	23.30	79	
	V2	4.08	9	105	3.63	22.37	76	
	V3	4.71	2	109	3.77	24.67	81	
	V4	3.77	16	102	3.57	23.43	83	
	V5	3.95	10	106	3.40	20.33	76	
	V6	3.48	24	111	3.83	24.13	74	
	V7	3.55	21	108	3.63	21.47	82	
	V8	2.52	33	90	3.10	22.73	74	
	V9	2.26	34	93	3.07	21.77	74	
	V10	3.95	10	107	4.23	24.10	83	
	V11	2.98	30	105	3.13	20.73	72	
	V12	3.78	14	109	3.83	16.20	81	
	V13	3.49	23	104	4.37	23.53	83	
	V14	3.08	29	110	3.47	21.43	82	
	V15	3.32	28	105	3.67	23.10	82	
	V16	2.72	32	115	3.53	20.13	81	
	V17	3.70	17	99	3.97	24.47	77	
	V18	-		-	-	-	-	
F2: Optimum input (100% NPK)	V1	4.71	2	108	4.50	26.87	79	1.64
	V2	4.57	4	113	3.77	21.93	80	4.45
	V3	4.81	1	119	4.17	24.43	82	0.91
	V4	4.40	6	111	3.60	22.98	83	5.73
	V5	4.26	8	110	4.03	17.23	76	2.82
	V6	3.84	13	108	4.00	15.70	75	3.27
	V7	3.67	18	105	3.43	20.40	76	1.09
	V8	2.91	31	107	3.63	15.97	80	3.55
	V9	3.39	27	111	3.57	23.30	74	10.27
	V10	4.29	7	103	3.97	24.40	81	3.09
	V11	3.53	22	100	3.80	19.03	80	5.00
	V12	3.95	10	107	3.43	23.30	81	1.55
	V13	3.56	20	117	3.70	24.87	82	0.64
	V14	3.60	19	111	3.70	20.10	81	4.73
	V15	3.46	25	109	3.73	23.77	75	1.27
	V16	3.41	26	116	3.63	20.50	72	6.27
	V17	3.78	14	109	3.67	24.57	80	0.73
	V18	-		-	-	-	-	
Interaction								
F at same V		NS		NS	NS	1.38	2.37	
V at same F		NS		NS	NS	1.51	2.81	
F1		3.52	2	105	3.65	22.23	79	
F2		3.89	1	110	3.78	21.73	79	3.35
C.D.(0.05)		0.12		2.64	NS	NS	NS	
C.V.(%)		3.78		2.89	16.58	4.85	3.09	

Table 4.1(b): Contd.

N-levels	Varieties	GHAGHRAGHAT						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test weight (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Mean of varieties:								
V1		4.62	2	105	4.17	25.09	79	1.64
V2		4.33	3	109	3.70	22.15	78	4.45
V3		4.76	1	114	3.97	24.55	82	0.91
V4		4.09	6	107	3.59	23.21	83	5.73
V5		4.11	5	108	3.72	18.78	76	2.82
V6		3.66	9	110	3.92	19.92	75	3.27
V7		3.61	10	107	3.53	20.94	79	1.09
V8		2.72	17	98	3.37	19.35	77	3.55
V9		2.83	16	102	3.32	22.54	74	10.27
V10		4.12	4	105	4.10	24.25	82	3.09
V11		3.26	14	102	3.47	19.88	76	5.00
V12		3.87	7	108	3.63	19.75	81	1.55
V13		3.53	11	110	4.04	24.20	82	0.64
V14		3.34	13	111	3.59	20.77	81	4.73
V15		3.39	12	107	3.70	23.44	78	1.27
V16		3.07	15	115	3.58	20.32	77	6.27
V17		3.74	8	104	3.82	24.52	79	0.73
V18		-		-	-	-	-	
C.D.(0.05)		0.55		10.22	0.52	0.98	1.67	
C.V. (%)		12.88		8.35	12.16	3.88	1.86	
Expt. Mean		3.71		107	3.72	21.98	79	
Soil type		Sandy loam						
pH		7.40						
N - levels (kg/ha)								
F1		60:30:20						
F2		120:60:40						
Recommended N:P:K (kg/ha)		120:60:40						
Varieties								
V1		IET 29947						
V2		IET 29940						
V3		IET 29939						
V4		IET 29694						
V5		IET 29689						
V6		IET 29692						
V7		IET 28123						
V8		IET 29691						
V9		IET 29690						
V10		IET 29696						
V11		IET 29700						
V12		IET 29975						
V13		IET 28965						
V14		IET 28956						
V15		IET 29142(R)						
V16		CO-51 (NC)						
V17		MTU 1153 (S)						
V18		-						
Available N:P:K of soil (kg/ha)		200:24:234						

Table 4.1(b): Contd.

F-levels	Varieties	JAGDALPUR						
		Grain Yield (t/ha)	Rank	Tillers/m^2 (No.)	Filled grains/ panicle (No.)	Test weight (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: Low input (50% NPK)	V1	4.90	9	270	187	26.08	88	
	V2	4.49	20	260	180	21.33	89	
	V3	5.21	6	290	174	31.82	94	
	V4	5.53	4	263	164	25.14	92	
	V5	4.01	29	210	196	25.61	97	
	V6	4.78	11	250	182	33.35	94	
	V7	4.25	25	227	133	23.65	93	
	V8	3.55	32	223	178	26.31	94	
	V9	4.40	22	240	179	28.56	87	
	V10	4.65	16	257	176	27.70	84	
	V11	3.79	30	247	118	29.64	90	
	V12	3.53	33	263	119	17.78	92	
	V13	2.70	35	223	182	27.35	86	
	V14	4.44	21	260	210	26.62	86	
	V15	4.80	10	273	226	23.59	92	
	V16	4.51	19	280	136	19.92	92	
	V17	4.53	17	247	162	25.59	92	
	V18	5.54	3	263	136	25.02	96	
F2: Optimum input (100% NPK)	V1	5.29	5	397	196	24.01	102	4.46
	V2	4.69	14	353	187	23.69	102	2.29
	V3	5.60	2	360	182	32.72	95	4.46
	V4	5.06	8	380	172	24.87	94	-5.37
	V5	3.04	34	297	204	25.22	102	-11.09
	V6	4.73	13	337	190	33.01	96	-0.57
	V7	4.74	12	343	139	23.88	96	5.60
	V8	3.78	31	330	193	25.78	96	2.63
	V9	4.52	18	333	187	28.32	102	1.37
	V10	4.05	28	340	186	27.94	106	-6.86
	V11	4.33	24	347	125	29.20	94	6.17
	V12	4.24	26	367	122	17.22	97	8.11
	V13	2.29	36	317	193	28.46	102	-4.69
	V14	4.12	27	333	222	26.38	102	-3.66
	V15	4.36	23	363	239	23.07	96	-5.03
	V16	4.69	14	353	141	20.62	95	2.06
	V17	5.13	7	347	180	24.93	96	6.86
	V18	5.80	1	390	144	25.76	101	2.97
Interaction								
F at same V		0.32		NS	NS	NS	1.37	
V at same F		0.35		NS	NS	NS	1.34	
F1		4.42	2	253	169	25.84	91	
F2		4.47	1	349	178	25.84	99	0.54
C.D.(0.05)		NS		23.22	NS	NS	0.24	
C.V.(%)		5.96		9.32	6.51	3.96	0.3	

Table 4.1(b): Contd.

N-levels	Varieties	JAGDALPUR						
		Grain Yield (t/ha)	Rank	Tillers/m^2 (No.)	Filled grains/ panicle (No.)	Test weight (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Mean of varieties:								
V1		5.10	4	333	191	25.05	95	4.46
V2		4.59	8	307	183	22.51	96	2.29
V3		5.41	2	325	178	32.27	95	4.46
V4		5.30	3	322	168	25.01	93	-5.37
V5		3.53	17	253	200	25.42	100	-11.09
V6		4.76	6	293	186	33.18	95	-0.57
V7		4.50	10	285	136	23.77	94	5.60
V8		3.67	16	277	185	26.05	95	2.63
V9		4.46	11	287	183	28.44	95	1.37
V10		4.35	12	298	181	27.82	95	-6.86
V11		4.06	14	297	122	29.42	92	6.17
V12		3.89	15	315	121	17.50	94	8.11
V13		2.50	18	270	187	27.91	94	-4.69
V14		4.28	13	297	216	26.50	94	-3.66
V15		4.58	9	318	232	23.33	94	-5.03
V16		4.60	7	317	139	20.27	93	2.06
V17		4.83	5	297	171	25.26	94	6.86
V18		5.67	1	327	140	25.39	99	2.97
C.D.(0.05)		0.23		35.69	20.68	1.01	0.97	
C.V. (%)		4.43		10.37	10.44	3.41	0.89	
Expt. Mean		4.45		301	173	25.84	95	
Soil type		-						
pH		-						
N - levels (kg/ha)								
F1		50:25:12.5						
F2		100:50:25						
Recommended N:P:K (kg/ha)		100:50:25						
Varieties								
V1		IET 29947						
V2		IET 29940						
V3		IET 29939						
V4		IET 29694						
V5		IET 29689						
V6		IET 29692						
V7		IET 28123						
V8		IET 29691						
V9		IET 29690						
V10		IET 29696						
V11		IET 29700						
V12		IET 29975						
V13		IET 28965						
V14		IET 28956						
V15		IET 29142(R)						
V16		CO-51 (NC)						
V17		MTU 1153 (S)						
V18		Local Check - BASTAR DHAN 1						
Available N:P:K of soil (kg/ha)		-						

Table 4.1(b): Contd.

F-levels	Varieties	KARJAT						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test weight (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: Low input (50% NPK)	V1	3.67	30	228	3.00	22.55	92	
	V2	4.00	27	246	3.69	25.32	92	
	V3	4.31	24	264	3.90	26.69	92	
	V4	4.53	22	265	4.10	27.46	88	
	V5	5.05	14	313	4.97	33.42	87	
	V6	4.49	23	264	3.97	27.05	86	
	V7	4.58	21	278	4.23	27.48	89	
	V8	4.78	19	285	4.42	27.71	87	
	V9	4.89	16	292	4.74	27.92	90	
	V10	4.83	17	288	4.45	27.85	92	
	V11	4.65	20	280	4.40	27.67	89	
	V12	4.25	25	248	3.73	25.67	88	
	V13	2.68	35	208	2.72	19.49	91	
	V14	2.24	36	199	2.54	18.21	90	
	V15	3.97	28	232	3.58	24.52	92	
	V16	3.49	31	220	2.98	22.37	88	
	V17	3.40	32	218	2.95	20.70	90	
	V18	3.87	29	229	3.43	23.92	94	
F2: Optimum input (100% NPK)	V1	5.02	15	251	3.52	23.06	93	13.50
	V2	5.28	11	272	4.14	25.70	93	12.80
	V3	5.36	9	281	4.27	27.24	92	10.50
	V4	5.47	7	286	4.55	28.14	90	9.40
	V5	5.82	1	321	5.09	34.20	89	7.70
	V6	5.43	8	283	4.49	27.76	87	9.40
	V7	5.49	6	299	4.84	28.16	90	9.10
	V8	5.56	4	304	5.00	28.38	88	7.80
	V9	5.72	2	311	5.03	31.48	93	8.30
	V10	5.65	3	306	5.01	28.39	93	8.20
	V11	5.51	5	302	4.96	28.16	87	8.60
	V12	5.33	10	273	4.20	26.05	89	10.80
	V13	3.37	33	225	3.39	19.69	91	6.90
	V14	3.03	34	222	3.05	18.57	91	7.90
	V15	5.25	12	261	4.08	25.22	93	12.80
	V16	4.83	17	250	3.79	22.72	93	13.40
	V17	4.07	26	242	3.45	22.65	91	6.70
	V18	5.24	13	256	3.96	24.38	94	13.70
Interaction								
F at same V		NS		NS	NS	NS	NS	
V at same F		NS		NS	NS	NS	NS	
F1		4.09	2	253	3.77	25.33	90	
F2		5.08	1	275	4.27	26.11	91	9.86
C.D.(0.05)		0.26		14.4	0.46	NS	0.6	
C.V.(%)		6.8		6.59	13.87	3.72	0.8	

Table 4.1(b): Contd.

N-levels	Varieties	KARJAT						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test weight (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Mean of varieties:								
	V1	4.35	14	240	3.26	22.81	92	13.50
	V2	4.64	11	259	3.92	25.51	92	12.80
	V3	4.84	9	273	4.09	26.97	92	10.50
	V4	5.00	7	275	4.33	27.80	89	9.40
	V5	5.44	1	317	5.03	33.81	88	7.70
	V6	4.96	8	274	4.23	27.41	87	9.40
	V7	5.04	6	289	4.54	27.82	89	9.10
	V8	5.17	4	294	4.71	28.05	88	7.80
	V9	5.31	2	302	4.89	29.70	92	8.30
	V10	5.24	3	297	4.73	28.12	93	8.20
	V11	5.08	5	291	4.68	27.92	88	8.60
	V12	4.79	10	260	3.97	25.86	89	10.80
	V13	3.03	17	216	3.06	19.59	91	6.90
	V14	2.64	18	211	2.80	18.39	90	7.90
	V15	4.61	12	247	3.83	24.87	92	12.80
	V16	4.16	15	235	3.39	22.55	90	13.40
	V17	3.74	16	230	3.20	21.68	91	6.70
	V18	4.56	13	243	3.70	24.15	94	13.70
	C.D.(0.05)	0.62		16.15	0.92	1.59	1.75	
	C.V. (%)	11.9		5.35	19.98	5.42	1.69	
	Expt. Mean	4.59		264	4.02	25.72	90	
	Soil type	-						
	pH	-						
	N - levels (kg/ha)							
	F1	50:25:25						
	F2	100:50:50						
	Recommended N:P:K (kg/ha)	100:50:50						
	Varieties							
	V1	IET 29947						
	V2	IET 29940						
	V3	IET 29939						
	V4	IET 29694						
	V5	IET 29689						
	V6	IET 29692						
	V7	IET 28123						
	V8	IET 29691						
	V9	IET 29690						
	V10	IET 29696						
	V11	IET 29700						
	V12	IET 29975						
	V13	IET 28965						
	V14	IET 28956						
	V15	IET 29142(R)						
	V16	CO-51 (NC)						
	V17	MTU 1153 (S)						
	V18	Local Check - KJT 3(115-120 days)						
Available N:P:K of soil (kg/ha)		-						

Table 4.1(b): Contd.

F-levels	Varieties	MANDYA						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test weight (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: Low input (50% NPK)	V1	5.66	23	330	3.44	23.86	103	
	V2	5.69	22	315	4.59	21.57	106	
	V3	5.88	16	328	3.98	29.83	92	
	V4	5.66	23	348	3.74	23.67	92	
	V5	6.03	13	319	5.52	25.08	93	
	V6	5.97	14	331	4.92	31.80	94	
	V7	5.34	32	337	3.52	22.22	87	
	V8	5.30	34	316	4.47	25.89	95	
	V9	5.56	27	339	4.05	26.86	105	
	V10	5.87	17	320	4.33	27.78	105	
	V11	5.04	35	309	3.18	26.47	85	
	V12	5.74	19	347	3.31	17.78	92	
	V13	5.64	25	318	4.11	27.46	101	
	V14	4.81	36	310	3.85	26.52	100	
	V15	5.64	25	311	3.83	21.18	93	
	V16	5.31	33	333	3.08	18.25	88	
	V17	5.55	28	318	4.22	23.38	92	
	V18	5.37	31	330	3.30	22.79	91	
F2: Optimum input (100% NPK)	V1	6.26	11	349	4.05	26.05	102	6.00
	V2	6.53	7	340	4.65	21.23	106	8.40
	V3	6.65	6	354	4.64	31.14	92	7.70
	V4	6.69	4	348	3.80	23.72	92	10.30
	V5	7.26	1	339	5.81	25.69	93	12.30
	V6	6.49	9	337	5.32	31.72	94	5.20
	V7	5.70	21	344	3.56	22.33	86	3.60
	V8	5.46	29	338	4.56	26.45	96	1.60
	V9	5.84	18	342	4.41	27.02	104	2.80
	V10	6.51	8	343	4.87	28.08	105	6.40
	V11	5.45	30	353	4.01	29.40	85	4.10
	V12	6.69	4	362	3.94	18.86	93	9.50
	V13	6.25	12	353	4.65	27.61	99	6.10
	V14	7.05	2	369	4.40	26.96	97	22.40
	V15	6.79	3	330	5.51	23.23	93	11.50
	V16	5.72	20	358	3.25	18.12	88	4.10
	V17	6.45	10	334	5.51	22.82	92	9.00
	V18	5.90	15	354	3.42	22.92	90	5.30
Interaction								
F at same V		NS		NS	0.53	NS	NS	
V at same F		NS		NS	0.53	NS	NS	
F1		5.56	2	325	3.97	24.58	95	
F2		6.32	1	347	4.46	25.19	95	7.57
C.D.(0.05)		NS		14.13	0.15	NS	NS	
C.V.(%)		16.97		5.08	4.39	4.54	1.67	

Table 4.1(b): Contd.

N-levels	Varieties	MANDYA						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test weight (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Mean of varieties:								
	V1	5.96	10	339	3.75	24.96	103	6.00
	V2	6.11	8	328	4.62	21.40	106	8.40
	V3	6.27	2	341	4.31	30.49	92	7.70
	V4	6.18	7	348	3.77	23.70	92	10.30
	V5	6.65	1	329	5.67	25.39	93	12.30
	V6	6.23	3	334	5.12	31.76	94	5.20
	V7	5.52	15	340	3.54	22.28	86	3.60
	V8	5.38	17	327	4.52	26.17	95	1.60
	V9	5.70	13	340	4.23	26.94	105	2.80
	V10	6.19	6	331	4.60	27.93	105	6.40
	V11	5.25	18	331	3.60	27.94	85	4.10
	V12	6.22	4	354	3.63	18.32	93	9.50
	V13	5.95	11	335	4.38	27.54	100	6.10
	V14	5.93	12	340	4.13	26.74	98	22.40
	V15	6.22	4	320	4.67	22.21	93	11.50
	V16	5.52	16	345	3.17	18.19	88	4.10
	V17	6.00	9	326	4.87	23.10	92	9.00
	V18	5.64	14	342	3.36	22.86	91	5.30
	C.D.(0.05)	0.6		23.24	0.37	1.06	1.25	
	C.V. (%)	8.88		6.05	7.74	3.72	1.15	
	Expt. Mean	5.94		336	4.22	24.88	95	
	Soil type	Red Sandy loam						
	pH	7.90						
	N - levels (kg/ha)							
	F1	50:25:25						
	F2	100:50:50						
	Recommended N:P:K (kg/ha)	100:50:50						
	Varieties							
	V1	IET 29947						
	V2	IET 29940						
	V3	IET 29939						
	V4	IET 29694						
	V5	IET 29689						
	V6	IET 29692						
	V7	IET 28123						
	V8	IET 29691						
	V9	IET 29690						
	V10	IET 29696						
	V11	IET 29700						
	V12	IET 29975						
	V13	IET 28965						
	V14	IET 28956						
	V15	IET 29142(R)						
	V16	CO-51 (NC)						
	V17	MTU 1153 (S)						
	V18	Local Check - Rasi(120-125 days)						
Available N:P:K of soil (kg/ha)		358:71.5:248.64						

Table 4.1(b): Contd.

F-levels	Varieties	MARUTERU						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test weight (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: Low input (50% NPK)	V1	6.06	10	268	4.88	27.47	95	
	V2	5.68	17	283	5.06	22.09	95	
	V3	5.41	20	306	4.35	28.46	91	
	V4	6.25	8	325	3.53	23.64	91	
	V5	5.74	16	296	5.17	25.75	94	
	V6	4.40	28	316	4.15	26.94	88	
	V7	4.78	25	303	3.19	23.78	96	
	V8	5.86	15	297	4.08	22.00	95	
	V9	6.95	3	322	4.92	26.00	97	
	V10	6.76	6	329	3.59	27.05	96	
	V11	2.29	34	284	3.75	25.18	81	
	V12	3.63	30	201	3.65	17.04	83	
	V13	4.75	26	304	5.10	27.76	94	
	V14	6.82	4	331	4.39	25.76	95	
	V15	4.71	27	289	4.77	23.77	87	
	V16	3.37	32	287	2.82	19.72	109	
	V17	5.50	19	285	4.21	23.34	81	
	V18	-		-	-	-	-	
F2: Optimum input (100% NPK)	V1	5.92	12	293	4.61	25.67	95	-1.33
	V2	6.17	9	300	4.34	20.50	95	4.67
	V3	5.99	11	321	5.45	27.37	95	5.52
	V4	5.92	12	339	4.17	24.67	96	-3.14
	V5	5.88	14	319	5.57	24.81	96	1.33
	V6	6.51	7	322	5.10	28.74	88	20.10
	V7	5.27	21	330	4.27	22.47	96	4.67
	V8	5.68	17	308	4.04	21.80	95	-1.71
	V9	7.14	1	306	4.70	25.95	97	1.81
	V10	6.80	5	318	3.98	26.52	96	0.38
	V11	2.90	33	300	3.98	26.27	83	5.81
	V12	3.75	29	308	4.87	17.34	88	1.14
	V13	5.08	23	299	4.09	27.28	93	3.14
	V14	7.00	2	340	4.40	25.36	96	1.71
	V15	4.81	24	307	3.68	27.32	87	0.95
	V16	3.51	31	318	2.98	21.59	108	1.33
	V17	5.11	22	290	4.74	24.87	82	-3.71
	V18	-		-	-	-	-	
Interaction								
F at same V		0.43		NS	0.35	0.86	1.4	
V at same F		0.46		NS	0.35	0.9	1.48	
F1		5.23	2	296	4.21	24.46	92	
F2		5.50	1	313	4.41	24.62	93	2.51
C.D.(0.05)		0.23		NS	0.1	NS	0.76	
C.V.(%)		5.13		13.82	2.66	2.06	0.96	

Table 4.1(b): Contd.

N-levels	Varieties	MARUTERU						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test weight (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Mean of varieties:								
	V1	5.99	5	281	4.75	26.57	95	-1.33
	V2	5.93	6	291	4.70	21.30	95	4.67
	V3	5.70	9	313	4.90	27.92	93	5.52
	V4	6.09	4	332	3.85	24.16	94	-3.14
	V5	5.81	7	308	5.37	25.28	95	1.33
	V6	5.46	10	319	4.63	27.84	88	20.10
	V7	5.03	12	316	3.73	23.13	96	4.67
	V8	5.77	8	303	4.06	21.90	95	-1.71
	V9	7.05	1	314	4.81	25.98	97	1.81
	V10	6.78	3	324	3.79	26.79	96	0.38
	V11	2.60	17	292	3.87	25.73	82	5.81
	V12	3.69	15	255	4.26	17.19	86	1.14
	V13	4.92	13	302	4.60	27.52	94	3.14
	V14	6.91	2	336	4.40	25.56	96	1.71
	V15	4.76	14	298	4.23	25.55	87	0.95
	V16	3.44	16	303	2.90	20.66	109	1.33
	V17	5.31	11	287	4.48	24.11	82	-3.71
	V18	-		-	-	-	-	
C.D.(0.05)		0.3		36.95	0.25	0.61	0.99	
C.V. (%)		4.96		10.62	5.04	2.17	0.93	
Expt. Mean		5.36		304	4.31	24.54	93	
Soil type		-						
pH		5.95						
N - levels (kg/ha)								
F1		45:30:30						
F2		90:60:60						
Recommended N:P:K (kg/ha)		90:60:60						
Varieties								
V1		IET 29947						
V2		IET 29940						
V3		IET 29939						
V4		IET 29694						
V5		IET 29689						
V6		IET 29692						
V7		IET 28123						
V8		IET 29691						
V9		IET 29690						
V10		IET 29696						
V11		IET 29700						
V12		IET 29975						
V13		IET 28965						
V14		IET 28956						
V15		IET 29142(R)						
V16		CO-51 (NC)						
V17		MTU 1153 (S)						
V18		-						
Available N:P:K of soil (kg/ha)		119:14.32:274						

Table 4.1(b): Contd.

F-levels	Varieties	NAGINA						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test weight (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: Low input (50% NPK)	V1	2.76	20	253	3.41	26.47	100	
	V2	2.56	28	239	3.37	26.30	95	
	V3	2.57	26	239	3.32	26.37	87	
	V4	2.71	21	244	3.40	26.42	91	
	V5	2.50	30	238	3.39	26.31	84	
	V6	2.65	23	221	3.15	26.30	93	
	V7	2.48	31	218	3.36	26.34	84	
	V8	2.66	22	239	3.32	26.37	92	
	V9	2.59	24	244	3.40	26.42	89	
	V10	2.57	26	237	3.31	26.29	77	
	V11	2.27	32	233	3.36	26.30	88	
	V12	2.52	29	233	3.47	26.37	84	
	V13	3.00	18	244	3.18	26.30	84	
	V14	2.59	24	241	3.40	26.39	80	
	V15	2.80	19	236	3.38	26.40	73	
	V16	2.17	34	217	3.30	26.30	88	
	V17	2.21	33	222	3.27	26.33	78	
	V18	-		-	-	-	-	
F2: Optimum input (100% NPK)	V1	4.58	5	333	3.60	26.57	100	16.55
	V2	4.33	13	316	3.36	26.40	95	16.09
	V3	4.38	12	317	3.48	26.39	89	16.45
	V4	4.51	9	325	3.20	26.46	90	16.36
	V5	4.30	14	310	3.52	26.41	85	16.36
	V6	4.46	10	320	2.95	26.42	97	16.45
	V7	4.29	15	310	2.98	26.40	85	16.45
	V8	4.67	3	321	3.16	26.34	92	18.27
	V9	4.67	3	312	3.36	26.38	88	18.91
	V10	4.57	6	317	3.48	26.39	77	18.18
	V11	4.44	11	325	3.20	26.46	87	19.73
	V12	4.52	8	317	3.35	26.33	85	18.18
	V13	4.87	1	297	3.36	26.39	82	17.00
	V14	4.54	7	306	3.48	26.42	81	17.73
	V15	4.83	2	299	3.20	26.36	74	18.45
	V16	4.06	17	279	2.50	26.34	89	17.18
	V17	4.16	16	285	3.52	26.33	80	17.73
	V18	-		-	-	-	-	
Interaction								
F at same V		NS		NS	0.07	0.04	NS	
V at same F		NS		NS	0.08	0.03	NS	
F1		2.57	2	235	3.34	26.35	86	
F2		4.48	1	311	3.28	26.40	87	17.42
C.D.(0.05)		0.04		6.65	0.05	0	NS	
C.V.(%)		1.26		2.86	1.8	0	1.5	

Table 4.1(b): Contd.

N-levels	Varieties	NAGINA						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test weight (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Mean of varieties:								
V1		3.67	3	293	3.51	26.52	100	16.55
V2		3.45	12	278	3.37	26.35	95	16.09
V3		3.48	11	278	3.40	26.38	88	16.45
V4		3.61	6	285	3.30	26.44	91	16.36
V5		3.40	13	274	3.46	26.36	84	16.36
V6		3.56	9	270	3.05	26.36	95	16.45
V7		3.39	14	264	3.17	26.37	85	16.45
V8		3.67	4	280	3.24	26.36	92	18.27
V9		3.63	5	278	3.38	26.40	89	18.91
V10		3.57	7	277	3.40	26.34	77	18.18
V11		3.36	15	279	3.28	26.38	87	19.73
V12		3.52	10	275	3.41	26.35	85	18.18
V13		3.94	1	271	3.27	26.35	83	17.00
V14		3.57	8	274	3.44	26.41	80	17.73
V15		3.82	2	268	3.29	26.38	74	18.45
V16		3.12	17	248	2.90	26.32	89	17.18
V17		3.19	16	253	3.40	26.33	79	17.73
V18		-		-	-	-	-	
C.D.(0.05)		0.13		15.06	0.05	0.03	1.56	
C.V. (%)		3.16		4.82	1.33	0.08	1.58	
Expt. Mean		3.52		273	3.31	26.38	87	
Soil type		-						
pH		7.70						
N - levels (kg/ha)								
F1		60:30:20						
F2		120:60:40						
Recommended N:P:K (kg/ha)		120:60:40						
Varieties								
V1		IET 29947						
V2		IET 29940						
V3		IET 29939						
V4		IET 29694						
V5		IET 29689						
V6		IET 29692						
V7		IET 28123						
V8		IET 29691						
V9		IET 29690						
V10		IET 29696						
V11		IET 29700						
V12		IET 29975						
V13		IET 28965						
V14		IET 28956						
V15		IET 29142(R)						
V16		CO-51 (NC)						
V17		MTU 1153 (S)						
V18		-						
Available N:P:K of soil (kg/ha)		21;18.33:209						

Table 4.1(b): Contd.

F-levels	Varieties	NAWAGAM						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test weight (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: Low input (50% NPK)	V1	5.30	26	296	3.62	25.27	102	
	V2	5.28	27	259	3.58	20.67	98	
	V3	5.03	31	236	3.74	28.90	93	
	V4	5.56	17	321	3.44	24.07	96	
	V5	5.38	23	273	3.97	25.50	95	
	V6	4.94	33	244	3.63	31.97	92	
	V7	5.15	28	259	3.94	22.47	98	
	V8	5.06	30	286	3.40	24.53	95	
	V9	5.65	12	242	3.52	27.17	95	
	V10	5.44	20	240	3.46	23.37	100	
	V11	4.47	36	269	3.43	23.90	99	
	V12	4.93	34	267	3.94	19.23	95	
	V13	5.42	21	219	3.65	27.13	99	
	V14	5.34	25	265	3.69	25.87	101	
	V15	4.96	32	271	4.01	21.90	95	
	V16	4.62	35	300	2.59	18.00	118	
	V17	5.41	22	300	3.26	26.50	98	
	V18	5.11	29	263	3.42	17.77	96	
F2: Optimum input (100% NPK)	V1	6.06	5	313	4.21	25.10	104	12.16
	V2	5.79	10	292	4.09	19.83	99	8.16
	V3	5.59	15	249	4.45	31.63	95	8.96
	V4	5.82	9	300	4.07	22.67	96	4.16
	V5	6.47	1	292	5.36	24.10	96	17.44
	V6	5.53	19	309	4.13	31.33	93	9.44
	V7	5.56	17	288	3.74	21.67	98	6.56
	V8	5.64	13	346	3.84	24.77	94	9.28
	V9	6.03	6	275	3.51	27.27	96	6.08
	V10	5.99	7	269	4.19	24.37	102	8.80
	V11	5.59	15	321	3.51	26.10	100	17.92
	V12	5.98	8	302	4.02	18.33	95	16.80
	V13	5.79	10	265	4.33	27.83	98	5.92
	V14	6.11	3	309	4.64	26.57	102	12.32
	V15	5.61	14	302	4.19	23.43	95	10.40
	V16	5.36	24	363	3.02	19.17	118	11.84
	V17	6.15	2	344	3.29	26.23	99	11.84
	V18	6.09	4	323	3.80	17.43	97	15.68
Interaction								
F at same V		0.35		NS	NS	NS	NS	
V at same F		0.44		NS	NS	NS	NS	
F1		5.17	2	267	3.57	24.12	98	
F2		5.84	1	303	4.02	24.32	99	10.76
C.D.(0.05)		0.37		28.03	NS	NS	0.52	
C.V.(%)		8.16		11.87	21.96	6.21	0.64	

Table 4.1(b): Contd.

N-levels	Varieties	NAWAGAM						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test weight (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Mean of varieties:								
V1		5.68	7	305	3.92	25.19	103	12.16
V2		5.54	10	276	3.84	20.25	99	8.16
V3		5.31	14	243	4.10	30.27	94	8.96
V4		5.69	6	310	3.76	23.37	96	4.16
V5		5.93	1	282	4.67	24.80	96	17.44
V6		5.24	16	277	3.88	31.65	93	9.44
V7		5.36	12	274	3.84	22.07	98	6.56
V8		5.35	13	316	3.62	24.65	95	9.28
V9		5.84	2	258	3.52	27.22	95	6.08
V10		5.72	5	254	3.83	23.87	101	8.80
V11		5.03	17	295	3.47	25.00	99	17.92
V12		5.46	11	284	3.98	18.78	95	16.80
V13		5.61	8	242	3.99	27.48	99	5.92
V14		5.73	4	287	4.17	26.22	102	12.32
V15		5.29	15	286	4.10	22.67	95	10.40
V16		4.99	18	332	2.81	18.59	118	11.84
V17		5.78	3	322	3.28	26.37	98	11.84
V18		5.60	9	293	3.61	17.60	97	15.68
C.D.(0.05)		0.25		30.41	0.51	2.21	1.41	
C.V. (%)		3.9		9.33	11.83	7.99	1.26	
Expt. Mean		5.51		285	3.80	24.22	98	
Soil type		Clay loam						
pH		7.57						
N - levels (kg/ha)								
F1		50:12.5:0						
F2		100:25:0						
Recommended N:P:K (kg/ha)		100:25:0						
Varieties								
V1		IET 29947						
V2		IET 29940						
V3		IET 29939						
V4		IET 29694						
V5		IET 29689						
V6		IET 29692						
V7		IET 28123						
V8		IET 29691						
V9		IET 29690						
V10		IET 29696						
V11		IET 29700						
V12		IET 29975						
V13		IET 28965						
V14		IET 28956						
V15		IET 29142(R)						
V16		CO-51 (NC)						
V17		MTU 1153 (S)						
V18		Local Check - Mahisagar(115 days)						
Available N:P:K of soil (kg/ha)		219:102:369						

Table 4.1(b): Contd.

F-levels	Varieties	PUDUCHERRY Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test weight (g)	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: Low input (50% NPK)	V1	6.01	29	209	3.89	26.13	
	V2	5.81	32	195	3.91	19.27	
	V3	5.85	31	200	3.95	31.77	
	V4	5.90	30	205	3.76	22.71	
	V5	6.27	25	224	6.83	25.34	
	V6	6.66	17	264	5.12	32.06	
	V7	5.48	36	151	3.25	22.10	
	V8	6.34	22	242	4.33	25.21	
	V9	6.28	24	229	4.33	26.06	
	V10	6.51	20	249	3.77	24.79	
	V11	6.48	21	244	2.38	19.23	
	V12	5.56	35	164	3.72	25.67	
	V13	6.04	28	214	4.41	28.70	
	V14	6.31	23	231	3.60	25.25	
	V15	6.22	26	221	3.83	23.29	
	V16	5.65	34	176	2.07	20.66	
	V17	6.13	27	219	3.28	21.10	
	V18	5.78	33	187	2.65	21.12	
F2: Optimum input (100% NPK)	V1	6.82	9	315	4.89	27.22	8.10
	V2	6.73	12	305	4.54	19.67	9.20
	V3	6.70	13	308	4.96	33.45	8.50
	V4	6.69	14	309	3.96	23.18	7.90
	V5	6.92	6	321	7.63	26.12	6.50
	V6	7.77	1	374	5.47	32.71	11.10
	V7	6.69	14	267	3.44	23.27	12.10
	V8	7.19	4	342	5.05	26.54	8.50
	V9	6.91	7	324	5.89	27.14	6.30
	V10	7.39	2	361	4.43	25.55	8.80
	V11	7.35	3	354	2.46	20.03	8.70
	V12	6.57	19	278	4.28	26.19	10.10
	V13	6.77	10	317	5.32	29.90	7.30
	V14	7.16	5	336	4.16	25.76	8.50
	V15	6.85	8	319	3.98	24.26	6.30
	V16	6.60	18	286	2.18	21.30	9.50
	V17	6.76	11	319	3.89	21.31	6.30
	V18	6.69	14	301	3.13	21.34	9.10
Interaction							
F at same V		0.12		1.79	0.35	NS	
V at same F		0.13		7.02	0.35	NS	
F1		6.07	2	213	3.84	24.47	
F2		6.92	1	319	4.43	25.27	8.49
C.D.(0.05)		0.08		9.33	0.09	0.05	
C.V.(%)		1.44		4.24	2.77	0.23	

Table 4.1(b): Contd.

N-levels	Varieties	PUDUCHERRY Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test weight (g)	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Mean of varieties:							
	V1	6.42	10	262	4.39	26.68	8.10
	V2	6.27	14	250	4.23	19.47	9.20
	V3	6.28	13	254	4.46	32.61	8.50
	V4	6.30	12	257	3.86	22.95	7.90
	V5	6.60	7	273	7.23	25.73	6.50
	V6	7.22	1	319	5.30	32.39	11.10
	V7	6.09	17	209	3.35	22.69	12.10
	V8	6.77	4	292	4.69	25.88	8.50
	V9	6.60	6	277	5.11	26.60	6.30
	V10	6.95	2	305	4.10	25.17	8.80
	V11	6.92	3	299	2.42	19.63	8.70
	V12	6.07	18	221	4.00	25.93	10.10
	V13	6.41	11	266	4.87	29.30	7.30
	V14	6.74	5	284	3.88	25.51	8.50
	V15	6.54	8	270	3.91	23.78	6.30
	V16	6.13	16	231	2.13	20.98	9.50
	V17	6.45	9	269	3.59	21.21	6.30
	V18	6.24	15	244	2.89	21.23	9.10
C.D.(0.05)		0.09		1.27	0.25	0.5	
C.V. (%)		1.18		0.42	5.28	1.77	
Expt. Mean		6.50		266	4.13	24.87	
Soil type		Clayey loam					
pH		6.39					
N - levels (kg/ha)							
F1		60:20:20					
F2		120:40:40					
Recommended N:P:K (kg/ha)		120:40:40					
Varieties							
V1		IET 29947					
V2		IET 29940					
V3		IET 29939					
V4		IET 29694					
V5		IET 29689					
V6		IET 29692					
V7		IET 28123					
V8		IET 29691					
V9		IET 29690					
V10		IET 29696					
V11		IET 29700					
V12		IET 29975					
V13		IET 28965					
V14		IET 28956					
V15		IET 29142(R)					
V16		CO-51 (NC)					
V17		MTU 1153 (S)					
V18		Local Check - ADT 53(105 days)					
Available N:P:K of soil (kg/ha)		145.6:34:106					

Table 4.1(b): Contd.

F-levels	Varieties	RANCHI					
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Test weight (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: Low input (50% NPK)	V1	3.26	27	211	24.22	78	
	V2	3.51	24	229	24.57	80	
	V3	3.00	31	195	24.17	75	
	V4	3.64	18	237	24.68	82	
	V5	3.52	23	225	24.60	81	
	V6	3.25	28	209	24.38	76	
	V7	3.88	7	241	24.72	80	
	V8	3.35	26	219	24.65	78	
	V9	3.65	15	234	24.78	81	
	V10	3.93	6	250	24.76	84	
	V11	3.62	20	236	24.62	82	
	V12	3.05	30	198	24.21	77	
	V13	2.89	33	189	23.90	75	
	V14	3.75	11	246	24.81	82	
	V15	3.54	21	230	24.61	85	
	V16	-		-	-	-	
	V17	3.22	29	213	24.30	77	
	V18	2.26	34	155	23.76	62	
F2: Optimum input (100% NPK)	V1	3.85	9	251	24.34	81	7.87
	V2	4.38	2	290	24.87	84	11.60
	V3	3.72	13	240	24.35	79	9.60
	V4	3.65	15	250	24.89	86	0.13
	V5	3.87	8	256	24.90	83	4.67
	V6	3.63	19	238	24.58	80	5.07
	V7	4.15	5	273	25.01	84	3.60
	V8	3.82	10	251	24.95	80	6.27
	V9	4.26	4	282	24.90	83	8.13
	V10	3.73	12	290	24.96	88	-2.67
	V11	4.35	3	288	24.82	84	9.73
	V12	3.53	22	235	24.52	80	6.40
	V13	3.36	25	222	24.12	78	6.27
	V14	4.42	1	287	25.02	86	8.93
	V15	3.65	15	252	24.87	89	1.47
	V16	-		-	-	-	
	V17	3.72	13	244	25.62	80	6.67
	V18	2.94	32	196	23.87	65	9.07
Interaction							
F at same V		NS		NS	NS	0.86	
V at same F		NS		NS	NS	0.88	
F1		3.37	2	219	24.46	79	
F2		3.83	1	256	24.74	82	6.05
C.D.(0.05)		0.28		9.45	0.22	0.37	
C.V.(%)		9.27		4.68	1.06	0.54	

Table 4.1(b): Contd.

N-levels	Varieties	RANCHI					
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Test weight (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Mean of varieties:							
	V1	3.56	11	231	24.28	80	7.87
	V2	3.95	5	259	24.72	82	11.60
	V3	3.36	14	217	24.26	77	9.60
	V4	3.65	8	244	24.79	84	0.13
	V5	3.70	7	241	24.75	82	4.67
	V6	3.44	13	223	24.48	78	5.07
	V7	4.02	2	257	24.87	82	3.60
	V8	3.59	10	235	24.80	79	6.27
	V9	3.96	4	258	24.84	82	8.13
	V10	3.83	6	270	24.86	86	-2.67
	V11	3.99	3	262	24.72	83	9.73
	V12	3.29	15	217	24.37	79	6.40
	V13	3.13	16	206	24.01	77	6.27
	V14	4.09	1	267	24.92	84	8.93
	V15	3.60	9	241	24.74	87	1.47
	V16	-		-	-	-	
	V17	3.47	12	229	24.96	79	6.67
	V18	2.60	17	176	23.82	64	9.07
C.D.(0.05)		0.42		32.82	0.35	0.6	
C.V. (%)		10.21		12.11	1.26	0.66	
Expt. Mean		3.60		237	24.65	81.23	
Soil type		-					
pH		5.80					
N - levels (kg/ha)							
F1		40:20:15					
F2		80:40:30					
Recommended N:P:K (kg/ha)		80:40:30					
Varieties							
V1		IET 29947					
V2		IET 29940					
V3		IET 29939					
V4		IET 29694					
V5		IET 29689					
V6		IET 29692					
V7		IET 28123					
V8		IET 29691					
V9		IET 29690					
V10		IET 29696					
V11		IET 29700					
V12		IET 29975					
V13		IET 28965					
V14		IET 28956					
V15		IET 29142(R)					
V16		-					
V17		MTU 1153 (S)					
V18		Local Check - BVD 111					
Available N:P:K of soil (kg/ha)		-					

Table 4.1(b): Contd.

F-levels	Varieties	SABOUR						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Filled grains/ panicle (No.)	Test weight (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: Low input (50% NPK)	V1	4.75	26	156	200	28.47	84	
	V2	5.26	15	169	229	24.23	85	
	V3	4.24	30	185	225	25.37	84	
	V4	5.40	13	182	195	23.23	83	
	V5	4.06	31	172	186	28.67	84	
	V6	4.99	21	182	209	32.27	85	
	V7	3.79	33	166	231	23.10	83	
	V8	3.76	34	166	240	25.93	83	
	V9	4.28	29	177	234	26.73	85	
	V10	4.39	28	179	197	27.30	83	
	V11	3.85	32	177	211	25.37	82	
	V12	3.04	36	161	187	24.00	83	
	V13	5.45	12	154	237	26.87	85	
	V14	4.77	25	180	239	28.80	83	
	V15	4.89	23	146	218	25.50	81	
	V16	3.47	35	169	235	25.50	82	
	V17	5.06	19	174	180	24.00	83	
	V18	5.23	16	161	199	29.60	84	
F2: Optimum input (100% NPK)	V1	5.39	14	252	229	29.07	85	8.00
	V2	6.01	3	255	249	24.87	84	9.38
	V3	5.15	18	237	237	25.60	85	11.38
	V4	5.96	5	251	219	23.53	82	7.00
	V5	4.82	24	262	204	29.10	84	9.50
	V6	5.63	10	227	220	32.63	85	8.00
	V7	5.75	8	214	247	23.40	83	24.50
	V8	4.92	22	249	252	26.40	83	14.50
	V9	5.02	20	197	251	28.10	85	9.25
	V10	5.60	11	233	220	27.77	84	15.13
	V11	4.57	27	218	225	25.97	82	9.00
	V12	5.16	17	225	214	25.30	82	26.50
	V13	6.04	2	252	265	27.07	85	7.38
	V14	5.71	9	231	257	29.50	83	11.75
	V15	5.89	6	274	237	26.50	81	12.50
	V16	5.85	7	213	256	25.70	82	29.75
	V17	6.07	1	219	199	24.20	83	12.63
	V18	5.98	4	243	232	29.80	84	9.38
Interaction								
F at same V		NS		23.89	NS	NS	NS	
V at same F		NS		26.34	NS	NS	NS	
F1		4.48	2	170	214	26.39	83	
F2		5.53	1	236	234	26.92	83	13.08
C.D.(0.05)		0.39		15.99	NS	0.34	NS	
C.V.(%)		9.45		9.51	37.03	1.56	0.69	

Table 4.1(b): Contd.

N-levels	Varieties	SABOUR						
		Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Filled grains/ panicle (No.)	Test weight (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Mean of varieties:								
	V1	5.07	9	204	214	28.77	84	8.00
	V2	5.64	3	212	239	24.55	85	9.38
	V3	4.70	12	211	231	25.49	85	11.38
	V4	5.68	2	216	207	23.38	83	7.00
	V5	4.44	15	217	195	28.89	84	9.50
	V6	5.31	7	205	215	32.45	85	8.00
	V7	4.77	11	190	239	23.25	83	24.50
	V8	4.34	16	208	246	26.17	83	14.50
	V9	4.65	14	187	242	27.42	85	9.25
	V10	5.00	10	206	208	27.54	84	15.13
	V11	4.21	17	198	218	25.67	82	9.00
	V12	4.10	18	193	200	24.65	83	26.50
	V13	5.75	1	203	251	26.97	85	7.38
	V14	5.24	8	206	248	29.15	83	11.75
	V15	5.39	6	210	227	26.00	81	12.50
	V16	4.66	13	191	246	25.60	82	29.75
	V17	5.57	5	196	189	24.10	83	12.63
	V18	5.61	4	202	215	29.70	84	9.38
	C.D.(0.05)	0.69		16.89	31.22	0.74	0.52	
	C.V. (%)	12.05		7.28	12.19	2.43	0.54	
	Expt. Mean	5.01		203	224	26.65	83	
	Soil type	-						
	pH	7.60						
	N - levels (kg/ha)							
	F1	50:20:10						
	F2	100:40:20						
	Recommended N:P:K (kg/ha)	100:40:20						
	Varieties							
	V1	IET 29947						
	V2	IET 29940						
	V3	IET 29939						
	V4	IET 29694						
	V5	IET 29689						
	V6	IET 29692						
	V7	IET 28123						
	V8	IET 29691						
	V9	IET 29690						
	V10	IET 29696						
	V11	IET 29700						
	V12	IET 29975						
	V13	IET 28965						
	V14	IET 28956						
	V15	IET 29142(R)						
	V16	CO-51 (NC)						
	V17	MTU 1153 (S)						
	V18	Local Check - Sabour Deep						
Available N:P:K of soil (kg/ha)		160.12:27.06:197.45						

Table 4.1(b): Contd.

F-levels	Varieties	VARANASI Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test weight (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)	Over all mean	Rank
F1: Low input (50% NPK)	V1	6.05	2	221	23.50	24.25	94		4.63	19
	V2	4.53	19	185	29.45	21.42	96		4.49	24
	V3	3.43	24	174	29.64	27.84	94		4.35	28
	V4	5.00	15	231	19.47	22.95	90		4.67	18
	V5	5.36	9	169	35.16	35.04	94		4.54	22
	V6	5.19	12	186	27.45	34.68	96		4.41	26
	V7	4.26	21	218	20.04	20.96	93		4.24	29
	V8	3.18	28	189	29.84	28.02	93		4.14	32
	V9	5.46	8	206	31.08	30.70	96		4.50	23
	V10	5.65	5	212	40.03	26.50	95		4.68	17
	V11	2.22	35	194	23.22	28.33	84		3.73	35
	V12	3.23	26	170	20.53	18.12	87		3.84	34
	V13	5.18	13	174	31.42	27.68	94		4.18	31
	V14	4.87	16	214	28.50	25.90	95		4.38	27
	V15	2.11	36	169	24.37	21.55	90		4.04	33
	V16	2.31	34	158	18.71	21.22	83		3.60	36
	V17	2.86	30	189	32.76	24.37	86		4.19	30
	V18	4.78	18	225	21.31	23.71	94		4.42	25
F2: Optimum input (100% NPK)	V1	6.11	1	215	30.54	27.29	94	0.55	5.40	2
	V2	4.81	17	188	33.67	20.11	96	2.55	5.32	4
	V3	3.23	26	151	36.23	26.77	94	-1.82	5.14	10
	V4	3.90	22	251	21.03	24.04	92	-10.00	5.23	7
	V5	5.32	10	163	43.42	26.44	93	-0.36	5.27	5
	V6	5.11	14	211	27.36	32.33	97	-0.73	5.23	8
	V7	4.46	20	234	29.21	22.64	94	1.82	5.13	11
	V8	3.38	25	207	34.56	26.45	93	1.82	4.86	13
	V9	5.32	10	226	37.30	29.09	97	-1.27	5.22	9
	V10	5.97	3	220	40.03	28.02	96	2.91	5.41	1
	V11	2.89	29	209	23.06	29.53	85	6.09	4.58	20
	V12	3.62	23	199	26.28	17.21	88	3.55	4.83	14
	V13	5.67	4	184	40.27	29.29	95	4.45	4.78	16
	V14	5.53	7	236	28.24	28.97	96	6.00	5.25	6
	V15	2.45	32	171	22.45	23.07	91	3.09	4.82	15
	V16	2.32	33	184	18.63	25.97	83	0.09	4.56	21
	V17	2.68	31	196	34.43	23.75	87	-1.64	4.91	12
	V18	5.62	6	242	29.76	23.27	95	7.64	5.35	3
Interaction										
F at same V		NS		16.77	1.9	3.23	0.73			
V at same F		NS		18.06	2.75	3.92	0.8			
F1		4.20	2	194	27.03	25.74	92		4.27	2
F2		4.36	1	205	30.92	25.79	92	1.37	5.06	1
C.D.(0.05)		0.11		10	2.62	NS	0.48			
C.V.(%)		2.98		6.06	10.92	14.09	0.63			

Table 4.1(b): Contd.

N-levels	Varieties	VARANASI Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Panicle Weight (g)	Test weight (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)	Over all mean	Rank
Mean of varieties:										
	V1	6.08	1	218	27.02	25.77	94	0.55	5.01	2
	V2	4.67	9	187	31.56	20.77	96	2.55	4.91	4
	V3	3.33	13	162	32.94	27.31	94	-1.82	4.74	10
	V4	4.45	10	241	20.25	23.50	91	-10.00	4.95	3
	V5	5.34	5	166	39.29	30.74	94	-0.36	4.90	5
	V6	5.15	8	199	27.41	33.51	96	-0.73	4.82	8
	V7	4.36	11	226	24.63	21.80	93	1.82	4.68	11
	V8	3.28	14	198	32.20	27.24	93	1.82	4.50	13
	V9	5.39	4	216	34.19	29.90	97	-1.27	4.86	7
	V10	5.81	2	216	40.03	27.26	96	2.91	5.04	1
	V11	2.56	16	202	23.14	28.93	85	6.09	4.16	17
	V12	3.43	12	185	23.41	17.67	88	3.55	4.33	16
	V13	5.43	3	179	35.85	28.49	95	4.45	4.48	14
	V14	5.20	6	225	28.37	27.44	96	6.00	4.81	9
	V15	2.28	18	170	23.41	22.31	91	3.09	4.43	15
	V16	2.32	17	171	18.67	23.60	83	0.09	4.08	18
	V17	2.77	15	193	33.60	24.06	87	-1.64	4.55	12
	V18	5.20	6	234	25.54	23.49	94	7.64	4.88	6
C.D.(0.05)		0.51		11.86	1.34	2.28	0.52			
C.V. (%)		10.52		5.21	4.06	7.76	0.49			
Expt. Mean		4.28		199	28.97	25.76	92		4.66	
Soil type		-								
pH		-								
N - levels (kg/ha)										
F1		60:30:20								
F2		120:60:40								
Recommended N:P:K (kg/ha)		120:60:40								
Varieties										
V1		IET 29947								
V2		IET 29940								
V3		IET 29939								
V4		IET 29694								
V5		IET 29689								
V6		IET 29692								
V7		IET 28123								
V8		IET 29691								
V9		IET 29690								
V10		IET 29696								
V11		IET 29700								
V12		IET 29975								
V13		IET 28965								
V14		IET 28956								
V15		IET 29142(R)								
V16		CO-51 (NC)								
V17		MTU 1153 (S)								
V18		Local Check - HUR 3022								
Available N:P:K of soil (kg/ha)		-								

4.1(c) AVT 2 - Irrigated Medium Early

AVT-2 IME cultures (IET 29738, IET 29734, IET 29726, IET 29708, IET 29717, IET 29720, IET 29820, IET 29808, IET 29822, IET 29188, IET 29304, IET 30282, IET 29203 and IET 30697) a total of thirteen cultures were evaluated at 17 locations *viz.,* **Aduthurai (150:60:60), Chinsurah (70:35:35), Dhangain (120:60:40), Faizabad (120:60:40), Gangavathi (150:75:75), Ghaghraghat (120:60:60), Kanpur (120:60:60), Karjat (100:50:50), Kota (120:60:40), Mandya (100:50:50), Maruteru (90:60:60), Nagina (120:60:40), Navsari (100:30:0), Nawagam (100:25:0), Puducherry (120:40:40), Varanasi (120:60:40)** and **Warangal (120:60:40)** in comparison to high yielding standard checks (MTU 1010, ADT 39(RP), Naveen (RP), ADT 56, US 312, Bagwari, along with IR 64 Sub 1, RNR 15048, RP 4-14, Ratna, KMP 225, GR 17, GAR 13, Chinna ponni and HUR 4-3 at respective local checks) under two recommended dose of fertilizers (50% and 100% RDF). The details and data received from these locations are summarized and presented in **Table 4.1(c)**.

Application of different nutrient levels significantly influenced the grain yield at all the locations except at **Gangavathi** and **Ghaghraghat** only. Application of 100% RDF recorded significantly higher grain yield at **Aduthurai** (6.53t/ha), **Chinsurah** (5.16 t/ha), **Dhangain** (4.91 t/ha), **Faizabad** (4.56 t/ha), **Kanpur** (4.58 t/ha), **Karjat** (4.56 t/ha), **Kota** (7.60 t/ha), **Mandya** (7.40 t/ha), **Maruteru** (6.71 t/ha), **Nagina** (4.55 t/ha), **Navsari** (4.43 t/ha), **Nawagam** (6.27 t/ha), **Puducherry** (6.45 t/ha), **Varanasi** (4.56 t/ha) and **Warangal** (5.51t/ha) with mean grain yield increase of 21% over 50% of RDF application. Nutrient response (kg grain/kg nutrient) was found to be higher (>5 kg grain / kg Nutrient) with the application of 100% RDF (12 out of 17 locations at **Aduthurai** (13.58), **Chinsurah** (18.71), **Dhangain** (9.10), **Faizabad** (9.70), **Kota** (11.95), **Mandya** (10.56), Maruteru (5.61), Nagina (17.18), Navsari (11.95), Nawagam (11.26), Puducherry (16.74) and Warangal (7.29) as compared to other locations.

Grain yield differences among the tested varieties were found to be significant at all the locations. Highest grain yield was recorded with IET 30282, IET 29708, IET 29808, IET 29738, IET 29734 and IET 29726 at **Aduthurai** (6.07 to 6.33 t/ha); IET 29808, IET 29738, IET 29726, IET 29717 and IET 29708 at **Chinsurah** (4.75 to 5.19 t/ha); IET 29820, IET 30697, IET 29734, IET 29726 and IET 29738 at **Dhangain** (4.71 to 5.25 t/ha); IET 30697, IET 29203, IET 29717, IET 29734, IET 29822 and IET29188 at **Faizabad** (4.19 to 4.46 t/ha); IET 29188, IET 29820 and IET 29726 at **Gangavathi** (5.36 to 5.98 t/ha); IET29738, IET 30282, IET 29822, IET 29808 and IET 29820 at **Ghaghraghat** (3.67 to 4.11 t/ha); IET 29738, IET 29734, IET 29708, IET 29822 and IET 29820 at **Kanpur** (4.45 to 4.86 t/ha); IET 29808, IET 30697, IET 29188, IET 29734 and IET 29726 at **Karjat** (5.05 to 5.96 t/ha); IET 29820, IET 29726, IET 29738, IET 29704 and IET 29734 at **Kota** (7.30 to 8.34 t/ha); IET 29726, IET 29808, IET 29717 and IET 29734 at **Mandya** (7.30 to 7.51 t/ha); IET 29808, IET 29188, IET 29304 and IET 29822 at **Maruteru** (6.90 to 7.25 t/ha); IET 30697, IET 30282, IET 29188, IET 29726 and IET 29738 at **Nagina** (3.77 to 3.91 t/ha); IET 29820, IET 29726 and IET 29808 at **Navsari** were comparable with Gondhra Bidhan-3 a National check (4.45 to 4.59 t/ha); IET 29738 and IET 29708 at **Nawagam** (6.23 to 6.86 t/ha) were comparable with high yielding checks at **Naveen, ADT 39(RP)** (6.32 to 6.49 t/ha); IET 29808, IET 29738, IET 29188, IET 29717 and IET 29822 at **Puducherry** (5.75 to 5.98 t/ha); IET 29726, IET 29808, IET 29738 and IET 29822 at **Varanasi** were comparable with high yielding local check HVR4-3 (4.78 to 5.28

t/ha); and IET 29734, IET29717, IET 29808, IET 29822 and IET 29726 at **Warangal** (5.58 to 5.31 t/ha) were found promising cultures interms of grain yield and yield attributing characters. Interaction effect among RDF x varieties was found to be significant at all the locations except at **Dhangain, Karjat, Kota, Mandya, Navsari, Nawagam** and **Puducherry** where in 50% RDF gave on par yields of cultures as compared to 100% RDF.

In this trial, mean over the locations, nutrient management with 100% RDF application recorded better yield over 50% RDF at all the locations with 21% higher grain yield. Among the cultures, IET 29726 (5.40 t/ha), IET 29822 (5.24 t/ha), IET 29808 (5.17 t/ha), IET 29734 (5.17 t/ha) and IET 29738 (5.15 t/ha) performed better and recorded higher mean grain yield across the locations as compared to other test entries and checks.

4.1(d) AVT 2 - Irrigated Medium

Thirteen AVT-2 entries IET 29743, IET 29741, IET 29833, IET 28523, IET 29742, IET 29290(R), IET 29301(R), IET 29257(R), IET 29284(R), IET 29014(R), IET 29002(R), IET 30757 and IET 29859 of medium duration were evaluated for their response to nutrients on yield attributes and grain yield at eighteen different locations viz., **Chinsurah (80:40:40), Coimbatore (150:50:50), Dhangain (120:60:40), Faizabad (120:60:60), Jagdalpur (120:60:30), Karjat (100:50:50), Kaul (150:60:60), Maruteru (90:60:60), Nagina (120:60:40), Navsari (100:30:0), Nawagam (100:25:0), Pantnagar (120:60:40), Puducherry (120:40:40), Pusa (120:60:40), ARI-Rajendranagar (120:60:40), Titabar (60:20:20), Varanasi (120:60:40)** and **Warangal (120:60:40)** under two different levels of nutrient input (50% and 100% RDF). The details and data received from these locations are summarized and presented in Table 4.1 (d).

Application of different nutrient levels (50 and 100% RDF) significantly influenced the grain yield at all the locations except **Faizabad, Jagdalpur**, **Maruteru, Nawagam** and **Varanasi** indicating application of higher dose is not required at this locations. However, the overall yield improvement was to the tune of 28% with 100% RDF compared to 50% RDF (3.95 t/ha). Higher nutrient response was recorded with 100% RDF at **Chinsurah** (22.05), **Nagina** (21.29), **Kaul** (12.41), **Nawagam** (14.05), **Pantnagar** (13.67), **Puducherry** (16.89), **Rajendranagar** (22.51) and **Titabar** (14.69) due to lower nutrient available status.

Grain yield differences among the tested cultures were found to be significant at all the locations except **Faizabad**. Among the tested entries higher grain yield was recorded by IET 29741 (6.18 t/ha) and IET 29002(R) (5.99 t/ha) at **Chinsurah**; IET 29741 (6.33 t/ha) and IET 29833 (6.18 t/ha) at **Coimbatore**; IET 29743 (3.85 t/ha) at **Dhangain**; IET 29741 (5.01 t/ha), IET 29742 (5.38 t/ha) and IET 29743 (5.24 t/ha) at **Jagdalpur**; IET 29741 (5.01 t/ha) and IET 29002(R) (4.85 t/ha) at **Karjat**; IET 28523 (5.91 t/ha) and IET 29014(R) (5.85 t/ha) at **Kaul**; IET 29743 (6.70 t/ha) and IET 29290(R) (6.36 t/ha) at **Maruteru**; IET 29742 (3.72 t/ha) and IET 29002(R) (3.72 t/ha) at **Nagina**; IET 29014(R) (4.65 t/ha) and IET 29284(R) (4.50 t/ha) at **Navsari**; IET 29741 (7.21 t/ha) and IET 29743 (6.83 t/ha) at **Nawagam**; IET 29284(R) (4.98 t/ha) and IET 29014(R) (4.57 t/ha) at **Pantnagar**; IET 29743 (5.76 t/ha) and IET 30757 (5.69 t/ha) at **Puduchery**; IET 29743 (4.42 t/ha) at **Pusa**; IET 29859 (5.49 t/ha) and IET 29741 (4.80

t/ha) at **Rajendranagar**; IET 29014(R) (7.47 t/ha) and IET 29002(R) (7.44 t/ha) at **Titabar**; and IET 29833 (5.34 t/ha) and IET 29743 (4.76 t/ha) at **Varanasi** and IET 29743 (6.85 t/ha) and IET 29742 (6.19 t/ha) at **Warangal** were found promising with higher grain yields.

In this trial, among cultures IET 29741 (5.02 t/ha) followed by IET 29743 (4.95 t/ha), IET 29833 (4.81 t/ha) and IET 29742 (4.78 t/ha) were found promising on the basis of overall mean grain yield across the locations. Interaction effect of nutrients and cultures found significant at **Chinsurah**, **Coimbatore**, **Karjat**, **Kaul**, **Maruteru**, **Pantnagar, Puducherry, Rajendranagar** and **Warangal** and application of 100% RFD resulted in better yields of cultivars at these locations. Application of 100% RDF of the location (28% higher) found significantly superior to 50% RDF application at all the locations.

4.1(e) AVT 2 - Late

Five AVT-2 Late duration entries (IET 28524, IET 29891, IET 29935, IET 30826 and IET 30829) were evaluated for its response to graded levels nutrients on grain yield and yield attributes at nine locations viz., **Aduthurai (150:50:50), Chinsurah (80:40:40), Chiplima (120:60:60), Dhangain (120:60:40), Karjat (100:50:50), Mandya (100:50:50), Maruteru (90:60:60), Nawagam (120:25:0)** and **Rajendranagar (120:60:40)** under two levels of RDF (50% and 100% RDF). The details and data received from these locations are summarized and presented in Table 4.1(e).

Application of nutrients significantly influenced the grain yield at all locations except **Maruteru** and the maximum grain yield was recorded at all the locations with 100% RDF with average increase of 19%. Application of 100% RDF recorded higher grain yields at **Aduthurai** (7.23 t/ha), **Chinsurah** (4.79 t/ha), **Chiplima** (4.96 t/ha), **Dhangain** (5.89 t/ha), **Karjat** (4.44 t/ha), **Mandya** (5.74 t/ha), **Nawagam** (6.56 t/ha) and **Rajendrangar** (3.95 t/ha). Higher nutrient response (kg grain/kg nutrient) was recorded with 100% RDF over 50% RDF at **Mandya** (17.81), **Karjat**(14.59), **Chinsurah** (11.88), **Nawagam** (11.97) and **Dhangain** (10.31) .

Grain yield differences among the tested cultures were found to be significant at all the locations. Significantly higher mean maximum grain yield was recorded by IET 28524 (7.55 t/ha) at **Aduthurai, Chinsurah** (5.00 t/ha), **Chiplima** (5.29 t/ha) and comparable with local check at **Dhangain** (5.83 t/ha). IET 29935 (6.14 t/ha) at **Mandya**; IET 29891 (7.25 t/ha) at **Nawagam** and **Rajendranagar (3.75 t/ha)** were found significant while at other locations performance of standard checks found promising. Interaction effects among RDF x varieties was found to be non-significant at all the location except **Chinsurah** and **Maruteru**. Mean over the locations the performance of IET 28524 (5.36 t/ha) was promising over other cultures at 100% RDF application.

In this trial, 100% RDF was found to be promising with 19 % increased grain yield and also exhibited higher nutrient recovery efficiency (8.53 kg grain/kg Nutrient). IET cultures were found to be promising in terms of higher grain yield at most of the locations however IET 28524 (5.36 t/ha) recorded better mean yields at higher RDF application.

Table 4.1(c): Summary of data on grain yield and ancillary characters of selected AVT -2 IME cultures grown under transplanted conditions at low and optimum levels level of recommended fertilizer doses, kharif 2023.

F-levels	Varieties	ADUTHURAI Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test wt(g)	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: low input (50% NPK)	V1	5.42	*20*	291	4.52	18.20	
	V2	4.98	*23*	285	5.22	19.23	
	V3	5.62	*19*	281	4.34	18.60	
	V4	4.80	*27*	262	2.26	16.47	
	V5	4.54	*31*	268	3.34	15.47	
	V6	4.70	*29*	262	4.22	18.27	
	V7	5.87	*17*	280	5.55	19.60	
	V8	5.04	*22*	265	5.32	19.70	
	V9	4.36	*33*	287	6.11	20.23	
	V10	4.77	*28*	260	2.68	15.33	
	V11	4.70	*29*	281	3.22	18.20	
	V12	4.34	*35*	274	2.52	16.23	
	V13	4.91	*24*	261	4.30	18.37	
	V14	4.36	*33*	251	3.09	19.30	
	V15	-		-	-	-	
	V16	-		-	-	-	
	V17	-		-	-	-	
	V18	4.83	*26*	243	2.73	16.33	
	V19	-		-	-	-	
	V20	4.30	*36*	272	3.32	16.40	
	V21	4.87	*25*	254	3.05	17.23	
	V22	-		-	-	-	
	V23	4.51	*32*	247	2.14	17.40	
F2: Optimum input (100% NPK)	V1	6.86	*7*	306	4.79	19.33	11.52
	V2	7.42	*1*	292	5.46	20.27	19.52
	V3	7.04	*5*	292	4.83	19.70	11.36
	V4	7.33	*3*	275	2.41	17.50	20.24
	V5	7.27	*4*	284	3.64	17.60	21.84
	V6	6.62	*8*	275	4.60	20.47	15.36
	V7	6.33	*11*	294	5.98	20.73	3.68
	V8	6.57	*9*	283	5.73	20.73	12.24
	V9	6.89	*6*	294	6.39	21.33	20.24
	V10	7.36	*2*	274	2.88	16.63	20.72
	V11	6.30	*12*	294	3.54	19.40	12.80
	V12	6.02	*15*	293	2.88	17.47	13.44
	V13	5.90	*16*	272	4.68	19.43	7.92
	V14	6.07	*14*	264	3.39	20.13	13.68
	V15	-		-	-	-	
	V16	-		-	-	-	
	V17	-		-	-	-	
	V18	5.65	*18*	254	3.05	17.43	6.56
	V19	-		-	-	-	
	V20	6.41	*10*	282	3.68	17.60	16.88
	V21	6.22	*13*	262	3.22	18.33	10.80
	V22	-		-	-	-	
	V23	5.22	*21*	264	2.26	18.33	5.68
Interaction							
N at same V		0.49		NS	0.06	0.23	
V at same N		0.48		NS	0.09	0.28	
Means of F levels:							
F1		4.83	*2*	268	3.77	17.81	
F2		6.53	*1*	281	4.08	19.02	13.58
C.D.(0.05)		0.09		10.01	0.09	0.22	
C.V.(%)		1.97		4.4	2.69	1.45	

Table 4.1(c): Contd.

F-levels	Varieties	ADUTHURAI					
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test wt(g)	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Mean of varieties							
V1		6.14	*3*	299	4.66	18.77	11.52
V2		6.20	*2*	289	5.34	19.75	19.52
V3		6.33	*1*	287	4.59	19.15	11.36
V4		6.07	*5*	269	2.34	16.99	20.24
V5		5.91	*7*	276	3.49	16.54	21.84
V6		5.66	*9*	269	4.41	19.37	15.36
V7		6.10	*4*	287	5.77	20.17	3.68
V8		5.81	*8*	274	5.53	20.22	12.24
V9		5.63	*10*	291	6.25	20.78	20.24
V10		6.07	*5*	267	2.78	15.98	20.72
V11		5.50	*12*	288	3.38	18.80	12.80
V12		5.18	*17*	283	2.70	16.85	13.44
V13		5.41	*13*	267	4.49	18.90	7.92
V14		5.22	*16*	258	3.24	19.72	13.68
V15		-		-	-	-	
V16		-		-	-	-	
V17		-		-	-	-	
V18		5.24	*15*	249	2.89	16.88	6.56
V19		-		-	-	-	
V20		5.36	*14*	277	3.50	17.00	16.88
V21		5.55	*11*	258	3.14	17.78	10.80
V22		-		-	-	-	
V23		4.87	*18*	256	2.20	17.87	5.68
C.D.(0.05)		0.35		5.53	0.04	0.16	
C.V.(%)		5.35		1.76	0.95	0.76	
Expt. Mean		5.68		274	3.93	18.42	
Soil type		Clay					
pH		7.22					
F - levels (kg/ha)							
F1		75:25:25					
F2		150:50:50					
Recmnd N:P:K (kg/ha)		150:50:50					
Varieties							
V1		IET 29738					
V2		IET 29734					
V3		IET 29726					
V4		IET 29708					
V5		IET 29717					
V6		IET 29820					
V7		IET 29808					
V8		IET 29822					
V9		IET 29188					
V10		IET 29304					
V11		IET 30282					
V12		IET 29203					
V13		IET 30697					
V14		Gondhra Bidhan-3 (NC)					
V15		-					
V16		-					
V17		-					
V18		MTU 1010 (C& S)					
V19		-					
V20		ADT 39 RP					
V21		Naveen (RP)					
V22		-					
V23		Local check - ADT 56(115 days)					
Available N:P:K		282;46:532					

Table 4.1(c): Contd.

F-levels	Varieties	CHINSURAH Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Days for 50% Flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: low input (50% NPK)	V1	4.37	*21*	282	3.11	72	
	V2	4.12	*23*	310	3.21	74	
	V3	4.48	*20*	375	3.87	70	
	V4	4.66	*15*	393	3.95	78	
	V5	4.70	*14*	405	3.96	80	
	V6	4.15	*22*	306	3.75	85	
	V7	4.06	*24*	227	3.85	84	
	V8	4.05	*25*	342	3.79	88	
	V9	4.04	*26*	350	3.99	84	
	V10	3.56	*28*	356	2.99	82	
	V11	3.50	*29*	225	3.01	75	
	V12	3.30	*33*	248	2.97	67	
	V13	3.74	*27*	180	3.02	98	
	V14	2.50	*34*	343	2.13	67	
	V15	-		-	-	-	
	V16	-		-	-	-	
	V17	-		-	-	-	
	V18	3.35	*31*	273	2.25	66	
	V19	-		-	-	-	
	V20	3.33	*32*	239	3.19	82	
	V21	3.50	*29*	306	2.06	71	
	V22	-		-	-	-	
	V23	-		-	-	-	
F2: Optimum input (100% NPK)	V1	5.26	*8*	283	4.25	75	12.71
	V2	5.20	*10*	351	3.11	79	15.43
	V3	5.65	*3*	399	4.78	74	16.71
	V4	5.72	*1*	387	4.98	82	15.14
	V5	5.67	*2*	459	4.96	85	13.86
	V6	5.11	*12*	336	4.00	89	13.71
	V7	5.43	*4*	280	3.50	90	19.57
	V8	5.03	*13*	355	3.60	92	14.00
	V9	5.25	*9*	211	3.70	90	17.29
	V10	5.33	*6*	340	4.12	88	25.29
	V11	5.40	*5*	245	4.02	81	27.14
	V12	5.16	*11*	269	2.99	72	26.57
	V13	5.33	*6*	400	3.98	102	22.71
	V14	4.56	*17*	398	2.96	72	29.43
	V15	-		-	-	-	
	V16	-		-	-	-	
	V17	-		-	-	-	
	V18	4.50	*18*	282	2.92	71	16.43
	V19	-		-	-	-	
	V20	4.50	*18*	240	4.00	88	16.71
	V21	4.57	*16*	342	3.04	75	15.29
	V22	-		-	-	-	
	V23	-		-	-	-	
Interaction							
N at same V		0.17		11.47	0.15	0.74	
V at same N		0.17		11.92	0.18	0.73	
Means of F levels:							
F1		3.85	*2*	303	3.24	78	
F2		5.16	*1*	328	3.82	83	18.71
C.D.(0.05)		0.03		5.49	0.15	0.17	
C.V.(%)		0.68		2.04	5.04	0.25	

Table 4.1(c): Contd.

F-levels	Varieties	CHINSURAH Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Days for 50% Flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Mean of varieties							
V1		4.82	*4*	282	3.68	74	12.71
V2		4.66	*6*	331	3.16	77	15.43
V3		5.07	*3*	387	4.33	72	16.71
V4		5.19	*1*	390	4.47	80	15.14
V5		5.19	*2*	432	4.46	83	13.86
V6		4.63	*8*	321	3.88	87	13.71
V7		4.75	*5*	253	3.68	87	19.57
V8		4.54	*9*	348	3.70	90	14.00
V9		4.65	*7*	281	3.85	87	17.29
V10		4.45	*12*	348	3.56	85	25.29
V11		4.45	*11*	235	3.52	78	27.14
V12		4.23	*13*	259	2.98	70	26.57
V13		4.54	*10*	290	3.50	100	22.71
V14		3.53	*17*	370	2.55	70	29.43
V15		-		-	-	-	
V16		-		-	-	-	
V17		-		-	-	-	
V18		3.93	*15*	277	2.59	69	16.43
V19		-		-	-	-	
V20		3.92	*16*	240	3.60	85	16.71
V21		4.04	*14*	324	2.55	73	15.29
V22		-		-	-	-	
V23		-		-	-	-	
C.D.(0.05)		0.12		8.11	0.1	0.52	
C.V.(%)		2.37		2.25	2.54	0.57	
Expt. Mean		4.50		316	3.53	80	
Soil type		Clay loam					
pH		-					
F - levels (kg/ha)							
F1		35:17.5:17.5					
F2		70:35:35					
Recmnd N:P:K (kg/ha)		70:35:35					
Varieties							
V1		IET 29738					
V2		IET 29734					
V3		IET 29726					
V4		IET 29708					
V5		IET 29717					
V6		IET 29820					
V7		IET 29808					
V8		IET 29822					
V9		IET 29188					
V10		IET 29304					
V11		IET 30282					
V12		IET 29203					
V13		IET 30697					
V14		Gondhra Bidhan-3 (NC)					
V15		-					
V16		-					
V17		-					
V18		MTU 1010 (C& S)					
V19		-					
V20		ADT 39 RP					
V21		Naveen (RP)					
V22		-					
V23		-					
Available N:P:K		-					

Table 4.1(c): Contd.

F-levels	Varieties	DHANGAIN Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test wt(g)	Days for 50% Flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: low input (50% NPK)	V1	4.70	*11*	295	6.36	27.07	86	
	V2	4.46	*16*	261	6.20	26.00	89	
	V3	4.64	*12*	278	6.25	26.53	85	
	V4	3.63	*31*	236	4.22	22.53	86	
	V5	3.72	*30*	238	4.40	22.67	83	
	V6	4.15	*23*	251	5.52	24.67	98	
	V7	3.25	*35*	225	2.98	21.20	100	
	V8	4.01	*26*	246	5.15	24.00	104	
	V9	4.10	*24*	246	5.33	24.40	103	
	V10	3.76	*29*	239	4.47	23.07	93	
	V11	3.59	*32*	229	4.01	22.27	85	
	V12	3.87	*27*	242	5.14	23.47	84	
	V13	4.34	*21*	253	5.88	25.47	108	
	V14	3.80	*28*	241	5.03	23.33	82	
	V15	-		-	-	-	-	
	V16	-		-	-	-	-	
	V17	-		-	-	-	-	
	V18	3.19	*36*	214	2.78	20.93	80	
	V19	-		-	-	-	-	
	V20	4.44	*17*	258	5.97	25.73	103	
	V21	3.43	*33*	228	4.00	22.13	84	
	V22	-		-	-	-	-	
	V23	3.36	*34*	224	3.76	22.00	84	
F2: Optimum input (100% NPK)	V1	5.80	*1*	307	7.10	27.20	87	10.00
	V2	5.50	*3*	272	6.26	26.27	91	9.45
	V3	5.64	*2*	285	6.57	27.07	87	9.09
	V4	4.50	*15*	243	4.68	23.87	88	7.91
	V5	4.56	*14*	250	4.74	24.40	85	7.64
	V6	5.27	*7*	260	5.78	25.20	99	10.18
	V7	4.35	*19*	231	3.45	21.87	102	10.00
	V8	5.08	*8*	258	5.28	25.20	106	9.73
	V9	5.30	*6*	259	5.35	25.20	104	10.91
	V10	4.63	*13*	250	4.91	24.67	95	7.91
	V11	4.43	*18*	237	4.54	23.87	86	7.64
	V12	5.02	*9*	256	5.22	25.07	85	10.45
	V13	5.38	*5*	263	5.88	25.87	109	9.45
	V14	4.85	*10*	251	5.07	24.80	84	9.55
	V15	-		-	-	-	-	
	V16	-		-	-	-	-	
	V17	-		-	-	-	-	
	V18	4.03	*25*	229	3.43	21.73	82	7.64
	V19	-		-	-	-	-	
	V20	5.43	*4*	267	6.19	26.00	105	9.00
	V21	4.35	*19*	233	4.22	23.20	86	8.36
	V22	-		-	-	-	-	
	V23	4.34	*21*	233	3.83	22.53	86	8.91
Interaction								
N at same V		NS		NS	NS	NS	NS	
V at same N		NS		NS	NS	NS	NS	
Means of F levels:								
F1		3.91	*2*	245	4.86	23.75	91	
F2		4.91	*1*	255	5.14	24.67	93	9.10
C.D.(0.05)		0.6		4.37	0.17	0.18	0.08	
C.V.(%)		16.53		2.11	4.23	0.92	0.1	

Table 4.1(c): Contd.

F-levels	Varieties	Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test wt(g)	Days for 50% Flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
		DHANGAIN						
Mean of varieties								
V1		5.25	*1*	301	6.73	27.14	87	10.00
V2		4.98	*3*	267	6.23	26.14	90	9.45
V3		5.14	*2*	281	6.41	26.80	86	9.09
V4		4.07	*13*	239	4.45	23.20	87	7.91
V5		4.14	*12*	244	4.57	23.54	84	7.64
V6		4.71	*6*	255	5.65	24.94	98	10.18
V7		3.80	*17*	228	3.22	21.54	101	10.00
V8		4.55	*8*	252	5.22	24.60	105	9.73
V9		4.70	*7*	253	5.34	24.80	104	10.91
V10		4.20	*11*	245	4.69	23.87	94	7.91
V11		4.01	*14*	233	4.28	23.07	86	7.64
V12		4.45	*9*	249	5.18	24.27	84	10.45
V13		4.86	*5*	258	5.88	25.67	108	9.45
V14		4.33	*10*	246	5.05	24.07	83	9.55
V15		-		-	-	-	-	
V16		-		-	-	-	-	
V17		-		-	-	-	-	
V18		3.61	*18*	221	3.11	21.33	81	7.64
V19		-		-	-	-	-	
V20		4.94	*4*	263	6.08	25.87	104	9.00
V21		3.89	*15*	231	4.11	22.67	85	8.36
V22		-		-	-	-	-	
V23		3.85	*16*	229	3.80	22.27	85	8.91
C.D.(0.05)		0.6		26.84	0.88	1.51	0.53	
C.V.(%)		11.92		9.41	15.38	5.44	0.51	
Expt. Mean		4.41		250	5.00	24.21	92	
Soil type		Clay loam						
pH		6.35						
F - levels (kg/ha)								
F1		60:30:20						
F2		120:60:40						
Recmnd N:P:K (kg/ha)		120:60:40						
Varieties								
V1		IET 29738						
V2		IET 29734						
V3		IET 29726						
V4		IET 29708						
V5		IET 29717						
V6		IET 29820						
V7		IET 29808						
V8		IET 29822						
V9		IET 29188						
V10		IET 29304						
V11		IET 30282						
V12		IET 29203						
V13		IET 30697						
V14		Gondhra Bidhan-3 (NC)						
V15		-						
V16		-						
V17		-						
V18		MTU 1010 (C& S)						
V19		-						
V20		ADT 39 RP						
V21		-						
V22		US 312						
V23		Local check - R. Bhagwari (110-115 Days)						
Available N:P:K of soil		282:42.4:162.2						

Table 4.1(c): Contd.

F-levels	Varieties	FAIZABAD Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test wt(g)	Days for 50% Flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: low input (50% NPK)	V1	3.25	*33*	207	4.17	20.60	89	
	V2	3.90	*18*	213	4.20	29.20	91	
	V3	3.30	*30*	217	3.23	21.70	92	
	V4	3.33	*28*	225	4.23	22.57	87	
	V5	3.49	*27*	221	3.87	24.27	89	
	V6	3.11	*36*	214	3.20	23.63	91	
	V7	3.19	*35*	217	3.57	23.90	87	
	V8	3.70	*22*	209	4.20	25.30	84	
	V9	3.67	*23*	224	4.63	26.03	89	
	V10	2.94	*38*	223	4.13	23.80	82	
	V11	3.33	*28*	217	4.27	25.37	88	
	V12	3.74	*20*	233	4.37	23.60	94	
	V13	3.29	*31*	222	2.83	23.50	82	
	V14	3.58	*25*	203	3.40	23.60	89	
	V15	-		-	-	-	-	
	V16	-		-	-	-	-	
	V17	-		-	-	-	-	
	V18	3.07	*37*	204	3.23	23.83	87	
	V19	3.54	*26*	266	3.46	26.30	86	
	V20	3.60	*24*	243	2.90	24.50	87	
	V21	3.23	*34*	231	2.55	23.43	86	
	V22	-		-	-	-	-	
	V23	3.28	*32*	223	4.50	26.40	93	
F2: Optimum input (100% NPK)	V1	4.69	*8*	246	4.67	21.17	93	12.00
	V2	4.76	*5*	256	4.57	29.67	92	7.17
	V3	4.56	*11*	254	3.23	21.70	92	10.50
	V4	4.72	*6*	274	4.23	22.57	87	11.58
	V5	5.00	*4*	264	4.67	24.87	94	12.58
	V6	4.28	*15*	268	3.67	24.40	96	9.75
	V7	4.58	*10*	247	4.13	24.27	91	11.58
	V8	5.21	*2*	254	4.63	25.63	88	12.58
	V9	5.25	*1*	275	4.77	26.37	94	13.17
	V10	3.74	*20*	256	4.70	24.70	88	6.67
	V11	4.53	*12*	267	4.77	26.07	91	10.00
	V12	4.72	*6*	296	4.83	24.53	96	8.17
	V13	5.09	*3*	254	3.40	24.23	86	15.00
	V14	4.32	*13*	256	3.90	24.10	92	6.17
	V15	-		-	-	-	-	
	V16	-		-	-	-	-	
	V17	-		-	-	-	-	
	V18	4.32	*13*	253	3.87	24.53	93	10.42
	V19	4.28	*15*	299	2.96	26.40	92	6.17
	V20	3.86	*19*	255	2.97	26.03	97	2.17
	V21	4.07	*17*	295	2.98	25.70	88	7.00
	V22	-		-	-	-	-	
	V23	4.67	*9*	242	4.87	26.83	97	11.58
Interaction								
N at same V		0.19		14.08	0.33	0.77	1.78	
V at same N		0.22		13.85	0.33	0.78	1.9	
Means of F levels:								
F1		3.40	*2*	222	3.73	24.29	88	
F2		4.56	*1*	264	4.10	24.94	92	9.70
C.D.(0.05)		0.17		2.55	0.05	0.29	0.98	
C.V.(%)		5.2		1.3	1.45	1.47	1.35	

Table 4.1(c): Contd.

F-levels	Varieties	FAIZABAD Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test wt(g)	Days for 50% Flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Mean of varieties								
V1		3.97	*9*	227	4.42	20.89	91	12.00
V2		4.33	*3*	235	4.39	29.44	92	7.17
V3		3.93	*12*	236	3.23	21.70	92	10.50
V4		4.03	*7*	249	4.23	22.57	87	11.58
V5		4.25	*4*	242	4.27	24.57	91	12.58
V6		3.70	*16*	241	3.44	24.02	94	9.75
V7		3.89	*14*	232	3.85	24.09	89	11.58
V8		4.46	*2*	232	4.42	25.47	86	12.58
V9		4.46	*1*	250	4.70	26.20	92	13.17
V10		3.34	*19*	240	4.42	24.25	85	6.67
V11		3.93	*11*	242	4.52	25.72	90	10.00
V12		4.23	*5*	265	4.60	24.07	95	8.17
V13		4.19	*6*	238	3.12	23.87	84	15.00
V14		3.95	*10*	229	3.65	23.85	91	6.17
V15		-		-	-	-	-	
V16		-		-	-	-	-	
V17		-		-	-	-	-	
V18		3.70	*16*	229	3.55	24.18	90	10.42
V19		3.91	*13*	282	3.21	26.35	89	6.17
V20		3.73	*15*	249	2.94	25.27	92	2.17
V21		3.65	*18*	263	2.77	24.57	87	7.00
V22		-		-	-	-	-	
V23		3.98	*8*	233	4.69	26.62	95	11.58
C.D.(0.05)		0.13		9.96	0.24	0.54	1.26	
C.V.(%)		2.93		3.59	5.27	1.93	1.23	
Expt. Mean		3.98		243	3.91	24.61	90	
Soil type		Sandy loam						
pH		7.60						
F - levels (kg/ha)								
F1		60:30:30						
F2		120:60:60						
Recmnd N:P:K (kg/ha)		120:60:60						
Varieties								
V1		IET 29738						
V2		IET 29734						
V3		IET 29726						
V4		IET 29708						
V5		IET 29717						
V6		IET 29820						
V7		IET 29808						
V8		IET 29822						
V9		IET 29188						
V10		IET 29304						
V11		IET 30282						
V12		IET 29203						
V13		IET 30697						
V14		Gondhra Bidhan-3 (NC)						
V15		-						
V16		-						
V17		-						
V18		MTU 1010 (C& S)						
V19		IR 64 sub1(RP)						
V20		ADT 39 RP						
V21		Naveen (RP)						
V22		-						
V23		Local check - NDR 2065(128 DAYS)						
Available N:P:K of soil		200:24:234						

Table 4.1(c): Contd.

F-levels	Varieties	GANGAVATHI Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test wt(g)	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: low input (50% NPK)	V1	4.93	*13*	207	2.36	22.99	
	V2	4.42	*21*	207	2.54	23.69	
	V3	6.02	*2*	224	2.81	26.38	
	V4	3.37	*33*	150	2.83	18.39	
	V5	3.04	*38*	149	2.66	24.16	
	V6	5.59	*7*	189	2.99	29.57	
	V7	4.86	*18*	168	3.87	19.31	
	V8	5.70	*5*	169	3.37	21.99	
	V9	5.14	*11*	130	3.29	20.38	
	V10	5.12	*12*	193	2.97	20.86	
	V11	4.87	*17*	207	2.66	18.08	
	V12	4.16	*25*	198	2.04	20.42	
	V13	3.84	*29*	168	2.76	17.42	
	V14	4.76	*19*	117	4.70	19.34	
	V15	3.16	*36*	179	2.55	25.97	
	V16	4.00	*26*	170	1.36	22.82	
	V17	2.59	*43*	125	1.83	22.82	
	V18	3.99	*27*	230	2.33	22.72	
	V19	-		-	-	-	
	V20	6.24	*1*	120	3.92	19.68	
	V21	3.15	*37*	164	2.00	19.53	
	V22	2.84	*40*	148	2.24	18.54	
	V23	2.60	*42*	135	2.02	12.77	
F2: Optimum input (100% NPK)	V1	4.91	*15*	186	3.24	20.06	-0.13
	V2	4.40	*23*	241	2.56	19.56	-0.13
	V3	5.93	*4*	186	2.86	26.07	-0.60
	V4	3.22	*35*	107	3.16	22.22	-1.00
	V5	2.38	*44*	116	3.46	24.08	-4.40
	V6	5.56	*9*	174	2.20	28.51	-0.20
	V7	5.60	*6*	182	3.80	17.03	4.93
	V8	4.89	*16*	177	3.09	20.34	-5.40
	V9	5.57	*8*	150	3.26	20.44	2.87
	V10	5.56	*9*	228	3.32	21.49	2.93
	V11	4.71	*20*	157	2.29	19.15	-1.07
	V12	4.41	*22*	183	2.37	23.88	1.67
	V13	3.89	*28*	160	2.78	17.32	0.33
	V14	4.92	*14*	131	4.10	19.08	1.07
	V15	2.90	*39*	161	2.28	26.02	-1.73
	V16	3.65	*30*	196	1.26	23.10	-2.33
	V17	2.70	*41*	105	1.86	21.34	0.73
	V18	4.38	*24*	162	2.23	23.19	2.60
	V19	-		-	-	-	
	V20	5.99	*3*	128	3.20	18.07	-1.67
	V21	3.58	*31*	138	2.07	19.19	2.87
	V22	3.41	*32*	149	2.42	18.34	3.80
	V23	3.29	*34*	126	2.27	12.57	4.60
Interaction							
N at same V		0.46		29.56	0.27	NS	
V at same N		0.54		35.23	0.27	NS	
Means of F levels:							
F1		4.29	*2*	170	2.73	21.27	
F2		4.36	*1*	161	2.73	20.96	0.44
C.D.(0.05)		NS		NS	NS	NS	
C.V.(%)		11.62		20.89	1.4	27.78	

Table 4.1(c): Contd.

F-levels	Varieties	GANGAVATHI Grain Yield(t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight(g)	Test wt(g)	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Mean of varieties							
V1		4.92	*8*	196	2.80	21.53	-0.13
V2		4.41	*11*	224	2.55	21.63	-0.13
V3		5.98	*2*	205	2.84	26.23	-0.60
V4		3.30	*17*	128	3.00	20.31	-1.00
V5		2.71	*21*	133	3.06	24.12	-4.40
V6		5.58	*3*	181	2.60	29.04	-0.20
V7		5.23	*7*	175	3.84	18.17	4.93
V8		5.30	*6*	173	3.23	21.17	-5.40
V9		5.36	*4*	140	3.28	20.41	2.87
V10		5.34	*5*	211	3.15	21.18	2.93
V11		4.79	*10*	182	2.48	18.62	-1.07
V12		4.29	*12*	190	2.21	22.15	1.67
V13		3.87	*14*	164	2.77	17.37	0.33
V14		4.84	*9*	124	4.40	19.21	1.07
V15		3.03	*19*	170	2.42	26.00	-1.73
V16		3.83	*15*	183	1.31	22.96	-2.33
V17		2.65	*22*	115	1.85	22.08	0.73
V18		4.19	*13*	196	2.28	22.96	2.60
V19		-		-	-	-	
V20		6.12	*1*	124	3.56	18.88	-1.67
V21		3.37	*16*	151	2.04	19.36	2.87
V22		3.13	*18*	149	2.33	18.44	3.80
V23		2.95	*20*	131	2.15	12.67	4.60
C.D.(0.05)		0.33		20.9	0.19	3.57	
C.V.(%)		6.63		11.04	6.17	14.77	
Expt. Mean		4.32		166	2.73	21.11	
Soil type		-					
pH		8.00					
F - levels (kg/ha)							
F1		75:37.5:37.5					
F2		150:75:75					
Recmnd N:P:K (kg/ha)		150:75:75					
Varieties							
V1		IET 29738					
V2		IET 29734					
V3		IET 29726					
V4		IET 29708					
V5		IET 29717					
V6		IET 29820					
V7		IET 29808					
V8		IET 29822					
V9		IET 29188					
V10		IET 29304					
V11		IET 30282					
V12		IET 29203					
V13		IET 30697					
V14		Gondhra Bidhan-3 (NC)					
V15		PR 113 (N)					
V16		Lalat (E & NE)					
V17		Karjat-7 (W)					
V18		MTU 1010 (C& S)					
V19		-					
V20		ADT 39 RP					
V21		Naveen (RP)					
V22		US 312					
V23		Local check - RNR 15048					
Available N:P:K of soil		-					

Table 4.1(c): Contd.

F-levels	Varieties	GHAGHRAGHAT						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test wt(g)	Days for 50% Flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: low input (50% NPK)	V1	3.71	*8*	129	3.97	22.50	78	
	V2	2.68	*29*	123	3.77	21.97	76	
	V3	3.47	*15*	135	4.03	21.30	79	
	V4	3.43	*16*	141	3.70	21.57	78	
	V5	3.43	*16*	147	3.73	22.63	79	
	V6	3.99	*4*	135	4.00	22.97	84	
	V7	3.67	*9*	138	4.30	22.27	83	
	V8	3.49	*12*	131	3.53	21.27	76	
	V9	3.33	*20*	132	4.07	22.03	82	
	V10	2.56	*31*	147	4.13	22.57	84	
	V11	3.48	*13*	138	4.07	23.13	81	
	V12	2.82	*24*	145	3.67	21.23	80	
	V13	3.48	*13*	128	4.27	22.23	82	
	V14	2.30	*33*	129	3.63	21.90	79	
	V15	-		-	-	-	-	
	V16	-		-	-	-	-	
	V17	-		-	-	-	-	
	V18	1.93	*34*	136	3.30	17.63	71	
	V19	-		-	-	-	-	
	V20	2.77	*27*	150	3.90	20.40	75	
	V21	2.46	*32*	137	4.07	21.30	83	
	V22	-		-	-	-	-	
	V23	-		-	-	-	-	
F2: Optimum input (100% NPK)	V1	3.63	*11*	142	4.47	28.33	73	-0.73
	V2	3.27	*21*	142	4.23	25.03	74	5.36
	V3	3.81	*6*	148	4.73	26.37	79	3.09
	V4	3.43	*16*	160	3.77	23.30	78	0.00
	V5	3.43	*16*	129	3.67	22.27	80	0.00
	V6	4.23	*1*	140	4.57	23.63	88	2.18
	V7	3.95	*5*	149	4.23	23.43	78	2.55
	V8	4.09	*2*	138	4.43	25.53	82	5.45
	V9	3.67	*9*	156	4.13	22.63	78	3.09
	V10	2.82	*24*	130	4.37	24.40	81	2.36
	V11	4.06	*3*	123	4.63	27.53	84	5.27
	V12	2.79	*26*	147	4.10	22.40	81	-0.27
	V13	3.78	*7*	154	4.40	25.63	82	2.73
	V14	2.77	*27*	150	3.63	21.20	80	4.27
	V15	-		-	-	-	-	
	V16	-		-	-	-	-	
	V17	-		-	-	-	-	
	V18	3.11	*22*	145	3.24	24.90	82	10.73
	V19	-		-	-	-	-	
	V20	2.64	*30*	138	4.33	23.23	82	-1.18
	V21	2.98	*23*	129	4.33	22.77	83	4.73
	V22	-		-	-	-	-	
	V23	-		-	-	-	-	
Interaction								
N at same V		0.4		16.71	NS	1.51	3.04	
V at same N		0.53		25.28	NS	1.95	2.98	
Means of F levels:								
F1		3.12	*2*	137	3.89	21.70	79	
F2		3.44	*1*	142	4.19	24.27	80	2.92
C.D.(0.05)		NS		NS	0.25	1.65	0.59	
C.V.(%)		16.63		21.07	7.3	8.45	0.87	

Table 4.1(c): Contd.

F-levels	Varieties	GHAGHRAGHAT						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test wt(g)	Days for 50% Flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Mean of varieties								
V1		3.67	*5*	136	4.22	25.42	76	-0.73
V2		2.98	*11*	133	4.00	23.50	75	5.36
V3		3.64	*6*	141	4.38	23.84	79	3.09
V4		3.43	*9*	151	3.74	22.44	78	0.00
V5		3.43	*9*	138	3.70	22.45	80	0.00
V6		4.11	*1*	137	4.29	23.30	86	2.18
V7		3.81	*2*	143	4.27	22.85	80	2.55
V8		3.79	*3*	135	3.98	23.40	79	5.45
V9		3.50	*8*	144	4.10	22.33	80	3.09
V10		2.69	*15*	139	4.25	23.49	83	2.36
V11		3.77	*4*	131	4.35	25.33	83	5.27
V12		2.81	*12*	146	3.89	21.82	80	-0.27
V13		3.63	*7*	141	4.34	23.93	82	2.73
V14		2.54	*16*	140	3.63	21.55	79	4.27
V15		-		-	-	-	-	
V16		-		-	-	-	-	
V17		-		-	-	-	-	
V18		2.52	*17*	140	3.27	21.27	77	10.73
V19		-		-	-	-	-	
V20		2.71	*14*	144	4.12	21.82	79	-1.18
V21		2.72	*13*	133	4.20	22.04	83	4.73
V22		-		-	-	-	-	
V23		-		-	-	-	-	
C.D.(0.05)		0.28		11.82	0.5	1.07	2.15	
C.V.(%)		7.48		7.42	10.78	4.07	2.35	
Expt. Mean		3.28		139	4.04	22.98	80	
Soil type		Sandy Loam						
pH		7.40						
F - levels (kg/ha)								
F1		60:30:20						
F2		120:60:40						
Recmnd N:P:K (kg/ha)		120:60:40						
Varieties								
V1		IET 29738						
V2		IET 29734						
V3		IET 29726						
V4		IET 29708						
V5		IET 29717						
V6		IET 29820						
V7		IET 29808						
V8		IET 29822						
V9		IET 29188						
V10		IET 29304						
V11		IET 30282						
V12		IET 29203						
V13		IET 30697						
V14		Gondhra Bidhan-3 (NC)						
V15		-						
V16		-						
V17		-						
V18		MTU 1010 (C& S)						
V19		-						
V20		ADT 39 RP						
V21		Naveen (RP)						
V22		-						
V23		-						
Available N:P:K of soil		200:24:234						

Table 4.1(c): Contd.

F-levels	Varieties	KANPUR Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Plant height (cm)	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: low input (50% NPK)	V1	4.28	*19*	333	3.42	84.70	
	V2	4.48	*14*	362	3.28	98.63	
	V3	4.11	*24*	325	3.34	81.77	
	V4	4.49	*11*	315	3.44	79.93	
	V5	4.20	*23*	306	3.40	82.57	
	V6	4.62	*5*	330	3.61	78.78	
	V7	3.90	*29*	307	3.39	85.65	
	V8	4.54	*10*	313	3.56	79.93	
	V9	4.10	*26*	326	3.25	84.17	
	V10	3.80	*32*	306	3.14	81.45	
	V11	3.99	*27*	331	3.10	80.31	
	V12	3.85	*31*	319	3.24	87.10	
	V13	4.11	*24*	310	3.22	83.72	
	V14	3.90	*29*	317	3.08	82.98	
	V15	-		-	-	-	
	V16	-		-	-	-	
	V17	-		-	-	-	
	V18	3.98	*28*	329	3.20	87.60	
	V19	-		-	-	-	
	V20	3.77	*33*	329	3.12	84.70	
	V21	3.69	*34*	341	3.16	91.00	
	V22	-		-	-	-	
	V23	-		-	-	-	
F2: Optimum input (100% NPK)	V1	4.61	*6*	416	3.61	104.57	2.75
	V2	4.89	*4*	438	3.39	120.35	3.42
	V3	4.61	*6*	414	3.45	105.74	4.17
	V4	4.97	*3*	428	3.63	105.95	4.00
	V5	4.56	*8*	419	3.57	106.54	3.00
	V6	5.10	*1*	447	3.85	106.84	4.00
	V7	4.49	*11*	417	3.59	107.56	4.92
	V8	5.07	*2*	445	3.81	107.98	4.42
	V9	4.49	*11*	420	3.43	108.13	3.25
	V10	4.41	*17*	408	3.35	107.45	5.08
	V11	4.46	*16*	418	3.31	108.36	3.92
	V12	4.28	*19*	411	3.47	106.00	3.58
	V13	4.56	*8*	443	3.41	109.72	3.75
	V14	4.37	*18*	407	3.37	110.02	3.92
	V15	-		-	-	-	
	V16	-		-	-	-	
	V17	-		-	-	-	
	V18	4.48	*14*	421	3.33	111.53	4.17
	V19	-		-	-	-	
	V20	4.25	*22*	434	3.45	114.47	4.00
	V21	4.26	*21*	423	3.48	116.95	4.75
	V22	-		-	-	-	
	V23	-		-	-	-	
Interaction							
N at same V		0.02		0.8	0.01	0.27	
V at same N		0.04		6.48	0.02	1.62	
Means of F levels:							
F1		4.11	*2*	323	3.29	84.41	
F2		4.58	*1*	424	3.50	109.30	3.95
C.D.(0.05)		0.04		9.03	0.02	2.23	
C.V.(%)		1.21		2.83	0.6	2.7	

Table 4.1(c): Contd.

F-levels	Varieties	KANPUR					
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Plant height (cm)	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Mean of varieties							
V1		4.45	*5*	375	3.52	94.64	2.75
V2		4.69	*4*	400	3.34	109.49	3.42
V3		4.36	*7*	370	3.40	93.76	4.17
V4		4.73	*3*	372	3.54	92.94	4.00
V5		4.38	*6*	362	3.49	94.56	3.00
V6		4.86	*1*	388	3.73	92.81	4.00
V7		4.20	*12*	362	3.49	96.61	4.92
V8		4.81	*2*	379	3.69	93.96	4.42
V9		4.30	*9*	373	3.34	96.15	3.25
V10		4.11	*14*	357	3.25	94.45	5.08
V11		4.23	*11*	375	3.21	94.34	3.92
V12		4.07	*15*	365	3.36	96.55	3.58
V13		4.34	*8*	376	3.32	96.72	3.75
V14		4.14	*13*	362	3.23	96.50	3.92
V15		-		-	-	-	
V16		-		-	-	-	
V17		-		-	-	-	
V18		4.23	*10*	375	3.27	99.57	4.17
V19		-		-	-	-	
V20		4.01	*16*	382	3.29	99.59	4.00
V21		3.98	*17*	382	3.32	103.98	4.75
V22		-		-	-	-	
V23		-		-	-	-	
C.D.(0.05)		0.01		0.56	0.01	0.19	
C.V.(%)		0.24		0.13	0.19	0.17	
Expt. Mean		4.34		374	3.40	96.86	
Soil type		Sandy loam					
pH		7.70					
F - levels (kg/ha)							
F1		60:30:30					
F2		120:60:60					
Recmnd N:P:K (kg/ha)		120:60:60					
Varieties							
V1		IET 29738					
V2		IET 29734					
V3		IET 29726					
V4		IET 29708					
V5		IET 29717					
V6		IET 29820					
V7		IET 29808					
V8		IET 29822					
V9		IET 29188					
V10		IET 29304					
V11		IET 30282					
V12		IET 29203					
V13		IET 30697					
V14		Gondhra Bidhan-3 (NC)					
V15		-					
V16		-					
V17		-					
V18		MTU 1010 (C& S)					
V19		-					
V20		ADT 39 RP					
V21		Naveen (RP)					
V22		-					
V23		-					
Available N:P:K of soil		-					

Table 4.1(c): Contd.

F-levels	Varieties	KARJAT Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test wt(g)	Days for 50% Flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: low input (50% NPK)	V1	2.50	*36*	210	3.42	18.38	97	
	V2	5.45	*5*	277	6.39	25.71	93	
	V3	5.47	*4*	311	6.90	29.73	95	
	V4	4.67	*14*	255	5.40	20.70	94	
	V5	3.94	*24*	242	4.13	19.84	94	
	V6	4.34	*21*	253	5.13	20.41	97	
	V7	4.73	*12*	258	5.71	21.31	96	
	V8	4.15	*23*	245	4.87	19.87	96	
	V9	5.12	*8*	271	5.79	23.25	93	
	V10	4.43	*17*	254	5.20	20.47	96	
	V11	3.85	*25*	239	4.06	19.64	91	
	V12	4.24	*22*	253	5.11	20.35	94	
	V13	4.92	*10*	263	5.77	22.46	98	
	V14	3.43	*31*	229	3.77	18.92	94	
	V15	-		-	-	-	-	
	V16	-		-	-	-	-	
	V17	-		-	-	-	-	
	V18	2.94	*34*	212	3.54	18.48	91	
	V19	-		-	-	-	-	
	V20	3.53	*30*	230	3.77	19.45	98	
	V21	3.80	*27*	235	3.90	19.52	93	
	V22	-		-	-	-	-	
	V23	3.36	*32*	221	3.69	18.65	94	
F2: Optimum input (100% NPK)	V1	2.86	*35*	222	3.59	20.64	100	3.60
	V2	5.72	*2*	314	7.40	26.64	95	2.70
	V3	5.90	*1*	340	7.46	30.93	97	4.30
	V4	4.95	*9*	279	6.35	23.03	97	2.80
	V5	4.41	*18*	271	4.74	22.19	96	4.70
	V6	4.72	*13*	276	5.92	22.97	101	3.80
	V7	5.36	*7*	283	6.51	23.23	99	6.30
	V8	4.52	*16*	272	5.45	22.67	98	3.70
	V9	5.71	*3*	310	7.07	24.77	101	5.90
	V10	4.92	*10*	278	5.97	23.02	102	4.90
	V11	4.37	*19*	267	4.72	21.86	94	5.20
	V12	4.57	*15*	275	5.79	22.95	94	3.30
	V13	5.42	*6*	296	6.66	24.21	100	5.00
	V14	3.75	*28*	262	4.51	21.25	95	3.20
	V15	-		-	-	-	-	
	V16	-		-	-	-	-	
	V17	-		-	-	-	-	
	V18	3.14	*33*	245	4.23	20.81	96	2.00
	V19	-		-	-	-	-	
	V20	3.83	*26*	265	4.56	21.50	98	3.00
	V21	4.36	*20*	267	4.64	21.64	94	5.60
	V22	-		-	-	-	-	
	V23	3.63	*29*	252	4.39	21.11	97	2.70
Interaction								
N at same V		NS		NS	NS	NS	NS	
V at same N		NS		NS	NS	NS	NS	
Means of F levels:								
F1		4.16	*2*	248	4.81	20.95	95	
F2		4.56	*1*	276	5.55	23.08	97	4.04
C.D.(0.05)		0.24		17.93	0.59	1.95	NS	
C.V.(%)		6.59		8.26	13.77	10.72	4.27	

Table 4.1(c): Contd.

F-levels	Varieties	KARJAT						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test wt(g)	Days for 50% Flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Mean of varieties								
V1		2.68	*18*	216	3.51	19.51	99	3.60
V2		5.59	*2*	296	6.90	26.18	94	2.70
V3		5.69	*1*	326	7.18	30.33	96	4.30
V4		4.81	*6*	267	5.88	21.87	95	2.80
V5		4.18	*11*	257	4.44	21.02	95	4.70
V6		4.53	*8*	265	5.53	21.69	99	3.80
V7		5.05	*5*	271	6.11	22.27	98	6.30
V8		4.34	*10*	259	5.16	21.27	97	3.70
V9		5.42	*3*	291	6.43	24.01	97	5.90
V10		4.68	*7*	266	5.59	21.75	99	4.90
V11		4.11	*12*	253	4.39	20.75	92	5.20
V12		4.41	*9*	264	5.45	21.65	94	3.30
V13		5.17	*4*	280	6.22	23.34	99	5.00
V14		3.59	*15*	246	4.14	20.09	94	3.20
V15		-		-	-	-	-	
V16		-		-	-	-	-	
V17		-		-	-	-	-	
V18		3.04	*17*	229	3.89	19.65	94	2.00
V19		-		-	-	-	-	
V20		3.68	*14*	248	4.17	20.48	98	3.00
V21		4.08	*13*	251	4.27	20.58	94	5.60
V22		-		-	-	-	-	
V23		3.50	*16*	237	4.04	19.88	96	2.70
C.D.(0.05)		0.37		28.99	0.52	2.36	3.02	
C.V.(%)		7.35		9.68	8.73	9.4	2.75	
Expt. Mean		4.36		262	5.18	22.02	96	
Soil type		-						
pH		-						
F - levels (kg/ha)								
F1		50:25:25						
F2		100:50:50						
Recmnd N:P:K (kg/ha)		100:50:50						
Varieties								
V1		IET 29738						
V2		IET 29734						
V3		IET 29726						
V4		IET 29708						
V5		IET 29717						
V6		IET 29820						
V7		IET 29808						
V8		IET 29822						
V9		IET 29188						
V10		IET 29304						
V11		IET 30282						
V12		IET 29203						
V13		IET 30697						
V14		Gondhra Bidhan-3 (NC)						
V15		-						
V16		-						
V17		-						
V18		MTU 1010 (C& S)						
V19		-						
V20		ADT 39 RP						
V21		Naveen (RP)						
V22		-						
V23		Local check - RP - 4 - 14 (115-120 days)						
Available N:P:K of soil		-						

Table 4.1(c): Contd.

F-levels	Varieties	KOTA Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test wt(g)	Days for 50% Flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: low input (50% NPK)	V1	7.10	*15*	211	5.85	24.93	89	
	V2	7.55	*10*	215	6.67	27.40	88	
	V3	7.07	*16*	221	5.64	26.56	84	
	V4	7.16	*14*	216	5.96	23.50	85	
	V5	6.66	*20*	231	4.69	24.99	84	
	V6	6.48	*22*	228	5.03	29.62	94	
	V7	6.94	*17*	246	4.79	21.87	98	
	V8	6.20	*26*	256	4.29	21.84	103	
	V9	6.03	*27*	213	5.09	20.56	99	
	V10	5.94	*28*	249	4.39	21.14	93	
	V11	5.79	*30*	263	4.07	20.62	85	
	V12	6.34	*23*	261	4.25	21.88	85	
	V13	5.34	*31*	258	3.81	18.34	100	
	V14	5.90	*29*	243	4.67	20.57	82	
	V15	6.28	*24*	226	5.20	24.46	88	
	V16	-		-	-	-	-	
	V17	-		-	-	-	-	
	V18	-		-	-	-	-	
	V19	-		-	-	-	-	
	V20	-		-	-	-	-	
	V21	-		-	-	-	-	
	V22	-		-	-	-	-	
	V23	5.09	*32*	264	3.50	27.18	80	
F2: Optimum input (100% NPK)	V1	8.31	*2*	228	6.66	25.64	90	11.00
	V2	9.20	*1*	230	7.54	27.80	89	15.00
	V3	8.00	*5*	239	5.88	27.91	85	8.45
	V4	8.29	*3*	230	6.51	23.79	87	10.27
	V5	7.75	*7*	249	5.49	25.68	84	9.91
	V6	8.12	*4*	250	5.35	30.79	95	14.91
	V7	7.62	*9*	266	5.23	22.19	99	6.18
	V8	7.95	*6*	276	4.85	22.27	104	15.91
	V9	7.43	*12*	236	5.64	21.26	100	12.73
	V10	7.46	*11*	270	4.92	21.61	94	13.82
	V11	6.79	*18*	283	4.49	20.96	86	9.09
	V12	6.64	*21*	279	4.48	22.83	86	2.73
	V13	6.22	*25*	277	4.20	18.77	102	8.00
	V14	7.64	*8*	265	5.05	22.26	83	15.82
	V15	7.40	*13*	246	5.56	24.79	89	10.18
	V16	-		-	-	-	-	
	V17	-		-	-	-	-	
	V18	-		-	-	-	-	
	V19	-		-	-	-	-	
	V20	-		-	-	-	-	
	V21	-		-	-	-	-	
	V22	-		-	-	-	-	
	V23	6.74	*19*	289	3.83	27.40	81	15.00
Interaction								
N at same V		NS		NS	NS	NS	NS	
V at same N		NS		NS	NS	NS	NS	
Means of F levels:								
F1		6.37	*2*	238	4.87	23.47	90	
F2		7.60	*1*	257	5.36	24.12	91	11.19
C.D.(0.05)		1.08		17.12	0.17	0.33	NS	
C.V.(%)		17.62		7.88	3.82	1.6	1.08	

Table 4.1(c): Contd.

F-levels	Varieties	KOTA						
		Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Panicle Weight (g)	Test wt(g)	Days for 50% Flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Mean of varieties								
V1		7.71	*3*	220	6.26	25.29	89	11.00
V2		8.38	*1*	222	7.11	27.60	88	15.00
V3		7.54	*4*	230	5.76	27.24	85	8.45
V4		7.73	*2*	223	6.24	23.65	86	10.27
V5		7.21	*7*	240	5.09	25.34	84	9.91
V6		7.30	*5*	239	5.19	30.21	95	14.91
V7		7.28	*6*	256	5.01	22.03	99	6.18
V8		7.08	*8*	266	4.57	22.06	104	15.91
V9		6.73	*11*	225	5.37	20.91	99	12.73
V10		6.70	*12*	260	4.66	21.38	94	13.82
V11		6.29	*14*	273	4.28	20.79	86	9.09
V12		6.49	*13*	270	4.37	22.36	85	2.73
V13		5.78	*16*	268	4.01	18.56	101	8.00
V14		6.77	*10*	254	4.86	21.42	82	15.82
V15		6.84	*9*	236	5.38	24.63	88	10.18
V16		-		-	-	-	-	
V17		-		-	-	-	-	
V18		-		-	-	-	-	
V19		-		-	-	-	-	
V20		-		-	-	-	-	
V21		-		-	-	-	-	
V22		-		-	-	-	-	
V23		5.92	*15*	276	3.67	27.29	81	15.00
C.D.(0.05)		0.54		12.97	0.38	0.73	0.52	
C.V.(%)		6.69		4.54	6.4	2.65	0.5	
Expt. Mean		6.98		247	5.11	23.79	90	
Soil type		Clay						
pH		7.52						
F - levels (kg/ha)								
F1		60:30:20						
F2		120:60:40						
Recmnd N:P:K (kg/ha)		120:60:40						
Varieties								
V1		IET 29738						
V2		IET 29734						
V3		IET 29726						
V4		IET 29708						
V5		IET 29717						
V6		IET 29820						
V7		IET 29808						
V8		IET 29822						
V9		IET 29188						
V10		IET 29304						
V11		IET 30282						
V12		IET 29203						
V13		IET 30697						
V14		Gondhra Bidhan-3 (NC)						
V15		-						
V16		-						
V17		-						
V18		-						
V19		-						
V20		-						
V21		-						
V22		-						
V23		Local check - Ratna(120-125 days)						
Available N:P:K of soil		201.3:21.52:408.12						

Table 4.1(c): Contd.

F-levels	Varieties	MANDYA						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test wt(g)	Days for 50% Flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: low input (50% NPK)	V1	6.00	*33*	353	4.24	26.16	102	
	V2	6.93	*14*	308	4.56	26.75	98	
	V3	6.63	*21*	317	4.90	27.51	101	
	V4	6.61	*23*	314	4.90	25.09	98	
	V5	6.66	*19*	293	4.89	24.49	94	
	V6	6.62	*22*	319	3.54	28.46	100	
	V7	6.49	*25*	305	4.99	20.35	99	
	V8	6.66	*19*	332	4.29	21.99	99	
	V9	6.34	*28*	293	5.02	21.83	99	
	V10	5.73	*35*	320	3.44	21.78	106	
	V11	6.32	*29*	318	3.71	23.36	97	
	V12	6.40	*26*	319	3.78	22.46	92	
	V13	6.26	*30*	296	3.61	19.10	98	
	V14	5.89	*34*	310	4.94	20.65	98	
	V15	-		-	-	-	-	
	V16	-		-	-	-	-	
	V17	-		-	-	-	-	
	V18	5.41	*36*	361	3.16	22.47	87	
	V19	-		-	-	-	-	
	V20	6.71	*18*	275	6.08	22.02	99	
	V21	6.39	*27*	319	3.41	21.02	92	
	V22	-		-	-	-	-	
	V23	6.07	*32*	333	2.97	25.50	91	
F2: Optimum input (100% NPK)	V1	7.32	*10*	363	4.63	26.55	102	13.20
	V2	8.09	*4*	330	5.50	25.47	98	11.60
	V3	8.14	*2*	328	5.04	27.15	100	15.10
	V4	7.98	*5*	333	5.07	25.04	98	13.70
	V5	8.13	*3*	349	5.09	24.88	93	14.70
	V6	7.89	*6*	336	3.99	28.61	98	12.70
	V7	8.22	*1*	355	5.66	21.75	98	17.30
	V8	7.45	*9*	338	5.00	22.58	97	7.90
	V9	7.83	*7*	324	5.23	23.44	98	14.90
	V10	6.74	*17*	363	3.93	21.30	106	10.10
	V11	6.93	*14*	358	3.83	22.15	96	6.10
	V12	6.82	*16*	337	3.93	21.24	92	4.20
	V13	7.26	*11*	358	4.38	19.57	97	10.00
	V14	6.17	*31*	343	5.57	21.44	98	2.80
	V15	-		-	-	-	-	
	V16	-		-	-	-	-	
	V17	-		-	-	-	-	
	V18	6.56	*24*	358	3.12	24.41	87	11.50
	V19	-		-	-	-	-	
	V20	7.55	*8*	312	6.40	21.07	98	8.40
	V21	7.11	*12*	327	3.28	21.62	92	7.20
	V22	-		-	-	-	-	
	V23	6.94	*13*	357	3.17	25.66	91	8.70
Interaction								
N at same V		NS		NS	NS	NS	NS	
V at same N		NS		NS	NS	NS	NS	
Means of F levels:								
F1		6.34	*2*	316	4.25	23.39	97	
F2		7.40	*1*	343	4.60	23.55	97	10.56
C.D.(0.05)		0.84		NS	0.2	NS	NS	
C.V.(%)		14.73		13.56	5.47	3.89	1.24	

Table 4.1(c): Contd.

F-levels	Varieties	MANDYA						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test wt(g)	Days for 50% Flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Mean of varieties								
V1		6.66	*12*	358	4.44	26.36	102	13.20
V2		7.51	*1*	319	5.03	26.11	98	11.60
V3		7.39	*3*	322	4.97	27.33	100	15.10
V4		7.30	*5*	323	4.99	25.07	98	13.70
V5		7.40	*2*	321	4.99	24.69	94	14.70
V6		7.26	*6*	327	3.77	28.54	99	12.70
V7		7.36	*4*	330	5.33	21.05	98	17.30
V8		7.06	*9*	335	4.65	22.29	98	7.90
V9		7.09	*8*	309	5.13	22.64	99	14.90
V10		6.24	*16*	341	3.69	21.54	106	10.10
V11		6.63	*13*	338	3.77	22.76	97	6.10
V12		6.61	*14*	328	3.86	21.85	92	4.20
V13		6.76	*10*	327	4.00	19.34	98	10.00
V14		6.03	*17*	327	5.26	21.05	98	2.80
V15		-		-	-	-	-	0.00
V16		-		-	-	-	-	0.00
V17		-		-	-	-	-	0.00
V18		5.99	*18*	360	3.14	23.44	87	11.50
V19		-		-	-	-	-	0.00
V20		7.13	*7*	293	6.24	21.55	99	8.40
V21		6.75	*11*	323	3.35	21.32	92	7.20
V22		-		-	-	-	-	0.00
V23		6.51	*15*	345	3.07	25.58	91	8.70
C.D.(0.05)		0.53		25.83	0.54	1.42	0.93	
C.V.(%)		6.71		6.86	10.6	5.28	0.84	
Expt. Mean		6.87		329	4.42	23.47	97	
Soil type		Red Sandy loam						
pH		7.78						
F - levels (kg/ha)								
F1		50:25:25						
F2		100:50:50						
Recmnd N:P:K (kg/ha)		100:50:50						
Varieties								
V1		IET 29738						
V2		IET 29734						
V3		IET 29726						
V4		IET 29708						
V5		IET 29717						
V6		IET 29820						
V7		IET 29808						
V8		IET 29822						
V9		IET 29188						
V10		IET 29304						
V11		IET 30282						
V12		IET 29203						
V13		IET 30697						
V14		Gondhra Bidhan-3 (NC)						
V15		-						
V16		-						
V17		-						
V18		MTU 1010 (C& S)						
V19		-						
V20		ADT 39 RP						
V21		Naveen (RP)						
V22		-						
V23		Local check - KMP 225(120-125 days)						
Available N:P:K of soil		365.6:69.43:269.40						

Table 4.1(c): Contd.

F-levels	Varieties	MARUTERU Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Panicle Weight (g)	Test wt(g)	Days for 50% Flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: low input (50% NPK)	V1	6.63	*15*	307	4.63	25.75	98	
	V2	4.68	*34*	296	5.07	27.52	94	
	V3	6.30	*19*	284	5.18	24.89	95	
	V4	6.31	*18*	285	5.34	24.43	96	
	V5	6.26	*21*	297	4.66	25.17	95	
	V6	5.18	*33*	300	4.59	22.40	100	
	V7	6.57	*16*	248	6.66	21.09	101	
	V8	7.27	*3*	302	5.98	20.83	99	
	V9	6.75	*12*	309	5.49	20.51	105	
	V10	6.85	*10*	293	5.40	20.34	100	
	V11	5.57	*32*	291	4.19	20.52	95	
	V12	5.83	*27*	308	4.09	22.56	95	
	V13	5.59	*31*	305	4.90	20.02	111	
	V14	5.95	*24*	311	4.74	21.03	85	
	V15	-		-	-	-	-	
	V16	-		-	-	-	-	
	V17	-		-	-	-	-	
	V18	5.93	*25*	310	3.89	18.93	83	
	V19	-		-	-	-	-	
	V20	6.29	*20*	322	5.41	21.97	99	
	V21	6.12	*23*	299	3.22	21.57	95	
	V22	-		-	-	-	-	
	V23	-		-	-	-	-	
F2: Optimum input (100% NPK)	V1	6.70	*13*	315	5.04	26.14	98	0.67
	V2	5.65	*29*	312	5.42	27.08	97	9.24
	V3	6.68	*14*	310	5.45	25.70	95	3.62
	V4	6.83	*11*	323	5.39	24.23	96	4.95
	V5	5.92	*26*	321	5.93	25.33	95	-3.24
	V6	7.02	*8*	320	4.80	22.28	100	17.52
	V7	7.23	*4*	273	6.57	21.18	101	6.29
	V8	7.23	*4*	302	5.68	21.28	99	-0.38
	V9	7.12	*6*	298	6.62	20.96	105	3.52
	V10	7.06	*7*	322	4.67	20.37	100	2.00
	V11	6.15	*22*	320	4.82	20.46	95	5.52
	V12	6.57	*16*	309	4.30	22.25	95	7.05
	V13	5.65	*29*	318	3.85	19.82	111	0.57
	V14	6.93	*9*	292	4.81	21.46	85	9.33
	V15	-		-	-	-	-	
	V16	-		-	-	-	-	
	V17	-		-	-	-	-	
	V18	5.69	*28*	295	3.85	18.39	83	-2.29
	V19	-		-	-	-	-	
	V20	7.33	*2*	288	5.58	21.74	99	9.90
	V21	8.33	*1*	326	4.06	21.34	95	21.05
	V22	-		-	-	-	-	
	V23	-		-	-	-	-	
Interaction								
N at same V		0.62		NS	0.27	NS	NS	
V at same N		0.62		NS	0.29	NS	NS	
Means of F levels:								
F1		6.12	*2*	298	4.91	22.33	97	
F2		6.71	*1*	308	5.11	22.35	97	5.61
C.D.(0.05)		0.19		NS	0.14	NS	NS	
C.V.(%)		3.54		8.45	3.3	1.59	0.8	

Table 4.1(c): Contd.

F-levels	Varieties	MARUTERU						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test wt(g)	Days for 50% Flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Mean of varieties								
V1		6.67	*7*	311	4.84	25.95	98	0.67
V2		5.17	*17*	304	5.25	27.30	96	9.24
V3		6.49	*9*	297	5.32	25.30	95	3.62
V4		6.57	*8*	304	5.37	24.33	96	4.95
V5		6.09	*13*	309	5.30	25.25	95	-3.24
V6		6.10	*12*	310	4.70	22.34	100	17.52
V7		6.90	*5*	261	6.62	21.14	101	6.29
V8		7.25	*1*	302	5.83	21.06	99	-0.38
V9		6.94	*4*	304	6.06	20.74	105	3.52
V10		6.96	*3*	308	5.04	20.36	100	2.00
V11		5.86	*14*	306	4.51	20.49	95	5.52
V12		6.20	*11*	308	4.20	22.41	95	7.05
V13		5.62	*16*	312	4.38	19.92	111	0.57
V14		6.44	*10*	302	4.78	21.25	85	9.33
V15		-		-	-	-	-	
V16		-		-	-	-	-	
V17		-		-	-	-	-	
V18		5.81	*15*	303	3.87	18.66	83	-2.29
V19		-		-	-	-	-	
V20		6.81	*6*	305	5.50	21.86	99	9.90
V21		7.23	*2*	313	3.64	21.46	95	21.05
V22		-		-	-	-	-	
V23		-		-	-	-	-	
C.D.(0.05)		0.44		26.56	0.19	0.69	1.36	
C.V.(%)		6.02		7.66	3.38	2.7	1.22	
Expt. Mean		6.42		303	5.01	22.34	97	
Soil type		-						
pH		5.95						
F - levels (kg/ha)								
F1		45:30:30						
F2		90:60:60						
Recmnd N:P:K (kg/ha)		90:60:60						
Varieties								
V1		IET 29738						
V2		IET 29734						
V3		IET 29726						
V4		IET 29708						
V5		IET 29717						
V6		IET 29820						
V7		IET 29808						
V8		IET 29822						
V9		IET 29188						
V10		IET 29304						
V11		IET 30282						
V12		IET 29203						
V13		IET 30697						
V14		Gondhra Bidhan-3 (NC)						
V15		-						
V16		-						
V17		-						
V18		MTU 1010 (C& S)						
V19		-						
V20		ADT 39 RP						
V21		Naveen (RP)						
V22		-						
V23		-						
Available N:P:K of soil		119:14.32:274						

Table 4.1(c): Contd.

F-levels	Varieties	NAGINA						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test wt(g)	Days for 50% Flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: low input (50% NPK)	V1	2.98	*17*	223	3.36	26.30	92	
	V2	2.86	*21*	233	3.36	26.30	96	
	V3	2.92	*19*	230	3.47	26.37	89	
	V4	2.58	*23*	233	3.47	26.37	88	
	V5	2.58	*23*	241	3.18	26.30	89	
	V6	2.22	*30*	228	3.52	26.27	113	
	V7	2.46	*25*	226	2.92	26.39	109	
	V8	2.93	*18*	221	3.15	26.30	115	
	V9	3.14	*16*	218	3.36	26.34	113	
	V10	2.44	*27*	206	2.96	26.40	97	
	V11	2.83	*22*	255	3.57	26.67	90	
	V12	2.45	*26*	212	2.98	27.07	91	
	V13	2.9	*20*	233	3.47	26.37	114	
	V14	2.36	*28*	207	3.29	26.30	83	
	V15	-		-	-	-	-	
	V16	-		-	-	-	-	
	V17	-		-	-	-	-	
	V18	2.28	*29*	206	3.37	25.77	82	
	V19	-		-	-	-	-	
	V20	-		-	-	-	-	
	V21	-		-	-	-	-	
	V22	-		-	-	-	-	
	V23	-		-	-	-	-	
F2: Optimum input (100% NPK)	V1	4.84	*2*	322	3.36	26.38	92	16.91
	V2	4.62	*8*	312	3.39	26.39	98	16.00
	V3	4.75	*3*	313	3.48	26.42	92	16.64
	V4	4.42	*10*	302	3.48	26.42	90	16.73
	V5	4.42	*10*	292	3.20	26.36	90	16.73
	V6	4.38	*13*	290	3.52	26.31	112	19.64
	V7	4.37	*14*	285	2.95	26.42	108	17.36
	V8	4.39	*12*	321	3.16	26.34	114	13.27
	V9	4.44	*9*	312	3.36	26.38	112	11.82
	V10	4.65	*5*	292	2.98	26.41	97	20.09
	V11	4.73	*4*	323	3.60	26.69	92	17.27
	V12	4.95	*1*	273	2.98	26.42	90	22.73
	V13	4.63	*7*	306	3.48	26.42	113	15.73
	V14	4.65	*5*	244	3.34	26.36	84	20.82
	V15	-		-	-	-	-	
	V16	-		-	-	-	-	
	V17	-		-	-	-	-	
	V18	4.03	*15*	238	3.39	25.77	84	15.91
	V19	-		-	-	-	-	
	V20	-		-	-	-	-	
	V21	-		-	-	-	-	
	V22	-		-	-	-	-	
	V23	-		-	-	-	-	
Interaction								
N at same V		0.27		18.71	0.02	NS	1.81	
V at same N		0.3		20.37	0.02	NS	1.81	
Means of F levels:								
F1		2.66	*2*	225	3.30	26.37	97	
F2		4.55	*1*	295	3.31	26.37	98	17.18
C.D.(0.05)		0.19		12.05	0.01	NS	NS	
C.V.(%)		5.79		5.11	0.32	0.86	0.67	

Table 4.1(c): Contd.

F-levels	Varieties	NAGINA						
		Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Panicle Weight (g)	Test wt(g)	Days for 50% Flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Mean of varieties								
V1		3.91	*1*	272	3.36	26.34	92	16.91
V2		3.74	*6*	272	3.38	26.35	97	16.00
V3		3.84	*2*	272	3.48	26.40	91	16.64
V4		3.50	*11*	268	3.48	26.40	89	16.73
V5		3.50	*11*	266	3.19	26.33	90	16.73
V6		3.30	*14*	259	3.52	26.29	113	19.64
V7		3.42	*13*	256	2.94	26.41	108	17.36
V8		3.66	*8*	271	3.16	26.32	114	13.27
V9		3.79	*3*	265	3.36	26.36	113	11.82
V10		3.55	*9*	249	2.97	26.41	97	20.09
V11		3.78	*4*	289	3.59	26.68	91	17.27
V12		3.70	*7*	243	2.98	26.75	91	22.73
V13		3.77	*5*	270	3.48	26.40	114	15.73
V14		3.51	*10*	226	3.32	26.33	84	20.82
V15		-		-	-	-	-	
V16		-		-	-	-	-	
V17		-		-	-	-	-	
V18		3.16	*15*	222	3.38	25.77	83	15.91
V19		-		-	-	-	-	
V20		-		-	-	-	-	
V21		-		-	-	-	-	
V22		-		-	-	-	-	
V23		-		-	-	-	-	
C.D.(0.05)		0.19		13.23	0.01	0.24	1.28	
C.V.(%)		4.64		4.41	0.28	0.8	1.14	
Expt. Mean		3.61		260	3.30	26.37	98	
Soil type		Clay						
pH		7.70						
F - levels (kg/ha)								
F1		60:30:20						
F2		120:60:40						
Recmnd N:P:K (kg/ha)		120:60:40						
Varieties								
V1		IET 29738						
V2		IET 29734						
V3		IET 29726						
V4		IET 29708						
V5		IET 29717						
V6		IET 29820						
V7		IET 29808						
V8		IET 29822						
V9		IET 29188						
V10		IET 29304						
V11		IET 30282						
V12		IET 29203						
V13		IET 30697						
V14		Gondhra Bidhan-3 (NC)						
V15		-						
V16		-						
V17		-						
V18		MTU 1010 (C& S)						
V19		-						
V20		-						
V21		-						
V22		-						
V23		-						
Available N:P:K of soil		21:18.33:209						

Table 4.1(c): Contd.

F-levels	Varieties	NAVSARI Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test wt(g)	Days for 50% Flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: low input (50% NPK)	V1	3.86	*23*	335	3.90	24.97	87	
	V2	3.50	*32*	303	4.97	26.23	92	
	V3	4.27	*17*	319	4.07	26.40	101	
	V4	4.01	*19*	332	5.15	23.53	89	
	V5	3.75	*27*	315	3.97	22.77	91	
	V6	3.76	*26*	319	4.42	30.67	89	
	V7	3.96	*20*	311	7.53	20.67	90	
	V8	3.86	*23*	338	6.07	18.00	91	
	V9	3.68	*28*	313	3.77	20.17	91	
	V10	3.82	*25*	335	3.75	21.37	89	
	V11	3.38	*34*	317	2.88	18.63	91	
	V12	3.58	*30*	315	3.00	21.83	92	
	V13	3.61	*29*	322	2.92	17.80	103	
	V14	4.61	*11*	311	4.75	20.07	88	
	V15	-		-	-	-	-	
	V16	-		-	-	-	-	
	V17	2.30	*37*	311	2.52	20.57	85	
	V18	2.25	*38*	296	2.58	20.93	87	
	V19	-		-	-	-	-	
	V20	4.30	*15*	340	6.68	20.97	90	
	V21	3.56	*31*	320	3.24	19.27	90	
	V22	-		-	-	-	-	
	V23	3.41	*33*	322	3.05	29.47	81	
F2: Optimum input (100% NPK)	V1	4.96	*4*	339	3.98	25.67	89	16.92
	V2	4.85	*6*	312	5.03	27.40	91	20.77
	V3	4.66	*10*	320	4.18	28.40	102	6.00
	V4	4.68	*9*	340	5.24	24.40	89	10.31
	V5	3.90	*21*	323	4.03	23.77	91	2.31
	V6	5.13	*3*	322	4.55	30.87	89	21.08
	V7	5.21	*2*	323	7.59	22.17	91	19.23
	V8	4.91	*5*	346	6.12	18.90	90	16.15
	V9	4.19	*18*	324	3.77	20.93	89	7.85
	V10	4.46	*13*	335	3.81	22.33	91	9.85
	V11	4.38	*14*	319	2.93	19.77	89	15.38
	V12	4.81	*7*	326	3.04	21.97	91	18.92
	V13	4.55	*12*	324	2.99	19.13	100	14.46
	V14	5.24	*1*	321	4.83	21.93	89	9.69
	V15	-		-	-	-	-	
	V16	-		-	-	-	-	
	V17	2.67	*36*	312	2.63	21.77	85	5.69
	V18	2.71	*35*	308	2.64	22.00	87	7.08
	V19	-		-	-	-	-	
	V20	4.72	*8*	337	6.79	21.90	90	6.46
	V21	4.30	*15*	333	3.34	20.17	90	11.38
	V22	-		-	-	-	-	
	V23	3.90	*21*	324	3.15	30.00	81	7.54
Interaction								
N at same V		NS		NS	NS	NS	1.25	
V at same N		NS		NS	NS	NS	1.22	
Means of F levels:								
F1		3.66	*2*	320	4.17	22.33	90	
F2		4.43	*1*	326	4.24	23.34	90	11.95
C.D.(0.05)		0.26		NS	0.07	NS	NS	
C.V.(%)		8.07		4.66	1.95	6.22	0.21	

Table 4.1(c): Contd.

F-levels	Varieties	NAVSARI						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test wt(g)	Days for 50% Flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Mean of varieties								
V1		4.41	*6*	337	3.94	25.32	88	16.92
V2		4.18	*10*	308	5.00	26.82	91	20.77
V3		4.47	*4*	320	4.13	27.40	102	6.00
V4		4.35	*8*	336	5.20	23.97	89	10.31
V5		3.83	*16*	319	4.00	23.27	91	2.31
V6		4.45	*5*	320	4.49	30.77	89	21.08
V7		4.59	*2*	317	7.56	21.42	90	19.23
V8		4.39	*7*	342	6.10	18.45	91	16.15
V9		3.94	*13*	318	3.77	20.55	90	7.85
V10		4.14	*11*	335	3.78	21.85	90	9.85
V11		3.88	*15*	318	2.91	19.20	90	15.38
V12		4.20	*9*	320	3.02	21.90	91	18.92
V13		4.08	*12*	323	2.96	18.47	102	14.46
V14		4.93	*1*	316	4.79	21.00	89	9.69
V15		-		-	-	-	-	
V16		-		-	-	-	-	
V17		2.49	*18*	312	2.58	21.17	85	5.69
V18		2.48	*19*	302	2.61	21.47	87	7.08
V19		-		-	-	-	-	
V20		4.51	*3*	339	6.74	21.44	90	6.46
V21		3.93	*14*	327	3.29	19.72	90	11.38
V22		-		-	-	-	-	
V23		3.66	*17*	323	3.10	29.74	81	7.54
C.D.(0.05)		0.45		10.17	0.12	1.91	0.88	
C.V.(%)		9.81		2.76	2.46	7.33	0.86	
Expt. Mean		4.04		323	4.21	22.84	90	
Soil type		Clayey						
pH		7.91						
F - levels (kg/ha)								
F1		50:15:0						
F2		100:30:0						
Recmnd N:P:K (kg/ha)		100:30:0						
Varieties								
V1		IET 29738						
V2		IET 29734						
V3		IET 29726						
V4		IET 29708						
V5		IET 29717						
V6		IET 29820						
V7		IET 29808						
V8		IET 29822						
V9		IET 29188						
V10		IET 29304						
V11		IET 30282						
V12		IET 29203						
V13		IET 30697						
V14		Gondhra Bidhan-3 (NC)						
V15		-						
V16		-						
V17		Karjat-7 (W)						
V18		MTU 1010 (C& S)						
V19		-						
V20		ADT 39 RP						
V21		Naveen (RP)						
V22		-						
V23		Local check - GR-17 (113-118 days)						
Available N:P:K of soil		256.5-33.8-789-0.55						

Table 4.1(c): Contd.

F-levels	Varieties	NAWAGAM Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test wt(g)	Days for 50% Flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: low input (50% NPK)	V1	5.94	*18*	332	4.90	23.20	110	
	V2	5.58	*29*	342	4.85	24.77	103	
	V3	5.78	*22*	286	4.10	24.53	99	
	V4	6.73	*4*	264	5.25	23.47	99	
	V5	5.78	*22*	302	3.52	23.37	103	
	V6	5.54	*31*	281	4.31	25.93	112	
	V7	5.65	*25*	258	4.35	18.90	110	
	V8	5.72	*24*	345	4.58	19.10	110	
	V9	5.60	*27*	217	4.66	20.87	116	
	V10	4.73	*35*	253	3.53	17.77	109	
	V11	5.54	*31*	302	3.79	19.23	109	
	V12	5.61	*26*	301	4.39	20.10	103	
	V13	3.79	*36*	273	2.54	17.70	118	
	V14	5.57	*30*	351	4.79	19.70	97	
	V15	-		-	-	-	-	
	V16	-		-	-	-	-	
	V17	-		-	-	-	-	
	V18	4.82	*34*	298	3.05	22.30	94	
	V19	-		-	-	-	-	
	V20	5.80	*21*	347	4.17	20.57	110	
	V21	6.17	*13*	339	3.29	21.40	108	
	V22	-		-	-	-	-	
	V23	5.82	*20*	361	4.34	15.83	111	
F2: Optimum input (100% NPK)	V1	6.51	*8*	374	5.20	23.97	112	9.12
	V2	6.18	*12*	339	5.30	25.00	106	9.60
	V3	6.56	*7*	317	4.28	24.53	100	12.48
	V4	6.98	*1*	329	5.51	24.00	102	4.00
	V5	6.45	*9*	375	3.77	23.73	106	10.72
	V6	6.04	*15*	356	4.59	27.50	113	8.00
	V7	6.02	*16*	317	4.98	19.40	111	5.92
	V8	5.59	*28*	351	4.39	19.37	111	-2.08
	V9	6.05	*14*	249	4.87	20.97	116	7.20
	V10	5.97	*17*	309	3.74	18.20	109	19.84
	V11	6.28	*11*	377	3.78	19.63	112	11.84
	V12	5.85	*19*	338	4.41	20.03	104	3.84
	V13	4.95	*33*	268	2.69	16.92	118	18.56
	V14	6.69	*6*	385	4.85	20.47	97	17.92
	V15	-		-	-	-	-	
	V16	-		-	-	-	-	
	V17	-		-	-	-	-	
	V18	6.36	*10*	353	3.30	22.68	96	24.64
	V19	-		-	-	-	-	
	V20	6.83	*2*	362	4.81	19.10	110	16.48
	V21	6.81	*3*	382	4.13	21.47	108	10.24
	V22	-		-	-	-	-	
	V23	6.72	*5*	417	4.85	15.97	112	14.40
Interaction								
N at same V		NS		NS	NS	NS	NS	
V at same N		NS		NS	NS	NS	NS	
Means of F levels:								
F1		5.57	*2*	303	4.13	21.04	107	
F2		6.27	*1*	344	4.41	21.27	108	11.26
C.D.(0.05)		0.3		NS	NS	NS	NS	
C.V.(%)		6.13		22.34	14.76	12.46	1.82	

Table 4.1(c): Contd.

F-levels	Varieties	NAWAGAM						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test wt(g)	Days for 50% Flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Mean of varieties								
V1		6.23	*5*	353	5.05	23.59	111	9.12
V2		5.88	*10*	341	5.08	24.89	105	9.60
V3		6.17	*6*	302	4.19	24.53	100	12.48
V4		6.86	*1*	296	5.38	23.74	100	4.00
V5		6.12	*8*	339	3.65	23.55	105	10.72
V6		5.79	*13*	318	4.45	26.72	112	8.00
V7		5.84	*11*	288	4.67	19.15	111	5.92
V8		5.66	*15*	348	4.49	19.24	111	-2.08
V9		5.83	*12*	233	4.77	20.92	116	7.20
V10		5.35	*17*	281	3.64	17.99	109	19.84
V11		5.91	*9*	340	3.79	19.43	111	11.84
V12		5.73	*14*	320	4.40	20.07	104	3.84
V13		4.37	*18*	270	2.62	17.31	118	18.56
V14		6.13	*7*	368	4.82	20.09	97	17.92
V15		-		-	-	-	-	
V16		-		-	-	-	-	
V17		-		-	-	-	-	
V18		5.59	*16*	326	3.18	22.49	95	24.64
V19		-		-	-	-	-	
V20		6.32	*3*	354	4.49	19.84	110	16.48
V21		6.49	*2*	361	3.71	21.44	108	10.24
V22		-		-	-	-	-	
V23		6.27	*4*	389	4.60	15.90	111	14.40
C.D.(0.05)		0.51		34.77	0.47	1.9	1.58	
C.V.(%)		7.54		9.4	9.55	7.84	1.29	
Expt. Mean		5.92		324	4.27	21.16	107	
Soil type		Clay loam						
pH		8.00						
F - levels (kg/ha)								
F1		50:12.5:0						
F2		100:25:0						
Recmnd N:P:K (kg/ha)		100:25:0						
Varieties								
V1		IET 29738						
V2		IET 29734						
V3		IET 29726						
V4		IET 29708						
V5		IET 29717						
V6		IET 29820						
V7		IET 29808						
V8		IET 29822						
V9		IET 29188						
V10		IET 29304						
V11		IET 30282						
V12		IET 29203						
V13		IET 30697						
V14		Gondhra Bidhan-3 (NC)						
V15		-						
V16		-						
V17		-						
V18		MTU 1010 (C& S)						
V19		-						
V20		ADT 39 RP						
V21		Naveen (RP)						
V22		-						
V23		Local check - GAR 13(125 days)						
Available N:P:K of soil		245.89:36.1:195						

Table 4.1(c): Contd.

F-levels	Varieties	PUDUCHERRY Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test wt(g)	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: low input (50% NPK)	V1	4.93	*22*	288	7.88	3.21	
	V2	4.58	*35*	234	4.02	2.32	
	V3	4.74	*30*	288	4.19	2.27	
	V4	4.80	*26*	252	6.96	2.40	
	V5	5.03	*20*	312	5.53	2.65	
	V6	4.59	*34*	210	3.15	2.32	
	V7	4.90	*23*	298	6.07	2.09	
	V8	5.19	*19*	348	6.29	2.10	
	V9	4.96	*21*	321	6.09	1.99	
	V10	4.90	*23*	274	5.85	2.10	
	V11	4.71	*32*	263	6.34	2.97	
	V12	4.90	*23*	271	2.73	2.62	
	V13	4.77	*28*	215	6.90	2.69	
	V14	4.75	*29*	182	5.11	2.48	
	V15	-		-	-	-	
	V16	-		-	-	-	
	V17	-		-	-	-	
	V18	4.65	*33*	252	3.44	2.08	
	V19	-		-	-	-	
	V20	4.72	*31*	242	6.14	2.17	
	V21	4.78	*27*	239	7.00	2.22	
	V22	-		-	-	-	
	V23	4.00	*36*	176	1.90	2.27	
F2: Optimum input (100% NPK)	V1	6.60	*4*	359	8.76	3.29	16.70
	V2	6.28	*17*	300	4.62	2.38	17.00
	V3	6.43	*12*	357	4.74	2.30	16.90
	V4	6.47	*9*	325	7.82	2.44	16.70
	V5	6.71	*2*	387	6.19	2.69	16.80
	V6	6.29	*16*	267	3.66	2.35	17.00
	V7	6.59	*5*	377	6.95	2.13	16.90
	V8	6.77	*1*	437	7.15	2.15	15.80
	V9	6.62	*3*	417	6.82	2.02	16.60
	V10	6.56	*6*	345	6.65	2.13	16.60
	V11	6.40	*14*	328	7.26	3.04	16.90
	V12	6.55	*7*	353	3.18	2.65	16.50
	V13	6.46	*10*	297	7.90	2.76	16.90
	V14	6.46	*10*	247	5.74	2.51	17.10
	V15	-		-	-	-	
	V16	-		-	-	-	
	V17	-		-	-	-	
	V18	6.35	*15*	333	3.85	2.10	17.00
	V19	-		-	-	-	
	V20	6.41	*13*	315	6.95	2.20	16.90
	V21	6.48	*8*	303	7.87	2.24	17.00
	V22	-		-	-	-	
	V23	5.60	*18*	238	2.15	2.29	16.00
Interaction							
N at same V		NS		4.47	0.11	0.02	
V at same N		NS		27.35	0.11	0.02	
Means of F levels:							
F1		4.77	*2*	259	5.31	2.39	
F2		6.45	*1*	332	6.01	2.43	16.74
C.D.(0.05)		0.13		37.66	0.04	0	
C.V.(%)		2.83		15.38	0.96	0.23	

Table 4.1(c): Contd.

F-levels	Varieties	PUDUCHERRY Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test wt(g)	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Mean of varieties							
V1		5.77	*4*	323	8.32	3.25	16.70
V2		5.43	*17*	267	4.32	2.35	17.00
V3		5.59	*12*	323	4.47	2.29	16.90
V4		5.64	*8*	288	7.39	2.42	16.70
V5		5.87	*2*	350	5.86	2.67	16.80
V6		5.44	*16*	238	3.41	2.34	17.00
V7		5.75	*5*	337	6.51	2.11	16.90
V8		5.98	*1*	393	6.72	2.13	15.80
V9		5.79	*3*	369	6.46	2.01	16.60
V10		5.73	*6*	309	6.25	2.12	16.60
V11		5.56	*14*	295	6.80	3.01	16.90
V12		5.73	*7*	312	2.96	2.64	16.50
V13		5.62	*10*	256	7.40	2.73	16.90
V14		5.61	*11*	215	5.43	2.50	17.10
V15		-		-	-	-	
V16		-		-	-	-	
V17		-		-	-	-	
V18		5.50	*15*	293	3.65	2.09	17.00
V19		-		-	-	-	
V20		5.57	*13*	278	6.55	2.19	16.90
V21		5.63	*9*	271	7.44	2.23	17.00
V22		-		-	-	-	
V23		4.80	*18*	207	2.03	2.28	16.00
C.D.(0.05)		0.05		3.16	0.08	0.02	
C.V.(%)		0.8		0.93	1.18	0.62	
Expt. Mean		5.61		296	5.66	2.41	
Soil type		Clayey loam					
pH		6.74					
F - levels (kg/ha)							
F1		60:20:20					
F2		120:40:40					
Recmnd N:P:K (kg/ha)		120:40:40					
Varieties							
V1		IET 29738					
V2		IET 29734					
V3		IET 29726					
V4		IET 29708					
V5		IET 29717					
V6		IET 29820					
V7		IET 29808					
V8		IET 29822					
V9		IET 29188					
V10		IET 29304					
V11		IET 30282					
V12		IET 29203					
V13		IET 30697					
V14		Gondhra Bidhan-3 (NC)					
V15		-					
V16		-					
V17		-					
V18		MTU 1010 (C& S)					
V19		-					
V20		ADT 39 RP					
V21		Naveen (RP)					
V22		-					
V23		Local check - Chinna Ponni(115 days)					
Available N:P:K of soil		145.6:24.9:105					

Table 4.1(c): Contd.

F-levels	Varieties	VARANASI						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test wt(g)	Days for 50% Flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: low input (50% NPK)	V1	5.28	*3*	180	49.37	28.14	101	
	V2	3.98	*26*	200	42.93	29.63	97	
	V3	4.52	*17*	182	42.83	26.95	96	
	V4	4.05	*22*	161	42.93	26.27	97	
	V5	4.02	*24*	165	36.83	26.16	94	
	V6	4.02	*24*	180	32.03	30.88	103	
	V7	5.00	*10*	158	45.67	20.38	108	
	V8	5.18	*5*	165	38.23	20.62	111	
	V9	3.47	*33*	147	41.83	21.08	112	
	V10	4.17	*21*	190	31.20	22.15	108	
	V11	3.58	*30*	219	26.47	23.60	95	
	V12	3.48	*31*	196	24.77	22.46	96	
	V13	3.61	*29*	185	28.67	18.50	115	
	V14	3.64	*27*	181	31.50	21.76	96	
	V15	-		-	-	-	-	
	V16	-		-	-	-	-	
	V17	-		-	-	-	-	
	V18	2.09	*35*	232	14.97	22.05	88	
	V19	-		-	-	-	-	
	V20	4.36	*18*	141	39.37	22.29	108	
	V21	3.64	*27*	221	22.50	20.72	94	
	V22	-		-	-	-	-	
	V23	4.74	*11*	193	25.43	20.53	105	
F2: Optimum input (100% NPK)	V1	5.18	*5*	169	38.13	28.93	102	-0.91
	V2	5.38	*1*	164	46.03	27.62	97	12.73
	V3	5.03	*9*	192	39.83	29.36	96	4.64
	V4	5.18	*5*	156	48.97	26.20	97	10.27
	V5	4.18	*20*	170	35.27	24.44	94	1.45
	V6	4.05	*22*	192	36.97	31.62	103	0.27
	V7	4.74	*11*	159	48.53	20.33	108	-2.36
	V8	5.38	*1*	214	38.63	20.37	111	1.82
	V9	5.18	*5*	178	47.17	22.16	112	15.55
	V10	4.63	*16*	211	33.90	22.26	107	4.18
	V11	4.67	*15*	240	25.97	23.53	95	9.91
	V12	4.71	*13*	216	29.47	21.47	96	11.18
	V13	2.59	*34*	237	26.43	19.53	115	-9.27
	V14	4.29	*19*	190	31.93	20.09	96	5.91
	V15	-		-	-	-	-	
	V16	-		-	-	-	-	
	V17	-		-	-	-	-	
	V18	2.03	*36*	249	16.67	18.90	88	-0.55
	V19	-		-	-	-	-	
	V20	4.70	*14*	145	41.30	20.95	107	3.09
	V21	3.48	*31*	247	23.13	19.29	94	-1.45
	V22	-		-	-	-	-	
	V23	5.26	*4*	224	29.10	19.74	105	4.73
Interaction								
N at same V		0.54		15.4	4.67	1.55	NS	
V at same N		0.6		17.6	5.06	1.77	NS	
Means of F levels:								
F1		4.05	*2*	183	34.31	23.57	101	
F2		4.48	*1*	197	35.41	23.16	101	3.95
C.D.(0.05)		0.37		11.9	NS	NS	NS	
C.V.(%)		10.39		7.55	10	6.2	1.65	

Table 4.1(c): Contd.

F-levels	Varieties	VARANASI Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test wt(g)	Days for 50% Flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Mean of varieties								
V1		5.23	*2*	175	43.75	28.54	102	-0.91
V2		4.68	*6*	182	44.48	28.63	97	12.73
V3		4.78	*5*	187	41.33	28.16	96	4.64
V4		4.62	*7*	159	45.95	26.24	97	10.27
V5		4.10	*12*	167	36.05	25.30	94	1.45
V6		4.04	*14*	186	34.50	31.25	103	0.27
V7		4.87	*4*	158	47.10	20.36	108	-2.36
V8		5.28	*1*	190	38.43	20.50	111	1.82
V9		4.33	*10*	163	44.50	21.62	112	15.55
V10		4.40	*9*	200	32.55	22.21	107	4.18
V11		4.13	*11*	230	26.22	23.57	95	9.91
V12		4.10	*13*	206	27.12	21.97	96	11.18
V13		3.10	*17*	211	27.55	19.02	115	-9.27
V14		3.97	*15*	186	31.72	20.93	96	5.91
V15		-		-	-	-	-	
V16		-		-	-	-	-	
V17		-		-	-	-	-	
V18		2.06	*18*	241	15.82	20.48	88	-0.55
V19		-		-	-	-	-	
V20		4.53	*8*	143	40.34	21.62	108	3.09
V21		3.56	*16*	234	22.82	20.01	94	-1.45
V22		-		-	-	-	-	
V23		5.00	*3*	209	27.27	20.14	105	4.73
C.D.(0.05)		0.38		10.89	3.3	1.1	0.81	
C.V.(%)		7.83		5.01	8.28	4.11	0.7	
Expt. Mean		4.26		190	34.86	23.36	101	
Soil type		-						
pH		7.40						
F - levels (kg/ha)								
F1		60:30:20						
F2		120:60:40						
Recmnd N:P:K (kg/ha)		120:60:40						
Varieties								
V1		IET 29738						
V2		IET 29734						
V3		IET 29726						
V4		IET 29708						
V5		IET 29717						
V6		IET 29820						
V7		IET 29808						
V8		IET 29822						
V9		IET 29188						
V10		IET 29304						
V11		IET 30282						
V12		IET 29203						
V13		IET 30697						
V14		Gondhra Bidhan-3 (NC)						
V15		-						
V16		-						
V17		-						
V18		MTU 1010 (C& S)						
V19		-						
V20		ADT 39 RP						
V21		Naveen (RP)						
V22		-						
V23		Local check - HUR 4-3(130-135 days)						
Available N:P:K of soil		182:32:207						

Table 4.1(c): Contd.

F-levels	Varieties	WARANGAL							Over all Mean	Rank
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test wt(g)	Days for 50% Flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)		
	V1	5.59	*11*	337	6.63	25.00	92		4.74	21
	V2	4.91	*18*	313	6.77	26.00	85		4.63	25
	V3	7.10	*3*	335	6.03	28.90	86		4.96	19
	V4	5.56	*12*	329	6.53	24.07	83		4.66	24
	V5	4.79	*19*	324	6.37	25.60	88		4.49	30
	V6	3.81	*30*	327	5.23	29.40	90		4.57	28
	V7	6.76	*4*	315	6.43	18.93	82		4.72	23
	V8	6.18	*7*	338	5.37	15.37	88		4.86	20
	V9	4.12	*24*	326	7.47	23.13	91		4.61	26
	V10	4.11	*25*	333	4.17	20.13	90		4.35	31
F1: low input (50% NPK)	V11	3.80	*31*	321	5.70	21.83	83		4.31	32
	V12	3.29	*34*	371	4.67	19.07	85		4.31	33
	V13	3.98	*27*	334	5.53	18.60	101		4.28	34
	V14	4.05	*26*	332	5.47	23.13	85		4.21	36
	V15	-		-	-	-	-		4.72	22
	V16	-		-	-	-	-		4.00	39
	V17	-		-	-	-	-		2.45	46
	V18	4.71	*20*	348	3.70	15.23	84		3.65	41
	V19	-		-	-	-	-		3.54	42
	V20	3.78	*32*	344	7.20	23.67	91		4.58	27
	V21	3.57	*33*	349	3.97	21.37	88		4.20	38
	V22	-		-	-	-	-		2.84	44
	V23	-		-	-	-	-		4.20	37
	V1	5.05	*16*	343	6.50	25.97	92	-4.91	5.57	8
	V2	6.25	*6*	330	10.37	29.33	84	12.18	5.71	2
	V3	8.08	*2*	345	8.13	27.67	88	8.91	5.84	1
	V4	5.05	*16*	333	7.17	24.30	84	-4.64	5.60	7
	V5	6.52	*5*	330	6.60	25.30	87	15.73	5.30	11
	V6	5.92	*8*	350	6.73	27.20	89	19.18	5.61	6
	V7	5.44	*14*	327	8.43	19.20	81	-12.00	5.63	5
	V8	8.40	*1*	344	5.53	14.67	84	20.18	5.63	4
	V9	5.53	*13*	341	7.53	23.53	92	12.82	5.69	3
	V10	4.17	*23*	350	4.67	19.00	89	0.55	5.39	9
F2: Optimum input (100% NPK)	V11	3.98	*27*	343	5.70	22.43	83	1.64	5.29	12
	V12	3.95	*29*	399	5.33	18.70	85	6.00	5.24	13
	V13	5.65	*10*	373	5.73	18.67	100	15.18	5.10	17
	V14	4.35	*22*	363	6.03	23.50	82	2.73	5.23	14
	V15	-		-	-	-	-		5.15	15
	V16	-		-	-	-	-		3.65	40
	V17	-		-	-	-	-		2.69	45
	V18	5.72	*9*	364	4.77	18.27	80	9.18	4.49	29
	V19	-		-	-	-	-		4.28	35
	V20	4.44	*21*	351	8.10	24.33	90	6.00	5.32	10
	V21	5.25	*15*	347	4.60	22.43	87	15.27	5.06	18
	V22	-		-	-	-	-		3.41	43
	V23	-		-	-	-	-		5.12	16
Interaction										
N at same V		0.7		NS	0.82	1.72	1.01			
V at same N		0.75		NS	0.82	1.7	1			
Means of F levels:										
F1		4.71	*2*	334	5.72	22.32	88		4.45	2
F2		5.51	*1*	349	6.58	22.62	87	7.29	5.37	1
C.D.(0.05)		0.41		4.9	0.28	NS	0.22			
C.V.(%)		9.31		1.68	5.31	2.33	0.3			

Table 4.1(c): Contd.

F-levels	Varieties	WARANGAL							Over all Mean	Rank
		Grain Yield(t/ha)	Rank	Panicle/ m^2 (No.)	Panicle Weight (g)	Test wt(g)	Days for 50% Flowering	Nutri. res. (kg grain/kg Nutri.) (Base 50%RDN)		
Mean of varieties										
V1		5.32	*6*	340	6.57	25.49	92	-4.91	5.15	5
V2		5.58	*5*	322	8.57	27.67	84	12.18	5.17	4
V3		7.59	*1*	340	7.08	28.29	87	8.91	5.40	1
V4		5.31	*7*	331	6.85	24.19	83	-4.64	5.13	7
V5		5.66	*4*	327	6.49	25.45	88	15.73	4.89	11
V6		4.87	*9*	339	5.98	28.30	90	19.18	5.09	8
V7		6.10	*3*	321	7.43	19.07	82	-12.00	5.17	3
V8		7.29	*2*	341	5.45	15.02	86	20.18	5.24	2
V9		4.83	*10*	333	7.50	23.33	92	12.82	5.15	6
V10		4.14	*14*	342	4.42	19.57	90	0.55	4.87	12
V11		3.89	*16*	332	5.70	22.13	83	1.64	4.80	13
V12		3.62	*17*	385	5.00	18.89	85	6.00	4.77	14
V13		4.82	*11*	353	5.63	18.64	101	15.18	4.69	16
V14		4.20	*13*	348	5.75	23.32	84	2.73	4.72	15
V15		-		-	-	-	-		4.94	10
V16		-		-	-	-	-		3.83	21
V17		-		-	-	-	-		2.57	23
V18		5.22	*8*	356	4.24	16.75	82	9.18	4.07	19
V19		-		-	-	-	-		3.91	20
V20		4.11	*15*	348	7.65	24.00	91	6.00	4.95	9
V21		4.41	*12*	348	4.29	21.90	88	15.27	4.63	18
V22		-		-	-	-	-		3.13	22
V23		-		-	-	-	-		4.66	17
C.D.(0.05)		0.49		14.81	0.58	1.21	0.72			
C.V.(%)		8.46		3.79	8.25	4.73	0.72			
Expt. Mean		5.11		341	6.15	22.47	87		4.91	
Soil type		Clay								
pH		8.73								
F - levels (kg/ha)										
F1		60:30:20								
F2		120:60:40								
Recmnd N:P:K (kg/ha)		120:60:40								
Varieties										
V1		IET 29738								
V2		IET 29734								
V3		IET 29726								
V4		IET 29708								
V5		IET 29717								
V6		IET 29820								
V7		IET 29808								
V8		IET 29822								
V9		IET 29188								
V10		IET 29304								
V11		IET 30282								
V12		IET 29203								
V13		IET 30697								
V14		Gondhra Bidhan-3 (NC)								
V15		-								
V16		-								
V17		-								
V18		MTU 1010 (C& S)								
V19		-								
V20		ADT 39 RP								
V21		Naveen (RP)								
V22		-								
V23		-								
Available N:P:K of soil		105:41:384								

Table 4.1 (d): Summary of data on grain yield and ancillary characters of selected Irrigated Medium (Transplanted) cultures grown under transplanted conditions at graded levels of recommended fertilizer doses, kharif 2023.

F-levels	Varieties	CHINSURAH				
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Nutri. res. (kg grain/kg Nutri.) (Base level 100% RDF)
F1: Low input 50% NPK	V1	4.36	18	305	2.47	
	V2	4.86	11	370	4.05	
	V3	3.56	27	309	2.19	
	V4	3.50	29	249	2.95	
	V5	4.00	25	276	3.10	
	V6	4.01	24	293	4.02	
	V7	4.00	25	332	2.11	
	V8	3.50	29	305	2.65	
	V9	4.52	17	356	3.12	
	V10	4.12	21	310	2.55	
	V11	4.03	23	245	2.13	
	V12	3.50	29	192	2.85	
	V13	4.53	15	347	3.11	
	V14	-		-	-	
	V15	4.12	21	232	2.04	
	V16	-		-	-	
	V17	3.14	32	243	2.11	
	V18	-		-	-	
	V19	-		-	-	
	V20	-		-	-	
	V21	3.56	27	301	3.12	
	V22	-		-	-	
F2: Optimum input 100% NPK	V1	6.12	7	353	3.56	22.00
	V2	7.50	3	382	5.22	33.00
	V3	6.26	5	342	4.25	33.75
	V4	4.55	13	278	4.19	13.13
	V5	4.67	12	331	4.25	8.38
	V6	7.55	2	317	4.21	44.25
	V7	4.35	19	318	4.10	4.38
	V8	4.55	13	318	4.23	13.13
	V9	7.26	4	383	5.11	34.25
	V10	5.19	9	346	3.25	13.38
	V11	7.95	1	331	3.45	49.00
	V12	4.34	20	250	3.45	10.50
	V13	5.50	8	341	4.56	12.13
	V14	-		-	-	
	V15	5.01	10	301	3.21	11.13
	V16	-		-	-	
	V17	4.53	15	271	3.10	17.38
	V18	-		-	-	
	V19	-		-	-	
	V20	-		-	-	
	V21	6.21	6	329	4.52	33.13
	V22	-		-	-	
Interaction						
F at same V		0.19		12.68	0.14	
V at same F		0.22		12.33	0.15	
F1		3.96	2	291	2.79	
F2		5.72	1	324	4.04	22.05
C.D.(0.05)		0.16		1.53	0.06	
C.V.(%)		3.82		0.57	2.1	

Table 4.1(d): Contd.

F-levels	Varieties	CHINSURAH				
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Nutri. res. (kg grain/kg Nutri.) (Base level 100% RDF)
Mean of varieties:						
V1		5.24	5	329	3.02	22.00
V2		6.18	1	376	4.64	33.00
V3		4.91	7	325	3.22	33.75
V4		4.03	13	263	3.57	13.13
V5		4.34	11	303	3.68	8.38
V6		5.78	4	305	4.12	44.25
V7		4.18	12	325	3.11	4.38
V8		4.03	13	311	3.44	13.13
V9		5.89	3	370	4.12	34.25
V10		4.66	9	328	2.90	13.38
V11		5.99	2	288	2.79	49.00
V12		3.92	15	221	3.15	10.50
V13		5.02	6	344	3.84	12.13
V14		-		-	-	
V15		4.57	10	267	2.63	11.13
V16		-		-	-	
V17		3.84	16	257	2.61	17.38
V18		-		-	-	
V19		-		-	-	
V20		-		-	-	
V21		4.89	8	315	3.82	33.13
V22		-		-	-	
C.D.(0.05)		0.13		8.96	0.1	
C.V. (%)		2.36		2.52	2.59	
Expt. Mean		4.84		308	3.41	
Soil type		-				
pH		-				
F - levels (kg/ha)						
F1		40:20:20				
F2		80:40:40				
Recommended N:P:K (kg/ha)		80:40:40				
Varieties						
V1		IET 29743				
V2		IET 29741				
V3		IET 29833				
V4		IET 28523				
V5		IET 29742				
V6		IET 29290(R)				
V7		IET 29301(R)				
V8		IET 29257(R)				
V9		IET 29284(R)				
V10		IET 29014(R)				
V11		IET 29002(R)				
V12		IET 30757				
V13		IET 29859				
V14		-				
V15		PR121 (N)				
V16		-				
V17		Karma Mahsuri (C)				
V18		-				
V19		-				
V20		-				
V21		Hybrid Check - Arize 6444 Gold				
V22		-				
Available N:P:K of soil (kg/ha)		-				

Table 4.1(d): Contd.

F-levels	Varieties	COIMBATORE				
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Nutri. res. (kg grain/kg Nutri.) (Base level 100% RDF)
F1: Low input 50% NPK	V1	4.54	22	285	2.25	
	V2	4.96	17	297	3.24	
	V3	4.82	20	293	3.12	
	V4	4.62	21	292	2.65	
	V5	4.54	22	290	2.25	
	V6	3.86	30	235	2.12	
	V7	3.64	32	226	2.02	
	V8	4.49	24	271	2.35	
	V9	3.92	29	238	2.15	
	V10	4.84	19	289	2.74	
	V11	4.37	25	264	2.36	
	V12	4.28	27	250	2.31	
	V13	4.32	26	265	2.43	
	V14	-		-	-	
	V15	3.65	31	231	2.03	
	V16	-		-	-	
	V17	3.98	28	236	2.08	
	V18	-		-	-	
	V19	-		-	-	
	V20	-		-	-	
	V21	-		-	-	
	V22	4.85	18	291	2.96	
F2: Optimum input 100% NPK	V1	6.49	6	380	3.16	15.60
	V2	7.69	1	417	4.33	21.84
	V3	7.54	2	402	4.17	21.76
	V4	6.71	5	386	3.55	16.72
	V5	6.45	7	375	3.12	15.28
	V6	5.64	14	325	3.05	14.24
	V7	5.45	16	313	2.88	14.48
	V8	6.31	8	364	3.29	14.56
	V9	5.86	12	329	3.01	15.52
	V10	6.76	4	387	3.62	15.36
	V11	6.26	10	356	3.29	15.12
	V12	6.12	11	342	3.21	14.72
	V13	6.27	9	355	3.29	15.60
	V14	-		-	-	
	V15	5.50	15	322	2.88	14.80
	V16	-		-	-	
	V17	5.84	13	327	2.95	14.88
	V18	-		-	-	
	V19	-		-	-	
	V20	-		-	-	
	V21	-		-	-	
	V22	6.78	3	386	3.85	15.44
Interaction						
F at same V		0.13		10.34	NS	
V at same F		0.13		10.17	NS	
F1		4.36	2	266	2.44	
F2		6.35	1	360	3.35	16.00
C.D.(0.05)		0.01		2.32	0.07	
C.V.(%)		0.22		0.84	2.6	

Table 4.1(d): Contd.

F-levels	Varieties	COIMBATORE				
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Nutri. res. (kg grain/kg Nutri.) (Base level 100% RDF)
Mean of varieties:						
V1		5.52	6	333	2.71	15.60
V2		6.33	1	357	3.79	21.84
V3		6.18	2	348	3.65	21.76
V4		5.67	5	339	3.10	16.72
V5		5.50	7	333	2.69	15.28
V6		4.75	14	280	2.59	14.24
V7		4.55	16	270	2.45	14.48
V8		5.40	8	317	2.82	14.56
V9		4.89	13	283	2.58	15.52
V10		5.80	4	338	3.18	15.36
V11		5.32	9	310	2.83	15.12
V12		5.20	11	296	2.76	14.72
V13		5.30	10	310	2.86	15.60
V14		-		-	-	
V15		4.58	15	276	2.46	14.80
V16		-		-	-	
V17		4.91	12	282	2.52	14.88
V18		-		-	-	
V19		-		-	-	
V20		-		-	-	
V21		-		-	-	
V22		5.82	3	339	3.41	15.44
C.D.(0.05)		0.09		7.31	0.09	
C.V. (%)		1.51		2.02	2.71	
Expt. Mean		5.35		313	2.90	
Soil type		-				
pH		8.12				
F - levels (kg/ha)						
F1		75:25:25				
F2		150:50:50				
Recommended N:P:K (kg/ha)		150:50:50				
Varieties						
V1		IET 29743				
V2		IET 29741				
V3		IET 29833				
V4		IET 28523				
V5		IET 29742				
V6		IET 29290(R)				
V7		IET 29301(R)				
V8		IET 29257(R)				
V9		IET 29284(R)				
V10		IET 29014(R)				
V11		IET 29002(R)				
V12		IET 30757				
V13		IET 29859				
V14		-				
V15		PR121 (N)				
V16		-				
V17		Karma Mahsuri (C)				
V18		-				
V19		-				
V20		-				
V21		-				
V22		Local Check - CO 56(135 days)				
Available N:P:K of soil (kg/ha)		237:23:436				

Table 4.1(d): Contd.

F-levels	Varieties	DHANGAIN Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 100% RDF)
F1: Low input 50% NPK	V1	3.43	11	286	5.93	23.33	87	
	V2	3.22	15	276	5.34	20.40	85	
	V3	2.87	28	255	4.53	20.53	98	
	V4	2.94	26	257	4.67	17.87	90	
	V5	3.16	18	268	5.21	27.60	91	
	V6	2.71	31	246	4.21	24.27	94	
	V7	2.41	37	227	3.57	19.87	121	
	V8	2.65	32	247	4.10	25.07	92	
	V9	2.97	24	257	4.67	22.27	96	
	V10	3.11	20	268	4.92	26.00	90	
	V11	2.79	29	249	4.45	24.67	87	
	V12	2.41	37	220	3.50	17.60	98	
	V13	2.62	33	246	3.93	25.47	91	
	V14	3.26	14	280	5.83	24.00	90	
	V15	2.73	30	248	4.27	26.00	93	
	V16	-		-	-	-	-	
	V17	3.08	22	268	4.92	20.27	97	
	V18	-		-	-	-	-	
	V19	-		-	-	-	-	
	V20	2.54	35	236	3.85	24.67	88	
	V21	2.51	36	231	3.72	21.47	88	
	V22	2.58	34	244	3.87	14.00	108	
F2: Optimum input 100% NPK	V1	4.27	1	301	6.25	26.93	90	7.64
	V2	3.98	3	290	6.05	23.73	89	6.91
	V3	3.52	9	272	4.84	24.27	101	5.91
	V4	3.58	8	273	5.00	22.80	92	5.82
	V5	3.91	4	287	5.78	24.27	94	6.82
	V6	3.32	13	255	4.26	24.27	96	5.55
	V7	2.95	25	234	3.65	23.73	123	4.91
	V8	3.21	16	252	4.21	25.60	94	5.09
	V9	3.64	7	276	5.05	23.73	99	6.09
	V10	3.78	5	284	5.33	24.27	92	6.09
	V11	3.50	10	272	4.73	25.07	91	6.45
	V12	2.90	27	228	3.56	22.67	101	4.45
	V13	3.18	17	252	4.14	24.27	94	5.09
	V14	4.02	2	299	6.24	25.73	93	6.91
	V15	3.41	12	270	4.64	26.67	96	6.18
	V16	-		-	-	-	-	
	V17	3.71	6	280	5.25	20.27	99	5.73
	V18	-		-	-	-	-	
	V19	-		-	-	-	-	
	V20	3.10	21	242	3.99	26.40	91	5.09
	V21	3.04	23	235	3.80	23.73	91	4.82
	V22	3.12	19	250	4.11	14.40	110	4.91
Interaction								
F at same V		NS		NS	NS	1.57	0.7	
V at same F		NS		NS	NS	1.54	0.73	
F1		2.84	2	253	4.50	22.4	94	
F2		3.48	1	266	4.78	23.8	97	5.81
C.D.(0.05)		0.07		2.92	0.06	0.26	0.35	
C.V.(%)		2.58		1.4	1.62	1.41	0.45	

Table 4.1(d): Contd.

F-levels	Varieties	DHANGAIN						
		Grain Yield (t/ha)	Rank	Panicle/ m^2 (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 100% RDF)
Mean of varieties:								
V1		3.85	1	293	6.09	25.1	88	7.64
V2		3.60	3	283	5.70	22.1	87	6.91
V3		3.20	9	264	4.69	22.4	100	5.91
V4		3.26	8	265	4.84	20.3	91	5.82
V5		3.54	4	278	5.50	25.9	93	6.82
V6		3.02	12	251	4.24	24.3	95	5.55
V7		2.68	18	231	3.61	21.8	122	4.91
V8		2.93	13	249	4.16	25.3	93	5.09
V9		3.31	7	267	4.86	23.0	98	6.09
V10		3.45	5	276	5.13	25.1	91	6.09
V11		3.15	10	261	4.59	24.9	89	6.45
V12		2.66	19	224	3.53	20.1	99	4.45
V13		2.90	14	249	4.04	24.9	92	5.09
V14		3.64	2	289	6.04	24.9	92	6.91
V15		3.07	11	259	4.46	26.3	95	6.18
V16		-		-	-	-	-	
V17		3.40	6	274	5.09	20.3	98	5.73
V18		-		-	-	-	-	
V19		-		-	-	-	-	
V20		2.82	16	239	3.92	25.5	89	5.09
V21		2.78	17	233	3.76	22.6	89	4.82
V22		2.85	15	247	3.99	14.2	109	4.91
C.D.(0.05)		0.41		26.5	0.95	1.11	0.5	
C.V. (%)		11.38		8.93	17.97	4.2	0.46	
Expt. Mean		3.16		260	4.64	23.11	95	
Soil type		Clay loam						
pH		6.35						
F - levels (kg/ha)								
F1		60:30:20						
F2		120:60:40						
Recommended N:P:K (kg/ha)		120:60:40						
Varieties								
V1		IET 29743						
V2		IET 29741						
V3		IET 29833						
V4		IET 28523						
V5		IET 29742						
V6		IET 29290(R)						
V7		IET 29301(R)						
V8		IET 29257(R)						
V9		IET 29284(R)						
V10		IET 29014(R)						
V11		IET 29002(R)						
V12		IET 30757						
V13		IET 29859						
V14		NC- NDR 359						
V15		PR121 (N)						
V16		-						
V17		Karma Mahsuri (C)						
V18		-						
V19		-						
V20		HRI 174						
V21		Hybrid Check - PA 6444						
V22		Local Check - R. Sweta(130-135 Days)						
Available N:P:K of soil (kg/ha)		282:42.4:162.2						

Table 4.1(d): Contd.

F-levels	Varieties	FAIZABAD Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: Low input 50% NPK	V1	3.31	25	207	2.60	28.60	102	
	V2	3.31	25	218	2.77	21.07	105	
	V3	3.36	22	217	3.40	25.43	103	
	V4	3.02	30	214	3.37	18.37	106	
	V5	3.14	29	217	2.73	18.47	103	
	V6	11.33	1	208	2.40	24.53	103	
	V7	2.63	33	185	3.37	22.70	101	
	V8	2.88	31	186	3.37	27.53	106	
	V9	3.33	24	213	4.60	19.13	108	
	V10	2.55	34	223	2.60	22.87	102	
	V11	2.77	32	194	2.17	18.60	104	
	V12	3.35	23	223	2.63	25.20	102	
	V13	3.26	27	211	3.40	18.13	103	
	V14	3.21	28	214	3.63	20.03	102	
	V15	4.13	17	217	2.36	26.87	105	
	V16	-		-	-	-	-	
	V17	3.50	21	200	3.57	18.87	101	
	V18	-		-	-	-	-	
	V19	-		-	-	-	-	
	V20	-		-	-	-	-	
	V21	-		-	-	-	-	
	V22	4.50	13	211	3.15	22.83	104	
F2: Optimum input 100% NPK	V1	4.55	12	263	3.20	29.53	105	10.33
	V2	5.08	6	247	3.60	22.30	108	14.75
	V3	4.93	9	252	3.93	25.80	108	13.08
	V4	5.10	5	270	4.17	19.07	109	17.33
	V5	5.52	2	243	3.37	19.13	106	19.83
	V6	4.95	8	229	3.40	24.97	105	-53.17
	V7	4.02	19	250	3.93	23.60	104	11.58
	V8	4.23	16	245	3.93	28.07	108	11.25
	V9	4.43	14	242	4.87	20.23	111	9.17
	V10	4.39	15	233	3.17	23.40	106	15.33
	V11	3.98	20	245	2.77	19.13	106	10.08
	V12	4.65	11	252	3.40	26.10	104	10.83
	V13	4.93	9	265	3.73	18.43	108	13.92
	V14	5.28	3	244	4.07	22.13	107	17.25
	V15	4.97	7	242	2.77	27.60	109	7.00
	V16	-		-	-	-	-	
	V17	4.10	18	233	3.83	20.10	106	5.00
	V18	-		-	-	-	-	
	V19	-		-	-	-	-	
	V20	-		-	-	-	-	
	V21	-		-	-	-	-	
	V22	5.23	4	242	3.55	24.10	108	6.08
Interaction								
F at same V		NS		13.78	NS	0.65	NS	
V at same F		NS		14.27	NS	0.77	NS	
F1		3.74	2	209	3.07	22.3	104	
F2		4.73	1	247	3.63	23.2	107	8.22
C.D.(0.05)		NS		6.4	0.16	0.57	0.74	
C.V.(%)		60.39		3.29	5.46	2.95	0.82	

Table 4.1(d): Contd.

F-levels	Varieties	FAIZABAD Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Mean of varieties:								
V1		3.93	11	235	2.90	29.1	104	10.33
V2		4.20	6	233	3.19	21.7	107	14.75
V3		4.15	7	234	3.67	25.6	106	13.08
V4		4.06	9	242	3.77	18.7	108	17.33
V5		4.33	4	230	3.05	18.8	105	19.83
V6		8.14	1	219	2.90	24.8	104	-53.17
V7		3.33	17	218	3.65	23.2	102	11.58
V8		3.56	14	216	3.65	27.8	107	11.25
V9		3.88	12	227	4.74	19.7	109	9.17
V10		3.47	15	228	2.89	23.1	104	15.33
V11		3.38	16	220	2.47	18.9	105	10.08
V12		4.00	10	238	3.02	25.7	103	10.83
V13		4.10	8	238	3.57	18.3	106	13.92
V14		4.25	5	229	3.85	21.1	105	17.25
V15		4.55	3	229	2.57	27.2	107	7.00
V16		-		-	-	-	-	
V17		3.80	13	216	3.70	19.5	104	5.00
V18		-		-	-	-	-	
V19		-		-	-	-	-	
V20		-		-	-	-	-	
V21		-		-	-	-	-	
V22		4.87	2	227	3.35	23.5	106	6.08
C.D.(0.05)		NS		9.75	0.23	0.46	1.36	
C.V. (%)		59.63		3.74	5.92	1.76	1.13	
Expt. Mean		4.23		228	3.35	22.73	105	
Soil type		Sand 32.2,Silt 48.6 & Clay 16.2						
pH		7.40						
F - levels (kg/ha)								
F1		60:30:30						
F2		120:60:60						
Recommended N:P:K (kg/ha)		120:60:60:25						
Varieties								
V1		IET 29743						
V2		IET 29741						
V3		IET 29833						
V4		IET 28523						
V5		IET 29742						
V6		IET 29290(R)						
V7		IET 29301(R)						
V8		IET 29257(R)						
V9		IET 29284(R)						
V10		IET 29014(R)						
V11		IET 29002(R)						
V12		IET 30757						
V13		IET 29859						
V14		NC- NDR 359						
V15		PR121 (N)						
V16		-						
V17		Karma Mahsuri (C)						
V18		-						
V19		-						
V20		-						
V21		-						
V22		Local Check - Sarjoo 52 (130 Days)						
Available N:P:K of soil (kg/ha)		205.4:23.5:232.5						

Table 4.1(d): Contd.

F-levels	Varieties	JAGDALPUR				
		Grain Yield (t/ha)	Rank	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 100% RDF)
F1: Low input 50% NPK	V1	4.98	7	24.53	92	
	V2	4.27	18	22.95	87	
	V3	5.22	4	20.1	96	
	V4	3.6	28	20.65	92	
	V5	4.93	8	25.47	93	
	V6	3.36	31	21.65	96	
	V7	3.45	30	16.18	105	
	V8	4.05	22	23.74	93	
	V9	4.6	12	19.93	95	
	V10	4.59	13	24.24	92	
	V11	4.29	17	25.35	91	
	V12	3.68	27	15.17	93	
	V13	4.68	10	26.7	92	
	V14	-		-	-	
	V15	3.82	25	28.31	92	
	V16	-		-	-	
	V17	5.01	6	18.66	91	
	V18	-		-	-	
	V19	-		-	-	
	V20	-		-	-	
	V21	-		-	-	
	V22	4.68	10	20.7	92	
F2: Optimum input 100% NPK	V1	5.5	2	24.36	95	4.95
	V2	5.32	3	23.67	91	10.00
	V3	5.13	5	19.36	99	-0.86
	V4	1.76	32	18.4	96	-17.52
	V5	5.83	1	24.24	95	8.57
	V6	4.21	19	20.53	99	8.10
	V7	3.78	26	18.3	101	3.14
	V8	4	24	23.38	108	-0.48
	V9	4.4	16	19.56	96	-1.90
	V10	4.44	14	23.31	91	-1.43
	V11	4.15	20	24.09	90	-1.33
	V12	4.41	15	15.12	96	6.95
	V13	4.03	23	24.82	95	-6.19
	V14	-		-	-	
	V15	3.53	29	27.45	95	-2.76
	V16	-		-	-	
	V17	4.7	9	18.59	94	-2.95
	V18	-		-	-	
	V19	-		-	-	
	V20	-		-	-	
	V21	-		-	-	
	V22	4.11	21	17.47	96	-5.43
Interaction						
F at same V		NS		NS	0.86	
V at same F		NS		NS	0.97	
F1		4.33	2	22.1	93	
F2		4.33	1	21.4	96	0.05
C.D.(0.05)		NS		NS	0.65	
C.V.(%)		15.29		5.43	0.78	

Table 4.1(d): Contd.

F-levels	Varieties	JAGDALPUR				
		Grain Yield (t/ha)	Rank	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 100% RDF)
Mean of varieties:						
V1		5.24	2	24.4	94	4.95
V2		4.80	5	23.3	89	10.00
V3		5.18	3	19.7	97	-0.86
V4		2.68	16	19.5	94	-17.52
V5		5.38	1	24.9	94	8.57
V6		3.79	13	21.1	97	8.10
V7		3.62	15	17.2	103	3.14
V8		4.03	12	23.6	101	-0.48
V9		4.50	7	19.7	96	-1.90
V10		4.52	6	23.8	92	-1.43
V11		4.22	10	24.7	90	-1.33
V12		4.05	11	15.1	94	6.95
V13		4.36	9	25.8	94	-6.19
V14		-		-	-	
V15		3.68	14	27.9	94	-2.76
V16		-		-	-	
V17		4.86	4	18.6	93	-2.95
V18		-		-	-	
V19		-		-	-	
V20		-		-	-	
V21		-		-	-	
V22		4.40	8	19.1	94	-5.43
C.D.(0.05)		0.78		1.78	0.61	
C.V. (%)		15.64		7.1	0.56	
Expt. Mean		4.33		21.78	95	
Soil type		Vertisol				
pH		6.58				
F - levels (kg/ha)						
F1		60:30:15				
F2		120:60:30				
Recommended N:P:K (kg/ha)		120:60:30				
Varieties						
V1		IET 29743				
V2		IET 29741				
V3		IET 29833				
V4		IET 28523				
V5		IET 29742				
V6		IET 29290(R)				
V7		IET 29301(R)				
V8		IET 29257(R)				
V9		IET 29284(R)				
V10		IET 29014(R)				
V11		IET 29002(R)				
V12		IET 30757				
V13		IET 29859				
V14		-				
V15		PR121 (N)				
V16		-				
V17		Karma Mahsuri (C)				
V18		-				
V19		-				
V20		-				
V21		-				
V22		Local Check - CG DHAN 1919				
Available N:P:K of soil (kg/ha)		-				

Table 4.1(d): Contd.

F-levels	Varieties	KARJAT Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 100% RDF)
F1: Low input 50% NPK	V1	3.56	15	238	4.21	25.72	95	
	V2	4.44	7	217	6.33	28.33	91	
	V3	3.39	19	215	3.90	23.46	95	
	V4	3.84	13	215	4.96	26.75	92	
	V5	3.77	14	212	4.23	26.47	96	
	V6	3.17	24	225	3.77	22.94	94	
	V7	2.98	27	242	3.66	21.68	94	
	V8	2.66	31	210	2.57	19.52	94	
	V9	3.86	12	212	5.02	27.50	97	
	V10	3.29	20	217	3.80	22.99	91	
	V11	4.22	10	260	5.15	27.53	91	
	V12	3.49	18	224	4.03	24.34	96	
	V13	3.56	15	245	4.14	25.47	97	
	V14	-		-	-	-	-	
	V15	-		-	-	-	-	
	V16	2.86	30	241	2.72	21.62	95	
	V17	2.46	32	265	2.46	19.42	97	
	V18	-		-	-	-	-	
	V19	-		-	-	-	-	
	V20	-		-	-	-	-	
	V21	-		-	-	-	-	
	V22	3.13	26	211	3.67	22.35	91	
F2: Optimum input 100% NPK	V1	4.52	6	260	4.49	26.76	96	9.60
	V2	5.58	1	243	7.68	30.81	92	11.40
	V3	3.97	11	236	4.17	24.68	96	5.80
	V4	5.24	4	253	5.28	28.31	96	14.00
	V5	4.65	5	253	4.58	28.06	98	8.80
	V6	3.29	20	244	4.05	24.27	96	1.20
	V7	3.24	23	256	3.72	23.56	98	2.60
	V8	2.97	28	252	3.35	22.69	95	3.10
	V9	5.45	3	234	6.49	28.67	98	15.90
	V10	3.56	15	237	4.17	24.63	92	2.70
	V11	5.48	2	289	7.50	28.81	92	12.60
	V12	4.34	9	255	4.33	25.51	97	8.50
	V13	4.38	8	262	4.36	26.55	98	8.20
	V14	-		-	-	-	-	
	V15	-		-	-	-	-	
	V16	3.15	25	259	3.53	23.43	98	2.90
	V17	2.90	29	287	2.78	20.43	98	4.40
	V18	-		-	-	-	-	
	V19	-		-	-	-	-	
	V20	-		-	-	-	-	
	V21	-		-	-	-	-	
	V22	3.27	22	248	3.85	23.69	91	1.40
Interaction								
F at same V		0.35		NS	NS	NS	NS	
V at same F		0.39		NS	NS	NS	NS	
F1		3.42	2	228	4.04	24.13	94	
F2		4.12	1	254	4.65	25.68	96	7.07
C.D.(0.05)		0.23		15.9	0.46	NS	0.91	
C.V.(%)		6.94		7.5	11.98	8.07	1.09	

Table 4.1(d): Contd.

F-levels	Varieties	KARJAT Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 100% RDF)
Mean of varieties:								
V1		4.04	6	249	4.35	26.24	96	9.60
V2		5.01	1	230	7.01	29.57	92	11.40
V3		3.68	9	225	4.04	24.07	95	5.80
V4		4.54	4	234	5.12	27.53	94	14.00
V5		4.21	5	233	4.41	27.27	97	8.80
V6		3.23	11	234	3.91	23.61	95	1.20
V7		3.11	13	249	3.69	22.62	96	2.60
V8		2.82	15	231	2.96	21.11	95	3.10
V9		4.66	3	223	5.76	28.09	98	15.90
V10		3.43	10	227	3.99	23.81	91	2.70
V11		4.85	2	275	6.33	28.17	92	12.60
V12		3.92	8	240	4.18	24.93	97	8.50
V13		3.97	7	254	4.25	26.01	98	8.20
V14		-		-	-	-	-	
V15		-		-	-	-	-	
V16		3.01	14	250	3.13	22.53	96	2.90
V17		2.68	16	276	2.62	19.93	98	4.40
V18		-		-	-	-	-	
V19		-		-	-	-	-	
V20		-		-	-	-	-	
V21		-		-	-	-	-	
V22		3.20	12	229	3.76	23.02	91	1.40
C.D.(0.05)		0.25		28.68	0.69	1.26	1.77	
C.V. (%)		5.74		10.3	13.79	4.36	1.62	
Expt. Mean		3.77		241	4.34	24.90	95	
Soil type		-						
pH		-						
F - levels (kg/ha)								
F1		50:25:25						
F2		100:50:50						
Recommended N:P:K (kg/ha)		100:50:50						
Varieties								
V1		IET 29743						
V2		IET 29741						
V3		IET 29833						
V4		IET 28523						
V5		IET 29742						
V6		IET 29290(R)						
V7		IET 29301(R)						
V8		IET 29257(R)						
V9		IET 29284(R)						
V10		IET 29014(R)						
V11		IET 29002(R)						
V12		IET 30757						
V13		IET 29859						
V14		-						
V15		-						
V16		CR Dhan 300 (E & NE)						
V17		Karma Mahsuri (C)						
V18		-						
V19		-						
V20		-						
V21		-						
V22		Local Check - KJT 2 (125-130 days)						
Available N:P:K of soil (kg/ha)		-						

Table 4.1(d): Contd.

F-levels	Varieties	KAUL					
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Nutri. res. (kg grain/kg Nutri.) (Base level 100% RDF)
F1: Low input 50% NPK	V1	5.11	17	263	2.70	26.37	
	V2	4.53	22	222	2.54	25.70	
	V3	3.61	28	201	2.25	23.53	
	V4	5.09	18	259	2.76	22.83	
	V5	4.55	21	221	2.54	26.33	
	V6	4.10	25	230	2.44	26.20	
	V7	-		-	-	-	
	V8	-		-	-	-	
	V9	4.19	24	209	2.54	26.17	
	V10	5.16	15	263	2.71	26.57	
	V11	3.80	26	234	2.43	26.00	
	V12	5.14	16	266	2.71	24.33	
	V13	3.71	27	239	2.25	23.00	
	V14	-		-	-	-	
	V15	4.85	19	248	2.73	26.20	
	V16	-		-	-	-	
	V17	4.28	23	225	2.43	24.73	
	V18	-		-	-	-	
	V19	-		-	-	-	
	V20	-		-	-	-	
	V21	-		-	-	-	
	V22	4.75	20	246	2.60	26.10	
F2: Optimum input 100% NPK	V1	6.55	3	295	2.98	26.53	10.67
	V2	5.84	12	246	2.66	26.10	9.70
	V3	5.85	11	268	2.68	23.73	16.59
	V4	6.72	2	288	2.89	26.97	12.07
	V5	5.82	13	265	2.66	26.63	9.41
	V6	5.72	14	255	2.68	27.93	12.00
	V7	-		-	-	-	
	V8	-		-	-	-	
	V9	5.97	8	259	2.62	27.73	13.19
	V10	6.53	4	288	2.89	26.67	10.15
	V11	5.88	10	248	2.73	26.37	15.41
	V12	6.45	5	293	2.89	25.13	9.70
	V13	5.94	9	260	2.41	23.10	16.52
	V14	-		-	-	-	
	V15	6.75	1	280	2.82	26.40	14.07
	V16	-		-	-	-	
	V17	6.03	7	245	2.62	25.27	12.96
	V18	-		-	-	-	
	V19	-		-	-	-	
	V20	-		-	-	-	
	V21	-		-	-	-	
	V22	6.28	6	283	2.85	27.90	11.33
Interaction							
F at same V		0.31		21.09	NS	1.42	
V at same F		0.32		20.88	NS	1.43	
F1		4.49	2	238	2.55	25.29	
F2		6.17	1	270	2.74	26.18	12.41
C.D.(0.05)		0.13		5.55	0.14	0.51	
C.V.(%)		2.66		2.51	5.65	2.12	

Table 4.1(d): Contd.

F-levels	Varieties	KAUL					
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Nutri. res. (kg grain/kg Nutri.) (Base level 100% RDF)
Mean of varieties:							
V1		5.83	3	279	2.84	26.45	10.67
V2		5.19	7	234	2.60	25.90	9.70
V3		4.73	14	235	2.47	23.63	16.59
V4		5.91	1	274	2.83	24.90	12.07
V5		5.19	7	243	2.60	26.48	9.41
V6		4.91	11	243	2.56	27.07	12.00
V7		-		-	-	-	
V8		-		-	-	-	
V9		5.08	10	234	2.58	26.95	13.19
V10		5.85	2	276	2.80	26.62	10.15
V11		4.84	12	241	2.58	26.19	15.41
V12		5.80	5	279	2.80	24.73	9.70
V13		4.83	13	250	2.33	23.05	16.52
V14		-		-	-	-	
V15		5.80	4	264	2.78	26.30	14.07
V16		-		-	-	-	
V17		5.16	9	235	2.53	25.00	12.96
V18		-		-	-	-	
V19		-		-	-	-	
V20		-		-	-	-	
V21		-		-	-	-	
V22		5.52	6	265	2.73	27.00	11.33
C.D.(0.05)		0.22		14.91	0.12	1.01	
C.V. (%)		3.58		5.13	3.97	3.39	
Expt. Mean		5.33		254	2.64	25.73	
Soil type		Clay Loam					
pH		8.00					
F - levels (kg/ha)							
F1		75:30:30					
F2		150:60:60					
Recommended N:P:K (kg/ha)		150:60:60					
Varieties							
V1		IET 29743					
V2		IET 29741					
V3		IET 29833					
V4		IET 28523					
V5		IET 29742					
V6		IET 29290(R)					
V7		-					
V8		-					
V9		IET 29284(R)					
V10		IET 29014(R)					
V11		IET 29002(R)					
V12		IET 30757					
V13		IET 29859					
V14		-					
V15		PR121 (N)					
V16		-					
V17		Karma Mahsuri (C)					
V18		-					
V19		-					
V20		-					
V21		-					
V22		Local Check - HKR 127(140 days)					
Available N:P:K of soil (kg/ha)		160:16:320					

Table 4.1(d): Contd.

F-levels	Varieties	MARUTERU Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 100% RDF)
F1: Low input 50% NPK	V1	6.83	1	294	4.98	25.57	98	
	V2	6.51	3	303	4.83	23.52	98	
	V3	5.59	11	308	4.36	22.61	107	
	V4	4.36	25	294	5.22	25.61	107	
	V5	5.75	9	284	6.26	26.56	99	
	V6	6.24	5	312	5.16	22.50	99	
	V7	4.27	26	291	3.82	26.93	111	
	V8	5.13	17	254	3.63	22.20	98	
	V9	4.89	19	298	4.90	21.24	105	
	V10	4.88	20	260	3.86	25.17	97	
	V11	3.97	30	191	4.23	18.29	99	
	V12	4.79	22	238	3.56	16.67	99	
	V13	5.80	8	274	3.66	27.84	96	
	V14	-		-	-	-	-	
	V15	5.17	16	311	3.47	25.72	98	
	V16	-		-	-	-	-	
	V17	5.50	14	253	4.22	6.08	97	
	V18	-		-	-	-	-	
	V19	-		-	-	-	-	
	V20	-		-	-	-	-	
	V21	-		-	-	-	-	
	V22	-		-	-	-	-	
F2: Optimum input 100% NPK	V1	6.56	2	263	5.35	25.24	98	-2.57
	V2	5.86	7	313	4.39	23.71	97	-6.19
	V3	5.58	12	313	5.38	22.56	108	-0.10
	V4	4.25	27	314	4.96	27.42	107	-1.05
	V5	4.84	21	228	5.95	26.27	100	-8.67
	V6	6.48	4	327	5.41	21.36	99	2.29
	V7	4.20	28	309	3.27	26.58	110	-0.67
	V8	5.02	18	326	3.69	24.17	98	-1.05
	V9	4.77	23	307	4.58	21.01	106	-1.14
	V10	5.56	13	247	4.73	26.45	97	6.48
	V11	4.08	29	272	5.27	18.46	100	1.05
	V12	5.34	15	251	3.87	16.08	98	5.24
	V13	6.10	6	288	3.66	26.15	97	2.86
	V14	-		-	-	-	-	
	V15	4.67	24	334	3.53	25.97	98	-4.76
	V16	-		-	-	-	-	
	V17	5.61	10	272	1.45	19.44	97	1.05
	V18	-		-	-	-	-	
	V19	-		-	-	-	-	
	V20	-		-	-	-	-	
	V21	-		-	-	-	-	
	V22	-		-	-	-	-	
Interaction								
F at same V		0.6		30.24	0.81	3.18	0.82	
V at same F		0.59		29.69	0.85	3.41	0.82	
F1		5.31	1	278	4.41	22.43	101	
F2		5.26	2	291	4.37	23.39	101	-0.48
C.D.(0.05)		NS		6.8	NS	NS	NS	
C.V.(%)		2.91		2.64	10.98	9.03	0.28	

Table 4.1(d): Contd.

F-levels	Varieties	MARUTERU						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 100% RDF)
Mean of varieties:								
V1		6.70	1	279	5.17	25.41	98	-2.57
V2		6.19	3	308	4.61	23.62	98	-6.19
V3		5.59	5	311	4.87	22.59	107	-0.10
V4		4.31	13	304	5.09	26.52	107	-1.05
V5		5.30	7	256	6.11	26.42	100	-8.67
V6		6.36	2	320	5.29	21.93	99	2.29
V7		4.24	14	300	3.55	26.76	111	-0.67
V8		5.08	9	290	3.66	23.19	98	-1.05
V9		4.83	12	302	4.74	21.13	106	-1.14
V10		5.22	8	254	4.30	25.81	97	6.48
V11		4.03	15	231	4.75	18.38	99	1.05
V12		5.07	10	245	3.72	16.38	98	5.24
V13		5.95	4	281	3.66	27.00	97	2.86
V14		-		-	-	-	-	
V15		4.92	11	322	3.50	25.85	98	-4.76
V16		-		-	-	-	-	
V17		5.56	6	263	2.84	12.76	97	1.05
V18		-		-	-	-	-	
V19		-		-	-	-	-	
V20		-		-	-	-	-	
V21		-		-	-	-	-	
V22		-		-	-	-	-	
C.D.(0.05)		0.42		21.39	0.57	2.25	0.58	
C.V. (%)		6.9		6.51	11.25	8.51	0.5	
Expt. Mean		5.29		284	4.39	22.91	101	
Soil type		-						
pH		5.95						
F - levels (kg/ha)								
F1		45:30:30						
F2		90:60:60						
Recommended N:P:K (kg/ha)		90:60:60						
Varieties								
V1		IET 29743						
V2		IET 29741						
V3		IET 29833						
V4		IET 28523						
V5		IET 29742						
V6		IET 29290(R)						
V7		IET 29301(R)						
V8		IET 29257(R)						
V9		IET 29284(R)						
V10		IET 29014(R)						
V11		IET 29002(R)						
V12		IET 30757						
V13		IET 29859						
V14		-						
V15		PR121 (N)						
V16		-						
V17		Karma Mahsuri (C)						
V18		-						
V19		-						
V20		-						
V21		-						
V22		-						
Available N:P:K of soil (kg/ha)		119:14.32:274						

Table 4.1(d): Contd.

F-levels	Varieties	NAGINA						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 100% RDF)
F1: Low input 50% NPK	V1	2.45	18	240	2.66	22.90	96	
	V2	2.36	25	231	2.70	22.88	103	
	V3	-		-	-	-	-	
	V4	2.37	22	229	2.72	22.97	104	
	V5	2.55	16	247	2.77	23.01	109	
	V6	2.35	26	241	2.76	23.46	112	
	V7	2.48	17	224	2.74	22.13	117	
	V8	2.44	19	238	2.72	22.91	108	
	V9	2.37	22	242	2.74	23.13	114	
	V10	2.40	21	237	2.77	22.87	98	
	V11	2.74	15	242	2.77	23.17	102	
	V12	2.43	20	237	2.66	22.95	113	
	V13	2.37	22	230	2.62	23.63	115	
	V14	-		-	-	-	-	
	V15	2.04	27	206	2.49	23.53	116	
	V16	-		-	-	-	-	
	V17	2.01	28	199	2.50	23.53	115	
	V18	-		-	-	-	-	
	V19	-		-	-	-	-	
	V20	-		-	-	-	-	
	V21	-		-	-	-	-	
	V22	-		-	-	-	-	
F2: Optimum input 100% NPK	V1	4.79	8	363	2.74	23.80	96	21.27
	V2	4.82	7	339	2.65	23.91	104	22.36
	V3	-		-	-	-	-	
	V4	4.87	6	353	2.83	23.56	103	22.73
	V5	4.89	3	340	2.86	23.58	109	21.27
	V6	4.92	1	354	2.84	23.48	112	23.36
	V7	4.90	2	357	2.84	23.43	118	22.00
	V8	4.89	3	360	2.84	23.39	108	22.27
	V9	4.74	10	342	2.85	23.57	114	21.55
	V10	4.88	5	365	2.84	23.42	98	22.55
	V11	4.69	12	368	2.85	23.29	103	17.73
	V12	4.77	9	305	2.71	23.63	114	21.27
	V13	4.74	10	323	2.84	23.97	116	21.55
	V14	-		-	-	-	-	
	V15	4.16	13	270	2.52	23.23	117	19.27
	V16	-		-	-	-	-	
	V17	4.08	14	255	2.52	23.14	118	18.82
	V18	-		-	-	-	-	
	V19	-		-	-	-	-	
	V20	-		-	-	-	-	
	V21	-		-	-	-	-	
	V22	-		-	-	-	-	
Interaction								
F at same V		NS		21.68	0.02	0.09	NS	
V at same F		NS		23.28	0.02	0.09	NS	
F1		2.38	2	232	2.69	23.08	109	
F2		4.72	1	335	2.77	23.53	109	21.29
C.D.(0.05)		0.07		13.18	0.01	0.03	NS	
C.V.(%)		2		4.95	0.3	0.12	0.72	

Table 4.1(d): Contd.

F-levels	Varieties	NAGINA						
		Grain Yield (t/ha)	Rank	Panicle/ m^2 (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 100% RDF)
Mean of varieties:								
	V1	3.62	7	302	2.70	23.35	96	21.27
	V2	3.59	10	285	2.68	23.40	103	22.36
	V3	-		-	-	-	-	
	V4	3.62	7	291	2.78	23.27	103	22.73
	V5	3.72	1	293	2.82	23.30	109	21.27
	V6	3.64	6	298	2.80	23.47	112	23.36
	V7	3.69	3	291	2.79	22.78	118	22.00
	V8	3.67	4	299	2.78	23.15	108	22.27
	V9	3.56	11	292	2.80	23.35	114	21.55
	V10	3.64	5	301	2.81	23.15	98	22.55
	V11	3.72	2	305	2.81	23.23	102	17.73
	V12	3.60	9	271	2.69	23.29	113	21.27
	V13	3.56	11	276	2.73	23.80	116	21.55
	V14	-		-	-	-	-	
	V15	3.10	13	238	2.51	23.38	116	19.27
	V16	-		-	-	-	-	
	V17	3.05	14	227	2.51	23.34	116	18.82
	V18	-		-	-	-	-	
	V19	-		-	-	-	-	
	V20	-		-	-	-	-	
	V21	-		-	-	-	-	
	V22	-		-	-	-	-	
	C.D.(0.05)	0.2		15.33	0.02	0.06	1.11	
	C.V. (%)	4.91		4.68	0.54	0.23	0.88	
	Expt. Mean	3.55		283	2.73	23.30	109	
	Soil type	-						
	pH	7.70						
	F - levels (kg/ha)							
	F1	60:30:20						
	F2	120:60:40						
	Recommended N:P:K (kg/ha)	120:60:40						
	Varieties							
	V1	IET 29743						
	V2	IET 29741						
	V3	-						
	V4	IET 28523						
	V5	IET 29742						
	V6	IET 29290(R)						
	V7	IET 29301(R)						
	V8	IET 29257(R)						
	V9	IET 29284(R)						
	V10	IET 29014(R)						
	V11	IET 29002(R)						
	V12	IET 30757						
	V13	IET 29859						
	V14	-						
	V15	PR121 (N)						
	V16	-						
	V17	Karma Mahsuri (C)						
	V18	-						
	V19	-						
	V20	-						
	V21	-						
	V22	-						
Available N:P:K of soil (kg/ha)		21:18.33:209						

Table 4.1(d): Contd.

F-levels	Varieties	NAVSARI						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 100% RDF)
F1: Low input 50% NPK	V1	3.25	36	331	4.82	23.78	90	
	V2	3.58	29	334	4.38	22.79	91	
	V3	4.00	18	337	5.80	20.22	88	
	V4	2.83	42	334	4.63	21.23	92	
	V5	3.92	21	328	5.55	24.96	88	
	V6	2.89	41	333	4.26	22.20	91	
	V7	3.49	33	329	1.90	18.95	103	
	V8	4.04	16	327	2.21	20.73	89	
	V9	4.26	12	323	2.32	14.33	97	
	V10	4.49	4	313	2.86	22.49	92	
	V11	3.57	30	327	6.57	26.48	91	
	V12	3.37	35	335	3.37	14.53	93	
	V13	3.74	27	331	2.90	24.59	100	
	V14	4.02	17	333	4.57	29.33	97	
	V15	3.76	26	332	3.38	26.42	92	
	V16	-		-	-	-	-	
	V17	3.93	19	334	6.38	22.21	95	
	V18	3.85	24	335	3.47	30.76	97	
	V19	2.97	40	341	5.57	30.08	95	
	V20	3.14	39	337	4.72	25.49	92	
	V21	3.93	19	335	4.41	17.58	88	
	V22	3.79	25	338	4.91	32.66	83	
F2: Optimum input 100% NPK	V1	3.57	30	330	4.93	23.92	91	4.92
	V2	4.32	11	339	4.56	23.00	89	11.38
	V3	4.36	8	346	6.05	20.33	88	5.54
	V4	3.17	38	344	4.74	21.41	92	5.23
	V5	4.45	5	339	5.69	25.08	89	8.15
	V6	3.40	34	346	4.50	22.38	91	7.85
	V7	3.89	23	334	2.60	19.01	101	6.15
	V8	4.43	6	338	2.63	20.77	90	6.00
	V9	4.73	2	339	2.51	15.58	97	7.23
	V10	4.80	1	330	2.95	22.54	90	4.77
	V11	3.91	22	339	6.70	26.56	93	5.23
	V12	3.64	28	346	3.61	14.56	93	4.15
	V13	4.19	14	341	3.05	24.66	101	6.92
	V14	4.33	10	345	4.74	29.37	96	4.77
	V15	4.18	15	340	3.61	26.41	91	6.46
	V16	-		-	-	-	-	
	V17	4.34	9	341	6.59	22.27	95	6.31
	V18	4.39	7	344	3.56	30.81	97	8.31
	V19	3.18	37	360	5.66	30.14	94	3.23
	V20	3.53	32	351	4.83	25.55	91	6.00
	V21	4.50	3	346	4.90	17.63	87	8.77
	V22	4.24	13	343	4.89	32.71	84	6.92
Interaction								
F at same V		NS		NS	0.08	NS	1.17	
V at same F		NS		NS	0.08	NS	1.6	
F1		3.66	2	332	4.24	23.4	92	
F2		4.07	1	342	4.44	23.6	92	6.40
C.D.(0.05)		0.24		NS	0.04	NS	NS	
C.V.(%)		8.1		4.07	1.24	1.81	2.03	

Table 4.1(d): Contd.

F-levels	Varieties	NAVSARI Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 100% RDF)
Mean of varieties:								
	V1	3.41	17	330	4.88	23.9	91	4.92
	V2	3.95	13	336	4.47	22.9	90	11.38
	V3	4.18	6	342	5.93	20.3	88	5.54
	V4	3.00	21	339	4.69	21.3	92	5.23
	V5	4.19	5	333	5.62	25.0	89	8.15
	V6	3.15	19	339	4.38	22.3	91	7.85
	V7	3.69	15	332	2.25	19.0	102	6.15
	V8	4.24	3	332	2.42	20.8	90	6.00
	V9	4.50	2	331	2.42	15.0	97	7.23
	V10	4.65	1	322	2.91	22.5	91	4.77
	V11	3.74	14	333	6.64	26.5	92	5.23
	V12	3.51	16	341	3.49	14.5	93	4.15
	V13	3.97	12	336	2.98	24.6	100	6.92
	V14	4.18	7	339	4.66	29.4	97	4.77
	V15	3.97	11	336	3.50	26.4	92	6.46
	V16	-		-	-	-	-	
	V17	4.14	8	337	6.49	22.2	95	6.31
	V18	4.12	9	340	3.52	30.8	97	8.31
	V19	3.08	20	351	5.62	30.1	94	3.23
	V20	3.34	18	344	4.78	25.5	91	6.00
	V21	4.22	4	341	4.66	17.6	88	8.77
	V22	4.02	10	340	4.90	32.7	84	6.92
	C.D.(0.05)	0.37		7.46	0.06	0.47	0.82	
	C.V. (%)	8.41		1.94	1.13	1.77	0.78	
	Expt. Mean	3.87		337	4.34	23.49	92	
	Soil type	Clayey						
	pH	7.88						
F - levels (kg/ha)								
	F1	50:15:0						
	F2	100:30:0						
	Recommended N:P:K (kg/ha)	100:30:0						
	Varieties							
	V1	IET 29743						
	V2	IET 29741						
	V3	IET 29833						
	V4	IET 28523						
	V5	IET 29742						
	V6	IET 29290(R)						
	V7	IET 29301(R)						
	V8	IET 29257(R)						
	V9	IET 29284(R)						
	V10	IET 29014(R)						
	V11	IET 29002(R)						
	V12	IET 30757						
	V13	IET 29859						
	V14	NC- NDR 359						
	V15	PR121 (N)						
	V16	-						
	V17	Karma Mahsuri (C)						
	V18	Akshaydhan (W)						
	V19	Jaya (S)						
	V20	HRI 174						
	V21	Hybrid Check - GRH-2						
	V22	Local Check - GR-17(113-118 days)						
Available N:P:K of soil (kg/ha)		252.6:34.2:855						

Table 4.1(d): Contd.

F-levels	Varieties	NAWAGAM Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 100% RDF)
F1: Low input 50% NPK	V1	6.66	8	288	3.94	22.20	108	
	V2	6.78	7	306	3.96	22.37	102	
	V3	5.36	24	244	4.15	20.07	108	
	V4	4.18	30	245	5.36	19.50	105	
	V5	5.57	21	224	3.59	24.33	108	
	V6	5.30	26	213	4.84	22.30	104	
	V7	3.25	32	261	3.75	16.97	111	
	V8	5.02	28	306	3.54	22.40	103	
	V9	5.38	23	206	4.87	18.43	106	
	V10	5.87	15	226	5.09	22.80	102	
	V11	5.82	16	233	5.06	24.90	102	
	V12	5.33	25	231	3.67	14.73	106	
	V13	5.44	22	306	3.65	24.63	102	
	V14	-		-	-	-	-	
	V15	5.64	20	261	3.49	24.87	101	
	V16	-		-	-	-	-	
	V17	5.09	27	267	4.00	17.50	112	
	V18	-		-	-	-	-	
	V19	-		-	-	-	-	
	V20	-		-	-	-	-	
	V21	-		-	-	-	-	
	V22	5.82	16	235	3.35	16.67	94	
F2: Optimum input 100% NPK	V1	6.99	3	297	4.75	23.17	109	5.28
	V2	7.64	1	315	5.47	22.20	104	13.76
	V3	6.47	13	263	4.85	20.50	109	17.76
	V4	4.57	29	314	5.41	20.07	108	6.24
	V5	6.57	11	284	4.93	23.90	111	16.00
	V6	6.04	14	295	5.16	20.83	107	11.84
	V7	3.65	31	301	4.19	15.47	113	6.40
	V8	5.67	18	351	3.93	22.13	106	10.40
	V9	6.49	12	271	5.73	17.50	107	17.76
	V10	6.87	4	287	7.05	24.23	103	16.00
	V11	7.01	2	286	5.72	25.10	106	19.04
	V12	6.64	9	319	4.64	15.27	109	20.96
	V13	6.60	10	343	4.52	25.83	106	18.56
	V14	-		-	-	-	-	
	V15	6.85	5	317	4.07	26.47	106	19.36
	V16	-		-	-	-	-	
	V17	5.67	18	321	4.67	17.60	112	9.28
	V18	-		-	-	-	-	
	V19	-		-	-	-	-	
	V20	-		-	-	-	-	
	V21	-		-	-	-	-	
	V22	6.83	6	319	4.92	17.23	97	16.16
Interaction								
F at same V		NS		NS	NS	NS	NS	
V at same F		NS		NS	NS	NS	NS	
F1		5.41	2	253	4.14	20.92	105	
F2		6.29	1	305	5.00	21.09	107	14.05
C.D.(0.05)		NS		25.91	NS	NS	0.68	
C.V.(%)		17.68		10.56	22.29	13.01	0.73	

Table 4.1(d): Contd.

F-levels	Varieties	NAWAGAM						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 100% RDF)
Mean of varieties:								
V1		6.83	2	293	4.35	22.69	109	5.28
V2		7.21	1	311	4.72	22.29	103	13.76
V3		5.92	11	253	4.50	20.29	109	17.76
V4		4.38	15	279	5.39	19.79	106	6.24
V5		6.07	7	254	4.26	24.12	109	16.00
V6		5.67	12	254	5.00	21.57	106	11.84
V7		3.45	16	281	3.97	16.22	112	6.40
V8		5.35	14	329	3.74	22.27	105	10.40
V9		5.94	10	238	5.30	17.97	107	17.76
V10		6.37	4	257	6.07	23.52	102	16.00
V11		6.42	3	259	5.39	25.00	104	19.04
V12		5.99	9	275	4.16	15.00	108	20.96
V13		6.02	8	325	4.09	25.23	104	18.56
V14		-		-	-	-	-	
V15		6.25	6	289	3.78	25.67	104	19.36
V16		-		-	-	-	-	
V17		5.38	13	294	4.34	17.55	112	9.28
V18		-		-	-	-	-	
V19		-		-	-	-	-	
V20		-		-	-	-	-	
V21		-		-	-	-	-	
V22		6.33	5	277	4.14	16.95	95	16.16
C.D.(0.05)		0.37		27.28	0.88	1.44	1.36	
C.V. (%)		5.42		8.46	16.74	5.94	1.11	
Expt. Mean		5.85		279	4.57	21.01	106	
Soil type		-						
pH		7.93						
F - levels (kg/ha)								
F1		50:12.5:0						
F2		100:25:0						
Recommended N:P:K (kg/ha)		100:25:0						
Varieties								
V1		IET 29743						
V2		IET 29741						
V3		IET 29833						
V4		IET 28523						
V5		IET 29742						
V6		IET 29290(R)						
V7		IET 29301(R)						
V8		IET 29257(R)						
V9		IET 29284(R)						
V10		IET 29014(R)						
V11		IET 29002(R)						
V12		IET 30757						
V13		IET 29859						
V14		-						
V15		PR121 (N)						
V16		-						
V17		Karma Mahsuri (C)						
V18		-						
V19		-						
V20		-						
V21		-						
V22		Local Check - Mahisagar(115 days)						
Available N:P:K of soil (kg/ha)		251:146:269						

Table 4.1(d): Contd.

F-levels	Varieties	PANTNAGAR						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 100% RDF)
F1: Low input 50% NPK	V1	2.68	28	223	1.50	31.70	96	
	V2	2.62	30	177	1.84	21.23	94	
	V3	2.90	23	181	1.85	26.37	110	
	V4	3.10	22	186	1.98	20.33	98	
	V5	2.77	25	192	1.68	20.80	103	
	V6	2.79	24	212	1.54	23.63	100	
	V7	2.63	29	215	1.47	24.67	116	
	V8	2.73	26	198	1.64	20.83	104	
	V9	4.43	13	211	2.33	26.27	107	
	V10	4.04	16	199	2.36	25.73	94	
	V11	3.68	19	219	1.86	24.17	95	
	V12	2.72	27	243	1.37	19.73	108	
	V13	3.23	20	246	1.55	25.87	97	
	V14	-		-	-	-	-	
	V15	4.09	15	228	1.90	26.23	99	
	V16	-		-	-	-	-	
	V17	3.13	21	223	1.60	29.57	97	
	V18	-		-	-	-	-	
	V19	-		-	-	-	-	
	V20	-		-	-	-	-	
	V21	-		-	-	-	-	
	V22	-		-	-	-	-	
F2: Optimum input 100% NPK	V1	4.64	8	242	2.15	31.67	95	17.82
	V2	4.54	10	217	2.31	22.40	95	17.45
	V3	4.37	14	230	2.20	26.17	116	13.36
	V4	4.49	11	234	2.17	21.43	96	12.64
	V5	4.80	6	266	2.06	25.80	103	18.45
	V6	5.05	4	252	2.28	23.17	105	20.55
	V7	4.92	5	261	2.11	25.77	119	20.82
	V8	4.63	9	252	2.13	21.17	100	17.27
	V9	5.53	1	266	2.32	26.90	106	10.00
	V10	5.10	3	241	2.36	26.70	94	9.64
	V11	5.16	2	269	2.08	24.57	94	13.45
	V12	4.04	16	247	1.93	21.33	103	12.00
	V13	4.48	12	278	1.77	25.40	96	11.36
	V14	-		-	-	-	-	
	V15	4.66	7	256	2.10	25.60	97	5.18
	V16	-		-	-	-	-	
	V17	3.69	18	230	1.87	28.20	95	5.09
	V18	-		-	-	-	-	
	V19	-		-	-	-	-	
	V20	-		-	-	-	-	
	V21	-		-	-	-	-	
	V22	-		-	-	-	-	
Interaction								
F at same V		0.37		12.82	0.14	0.26	NS	
V at same F		0.4		13.47	0.14	0.45	NS	
F1		3.17	2	210	1.76	24.48	101	
F2		4.67	1	249	2.12	25.09	101	13.67
C.D.(0.05)		0.21		6.82	0.07	0.48	NS	
C.V.(%)		5.89		3.27	3.85	2.13	0.93	

Table 4.1(d): Contd.

F-levels	Varieties	PANTNAGAR						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 100% RDF)
Mean of varieties:								
V1		3.66	11	233	1.83	31.69	96	17.82
V2		3.58	13	197	2.08	21.82	94	17.45
V3		3.64	12	205	2.03	26.27	113	13.36
V4		3.80	7	210	2.08	20.88	97	12.64
V5		3.79	8	229	1.87	23.30	103	18.45
V6		3.92	5	232	1.91	23.40	102	20.55
V7		3.78	9	238	1.79	25.22	117	20.82
V8		3.68	10	225	1.89	21.00	102	17.27
V9		4.98	1	238	2.33	26.59	106	10.00
V10		4.57	2	220	2.36	26.22	94	9.64
V11		4.42	3	244	1.97	24.37	95	13.45
V12		3.38	15	245	1.65	20.53	106	12.00
V13		3.86	6	262	1.66	25.64	96	11.36
V14		-		-	-	-	-	
V15		4.38	4	242	2.00	25.92	98	5.18
V16		-		-	-	-	-	
V17		3.41	14	227	1.74	28.89	96	5.09
V18		-		-	-	-	-	
V19		-		-	-	-	-	
V20		-		-	-	-	-	
V21		-		-	-	-	-	
V22		-		-	-	-	-	
C.D.(0.05)		0.27		9.06	0.1	0.19	3.86	
C.V. (%)		5.85		3.42	4.34	0.65	3.31	
Expt. Mean		3.92		230	1.94	24.78	101	
Soil type		Silt Loam						
pH		7.50						
F - levels (kg/ha)								
F1		60:30:20						
F2		120:60:40						
Recommended N:P:K (kg/ha)		120:60:40						
Varieties								
V1		IET 29743						
V2		IET 29741						
V3		IET 29833						
V4		IET 28523						
V5		IET 29742						
V6		IET 29290(R)						
V7		IET 29301(R)						
V8		IET 29257(R)						
V9		IET 29284(R)						
V10		IET 29014(R)						
V11		IET 29002(R)						
V12		IET 30757						
V13		IET 29859						
V14		-						
V15		PR121 (N)						
V16		-						
V17		Karma Mahsuri (C)						
V18		-						
V19		-						
V20		-						
V21		-						
V22		-						
Available N:P:K of soil (kg/ha)		222.3:38.5:212.3						

Table 4.1(d): Contd.

F-levels	Varieties	PUDUCHERRY					
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Nutri. res. (kg grain/kg Nutri.) (Base level 100% RDF)
F1: Low input 50% NPK	V1	4.88	18	258	4.82	23.29	
	V2	4.36	31	169	4.71	20.15	
	V3	4.40	30	182	4.78	23.11	
	V4	4.52	28	189	3.74	24.25	
	V5	4.81	20	230	4.64	23.31	
	V6	4.76	23	206	3.68	22.37	
	V7	4.79	21	220	4.52	18.12	
	V8	4.46	29	174	3.31	17.97	
	V9	4.72	24	194	4.49	13.46	
	V10	4.62	26	204	4.58	21.29	
	V11	4.70	25	240	4.37	21.89	
	V12	4.83	19	239	3.55	12.87	
	V13	4.91	17	232	3.81	22.27	
	V14	-		-	-	-	
	V15	4.77	22	220	3.39	12.40	
	V16	-		-	-	-	
	V17	4.56	27	171	4.28	23.32	
	V18	-		-	-	-	
	V19	-		-	-	-	
	V20	-		-	-	-	
	V21	-		-	-	-	
	V22	3.94	32	159	3.93	17.03	
F2: Optimum input 100% NPK	V1	6.63	1	334	5.53	23.66	17.50
	V2	6.12	14	217	5.19	20.23	17.60
	V3	6.20	12	223	5.33	23.15	18.00
	V4	6.27	11	234	4.56	24.36	17.50
	V5	6.42	6	294	5.37	23.40	16.10
	V6	6.41	7	262	3.98	22.48	16.50
	V7	6.45	5	281	5.23	18.15	16.60
	V8	5.87	15	215	3.88	18.03	14.10
	V9	6.30	10	248	4.80	13.59	15.80
	V10	6.32	9	256	4.96	21.43	17.00
	V11	6.46	3	302	4.90	22.02	17.60
	V12	6.55	2	316	4.42	12.90	17.20
	V13	6.46	3	309	4.00	22.38	15.50
	V14	-		-	-	-	
	V15	6.36	8	275	3.74	14.51	15.90
	V16	-		-	-	-	
	V17	6.19	13	229	4.82	23.47	16.30
	V18	-		-	-	-	
	V19	-		-	-	-	
	V20	-		-	-	-	
	V21	-		-	-	-	
	V22	5.57	16	204	4.23	17.10	16.30
Interaction							
F at same V		0.07		3.06	0.06	0.23	
V at same F		0.28		23.33	0.07	0.22	
F1		4.63	2	206	4.16	19.82	
F2		6.29	1	263	4.68	20.05	16.59
C.D.(0.05)		0.37		32.44	0.05	0.01	
C.V.(%)		7.68		15.47	1.22	0.03	

Table 4.1(d): Contd.

F-levels	Varieties	PUDUCHERRY					
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Nutri. res. (kg grain/kg Nutri.) (Base level 100% RDF)
Mean of varieties:							
V1		5.76	1	296	5.18	23.48	17.50
V2		5.24	14	193	4.95	20.19	17.60
V3		5.30	13	203	5.06	23.13	18.00
V4		5.40	11	212	4.15	24.31	17.50
V5		5.62	5	262	5.01	23.36	16.10
V6		5.59	6	234	3.83	22.43	16.50
V7		5.62	4	251	4.88	18.14	16.60
V8		5.17	15	195	3.60	18.00	14.10
V9		5.51	9	221	4.65	13.53	15.80
V10		5.47	10	230	4.77	21.36	17.00
V11		5.58	7	271	4.64	21.96	17.60
V12		5.69	2	278	3.99	12.89	17.20
V13		5.69	3	271	3.91	22.33	15.50
V14		-		-	-	-	
V15		5.57	8	247	3.57	13.46	15.90
V16		-		-	-	-	
V17		5.38	12	200	4.55	23.40	16.30
V18		-		-	-	-	
V19		-		-	-	-	
V20		-		-	-	-	
V21		-		-	-	-	
V22		4.76	16	182	4.08	17.07	16.30
C.D.(0.05)		0.05		2.16	0.04	0.16	
C.V. (%)		0.83		0.8	0.78	0.71	
Expt. Mean		5.46		234	4.42	19.94	
Soil type		Clay loam					
pH		6.39					
F - levels (kg/ha)							
F1		60:20:20					
F2		120:40:40					
Recommended N:P:K (kg/ha)		120:40:40					
Varieties							
V1		IET 29743					
V2		IET 29741					
V3		IET 29833					
V4		IET 28523					
V5		IET 29742					
V6		IET 29290(R)					
V7		IET 29301(R)					
V8		IET 29257(R)					
V9		IET 29284(R)					
V10		IET 29014(R)					
V11		IET 29002(R)					
V12		IET 30757					
V13		IET 29859					
V14		-					
V15		PR121 (N)					
V16		-					
V17		Karma Mahsuri (C)					
V18		-					
V19		-					
V20		-					
V21		-					
V22		Local Check - White Ponni(135 days)					
Available N:P:K of soil (kg/ha)		156.8:30.8:125					

Table 4.1(d): Contd.

F-levels	Varieties	PUSA Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 100% RDF)
F1: Low input 50% NPK	V1	4.04	14	205	2.20	21.90	103	
	V2	3.54	22	178	1.97	22.00	101	
	V3	3.50	23	173	2.10	22.40	102	
	V4	3.92	18	193	1.67	22.53	102	
	V5	3.76	20	190	2.07	22.00	104	
	V6	3.64	21	174	1.87	23.17	103	
	V7	3.25	26	165	1.80	21.83	99	
	V8	3.28	25	163	1.73	22.33	101	
	V9	3.19	27	157	1.80	22.60	98	
	V10	3.03	29	154	1.63	21.83	94	
	V11	3.18	28	151	1.57	23.37	100	
	V12	2.56	30	132	1.53	21.43	102	
	V13	4.00	15	198	2.00	22.43	101	
	V14	-		-	-	-	-	
	V15	-		-	-	-	-	
	V16	4.26	8	201	2.10	23.43	100	
	V17	-		-	-	-	-	
	V18	-		-	-	-	-	
	V19	-		-	-	-	-	
	V20	-		-	-	-	-	
	V21	-		-	-	-	-	
	V22	3.95	17	208	2.13	21.07	92	
F2: Optimum input 100% NPK	V1	4.79	3	239	2.93	22.17	105	6.82
	V2	4.06	13	202	2.67	22.30	103	4.73
	V3	4.11	10	201	2.80	22.73	103	5.55
	V4	4.63	5	223	2.80	23.03	103	6.45
	V5	4.45	6	220	3.00	22.40	105	6.27
	V6	4.33	7	203	2.87	23.60	105	6.27
	V7	4.00	15	199	2.60	22.27	101	6.82
	V8	4.07	11	197	2.50	22.83	104	7.18
	V9	4.07	11	195	2.63	23.07	100	8.00
	V10	3.84	19	192	2.60	22.20	98	7.36
	V11	4.16	9	194	2.60	23.77	102	8.91
	V12	3.47	24	176	2.40	21.90	104	8.27
	V13	4.75	4	230	2.40	22.87	104	6.82
	V14	-		-	-	-	-	
	V15	-		-	-	-	-	
	V16	4.98	1	233	3.10	23.73	102	6.55
	V17	-		-	-	-	-	
	V18	-		-	-	-	-	
	V19	-		-	-	-	-	
	V20	-		-	-	-	-	
	V21	-		-	-	-	-	
	V22	4.81	2	246	3.20	21.67	95	7.82
Interaction								
F at same V		NS		NS	0.19	NS	NS	
V at same F		NS		NS	0.22	NS	NS	
F1		3.54	2	176	1.88	22.29	100	
F2		4.30	1	210	2.74	22.70	102	6.92
C.D.(0.05)		0.26		12.65	0.15	0.07	0.42	
C.V.(%)		7.29		7.23	7.35	0.32	0.45	

Table 4.1(d): Contd.

F-levels	Varieties	PUSA						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 100% RDF)
Mean of varieties:								
V1		4.42	2	222	2.57	22.04	104	6.82
V2		3.80	9	190	2.32	22.15	102	4.73
V3		3.81	8	187	2.45	22.57	102	5.55
V4		4.28	5	208	2.24	22.78	103	6.45
V5		4.11	6	205	2.54	22.20	105	6.27
V6		3.99	7	189	2.37	23.39	104	6.27
V7		3.63	13	182	2.20	22.05	100	6.82
V8		3.68	10	180	2.12	22.58	103	7.18
V9		3.63	12	176	2.22	22.84	99	8.00
V10		3.44	14	173	2.12	22.02	96	7.36
V11		3.67	11	172	2.09	23.57	101	8.91
V12		3.02	15	154	1.97	21.67	103	8.27
V13		4.38	4	214	2.20	22.65	102	6.82
V14		-		-	-	-	-	
V15		-		-	-	-	-	
V16		4.62	1	217	2.60	23.58	101	6.55
V17		-		-	-	-	-	
V18		-		-	-	-	-	
V19		-		-	-	-	-	
V20		-		-	-	-	-	
V21		-		-	-	-	-	
V22		4.38	3	227	2.67	21.37	94	7.82
C.D.(0.05)		0.16		7.4	0.13	0.29	2.06	
C.V. (%)		3.53		3.32	4.98	1.12	1.76	
Expt. Mean		3.92		193	2.31	22.50	101	
Soil type		Sandy loam						
pH		8.60						
F - levels (kg/ha)								
F1		60:30:20						
F2		120:60:40						
Recommended N:P:K (kg/ha)		120:60:40						
Varieties								
V1		IET 29743						
V2		IET 29741						
V3		IET 29833						
V4		IET 28523						
V5		IET 29742						
V6		IET 29290(R)						
V7		IET 29301(R)						
V8		IET 29257(R)						
V9		IET 29284(R)						
V10		IET 29014(R)						
V11		IET 29002(R)						
V12		IET 30757						
V13		IET 29859						
V14		-						
V15		-						
V16		CR Dhan 300 (E & NE)						
V17		-						
V18		-						
V19		-						
V20		-						
V21		-						
V22		Local Check - Rajendra Saraswati(110-115 days)						
Available N:P:K of soil (kg/ha)		-						

Table 4.1(d): Contd.

F-levels	Varieties	Rajendrangar ARI Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Panicle wt (g)	Test wt (g)	Nutri. res. (kg grain/kg Nutri.) (Base level 100% RDF)
F1: Low input 50% NPK	V1	2.79	29	227	3.12	21.67	
	V2	3.65	19	264	4.51	23.97	
	V3	3.51	21	257	3.92	21.03	
	V4	2.95	26	237	4.09	15.50	
	V5	3.66	18	264	4.48	23.50	
	V6	2.81	28	233	3.81	20.73	
	V7	2.44	31	138	2.90	13.77	
	V8	3.19	24	253	2.69	19.80	
	V9	3.26	23	255	3.83	17.53	
	V10	2.65	30	196	4.68	24.13	
	V11	2.39	32	138	5.24	26.57	
	V12	2.83	27	233	3.47	12.60	
	V13	3.85	17	265	3.16	25.97	
	V14	-		-	-	-	
	V15	3.08	25	243	2.97	25.33	
	V16	-		-	-	-	
	V17	3.59	20	263	3.27	16.23	
	V18	-		-	-	-	
	V19	-		-	-	-	
	V20	-		-	-	-	
	V21	-		-	-	-	
	V22	3.49	22	256	3.14	11.00	
F2: Optimum input 100% NPK	V1	5.07	14	306	3.52	22.57	20.73
	V2	5.95	4	357	4.64	25.03	20.91
	V3	5.84	6	353	4.55	20.83	21.18
	V4	6.28	2	367	5.95	16.67	30.27
	V5	5.01	15	298	4.83	23.50	12.27
	V6	4.74	16	292	4.87	22.67	17.55
	V7	5.78	7	348	3.38	14.50	30.36
	V8	5.17	11	316	2.80	20.67	18.00
	V9	5.33	10	321	4.46	19.33	18.82
	V10	5.64	9	341	5.40	25.50	27.18
	V11	5.67	8	342	5.82	28.03	29.82
	V12	5.98	3	358	4.33	13.40	28.64
	V13	7.12	1	388	3.31	26.90	29.73
	V14	-		-	-	-	
	V15	5.14	12	315	3.11	26.33	18.73
	V16	-		-	-	-	
	V17	5.10	13	312	3.50	17.17	13.73
	V18	-		-	-	-	
	V19	-		-	-	-	
	V20	-		-	-	-	
	V21	-		-	-	-	
	V22	5.94	5	356	3.42	11.77	22.27
Interaction							
F at same V		0.74		31.66	NS	0.41	
V at same F		0.76		30.81	NS	0.48	
F1		3.13	2	233	3.71	19.96	
F2		5.61	1	336	4.24	20.93	22.51
C.D.(0.05)		0.32		3.93	0.07	0.34	
C.V.(%)		8.28		1.58	1.89	1.92	

Table 4.1(d): Contd.

F-levels	Varieties	Rajendrangar ARI Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Nutri. res. (kg grain/kg Nutri.) (Base level 100% RDF)
Mean of varieties:							
V1		3.93	15	266	3.32	22.12	20.73
V2		4.80	2	310	4.58	24.50	20.91
V3		4.68	4	305	4.24	20.93	21.18
V4		4.62	5	302	5.02	16.09	30.27
V5		4.34	8	281	4.66	23.50	12.27
V6		3.78	16	263	4.34	21.70	17.55
V7		4.11	12	243	3.14	14.14	30.36
V8		4.18	10	284	2.75	20.24	18.00
V9		4.30	9	288	4.15	18.43	18.82
V10		4.15	11	269	5.04	24.82	27.18
V11		4.03	14	240	5.53	27.30	29.82
V12		4.41	6	296	3.90	13.00	28.64
V13		5.49	1	327	3.24	26.44	29.73
V14		-		-	-	-	
V15		4.11	13	279	3.04	25.83	18.73
V16		-		-	-	-	
V17		4.35	7	288	3.39	16.70	13.73
V18		-		-	-	-	
V19		-		-	-	-	
V20		-		-	-	-	
V21		-		-	-	-	
V22		4.72	3	306	3.28	11.39	22.27
C.D.(0.05)		0.53		22.39	0.51	0.29	
C.V. (%)		10.4		6.82	11.22	1.24	
Expt. Mean		4.37		284	3.97	20.44	
Soil type		-					
pH		7.00					
F - levels (kg/ha)							
F1		60:30:20					
F2		120:60:40					
Recommended N:P:K (kg/ha)		120:60:40					
Varieties							
V1		IET 29743					
V2		IET 29741					
V3		IET 29833					
V4		IET 28523					
V5		IET 29742					
V6		IET 29290(R)					
V7		IET 29301(R)					
V8		IET 29257(R)					
V9		IET 29284(R)					
V10		IET 29014(R)					
V11		IET 29002(R)					
V12		IET 30757					
V13		IET 29859					
V14		-					
V15		PR121 (N)					
V16		-					
V17		Karma Mahsuri (C)					
V18		-					
V19		-					
V20		-					
V21		-					
V22		Local Check - RNR 15048(120 days)					
Available N:P:K of soil (kg/ha)		-					

Table 4.1(d): Contd.

F-levels	Varieties	TITABAR						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 100% RDF)
F1: Low input 50% NPK	V1	4.80	27	266	4.20	23.17	98	
	V2	6.54	9	238	5.57	26.07	93	
	V3	5.40	22	250	5.07	24.57	119	
	V4	6.24	15	260	4.20	21.30	96	
	V5	5.47	21	241	5.27	25.77	96	
	V6	5.26	24	258	4.10	25.27	96	
	V7	3.78	38	240	4.80	20.60	119	
	V8	4.80	27	233	3.40	22.47	99	
	V9	4.99	25	280	5.80	20.30	99	
	V10	7.43	3	260	4.17	26.17	92	
	V11	7.12	6	205	3.97	26.13	119	
	V12	5.74	19	217	4.00	25.17	91	
	V13	5.66	20	251	4.23	22.27	90	
	V14	3.80	37	243	4.80	23.03	97	
	V15	6.43	13	269	4.00	21.43	93	
	V16	3.85	36	255	5.03	21.63	97	
	V17	4.58	32	204	3.93	24.17	123	
	V18	2.75	42	234	4.07	28.70	100	
	V19	3.61	40	222	4.03	21.90	89	
	V20	-		-	-	-	-	
	V21	4.43	34	296	4.80	21.17	90	
	V22	3.68	39	229	4.23	23.53	103	
F2: Optimum input 100% NPK	V1	6.10	17	270	4.47	23.67	101	21.67
	V2	7.40	4	243	6.07	26.40	96	14.33
	V3	6.87	8	257	5.37	25.00	122	24.50
	V4	7.12	6	263	4.50	22.07	99	14.67
	V5	6.41	14	252	5.77	26.17	99	15.67
	V6	6.06	18	267	4.40	25.77	99	13.33
	V7	4.74	29	250	5.30	20.97	122	16.00
	V8	6.20	16	241	3.70	22.87	102	23.33
	V9	6.47	11	285	6.23	20.90	102	24.67
	V10	7.51	2	267	4.27	26.57	95	1.33
	V11	7.75	1	213	4.50	26.70	122	10.50
	V12	6.54	9	224	4.50	25.67	94	13.33
	V13	6.47	11	259	4.70	22.67	93	13.50
	V14	4.60	31	249	5.23	23.67	100	13.33
	V15	7.23	5	273	4.40	21.83	96	13.33
	V16	4.65	30	261	5.57	22.00	100	13.33
	V17	5.37	23	213	4.40	24.67	125	13.17
	V18	3.54	41	243	4.50	29.33	103	13.17
	V19	4.42	35	195	4.57	22.40	91	13.50
	V20	-		-	-	-	-	
	V21	4.90	26	302	5.30	21.43	93	7.83
	V22	4.52	33	235	4.50	24.30	105	14.00
Interaction								
F at same V		NS		NS	NS	NS	NS	
V at same F		NS		NS	NS	NS	NS	
F1		5.06	2	245	4.46	23.56	100	
F2		5.95	1	251	4.87	24.05	103	14.69
C.D.(0.05)		0.06		NS	0.13	0.09	0.14	
C.V.(%)		1.39		5.13	3.57	0.52	0.18	

Table 4.1(d): Contd.

F-levels	Varieties	TITABAR						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 100% RDF)
Mean of varieties:								
V1		5.45	13	268	4.34	23.42	100	21.67
V2		6.97	3	241	5.82	26.24	95	14.33
V3		6.14	7	254	5.22	24.79	121	24.50
V4		6.68	5	262	4.35	21.69	98	14.67
V5		5.94	9	247	5.52	25.97	98	15.67
V6		5.66	11	263	4.25	25.52	98	13.33
V7		4.26	16	245	5.05	20.79	121	16.00
V8		5.50	12	237	3.55	22.67	100	23.33
V9		5.73	10	283	6.02	20.60	101	24.67
V10		7.47	1	264	4.22	26.37	94	1.33
V11		7.44	2	209	4.24	26.42	121	10.50
V12		6.14	6	221	4.25	25.42	92	13.33
V13		6.07	8	255	4.47	22.47	91	13.50
V14		4.20	18	246	5.02	23.35	98	13.33
V15		6.83	4	271	4.20	21.63	95	13.33
V16		4.25	17	258	5.30	21.82	99	13.33
V17		4.98	14	208	4.17	24.42	124	13.17
V18		3.15	21	239	4.29	29.02	102	13.17
V19		4.02	20	209	4.30	22.15	90	13.50
V20		-		-	-	-	-	
V21		4.67	15	299	5.05	21.30	92	7.83
V22		4.10	19	232	4.37	23.92	104	14.00
C.D.(0.05)		1.2		17.61	0.39	0.88	1.68	
C.V. (%)		19.1		6.21	7.39	3.25	1.45	
Expt. Mean		5.51		248	4.66	23.81	101	
Soil type		-						
pH		5.70						
F - levels (kg/ha)								
F1		30:10:20						
F2		60:20:40						
Recommended N:P:K (kg/ha)		60:20:40						
Varieties								
V1		IET 29743						
V2		IET 29741						
V3		IET 29833						
V4		IET 28523						
V5		IET 29742						
V6		IET 29290(R)						
V7		IET 29301(R)						
V8		IET 29257(R)						
V9		IET 29284(R)						
V10		IET 29014(R)						
V11		IET 29002(R)						
V12		IET 30757						
V13		IET 29859						
V14		NC- NDR 359						
V15		PR121 (N)						
V16		CR Dhan 300 (E & NE)						
V17		Karma Mahsuri (C)						
V18		Akshaydhan (W)						
V19		Jaya (S)						
V20		-						
V21		Hybrid Check						
V22		Local Check - TTB-404(135 days)						
Available N:P:K of soil (kg/ha)		-						

Table 4.1(d): Contd.

F-levels	Varieties	VARANASI						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 100% RDF)
F1: Low input 50% NPK	V1	4.83	3	196	39.36	21.74	95	
	V2	4.97	2	208	34.58	23.87	95	
	V3	5.90	1	172	32.78	23.06	111	
	V4	3.39	23	196	34.33	22.37	100	
	V5	3.79	19	186	33.45	25.41	101	
	V6	2.90	24	170	33.73	23.82	98	
	V7	4.17	15	230	38.08	21.22	115	
	V8	4.53	10	225	33.20	23.18	105	
	V9	1.53	27	66	15.04	6.90	35	
	V10	1.06	32	55	15.38	8.80	31	
	V11	4.48	13	189	44.39	24.68	95	
	V12	1.13	31	68	13.18	8.04	35	
	V13	4.33	14	210	35.04	26.10	111	
	V14	-		-	-	-	-	
	V15	3.63	20	188	34.49	24.26	108	
	V16	-		-	-	-	-	
	V17	3.99	17	187	29.90	23.66	116	
	V18	-		-	-	-	-	
	V19	-		-	-	-	-	
	V20	-		-	-	-	-	
	V21	-		-	-	-	-	
	V22	1.39	30	65	10.70	7.94	32	
F2: Optimum input 100% NPK	V1	4.68	7	169	40.23	22.79	98	-1.36
	V2	4.49	12	191	46.32	24.34	95	-4.36
	V3	4.77	4	203	34.84	14.41	113	-10.27
	V4	3.50	22	170	38.83	24.91	100	1.00
	V5	4.77	4	179	41.80	25.51	101	8.91
	V6	3.57	21	178	34.64	21.84	99	6.09
	V7	3.90	18	183	33.93	24.90	115	-2.45
	V8	4.59	8	195	46.82	23.22	106	0.55
	V9	1.48	28	62	14.85	8.04	35	-0.45
	V10	1.62	25	67	14.19	8.81	32	5.09
	V11	4.59	8	176	44.90	24.29	95	1.00
	V12	1.54	26	65	13.17	9.18	35	3.73
	V13	4.53	10	188	38.69	25.75	109	1.82
	V14	-		-	-	-	-	
	V15	4.12	16	203	40.68	25.56	109	4.45
	V16	-		-	-	-	-	
	V17	4.73	6	194	37.28	22.28	114	6.73
	V18	-		-	-	-	-	
	V19	-		-	-	-	-	
	V20	-		-	-	-	-	
	V21	-		-	-	-	-	
	V22	1.48	28	62	13.70	8.64	32	0.82
Interaction								
F at same V		NS		NS	NS	NS	NS	
V at same F		NS		NS	NS	NS	NS	
F1		3.50	2	163	29.85	19.69	86	
F2		3.65	1	155	33.43	19.65	87	1.33
C.D.(0.05)		NS		NS	0.5	NS	0.32	
C.V.(%)		9.12		7.6	1.8	19.42	0.42	

Table 4.1(d): Contd.

F-levels	Varieties	VARANASI						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 100% RDF)
	Mean of varieties:							
	V1	4.76	2	183	39.80	22.27	97	-1.36
	V2	4.73	3	200	40.45	24.11	95	-4.36
	V3	5.34	1	188	33.81	18.74	112	-10.27
	V4	3.45	11	183	36.58	23.64	100	1.00
	V5	4.28	8	183	37.63	25.46	101	8.91
	V6	3.24	12	174	34.19	22.83	99	6.09
	V7	4.04	9	207	36.01	23.06	115	-2.45
	V8	4.56	4	210	40.01	23.20	105	0.55
	V9	1.51	13	64	14.95	7.47	35	-0.45
	V10	1.34	15	61	14.79	8.81	32	5.09
	V11	4.54	5	183	44.65	24.49	95	1.00
	V12	1.34	16	66	13.18	8.61	35	3.73
	V13	4.43	6	199	36.87	25.93	110	1.82
	V14	-		-	-	-	-	
	V15	3.88	10	195	37.59	24.91	109	4.45
	V16	-		-	-	-	-	
	V17	4.36	7	191	33.59	22.97	115	6.73
	V18	-		-	-	-	-	
	V19	-		-	-	-	-	
	V20	-		-	-	-	-	
	V21	-		-	-	-	-	
	V22	1.44	14	63	12.20	8.29	32	0.82
	C.D.(0.05)	1.23		54.81	12.39	7.62	29.95	
	C.V. (%)	29.85		29.8	33.91	33.54	29.95	
	Expt. Mean	3.57		159	31.64	19.67	87	
	Soil type	Loam						
	pH	7.40						
	F - levels (kg/ha)							
	F1	60:30:20						
	F2	120:60:40						
	Recommended N:P:K (kg/ha)	120:60:40						
	Varieties							
	V1	IET 29743						
	V2	IET 29741						
	V3	IET 29833						
	V4	IET 28523						
	V5	IET 29742						
	V6	IET 29290(R)						
	V7	IET 29301(R)						
	V8	IET 29257(R)						
	V9	IET 29284(R)						
	V10	IET 29014(R)						
	V11	IET 29002(R)						
	V12	IET 30757						
	V13	IET 29859						
	V14	-						
	V15	PR121 (N)						
	V16	-						
	V17	Karma Mahsuri (C)						
	V18	-						
	V19	-						
	V20	-						
	V21	-						
	V22	Local Check - HUR 105						
	Available N:P:K of soil (kg/ha)	-						

Table 4.1(d): Contd.

F-levels	Varieties	WARANGAL							Over all mean	Rank
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)		
F1: Low input 50% NPK	V1	6.36	5	351	3.40	24.20	93		4.38	20
	V2	-		-	-	-	-		4.38	19
	V3	5.20	9	348	5.13	25.07	96		4.27	21
	V4	3.44	21	287	7.00	27.17	93		3.77	34
	V5	5.09	10	326	6.97	25.50	89		4.18	23
	V6	2.24	27	335	4.33	23.90	92		4.10	27
	V7	4.47	14	332	4.37	18.47	104		3.42	40
	V8	4.16	17	335	2.97	23.90	93		3.77	35
	V9	2.05	28	325	5.07	19.03	97		3.80	32
	V10	6.03	7	311	5.23	24.47	87		4.12	24
	V11	3.98	19	337	5.07	25.47	87		3.99	28
	V12	3.37	22	330	3.90	16.60	95		3.61	37
	V13	4.14	18	317	3.53	28.13	91		4.12	25
	V14	-		-	-	-	-		3.57	39
	V15	3.66	20	341	4.70	19.13	85		4.10	26
	V16	-		-	-	-	-		3.66	36
	V17	4.80	11	347	3.37	21.93	84		3.92	30
	V18	-		-	-	-	-		3.30	42
	V19	-		-	-	-	-		3.29	43
	V20	-		-	-	-	-		2.84	44
	V21	-		-	-	-	-		3.61	38
	V22	-		-	-	-	-		3.89	31
F2: Optimum input 100% NPK	V1	7.34	2	360	3.43	24.93	93	8.91	5.51	2
	V2	-		-	-	-	-		5.66	1
	V3	5.28	8	352	5.83	24.67	96	0.73	5.36	4
	V4	3.20	24	350	7.47	27.13	93	-2.18	4.78	13
	V5	7.28	3	326	7.83	25.40	89	19.91	5.37	3
	V6	6.43	4	355	4.57	23.77	93	38.09	5.12	9
	V7	4.53	13	354	5.87	19.20	103	0.55	4.40	18
	V8	4.20	16	339	3.23	23.63	94	0.36	4.71	15
	V9	7.36	1	337	5.83	19.77	97	48.27	5.24	5
	V10	6.24	6	324	5.40	25.10	87	1.91	5.17	8
	V11	2.53	26	345	5.40	26.17	87	-13.18	5.18	7
	V12	3.19	25	347	4.23	20.97	95	-1.64	4.72	14
	V13	4.22	15	338	3.83	27.20	92	0.73	5.22	6
	V14	-		-	-	-	-		4.56	17
	V15	3.34	23	364	4.87	24.70	85	-2.91	4.99	10
	V16	-		-	-	-	-		4.26	22
	V17	4.78	12	360	3.63	24.83	84	-0.18	4.79	11
	V18	-		-	-	-	-		3.97	29
	V19	-		-	-	-	-		3.80	33
	V20	-		-	-	-	-		3.32	41
	V21	-		-	-	-	-		4.66	16
	V22	-		-	-	-	-		4.78	12
Interaction										
F at same V		0.25		15.5	NS	2.05	NS			
V at same F		0.31		15.63	NS	2.65	NS			
F1		4.21	2	330	4.65	23.07	92		3.95	2
F2		4.99	1	346	5.10	24.11	92	7.10	5.04	1
C.D.(0.05)		0.25		5.9	0.1	NS	NS			
C.V.(%)		5.85		1.86	2.16	10.26	0.41			

Table 4.1(d): Contd.

F-levels	Varieties	WARANGAL Grain Yield (t/ha)	Rank	Panicle / m^2 (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)	Over all mean	Rank
Mean of varieties:										
	V1	6.85	1	356	3.42	24.57	93	8.91	4.95	2
	V2	-		-	-	-	-		5.02	1
	V3	5.24	4	350	5.48	24.87	96	0.73	4.81	3
	V4	3.32	12	318	7.24	27.15	93	-2.18	4.28	13
	V5	6.19	2	326	7.40	25.45	89	19.91	4.78	4
	V6	4.34	8	345	4.45	23.84	92	38.09	4.61	7
	V7	4.50	7	343	5.12	18.84	104	0.55	3.91	19
	V8	4.18	9	337	3.10	23.77	93	0.36	4.24	14
	V9	4.71	6	331	5.45	19.40	97	48.27	4.52	10
	V10	6.14	3	317	5.32	24.79	87	1.91	4.64	6
	V11	3.26	14	341	5.24	25.82	87	-13.18	4.59	8
	V12	3.28	13	339	4.07	18.79	95	-1.64	4.16	15
	V13	4.18	9	328	3.68	27.67	92	0.73	4.67	5
	V14	-		-	-	-	-		4.07	17
	V15	3.50	11	353	4.79	21.92	85	-2.91	4.55	9
	V16	-		-	-	-	-		3.96	18
	V17	4.79	5	354	3.50	23.38	84	-0.18	4.35	11
	V18	-		-	-	-	-		3.63	20
	V19	-		-	-	-	-		3.55	21
	V20	-		-	-	-	-		3.08	22
	V21	-		-	-	-	-		4.14	16
	V22	-		-	-	-	-		4.34	12
C.D.(0.05)		0.18		10.96	0.48	1.45	0.67			
C.V. (%)		3.3		2.81	8.62	5.33	0.63			
Expt. Mean		4.60		338	4.87	23.59	92		4.50	
Soil type		Clay								
pH		8.49								
F - levels (kg/ha)										
F1		60:30:20								
F2		120:60:40								
Recommended N:P:K (kg/ha)		120:60:40								
Varieties										
V1		IET 29743								
V2		-								
V3		IET 29833								
V4		IET 28523								
V5		IET 29742								
V6		IET 29290(R)								
V7		IET 29301(R)								
V8		IET 29257(R)								
V9		IET 29284(R)								
V10		IET 29014(R)								
V11		IET 29002(R)								
V12		IET 30757								
V13		IET 29859								
V14		-								
V15		PR121 (N)								
V16		-								
V17		Karma Mahsuri (C)								
V18		-								
V19		-								
V20		-								
V21		-								
V22		-								
Available N:P:K of soil (kg/ha)		125:51:358								

Table 4.1 (e): Summary of data on grain yield and ancillary characters of selected late cultures grown under transplanted conditions at graded levels of recommended fertilizer doses, kharif 2023.

F-levels	Varieties	ADUTHURAI Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt(g)	Test wt(g)	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1	V1	7.29	4	266	4.42	18.47	
	V2	6.77	11	252	3.15	17.40	
	V3	6.51	14	278	3.52	16.27	
	V4	7.00	6	261	3.22	16.33	
	V5	6.98	8	257	5.11	19.30	
	V6	6.64	12	282	4.25	18.63	
	V7	6.44	15	292	5.31	19.47	
	V8	-	-	-	-	-	
	V9	-	-	-	-	-	
	V10	6.17	16	242	2.22	17.43	
F2	V1	7.80	1	281	4.52	19.40	4.08
	V2	7.71	3	261	3.37	18.37	7.52
	V3	7.00	6	288	3.63	17.53	3.92
	V4	7.27	5	273	2.66	17.37	2.16
	V5	7.74	2	264	5.45	20.33	6.08
	V6	6.97	9	295	4.38	19.50	2.64
	V7	6.82	10	302	5.56	20.30	3.04
	V8	-	-	-	-	-	-
	V9	-	-	-	-	-	-
	V10	6.55	13	262	2.34	18.40	3.04
Interaction							
F at same V		NS		NS	0.26	NS	
V at same F		NS		NS	0.26	NS	
F1		6.73	2	266	3.90	17.91	
F2		7.23	1	278	3.99	18.90	4.06
C.D.(0.05)		0.32		6.38	NS	0.19	
C.V.(%)		3.7		1.89	2.23	0.83	
Mean of varieties:							
V1		7.55	1	274	4.47	18.94	4.08
V2		7.24	3	257	3.26	17.89	7.52
V3		6.76	6	283	3.58	16.90	3.92
V4		7.14	4	267	2.94	16.85	2.16
V5		7.36	2	261	5.28	19.82	6.08
V6		6.81	5	288	4.32	19.07	2.64
V7		6.63	7	297	5.44	19.89	3.04
V8		-	-	-	-	-	-
V9		-	-	-	-	-	-
V10		6.36	8	252	2.28	17.92	3.04
C.D.(0.05)		0.38		4.04	0.18	0.17	
C.V. (%)		4.59		1.25	3.96	0.76	
Expt. Mean		6.98		272	3.94	18	

Table 4.1 (e): Contd.

F-levels	Varieties	ADUTHURAI					
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt(g)	Test wt(g)	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Soil type		Clay					
pH		7.20					
N - levels (kg/ha)							
F1		75:25:25					
F2		150:50:50					
Recommended N:P:K (kg/ha)		150:50:50					
Varieties							
V1		IET 28524					
V2		IET 29891					
V3		IET 29935					
V4		IET 30826					
V5		IET 30829					
V6		Swarna (NC)					
V7		Salivahana (W)					
V8		-					
V9		-					
V10		Local Check - ADT 56					
Available N:P:K of soil (kg/ha)		278:42:465					

Table 4.1 (e): Contd.

F-levels	Varieties	CHINSURAH				
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt(g)	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1	V1	4.53	5	347	4.23	
	V2	4.12	12	304	2.13	
	V3	4.22	10	334	3.45	
	V4	4.21	11	233	2.22	
	V5	3.52	14	320	1.48	
	V6	3.50	15	327	3.12	
	V7	-	-	-	-	
	V8	3.57	13	280	2.01	
	V9	-	-	-	-	
	V10	3.04	16	287	2.47	
F2	V1	5.46	2	370	5.01	11.63
	V2	4.54	4	353	4.56	5.25
	V3	5.49	1	395	4.77	15.88
	V4	4.51	6	320	4.37	3.75
	V5	5.01	3	344	4.56	18.63
	V6	4.45	8	341	4.11	11.88
	V7	-	-	-	-	-
	V8	4.50	7	288	4.01	11.63
	V9	-	-	-	-	-
	V10	4.35	9	301	4.55	16.38
Interaction						
F at same V		0.35		10.48	0.56	
V at same F		0.36		11.86	0.63	
F1		3.84	2	304	2.64	
F2		4.79	1	339	4.49	11.88
C.D.(0.05)		0.19		8.53	0.44	
C.V.(%)		3.62		2.14	9.86	
Mean of varieties:						
V1		5.00	1	358	4.62	11.63
V2		4.33	4	329	3.35	5.25
V3		4.86	2	364	4.11	15.88
V4		4.36	3	277	3.30	3.75
V5		4.27	5	332	3.02	18.63
V6		3.98	7	334	3.62	11.88
V7		-	-	-	-	-
V8		4.04	6	284	3.01	11.63
V9		-	-	-	-	-
V10		3.70	8	294	3.51	16.38
C.D.(0.05)		0.24		7.41	0.4	
C.V. (%)		4.79		1.95	9.4	
Expt. Mean		4.31		321	3.57	

Table 4.1 (e): Contd.

F-levels	Varieties	CHINSURAH				
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt(g)	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Soil type		Clay Loam				
pH		-				
N - levels (kg/ha)						
F1		40:20:20				
F2		80:40:40				
Recommended N:P:K (kg/ha)		80:40:40				
Varieties						
V1		IET 28524				
V2		IET 29891				
V3		IET 29935				
V4		IET 30826				
V5		IET 30829				
V6		Swarna (NC)				
V7		-				
V8		Pushyami (S)				
V9		-				
V10		Local Check - Kanak				
Available N:P:K of soil (kg/ha)		-				

Table 4.1 (e): Contd.

F-levels	Varieties	CHIPLIMA					
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Test wt(g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1	V1	5.07	4	244	20.53	101	
	V2	4.20	16	196	20.27	100	
	V3	4.73	9	205	80.63	100	
	V4	4.67	11	193	20.43	99	
	V5	4.23	15	183	20.17	99	
	V6	5.00	5	229	20.83	116	
	V7	-	-	-	-	-	
	V8	4.53		204	20.67	99	
	V9	-	-	-	-	-	
	V10	4.90	7	221	20.47	117	
F2	V1	5.50	1	267	21.30	103	3.91
	V2	4.50	14	215	20.97	100	2.73
	V3	4.93	6	244	20.97	101	1.82
	V4	4.73	9	202	21.03	102	0.55
	V5	4.57	12	218	20.83	102	3.09
	V6	5.50	1	247	21.07	120	4.55
	V7	-	-	-	-	-	-
	V8	4.83		248	20.93	103	2.73
	V9	-	-	-	-	-	-
	V10	5.13	3	219	20.93	118	2.09
Interaction							
F at same V		NS		NS	NS	NS	
V at same F		NS		NS	NS	NS	
F1		4.67	2	209	28.00	104	
F2		4.96	1	233	21.00	106	2.68
C.D.(0.05)		0.22		13.15	NS	1.55	
C.V.(%)		3.65		4.79	106.86	1.19	
Mean of varieties:							
V1		5.29	1	255	20.92	102	3.91
V2		4.35	8	206	20.62	100	2.73
V3		4.83	4	225	50.80	101	1.82
V4		4.70	5	197	20.73	101	0.55
V5		4.40	7	200	20.50	101	3.09
V6		5.25	2	238	20.95	118	4.55
V7		-	-	-	-	-	-
V8		4.68	6	226	20.80	101	2.73
V9		-	-	-	-	-	-
V10		5.02	3	220	20.70	118	2.09
C.D.(0.05)		0.32		14.92	NS	1.66	
C.V. (%)		5.69		5.71	106.26	1.34	
Expt. Mean		4.81		221	25	105	

Table 4.1 (e): Contd.

F-levels	Varieties	CHIPLIMA					
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Test wt(g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Soil type		Sandy loam					
pH		-					
N - levels (kg/ha)							
F1		60:30:20					
F2		120:60:40					
Recommended N:P:K (kg/ha)		120:60:40					
Varieties							
V1		IET 28524					
V2		IET 29891					
V3		IET 29935					
V4		IET 30826					
V5		IET 30829					
V6		Swarna (NC)					
V7		-					
V8		Pushyami (S)					
V9		-					
V10		Local Check - Hasanta (145 days)					
Available N:P:K of soil (kg/ha)		-					

Table 4.1 (e): Contd.

F-levels	Varieties	DHANGAIN Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt(g)	Test wt(g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1	V1	5.16	9	263	4.44	23.20	100	
	V2	4.25	15	236	3.88	21.07	73	
	V3	4.47	14	241	3.66	22.27	109	
	V4	4.18	16	232	3.44	20.67	91	
	V5	4.76	13	245	4.00	22.40	87	
	V6	4.80	12	252	4.00	22.93	102	
	V7	-	-	-	-	-	-	
	V8	5.42	6	275	4.66	25.20	103	
	V9	-	-	-	-	-	-	
	V10	4.97	11	259	4.33	23.20	97	
F2	V1	6.50	2	283	4.55	24.40	102	12.18
	V2	5.26	8	246	3.88	22.27	74	9.18
	V3	5.31	7	253	4.00	22.67	111	7.64
	V4	5.06	10	241	3.77	20.80	93	8.00
	V5	5.72	5	260	4.11	22.93	89	8.73
	V6	6.21	4	269	4.11	23.73	104	12.82
	V7	-	-	-	-	-	-	-
	V8	6.69	1	289	5.33	25.87	105	11.55
	V9	-	-	-	-	-	-	-
	V10	6.33	3	274	4.55	24.27	99	12.36
Interaction								
F at same V		NS		NS	NS	NS	NS	
V at same F		NS		NS	NS	NS	NS	
F1		4.75	2	250	4.05	22.62	95	
F2		5.89	1	264	4.29	23.37	97	10.31
C.D.(0.05)		0.14		7.10	NS	NS	0.18	
C.V.(%)		2.08		2.22	10.04	4.15	0.15	
Mean of varieties:								
V1		5.83	2	273	4.50	23.80	101	12.18
V2		4.76	7	241	3.88	21.67	74	9.18
V3		4.89	6	247	3.83	22.47	110	7.64
V4		4.62	8	237	3.61	20.74	92	8.00
V5		5.24	5	253	4.06	22.67	88	8.73
V6		5.51	4	261	4.06	23.33	103	12.82
V7		-	-	-	-	-	-	-
V8		6.06	1	282	5.00	25.54	104	11.55
V9		-	-	-	-	-	-	-
V10		5.65	3	267	4.44	23.74	98	12.36
C.D.(0.05)		0.56		25.86	NS	1.79	0.64	
C.V. (%)		8.87		8.50	17.23	6.59	0.56	
Expt. Mean		5.32		257	4.17	23	96	

Table 4.1 (e): Contd.

F-levels	Varieties	DHANGAIN						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt(g)	Test wt(g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Soil type		Clay loam						
pH		6.35						
N - levels (kg/ha)								
F1		60:30:20						
F2		120:60:40						
Recommended N:P:K (kg/ha)		120:60:40						
Varieties								
V1		IET 28524						
V2		IET 29891						
V3		IET 29935						
V4		IET 30826						
V5		IET 30829						
V6		Swarna (NC)						
V7		-						
V8		Pushyami (S)						
V9		-						
V10		Local Check - R.Mahsuri (150 days)						
Available N:P:K of soil (kg/ha)		282:42:262						

Table 4.1 (e): Contd.

F-levels	Varieties	KARJAT						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt(g)	Test wt(g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1	V1	3.24	11	280	2.76	29.00	113	
	V2	2.64	14	250	1.87	18.58	111	
	V3	2.76	13	252	2.26	22.81	105	
	V4	3.56	10	281	2.87	29.11	99	
	V5	2.56	15	231	1.84	18.47	103	
	V6	2.86	12	279	2.63	24.59	107	
	V7	-	-	-	-	-	-	
	V8	3.86	9	299	2.95	30.08	110	
	V9	-	-	-	-	-	-	
	V10	2.40	16	227	1.77	18.38	111	
F2	V1	4.54	3	317	3.15	30.67	115	13.00
	V2	4.17	6	283	2.68	20.83	115	15.30
	V3	4.26	5	284	3.02	24.03	108	15.00
	V4	4.85	2	317	3.16	31.23	107	12.90
	V5	4.15	7	268	2.40	20.43	110	15.90
	V6	4.36	4	313	3.05	25.39	108	15.00
	V7	-	-	-	-	-	-	-
	V8	5.26	1	330	3.26	31.75	112	14.00
	V9	-	-	-	-	-	-	-
	V10	3.96	8	257	1.98	20.21	114	15.60
Interaction								
F at same V		NS		NS	0.28	NS	NS	
V at same F		NS		NS	0.34	NS	NS	
F1		2.99	2	262	2.37	23.88	107	
F2		4.44	1	296	2.84	25.57	111	14.59
C.D.(0.05)		0.43		22.98	0.28	NS	1.43	
C.V.(%)		9.23		6.63	8.71	7.64	1.06	
Mean of varieties:								
V1		3.89	3	298	2.96	29.84	114	13.00
V2		3.41	6	267	2.28	19.71	113	15.30
V3		3.51	5	268	2.64	23.42	106	15.00
V4		4.21	2	299	3.02	30.17	103	12.90
V5		3.36	7	249	2.12	19.45	106	15.90
V6		3.61	4	296	2.84	24.99	107	15.00
V7		-	-	-	-	-	-	-
V8		4.56	1	314	3.11	30.92	111	14.00
V9		-	-	-	-	-	-	-
V10		3.18	8	242	1.88	19.30	113	15.60
C.D.(0.05)		0.31		18.28	0.19	2.67	2.75	
C.V. (%)		7.07		5.54	6.32	9.12	2.13	
Expt. Mean		3.71		279	2.60	25	109	

Table 4.1 (e): Contd.

F-levels	Varieties	KARJAT						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt(g)	Test wt(g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Soil type		-						
pH		-						
N - levels (kg/ha)								
F1		50:25:25						
F2		100:50:50						
Recommended N:P:K (kg/ha)		100:50:50						
Varieties								
V1		IET 28524						
V2		IET 29891						
V3		IET 29935						
V4		IET 30826						
V5		IET 30829						
V6		Swarna (NC)						
V7		-						
V8		Pushyami (S)						
V9		-						
V10		Local Check - KJT 8 (135-140 days)						
Available N:P:K of soil (kg/ha)		-						

Table 4.1 (e): Contd.

F-levels	Varieties	MANDYA Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Panicle wt(g)	Test wt(g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1	V1	5.23	10	314	4.18	19.96	106	
	V2	5.15	11	322	3.14	25.95	100	
	V3	5.77	6	303	4.18	20.18	118	
	V4	3.90	16	312	2.80	23.43	101	
	V5	4.52	15	298	3.45	25.09	100	
	V6	5.43	8	367	2.71	19.72	113	
	V7	0.00	17	0	0.00	0.00	0	
	V8	4.64	14	316	4.53	18.56	111	
	V9	0.00	17	0	0.00	0.00	0	
	V10	4.98	12	322	3.24	21.90	112	
F2	V1	5.86	3	338	4.91	20.52	105	6.30
	V2	5.79	5	343	3.87	26.11	100	6.40
	V3	6.51	1	339	5.03	20.12	117	7.40
	V4	4.77	13	339	3.43	24.38	100	8.70
	V5	5.31	9	321	3.80	24.99	100	7.90
	V6	6.24	2	390	2.81	19.93	113	8.10
	V7	-	-	-	-	-	-	-
	V8	5.83	4	328	4.71	18.23	112	11.90
	V9	-	-	-	-	-	-	-
	V10	5.63	7	352	3.35	21.91	112	6.50
Interaction								
F at same V		NS		NS	NS	NS	NS	
V at same F		NS		NS	NS	NS	NS	
F1		3.96	2	255	2.82	17.48	86	
F2		5.74	1	344	3.99	22.02	107	17.81
C.D.(0.05)		0.71		NS	NS	NS	NS	
C.V.(%)		10.68		12.45	14.06	1.37	0.47	
Mean of varieties:								
V1		5.55	3	326	4.55	20.24	106	6.30
V2		5.47	4	333	3.51	26.03	100	6.40
V3		6.14	1	321	4.61	20.15	117	7.40
V4		4.34	8	325	3.12	23.91	101	8.70
V5		4.92	7	309	3.63	25.04	100	7.90
V6		5.84	2	378	2.76	19.83	113	8.10
V7		-	-	-	-	-	-	-
V8		5.24	6	322	4.62	18.40	112	11.90
V9		-	-	-	-	-	-	-
V10		5.31	5	337	3.30	21.91	112	6.50
C.D.(0.05)		0.68		37.35	0.49	0.77	0.73	
C.V. (%)		10.78		9.53	10.97	2.96	0.57	
Expt. Mean		5.35		331	3.76	21.9	107	

Table 4.1 (e): Contd.

F-levels	Varieties	MANDYA						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt(g)	Test wt(g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Soil type		Red Sandy Loam						
pH		7.51						
N - levels (kg/ha)								
F1		50:25:25						
F2		100:50:50						
Recommended N:P:K (kg/ha)		100:50:50						
Varieties								
V1		IET 28524						
V2		IET 29891						
V3		IET 29935						
V4		IET 30826						
V5		IET 30829						
V6		Swarna (NC)						
V7		-						
V8		Pushyami (S)						
V9		-						
V10		Local Check - BR 2655(140-145 days)						
Available N:P:K of soil (kg/ha)		368:65:245						

Table 4.1 (e): Contd.

F-levels	Varieties	MARUTERU						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt(g)	Test wt(g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1	V1	4.48	12	276	3.46	20.71	107	
	V2	3.94	13	265	3.64	25.25	88	
	V3	6.20	6	276	3.63	22.09	94	
	V4	5.86	8	296	2.82	22.86	96	
	V5	6.07	7	343	3.94	24.25	97	
	V6	6.60	3	330	4.13	16.86	115	
	V7	-	-	-	-	-	-	
	V8	7.44	1	297	5.13	18.56	115	
	V9	-	-	-	-	-	-	
	V10	-	-	-	-	-	-	
F2	V1	5.51	11	305	4.01	21.29	107	9.81
	V2	3.70	14	293	3.73	25.62	88	-2.29
	V3	5.76	10	308	4.20	22.65	94	-4.19
	V4	5.82	9	280	2.87	21.88	96	-0.38
	V5	6.99	2	331	3.74	24.22	97	8.76
	V6	6.60	3	340	4.09	19.91	114	0.00
	V7	-	-	-	-	-	-	-
	V8	6.60	3	306	5.24	18.49	116	-8.00
	V9	-	-	-	-	-	-	-
	V10	-	-	-	-	-	-	-
Interaction								
F at same V		0.61		NS	0.26	NS	NS	
V at same F		0.58		NS	0.25	NS	NS	
F1		5.80	2	297	3.82	21.51	102	
F2		5.85	1	309	3.98	22.01	102	0.53
C.D.(0.05)		NS		8.87	0.07	NS	NS	
C.V.(%)		2.31		2.20	1.39	7.63	0.66	
Mean of varieties:								
V1		5.00	6	291	3.74	21.00	107	9.81
V2		3.82	7	279	3.69	25.44	88	-2.29
V3		5.98	4	292	3.92	22.37	94	-4.19
V4		5.84	5	288	2.85	22.37	96	-0.38
V5		6.53	3	337	3.84	24.24	97	8.76
V6		6.60	2	335	4.11	18.39	114	0.00
V7		-	-	-	-	-	-	-
V8		7.02	1	301	5.19	18.53	115	-8.00
V9		-	-	-	-	-	-	-
V10		-	-	-	-	-	-	-
C.D.(0.05)		0.43		26.22	0.19	1.69	0.81	
C.V. (%)		6.21		7.26	4.01	6.51	0.67	
Expt. Mean		5.83		303	3.90	21.8	102	

Table 4.1 (e): Contd.

F-levels	Varieties	MARUTERU						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt(g)	Test wt(g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Soil type		Alluvial clay						
pH		5.95						
N - levels (kg/ha)								
F1		45:30:30						
F2		90:60:60						
Recommended N:P:K (kg/ha)		90:60:60						
Varieties								
V1		IET 28524						
V2		IET 29891						
V3		IET 29935						
V4		IET 30826						
V5		IET 30829						
V6		Swarna (NC)						
V7		-						
V8		Pushyami (S)						
V9		-						
V10		-						
Available N:P:K of soil (kg/ha)		119:14:274						

Table 4.1 (e): Contd.

F-levels	Varieties	NAWAGAM						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt(g)	Test wt(g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1	V1	5.95	12	236	3.17	18.57	110	
	V2	6.52	7	209	2.74	22.20	85	
	V3	6.92	5	220	2.86	18.17	91	
	V4	3.60	15	292	1.76	17.40	92	
	V5	3.35	16	290	2.35	21.17	93	
	V6	6.17	11	286	2.39	17.80	111	
	V7	-	-	-	-	-	-	
	V8	6.52	7	255	3.45	17.60	111	
	V9	-	-	-	-	-	-	
	V10	6.49	9	307	3.01	14.60	93	
F2	V1	6.92	5	277	3.43	19.30	112	13.38
	V2	7.98	1	281	3.35	25.50	86	20.14
	V3	7.43	2	306	3.24	18.40	93	7.03
	V4	4.66	14	327	2.07	18.57	94	14.62
	V5	4.81	13	338	3.18	23.63	96	20.14
	V6	6.35	10	342	3.33	17.30	111	2.48
	V7	-	-	-	-	-	-	-
	V8	7.37	3	336	4.17	17.77	95	11.72
	V9	-	-	-	-	-	-	-
	V10	6.94	4	338	3.57	13.87	113	6.21
Interaction								
F at same V		NS		NS	NS	NS	1.15	
V at same F		NS		NS	NS	NS	1.80	
F1		5.69	2	262	2.72	18.44	98	
F2		6.56	1	318	3.29	19.29	100	11.97
C.D.(0.05)		0.86		41.11	0.24	NS	NS	
C.V.(%)		11.33		11.41	6.30	11.98	1.51	
Mean of varieties:								
V1		6.44	5	256	3.30	18.94	111	13.38
V2		7.25	1	245	3.05	23.85	86	20.14
V3		7.18	2	263	3.05	18.29	92	7.03
V4		4.13	7	310	1.92	17.99	93	14.62
V5		4.08	8	314	2.77	22.40	94	20.14
V6		6.26	6	314	2.86	17.55	111	2.48
V7		-	-	-	-	-	-	-
V8		6.95	3	295	3.81	17.69	103	11.72
V9		-	-	-	-	-	-	-
V10		6.72	4	323	3.29	14.24	103	6.21
C.D.(0.05)		0.54		30.79	0.45	1.65	0.82	
C.V. (%)		7.42		8.98	12.56	7.38	0.70	
Expt. Mean		6.12		290	3.00	18.9	99	

Table 4.1 (e): Contd.

F-levels	Varieties	NAWAGAM						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt(g)	Test wt(g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Soil type		-						
pH		7.62						
N - levels (kg/ha)								
F1		60:12.5:0						
F2		120:25:0						
Recommended N:P:K (kg/ha)		120:25:0						
Varieties								
V1		IET 28524						
V2		IET 29891						
V3		IET 29935						
V4		IET 30826						
V5		IET 30829						
V6		Swarna (NC)						
V7		-						
V8		Pushyami (S)						
V9		-						
V10		Local Check - GR 1 (125 DAYS)						
Available N:P:K of soil (kg/ha)		219:80:234						

Table 4.1 (e): Contd.

F-levels	Varieties	RAJENDRANAGAR Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt(g)	Test wt(g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)	Over all mean	Rank
F1	V1	3.30	11	306	4.41	21.67	95		4.92	11
	V2	3.22	12	305	4.23	28.40	82		4.53	15
	V3	2.75	16	287	3.05	17.30	78		4.93	10
	V4	2.69	17	250	2.76	21.47	77		4.41	16
	V5	2.65	18	247	2.50	22.80	77		4.29	17
	V6	2.95	15	288	2.55	17.63	94		4.88	12
	V7	-	-	-	-	-	-		3.22	19
	V8	3.04	14	290	3.48	17.10	96		4.88	13
	V9	3.07	13	296	1.98	11.60	96		1.54	20
	V10	3.42	10	311	3.04	11.67	82		4.55	14
F2	V1	4.12	3	390	5.24	22.67	97	7.45	5.80	2
	V2	4.28	1	390	4.78	29.93	84	9.64	5.33	8
	V3	3.60	9	315	3.89	18.30	80	7.73	5.59	5
	V4	3.65	8	321	3.17	22.47	79	8.73	5.04	9
	V5	4.01	5	357	3.15	23.10	79	12.36	5.37	7
	V6	4.08	4	362	3.01	18.83	96	10.27	5.64	3
	V7	-	-	-	-	-	-	-	6.82	1
	V8	3.75	7	339	3.55	18.30	98	6.45	5.60	4
	V9	3.76	6	350	2.25	11.67	98	6.27	3.76	18
	V10	4.28	1	402	3.69	11.77	84	7.82	5.40	6
Interaction										
F at same V		NS		NS	NS	NS	NS			
V at same F		NS		NS	NS	NS	NS			
F1		3.01	2	287	3.11	18.85	87		4.60	2
F2		3.95	1	358	3.64	19.67	89	8.53	5.49	1
C.D.(0.05)		0.84		37.63	0.39	0.00	NS			
C.V.(%)		20.74		9.96	9.96	0.00	2.50			
Mean of varieties:										
V1		3.71	3	348	4.83	22.17	96	7.45	5.36	2
V2		3.75	2	347	4.51	29.17	83	9.64	4.93	7
V3		3.18	8	301	3.47	17.80	79	7.73	5.26	4
V4		3.17	9	285	2.97	21.97	78	8.73	4.72	9
V5		3.33	7	302	2.83	22.95	78	12.36	4.83	8
V6		3.52	4	325	2.78	18.23	95	10.27	5.26	3
V7		-	-	-	-	-	-	-	6.63	1
V8		3.40	6	315	3.52	17.70	97	6.45	5.24	5
V9		3.42	5	323	2.12	11.64	97	6.27	3.42	10
V10		3.85	1	356	3.37	11.72	83	7.82	4.97	6
C.D.(0.05)		0.38		25.89	0.47	0.73	0.25			
C.V. (%)		9.36		6.88	12.01	3.23	0.25			
Expt. Mean		3.48		322	3.37	19.3	88		5.10	

Table 4.1 (e): Contd.

F-levels	Varieties	RAJENDRANAGAR Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt(g)	Test wt(g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)	Over all mean	Rank
Soil type		Clay loam								
pH		7.10								
N - levels (kg/ha)										
F1		60:30:20								
F2		120:60:40								
Recommended N:P:K (kg/ha)		120:60:40								
Varieties										
V1		IET 28524								
V2		IET 29891								
V3		IET 29935								
V4		IET 30826								
V5		IET 30829								
V6		Swarna (NC)								
V7		-								
V8		Pushyami (S)								
V9		Samba Mahsuri (RP)								
V10		Local Check - RNR 15048 (120 DAYS)								
Available N:P:K of soil (kg/ha)		-								

4.1(f) AVT 2 - CSTVT

One culture Viz., IET 30201 was evaluated in comparison with standard varieties (Pusa 44 and BPT 5204) at **Gangavathi (150:75:75), Maruteru (90:60:60), Nagina (120:60:40)** and **Navsari (120:30:0)** under two recommended level of input (50 and 100% RDF). The data is summarized and presented in Table 4.1(f).

Different levels of RDF did not exhibit significant differences in grain yield and yield attributes at **Gangavathi** and **Maruteru**. Application of 100% RDF recorded significantly higher grain yield of (4.50 t/ha) over 50% RDF (2.72 t/ha) at **Nagina**; while at **Navsari**, 100% RDF gave higher grain yield of (3.35 t/ha) over 50% RDF (2.85 t/ha). Nutrient response (kg grain / kg Nutrients) was also marginally higher at 100% RDF over 50% RDF (6.63 to 16.23 kg grain/kg nutrient).

Average yield of culture IET 30201 (4.63 t/ha) found to be promising over checks. Interaction effects of N levels and varieties were found to be non-significant at all locations except **Gangavathi**.

4. 1(g) AVT 2 - AL & ISTVT

Saline tolerant cultures (seven) viz., IET 30162, IET 30164, IET 30165, IET 30176, IET 30178, IET 30827 and IET 30830 were evaluated for its response to different doses of nutrients on grain yield at **Navsari (120:30:0).** The details and data received from these locations are summarized and presented in Table 4.1(g).

Application of RDF doses did not influence the grain yield significantly and 50% RDF found on par with 100% RDF application (120:30:0)

Grain yield differences among the tested cultures was found to be significant and none of the entries found promising over checks. Interaction effects among RFD x varieties on grain yield was found to be non-significant. Mean over the locations, standard and local checks performance was superior over test entries.

In this trial, 100% RDF was found to be not promising however, exhibited higher nutrient efficiency (5.16). IET cultures were not found to be promising over other local checks as the performance of standard checks was promising.

Table 4.1(f): Summary of data on grain yield and ancillary characters of selected AET CSTVT cultures grown under transplanted conditions at graded levels of recommended fertilizer doses, kharif 2023.

F-levels	Varieties	GANGAVATHI						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: Low input (50% NPK)	V1	3.92	5	159.33	66.83	13.49	81	
	V2	-		-	-	-	-	
	V3	-		-	-	-	-	
	V4	4.17	3	180.33	68.27	21.21	73	
	V5	4.07	4	157.33	57.57	16.9	65	
F2: Optimum input (100% NPK)	V1	3.53	6	204.67	70.83	19.55	81	-2.60
	V2	-		-	-	-	-	
	V3	-		-	-	-	-	
	V4	4.25	2	240.67	88.07	17.68	73	0.53
	V5	4.65	1	183	70.67	19.85	65	3.87
Interaction								
F at same V		0.43		NS	NS	3.27	NS	
V at same F		0.76		NS	NS	4.67	NS	
F1		4.05	2	166	64.22	17.20	73	
F2		4.14	1	209	76.52	19.03	73	0.60
C.D.(0.05)		NS		NS	4.3	NS	NS	
C.V.(%)		10.7		14.51	3.01	13.48	0	
Mean of varieties:								
V1		3.73	3	182	68.83	16.52	81	-2.60
V2		-		-	-	-	-	
V3		-		-	-	-	-	
V4		4.21	2	211	78.17	19.45	73	0.53
V5		4.36	1	170	64.12	18.38	65	3.87
C.D.(0.05)		0.31		13.78	6.52	NS	0	
C.V. (%)		5.62		5.52	6.96	9.58	0	
Expt. Mean		4.10		188	70.37	18.11	73	
Soil type		-						
pH		-						
F - levels (kg/ha)								
F1		75:37.5:37.5						
F2		150:75:75						
Recommended N:P:K (kg/ha)		150:75:75						
Varieties								
V1		IET 30201						
V2		-						
V3		-						
V4		Pusa 44						
V5		Local Check - BPT 5204						
Available N:P:K of soil (kg/ha)		-						

Table 4.1(f): Contd.

F-levels	Varieties	MARUTERU						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: Low input (50% NPK)	V1	7.2	4	320.67	4.12	25.27	96.67	
	V2	-		-	-	-	-	
	V3	-		-	-	-	-	
	V4	7.41	3	322	4.46	22.31	98	
	V5	-		-	-	-	-	
F2: Optimum input (100% NPK)	V1	7.65	2	301.33	4.14	25.38	98	4.29
	V2	-		-	-	-	-	
	V3	-		-	-	-	-	
	V4	7.93	1	286.67	4.52	22.73	98.33	4.95
	V5	-		-	-	-	-	
Interaction								
F at same V		NS		NS	NS	NS	NS	
V at same F		NS		NS	NS	NS	NS	
F1		7.31	2	321	4.29	23.79	97	
F2		7.79	1	294	4.33	24.06	98	4.62
C.D.(0.05)		NS		5.87	NS	0.2	0.72	
C.V.(%)		2.85		0.77	4.82	0.34	0.3	
Mean of varieties:								
V1		7.43	2	311	4.13	25.33	97	4.29
V2		-		-	-	-	-	
V3		-		-	-	-	-	
V4		7.67	-	304	4.49	22.52	98	4.95
V5		-		-	-	-	-	
C.D.(0.05)		NS		27.81	0.09	0.25	0.42	
C.V. (%)		3.09		8.81	2.02	1.03	0.42	
Expt. Mean		7.55		308	4.31	23.92	98	
Soil type		-						
pH		5.95						
F - levels (kg/ha)								
F1		45:30:30						
F2		90:60:60						
Recommended N:P:K (kg/ha)		90:60:60						
		.						
Varieties								
V1		IET 30201						
V2		-						
V3		-						
V4		Pusa 44						
V5		-						
Available N:P:K of soil (kg/ha)		119:14.32:274						

Table 4.1(f): Contd.

F-levels	Varieties	NAGINA Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: Low input (50% NPK)	V1	3.01	3	259	2.92	28.91	89.33	
	V2	-		-	-	-	-	
	V3	-		-	-	-	-	
	V4	2.42	4	213.67	2.81	32.73	109.67	
	V5	-		-	-	-	-	
F2: Optimum input (100% NPK)	V1	4.8	1	345.33	3.25	28.97	90	16.27
	V2	-		-	-	-	-	
	V3	-		-	-	-	-	
	V4	4.2	2	303	3.19	34.71	111.67	16.18
	V5	-		-	-	-	-	
Interaction								
F at same V		NS		NS	0.01	0.02	NS	
V at same F		NS		NS	0.01	0.04	NS	
F1		2.72	2	236	2.87	30.82	100	
F2		4.50	1	324	3.22	31.84	101	16.23
C.D.(0.05)		0.63		27.37	0.01	0.05	NS	
C.V.(%)		7.01		3.93	0.09	0.06	0.76	
Mean of varieties:								
V1		3.91	1	302	3.09	28.94	90	16.27
V2		-		-	-	-	-	
V3		-		-	-	-	-	
V4		3.31	2	258	3.00	33.72	111	16.18
V5		-		-	-	-	-	
C.D.(0.05)		0.3		12.71	0.01	0.02	1.11	
C.V. (%)		7.99		4.42	0.21	0.05	1.08	
Expt. Mean		3.61		280	3.04	31.33	100	
Soil type		-						
pH		7.70						
F - levels (kg/ha)								
F1		60:30:20						
F2		120:60:40						
Recommended N:P:K (kg/ha)		120:60:40						
		.						
Varieties								
V1		IET 30201						
V2		-						
V3		-						
V4		Pusa 44						
V5		-						
Available N:P:K of soil (kg/ha)		21:18.33:209						

Table 4.1(f): Contd.

F-levels	Varieties	NAVSARI Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)	Over all mean	Rank
F1: Low input (50% NPK)	V1	3.29	4	284.33	2.97	23.87	103.67		4.36	3
	V2	2.62	9	273.33	2.77	23.73	88.67		2.62	10
	V3	2.72	8	258	3	23.97	102.33		2.72	9
	V4	2.49	10	264.33	2.93	23.73	106.67		4.12	5
	V5	3.13	6	297.67	3.1	24.4	105.67		3.60	6
F2: Optimum input (100% NPK)	V1	3.66	1	317.67	3.17	24.4	101.33	4.93	4.91	1
	V2	3.15	5	302.33	2.93	24.27	87.67	7.07	3.15	8
	V3	3.54	3	282	3.23	24.47	100.67	10.93	3.54	7
	V4	2.75	7	295.67	3.17	23.13	102.67	3.47	4.78	2
	V5	3.66	1	311	3.2	24.93	102.67	7.07	4.16	4
Interaction										
F at same V		NS		NS	NS	NS	NS			
V at same F		NS		NS	NS	NS	NS			
F1		2.85	2	276	2.95	23.94	101		4.23	2
F2		3.35	1	302	3.14	24.24	99	6.69	4.95	1
C.D.(0.05)		0.38		21.61	0.16	NS	1.79			
C.V.(%)		7.71		4.76	3.34	0.82	1.14			
Mean of varieties:										
V1		3.48	1	301	3.07	24.14	103	4.93	4.63	1
V2		2.89	4	288	2.85	24.00	88	7.07	2.89	5
V3		3.13	3	270	3.12	24.22	102	10.93	3.13	4
V4		2.62	5	280	3.05	23.43	105	3.47	4.45	2
V5		3.40	2	304	3.15	24.67	104	7.07	3.88	3
C.D.(0.05)		0.34		23.32	NS	0.61	1.69			
C.V. (%)		9.06		6.6	5.79	2.09	1.38			
Expt. Mean		3.10		289	3.05	24.09	100		4.59	
Soil type		Saline								
pH		8.60								
F - levels (kg/ha)										
F1		60:15:0								
F2		120:30:0								
Recommended N:P:K (kg/ha)		120:30:0								
Varieties										
V1		IET 30201								
V2		CSR 10								
V3		CSR 36								
V4		Pusa 44								
V5		Local Check - GR-19								
Available N:P:K of soil (kg/ha)		283:36.8:1257								

Table 4.1(g): Summary of data on grain yield and ancillary characters of selected IET AL&ISTVT cultures grown under transplanted conditions at graded levels of recommended fertilizer doses, kharif 2023.

F-levels	Varieties	NAVSARI						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: Low input (50% NPK)	V1	2.99	15	276	3.14	23.47	92	
	V2	2.86	19	271	2.62	23.20	92	
	V3	2.48	22	273	2.79	23.27	97	
	V4	2.95	17	276	3.00	23.47	98	
	V5	2.17	24	262	2.65	23.00	96	
	V6	2.81	21	276	2.88	23.40	97	
	V7	2.94	18	278	3.13	23.37	96	
	V8	3.08	12	287	3.00	24.00	101	
	V9	3.14	11	264	2.98	23.57	89	
	V10	3.07	13	273	3.12	23.97	99	
	V11	2.34	23	278	2.91	23.77	102	
	V12	3.21	8	278	3.51	24.73	103	
F2: Optimum input (100% NPK)	V1	3.23	6	291	3.39	24.20	90	3.20
	V2	3.03	14	273	2.89	23.67	89	2.27
	V3	3.23	6	275	2.87	23.73	90	10.00
	V4	3.24	5	291	3.33	24.20	93	3.87
	V5	2.99	15	273	2.76	23.40	89	10.93
	V6	3.20	9	284	3.05	24.00	90	5.20
	V7	3.20	9	285	3.11	24.20	90	3.47
	V8	3.32	3	291	3.30	24.43	100	3.20
	V9	3.38	2	278	2.96	24.57	87	3.20
	V10	3.27	4	284	3.16	24.83	95	2.67
	V11	2.85	20	287	2.87	24.2	100	6.80
	V12	3.74	1	294	3.53	25.13	101	7.07
Interaction								
F at same V		NS		NS	NS	NS	2.73	
V at same F		NS		NS	NS	NS	2.88	
F1		2.84	2	274	2.98	23.60	97	
F2		3.22	1	284	3.10	24.21	93	5.16
C.D.(0.05)		NS		7.9	NS	NS	1.57	
C.V.(%)		12.75		2.79	7.13	2.95	1.63	

Table 4.1(g): Contd.

F-levels	Varieties	NAVSARI Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Mean of varieties:								
	V1	3.11	5	284	3.27	23.84	91	3.20
	V2	2.95	9	272	2.76	23.44	90	2.27
	V3	2.86	10	274	2.83	23.50	94	10.00
	V4	3.10	6	284	3.17	23.84	95	3.87
	V5	2.58	12	268	2.71	23.20	93	10.93
	V6	3.01	8	280	2.97	23.70	94	5.20
	V7	3.07	7	281	3.12	23.79	93	3.47
	V8	3.20	3	289	3.15	24.22	101	3.20
	V9	3.26	2	271	2.97	24.07	88	3.20
	V10	3.17	4	279	3.14	24.40	97	2.67
	V11	2.60	11	282	2.89	23.99	101	6.80
	V12	3.48	1	286	3.52	24.93	102	7.07
C.D.(0.05)		0.43		12.92	0.23	0.54	1.93	
C.V. (%)		12.42		4.01	6.55	1.97	1.76	
Expt. Mean		3.03		279	3.04	23.91	95	
Soil type		-						
pH		8.63						
F - levels (kg/ha)								
F1		60:15:0						
F2		120:30:0						
Recommended N:P:K (kg/ha)		120:30:0						
Varieties								
V1		IET 30162						
V2		IET 30164						
V3		IET 30165						
V4		IET 30176						
V5		IET 30178						
V6		IET 30827						
V7		IET 30830						
V8		CSR 36						
V9		CSR 10						
V10		FL 478						
V11		Pusa 44						
V12		Local Check - GNR 5						
Available N:P:K of soil (kg/ha)		294:47.8:1246						

4.1(h) AVT 2 - Aerobic

Aerobic rice cultivation is a system where rice is grown under aerated conditions without standing water as against the usual transplanted flooded rice which is grown just like wheat crop. Rice is grown on dry but irrigated as per the need of the crop same as other irrigated dry (ID) crops such as Wheat and Barley. The crop is provided with irrigation water depending upon the season, evapotranspiration and specific needs of the crop. It is characterized by the presence of air in the soil medium and its limited water requirement as compared to the flooded irrigated rice.

Eight AVT-2 entries (IET 30051, IET 30024, IET 30004, IET 30029, IET 30021, IET 30041, IET 29405(R) and IET 28636 were evaluated against CR Dhan 201, DR Dhan 54, Pusa 44 and Local check MTU 1010) for their response to two fertilizer levels on grain yield at six locations viz., **Jagdalpur (120:60:40), Kota (120:60:40), Ludhiana (150:30:30), Nawagam (80:25:0), Pantnagar (120:60:40)** and **Raipur (100:60:40)**. The data received from these locations are summarized and presented in Table 4.1(h).

Different doses of RDF exhibited significant differences on grain yield at all the locations except **Ludhiana**. Application of 100% RDF recorded higher yield at **Jagdalpur** (2.43 t/ha), **Kota** (4.52 t/ha), **Ludhiana** (4.86 t/ha), **Nawagam** (5.17 t/ha), **Pantnagar** (4.35 t/ha) and **Raipur** (3.94 t/ha). Nutrient response (kg grain / kg N) was higher at 100 % RDF over 50% RDF at **Pantnagar** (15.20), **Nawagam** (10.57), **Raipur** (8.78) and **Ludhiana** (8.78).

Grain yield of cultures differed significantly at all locations. Among the entries tested, IET 30041 recorded higher yield at **Nawagam** (5.57 t/ha) and IET 30004 at **Pantnagar** (4.73 t/ha) and IET 30029 at Raipur (4.18 t/ha) over other entries. Average over the locations, the performance of IET 30004 (3.82 t/ha) followed by IET 30029 (3.77 t/ha) were found to be promising. Interaction effects of RDF doses and varieties was found to be non-significant at all the locations except **Ludhiana** and **Pantnagar** where, 100% RDF realised higher grain yield with test cultures.

Summarized over the locations, application of 100% RDF was found to be promising (27% higher grain yield) and also exhibited higher nutrient response. IET 30004 and IET 30029 were found to be promising with higher grain yield (3.82 and 3.77 t/ha) across the locations.

Table 4.1(h): Summary of data on grain yield and ancillary characters of selected AET Aerobic cultures at graded levels of recommended fertilizer doses, kharif 2023.

F-levels	Varieties	JAGDALPUR					KOTA						
		Grain Yield (t/ha)	Rank	Filled grains/ panicle (no.)	Days 50% flower ing	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)	Grain Yield (t/ha)	Ran k	Panicle/ m^2 (No.)	Panicle wt (g)	Test wt (g)	Days 50% floweri ng	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1	V1	1.96	16	87.33	58		3.73	14	219	3.24	18.94	81	
	V2	2.2	9	110.13	54		3.78	13	202	3.75	18.50	77	
	V3	1.97	14	91.37	67		3.26	19	185	3.46	24.55	81	
	V4	1.93	19	111.03	64		2.71	20	225	2.61	17.71	96	
	V5	2.08	12	74.20	67		3.66	17	217	3.19	24.05	93	
	V6	1.73	24	77.80	57		4.14	10	217	3.49	19.21	78	
	V7	1.9	20	102.07	58		4.01	12	222	3.27	21.77	79	
	V8	1.89	22	95.40	61		4.78	3	230	3.74	20.25	80	
	V9	1.98	13	96.93	60		3.49	18	214	2.97	21.42	79	
	V10	-	-	-	-		3.73	14	218	3.00	18.64	78	
	V11	1.97	14	103.87	59		-	-	-	-	-	-	
	V12	1.9	20	79.93	63		-	-	-	-	-	-	
	V13	1.96	16	97.73	58		-	-	-	-	-	-	
F2	V1	2.52	6	93.67	61	6.22	4.74	4	250	3.58	19.71	82	9.18
	V2	2.45	7	121.57	57	2.78	4.58	5	229	4.45	19.23	79	7.27
	V3	1.83	23	95.68	70	-1.56	3.70	16	204	4.26	25.33	83	4.00
	V4	2.7	2	114.63	65	8.56	4.29	9	245	3.08	18.51	98	14.36
	V5	2.61	4	90.23	70	5.89	4.33	8	234	3.51	24.69	94	6.09
	V6	2.36	8	90.43	63	7.00	4.90	2	241	3.80	20.06	80	6.91
	V7	2.55	5	105.27	61	7.22	4.47	7	237	3.62	22.36	81	4.18
	V8	2.14	11	89.87	64	2.78	5.52	1	249	4.49	20.90	80	6.73
	V9	2.16	10	109.94	61	2.00	4.13	11	230	3.66	22.02	80	5.82
	V10	-	-	-	-	-	4.55	6	244	3.15	19.23	79	7.45
	V11	3.19	1	119.39	61	13.56	-	-	-	-	-	-	-
	V12	1.96	16	88.82	65	0.67	-	-	-	-	-	-	-
	V13	2.68	3	105.67	61	8.00	-	-	-	-	-	-	-
Interaction													
F at same V		NS		NS	1.25		NS		NS	NS		NS	
V at same F		NS		NS	1.29		NS		NS	NS		NS	
Mean of F levels													
F1		1.96	2	94	61		3.73	2	215	3.27	20.50	82	
F2		2.43	1	102	63	5.26	4.52	1	236	3.76	21.20	83	7.20
C.D.(0.05)		0.1		6.86	0.62		3.73		214.93	3.27	20.5	82.23	
C.V.(%)		4.65		6.9	0.99		4.52		236.33	3.76	21.2	83.4	

Table 4.1(h): Contd.

F-levels	Varieties	JAGDALPUR					KOTA						
		Grain Yield (t/ha)	Rank	Filled grains/ panicle (no.)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)	Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Mean of varieties:													
V1		2.24	6	91	60	6.22	4.24	4	235	3.41	19.33	81	9.18
V2		2.33	3	116	56	2.78	4.18	5	216	4.10	18.87	78	7.27
V3		1.90	12	94	69	-1.56	3.48	10	195	3.86	24.94	82	4.00
V4		2.32	5	113	65	8.56	3.50	9	235	2.85	18.11	97	14.36
V5		2.35	2	82	69	5.89	4.00	7	226	3.35	24.37	94	6.09
V6		2.05	9	84	60	7.00	4.52	2	229	3.65	19.64	79	6.91
V7		2.23	7	104	60	7.22	4.24	3	230	3.45	22.07	80	4.18
V8		2.02	10	93	63	2.78	5.15	1	239	4.12	20.58	80	6.73
V9		2.07	8	103	60	2.00	3.81	8	222	3.32	21.72	80	5.82
V10		-	-	-	-	-	4.14	6	231	3.08	18.94	78	7.45
V11		2.58	1	112	60	13.56	-	-	-	-	-	-	-
V12		1.93	11	84	64	0.67	-	-	-	-	-	-	-
V13		2.32	4	102	60	8.00	-	-	-	-	-	-	-
C.D.(0.05)		0.39		12.63	0.89		0.38		13.67	0.28	0.55	0.62	
C.V. (%)		15.3		11.16	1.24		7.98		5.19	6.74	2.28	0.64	
Expt. Mean		2.19		98	62		4.13		226	3.52	20.85	83	
Soil type							Clay						
pH							7.78						
N - levels (kg/ha)													
F1		50:25:15					60:30:20						
F2		100:50:30					120:60:40						
Recommended N:P:K (kg/ha)		100:50:30					120:60:40						
Varieties													
V1		IET 30051					IET 30051						
V2		IET 30024					IET 30024						
V3		IET 30004					IET 30004						
V4		IET 30029					IET 30029						
V5		IET 30021					IET 30021						
V6		IET 30041					IET 30041						
V7		IET 29405(R)					IET 29405(R)						
V8		IET 28636					IET 28636						
V9		CR Dhan 201(NC)					CR Dhan 201(NC)						
V10		-					CR Dhan 202 (N, E, NE & C)						
V11		DRR Dhan 54					-						
V12		Pusa 44 (RP)					-						
V13		Local Check - MTU 1010					-						
Available N:P:K of soil (kg/ha)							202.68:19.92:347.88						

Table 4.1(h): Contd.

F-levels	Varieties	LUDHIANA							NAWAGAM						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)	Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1	V1	3.95	13	358	2.01	22.75	77.33		4.23	19	143.09	2.69	19.9	72.33	
	V2	3.55	17	347	1.34	22.09	79.67		3.92	21	135.95	2.36	19.73	91.33	
	V3	3.99	11	372	1.97	21.73	84		4.58	17	145.71	2.63	25.6	72.67	
	V4	-	-	-	-	-	-		4.63	16	135.96	2.81	19.3	88.33	
	V5	3.88	16	347	1.85	21.1	77		5.24	8	163.1	2.82	26.03	88.67	
	V6	-	-	-	-	-	-		5.19	9	143.81	3.11	20.77	72.67	
	V7	4.36	7	328	2.17	22.41	80.67		4.36	18	150	2.7	23.9	71.33	
	V8	5.13	5	335	2.43	22.62	83.33		5.09	11	146.67	2.94	20.87	71.33	
	V9	3.42	18	347	1.74	22.71	77.67		5.18	10	130.95	3.69	23.13	72.33	
	V10	-	-	-	-	-	-		-	-	-	-	-	-	
	V11	3.89	15	327	1.95	23.38	79.33		3.88	22	140.71	2.93	25.67	72.67	
	V12	-	-	-	-	-	-		2.8	24	149.52	2.83	18.4	91.67	
	V13	4.01	10	367	2.03	22.14	85		4.97	12	146.43	3.01	18.6	68.33	
F2	V1	5.45	2	385	2.24	22.66	78	14.29	4.81	14	185.76	3.74	22.47	72.33	9.28
	V2	3.99	11	385	1.88	22.22	80	4.19	4.07	20	155.28	4.05	20.1	92.33	2.40
	V3	5.31	3	363	2.63	21.72	82	12.57	5.34	7	176.95	3.9	26.1	93.33	12.16
	V4	-	-	-	-	-	-	-	5.57	6	182.43	3.24	18.57	90.67	15.04
	V5	3.9	14	315	2.33	21.18	77.33	0.19	5.83	3	189.1	4.58	25.87	91.67	9.44
	V6	-	-	-	-	-	-	-	5.95	1	182.67	3.45	21.3	73.67	12.16
	V7	4.39	6	350	2.44	22.6	83.33	0.29	4.89	13	165.29	3.56	23.8	72.33	8.48
	V8	5.26	4	372	2.81	22.82	83.67	1.24	5.85	2	177.43	3.15	21.23	72.67	12.16
	V9	4.27	8	418	2.78	22.82	77.33	8.10	5.83	3	163.14	3.69	22.23	75	10.40
	V10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	V11	4.19	9	360	2.41	23.39	77.33	2.86	4.67	15	153.62	2.96	24.63	74.67	12.64
	V12	-	-	-	-	-	-		3.52	23	164.81	1.84	18.3	93.33	11.52
	V13	7.02	1	387	2.69	22.06	85.67	28.67	5.67	5	180.29	3.89	18.93	74.33	11.20
Interaction															
F at same V		1.07		NS	NS	NS	NS		NS		NS	0.54	NS	1.81	
V at same F		1.31		NS	NS	NS	NS		NS		NS	0.67	NS	1.99	
Mean of F levels															
F1		4.02	2	347	1.94	22.33	80		4.51	2	144	2.88	21.83	78	
F2		4.86	1	371	2.47	22.39	81	8.04	5.17	1	173	3.50	21.96	81	10.57
C.D.(0.05)		NS		NS	0.5	NS	NS		0.59		4.55	0.55	ns	1.26	
C.V.(%)		20.75		8.7	19.18	2.1	0.74		11.97		2.83	16.97	10.12	1.57	

Table 4.1(h): Contd.

F-levels	Varieties	LUDHIANA							NAWAGAM						
		Grain Yield (t/ha)	Rank	Panicle /m^2 (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)	Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Mean of varieties:															
V1		4.70	3	372	2.13	22.71	78	14.29	4.52	9	164	3.22	21.19	72	9.28
V2		3.77	9	366	1.61	22.16	80	4.19	4.00	11	146	3.21	19.92	92	2.40
V3		4.65	4	368	2.30	21.73	83	12.57	4.96	7	161	3.27	25.85	83	12.16
V4		-	-	-	-	-	-	-	5.10	6	159	3.03	18.94	90	15.04
V5		3.89	7	331	2.09	21.14	77	0.19	5.54	2	176	3.70	25.95	90	9.44
V6		-	-	-	-	-	-	-	5.57	1	163	3.28	21.04	73	12.16
V7		4.38	5	339	2.31	22.51	82	0.29	4.63	8	158	3.13	23.85	72	8.48
V8		5.20	2	353	2.62	22.72	84	1.24	5.47	4	162	3.05	21.05	72	12.16
V9		3.85	8	383	2.26	22.77	78	8.10	5.51	3	147	3.69	22.68	74	10.40
V10		-	-	-	-	-	-	-	-	-	-	-	-	-	-
V11		4.04	6	343	2.18	23.39	78	2.86	4.28	10	147	2.95	25.15	74	12.64
V12		-	-	-	-	-	-	-	3.16	12	157	2.34	18.35	93	11.52
V13		5.52	1	377	2.36	22.10	85	28.67	5.32	5	163	3.45	18.77	71	11.20
C.D.(0.05)		0.76		NS	0.46	1.11	1.49		0.45		13.8	0.38	1.65	1.28	
C.V. (%)		14.59		11.73	18.02	4.26	1.59		8.06		7.53	10.41	6.54	1.39	
Expt. Mean		4.44		359	2.21	22.36	80		4.84		159	3.19	21.89	80	
Soil type		Sandy Loam							-						
pH		7.60							7.64						
N - levels (kg/ha)															
F1		75:15:15							50:12.5:0						
F2		150:30:30							100:25:0						
Recommended N:P:K (kg/ha)		150:30:30							100:25:0						
Varieties															
V1		IET 30051							IET 30051						
V2		IET 30024							IET 30024						
V3		IET 30004							IET 30004						
V4		-							IET 30029						
V5		IET 30021							IET 30021						
V6		-							IET 30041						
V7		IET 29405(R)							IET 29405(R)						
V8		IET 28636							IET 28636						
V9		CR Dhan 201(NC)							CR Dhan 201(NC)						
V10		-							-						
V11		DRR Dhan 54							DRR Dhan 54						
V12		-							Pusa 44 (RP)						
V13		Local Check - PR 126(118 days)							Local Check - Mahisagar(115 days)						
Available N:P:K of soil (kg/ha)		270:28:178							188.6:109:332						

Table 4.1(h): Contd.

F-levels	Varieties	PANTNAGAR						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1	V1	2.09	20	188	1.27	28.13	116.33	
	V2	3.36	16	205.33	1.6	26.4	105	
	V3	4.16	9	205.33	2.01	25.57	103.33	
	V4	3.86	12	229.33	1.69	24.57	105.33	
	V5	1.65	22	213.67	1.05	24.43	103	
	V6	1.65	22	231	0.89	26.33	115	
	V7	1.96	21	212.67	1.17	27.97	118.33	
	V8	1.43	24	213	0.87	21.83	115.67	
	V9	2.71	19	237	1.34	26.93	119.67	
	V10	-	-	-	-	-	-	
	V11	3.43	15	239.33	1.58	24.43	119.33	
	V12	3.09	17	191.67	1.75	25.17	117.67	
	V13	2.73	18	182.67	1.62	30.1	119	
F2	V1	3.8	13	239.67	1.87	24.53	109.33	15.55
	V2	4.24	7	213.67	2.21	27.67	106.33	8.00
	V3	5.29	1	219.67	2.44	24.7	104.33	10.27
	V4	3.7	14	237	1.81	24.53	107	-1.45
	V5	4.02	10	261.33	1.6	24.5	106.67	21.55
	V6	4.37	5	242	1.85	26.97	109.33	24.73
	V7	4.66	4	228.67	2.1	26.93	113.33	24.55
	V8	4.71	3	217.67	2.04	23.67	112	29.82
	V9	4.02	10	239.33	1.65	27.03	105.33	11.91
	V10	-	-	-	-	-	-	-
	V11	4.84	2	252.67	2.03	22.53	101.67	12.82
	V12	4.29	6	242.67	1.84	25.43	121.67	10.91
	V13	4.24	7	248.33	1.84	31.5	122.33	13.73
Interaction								
F at same V		0.42		15.87	0.15	0.43	2.29	
V at same F		0.49		18.08	0.15	0.5	3.2	
Mean of F levels								
F1		2.68	2	212	1.40	25.99	113	
F2		4.35	1	237	1.94	25.83	110	15.20
C.D.(0.05)		0.35		12.57	0.03	NS	3	
C.V.(%)		9.85		5.52	1.89	1.38	2.65	

Table 4.1(h): Contd.

F-levels	Varieties	PANTNAGAR						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Mean of varieties:								
	V1	2.95	11	214	1.57	26.33	113	15.55
	V2	3.80	3	210	1.91	27.04	106	8.00
	V3	4.73	1	213	2.23	25.14	104	10.27
	V4	3.78	4	233	1.75	24.55	106	-1.45
	V5	2.84	12	238	1.33	24.47	105	21.55
	V6	3.01	10	237	1.37	26.65	112	24.73
	V7	3.31	8	221	1.64	27.45	116	24.55
	V8	3.07	9	215	1.46	22.75	114	29.82
	V9	3.37	7	238	1.50	26.98	113	11.91
	V10	-	-	-	-	-	-	-
	V11	4.14	2	246	1.81	23.48	111	12.82
	V12	3.69	5	217	1.80	25.30	120	10.91
	V13	3.49	6	216	1.73	30.80	121	13.73
C.D.(0.05)		0.3		11.22	0.11	0.31	1.62	
C.V. (%)		7.33		4.33	5.47	1.02	1.26	
Expt. Mean		3.51		225	1.67	25.91	112	
Soil type		Silt Loam						
pH		7.40						
N - levels (kg/ha)								
	F1	60:30:20						
	F2	120:60:40						
Recommended N:P:K (kg/ha)		120:60:40						
Varieties								
	V1	IET 30051						
	V2	IET 30024						
	V3	IET 30004						
	V4	IET 30029						
	V5	IET 30021						
	V6	IET 30041						
	V7	IET 29405(R)						
	V8	IET 28636						
	V9	CR Dhan 201(NC)						
	V10	-						
	V11	DRR Dhan 54						
	V12	Pusa 44 (RP)						
	V13	Local Check - PD 24(130-145 days)						
Available N:P:K of soil (kg/ha)		222.3:38.5:212.3						

Table 4.1(h): Contd.

F-levels	Varieties	RAIPUR							Over all mean	Rank
		Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)		
F1	V1	3.12	19	199	2.95	21.2	72		3.18	24
	V2	3.11	20	201	2.81	18.23	72		3.32	19
	V3	2.76	23	172	3.24	26.87	74		3.45	15
	V4	3.47	12	258	2.84	20.47	86		3.32	20
	V5	3.17	17	234	2.7	28	82		3.28	22
	V6	2.42	24	199	2.98	21.17	74		3.03	25
	V7	2.77	22	215	3.27	24.97	72		3.23	23
	V8	3.34	14	216	3.41	23.03	76		3.61	14
	V9	3.33	15	213	3.2	22.17	72		3.35	18
	V10	-	-	-	-	-	-		3.73	13
	V11	3.31	16	169	3.42	25.97	72		3.30	21
	V12	2.84	21	219	2.75	22.23	86		2.66	26
	V13	3.16	18	231	2.86	21.43	74		3.37	16
F2	V1	3.57	11	266	3.73	22.17	73	4.50	4.15	10
	V2	3.74	8	276	3.77	20.33	72	6.30	3.85	12
	V3	3.6	10	253	3.91	27	75	8.40	4.18	7
	V4	4.88	1	316	3.29	20.5	86	14.10	4.23	4
	V5	4.21	2	265	3.84	28.47	82	10.40	4.15	9
	V6	3.4	13	229	3.71	21.8	74	9.80	4.20	5
	V7	3.96	7	246	3.8	25.27	72	11.90	4.15	8
	V8	4.21	2	260	3.97	24.03	76	8.70	4.62	2
	V9	4.09	4	258	3.98	22.37	73	7.60	4.08	11
	V10	-	-	-	-	-	-	-	4.55	3
	V11	4.02	5	261	4.2	26.43	73	7.10	4.18	6
	V12	3.67	9	264	3.55	23.6	86	8.30	3.36	17
	V13	3.98	6	274	3.6	22.1	75	8.20	4.72	1
Interaction										
F at same V		NS		NS	NS	NS	NS			
V at same F		NS		NS	NS	NS	NS			
Mean of F levels										
F1		3.07	2	210	3.04	22.98	76		3.33	2
F2		3.94	1	264	3.78	23.67	76	8.78	4.21	1
C.D.(0.05)		0.52		27.24	0.39	ns	ns			
C.V.(%)		14.53		11.32	11.2	3.44	0.71			

Table 4.1(h): Contd.

F-levels	Varieties	RAIPUR							Over all mean	Rank
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)		
Mean of varieties:										
V1		3.35	9	232	3.34	21.69	73	4.50	3.66	10
V2		3.43	7	238	3.29	19.28	72	6.30	3.58	12
V3		3.18	11	212	3.58	26.94	74	8.40	3.82	4
V4		4.18	1	287	3.07	20.49	86	14.10	3.77	5
V5		3.69	4	250	3.27	28.24	82	10.40	3.72	8
V6		2.91	12	214	3.35	21.49	74	9.80	3.61	11
V7		3.37	8	230	3.54	25.12	72	11.90	3.69	9
V8		3.78	2	238	3.69	23.53	76	8.70	4.11	2
V9		3.71	3	235	3.59	22.27	73	7.60	3.72	7
V10		-	-	-	-	-	-	-	4.14	1
V11		3.67	5	215	3.81	26.20	73	7.10	3.74	6
V12		3.26	10	242	3.15	22.92	86	8.30	3.01	13
V13		3.57	6	253	3.23	21.77	74	8.20	4.04	3
C.D.(0.05)		0.45		28.25	0.4	1.41	0.67			
C.V. (%)		11.1		10.32	10.28	5.25	0.76			
Expt. Mean		3.51		237	3.41	23.33	76		3.77	
Soil type		Vertisols								
pH		7.10								
N - levels (kg/ha)										
F1		50:30:20								
F2		100:60:40								
Recommended N:P:K (kg/ha)		100:60:40								
Varieties										
V1		IET 30051								
V2		IET 30024								
V3		IET 30004								
V4		IET 30029								
V5		IET 30021								
V6		IET 30041								
V7		IET 29405(R)								
V8		IET 28636								
V9		CR Dhan 201(NC)								
V10		-								
V11		DRR Dhan 54								
V12		Pusa 44 (RP)								
V13		Local Check - Indira Aerobic-1(115 days)								
Available N:P:K of soil (kg/ha)		186.3:20.3:309.6								

4.1(i) AVT 2 - MS

Four entries (IET 30083, IET 30078, IET 30107 and IET 29536(R)) of medium slender group were evaluated for their response to two levels of nutrients (50% and 100% RDF) on grain yield at nine different locations i.e., **Faizabad (120:60:40), Dhangain, (120:60:40), Karjat (100:50:50), Mandya (100:50:50), Maruteru (90:60:60), Nagina (120:60:40), Nawagam (100:25:0), Raipur (120:60:40)** and **Rajendranagar (120:60:40)**. The details and data received from these locations are summarized and presented in Table 4.1 (i).

RDF doses significantly influenced the grain yield at seven locations (except **Faizabad** only) and the significant increase in grain yield was observed with 100% RDF at all the locations. Application of 100% RDF recorded higher grain yield at **Karjat** (4.53 t/ha), **Mandya** (7.54 t/ha), **Maruteru** (6.76 t/ha), **Nagina** (4.38 t/ha), **Nawagam** (5.75 t/ha), **Raipur** (5.09 t/ha), **Rajendranagar** (5.21 t/ha) and **Dhangain** (5.97 t/ha). Average over the locations, higher mean grain yield of 5.44 t/ha was recorded with 100% RDF with 19% higher yield over 50% of RDF. Higher nutrient response was (kg grain/kg nutrient) recorded with 100% RDF at **Rajendranagar** (15.34), **Nagina** (17.62), **Mandya** (12.40), **Nawagam** (12.09), **Karjat** (10.44), **Raipur** (9.59) and Dhangain (9.68) over other centres.

Grain yield differences among the tested cultures were also found to be significant seven out of eight locations. Significantly higher mean maximum grain yield was recorded by IET 30078 at **Maruteru** (7.30 t/ha) and **Raipur** (5.10 t/ha); IET 30083 at **Nagina** (3.70 t/ha), **Rajendranagar** (4.76 t/ha) and **Dhangain** (6.14 t/ha); IET 29536(R) at **Nawagam** (6.02 t/ha). The interaction effect between fertilizer levels and varieties was found to be significant at all the locations except at **Faizabad** only. Mean over the locations, cultivar IET 29536(R) (5.61 t/ha) followed by IET 30078 (5.44 t/ha) were found to be promising on 100% RDF application and recorded better yields over other test entries.

In this trial, application of 100% RDF was found to be promising (19% higher yield) and also exhibited higher nutrient response. Entries viz., IET 29536(R) and IET 30078 (5.61 and 5.44 t/ha) respectively and IET 30083 (5.19 t/ha) were found to be promising with better yields over other test entries and checks at 100% of RDF application at respective locations.

Table 4.1i: Summary of data on grain yield and ancillary characters of selected AET MS cultures grown under transplanted conditions at low and optimum recommended fertilizer doses, kharif 2023.

F-levels	Varieties	FAIZABAD						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: Low input (50% NPK)	V1	4.40	7	221	2.74	15.40	107	
	V2	4.43	6	212	3.36	14.10	111	
	V3	4.40	7	237	3.40	18.30	111	
	V4	14.40	1	223	3.10	17.27	108	
	V5	3.43	13	210	2.64	17.30	109	
	V6	3.30	14	214	2.28	15.20	113	
	V7	-		-	-	-	-	
	V8	3.70	12	236	2.51	15.47	113	
F2: Optimum input (100% NPK)	V1	4.77	4	266	3.03	17.30	113	3.08
	V2	5.18	2	268	3.70	15.53	115	6.25
	V3	4.90	3	274	4.07	20.20	116	4.17
	V4	4.40	7	276	3.63	18.87	114	-83.33
	V5	3.93	10	242	2.80	18.47	113	4.17
	V6	3.90	11	251	2.87	16.50	116	5.00
	V7	-		-	-	-	-	
	V8	4.70	5	275	3.13	16.17	116	8.33
Interaction								
F at same V		NS		NS	NS	NS	NS	
V at same F		NS		NS	NS	NS	NS	
F1		5.44	1	222	2.86	16.15	110	
F2		4.54	2	265	3.32	17.58	115	-7.48
C.D.(0.05)		NS		8.16	0.39	0.85	1.42	
C.V.(%)		101.01		2.53	9.48	3.77	0.95	
Mean of varieties:								
V1		4.59	4	244	2.89	16.35	110	3.08
V2		4.81	2	240	3.53	14.82	113	6.25
V3		4.65	3	256	3.74	19.25	113	4.17
V4		9.40	1	250	3.37	18.07	111	-83.33
V5		3.68	6	226	2.72	17.89	111	4.17
V6		3.60	7	233	2.58	15.85	115	5.00
V7		-		-	-	-	-	
V8		4.20	5	255	2.82	15.82	114	8.33
C.D.(0.05)		NS		9.92	0.27	0.55	1.73	
C.V. (%)		100.34		3.42	7.2	2.75	1.29	
Expt. Mean		4.99		243	3.09	16.86	113	
Soil type		Sand 32.2,Silt 48.6 & Clay 16.2						
pH		7.40						
F - levels (kg/ha)								
F1		60:30:30						
F2		120:60:60						
Recommended N:P:K (kg/ha)		120:60:60						
Varieties								
V1		IET 30083						
V2		IET 30078						
V3		IET 30107						
V4		IET 29536 (R)						
V5		WGL 14 (NC 1)						
V6		BPT 5204 (NC 2)						
V7		-						
V8		Local check - Sambha Mahsuri-Sub 1(145 days)						
Available N:P:K of soil (kg/ha)		205.4:23.5:232.5						

Table 4.1i: Contd.

F-levels	Varieties	DHANGAIN Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: Low input (50% NPK)	V1	5.53	6	282	4.44	20.67	96	
	V2	5.17	9	241	3.66	18.00	112	
	V3	5.47	8	251	3.88	19.47	99	
	V4	5.48	7	259	4.11	19.33	91	
	V5	4.78	12	243	3.44	15.33	97	
	V6	3.95	14	222	3.11	14.27	102	
	V7	-	-	-	-	-	-	
	V8	3.96	13	219	2.78	13.87	103	
F2: Optimum input (100% NPK)	V1	6.75	1	317	4.77	21.60	99	11.09
	V2	6.06	4	260	3.93	19.47	114	8.09
	V3	6.4	3	262	4.11	19.73	101	8.45
	V4	6.6	2	275	4.33	20.67	93	10.18
	V5	5.74	5	251	3.55	17.60	99	8.73
	V6	5.16	10	244	3.55	15.60	104	11.00
	V7	-	-	-	-	-	-	-
	V8	5.08	11	229	3.44	14.40	105	10.18
Interaction								
F at same V		NS		NS	NS	NS	NS	
V at same F		NS		NS	NS	NS	NS	
F1		4.91	2	245	3.63	17.28	100	
F2		5.97	1	263	3.95	18.44	102	9.68
C.D.(0.05)		0.79		2.77	0.17	0.46	0.54	
C.V.(%)		11		0.82	3.46	1.92	0.4	
Mean of varieties:								
V1		6.14	1	300	4.61	21.14	98	11.09
V2		5.62	4	251	3.80	18.74	113	8.09
V3		5.94	3	257	4.00	19.60	100	8.45
V4		6.04	2	267	4.22	20.00	92	10.18
V5		5.26	5	247	3.50	16.47	98	8.73
V6		4.56	6	233	3.33	14.94	103	11.00
V7		-	-	-	-	-	-	-
V8		4.52	7	224	3.11	14.14	104	10.18
C.D.(0.05)		0.56		29.13	0.72	1.82	0.51	
C.V. (%)		8.67		9.63	15.88	8.58	0.43	
Expt. Mean		5.44		254	3.79	17.86	101	
Soil type		Clay loam						
pH		6.35						
F - levels (kg/ha)								
F1		60:30:20						
F2		120:60:40						
Recommended N:P:K (kg/ha)		120:60:40						
Varieties								
V1		IET 30083						
V2		IET 30078						
V3		IET 30107						
V4		IET 29536 (R)						
V5		WGL 14 (NC 1)						
V6		BPT 5204 (NC 2)						
V7		-						
V8		Local check - R. Sweta(135-140 Days)						
Available N:P:K of soil (kg/ha)		282:42.4:162.2						

Table 4.1i: Contd.

F-levels	Varieties	KARJAT Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: Low input (50% NPK)	V1	3.09	14	244	1.68	17.45	94	
	V2	3.66	7	316	2.37	23.21	94	
	V3	3.34	12	263	1.77	19.93	97	
	V4	3.41	11	270	2.06	20.50	97	
	V5	4.10	6	320	2.47	24.48	97	
	V6	3.66	7	274	2.23	20.71	98	
	V7	-		-	-	-	-	
	V8	3.15	13	251	1.75	19.43	97	
F2: Optimum input (100% NPK)	V1	3.55	10	271	2.09	18.46	96	4.60
	V2	5.14	2	343	2.57	25.12	97	14.80
	V3	4.54	5	303	2.32	21.72	98	12.00
	V4	4.76	4	316	2.34	22.26	98	13.50
	V5	5.30	1	352	2.69	25.76	99	12.00
	V6	4.85	3	337	2.55	22.93	99	11.90
	V7	-		-	-	-	-	
	V8	3.58	9	290	2.17	21.57	98	4.30
Interaction								
F at same V		0.55		NS	NS	NS	NS	
V at same F		0.58		NS	NS	NS	NS	
F1		3.49	2	277	2.05	20.82	96	
F2		4.53	1	316	2.39	22.55	98	10.44
C.D.(0.05)		0.37		21.9	NS	NS	NS	
C.V.(%)		6.97		5.56	12.54	6.38	1.26	
Mean of varieties:								
V1		3.32	7	258	1.89	17.96	95	4.60
V2		4.40	2	330	2.47	24.17	96	14.80
V3		3.94	5	283	2.05	20.83	98	12.00
V4		4.09	4	293	2.20	21.38	98	13.50
V5		4.70	1	336	2.58	25.12	98	12.00
V6		4.26	3	305	2.39	21.82	98	11.90
V7		-		-	-	-	-	
V8		3.37	6	271	1.96	20.50	98	4.30
C.D.(0.05)		0.39		25.54	0.32	1.01	1.6	
C.V. (%)		8.11		7.23	12.22	3.9	1.38	
Expt. Mean		4.01		296	2.22	21.68	97	
Soil type		-						
pH		-						
F - levels (kg/ha)								
F1		50:25:25						
F2		100:50:50						
Recommended N:P:K (kg/ha)		100:50:50						
Varieties								
V1		IET 30083						
V2		IET 30078						
V3		IET 30107						
V4		IET 29536 (R)						
V5		WGL 14 (NC 1)						
V6		BPT 5204 (NC 2)						
V7		-						
V8		Local check - KJT 9 (120-125 Days)						
Available N:P:K of soil (kg/ha)		-						

Table 4.1i: Contd.

F-levels	Varieties	MANDYA						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: Low input (50% NPK)	V1	6.85	7	358	3.46	17.36	73	
	V2	5.39	14	300	3.72	21.43	81	
	V3	6.79	8	301	3.88	13.84	75	
	V4	6.15	11	331	3.37	16.97	73	
	V5	5.75	13	311	3.37	17.18	74	
	V6	5.96	12	373	2.81	15.15	79	
	V7	-		-	-	-	-	
	V8	7.23	5	329	3.50	18.45	69	
F2: Optimum input (100% NPK)	V1	8.21	2	372	3.82	17.71	73	13.60
	V2	6.35	10	342	4.15	21.52	81	9.60
	V3	7.94	4	323	4.50	13.70	75	11.50
	V4	8.02	3	368	3.99	18.31	73	18.70
	V5	6.47	9	355	3.70	17.16	74	7.20
	V6	7.02	6	395	3.02	15.62	79	10.60
	V7	-		-	-	-	-	
	V8	8.79	1	365	3.64	18.54	69	15.60
Interaction								
F at same V		NS		NS	NS	NS	NS	
V at same F		NS		NS	NS	NS	NS	
F1		6.30	2	329	3.44	17.20	75	
F2		7.54	1	360	3.83	17.51	75	12.40
C.D.(0.05)		0.65		24.44	0.29	NS	NS	
C.V.(%)		7.08		5.34	6.07	5.42	0.21	
Mean of varieties:								
V1		7.53	2	365	3.64	17.54	73	13.60
V2		5.87	7	321	3.94	21.48	81	9.60
V3		7.37	3	312	4.19	13.77	75	11.50
V4		7.09	4	349	3.68	17.64	73	18.70
V5		6.11	6	333	3.54	17.17	74	7.20
V6		6.49	5	384	2.92	15.39	79	10.60
V7		-		-	-	-	-	
V8		8.01	1	347	3.57	18.50	69	15.60
C.D.(0.05)		0.52		29.69	0.42	0.92	0.39	
C.V. (%)		6.25		7.23	9.67	4.46	0.44	
Expt. Mean		6.92		344	3.64	17.35	75	
Soil type		Red sandy loam						
pH		7.94						
F - levels (kg/ha)								
F1		50:25:25						
F2		100:50:50						
Recommended N:P:K (kg/ha)		100:50:50						
Varieties								
V1		IET 30083						
V2		IET 30078						
V3		IET 30107						
V4		IET 29536 (R)						
V5		WGL 14 (NC 1)						
V6		BPT 5204 (NC 2)						
V7		-						
V8		Local check - KRH 11 (130-135 Days)						
Available N:P:K of soil (kg/ha)		341.5:53:238						

Table 4.1i: Contd.

F-levels	Varieties	MARUTERU Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: Low input (50% NPK)	V1	6.58	9	321	4.42	107	
	V2	7.26	4	372	4.12	126	
	V3	7.29	3	315	4.55	100	
	V4	4.75	12	243	3.83	97	
	V5	7.18	5	349	3.60	107	
	V6	6.04	10	348	3.39	110	
	V7	-		-	-	-	
	V8	-		-	-	-	
F2: Optimum input (100% NPK)	V1	6.72	8	313	4.47	107	1.33
	V2	7.34	2	371	4.11	126	0.76
	V3	7.04	7	335	4.28	100	-2.38
	V4	5.03	11	269	4.03	97	2.67
	V5	7.35	1	352	3.89	107	1.62
	V6	7.05	6	344	3.35	112	9.62
	V7	-		-	-	-	
	V8	-		-	-	-	
Interaction							
F at same V		NS		NS	0.24	NS	
V at same F		NS		NS	0.23	NS	
F1		6.52	2	325	3.99	108	
F2		6.76	1	331	4.02	108	2.27
C.D.(0.05)		0.05		NS	NS	NS	
C.V.(%)		0.54		7.76	1.37	0.41	
Mean of varieties:							
V1		6.65	4	317	4.45	107	1.33
V2		7.30	1	372	4.12	126	0.76
V3		7.17	3	325	4.42	100	-2.38
V4		4.89	6	256	3.93	97	2.67
V5		7.27	2	351	3.75	107	1.62
V6		6.55	5	346	3.37	111	9.62
V7		-		-	-	-	
V8		-		-	-	-	
C.D.(0.05)		0.39		21.82	0.17	0.8	
C.V. (%)		4.85		5.53	3.51	0.62	
Expt. Mean		6.64		328	4.00	108	
Soil type		-					
pH		5.95					
F - levels (kg/ha)							
F1		45:30:30					
F2		90:60:60					
Recommended N:P:K (kg/ha)		90:60:60					
Varieties							
V1		IET 30083					
V2		IET 30078					
V3		IET 30107					
V4		IET 29536 (R)					
V5		WGL 14 (NC 1)					
V6		BPT 5204 (NC 2)					
V7		-					
V8		-					
Available N:P:K of soil (kg/ha)		119:14.32:274					

Table 4.1i: Contd.

F-levels	Varieties	NAGINA						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: Low input (50% NPK)	V1	2.66	6	215	2.54	24.31	115	
	V2	-		-	-	-	-	
	V3	2.56	7	226	2.65	24.87	116	
	V4	2.43	8	215	2.48	24.89	111	
	V5	2.25	10	200	2.20	21.93	117	
	V6	2.29	9	205	2.13	22.50	116	
	V7	-		-	-	-	-	
	V8	-		-	-	-	-	
F2: Optimum input (100% NPK)	V1	4.74	1	317	2.72	23.61	115	18.91
	V2	-		-	-	-	-	
	V3	4.70	2	309	2.77	25.90	116	19.45
	V4	4.61	3	305	2.63	24.21	112	19.82
	V5	3.96	4	266	2.50	22.22	119	15.55
	V6	3.87	5	271	2.16	23.21	116	14.36
	V7	-		-	-	-	-	
	V8	-		-	-	-	-	
Interaction								
F at same V		0.25		16.19	0.03	0.63	NS	
V at same F		0.27		14.57	0.04	0.72	NS	
F1		2.44	2	212	2.40	23.70	115	
F2		4.38	1	294	2.56	23.83	116	17.62
C.D.(0.05)		0.19		2.01	0.04	NS	NS	
C.V.(%)		3.52		0.51	1.11	1.51	0.42	
Mean of varieties:								
V1		3.70	1	266	2.63	23.96	115	18.91
V2		-		-	-	-	-	
V3		3.63	2	268	2.71	25.39	116	19.45
V4		3.52	3	260	2.56	24.55	112	19.82
V5		3.11	4	233	2.35	22.08	118	15.55
V6		3.08	5	238	2.15	22.86	116	14.36
V7		-		-	-	-	-	
V8		-		-	-	-	-	
C.D.(0.05)		0.18		11.45	0.02	0.45	1.02	
C.V. (%)		4.29		3.7	0.7	1.54	0.72	
Expt. Mean		3.41		253	2.48	23.77	115	
Soil type		-						
pH		7.70						
F - levels (kg/ha)								
F1		60:30:20						
F2		120:60:40						
Recommended N:P:K (kg/ha)		120:60:40						
Varieties								
V1		IET 30083						
V2		-						
V3		IET 30107						
V4		IET 29536 (R)						
V5		WGL 14 (NC 1)						
V6		BPT 5204 (NC 2)						
V7		-						
V8		-						
Available N:P:K of soil (kg/ha)		21:18.33:209						

Table 4.1i: Contd.

F-levels	Varieties	NAWAGAM Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: Low input (50% NPK)	V1	4.65	13	214	3.10	14.47	109	
	V2	5.29	7	161	2.64	18.20	117	
	V3	4.80	12	215	3.00	12.27	111	
	V4	5.50	5	184	2.82	16.60	94	
	V5	4.90	11	194	2.95	14.70	111	
	V6	4.49	14	209	1.85	12.83	115	
	V7	-		-	-	-	-	
	V8	5.33	6	203	2.95	13.60	91	
F2: Optimum input (100% NPK)	V1	5.29	7	292	3.08	14.37	111	10.24
	V2	6.37	2	224	2.97	18.27	117	17.28
	V3	4.92	10	246	3.21	12.00	113	1.92
	V4	6.53	1	271	2.85	16.63	95	16.48
	V5	6.02	3	256	3.21	14.50	112	17.92
	V6	5.19	9	243	2.01	13.43	117	11.20
	V7	-		-	-	-	-	
	V8	5.93	4	286	3.07	14.87	94	9.60
Interaction								
F at same V		NS		NS	NS	NS	NS	
V at same F		NS		NS	NS	NS	NS	
F1		4.99	2	197	2.76	14.67	107	
F2		5.75	1	260	2.91	14.87	108	12.09
C.D.(0.05)		0.73		40.27	NS	NS	NS	
C.V.(%)		10.25		13.28	11.68	5.75	1.38	
Mean of varieties:								
V1		4.97	5	253	3.09	14.42	110	10.24
V2		5.83	2	193	2.81	18.24	117	17.28
V3		4.86	6	230	3.11	12.14	112	1.92
V4		6.02	1	228	2.84	16.62	95	16.48
V5		5.46	4	225	3.08	14.60	112	17.92
V6		4.84	7	226	1.93	13.13	116	11.20
V7		-		-	-	-	-	
V8		5.63	3	244	3.01	14.24	93	9.60
C.D.(0.05)		0.56		32.34	0.32	1.42	1.19	
C.V. (%)		8.78		11.88	9.6	8.04	0.93	
Expt. Mean		5.37		228	2.84	14.77	108	
Soil type		-						
pH		7.70						
F - levels (kg/ha)								
F1		50:12.5:0						
F2		100:25:0						
Recommended N:P:K (kg/ha)		100:25:0						
Varieties								
V1		IET 30083						
V2		IET 30078						
V3		IET 30107						
V4		IET 29536 (R)						
V5		WGL 14 (NC 1)						
V6		BPT 5204 (NC 2)						
V7		-						
V8		Local check - GR 15 (125 Days)						
Available N:P:K of soil (kg/ha)		21:18.33:209						

Table 4.1i: Contd.

F-levels	Varieties	RAIPUR						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: Low input (50% NPK)	V1	4.50	9	226	4.89	18.47	100	
	V2	4.67	8	220	3.92	21.70	107	
	V3	3.80	14	202	4.35	15.10	94	
	V4	4.43	10	196	4.21	17.73	90	
	V5	3.34	15	194	3.73	15.93	98	
	V6	3.32	16	258	3.42	15.90	104	
	V7	4.20	11	272	3.79	15.80	94	
	V8	4.01	13	188	6.27	18.50	90	
F2: Optimum input (100% NPK)	V1	5.55	1	274	5.86	18.50	100	9.55
	V2	5.52	2	294	4.83	22.90	108	7.73
	V3	5.33	4	246	5.72	15.20	95	13.91
	V4	5.48	3	273	4.77	18.33	90	9.55
	V5	4.72	7	253	4.98	16.87	99	12.55
	V6	4.14	12	304	3.64	16.07	104	7.45
	V7	5.23	5	310	4.47	16.27	94	9.36
	V8	4.74	6	237	6.62	19.13	90	6.64
Interaction								
F at same V		NS		NS	NS	NS	NS	
V at same F		NS		NS	NS	NS	NS	
F1		4.03	2	220	4.32	17.39	97	
F2		5.09	1	274	5.11	17.91	98	9.59
C.D.(0.05)		0.71		33.07	0.61	NS	NS	
C.V.(%)		12.59		10.79	10.46	3.52	0.44	
Mean of varieties:								
V1		5.03	2	250	5.38	18.49	100	9.55
V2		5.10	1	257	4.38	22.30	108	7.73
V3		4.57	5	224	5.04	15.15	95	13.91
V4		4.96	3	235	4.49	18.03	90	9.55
V5		4.03	7	224	4.36	16.40	99	12.55
V6		3.73	8	281	3.53	15.99	104	7.45
V7		4.72	4	291	4.13	16.04	94	9.36
V8		4.38	6	212	6.45	18.82	90	6.64
C.D.(0.05)		0.56		29.51	0.57	0.49	0.7	
C.V. (%)		10.4		10.12	10.15	2.36	0.61	
Expt. Mean		4.56		247	4.72		97	
Soil type		Vertisols						
pH		7.01						
F - levels (kg/ha)								
F1		60:30:20						
F2		120:60:40						
Recommended N:P:K (kg/ha)		120:60:40						
Varieties								
V1		IET 30083						
V2		IET 30078						
V3		IET 30107						
V4		IET 29536 (R)						
V5		WGL 14 (NC 1)						
V6		BPT 5204 (NC 2)						
V7		Improved Samba Mahsuri (N, E & C)						
V8		Local check - CG 1919 (130 Days)						
Available N:P:K of soil (kg/ha)		189.4:19.6:293.8						

Table 4.1i: Contd.

F-levels	Varieties	RAJENDRANAGAR Grain Yield (t/ha)	Ran k	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)	Over all mean	Rank
F1: Low input (50% NPK)	V1	3.54	10	268	4.08	14.83	76		4.64	11
	V2	3.63	9	275	2.82	17.50	79		4.94	10
	V3	3.31	14	260	3.14	12.57	78		4.64	12
	V4	3.78	8	277	2.42	15.27	74		5.59	5
	V5	3.53	11	264	2.06	12.27	81		4.36	14
	V6	3.42	13	262	3.53	11.77	66		4.05	16
	V7	-		-	-	-	-		4.20	15
	V8	3.43	12	262	3.32	11.70	77		4.40	13
F2: Optimum input (100% NPK)	V1	5.98	1	420	4.32	16.97	80	22.18	5.73	2
	V2	5.65	2	386	3.84	18.13	82	18.36	5.95	1
	V3	4.57	7	279	3.49	13.33	81	11.45	5.59	4
	V4	5.21	4	316	2.71	15.73	79	13.00	5.63	3
	V5	4.79	5	313	2.13	12.73	86	11.45	5.36	6
	V6	5.54	3	323	3.68	12.10	71	19.27	5.19	9
	V7	-		-	-	-	-		5.23	8
	V8	4.71	6	283	3.57	12.13	81	11.64	5.36	7
Interaction										
F at same V		0.4		51.26	NS	0.53	NS			
V at same F		0.46		57.27	NS	0.69	NS			
F1		3.52	2	267	3.05	13.70	76		4.63	2
F2		5.21	1	331	3.39	14.45	80	15.34	5.53	1
C.D.(0.05)		0.34		40.9	0.12	0.62	2.16			
C.V.(%)		5.79		10.3	2.91	3.33	2.08			
Mean of varieties:										
V1		4.76	1	344	4.20	15.90	78	22.18	5.19	3
V2		4.64	2	330	3.33	17.82	81	18.36	5.44	2
V3		3.94	7	270	3.32	12.95	79	11.45	5.12	4
V4		4.50	3	296	2.57	15.50	77	13.00	5.61	1
V5		4.16	5	289	2.10	12.50	84	11.45	4.86	6
V6		4.48	4	292	3.61	11.94	69	19.27	4.62	8
V7		-		-	-	-	-		4.72	7
V8		4.07	6	272	3.45	11.92	79	11.64	4.88	5
C.D.(0.05)		0.29		36.25	0.47	0.37	1.52			
C.V. (%)		5.49		10.17	12.36	2.23	1.64			
Expt. Mean		4.36		299	3.22	14.07	78		5.08	
Soil type		Vertisols								
pH		7.01								
F - levels (kg/ha)										
F1		60:30:20								
F2		120:60:40								
Recommended N:P:K (kg/ha)		120:60:40								
Varieties										
V1		IET 30083								
V2		IET 30078								
V3		IET 30107								
V4		IET 29536 (R)								
V5		WGL 14 (NC 1)								
V6		BPT 5204 (NC 2)								
V7		-								
V8		Local check - CG 1919(130 Days)								
Available N:P:K of soil (kg/ha)		189.4:19.6:293.8								

4.1(j) AVT 2 - Phosphorous efficient cultivars (LPT)

Phosphorus is an important nutrient for rice production but the use efficiency of this nutrient is very low (20-30%) and its deficiency has been identified as one of the major constraint limiting production of rice in most of the Indian soils. Enhancing phosphorus use efficiency (PUE) in rice would offer an affordable option for improving yields and economic returns with reduced inputs to farming community. Further, research studies have revealed that genotypic differences for PUE exist and there is a need to identify the cultivars which are adopted to low P situations and have higher P use efficiency. Hence, the present trial is constituted to evaluate the identified cultures and cultivars with the following objectives: 1) To study the comparative performance of elite lines and cultivars in different levels of Phosphorus and 2) To identify the elite lines for tolerance to low soil P conditions. The trial was conducted at seven locations (**Gangavathi, Karjat, Mandya, Maruteru, Raipur, Ranchi and Varanasi**). Split plot design was adopted with 3 main plots of phosphorus levels (P_1- No Phosphorus (Control) (N and K Constant), P_2: 50% of recommended P dose (N and K is constant) and P_3: 100 % of recommended dose of P (N and K constant). Subplots consist of advanced cultures and checks. The results were summarized and presented in **Table 4.1j** and the salient findings are as followed.

Interaction effect of phosphorus level and advanced cultures on grain yield was found significant only at **Gangavathi** and **Maruteru** while, higher 'P' application recorded better yields (50 and 100% of recommended P) at these centers.

Application of 'P' significantly influenced the grain yield at **Karjat, Mandya, Ranchi** and **Varanasi**. Mean maximum grain yield was with 100% RDP (4.79 t/ha) followed by 50% of RDP (4.47 t/ha) and average increase with 100% RDP was to the tune of 7% over 50% 'P' application.

The performance of cultures was significant for grain yield at all locations except at **Mandya** and **Varanasi**. Among the cultures tested, IET 29549 (6.37 t/ha) at **Gangavathi**; IET 30233 (5.31 t/ha) at **Karjat**; IET 30230 (5.63 t/ha) at **Mandya**; IET 30235 (7.58 t/ha) at **Maruteru** and IET 30252 (4.46 t/ha) at **Raipur** were found promising with better yields and promising over checks. At **Varanasi** and **Ranchi**, the standard checks were found promising and gave better yields over checks.

Mean over the locations (seven locations) all the cultures were 'P' responsive except at **Mandya** and **Varanasi** where in soil 'P' levels were very high. Among the cultures, across the locations the culture IET 30252 (4.76 t/ha) and IET 30230(4.71 t/ha) were found promising and gave better yields over other cultures and on par with checks at most of the locations.

Table 4.1(j): Summary of data on grain yield and ancillary characters of selected AVT LPT cultures grown under transplanted conditions at graded levels of recommended N fertilizer doses, kharif 2023.

P-levels	Varieties	GANGAVATHI					
		Grain Yield (t/ha)	***Rank***	Panicle/m^2 (No.)	Panicle wt (g)	Tes wt (g)	Phosphorous res. (kg grain/kg P) (Base level 0% RDP)
P1: 0% of recommended P dose (N and K is constant)	V1	-		-	-	-	
	V2	-		-	-	-	
	V3	-		-	-	-	
	V4	-		-	-	-	
	V5	-		-	-	-	
	V6	-		-	-	-	
	V7	-		-	-	-	
	V8	-		-	-	-	
	V9	-		-	-	-	
	V10	-		-	-	-	
	V11	-		-	-	-	
	V12	-		-	-	-	
P2: 50% of recommended P dose (N and K is constant)	V1	6.07	*2*	236	3.05	19.37	
	V2	5.03	*9*	215	3.04	22.67	
	V3	5.20	*8*	270	3.81	30.20	
	V4	4.12	*16*	208	2.45	21.60	
	V5	4.37	*14*	220	2.94	20.40	
	V6	4.87	*10*	297	1.86	20.03	
	V7	5.56	*5*	257	2.51	28.07	
	V8	4.05	*17*	268	2.23	18.60	
	V9	-		-	-	-	
	V10	3.95	*19*	310	2.34	14.20	
	V11	2.73	*22*	281	1.57	13.63	
	V12	4.79	*11*	259	2.37	14.10	
P3: 100% of recommended P dose	V1	6.67	*1*	271	2.31	19.10	16.00
	V2	5.36	*6*	236	2.45	22.63	8.80
	V3	4.69	*13*	263	3.23	23.30	-13.60
	V4	4.02	*18*	222	2.21	20.80	-2.67
	V5	4.74	*12*	219	3.11	20.73	9.87
	V6	5.32	*7*	314	2.25	20.80	12.00
	V7	5.99	*3*	318	2.21	28.47	11.47
	V8	3.50	*20*	297	2.15	18.37	-14.67
	V9	-		-	-	-	
	V10	4.37	*14*	335	1.95	13.60	11.20
	V11	3.15	*21*	255	2.15	14.50	11.20
	V12	5.76	*4*	339	2.65	15.55	25.87
Interaction							
P at same V		0.62		24.96	0.28	NS	
V at same P		0.84		27.18	0.33	NS	
P1		-		-	-	-	
P2		4.61	*2*	257	2.56	20.26	
P3		4.87	*1*	279	2.42	19.80	6.86
C.D.(0.05)		NS		16.82	NS	NS	
C.V.(%)		15.21		5.93	9.31	14.2	

Table 4.1(j): Contd.

P-levels	Varieties	GANGAVATHI					
		Grain Yield (t/ha)	***Rank***	Panicle/m^2 (No.)	Panicle wt (g)	Tes wt (g)	Phosphorous res. (kg grain/kg P) (Base level 0% RDP)
Mean of varieties:							
	V1	6.37	*1*	254	2.68	19.2	16.00
	V2	5.20	*4*	225	2.75	22.7	8.80
	V3	4.95	*6*	267	3.52	26.8	-13.60
	V4	4.07	*9*	215	2.33	21.2	-2.67
	V5	4.56	*7*	220	3.03	20.6	9.87
	V6	5.10	*5*	306	2.06	20.4	12.00
	V7	5.78	*2*	288	2.36	28.3	11.47
	V8	3.78	*10*	283	2.19	18.5	-14.67
	V9	-		-	-	-	
	V10	4.16	*8*	323	2.15	13.9	11.20
	V11	2.94	*11*	268	1.86	14.1	11.20
	V12	5.28	*3*	299	2.51	14.8	25.87
	C.D.(0.05)	0.44		17.65	0.2	3.1	
	C.V.(%)	7.92		5.65	6.78	13.25	
	Expt. Mean	4.74		268	2.49	20.03	
	Soil type	-					
	pH	-					
	P - levels (kg/ha)						
	P1 (0%)	0					
	P2 (50%)	37.5					
	P3 (100%)	75					
	Recommended NPK (kg/ha)	150:75:75					
	Varieties						
	V1	IET 29549					
	V2	IET 30240					
	V3	IET 30252					
	V4	IET 30235					
	V5	IET 30233					
	V6	IET 30230					
	V7	IET 30242					
	V8	Swarna					
	V9	-					
	V10	Improved Samba Mahsuri					
	V11	BPT 5204					
	V12	Local check					
	Availabe NPK of soil (kg/ha)	-					

Table 4.1(j): Contd.

P-levels	Varieties	KARJAT						
		Grain Yield (t/ha)	***Rank***	Panicle/m^2 (No.)	Panicle wt (g)	Tes wt (g)	Days for 50% Flowering	Phosphorous res. (kg grain/kg P) (Base level 0% RDP)
P1: 0% of recommended P dose (N and K is constant)	V1	3.14	*27*	172	2.04	25.15	95	
	V2	4.44	*17*	190	2.82	26.22	97	
	V3	3.54	*25*	170	2.63	25.98	96	
	V4	3.74	*24*	184	2.74	26.19	99	
	V5	4.54	*14*	198	3.51	31.18	97	
	V6	4.46	*16*	195	2.92	27.39	96	
	V7	4.52	*15*	197	3.37	28.27	98	
	V8	3.19	*26*	164	2.18	25.61	97	
	V9	-		-	-	-	-	
	V10	4.61	*13*	217	3.69	32.07	97	
	V11	-		-	-	-	-	
	V12	-		-	-	-	-	
P2: 50% of recommended P dose (N and K is constant)	V1	4.15	*23*	185	2.23	25.63	98	40.40
	V2	4.88	*10*	203	3.24	27.58	100	17.60
	V3	4.36	*19*	187	2.81	27.07	99	32.80
	V4	4.64	*12*	198	2.87	27.16	98	36.00
	V5	5.62	*5*	224	3.63	31.69	99	43.20
	V6	5.43	*8*	208	3.28	27.72	97	38.80
	V7	5.59	*6*	217	3.48	29.60	99	42.80
	V8	4.21	*22*	187	2.74	25.96	98	40.80
	V9	-		-	-	-	-	
	V10	5.75	*3*	229	3.82	32.83	98	45.60
	V11	-		-	-	-	-	
	V12	-		-	-	-	-	
P3: 100% of recommended P dose	V1	4.27	*20*	188	2.28	28.13	99	22.60
	V2	4.92	*9*	215	3.34	28.26	99	9.60
	V3	4.42	*18*	212	2.86	27.72	99	17.60
	V4	4.78	*11*	214	3.11	27.00	99	20.80
	V5	5.77	*2*	232	3.80	32.29	99	24.60
	V6	5.53	*7*	226	3.56	28.89	99	21.40
	V7	5.63	*4*	231	3.73	30.37	100	22.20
	V8	4.27	*20*	198	2.83	27.43	100	21.60
	V9	-		-	-	-	-	
	V10	5.82	*1*	240	3.84	33.21	99	24.20
	V11	-		-	-	-	-	
	V12	-		-	-	-	-	
Interaction								
P at same V		NS		NS	NS	NS	1.34	
V at same P		NS		NS	NS	NS	1.33	
P1		4.02	*3*	188	2.88	27.56	97	
P2		4.96	*2*	204	3.12	28.36	98	37.56
P3		5.05	*1*	217	3.26	29.26	99	20.51
C.D.(0.05)		0.15		4.91	0.12	0.4	0.68	
C.V.(%)		6.73		5	8.28	2.94	1.44	

Table 4.1(j): Contd.

P-levels	Varieties	KARJAT						
		Grain Yield (t/ha)	***Rank***	Panicle/m^2 (No.)	Panicle wt (g)	Tes wt (g)	Days for 50% Flowering	Phosphorous res. (kg grain/kg P) (Base level 0% RDP)
Mean of varieties:								
	V1	3.85	*9*	182	2.18	26.3	97	31.50
	V2	4.75	*5*	203	3.13	27.4	99	13.60
	V3	4.11	*7*	190	2.77	26.9	98	25.20
	V4	4.39	*6*	199	2.91	26.8	99	28.40
	V5	5.31	*2*	218	3.65	31.7	98	33.90
	V6	5.14	*4*	210	3.25	28.0	97	30.10
	V7	5.25	*3*	215	3.53	29.4	99	32.50
	V8	3.89	*8*	183	2.58	26.3	98	31.20
	V9	-		-	-	-	-	
	V10	5.39	*1*	229	3.78	32.7	98	34.90
	V11	-		-	-	-	-	
	V12	-		-	-	-	-	
	C.D.(0.05)	0.41		13.17	0.16	1.16	0.77	
	C.V.(%)	9.39		6.88	5.49	4.33	0.83	
	Expt. Mean	4.67		203	3.09	28.39	98	
	Soil type	-						
	pH	-						
	P - levels (kg/ha)							
	P1 (0%)	0						
	P2 (50%)	25.0						
	P3 (100%)	50						
	Recommended NPK (kg/ha)	120:50:50						
	Varieties							
	V1	IET 29549						
	V2	IET 30240						
	V3	IET 30252						
	V4	IET 30235						
	V5	IET 30233						
	V6	IET 30230						
	V7	IET 30242						
	V8	Swarna						
	V9	-						
	V10	Improved Samba Mahsuri						
	V11	-						
	V12	-						
	Availabe NPK of soil (kg/ha)	-						

Table 4.1(j): Contd.

P-levels	Varieties	MANDYA Grain Yield (t/ha)	*Rank*	Panicle/m^2 (No.)	Panicle wt (g)	Tes wt (g)	Days for 50% Flowering	Phosphorous res. (kg grain/kg P) (Base level 0% RDP)
P1: 0% of recommended P dose (N and K is constant)	V1	4.64	*13*	362	3.46	20.61	101	
	V2	5.07	*8*	354	3.90	23.53	105	
	V3	5.11	*7*	331	4.22	24.08	104	
	V4	5.29	*6*	367	4.35	23.15	104	
	V5	4.70	*11*	356	4.47	20.91	106	
	V6	5.52	*5*	359	3.21	20.84	89	
	V7	3.60	*20*	364	3.23	26.13	97	
	V8	3.98	*19*	402	2.52	19.00	108	
	V9	4.55	*16*	368	3.35	22.18	89	
	V10	4.20	*18*	385	2.51	13.88	102	
	V11	-		-	-	-	-	
	V12	-		-	-	-	-	
P2: 50% of recommended P dose (N and K is constant)	V1	4.88	*9*	369	3.90	20.75	101	9.60
	V2	5.72	*3*	360	4.04	23.39	105	26.00
	V3	5.68	*4*	332	4.27	24.51	104	22.80
	V4	5.75	*1*	371	4.47	23.48	104	18.40
	V5	4.88	*9*	357	4.60	21.33	108	7.20
	V6	5.74	*2*	358	3.28	21.16	89	8.80
	V7	4.57	*15*	373	3.29	28.89	97	38.80
	V8	4.28	*17*	417	2.80	19.52	108	12.00
	V9	4.68	*12*	380	3.51	23.18	89	5.20
	V10	4.58	*14*	387	2.52	14.07	101	15.20
	V11	-		-	-	-	-	
	V12	-		-	-	-	-	
P3: 100% of recommended P dose	V1	-		-	-	-	-	
	V2	-		-	-	-	-	
	V3	-		-	-	-	-	
	V4	-		-	-	-	-	
	V5	-		-	-	-	-	
	V6	-		-	-	-	-	
	V7	-		-	-	-	-	
	V8	-		-	-	-	-	
	V9	-		-	-	-	-	
	V10	-		-	-	-	-	
	V11	-		-	-	-	-	
	V12	-		-	-	-	-	
Interaction								
P at same V		NS		NS	NS	NS	NS	
V at same P		NS		NS	NS	NS	NS	
P1		4.67	*2*	365	3.52	21.43	101	
P2		5.08	*1*	370	3.67	22.03	101	16.40
P3		-		-	-	-	-	
C.D.(0.05)		0.5		13.4	0.35	0.36	0.53	
C.V.(%)		18.23		6.49	17.43	2.93	0.93	

Table 4.1(j): Contd.

P-levels	Varieties	MANDYA						
		Grain Yield (t/ha)	***Rank***	Panicle/m^2 (No.)	Panicle wt (g)	Tes wt (g)	Days for 50% Flowering	Phosphorous res. (kg grain/kg P) (Base level 0% RDP)
Mean of varieties:								
	V1	4.76	*6*	365	3.68	20.7	101	9.60
	V2	5.40	*3*	357	3.97	23.5	105	26.00
	V3	5.40	*3*	331	4.25	24.3	104	22.80
	V4	5.52	*2*	369	4.41	23.3	104	18.40
	V5	4.79	*5*	356	4.54	21.1	107	7.20
	V6	5.63	*1*	359	3.25	21.0	89	8.80
	V7	4.09	*10*	369	3.26	27.5	97	38.80
	V8	4.13	*9*	409	2.66	19.3	108	12.00
	V9	4.62	*7*	374	3.43	22.7	89	5.20
	V10	4.39	*8*	386	2.52	14.0	102	15.20
	V11	-		-	-	-	-	
	V12	-		-	-	-	-	
	C.D.(0.05)	NS		21.74	NS	NS	NS	
	C.V.(%)	11.07		6.21	10.3	3	0.81	
	Expt. Mean	4.87		368	3.60	21.73	101	
	Soil type	Red sandy loam						
	pH	8.0						
	P - levels (kg/ha)							
	P1 (0%)	0						
	P2 (50%)	25						
	P3 (100%)	50						
	Recommended NPK (kg/ha)	105:50:50						
	Varieties							
	V1	IET 29549						
	V2	IET 30240						
	V3	IET 30252						
	V4	IET 30235						
	V5	IET 30233						
	V6	IET 30230						
	V7	IET 30242						
	V8	Swarna						
	V9	Rasi						
	V10	Improved Samba Mahsuri						
	V11	-						
	V12	-						
	Availabe NPK of soil (kg/ha)	294:65.8:253.6						

Table 4.1(j): Contd.

P-levels	Varieties	MARUTERU Grain Yield (t/ha)	***Rank***	Panicle/m^2 (No.)	Panicle wt (g)	Tes wt (g)	Phosphorous res. (kg grain/kg P) (Base level 0% RDP)
P1: 0% of recommended P dose (N and K is constant)	V1	5.47	*24*	262	3.91	19.87	
	V2	5.18	*26*	296	5.10	23.22	
	V3	6.73	*7*	311	4.60	25.35	
	V4	7.27	*4*	313	4.28	23.80	
	V5	6.91	*6*	308	4.13	20.31	
	V6	5.88	*17*	297	3.07	21.04	
	V7	4.31	*27*	344	2.48	25.69	
	V8	6.19	*8*	341	3.74	19.87	
	V9	-		-	-	-	
	V10	5.84	*18*	361	3.12	15.42	
	V11	-		-	-	-	
	V12	-		-	-	-	
P2: 50% of recommended P dose (N and K is constant)	V1	6.01	*14*	268	4.38	20.49	36.00
	V2	5.27	*25*	300	4.61	24.21	6.00
	V3	6.97	*5*	314	4.89	25.42	16.00
	V4	7.37	*2*	336	4.27	24.46	6.67
	V5	6.06	*10*	351	4.22	20.68	-56.67
	V6	5.96	*16*	296	3.35	22.17	5.33
	V7	5.74	*20*	340	2.85	26.45	95.33
	V8	6.16	*9*	331	3.48	20.29	-2.00
	V9	-		-	-	-	
	V10	5.49	*23*	390	3.41	15.27	-23.33
	V11	-		-	-	-	
	V12	-		-	-	-	
P3: 100% of recommended P dose	V1	5.76	*19*	264	4.33	20.63	9.67
	V2	5.54	*21*	308	4.55	24.24	12.00
	V3	7.30	*3*	306	4.87	25.40	19.00
	V4	8.09	*1*	328	4.25	24.38	27.33
	V5	6.04	*11*	335	4.26	20.70	-29.00
	V6	6.02	*13*	305	3.33	22.30	4.67
	V7	5.98	*15*	337	2.83	26.74	55.67
	V8	6.04	*11*	331	3.49	20.56	-5.00
	V9	-		-	-	-	
	V10	5.54	*21*	374	3.37	15.34	-10.00
	V11	-		-	-	-	
	V12	-		-	-	-	
Interaction							
P at same V		0.58		NS	0.23	NS	
V at same P		0.55		NS	0.22	NS	
P1		5.98	*3*	315	3.83	21.62	
P2		6.11	*2*	325	3.94	22.16	5.56
P3		6.26	*1*	321	3.92	22.25	5.62
C.D.(0.05)		NS		NS	NS	0.15	
C.V.(%)		5.33		7.97	3.4	1.37	

Table 4.1(j): Contd.

P-levels	Varieties	MARUTERU					
		Grain Yield (t/ha)	***Rank***	Panicle/m^2 (No.)	Panicle wt (g)	Tes wt (g)	Phosphorous res. (kg grain/kg P) (Base level 0% RDP)
Mean of varieties:							
	V1	5.75	*6*	264	4.21	20.3	22.83
	V2	5.33	*9*	301	4.75	23.9	9.00
	V3	7.00	*2*	310	4.79	25.4	17.50
	V4	7.58	*1*	326	4.27	24.2	17.00
	V5	6.34	*3*	331	4.20	20.6	-42.83
	V6	5.95	*5*	299	3.25	21.8	5.00
	V7	5.34	*8*	340	2.72	26.3	75.50
	V8	6.13	*4*	334	3.57	20.2	-3.50
	V9	-		-	-	-	
	V10	5.62	*7*	375	3.30	15.3	-16.67
	V11	-		-	-	-	
	V12	-		-	-	-	
	C.D.(0.05)	0.33		19.69	0.14	0.32	
	C.V.(%)	5.76		6.52	3.68	1.55	
	Expt. Mean	6.12		320	3.90	22.01	
	Soil type	-					
	pH	6.0					
	P - levels (kg/ha)						
	P1 (0%)	0					
	P2 (50%)	15					
	P3 (100%)	30					
	Recommended NPK (kg/ha)	90:60:60					
	Varieties						
	V1	IET 29549					
	V2	IET 30240					
	V3	IET 30252					
	V4	IET 30235					
	V5	IET 30233					
	V6	IET 30230					
	V7	IET 30242					
	V8	Swarna					
	V9	-					
	V10	Improved Samba Mahsuri					
	V11	-					
	V12	-					
	Availabe NPK of soil (kg/ha)	119:14.32;274					

Table 4.1(j): Contd.

P-levels	Varieties	RAIPUR						
		Grain Yield (t/ha)	***Rank***	Panicle/m^2 (No.)	Panicle wt (g)	Tes wt (g)	Days for 50% Flowering	Phosphorous res. (kg grain/kg P) (Base level 0% RDP)
P1: 0% of recommended P dose (N and K is constant)	V1	3.65	*23*	193	2.43	20.80	98	
	V2	3.30	*30*	223	2.85	22.80	106	
	V3	4.26	*6*	205	3.95	24.10	96	
	V4	3.59	*28*	191	3.20	22.70	106	
	V5	3.65	*23*	173	4.05	20.80	105	
	V6	3.99	*11*	226	2.88	22.20	89	
	V7	3.72	*19*	184	3.80	29.50	88	
	V8	3.56	*29*	228	2.75	19.50	106	
	V9	-		-	-	-	-	
	V10	3.13	*33*	246	2.88	13.80	104	
	V11	3.14	*32*	240	1.98	17.11	108	
	V12	3.71	*20*	244	2.78	18.57	104	
P2: 50% of recommended P dose (N and K is constant)	V1	3.75	*18*	204	3.52	20.35	98	3.33
	V2	3.91	*14*	223	2.88	22.70	106	20.33
	V3	4.26	*6*	207	4.38	24.77	97	0.00
	V4	3.78	*17*	205	3.66	23.47	106	6.33
	V5	4.35	*5*	187	4.39	21.60	105	23.33
	V6	3.81	*16*	227	2.88	23.30	89	-6.00
	V7	3.67	*21*	213	2.89	28.25	88	-1.67
	V8	3.90	*15*	243	2.96	19.83	106	11.33
	V9	-		-	-	-	-	
	V10	3.62	*26*	252	2.99	13.83	105	16.33
	V11	3.61	*27*	252	2.64	16.50	108	15.67
	V12	3.63	*25*	249	2.77	19.00	104	-2.67
P3: 100% of recommended P dose	V1	4.23	*8*	216	3.94	21.43	98	9.67
	V2	4.55	*3*	230	3.83	23.47	106	20.83
	V3	4.87	*1*	223	3.68	25.30	97	10.17
	V4	4.56	*2*	217	4.14	23.27	106	16.17
	V5	4.03	*10*	197	4.30	21.67	106	6.33
	V6	3.25	*31*	226	3.23	23.13	89	-12.33
	V7	3.97	*13*	215	3.83	29.86	88	4.17
	V8	4.43	*4*	243	3.05	19.75	106	14.50
	V9	-		-	-	-	-	
	V10	4.15	*9*	266	2.28	13.57	105	17.00
	V11	3.99	*11*	265	2.22	17.80	108	14.17
	V12	3.67	*21*	258	3.01	19.12	105	-0.67
Interaction								
P at same V		NS		NS	NS	NS	NS	
V at same P		NS		NS	NS	NS	NS	
P1		3.61	*3*	214	3.05	21.08	101	
P2		3.84	*2*	224	3.27	21.24	101	9.42
P3		4.15	*1*	232	3.41	21.67	101	10.91
C.D.(0.05)		NS		NS	NS	NS	NS	
C.V.(%)		18.99		12.45	14.54	3.82	0.5	

Table 4.1(j): Contd.

P-levels	Varieties	RAIPUR						
		Grain Yield (t/ha)	***Rank***	Panicle/m² (No.)	Panicle wt (g)	Tes wt (g)	Days for 50% Flowering	Phosphorous res. (kg grain/kg P) (Base level 0% RDP)
Mean of varieties:								
	V1	3.88	*6*	204	3.30	20.9	98	6.50
	V2	3.92	*5*	225	3.19	23.0	106	20.58
	V3	4.46	*1*	212	4.00	24.7	97	5.08
	V4	3.98	*3*	204	3.67	23.1	106	11.25
	V5	4.01	*2*	186	4.25	21.4	105	14.83
	V6	3.68	*8*	226	3.00	22.9	89	-9.17
	V7	3.79	*7*	204	3.51	29.2	88	1.25
	V8	3.96	*4*	238	2.92	19.7	106	12.92
	V9	-		-	-	-	-	
	V10	3.63	*10*	255	2.72	13.7	105	16.67
	V11	3.58	*11*	252	2.28	17.1	108	14.92
	V12	3.67	*9*	250	2.85	18.9	104	-1.67
	C.D.(0.05)	0.49		21.61	0.5	0.55	0.59	
	C.V.(%)	13.5		10.26	16.47	2.76	0.62	
	Expt. Mean	3.87		223	3.24	21.33	101	
	Soil type	Vertisols						
	pH	6.9						
	P - levels (kg/ha)							
	P1 (0%)	0						
	P2 (50%)	30						
	P3 (100%)	60						
	Recommended NPK (kg/ha)	100:60:40						
	Varieties							
	V1	IET 29549						
	V2	IET 30240						
	V3	IET 30252						
	V4	IET 30235						
	V5	IET 30233						
	V6	IET 30230						
	V7	IET 30242						
	V8	Swarna						
	V9	-						
	V10	Improved Samba Mahsuri						
	V11	BPT 5204						
	V12	Local check - CG Devbhog(135 days)						
	Availabe NPK of soil (kg/ha)	173.6:18.4:301.7						

Table 4.1(j): Contd.

P-levels	Varieties	RANCHI					
		Grain Yield (t/ha)	***Rank***	Panicle/m^2 (No.)	Panicle wt (g)	Tes wt (g)	Phosphorous res. (kg grain/kg P) (Base level 0% RDP)
P1: 0% of recommended P dose (N and K is constant)	V1	4.05	*25*	239	3.26	24.15	
	V2	3.86	*26*	224	3.17	24.08	
	V3	4.31	*17*	250	3.38	24.35	
	V4	3.86	*26*	223	3.40	24.10	
	V5	4.18	*22*	242	3.35	24.21	
	V6	4.35	*15*	253	3.48	24.45	
	V7	4.22	*21*	244	3.42	24.36	
	V8	4.62	*7*	268	3.51	24.68	
	V9	-		-	-	-	
	V10	4.48	*12*	258	3.47	24.44	
	V11	-		-	-	-	
	V12	-		-	-	-	
P2: 50% of recommended P dose (N and K is constant)	V1	4.27	*20*	245	3.32	24.22	11.00
	V2	4.13	*24*	239	3.28	24.12	13.50
	V3	4.52	*11*	260	3.41	24.42	10.50
	V4	4.14	*23*	240	3.47	24.21	14.00
	V5	4.35	*15*	252	3.38	24.31	8.50
	V6	4.57	*10*	265	3.52	24.57	11.00
	V7	4.48	*12*	259	3.49	24.47	13.00
	V8	4.71	*6*	272	3.56	24.78	4.50
	V9	-		-	-	-	
	V10	4.59	*9*	266	3.53	24.58	5.50
	V11	-		-	-	-	
	V12	-		-	-	-	
P3: 100% of recommended P dose	V1	4.31	*17*	249	3.42	24.27	6.50
	V2	4.48	*12*	260	3.13	24.18	15.50
	V3	4.78	*2*	277	3.46	24.50	11.75
	V4	4.28	*19*	247	3.52	24.28	10.50
	V5	4.62	*7*	268	3.41	24.39	11.00
	V6	4.75	*4*	276	3.59	24.60	10.00
	V7	4.78	*2*	279	3.52	24.51	14.00
	V8	4.85	*1*	282	3.61	24.81	5.75
	V9	-		-	-	-	
	V10	4.72	*5*	272	3.55	24.62	6.00
	V11	-		-	-	-	
	V12	-		-	-	-	
Interaction							
P at same V		NS		NS	NS	NS	
V at same P		NS		NS	NS	NS	
P1		4.21	*3*	245	3.38	24.31	
P2		4.42	*2*	255	3.44	24.41	10.17
P3		4.62	*1*	268	3.47	24.46	10.11
C.D.(0.05)		0.12		NS	0.03	0.04	
C.V.(%)		5.46		11.66	1.99	0.3	

Table 4.1(j): Contd.

P-levels	Varieties	RANCHI Grain Yield (t/ha)	*Rank*	Panicle/m^2 (No.)	Panicle wt (g)	Tes wt (g)	Phosphorous res. (kg grain/kg P) (Base level 0% RDP)
Mean of varieties:							
	V1	4.21	*7*	244	3.33	24.2	8.75
	V2	4.16	*8*	241	3.19	24.1	14.50
	V3	4.54	*4*	262	3.42	24.4	11.13
	V4	4.09	*9*	237	3.46	24.2	12.25
	V5	4.38	*6*	254	3.38	24.3	9.75
	V6	4.56	*3*	265	3.53	24.5	10.50
	V7	4.49	*5*	261	3.48	24.4	13.50
	V8	4.73	*1*	274	3.56	24.8	5.12
	V9	-		-	-	-	
	V10	4.60	*2*	265	3.52	24.5	5.75
	V11	-		-	-	-	
	V12	-		-	-	-	
	C.D.(0.05)	0.37		19.5	0.1	0.09	
	C.V.(%)	8.87		8.08	3.03	0.41	
	Expt. Mean	4.42		256	3.43	24.39	
	Soil type	-					
	pH	-					
	P - levels (kg/ha)						
	P1 (0%)	0					
	P2 (50%)	20					
	P3 (100%)	40					
	Recommended NPK (kg/ha)	80:40:30					
	Varieties						
	V1	IET 29549					
	V2	IET 30240					
	V3	IET 30252					
	V4	IET 30235					
	V5	IET 30233					
	V6	IET 30230					
	V7	IET 30242					
	V8	Swarna					
	V9	-					
	V10	Improved Samba Mahsuri					
	V11	-					
	V12	-					
	Availabe NPK of soil (kg/ha)	224:46:163					

Table 4.1(j): Contd.

P-levels	Varieties	VARANASI							Mean Grain Yield (t/ha)	Rank
		Grain Yield (t/ha)	***Rank***	Panicle/m^2 (No.)	Panicle wt (g)	Tes wt (g)	Days for 50% Flowering	Phosphorous res. (kg grain/kg P) (Base level 0% RDP)		
P1: 0% of recommended P dose (N and K is constant)	V1	-		-	-	-	-		4.19	*29*
	V2	-		-	-	-	-		4.37	*25*
	V3	-		-	-	-	-		4.79	*9*
	V4	-		-	-	-	-		4.75	*10*
	V5	-		-	-	-	-		4.80	*8*
	V6	-		-	-	-	-		4.84	*5*
	V7	-		-	-	-	-		4.07	*30*
	V8	-		-	-	-	-		4.31	*26*
	V9	-		-	-	-	-		4.55	*19*
	V10	-		-	-	-	-		4.45	*24*
	V11	-		-	-	-	-		3.14	*35*
	V12	-		-	-	-	-		3.71	*32*
P2: 50% of recommended P dose (N and K is constant)	V1	2.46	*15*	189	24.52	17.00	94		4.51	*21*
	V2	2.60	*13*	183	21.33	21.63	98		4.51	*22*
	V3	2.62	*12*	167	21.59	21.73	99		4.80	*7*
	V4	2.10	*17*	141	21.16	21.83	94		4.56	*18*
	V5	1.85	*18*	116	30.12	20.83	101		4.50	*23*
	V6	1.26	*20*	159	11.21	22.63	82		4.52	*20*
	V7	2.47	*14*	171	18.71	22.50	83		4.58	*16*
	V8	2.68	*11*	150	17.05	18.83	99		4.28	*27*
	V9	-		-	-	-	-		4.68	*12*
	V10	1.81	*19*	159	17.39	14.07	100		4.26	*28*
	V11	-		-	-	-	-		3.17	*34*
	V12	3.07	*9*	201	21.35	23.50	99		3.83	*31*
P3: 100% of recommended P dose	V1	4.41	*4*	134	32.02	18.47	93	65.00	4.94	*2*
	V2	3.42	*7*	195	26.13	24.93	98	27.33	4.71	*11*
	V3	3.10	*8*	170	21.07	23.43	99	16.00	4.86	*4*
	V4	2.31	*16*	150	23.15	21.23	95	7.00	4.67	*13*
	V5	2.70	*10*	118	21.91	18.40	101	28.33	4.65	*14*
	V6	4.56	*1*	170	20.29	31.47	83	110.00	4.91	*3*
	V7	4.42	*3*	190	21.01	25.43	84	65.00	5.13	*1*
	V8	4.33	*5*	177	21.60	20.60	99	55.00	4.57	*17*
	V9	-		-	-	-	-			
	V10	4.27	*6*	189	16.20	20.67	101	82.00	4.81	*6*
	V11	-		-	-	-	-		3.57	*33*
	V12	4.48	*2*	223	22.93	24.00	101	47.00	4.64	*15*
Interaction										
P at same V		NS		NS	NS	NS	NS			
V at same P		NS		NS	NS	NS	NS			
P1									4.50	*2*
P2		2.29	*2*	164	20.44	20.46	95		4.47	*3*
P3		3.80	*1*	172	22.63	22.86	95	126.67	4.79	*1*
C.D.(0.05)		0.53		2.35	1.32	0.63	0.11			
C.V.(%)		30.77		2.5	10.89	5.15	0.21			

Table 4.1(j): Contd.

P-levels	Varieties	VARANASI Grain Yield (t/ha)	***Rank***	Panicle/m^2 (No.)	Panicle wt (g)	Tes wt (g)	Days for 50% Flowering	Phosphorous res. (kg grain/kg P) (Base level 0% RDP)	Mean Grain Yield (t/ha)	Rank
Mean of varieties:										
	V1	3.44	*4*	162	28.27	17.7	94	65.00	4.61	*4*
	V2	3.01	*6*	189	23.73	23.3	98	27.33	4.54	*7*
	V3	2.86	*8*	169	21.33	22.6	99	16.00	4.76	*1*
	V4	2.21	*10*	146	22.16	21.5	95	7.00	4.55	*6*
	V5	2.28	*9*	117	26.02	19.6	101	28.33	4.52	*8*
	V6	2.91	*7*	165	15.75	27.1	83	110.00	4.71	*2*
	V7	3.45	*3*	181	19.86	24.0	84	65.00	4.60	*5*
	V8	3.51	*2*	164	19.33	19.7	99	55.00	4.30	*10*
	V9	-		-	-	-	-		4.62	*3*
	V10	3.04	*5*	174	16.80	17.4	100	82.00	4.41	*9*
	V11	-		-	-	-	-		3.26	*12*
	V12	3.78	*1*	212	22.14	23.8	100	47.00	4.24	*11*
	C.D.(0.05)	NS		3.74	NS	NS	NS			
	C.V.(%)	11.9		2.34	9.23	4.99	0.63			
	Expt. Mean	3.05		168	21.54	21.66	95		4.53	
	Soil type	Sandy clay loam								
	pH	7.6								
	P - levels (kg/ha)									
	P1 (0%)	0								
	P2 (50%)	30								
	P3 (100%)	60								
	Recommended NPK (kg/ha)	120:60:40								
	Varieties									
	V1	IET 29549								
	V2	IET 30240								
	V3	IET 30252								
	V4	IET 30235								
	V5	IET 30233								
	V6	IET 30230								
	V7	IET 30242								
	V8	Swarna								
	V9	-								
	V10	Improved Samba Mahsuri								
	V11	-								
	V12	Local check - HUR 917(140 days)								
	Availabe NPK of soil (kg/ha)	-								

4.1k AVT-2 LNT

Evaluation of identified cultures and cultivars for enhancing nitrogen use efficiency in irrigated rice

The productivity of rice is very low due to imbalanced and excessive use of nitrogen fertilizers by the farmers. It has been reported that the apparent recovery efficiency of applied nitrogen is approximately about 30-33% whereas, the remaining amount of N is either lost through surface runoff, leaching, volatilization or denitrification and further adds to increased cost of production and environmental degradation. The use of efficient and economical rates of nitrogen fertilizer is important for enhancing crop productivity and maintaining environmental sustainability. To achieve this, it is imperative to identify high nitrogen efficient cultivars which can minimize the losses. Large numbers of rice cultivars have been released in India so far, but the question is that whether these cultivars are capable of utilizing the nitrogen efficiently and there by enhance NUE. Inter varietal differences for nitrogen use efficiency has been reported by many researchers. Therefore, there is a need to identify the cultivars which can efficiently utilize the N and to develop a sustainable nitrogen rate recommendation for these cultivars which can further give enhanced yield and resource use efficiency. Hence the present trial is constituted to evaluate the identified cultures (NIL's) and cultivars with the following objective: 1) To study the comparative performance of elite lines and cultivars under different levels of nitrogen. The trial was conducted at nine locations (**Gangavathi**, **Karjat, Kaul, Mandya, Maruteru, Pusa, Raipur, Ranchi and Varanasi**). Split plot design was adopted with 3 main plots of nitrogen levels (N_1- No nitrogen, N_2: 50 %of recommended N dose (P and K is constant) and N_3: 100 % of recommended dose of N (P and K constant). Subplots consists of 6 advanced cultures along with four checks. The results were summarized and presented in **Table 4.1k** and the salient findings are as followed.

Interaction effect of nitrogen level and advanced cultures on grain yield was found significant at **Kaul, Maruteru** and **Pusa**. However, the objective is to find out suitable and efficient cultivars under low recommended N application for reducing Nitrogen input without any yield penality.

In **Gangavathi**, the cultures were evaluated only at two levels of Nitrogen i.e. 50% and 100% of RDN. However, there is no significant difference of cultivars on grain yield. Among the cultures, the grain yield of IET 29578, IET 29577 and IET 30261 were promising interms of higher grain yield (5.22 t/ha to 6.00 t/ha) which were comparable to variety Swarna (4.15 t/ha).

In clay loam soils of **Karjat,** all cultures performed better under 50% and 100% of RDN over no 'N' application. Among the cultures, IET 29578 (5.14 t/ha) and IET 30273 (4.67 t/ha) found promising with higher grain yield. Among nitrogen levels 100% RDN resulted significantly highest grain yield (5.01 t/ha) and significantly superior over 50% RDN (4.22 t/ha). All the cultures performed significantly superior at 100% RDN over 50% RDN.

All cultures were tested at two graded levels of N (50, 100 of RDN) at **Kaul** also **(150:60:60)**. Interaction effect of cultures vs N fertilizer was significant and 100% RDN and found significant (5.37 t/ha) over 50% (4.24 t/ha). Among the cultures, IET 29578 (5.73 t/ha) followed by IET 29581 (5.68 t/ha) were found promising and significantly superior to checks as well as other cultures tested.

At **Mandya,** interaction effect of nitrogen level and advanced cultures on grain yield was significant. Among nitrogen levels (50% RDN and no 'N' application), 50% N application gave significantly higher grain yield of 4.77 t/ha over no N application (3.99 t/ha). Among advanced cultures IET 30261 (5.21 t/ha) resulted the higher grain yield followed by IET 29577 (5.91 t/ha) at 50% of RDN. Mean over 'N' levels, the highest agronomic efficiency of N was recorded in IET 30261 (20.00) followed by IET 29577 (18.80) and found superior over checks tested due to better yield at 50% RDN application.

At **Maruteru**, interaction effect 'N' levels and cultivars, 'N' levels as well cultivars was found significant (0, 50 and 100% RDN application). Application of RDN @ 100% (90 kg/ha) found significantly superior to 50% RDN (5.39 t/ha) and no 'N' application (4.62 t/ha). Cultures were significantly superior in recording better yield at higher 'N' application (100% RDN). Further, among cultures IET 30273 (5.78 t/ha) found significantly promising over other cultures and checks with better Nitrogen response (24.39 kg grain/kg N)

At **Pusa**, the cultures were evaluated at three levels of N application (0, 50 and 100% of RDN). Interaction effect was significant and most of the cultures recorded significantly higher grain yield (4.72 t/ha) at maximum RDN (100% RDN). Application of 100% RDN gave significantly maximum grain of 4.72 t/ha over 50% RDN (3.39 t/ha) and no 'N' application (1.93 t/ha). Among the cultures, IET 29577 (3.76 t/ha) followed by IET 29581 (3.73 t/ha) found promising with higher yields over cultures and local checks.

At **Raipur**, the cultures tested at three levels of N application (0, 50, 100% RDN). The interaction effect was not significant, however, most of the cultures recorded significantly higher grain yield at 100% of RDN. Application of 100% RDN gave significantly higher grain yield of (5.07 t/ha) over 50% RDN (4.16 t/ha). Among the cultures, IET 30273 (4.40 t/ha) followed by IET 29577 (4.34 t/ha) which were comparable with Swarna (4.55 t/ha) in terms of grain yield.

At **Ranchi**, three levels of 'N' (0, 50, 100% RDN) was applied for evaluation of cultures and their response. Interaction effect of 'N' levels vs cultures was non-significant. Application of 100% RDN (3.77 t/ha) was significantly higher over 50% (3.24 t/ha) and no N application (2.10 t/ha). Mean over the 'N' levels, the culture IET 30270 (3.58 t/ha) followed by Rasi (3.53 t/ha) were found promising over other cultures and checks.

At **Varanasi**, the cultures were evaluated at two levels of RDN i.e. 50% and 100%RDN (120:60:40). Application of 100% RDN gave significantly higher grain yield of (4.30 t/ha) over 50% RDN (3.00 t/ha) with better nutrient response of (21.69 lg grain/kg N). Among the cultures, only IET 30261 and IET 29581 (4.03 to 4.32 t/ha) were found promising over other cultures.

Trial results compiled for nine locations to identify N efficient cultivars revealed that IET 29578, IET 30261, IET 29577, IET 29581 (4.11 to 4.41 t/ha) are the high yielding and high nitrogen use efficient cultivars and promising over other cultures across the locations. Most of the cultures performed well under 100% of RDN.

Table 4.1(k): Summary of data on grain yield and ancillary characters of selected AVT-2 LNT cultures grown under transplanted conditions at graded levels of recommended N fertilizer doses, kharif 2023.

N-levels	Varieties	GANGAVATHI					
		Grain Yield (t/ha)	***Rank***	Panicle/m^2 (No.)	Panicle wt (g)	Tes wt (g)	Nitrogen. res. (kg grain/kg N) (Base level 50% RDN)
N1: No nitrogen (Control) (P and K is constant)	V1	-		-	-	-	
	V2	-		-	-	-	
	V3	-		-	-	-	
	V4	-		-	-	-	
	V5	-		-	-	-	
	V6	-		-	-	-	
	V7	-		-	-	-	
	V8	-		-	-	-	
	V9	-		-	-	-	
	V10	-		-	-	-	
	V11	-		-	-	-	
N2: 50% of recommended N dose (P and K is constant)	V1	6.26	*1*	101	3.53	16.93	
	V2	5.22	*5*	80	3.17	21.17	
	V3	5.00	*7*	96	3.13	19.07	
	V4	5.55	*3*	85	3.23	21.00	
	V5	4.12	*14*	97	3.77	20.80	
	V6	2.98	*19*	37	1.90	17.17	
	V7	4.65	*9*	84	3.23	18.50	
	V8	-		-	-	-	
	V9	4.45	*11*	98	3.30	13.87	
	V10	4.43	*12*	78	2.97	10.77	
	V11	3.21	*17*	110	3.53	14.20	
N3: 100% of recommended N dose	V1	5.74	*2*	82	3.60	16.77	-6.93
	V2	5.33	*4*	104	2.70	21.43	1.47
	V3	4.36	*13*	84	3.63	19.10	-8.53
	V4	4.89	*8*	82	3.13	18.73	-8.80
	V5	4.55	*10*	102	3.87	20.23	5.73
	V6	2.74	*20*	43	2.27	15.90	-3.20
	V7	3.65	*16*	79	2.97	18.20	-13.33
	V8	-		-	-	-	
	V9	4.04	*15*	75	2.97	13.87	-5.47
	V10	5.10	*6*	87	5.00	13.07	8.93
	V11	3.09	*18*	107	4.17	13.53	-1.60
Interaction							
N at same V		NS		NS	NS	NS	
V at same N		NS		NS	NS	NS	
F1		-		-	-	-	
F2		4.59	*1*	87	3.18	17.35	
F3		4.35	*2*	85	3.43	17.08	-3.17
C.D.(0.05)		0.17		1.49	0.13	1.53	
C.V.(%)		6.91		3.09	7.06	15.83	

Table 4.1(k): Contd.

N-levels	Varieties	GANGAVATHI					
		Grain Yield (t/ha)	***Rank***	Panicle/m^2 (No.)	Panicle wt (g)	Tes wt (g)	Nitrogen. res. (kg grain/kg N) (Base level 50% RDN)
Mean of varieties:							
	V1	6.00	*1*	92	3.57	16.85	-6.93
	V2	5.28	*2*	92	2.94	21.30	1.47
	V3	4.68	*5*	90	3.38	19.09	-8.53
	V4	5.22	*3*	83	3.18	19.87	-8.80
	V5	4.34	*6*	100	3.82	20.52	5.73
	V6	2.86	*10*	40	2.09	16.54	-3.20
	V7	4.15	*8*	82	3.10	18.35	-13.33
	V8	-		-	-	-	
	V9	4.25	*7*	87	3.14	13.87	-5.47
	V10	4.77	*4*	82	3.99	11.92	8.93
	V11	3.15	*9*	108	3.85	13.87	-1.60
	C.D.(0.05)	NS		4.54	NS	NS	
	C.V.(%)	5.21		5.56	7.09	15.41	
	Expt. Mean	4.47		86	3.30	17.22	
	Soil type	-					
	pH	8.2					
	N - levels (kg/ha)						
	F1	-					
	F2	75					
	F3	150					
	Recommended NPK (kg/ha)	150:75:75					
	Varieties						
	V1	IET 29578					
	V2	IET 29577					
	V3	IET 30270					
	V4	IET 30261					
	V5	IET 29581					
	V6	IET 30273					
	V7	Swarna					
	V8	-					
	V9	Improved Samba Mahsuri					
	V10	BPT 5204					
	V11	Local check - RNR 15048					
	Available NPK (kg/ha)	-					

Table 4.1(k): Contd.

N-levels	Varieties	KARJAT						
		Grain Yield (t/ha)	***Rank***	Panicle/m^2 (No.)	Panicle wt (g)	Tes wt (g)	Days for 50% Flowering	Nitrogen. res. (kg grain/kg N) (Base level 0% RDN)
N1: No nitrogen (Control) (P and K is constant)	V1	4.17	*14*	217	4.76	28.36	97	
	V2	3.46	*20*	204	2.84	22.54	97	
	V3	2.64	*23*	181	2.72	22.22	99	
	V4	3.56	*18*	208	3.62	23.28	99	
	V5	2.44	*24*	179	2.71	20.67	98	
	V6	3.92	*16*	212	4.27	24.59	98	
	V7	3.18	*22*	200	2.74	22.48	99	
	V8	-		-	-	-	-	
	V9	3.64	*17*	211	3.65	23.54	99	
	V10	-		-	-	-	-	
	V11	-		-	-	-	-	
N2: 50% of recommended N dose (P and K is constant)	V1	5.01	*5*	248	5.00	30.37	100	14.00
	V2	4.23	*12*	243	3.22	24.01	99	12.83
	V3	3.55	*19*	232	2.90	23.33	99	15.17
	V4	4.40	*10*	245	3.90	24.45	99	14.00
	V5	3.27	*21*	220	2.87	21.18	98	13.83
	V6	4.67	*8*	248	4.39	27.42	98	12.50
	V7	4.21	*13*	241	3.16	23.92	96	17.17
	V8	-		-	-	-	-	
	V9	4.43	*9*	246	4.01	25.21	99	13.17
	V10	-		-	-	-	-	
	V11	-		-	-	-	-	
N3: 100% of recommended N dose	V1	6.25	*1*	259	5.14	32.42	99	17.33
	V2	4.94	*6*	253	3.52	25.55	96	12.33
	V3	4.36	*11*	242	3.25	24.78	98	14.33
	V4	5.04	*4*	254	4.25	25.74	100	12.33
	V5	4.13	*15*	233	3.12	22.68	97	14.08
	V6	5.43	*2*	256	4.64	29.40	96	12.58
	V7	4.85	*7*	248	3.52	25.39	100	13.92
	V8	-		-	-	-	-	
	V9	5.11	*3*	254	4.37	26.83	99	12.25
	V10	-		-	-	-	-	
	V11	-		-	-	-	-	
Interaction								
N at same V		NS		NS	NS	NS	1.42	
V at same N		NS		NS	NS	NS	1.35	
F1		3.38	*3*	202	3.41	23.46	98	
F2		4.22	*2*	240	3.68	24.99	99	14.08
F3		5.01	*1*	250	3.98	26.60	98	13.65
C.D.(0.05)		0.18		12.16	0.11	0.92	NS	
C.V.(%)		8.22		10.28	5.65	7.17	0.83	

Table 4.1(k): Contd.

N-levels	Varieties	KARJAT						
		Grain Yield (t/ha)	***Rank***	Panicle/m^2 (No.)	Panicle wt (g)	Tes wt (g)	Days for 50% Flowering	Nitrogen. res. (kg grain/kg N) (Base level 0% RDN)
Mean of varieties:								
	V1	5.14	*1*	242	4.97	30.38	99	15.67
	V2	4.21	*5*	233	3.19	24.03	97	12.58
	V3	3.52	*7*	218	2.96	23.44	99	14.75
	V4	4.33	*4*	236	3.92	24.49	99	13.17
	V5	3.28	*8*	211	2.90	21.51	98	13.96
	V6	4.67	*2*	239	4.43	27.14	98	12.54
	V7	4.08	*6*	230	3.14	23.93	98	15.54
	V8	-		-	-	-	-	
	V9	4.39	*3*	237	4.01	25.19	99	12.71
	V10	-		-	-	-	-	
	V11	-		-	-	-	-	
	C.D.(0.05)	0.41		12.76	0.19	1.24	0.82	
	C.V.(%)	10.36		5.87	5.42	5.25	0.88	
	Expt. Mean	4.20		231	3.69	25.02	98	
	Soil type	-						
	pH	-						
	N - levels (kg/ha)							
	F1	0						
	F2	60						
	F3	120						
	Recommended NPK (kg/ha)	120;50:50						
	Varieties							
	V1	IET 29578						
	V2	IET 29577						
	V3	IET 30270						
	V4	IET 30261						
	V5	IET 29581						
	V6	IET 30273						
	V7	Swarna						
	V8	-						
	V9	Improved Samba Mahsuri						
	V10	-						
	V11	-						
	Available NPK (kg/ha)	-						

Table 4.1(k): Contd.

N-levels	Varieties	KAUL					
		Grain Yield (t/ha)	***Rank***	Panicle/m^2 (No.)	Panicle wt (g)	Tes wt (g)	Nitrogen. res. (kg grain/kg N) (Base level 0% RDN)
N1: No nitrogen (Control) (P and K is constant)	V1	-		-	-	-	
	V2	-		-	-	-	
	V3	-		-	-	-	
	V4	-		-	-	-	
	V5	-		-	-	-	
	V6	-		-	-	-	
	V7	-		-	-	-	
	V8	-		-	-	-	
	V9	-		-	-	-	
	V10	-		-	-	-	
	V11	-		-	-	-	
N2: 50% of recommended N dose (P and K is constant)	V1	5.11	*7*	245	2.33	24.27	
	V2	4.05	*11*	214	2.07	22.90	
	V3	3.45	*13*	216	1.70	23.53	
	V4	3.54	*12*	224	1.52	22.20	
	V5	5.37	*4*	265	2.45	24.03	
	V6	3.31	*14*	216	1.85	23.10	
	V7	-		-	-	-	
	V8	-		-	-	-	
	V9	-		-	-	-	
	V10	-		-	-	-	
	V11	4.84	*9*	232	2.25	24.07	
N3: 100% of recommended N dose	V1	6.34	*1*	296	2.97	24.93	16.40
	V2	5.23	*6*	247	2.35	23.67	15.73
	V3	5.08	*8*	246	2.10	23.97	21.73
	V4	5.24	*5*	246	1.79	23.20	22.67
	V5	5.99	*2*	281	2.64	25.17	8.27
	V6	4.20	*10*	246	2.00	23.60	11.87
	V7	-		-	-	-	-
	V8	-		-	-	-	-
	V9	-		-	-	-	-
	V10	-		-	-	-	-
	V11	5.48	*3*	250	2.37	24.27	8.53
Interaction							
N at same V		0.5		NS	0.22	NS	
V at same N		0.47		NS	0.24	NS	
F1		-		-	-	-	
F2		4.24	*2*	230	2.02	23.44	
F3		5.37	*1*	259	2.32	24.12	15.03
C.D.(0.05)		0.09		14.63	0.15	0.44	
C.V.(%)		1.39		4.51	5.13	1.38	

Table 4.1(k): Contd.

N-levels	Varieties	KAUL					
		Grain Yield (t/ha)	***Rank***	Panicle/m^2 (No.)	Panicle wt (g)	Tes wt (g)	Nitrogen. res. (kg grain/kg N) (Base level 0% RDN)
Mean of varieties:							
	V1	5.73	*1*	270	2.65	24.60	16.40
	V2	4.64	*4*	231	2.21	23.29	15.73
	V3	4.27	*6*	231	1.90	23.75	21.73
	V4	4.39	*5*	235	1.66	22.70	22.67
	V5	5.68	*2*	273	2.55	24.60	8.27
	V6	3.76	*7*	231	1.93	23.35	11.87
	V7	-		-	-	-	-
	V8	-		-	-	-	-
	V9	-		-	-	-	-
	V10	-		-	-	-	-
	V11	5.16	*3*	241	2.31	24.17	8.53
	C.D.(0.05)	0.35		20.17	0.16	0.71	
	C.V.(%)	6.17		6.92	6.13	2.51	
	Expt. Mean	4.80		245	2.17	23.78	
	Soil type	-					
	pH	8.0					
	N - levels (kg/ha)						
	F1	0					
	F2	75					
	F3	150					
	Recommended NPK (kg/ha)	150:60:60					
	Varieties						
	V1	IET 29578					
	V2	IET 29577					
	V3	IET 30270					
	V4	IET 30261					
	V5	IET 29581					
	V6	IET 30273					
	V7	-					
	V8	-					
	V9	-					
	V10	-					
	V11	Local check - HKR 127 (140 days)					
	Available NPK (kg/ha)	160:16:320					

Table 4.1(k): Contd.

N-levels	Varieties	MANDYA Grain Yield (t/ha)	***Rank***	Panicle/m^2 (No.)	Panicle wt (g)	Tes wt (g)	Days for 50% Flowering	Nitrogen. res. (kg grain/kg N) (Base level 0% RDN)
N1: No nitrogen (Control) (P and K is constant)	V1	4.12	*11*	275	3.51	17.10	98	
	V2	4.72	*6*	287	3.72	22.47	106	
	V3	4.72	*6*	286	4.01	19.84	102	
	V4	4.71	*8*	243	5.07	19.89	106	
	V5	3.61	*15*	296	3.46	21.95	101	
	V6	4.27	*9*	246	3.66	16.68	107	
	V7	3.90	*14*	320	2.48	18.93	111	
	V8	3.18	*17*	257	3.14	13.31	90	
	V9	2.70	*18*	299	2.43	16.49	105	
	V10	-		-	-	-	-	
	V11	-		-	-	-	-	
N2: 50% of recommended N dose (P and K is constant)	V1	4.88	*5*	333	3.82	18.22	98	15.20
	V2	5.66	*2*	322	4.21	22.74	107	18.80
	V3	5.25	*4*	321	4.36	19.91	101	10.60
	V4	5.71	*1*	293	5.62	20.14	107	20.00
	V5	4.27	*9*	339	3.73	22.44	100	13.20
	V6	5.61	*3*	317	4.69	16.78	107	26.80
	V7	4.08	*12*	347	2.66	18.54	111	3.60
	V8	4.06	*13*	307	3.81	13.63	90	17.60
	V9	3.45	*16*	331	2.79	17.99	106	15.00
	V10	-		-	-	-	-	
	V11	-		-	-	-	-	
N3: 100% of recommended N dose	V1	-		-	-	-	-	
	V2	-		-	-	-	-	
	V3	-		-	-	-	-	
	V4	-		-	-	-	-	
	V5	-		-	-	-	-	
	V6	-		-	-	-	-	
	V7	-		-	-	-	-	
	V8	-		-	-	-	-	
	V9	-		-	-	-	-	
	V10	-		-	-	-	-	
	V11	-		-	-	-	-	
Interaction								
N at same V		NS		NS	NS	NS	NS	
V at same N		NS		NS	NS	NS	NS	
F1		3.99	*2*	279	3.50	18.52	103	
F2		4.77	*1*	323	3.97	18.93	103	15.64
F3		-		-	-	-	-	
C.D.(0.05)		0.32		17.17	0.2	0.99	0.48	
C.V.(%)		12.48		9.64	9.22	8.9	0.79	

Table 4.1(k): Contd.

N-levels	Varieties	MANDYA Grain Yield (t/ha)	***Rank***	Panicle/m^2 (No.)	Panicle wt (g)	Tes wt (g)	Days for 50% Flowering	Nitrogen. res. (kg grain/kg N) (Base level 0% RDN)
Mean of varieties:								
	V1	4.50	*5*	304	3.67	17.66	98	15.20
	V2	5.19	*2*	304	3.97	22.61	107	18.80
	V3	4.99	*3*	303	4.19	19.88	102	10.60
	V4	5.21	*1*	268	5.35	20.02	107	20.00
	V5	3.94	*7*	318	3.60	22.20	101	13.20
	V6	4.94	*4*	281	4.18	16.73	107	26.80
	V7	3.99	*6*	334	2.57	18.74	111	3.60
	V8	3.62	*8*	282	3.48	13.47	90	17.60
	V9	3.08	*9*	315	2.61	17.24	106	15.00
	V10	-		-	-	-	-	
	V11	-		-	-	-	-	
	C.D.(0.05)	NS		28.11	NS	NS	NS	
	C.V.(%)	10.07		9.7	6.99	10.04	0.92	
	Expt. Mean	4.38		301	3.73	18.73	103	
	Soil type	Red sandy loam						
	pH	7.68						
	N - levels (kg/ha)							
	F1	0						
	F2	50						
	F3	100						
	Recommended NPK (kg/ha)	100:50:50						
	Varieties							
	V1	IET 29578						
	V2	IET 29577						
	V3	IET 30270						
	V4	IET 30261						
	V5	IET 29581						
	V6	IET 30273						
	V7	Swarna						
	V8	Rasi						
	V9	Improved Samba Mahsuri						
	V10	-						
	V11	-						
	Available NPK (kg/ha)	-						

Table 4.1(k): Contd.

N-levels	Varieties	MARUTERU Grain Yield (t/ha)	***Rank***	Panicle/m^2 (No.)	Panicle wt (g)	Tes wt (g)	Days for 50% Flowering	Nitrogen. res. (kg grain/kg N) (Base level 0% RDN)
N1: No nitrogen (Control) (P and K is constant)	V1	4.24	*22*	270	4.15	20.44	105	
	V2	4.60	*18*	237	4.12	24.30	98	
	V3	5.17	*15*	313	4.09	23.51	105	
	V4	4.88	*17*	288	5.04	17.34	98	
	V5	4.22	*23*	307	3.83	23.09	98	
	V6	5.21	*14*	292	5.37	18.37	98	
	V7	4.50	*20*	282	3.32	20.08	109	
	V8	-		-	-	-	-	
	V9	4.13	*24*	232	2.57	14.64	108	
	V10	-		-	-	-	-	
	V11	-		-	-	-	-	
N2: 50% of recommended N dose (P and K is constant)	V1	4.46	*21*	298	4.55	20.04	105	4.89
	V2	5.26	*12*	256	4.37	24.36	99	14.67
	V3	5.09	*16*	328	4.17	23.35	105	-1.78
	V4	5.82	*6*	303	5.16	17.46	98	20.89
	V5	5.55	*10*	311	3.84	23.97	98	29.56
	V6	5.81	*8*	318	5.40	19.24	96	13.33
	V7	5.91	*5*	320	3.35	20.75	109	31.33
	V8	-		-	-	-	-	
	V9	5.22	*13*	270	2.68	14.72	106	24.22
	V10	-		-	-	-	-	
	V11	-		-	-	-	-	
N3: 100% of recommended N dose	V1	4.58	*19*	309	4.59	19.87	107	3.78
	V2	5.61	*9*	265	4.42	24.24	99	11.22
	V3	5.37	*11*	325	4.21	23.58	105	2.22
	V4	6.22	*3*	312	5.24	17.43	98	14.89
	V5	5.95	*4*	325	3.97	23.88	98	19.22
	V6	6.32	*2*	359	5.47	19.38	97	12.33
	V7	5.82	*6*	334	3.38	20.85	109	14.67
	V8	-		-	-	-	-	
	V9	6.37	*1*	270	2.77	15.71	107	24.89
	V10	-		-	-	-	-	
	V11	-		-	-	-	-	
Interaction								
N at same V		0.63		NS	NS	NS	NS	
V at same N		0.6		NS	NS	NS	NS	
F1		4.62	*3*	278	4.06	20.22	102	
F2		5.39	*2*	301	4.19	20.49	102	15.43
F3		5.78	*1*	312	4.26	20.62	103	
C.D.(0.05)		0.23		13.21	0.07	NS	NS	
C.V.(%)		8.53		8.68	3.28	2.02	1.02	

Table 4.1(k): Contd.

N-levels	Varieties	MARUTERU Grain Yield (t/ha)	*Rank*	Panicle/m^2 (No.)	Panicle wt (g)	Tes wt (g)	Days for 50% Flowering	Nitrogen. res. (kg grain/kg N) (Base level 0% RDN)
Mean of varieties:								
	V1	4.43	*8*	292	4.43	20.12	106	4.33
	V2	5.16	*7*	253	4.30	24.30	99	12.94
	V3	5.21	*6*	322	4.16	23.48	105	0.22
	V4	5.64	*2*	301	5.15	17.41	98	17.89
	V5	5.24	*4*	314	3.88	23.65	98	24.39
	V6	5.78	*1*	323	5.41	19.00	97	12.83
	V7	5.41	*3*	312	3.35	20.56	109	23.00
	V8	-		-	-	-	-	
	V9	5.24	*4*	257	2.67	15.02	107	24.56
	V10	-		-	-	-	-	
	V11	-		-	-	-	-	
	C.D.(0.05)	0.36		22.21	0.11	0.48	0.85	
	C.V.(%)	7.31		7.94	2.71	2.47	0.88	
	Expt. Mean	5.26		297	4.17	20.44	102	
	Soil type	-						
	pH	5.95						
	N - levels (kg/ha)							
	F1	0						
	F2	45						
	F3	90						
	Recommended NPK (kg/ha)	90:60:60						
	Varieties							
	V1	IET 29578						
	V2	IET 29577						
	V3	IET 30270						
	V4	IET 30261						
	V5	IET 29581						
	V6	IET 30273						
	V7	Swarna						
	V8	-						
	V9	Improved Samba Mahsuri						
	V10	-						
	V11	-						
	Available NPK (kg/ha)	119:14.32:274						

Table 4.1(k): Contd.

N-levels	Varieties	PUSA						
		Grain Yield (t/ha)	***Rank***	Panicle/m² (No.)	Panicle wt (g)	Tes wt (g)	Days for 50% Flowering	Nitrogen. res. (kg grain/kg N) (Base level 0% RDN)
N1: No nitrogen (Control) (P and K is constant)	V1	2.03	*27*	155	1.60	20.47	101	
	V2	2.46	*23*	187	1.77	20.53	103	
	V3	2.16	*25*	168	1.50	20.10	102	
	V4	1.84	*28*	139	1.37	20.67	105	
	V5	2.38	*24*	182	1.70	20.37	99	
	V6	1.75	*30*	139	1.30	19.63	103	
	V7	1.80	*29*	143	1.23	19.73	106	
	V8	2.05	*26*	157	1.20	20.40	108	
	V9	1.73	*31*	125	1.17	21.57	109	
	V10	1.65	*32*	120	1.23	21.50	106	
	V11	1.42	*33*	115	1.13	19.30	91	
N2: 50% of recommended N dose (P and K is constant)	V1	3.37	*18*	190	2.13	21.17	102	22.33
	V2	3.89	*12*	215	2.63	21.57	105	23.83
	V3	3.41	*17*	194	2.07	20.90	105	20.83
	V4	2.98	*21*	164	1.90	21.57	107	19.00
	V5	3.85	*13*	212	2.60	21.63	102	24.50
	V6	2.90	*22*	166	1.83	20.83	105	19.17
	V7	3.05	*20*	174	1.80	20.83	108	20.83
	V8	3.18	*19*	176	1.70	21.50	109	18.83
	V9	3.57	*15*	192	1.90	22.07	110	30.67
	V10	3.66	*14*	194	2.10	22.43	107	33.50
	V11	3.46	*16*	192	2.20	21.40	93	34.00
N3: 100% of recommended N dose	V1	4.34	*9*	220	2.93	21.50	104	19.25
	V2	4.94	*4*	244	3.40	21.97	106	20.67
	V3	4.52	*8*	228	2.70	21.60	106	19.67
	V4	4.32	*10*	212	2.40	22.10	109	20.67
	V5	4.96	*3*	242	3.30	22.30	104	21.50
	V6	4.10	*11*	205	2.60	21.70	107	19.58
	V7	4.82	*5*	242	2.97	21.63	109	25.17
	V8	4.62	*7*	227	2.87	22.13	112	21.42
	V9	5.07	*2*	243	3.20	22.73	113	27.83
	V10	5.39	*1*	256	3.40	22.93	110	31.17
	V11	4.82	*5*	239	3.03	21.87	95	28.33
Interaction								
N at same V		0.23		13.86	0.18	0.4	NS	
V at same N		0.25		14.14	0.18	0.38	NS	
F1		1.93	*3*	148	1.38	20.39	103	
F2		3.39	*2*	188	2.08	21.45	105	24.32
F3		4.72	*1*	233	2.98	22.04	107	23.20
C.D.(0.05)		0.16		7.95	0.06	0.09	0.26	
C.V.(%)		11.09		9.59	6.06	0.92	0.57	

Table 4.1(k): Contd.

N-levels	Varieties	PUSA						
		Grain Yield (t/ha)	***Rank***	Panicle/m^2 (No.)	Panicle wt (g)	Tes wt (g)	Days for 50% Flowering	Nitrogen. res. (kg grain/kg N) (Base level 0% RDN)
Mean of varieties:								
	V1	3.25	*7*	188	2.22	21.05	102	20.79
	V2	3.76	*1*	215	2.60	21.36	105	22.25
	V3	3.36	*5*	196	2.09	20.87	104	20.25
	V4	3.05	*10*	172	1.89	21.45	107	19.83
	V5	3.73	*2*	212	2.53	21.43	102	23.00
	V6	2.92	*11*	170	1.91	20.72	105	19.38
	V7	3.22	*9*	186	2.00	20.73	108	23.00
	V8	3.28	*6*	187	1.92	21.34	110	20.13
	V9	3.46	*4*	187	2.09	22.12	111	29.25
	V10	3.57	*3*	190	2.24	22.29	108	32.33
	V11	3.23	*8*	182	2.12	20.86	93	31.17
	C.D.(0.05)	0.14		8	0.11	0.23	1.93	
	C.V.(%)	4.28		4.48	5.22	1.15	1.95	
	Expt. Mean	3.35		190	2.15	21.29	105	
	Soil type	Sandy loam						
	pH	8.80						
	N - levels (kg/ha)							
	F1	0						
	F2	60						
	F3	120						
	Recommended NPK (kg/ha)	120:60:40						
	Varieties							
	V1	IET 29578						
	V2	IET 29577						
	V3	IET 30270						
	V4	IET 30261						
	V5	IET 29581						
	V6	IET 30273						
	V7	Swarna						
	V8	Rasi						
	V9	Improved Samba Mahsuri						
	V10	BPT 5204						
	V11	Local check - Rajendra Saraswati(120-125 days)						
	Available NPK (kg/ha)	218:14.5:119						

Table 4.1(k): Contd.

N-levels	Varieties	RAIPUR						
		Grain Yield (t/ha)	***Rank***	Panicle/m^2 (No.)	Panicle wt (g)	Tes wt (g)	Days for 50% Flowering	Nitrogen. res. (kg grain/kg N) (Base level 0% RDN)
N1: No nitrogen (Control) (P and K is constant)	V1	2.57	*29*	149	2.44	17.93	96	
	V2	3.33	*23*	153	3.47	22.23	99	
	V3	3.28	*24*	149	2.73	19.03	100	
	V4	2.41	*30*	108	3.25	19.20	103	
	V5	2.79	*27*	137	2.24	22.43	89	
	V6	3.55	*21*	122	3.63	17.43	93	
	V7	3.54	*22*	167	2.70	18.73	103	
	V8	-		-	-	-	-	
	V9	3.27	*25*	149	2.51	13.90	103	
	V10	2.89	*26*	187	2.18	13.80	108	
	V11	2.70	*28*	167	1.75	18.27	104	
N2: 50% of recommended N dose (P and K is constant)	V1	4.33	*14*	198	2.53	19.00	97	35.20
	V2	4.56	*12*	177	4.17	22.30	99	24.60
	V3	3.95	*18*	171	3.25	19.13	100	13.40
	V4	3.70	*19*	119	3.43	19.30	103	25.80
	V5	3.59	*20*	177	2.53	22.53	90	16.00
	V6	4.47	*13*	150	4.19	18.00	93	18.40
	V7	4.61	*11*	215	3.37	19.50	104	21.40
	V8	-		-	-	-	-	
	V9	4.21	*15*	206	2.59	16.77	103	18.80
	V10	4.10	*16*	224	2.34	14.40	108	24.20
	V11	4.06	*17*	215	2.30	18.60	105	27.20
N3: 100% of recommended N dose	V1	5.31	*2*	230	3.26	19.13	97	27.40
	V2	5.12	*4*	190	4.65	24.10	99	17.90
	V3	4.90	*7*	203	3.42	19.17	100	16.20
	V4	5.09	*6*	180	4.53	19.33	103	26.80
	V5	4.82	*9*	217	2.91	23.00	90	20.30
	V6	5.18	*3*	185	5.10	18.73	93	16.30
	V7	5.49	*1*	257	4.15	19.77	104	19.50
	V8	-		-	-	-	-	
	V9	5.12	*4*	277	2.85	16.93	104	18.50
	V10	4.89	*8*	283	2.78	15.27	109	20.00
	V11	4.75	*10*	259	3.35	18.90	105	20.50
Interaction								
N at same V		NS		NS	NS	NS	NS	
V at same N		NS		NS	NS	NS	NS	
F1		3.03	*3*	149	2.69	18.30	100	
F2		4.16	*2*	185	3.07	18.95	100	22.50
F3		5.07	*1*	228	3.70	19.43	100	20.34
C.D.(0.05)		0.22		9	0.18	0.32	NS	
C.V.(%)		11.65		10.48	12.57	3.7	1.15	

Table 4.1(k): Contd.

N-levels	Varieties	RAIPUR						
		Grain Yield (t/ha)	***Rank***	Panicle/m^2 (No.)	Panicle wt (g)	Tes wt (g)	Days for 50% Flowering	Nitrogen. res. (kg grain/kg N) (Base level 0% RDN)
Mean of varieties:								
	V1	4.07	*5*	192	2.74	18.69	97	31.30
	V2	4.34	*3*	173	4.10	22.88	99	21.25
	V3	4.04	*6*	174	3.13	19.11	100	14.80
	V4	3.73	*9*	136	3.74	19.28	103	26.30
	V5	3.73	*9*	177	2.56	22.65	89	18.15
	V6	4.40	*2*	152	4.31	18.05	93	17.35
	V7	4.55	*1*	213	3.41	19.33	104	20.45
	V8	-		-	-	-	-	
	V9	4.20	*4*	211	2.65	15.87	103	18.65
	V10	3.96	*7*	231	2.43	14.49	108	22.10
	V11	3.84	*8*	214	2.47	18.59	104	23.85
	C.D.(0.05)	0.4		18.22	0.31	1.23	0.47	
	C.V.(%)	10.3		10.32	10.33	6.93	0.5	
	Expt. Mean	4.09		187	3.15	18.89	100	
	Soil type	Vertisol						
	pH	7.20						
	N - levels (kg/ha)							
	F1	0						
	F2	50						
	F3	100						
	Recommended NPK (kg/ha)	100:60:40						
	Varieties							
	V1	IET 29578						
	V2	IET 29577						
	V3	IET 30270						
	V4	IET 30261						
	V5	IET 29581						
	V6	IET 30273						
	V7	Swarna						
	V8	-						
	V9	Improved Samba Mahsuri						
	V10	BPT 5204						
	V11	Local check - CG Devbhog(135 days)						
	Available NPK (kg/ha)	144.2:18.9:376.7						

Table 4.1(k): Contd.

N-levels	Varieties	RANCHI						
		Grain Yield (t/ha)	***Rank***	Panicle/m^2 (No.)	Panicle wt (g)	Tes wt (g)	Available N % in soil	Nitrogen. res. (kg grain/kg N) (Base level 0% RDN)
N1: No nitrogen (Control) (P and K is constant)	V1	2.15	*23*	176	2.63	23.52	206.40	
	V2	1.83	*25*	148	2.23	23.27	210.50	
	V3	2.46	*19*	200	2.70	23.85	210.50	
	V4	2.02	*24*	165	2.62	23.47	203.70	
	V5	2.23	*22*	180	2.79	23.76	205.00	
	V6	1.75	*27*	145	2.20	23.25	201.50	
	V7	1.83	*25*	150	2.22	23.31	203.60	
	V8	2.33	*20*	185	3.00	23.81	208.50	
	V9	2.26	*21*	183	2.89	23.79	206.07	
	V10	-		-	-	-	-	
	V11	-		-	-	-	-	
N2: 50% of recommended N dose (P and K is constant)	V1	3.67	*8*	301	3.65	23.61	226.33	38.00
	V2	3.02	*14*	245	3.30	23.48	220.20	29.75
	V3	3.96	*5*	290	3.97	23.94	229.57	37.50
	V4	2.74	*17*	220	3.08	23.74	217.20	18.00
	V5	3.02	*14*	238	3.33	23.91	221.27	19.75
	V6	2.77	*16*	230	2.85	23.32	219.50	25.50
	V7	2.52	*18*	206	2.75	23.37	215.22	17.25
	V8	3.86	*6*	308	4.25	24.09	225.57	38.25
	V9	3.64	*9*	292	3.97	23.97	224.20	34.50
	V10	-		-	-	-	-	
	V11	-		-	-	-	-	
N3: 100% of recommended N dose	V1	4.18	*3*	326	4.18	23.76	230.20	25.38
	V2	3.57	*10*	281	3.93	23.48	226.50	21.75
	V3	4.32	*2*	338	4.30	24.01	236.30	23.25
	V4	3.24	*11*	260	3.55	23.92	224.20	15.25
	V5	3.84	*7*	295	3.82	24.15	231.10	20.13
	V6	3.16	*12*	247	3.75	23.56	230.27	17.63
	V7	3.04	*13*	247	3.05	23.51	228.57	15.13
	V8	4.39	*1*	302	4.30	24.32	235.53	25.75
	V9	4.17	*4*	327	4.15	24.16	232.80	23.88
	V10	-		-	-	-	-	
	V11	-		-	-	-	-	
Interaction								
N at same V		NS		32.26	0.32	NS	NS	
V at same N		NS		31.25	0.31	NS	NS	
F1		2.10	*3*	170	2.59	23.56	206.20	
F2		3.24	*2*	259	3.46	23.71	222.12	28.72
F3		3.77	*1*	292	3.89	23.87	230.61	20.90
C.D.(0.05)		0.19		11.73	0.11	0.08	5.37	
C.V.(%)		12.96		10.1	7.05	0.68	5.06	

Table 4.1(k): Contd.

N-levels	Varieties	RANCHI Grain Yield (t/ha)	*Rank*	Panicle/m² (No.)	Panicle wt (g)	Tes wt (g)	Available N % in soil	Nitrogen. res. (kg grain/kg N) (Base level 0% RDN)
Mean of varieties:								
	V1	3.33	*4*	268	3.49	23.63	220.98	31.69
	V2	2.81	*6*	225	3.15	23.41	219.07	25.75
	V3	3.58	*1*	276	3.66	23.93	225.46	30.38
	V4	2.67	*7*	215	3.08	23.71	215.03	16.63
	V5	3.03	*5*	238	3.31	23.94	219.12	19.94
	V6	2.56	*8*	207	2.93	23.38	217.09	21.56
	V7	2.46	*9*	201	2.67	23.40	215.80	16.19
	V8	3.53	*2*	265	3.85	24.07	223.20	32.00
	V9	3.36	*3*	267	3.67	23.97	221.02	29.19
	V10	-		-	-	-	-	
	V11	-		-	-	-	-	
	C.D.(0.05)	0.28		18.62	0.18	0.28	NS	
	C.V.(%)	9.8		8.22	5.84	1.26	8.59	
	Expt. Mean	3.04		240	3.31	23.72	219.64	
	Soil type	-						
	pH	-						
	N - levels (kg/ha)							
	F1	0						
	F2	40						
	F3	80						
	Recommended NPK (kg/ha)	80:40:30						
	Varieties							
	V1	IET 29578						
	V2	IET 29577						
	V3	IET 30270						
	V4	IET 30261						
	V5	IET 29581						
	V6	IET 30273						
	V7	Swarna						
	V8	Rasi						
	V9	Improved Samba Mahsuri						
	V10	-						
	V11	-						
	Available NPK (kg/ha)	230:42:158						

Table 4.1(k): Contd.

N-levels	Varieties	VARANASI							Mean Grain Yield (t/ha)	Rank
		Grain Yield (t/ha)	***Rank***	Panicle/m^2 (No.)	Panicle wt (g)	Tes wt (g)	Days for 50% Flowering	Nitrogen. res. (kg grain/kg N) (Base level 0% RDN)		
N1: No nitrogen (Control) (P and K is constant)	V1	-		-	-	-	-		3.21	*27*
	V2	-		-	-	-	-		3.40	*25*
	V3	-		-	-	-	-		3.41	*24*
	V4	-		-	-	-	-		3.24	*26*
	V5	-		-	-	-	-		2.95	*30*
	V6	-		-	-	-	-		3.41	*23*
	V7	-		-	-	-	-		3.13	*28*
	V8	-		-	-	-	-		2.52	*31*
	V9	-		-	-	-	-		2.96	*29*
	V10	-		-	-	-	-		2.27	*32*
	V11	-		-	-	-	-		2.06	*33*
N2: 50% of recommended N dose (P and K is constant)	V1	3.19	*11*	146.67	33.98	24.22	100.67		4.48	*11*
	V2	2.59	*18*	116.33	26.58	19.2	105.67		4.28	*13*
	V3	2.69	*16*	131	28.75	23.92	100.67		4.04	*16*
	V4	3.31	*8*	99.33	41.49	18.7	109		4.19	*14*
	V5	2.65	*17*	122.33	31.59	18.14	107		3.97	*19*
	V6	3.1	*12*	103.67	32.59	19.06	101.67		3.96	*20*
	V7	2.9	*14*	111	24.63	19.17	115		3.99	*17*
	V8	-		-	-	-	-		3.70	*22*
	V9	2.88	*15*	134.33	22.67	18.54	105		3.98	*18*
	V10	-		-	-	-	-		4.06	*15*
	V11	3.65	*7*	160.33	24.31	23.27	101		3.84	*21*
N3: 100% of recommended N dose	V1	3.25	*10*	173.67	28.15	25.66	102	1.00	5.00	*2*
	V2	3.29	*9*	162.33	26.49	17.38	105.33	11.67	4.75	*6*
	V3	2.92	*13*	151.67	25.78	25.31	100.67	3.83	4.48	*10*
	V4	5.32	*2*	120.67	32.43	19.86	108.33	33.50	4.92	*5*
	V5	5.41	*1*	117	35.11	19.68	108	46.00	4.96	*3*
	V6	4.35	*5*	119.33	25.09	17.99	101	20.83	4.44	*12*
	V7	4.23	*6*	143.67	18.38	18.76	115	22.17	4.56	*8*
	V8	-		-	-	-	-		4.51	*9*
	V9	4.75	*4*	182.67	25.44	22.77	106.33	31.17	4.95	*4*
	V10	-		-	-	-	-		5.13	*1*
	V11	5.15	*3*	184	25.21	23.71	102.67	25.00	4.66	*7*
Interaction										
N at same V		NS		NS	NS	NS	NS			
V at same N		NS		NS	NS	NS	NS			
F1		-		-	-	-	-		3.17	*3*
F2		3.00	*2*	125	29.62	20.47	105		4.11	*2*
F3		4.30	*1*	151	26.90	21.24	105	21.69	4.79	*1*
C.D.(0.05)		0.22		4.32	2.52	0.45	0.26			
C.V.(%)		9.97		5.3	15.08	3.66	0.42			

Table 4.1(k): Contd.

N-levels	Varieties	VARANASI Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Panicle wt (g)	Tes wt (g)	Days for 50% Flowering	Nitrogen. res. (kg grain/kg N) (Base level 0% RDN)	Mean Grain Yield (t/ha)	Rank
Mean of varieties:										
	V1	3.22	*7*	160	31.07	24.94	101	1.00	4.41	*1*
	V2	2.94	*8*	139	26.54	18.29	106	11.67	4.26	*3*
	V3	2.81	*9*	141	27.27	24.62	101	3.83	4.05	*6*
	V4	4.32	*2*	110	36.96	19.28	109	33.50	4.28	*2*
	V5	4.03	*3*	120	33.35	18.91	108	46.00	4.11	*4*
	V6	3.73	*5*	112	28.84	18.53	101	20.83	3.96	*8*
	V7	3.57	*6*	127	21.51	18.97	115	22.17	3.93	*10*
	V8	-		-	-	-	-		3.48	*11*
	V9	3.82	*4*	159	24.06	20.66	106	31.17	3.97	*7*
	V10	-		-	-	-	-		4.10	*5*
	V11	4.40	*1*	172	24.76	23.49	102	25.00	3.96	*9*
	C.D.(0.05)	NS		4.05	NS	NS	NS			
	C.V.(%)	5.6		3.05	7.99	4.51	0.44			
	Expt. Mean	3.65		138	28.26	20.85	105		4.14	
	Soil type	-								
	pH	7.6								
	N - levels (kg/ha)									
	F1	0								
	F2	60								
	F3	120								
	Recommended NPK (kg/ha)	120:60:40								
	Varieties									
	V1	IET 29578								
	V2	IET 29577								
	V3	IET 30270								
	V4	IET 30261								
	V5	IET 29581								
	V6	IET 30273								
	V7	Swarna								
	V8	-								
	V9	Improved Samba Mahsuri								
	V10	-								
	V11	Local check - HUR 3-4								
	Available NPK (kg/ha)	-								

4.1(l) AVT 2 - Boro

The grain yield performance of boro culture IET 29624 and its response to nutrient levels was evaluated against two standard checks (Gowtam and IR 64) along with one local check (Sukumar) under two graded levels of nutrient (50 and100% of recommended dose of nutrient) at **Chinsurah** 2022-23 *boro* season. The data received this location is summarized and presented in **Table 4.1l.**

The culture didn't differ differed significantly for grain yield at **Chinsurah** location. The mean maximum grain yield was recorded by Gowtam (4.57 t/ha) followed by IET 29624 (4.35 t/ha) and the performance of standard checks were not promising.

RDF doses significantly influenced the grain yield and the increase in grain yield with 100% of RDF was 38% with better nutrient response of 9.77 kg grain/kg nutrient. Interaction effects between cultivars x RDF levels for grain yield was non-significant.

In this trial, IET culture (IET 29624) were evaluated against two high yielding standard checks (Gowtam and IR 64) along with one local check (Sukumar) at **Chinsurah**. The maximum grain yield was recorded by Gowtam (4.57 t/ha) followed by IET 29624 (4.35 t/ha) and found promising over standard checks at 100% of RDF application.

Table 4.1(l): Summary of data on grain yield and ancillary characters of selected NMT BORO cultures grown under transplanted conditions at graded levels of fertilizer doses, Boro season 2022-23.

F-levels	Varieties	CHINSURAH						Over all mean	Rank
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 100% RDF)		
F1	V1	3.35	7	290	4.48	111		3.35	7
	V2	4.14	5	292	4.01	110		4.14	5
	V3	2.89	8	291	4.17	108		2.89	8
	V4	3.72	6	299	3.51	108		3.72	6
F2	V1	5.34	1	349	5.12	113	14.21	5.34	1
	V2	5.00	2	357	4.2	114	6.14	5.00	2
	V3	4.50	4	363	4.24	111	11.50	4.50	4
	V4	4.73	3	319	4.21	113	7.21	4.73	3
Interation									
F at same V		NS		11.23	0.14	NS			
V at same F		NS		11.13	0.32	NS			
F1		3.53	2	293	4.04	109		3.53	2
F2		4.89	1	347	4.44	113	9.77	4.89	1
C.D.(0.05)		1.24		6.84	NS	0.36			
C.V.(%)		16.72		1.22	5.42	0.18			
Mean of varieties:									
V1		4.35	2	320	4.80	112	14.21	4.35	2
V2		4.57	1	325	4.11	112	6.14	4.57	1
V3		3.70	4	327	4.21	110	11.50	3.70	4
V4		4.23	3	309	3.86	111	7.21	4.23	3
C.D.(0.05)		NS		7.94	0.1	NS			
C.V. (%)		11.97		1.97	1.85	2.67			
Expt. Mean		4.21		320	4.24	111		4.21	
Soil type		Clay loam							
pH		-							
F - levels (kg/ha)									
F1		70:35:35							
F2		140:70:70							
Recommended N:P:K (kg/ha)		140:70:70							
Varieties									
V1		IET 29624							
V2		Gowtam							
V3		IR 64							
V4		Local Check(Sukumar)							
Available N:P:K of soil (kg/ha)		-							

4.1m NIL – HT (Herbicie Tolerant)

For conducting Advance variety trial 1-NIL (**Herbicide Tolerant Genotypes**), seed was sent to five locations (**Cuttack, Dhangain, Coimbatore**, **Nagina, New Delhi)** to evaluate the performance of thirteen entries with nominated herbicide tolerant lines (NILs) including four susceptible check and one herbicide tolerant check against two herbicides i.e., Imazethapyr and Byspyribac sodium (NC) along with weed free check and weedy check. The results were received from four centers (**Cuttack, Dhangain, Coimbatore** and **Nagina)** out of which the data of three centers was rejected due to recording of high yield with the susceptible entries**.** The results indicated the superiority of the Bispyribac-sodium (3.55 t/ha) followed by Imazethapyr (2.68 t/ha) considering the zero yield in susceptible lines (G9, G10, G11 and G12) by Imazethapyr. However, significantly higher mean grain yield (4.37 t/ha) was observed with weed free check. In case of imazethapyr treatment, the lines G5 (5.10 t/ha) and G7 (5.10 t/ha) exhibited significantly superior grain yield which was comparable with G6 (4.80 t/ha) with no or low phytotoxicity to Imazethapyr which might have contributed to higher crop growth and grain yield.

Table 4.1(m): Summary of data on grain yield of selected NIL-HT cultures grown under different weed control management, ***Kharif*** 2023

Location	Cuttack								
Subplot	Grain Yield (t/ha)								
	Main plot								
	Imazethapyr	Rank	Bispyribac sodium (NC)	Rank	Weed free check (Without weeds)	Rank	Weedy check (No weeding to be done)	Rank	Average of sub plot
G1	3.20	6	3.30	8	3.39	9	1.20	6	5.01
G2	2.70	7	4.10	3	3.97	8	0.80	10	4.95
G3	3.47	5	3.20	9	4.80	3	1.60	1	3.88
G4	3.80	4	2.90	10	4.29	7	1.40	4	4.67
G5	5.10	1	4.40	1	4.40	6	1.20	6	3.64
G6	4.80	2	3.90	4	5.10	1	0.90	9	3.84
G7	5.10	1	3.60	6	4.90	2	1.39	5	3.62
G8	4.59	3	4.20	2	4.70	4	0.95	8	3.93
G9	0.00		3.50	7	5.10	1	1.10	7	3.53
G10	0.00		2.90	10	4.20	5	1.57	2	3.67
G11	0.00		3.70	5	4.80	3	0.80	10	3.90
G12	0.00		4.10	3	4.70	4	0.80	10	3.80
G13	2.11	8	2.30	11	2.50	10	1.47	3	5.05
Average of Main plot	2.68		3.55		4.37		1.2		

Designation	Cross combination	Code
Pusa 1988 -15-7-44-98-15 (IET 30829)	Pusa 44*4/ Robin	G1
Pusa 1988-15-7-44-98-67 (IET 30826)	Pusa 44*4/ Robin	G2
CBHTR 22003	CO51 x Robin	G3
CBHTR 22004	CO51 x Robin	G4
CR 4431-63-2-1-1	Pooja*4 / Robin	G5
CR 4431-117-3-2-1	Pooja*4 / Robin	G6
CR 4430-1-3-2-1	Swarna Sub 1*4 / Robin	G7
CR 4430-13-19-1-1	Swarna Sub 1*4 / Robin	G8
Pusa 44 (Recurrent Parent)		G9
CO 51 (Recurrent parent)		G10
Pooja (Recurrent Parent)		G11
Swarna Sub1 (Recurrent Parent)		G12
Robin (Herbicide Tolerant Check)		G13

4.1n NMT – AVT 2 BT

Five BT cultures (1808, 1815, 1827, 1828 and 1827) were evaluated for its response to nutrient application in terms of grain yield and yield attributes at four locations viz., **Kaul (90:30:0), Ludhiana (40:30:30), Nagina (120:60:40)** and **Pantnagar (120:60:40)** under two different nutrient levels (50% and 100% RFD). The details and data received from these locations are summarized and presented in Table 4.1(n).

Application of different RDF doses (50% and 100% RDF) significantly influenced the grain yield at at all three locations (**Kaul, Ludhiana, Nagina** and **Pantnagar)** and the maximum increase in grain yield was observed at most of the locations and higher nutrient response (6.73 to 20.78 kg grain/kg Nutrient). Application of 100% RDF recorded significantly higher grain yields at **Kaul** (5.47 t/ha), **Ludhiana** (4.21 t/ha), **Nagina** (4.51 t/ha) and **Pantnagar** (4.02 t/ha). Higher nutrient response was recorded with 100% RDF at **Kaul** (20.78 kg grain /kg Nutrient) followed by **Nagina** (20.48 kg grain /kg Nutrient).

Grain yield differences among the tested cultures were significant at all locations. Significantly higher mean maximum grain yield was recorded by IET cultures at all the locations over local checks. At **Kaul**, 1828 (5.37 t/ha) followed by 1827 (5.23 t/ha); at **Ludhiana** 1828 (4.63 t/ha) followed by 1815 (4.59 t/ha); at **Nagina** 1828 (3.62 t/ha) followed by 1808 (3.50 t/ha) and while at **Pantnagar** 1808 (4.53 t/ha) were found promising and superior to other entries tested. Among the entries tested at all locations, mean grain yield of IET culture 1828 (4.34 t/ha) was higher followed by IET culture 1808 (3.98 t/ha) and found promising.

In this trial application of 100% RFD was found promising and most of the IET cultures (IET 1828 and 1808) were superior (3.98 to 4.34 t/ha) to local checks.

Table 4.1 (n): Summary of data on grain yield and ancillary characters of selectedAVT-2 Basmati cultures grown under transplanted conditions at graded levels of recommended fertilizer doses, kharif 2023.

F-levels	Varieties	KAUL					
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt(g)	Test wt(g)	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1	V1	3.95	11	301	1.65	24.23	
	V2	3.95	11	303	1.65	24.17	
	V3	4.40	8	338	1.86	25.60	
	V4	4.74	7	345	1.80	26.30	
	V5	4.08	10	298	1.60	23.83	
	V6	4.22	9	327	1.80	25.67	
F2	V1	5.12	5	342	1.89	23.60	19.50
	V2	5.15	4	350	1.73	24.13	20.00
	V3	6.06	1	371	2.00	26.33	27.67
	V4	6.00	2	377	1.97	25.20	21.00
	V5	5.08	6	335	1.70	24.40	16.67
	V6	5.41	3	372	1.87	25.83	19.83
Interaction							
F at same V		NS		NS	NS	NS	
V at same F		NS		NS	NS	NS	
F1		4.22	2	319	1.73	24.97	
F2		5.47	1	358	1.86	24.92	20.78
C.D.(0.05)		0.03		11.49	NS	NS	
C.V.(%)		0.48		2.37	9.10	3.15	
Mean of varieties:							
V1		4.54	6	322	1.77	23.92	19.50
V2		4.55	5	327	1.69	24.15	20.00
V3		5.23	2	355	1.93	25.97	27.67
V4		5.37	1	361	1.89	25.75	21.00
V5		4.58	4	317	1.65	24.12	16.67
V6		4.82	3	350	1.84	25.75	19.83
C.D.(0.05)		0.55		26.21	0.17	0.98	
C.V. (%)		9.38		6.43	7.67	3.27	
Expt. Mean		4.85		338	1.79	25	
Soil type		Clay LOAM					
pH		8.00					
N - levels (kg/ha)							
F1		45:15:00					
F2		90:30:30					
Recommended N:P:K (kg/ha)		90:30:30					
Varieties							
V1		IET 1808					
V2		IET 1815					
V3		IET 1827					
V4		IET 1828					
V5		IET 1829					
V6		PB 1121 (LC)					
Available N:P:K of soil (kg/ha)		160:16:360					

Table 4.1 (n): Contd.

F-levels	Varieties	LUDHIANA						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt(g)	Test wt(g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1	V1	2.92	12	268.4	1.67	27.60	104	
	V2	4.33	5	222.2	2.27	28.70	107	
	V3	3.54	10	260.7	2.06	27.93	90	
	V4	4.55	3	266.2	2.26	26.93	90	
	V5	3.26	11	277.2	1.61	26.07	102	
	V6	3.67	7	290.4	2.19	27.30	96	
F2	V1	3.59	9	297.0	1.73	27.57	105	13.40
	V2	4.85	1	316.8	2.56	28.80	107	10.40
	V3	4.04	6	301.4	2.15	27.83	91	10.00
	V4	4.71	2	286.0	2.35	26.73	90	3.20
	V5	3.65	8	292.6	1.69	26.03	103	7.80
	V6	4.43	4	325.6	2.25	27.20	98	15.20
Interaction								
F at same V		NS		NS	NS	NS	NS	
V at same F		NS		NS	NS	NS	NS	
F1		3.71	2	264	2.01	27.42	98	
F2		4.21	1	303	2.12	27.36	99	10.00
C.D.(0.05)		0.32		16.79	0.11	NS	NS	
C.V.(%)		5.59		4.13	3.76	1.23	1.38	
Mean of varieties:								
V1		3.26	6	283	1.70	27.59	105	13.40
V2		4.59	2	270	2.42	28.75	107	10.40
V3		3.79	4	281	2.11	27.88	91	10.00
V4		4.63	1	276	2.31	26.83	90	3.20
V5		3.46	5	285	1.65	26.05	102	7.80
V6		4.05	3	308	2.22	27.25	97	15.20
C.D.(0.05)		0.40		NS	0.13	0.95	1.21	
C.V. (%)		8.35		8.03	5.40	2.87	1.02	
Expt. Mean		3.96		284	2.07	27	99	
Soil type		Sandy loam						
pH		7.60						
N - levels (kg/ha)								
F1		20:15:15						
F2		40:30:30						
Recommended N:P:K (kg/ha)		40:30:30						
Varieties								
V1		IET 1808						
V2		IET 1815						
V3		IET 1827						
V4		IET 1828						
V5		IET 1829						
V6		Punjab Basmati 7 (LC)						
Available N:P:K of soil (kg/ha)		-						

Table 4.1 (n): Contd.

F-levels	Varieties	NAGINA						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt(g)	Test wt(g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1	V1	2.35	9	218	2.93	22.73	98	
	V2	2.39	7	207	2.92	22.47	95	
	V3	2.38	8	219	2.90	22.93	77	
	V4	2.33	10	211	2.87	22.50	74	
	V5	1.84	12	197	2.89	22.27	106	
	V6	2.25	11	203	2.88	22.87	83	
F2	V1	4.85	2	310	3.07	23.57	99	22.73
	V2	4.45	4	316	3.04	23.60	96	18.73
	V3	4.81	3	308	3.02	23.43	77	22.09
	V4	4.91	1	303	3.01	24.00	75	23.45
	V5	3.62	6	291	3.03	23.10	106	16.18
	V6	4.42	5	315	3.01	23.37	86	19.73
Interaction								
F at same V		0.27		NS	NS	0.10	NS	
V at same F		0.28		NS	NS	0.09	NS	
F1		2.26	2	209	2.90	22.63	89	
F2		4.51	1	307	3.03	23.51	90	20.48
C.D.(0.05)		0.18		23.00	NS	0.00	NS	
C.V.(%)		3.70		6.21	4.59	0.00	0.99	
Mean of varieties:								
V1		3.60	2	264	3.00	23.15	99	22.73
V2		3.42	4	262	2.98	23.04	96	18.73
V3		3.60	3	264	2.96	23.18	77	22.09
V4		3.62	1	257	2.94	23.25	74	23.45
V5		2.73	6	244	2.96	22.69	106	16.18
V6		3.34	5	259	2.95	23.12	85	19.73
C.D.(0.05)		0.19		10.63	NS	0.07	1.59	
C.V. (%)		4.65		3.42	2.04	0.26	1.48	
Expt. Mean		3.38		258	2.96	23	89	
Soil type		-						
pH		7.70						
N - levels (kg/ha)								
F1		60:30:20						
F2		120:60:40						
Recommended N:P:K (kg/ha)		120:60:40						
Varieties								
V1		IET 1808						
V2		IET 1815						
V3		IET 1827						
V4		IET 1828						
V5		IET 1829						
V6		Local Check (1830)						
Available N:P:K of soil (kg/ha)		21:18:209						

Table 4.1 (n): Contd.

F-levels	Varieties	PANTNAGAR							Over all mean	Rank
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt(g)	Test wt(g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)		
F1	V1	4.25	3	214	2.13	22.30	107		3.37	10
	V2	2.85	11	199	1.70	20.60	106		3.38	9
	V3	2.66	12	200	1.64	21.70	85		3.25	11
	V4	3.45	8	207	1.86	21.17	85		3.77	7
	V5	2.96	10	195	1.78	20.90	109		3.04	12
	V6	3.52	7	210	1.88	22.00	107		3.42	8
F2	V1	4.80	1	233	2.30	22.73	106	5.00	4.59	4
	V2	3.24	9	229	1.80	23.97	106	3.55	4.42	5
	V3	3.91	5	221	2.01	22.50	85	11.36	4.71	2
	V4	4.02	4	214	2.19	22.27	85	5.18	4.91	1
	V5	3.84	6	231	1.90	23.13	108	8.00	4.05	6
	V6	4.32	2	229	2.17	22.47	107	7.27	4.65	3
Interaction										
F at same V		0.33		9.05	0.13	NS	NS			
V at same F		0.30		10.82	0.13	NS	NS			
F1		3.28	2	204	1.83	21.45	100		3.37	2
F2		4.02	1	226	2.06	22.85	100	6.73	4.55	1
C.D.(0.05)		0.03		8.90	0.07	1.15	NS			
C.V.(%)		0.63		2.88	2.54	3.63	1.93			
Mean of varieties:										
V1		4.53	1	224	2.22	22.52	107	5.00	3.98	3
V2		3.05	6	214	1.75	22.29	106	3.55	3.90	5
V3		3.29	5	210	1.83	22.10	85	11.36	3.98	4
V4		3.74	3	211	2.03	21.72	85	5.18	4.34	1
V5		3.40	4	213	1.84	22.02	109	8.00	3.54	6
V6		3.92	2	220	2.03	22.24	107	7.27	4.03	2
C.D.(0.05)		0.23		6.40	0.09	NS	1.27			
C.V. (%)		5.29		2.47	4.03	4.01	1.06			
Expt. Mean		3.65		215	1.95	22	100		3.96	
Soil type		Silt loam								
pH		7.40								
N - levels (kg/ha)										
F1		60:30:20								
F2		120:60:40								
Recommended N:P:K (kg/ha)		120:60:40								
Varieties										
V1		IET 1808								
V2		IET 1815								
V3		IET 1827								
V4		IET 1828								
V5		IET 1829								
V6		Local Check (Pant Basmati 1)								
Available N:P:K of soil (kg/ha)		231:22:221								

4.1(o) AVT 2 - Early (Direct Seeded)

Seven AVT-2 entries (IET 29036, IET 30330, IET 30328, IET 29052, IET 30351, IET 30334 and IET 30336) were evaluated for their response to low and optimum level of nutrients application (50 and 100% RDF) on grain yield in comparison to standard varieties i.e. Sahbhagidhan, CO 53, MTU 1010, BVD 111, Samleshwari, Baramidhan-2 at five locations viz., **Coimbatore (100:50:50), Jagdalpur (100:60:30), Raipur (120:60:60), Ranchi (60:40:30)** and **Rewa (50:30:20).** The experiments were conducted in a split plot design at all the locations**.** The main plot treatments were two levels of fertilizer input (50% and 100% RDF) and cultures assigned to sub plots. The data received from these locations are summarized and presented in **Table 4.1o**. The evaluation was done at 50% RDF at **Rewa** center.

Application of different doses of RDF (50% and 100%) exhibited significant influence on grain yield at all locations except at **Jagdalpur** only. Grain yield increased with increasing level of input from 50% to 100% RFD at these locations. Application of 100% NPK recorded significantly higher yield at **Coimbatore** (3.99 t/ha), **Raipur** (4.84 t/ha) and **Ranchi** (3.56 t/ha). Nutrient response (kg grain / kg nutrient) was higher at 100 % RDF at **Raipur** (12.53) followed by **Coimbatore** (11.27) compared to 50% NPK.

Grain yield differences among the tested genotypes were significant at all the locations. Significant mean maximum yield was recorded by IET 29036 at **Coimbatore** (3.63 t/ha), IET 30334 at **Raipur** (4.65 t/ha), IET 30351 at **Ranchi** (4.03 t/ha).

In conclusion, 100% of RDF was found promising across the locations with 22% higher grain yield and IET 30334 followed by IET 30336 and IET 30351 (4.06 to 4.22 t/ha) were found promising with higher grain yield across the locations among the tested cultures.

Table 4.1(o): Summary of data on grain yield and ancillary characters of selected AVT-2 E(DS) cultures grown under transplanted conditions at graded levels of recommended fertilizer doses, kharif 2023.

F-levels	Varieties	COIMBATORE				
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: Low input (50% NPK)	V1	3.04	10	216	1.91	
	V2	3.00	12	207	1.81	
	V3	2.43	18	169	1.52	
	V4	2.77	16	191	1.68	
	V5	2.72	17	186	1.68	
	V6	3.02	11	212	1.93	
	V7	2.97	13	202	1.82	
	V8	2.96	14	203	1.77	
	V9	2.82	15	195	1.69	
F2: Medium input (100% NPK)	V1	4.22	1	289	2.54	11.80
	V2	4.19	2	282	2.45	11.90
	V3	3.66	9	238	2.24	12.30
	V4	3.85	7	263	2.33	10.80
	V5	3.83	8	265	2.27	11.10
	V6	4.14	3	281	2.46	11.20
	V7	4.05	4	279	2.42	10.80
	V8	4.01	5	280	2.41	10.50
	V9	3.92	6	268	2.38	11.00
Interaction						
F at same V		NS		NS	NS	
V at same F		NS		NS	NS	
Mean of F level						
F1		2.86	2	198	1.76	
F2		3.99	1	272	2.39	11.27
C.D.(0.05)		0.07		4.38	0.1	
C.V.(%)		1.66		1.59	3.98	
Mean of varieties:						
V1		3.63	1	252	2.23	11.80
V2		3.60	2	244	2.13	11.90
V3		3.05	9	203	1.88	12.30
V4		3.31	7	227	2.01	10.80
V5		3.28	8	226	1.98	11.10
V6		3.58	3	247	2.20	11.20
V7		3.51	4	241	2.12	10.80
V8		3.49	5	242	2.09	10.50
V9		3.37	6	232	2.04	11.00
C.D.(0.05)		0.08		7.01	0.07	
C.V. (%)		1.88		2.56	2.71	
Expt. Mean		3.41		233	2.07	
Soil type		Clay loam				
pH		8.09				
F - levels (kg/ha)						
F1		50:25:25				
F2		100:50:50				
Recommended N:P:K (kg/ha)		100:50:50				
Varieties						
V1		IET 29036				
V2		IET 30330				
V3		IET 30328				
V4		IET 29052				
V5		IET 30351				
V6		IET 30334				
V7		IET 30336				
V8		NC: Sahabhagidhan				
V9		Local check - CO 53(115 days)				
Available N:P:K of soil (kg/ha)		217:22:428				

Table 4.1o: Contd.

F-levels	Varieties	JAGDALPUR Grain Yield (t/ha)	Rank	Tillers/m^2 (No.)	Filled grain/ panicle (No.)	Test weight (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: Low input (50% NPK)	V1	5.23	6	255	85	27.12	47	
	V2	4.94	15	190	124	26.25	51	
	V3	5.21	8	242	73	27.18	46	
	V4	5.26	4	190	129	26.07	60	
	V5	4.72	17	230	74	25.80	46	
	V6	5.13	10	213	96	27.33	48	
	V7	5.22	7	257	115	28.16	52	
	V8	4.32	18	188	100	25.80	42	
	V9	5.55	1	194	82	24.34	55	
F2: Medium input (100% NPK)	V1	5.42	3	338	92	26.49	51	2.00
	V2	4.86	16	375	108	26.66	54	-0.84
	V3	5.06	11	355	144	27.51	51	-1.58
	V4	5.04	12	333	167	23.69	64	-2.32
	V5	5.00	14	367	131	25.01	50	2.95
	V6	5.25	5	338	98	26.56	52	1.26
	V7	5.01	13	347	105	26.39	55	-2.21
	V8	5.19	9	337	127	25.90	45	9.16
	V9	5.51	2	333	174	22.85	56	-0.42
Interaction								
F at same V		0.39		NS	27.12	NS	1.28	
V at same F		0.67		NS	31.37	NS	1.25	
Mean of F level								
F1		5.06	2	218	97.37	26.45	50	
F2		5.15	1	347	127.44	25.67	53	0.89
C.D.(0.05)		NS		65.98	23.27	NS	0.42	
C.V.(%)		12.05		19.95	17.68	5.12	0.7	
Mean of varieties:								
V1		5.33	2	297	88.50	26.81	49	2.00
V2		4.90	7	283	116.00	26.46	53	-0.84
V3		5.14	5	298	108.50	27.35	49	-1.58
V4		5.15	4	262	148.33	24.88	62	-2.32
V5		4.86	8	298	102.50	25.41	48	2.95
V6		5.19	3	276	97.00	26.95	50	1.26
V7		5.12	6	302	109.67	27.28	54	-2.21
V8		4.76	9	263	113.17	25.85	44	9.16
V9		5.53	1	264	128.00	23.60	56	-0.42
C.D.(0.05)		0.28		30.45	19.18	1.23	0.91	
C.V. (%)		4.67		9.24	14.62	4.06	1.51	
Expt. Mean		5.09		286	110.14	26.31	52	
Soil type		-						
pH		-						
F - levels (kg/ha)								
F1		50:30:15						
F2		100:60:30						
Recommended N:P:K		100:60:30						
Varieties								
V1		IET 29036						
V2		IET 30330						
V3		IET 30328						
V4		IET 29052						
V5		IET 30351						
V6		IET 30334						
V7		IET 30336						
V8		NC: Sahabhagidhan						
V9		Local check - Samleshwari						
Available N:P:K		-						

Table 4.1o: Contd.

F-levels	Varieties	RAIPUR						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test weight (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: Low input (50% NPK)	V1	3.25	14	134	3.16	25.67	75	
	V2	3.64	12	194	3.38	25.63	75	
	V3	3.22	16	175	3.30	27.40	75	
	V4	3.67	11	152	4.56	27.40	88	
	V5	3.23	15	176	2.56	24.90	75	
	V6	4.12	9	197	3.40	26.00	72	
	V7	3.30	13	133	3.96	27.03	77	
	V8	2.96	17	170	2.97	24.07	69	
	V9	2.68	18	152	3.07	24.43	68	
F2: Medium input (100% NPK)	V1	4.83	7	215	3.95	27.10	75	13.17
	V2	5.22	2	221	4.02	27.23	75	13.17
	V3	5.30	1	228	3.97	27.90	75	17.33
	V4	4.94	4	168	5.13	29.03	89	10.58
	V5	4.88	6	240	3.25	26.13	75	13.75
	V6	5.18	3	246	4.03	27.87	73	8.83
	V7	4.89	5	153	4.64	29.17	78	13.25
	V8	4.68	8	205	3.44	26.40	70	14.33
	V9	3.68	10	204	3.77	25.50	68	8.33
Interaction								
F at same V		NS		NS	NS	NS	NS	
V at same F		NS		NS	NS	NS	NS	
Mean of F level								
F1		3.34	2	165	3.37	25.84	75	
F2		4.84	1	209	4.02	27.37	75	12.53
C.D.(0.05)		0.65		31.08	0.6	NS	NS	
C.V.(%)		13.47		14.21	13.96	5.63	1.01	
Mean of varieties:								
V1		4.04	7	175	3.56	26.39	75	13.17
V2		4.43	2	207	3.70	26.43	75	13.17
V3		4.26	4	202	3.64	27.65	75	17.33
V4		4.31	3	160	4.85	28.22	89	10.58
V5		4.06	6	208	2.91	25.52	75	13.75
V6		4.65	1	221	3.72	26.94	73	8.83
V7		4.10	5	143	4.30	28.10	78	13.25
V8		3.82	8	187	3.21	25.24	70	14.33
V9		3.18	9	178	3.42	24.97	68	8.33
C.D.(0.05)		0.48		23.42	0.44	0.67	0.62	
C.V. (%)		10.12		10.75	10.21	2.16	0.71	
Expt. Mean		4.09		187	3.70	26.60	75	
Soil type		Vertisol						
pH		6.90						
F - levels (kg/ha)								
F1		60:30:30						
F2		120:60:60						
Recommended N:P:K		120:60:60						
Varieties								
V1		IET 29036						
V2		IET 30330						
V3		IET 30328						
V4		IET 29052						
V5		IET 30351						
V6		IET 30334						
V7		IET 30336						
V8		NC: Sahabhagidhan						
V9		Local check - CG Barani Dhan-2(112 days)						
Available N:P:K of soil		177.1:23.8:455.5						

Table 4.1o: Contd.

F-levels	Varieties	RANCHI Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test weight (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)	Over all mean	Rank
F1: Low input (50% NPK)	V1	2.85	14	196	2.63	15.56	76		3.59	14
	V2	3.06	13	227	2.74	23.56	82		3.66	12
	V3	3.34	10	245	3.01	23.76	84		3.55	16
	V4	2.58	16	182	2.33	22.20	85		3.57	15
	V5	3.85	5	283	3.42	23.67	80		3.63	13
	V6	3.25	11	232	2.93	23.68	78		3.88	10
	V7	3.69	6	262	3.30	23.58	76		3.80	11
	V8	3.51	8	236	3.16	23.49	81		3.44	17
	V9	2.15	18	155	1.97	22.15	63		3.30	18
F2: Medium input (100% NPK)	V1	3.15	12	224	3.15	22.87	79	4.62	4.41	7
	V2	3.48	9	244	3.48	23.79	84	6.46	4.44	6
	V3	3.96	4	271	3.87	23.94	88	9.54	4.50	3
	V4	2.84	15	196	2.82	22.34	86	4.00	4.17	8
	V5	4.21	2	291	4.11	23.78	83	5.54	4.48	4
	V6	3.64	7	250	3.61	23.79	81	6.00	4.55	2
	V7	4.31	1	270	3.89	23.68	80	9.54	4.57	1
	V8	4.00	3	284	3.96	23.47	84	7.54	4.47	5
	V9	2.44	17	150	2.41	22.25	67	4.46	3.89	9
Interaction										
F at same V		NS		NS	NS	NS	0.8			
V at same F		NS		NS	NS	NS	0.79			
Mean of F level										
F1		3.14	2	224	2.83	22.41	78		3.60	2
F2		3.56	1	242	3.48	23.32	81	6.41	4.38	1
C.D.(0.05)		0.24		NS	0.3	NS	0.28			
C.V.(%)		6.05		16.46	8.11	11.93	0.3			
Mean of varieties:										
V1		3.00	7	210	2.89	19.22	78	4.62	4.00	6
V2		3.27	6	236	3.11	23.68	83	6.46	4.05	4
V3		3.65	4	258	3.44	23.85	86	9.54	4.02	5
V4		2.71	8	189	2.58	22.27	85	4.00	3.87	8
V5		4.03	1	287	3.77	23.73	82	5.54	4.06	3
V6		3.45	5	241	3.27	23.74	80	6.00	4.22	1
V7		4.00	2	266	3.60	23.63	78	9.54	4.18	2
V8		3.76	3	260	3.56	23.48	83	7.54	3.95	7
V9		2.30	9	153	2.19	22.20	65	4.46	3.59	9
C.D.(0.05)		0.32		26.71	0.2	NS	0.57			
C.V. (%)		8.27		9.82	5.45	11.69	0.61			
Expt. Mean		3.35		233	3.16	22.86	80		3.99	
Soil type		-								
pH		-								
F - levels (kg/ha)										
F1		30:20:15								
F2		60:40:30								
Recommended N:P:K		60:40:30								
Varieties										
V1		IET 29036								
V2		IET 30330								
V3		IET 30328								
V4		IET 29052								
V5		IET 30351								
V6		IET 30334								
V7		IET 30336								
V8		NC: Sahabhagidhan								
V9		Local check - BVD 111								
Available N:P:K of soil		-								

Table 4.1o: Contd.

F-levels	Varieties	REWA					
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test Weight (g)	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: Low input (50% NPK)	V1	2.47		276	2.4	20.07	
	V2	-		-	-	-	
	V3	2.51		266.33	2.47	80.07	
	V4	2.73		260.67	2.33	19	
	V5	3.3		264.33	2.17	20.2	
	V6	2.45		267.33	2.4	19.93	
	V7	3.24		264.67	2.17	19.6	
	V8	3.18		260	2.07	18.13	
	V9	2.95		253.67	2.1	21	
C.D.(0.05)		0.18	20.2	0.71	62.96		
C.V.(%)		3.53	4.37	17.9	131.92		
Expt. Mean		2.85	264.13	2.26	27.25		
C.D.(0.05)		0.07		4.38	0.1		
Soil type		-					
pH		-					
F - levels (kg/ha)							
F1		-					
F2		-					
Recommended N:P:K (kg/ha)		-					
Varieties							
V1		IET 29036					
V2		-					
V3		IET 30328					
V4		IET 29052					
V5		IET 30351					
V6		IET 30334					
V7		IET 30336					
V8		NC: Sahabhagidhan					
V9		Local check - MTU 1010					
Available N:P:K of soil (kg/ha)		-					

4. 1(p) AVT 2 - Rainfed Shallow Lowland

Three AVT-2cultures (IET 30409, IET 30410 and IET 30367) of rainfed shallow land were evaluated for its response to levels RDF on grain yield at **Chinsurah (80:40:40), Dhangain (120:60:40), Ghaghraghat (120:60:60), Maruteru (90:60:60)** and **Titabar (60:20:40)** under two levels of RDF (50% and 100% RDF). The details and data received are summarized and presented in **Table 4.1(p).**

RDF doses of nutrient application significantly influenced the grain yield at all the locations. The mean maximum increase in grain yield was recorded with 100% RDF (4.55 t/ha) with higher nutrient response ranging from 3.79 to 17.38 kg grain/kg nutrient over 50% RDF at different locations.

Grain yield differences among the tested cultures were significant at **Chinsurah, Dhangain, Ghagharaghat, Maruteru, Titabar** only wherein IET 30409 (4.35 t/ha) followed by IET 30367 (4.26 t/ha) recorded significantly higher grain yield followed by check variety. Interaction effects between cultures and nutrient levels were significant at all locations except at **Maruteru**. All the cultivars were found to be promising and significant at 100% RDF over 50% RDF.

In this trial, 100% RDF was found to be promising and also exhibited higher nutrient recovery efficiency. Among the IET cultures, IET 30409 (4.53t/ha) followed by IET 30367 (4.37 t/ha) were found promising in terms of higher mean grain yield and nutrient response and on par with Swarna Sub-1 (4.38 t/ha).

Table 4.1(p): Summary of data on grain yield and ancillary characters of selected AVT-2 RSL cultures grown under transplanted conditions at graded levels of recommended fertilizer doses, kharif 2023.

F-levels	Varieties	CHINSURAH					DHANGAIN						
		Grain Yield (t/ha)	Rank	Panicle/ m² (No.)	Panicle wt (g)	Nutri. res. (kg grain/kg Nutri.) (Base level 100% RDF)	Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Panicle wt (g)	Test wt (g)	Days to 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 100% RDF)
F1: Low input (50% NPK)	V1	3.55	8	335	3.01		4.58	6	258	5.62	21.33	117	
	V2	4.01	7	346	3.24		4.28	7	244	5.55	22.87	118	
	V3	4.22	5	384	3.45		4.16	8	265	4.84	17.27	131	
	V4	3.10	9	243	2.35		4.03	9	241	4.40	23.53	109	
	V5	3.01	10	310	2.76		3.93	10	220	4.18	20.50	109	
F2: Optimum input (100% NPK)	V1	5.20	3	348	4.11	20.63	5.94	1	287	6.31	23.13	119	12.36
	V2	5.25	2	363	4.37	15.50	5.54	2	257	5.89	23.47	120	11.45
	V3	5.64	1	408	4.65	17.75	5.41	4	241	5.47	19.27	134	11.36
	V4	4.55	4	273	3.95	18.13	5.42	3	249	5.59	24.80	111	12.64
	V5	4.20	6	316	3.46	14.88	5.24	5	238	4.33	21.40	111	11.91
Interaction													
F at same V		0.19		NS	0.09		NS		NS	NS	NS	NS	
V at same F		0.19		NS	0.1		NS		NS	NS	NS	NS	
F1		3.58	2	324	2.96		4.20	2	246	4.92	21.10	117	
F2		4.97	1	341	4.11	17.38	5.51	1	254	5.52	22.41	119	11.95
C.D.(0.05)		0.11		9.33	0.08		0.51		NS	0.59	1.28	0.57	
C.V.(%)		1.67		1.79	1.42		6.72		8.62	7.22	3.74	0.31	
Mean of varieties:													
V1		4.38	3	342	3.56	20.63	5.26	1	273	5.97	22.2	118	12.36
V2		4.63	2	354	3.81	15.50	4.91	2	250	5.72	23.2	119	11.45
V3		4.93	1	396	4.05	17.75	4.79	3	253	5.16	18.3	133	11.36
V4		3.83	4	258	3.15	18.13	4.73	4	245	5.00	24.2	110	12.64
V5		3.61	5	313	3.11	14.88	4.59	5	229	4.26	21.0	110	11.91
C.D.(0.05)		0.13		8.78	0.06		NS		NS	1.11	1.68	0.61	
C.V. (%)		2.56		2.16	1.42		9.61		9.97	17.37	6.33	0.42	
Expt. Mean		4.27		332	3.54		4.85		250	5.22	21.76	118	
Soil type		Clay loam					Clay loam						
pH		-					6.35						
N - levels (kg/ha)													
F1		40:20:20					60:30:20						
F2		80:40:40					120:60:40						
Recommended NPK (kg/ha)		80:40:40					120:60:40						
Varieties													
V1		IET 30409					IET 30409						
V2		IET 30410					IET 30410						
V3		IET 30367					IET 30367						
V4		NC: Swarna Sub 1					NC: Swarna Sub 1						
V5		Local check - Sujala					Local check - R.Mahsuri - 1(150-155 Days)						
Available N:P:K of soil (kg/ha)		-					282:42.4:162.2						

Table 4.1(p): Contd.

F-levels	Varieties	GHAGHRAGHAT Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Panicle wt (g)	Test wt (g)	Days to 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 100% RDF)	MARUTERU Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Panicle wt (g)	Test wt (g)	Days to 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 100% RDF)
F1: Low input (50% NPK)	V1	3.68	4	205	3.73	22.77	119		5.96	7	248	5.13	21.74	125	
	V2	3.00	8	206	3.63	24.53	119		5.26	10	295	4.12	23.30	125	
	V3	3.13	7	223	4.23	25.60	120		5.81	8	354	3.05	18.45	125	
	V4	2.96	10	183	3.13	21.10	123		6.30	3	317	3.97	19.12	110	
	V5	3.00	8	202	3.20	20.50	120		6.10	5	292	3.87	21.53	111	
F2: Optimum input (100% NPK)	V1	4.04	1	196	3.57	24.50	119	3.27	6.26	4	328	5.32	21.96	126	2.86
	V2	3.87	2	183	3.20	23.33	115	7.91	5.64	9	348	3.26	22.66	125	3.62
	V3	3.71	3	195	3.53	22.23	121	5.27	6.02	6	294	3.65	18.23	126	2.00
	V4	3.48	5	206	3.77	23.40	126	4.73	6.98	1	335	3.69	19.81	111	6.48
	V5	3.19	6	190	3.87	21.20	121	1.73	6.52	2	342	4.41	21.94	111	4.00
Interaction															
F at same V		0.27		NS	0.57	1.68	1.98		NS		32.38	0.28	0.59	NS	
V at same F		0.33		NS	0.53	2.04	2.26		NS		32.7	0.28	0.77	NS	
F1		3.15	2	204	3.58	22.90	120		5.89	2	301	4.03	20.83	119	
F2		3.66	1	194	3.59	22.93	120	4.58	6.28	1	329	4.07	20.92	120	3.79
C.D.(0.05)		0.29		NS	NS	NS	NS		0.06		19.27	NS	NS	NS	
C.V.(%)		5.33		5.71	2.65	4.92	0.95		0.65		3.89	2.44	2.21	0.7	
Mean of varieties:															
V1		3.86	1	201	3.65	23.6	119	3.27	6.11	3	288	5.23	21.9	126	2.86
V2		3.44	2	194	3.42	23.9	117	7.91	5.45	5	321	3.69	23.0	125	3.62
V3		3.42	3	209	3.88	23.9	120	5.27	5.92	4	324	3.35	18.3	125	2.00
V4		3.22	4	194	3.45	22.3	124	4.73	6.64	1	326	3.83	19.5	111	6.48
V5		3.10	5	196	3.54	20.9	121	1.73	6.31	2	317	4.14	21.7	111	4.00
C.D.(0.05)		0.19		19.42	NS	1.18	1.4		0.45		22.9	0.2	0.42	1.11	
C.V. (%)		4.53		7.98	9.23	4.22	0.95		5.98		5.93	4.04	1.63	0.76	
Expt. Mean		3.41		199	3.59	22.92	120		6.09		315	4.05	20.87	120	
Soil type		Sand: 32.2; Silt: 48.6 & Clay:16.2							-						
pH		7.40							5.95						
N - levels (kg/ha)															
F1		60:30:20							45:30:30						
F2		120:60:40							90:60:60						
Recommended NPK (kg/ha)		120:60:40							90:60:60						
Varieties															
V1		IET 30409							IET 30409						
V2		IET 30410							IET 30410						
V3		IET 30367							IET 30367						
V4		NC: Swarna Sub 1							NC: Swarna Sub 1						
V5		Local check - Sambha Sub 1							Local check - Swarna						
Available N:P:K of soil (kg/ha)		200:24:234							119:14.32:274						

Table 4.1(p): Contd.

F-levels	Varieties	TITABAR							Over all mean	Rank
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days to 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 100% RDF)		
F1: Low input (50% NPK)	V1	2.90	8	230	4.83	23.47	119		4.13	6
	V2	3.27	5	298	5.70	20.97	121		3.96	8
	V3	2.67	10	217	5.27	23.80	122		4.00	7
	V4	3.37	3	269	5.37	21.97	121		3.95	9
	V5	3.07	7	227	5.00	22.20	126		3.82	10
F2: Optimum input (100% NPK)	V1	3.20	6	233	4.97	23.87	123	5.00	4.93	1
	V2	3.50	2	305	5.87	21.00	126	3.83	4.76	3
	V3	2.90	8	258	5.53	24.00	123	3.83	4.74	4
	V4	3.57	1	276	5.60	22.50	122	3.33	4.80	2
	V5	3.30	4	228	5.37	22.47	126	3.83	4.49	5
Interation										
F at same V		NS		NS	NS	NS	2.07			
V at same F		NS		NS	NS	NS	3.97			
F1		3.06	2	248	5.23	22.48	122		3.97	2
F2		3.29	1	260	5.47	22.77	124	3.97	4.74	1
C.D.(0.05)		0.2		NS	NS	NS	NS			
C.V.(%)		3.98		6.48	3.56	1.73	2.39			
Mean of varieties:										
V1		3.05	4	231	4.90	23.7	121	5.00	4.53	1
V2		3.39	2	302	5.79	21.0	123	3.83	4.36	4
V3		2.79	5	237	5.40	23.9	123	3.83	4.37	3
V4		3.47	1	273	5.49	22.2	122	3.33	4.38	2
V5		3.19	3	227	5.19	22.3	126	3.83	4.16	5
C.D.(0.05)		0.25		22.31	0.21	0.53	1.46			
C.V. (%)		6.41		7.17	3.21	1.9	0.97			
Expt. Mean		3.18		254	5.35	22.63	123		4.23	
Soil type		Clay loam								
pH		5.50								
N - levels (kg/ha)										
F1		30:10:20								
F2		60:20:40								
Recommended NPK (kg/ha)		60:20:40								
Varieties										
V1		IET 30409								
V2		IET 30410								
V3		IET 30367								
V4		NC: Swarna Sub 1								
V5		Local check - Bahadur(155-160 days)								
Available N:P:K of soil (kg/ha)		-								

4. 1(q) AVT 2 - Semi-Deep Water

The grain yield performance of SDW cultures and response to nutrient levels of two selected IET cultures (IET 29026 and IET 29031) were evaluated against two standard checks (CR Dhan 506, Rajdeep and Sambha Sub 1) at three locations *viz.,* **Chinsurah, Ghaghraghat** and **Pusa**. The data received from these locations are summarized and presented in **Table 4.1(q).**

The cultivars differed significantly for grain yield at both the locations (**Ghaghraghat** and **Pusa**). The mean maximum grain yield was recorded by IET 29031 at **Ghaghraghat** (3.23 t/ha) and **Pusa** (4.77 t/ha). The performance of standard checks was at par to test cultures at both the locations. No significant difference was observed at **Chinsurah**.

RDF dose significantly influenced the grain yield at **Ghaghraghat**, **Chinsurah** and **Pusa** locations and the increase in grain yield with 100% of RDF was to the tune of 46%. Interaction effects between cultivars RDF dose for grain yield were non-significant only at **Pusa**.

In this trial, IET 29026 and IET 29031 cultures were evaluated against high yielding standard checks (CR Dhan 506 and Rajdeep) along with one local check at three locations. Over the locations, maximum grain yield was recorded by IET 29031 (4.41 t/ha) followed by IET 29026 (3.95 t/ha) and are suitable at 100% of RDF among the tested cultures.

Table 4.1q: Summary of data on grain yield and ancillary characters of selected AVT-2 SDW cultures grown under transplanted conditions at graded levels of recommended fertilizer doses, kharif 2023.

F-levels	Varieties	CHINSURAH Grain Yield (t/ha)	*Rank*	Panicle/m² (No.)	Panicle wt (g)	Nutri. res. (kg grain/ kg Nutri.) (Base level 100% RDF)	GHAGHRAGHAT Grain Yield (t/ha)	*Rank*	Panicle/m² (No.)	Panicle wt (g)	Test wt (g)	Days to 50% flowering	Nutri. res. (kg grain/ kg Nutri.) (Base level 100% RDF)
F1: Low input (50% NPK)	V1	4.39	*6*	296	3.75		2.22	*8*	182	3.87	24.53	116	
	V2	4.55	*5*	328	4.22		2.86	*4*	171	4.10	24.87	118	
	V3	3.10	*8*	257	3.11		2.31	*7*	174	4.27	24.53	122	
	V4	3.15	*7*	238	3.25		2.66	*5*	187	4.20	24.50	121	
F2: Optimum input (100% NPK)	V1	5.67	*2*	346	4.25	16.00	2.96	*3*	173	3.63	25.33	121	6.73
	V2	5.89	*1*	335	5.01	16.75	3.60	*1*	158	3.60	24.67	119	6.73
	V3	5.01	*4*	294	4.10	23.88	2.32	*6*	180	3.73	24.37	122	0.09
	V4	5.12	*3*	266	4.27	24.63	3.36	*2*	191	3.87	21.40	119	6.36
Interaction													
N at same V		0.26		10.31	0.18		0.37		NS	NS	1.11	1.09	
V at same N		0.23		9.88	0.27		0.32		NS	NS	1.31	1.59	
F1		3.80	*2*	280	3.58		2.51	*2*	179	4.11	24.61	119	
F2		5.42	*1*	310	4.41	20.31	3.06	*1*	176	3.71	23.94	120	4.98
C.D.(0.05)		0.04		21.42	NS		0.06		NS	NS	NS	NS	
C.V.(%)		0.54		5.73	7.74		1.28		4.29	9.44	2.65	0.78	
Mean of varieties:													
V1		5.03	*2*	321	4.00	16.00	2.59	*3*	178	3.75	24.93	119	6.73
V2		5.22	*1*	331	4.62	16.75	3.23	*1*	165	3.85	24.77	119	6.73
V3		4.06	*4*	276	3.61	23.88	2.32	*4*	177	4.00	24.45	122	0.09
V4		4.14	*3*	252	3.76	24.63	3.01	*2*	189	4.04	22.95	120	6.36
C.D.(0.05)		NS		7.29	0.13		0.26		13.56	NS	0.78	0.77	
C.V.(%)		11.21		1.96	2.57		7.37		6.09	6.13	2.56	0.51	
Expt. Mean		4.61		295	4.00		2.79		177	3.91	24.28	120	
Soil type		Clay loam					Sand loam						
pH		-					7.4						
F - levels (kg/ha)													
F1		40:20:20					60:30:20						
F2		80:40:40					120:60:40						
Recomd NPK (kg/ha)		80:40:40					120:60:40						
Varieties													
V1		IET 29026					IET 29026						
V2		IET 29031					IET 29031						
V3		NC: CR Dhan 506					NC: CR Dhan 506						
V4		Local check - Rajdeep					Local check - Sambha Sub 1						
Availabe NPK of soil (kg/ha)		-					200:24:234						

Table 4.1q: Contd.

F-levels	Varieties	PUSA Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days to 50% flowering	Nutri. res. (kg grain/ kg Nutri.) (Base level 100% RDF)	Over all mean	Rank
F1: Low input (50% NPK)	V1	3.07	*7*	257	2.43	22.63	126		3.23	*7*
	V2	3.63	*6*	282	2.53	22.30	123		3.68	*5*
	V3	3.02	*8*	258	2.50	22.80	121		2.81	*8*
	V4	3.97	*5*	285	2.73	22.63	110		3.26	*6*
F2: Optimum input (100% NPK)	V1	5.41	*3*	307	3.40	23.33	127	16.71	4.68	*3*
	V2	5.90	*2*	322	3.60	23.40	124	16.21	5.13	*1*
	V3	5.38	*4*	312	3.27	23.57	123	16.86	4.24	*4*
	V4	5.99	*1*	330	3.70	23.63	111	14.43	4.82	*2*
Interaction										
N at same V		NS		NS	NS	NS	NS			
V at same N		NS		NS	NS	NS	NS			
F1		3.42	*2*	271	2.55	22.59	120		3.24	*2*
F2		5.67	*1*	318	3.49	23.48	121	16.05	4.72	*1*
C.D.(0.05)		0.73		22.64	0.09	0.18	NS			
C.V.(%)		9.15		4.38	1.79	0.44	1.18			
Mean of varieties:										
V1		4.24	*3*	282	2.92	22.98	127	16.71	3.95	*3*
V2		4.77	*2*	302	3.07	22.85	124	16.21	4.41	*1*
V3		4.20	*4*	285	2.89	23.19	122	16.86	3.52	*4*
V4		4.98	*1*	308	3.22	23.13	111	14.43	4.04	*2*
C.D.(0.05)		0.49		15.08	0.22	NS	2.86			
C.V.(%)		8.63		4.08	5.7	1.05	1.88			
Expt. Mean		4.55		294	3.02	23.04	121		3.98	
Soil type		Sand loam								
pH		8.5								
F - levels (kg/ha)										
F1		75:40:25								
F2		150:80:50								
Recomd NPK (kg/ha)		150:80:50								
Varieties										
V1		IET 29026								
V2		IET 29031								
V3		NC: CR Dhan 506								
V4		Local check - Rajshree(150-155 days)								
Availabe NPK of soil (kg/ha)		-								

RESOURCE CONSERVATION TECHNOLOGIES

4.2 RESOURCE CONSERVATION TECHNOLOGIES TRIALS (RCTs)

4.2.1. Water management for enhancing water use efficiency and productivity of mechanical transplanted rice (Kharif)

Increasing water scarcity is becoming real threat to rice cultivation. Hence water-saving technology needs to be developed which not only economically beneficial but also maintains soil health. Any approach that would lessen the amount of water use without compromising the rice yield would certainly be a welcome strategy. Introduction of mechanical transplanting and wet direct seeding are the alternative practices to solve water crisis, and as a methodology for increasing the productivity of irrigated rice. AWD is also called 'intermittent irrigation' or 'controlled irrigation' which can reduce the water requirement by 30 % in irrigated rice system. To evaluate the suitable and promising irrigation management practices in different crop establishment methods a trial was formulated and conducted at 7 locations (**Aduthurai, Ranchi Warangal, Karaikal, Khudwani, Ludhiana and Mandya**). Split plot design was adopted with 3 main plots of crop establishment methods {M_1: Mechanical Transplanting method on puddled soil (crop management methods same as for puddled transplanted rice), M_2: Direct wet seeding on puddled soil (Use of Drum seeder/ dibbling of sprouted seed at 25 x 25 cm) fb crop management practices as per direct wet seeded rice, M_3: Manual transplanting and 3 subplots of irrigation management {I_1: Flooding throughout crop growth (3 + / - 2 cm), I_2: Saturation maintenance up to PI and (3 + / - 2 cm) after PI and I_3: Alternate wetting and drying (irrigation at 5 -7 days interval with 5 cm/ha of water (5 cm irrigation at 3 DADPW) up to PI and (3 + / - 2 cm) after PI}and replicated three times. The results were summarized and presented in **Table 2.2.1** and the salient findings are as followed.

At **Aduthurai**, interaction of crop establishment methods and irrigation management on grain yield was found to be significant. Mechanical transplanting along with irrigation at saturation resulted in the highest grain yield (6.22 t/ha) followed by manual transplanting with alternate wetting and drying (5.98 t/ha). Among establishment methods, mechanical transplanting resulted in the highest grain yield (5.77 t/ha) and among irrigation managements, alternate wetting and drying resulted in the highest grain yield (5.84 t/ha). Among establishment methods, the highest water input was recorded in mechanical transplanting (1245 mm/ha). However, it was interesting to note that the water input was similar under all irrigation management practices (1035 mm/ha). Among establishment methods, the highest cost of cultivation was recorded under mechanical transplanting method (Rs. 51003/-) followed by direct wet seeding (Rs. 50580/-) and the lowest in manual transplanting (Rs. 50030/-). However, among irrigation management practices, the cost of cultivation was the lowest under irrigation at saturation (Rs. 48383/-). In clay loam soils of **Ranchi**, the interaction effect and crop establishment effect on grain yield was found to be non-significant. Among establishment methods, the highest grain yield was under manual transplanting (5.13 t/ha), however, the lowest cost of cultivation was recorded under direct wet seeding (Rs. 27400/-). Among irrigation managements, alternate wetting and drying recorded the highest grain yield (5.04 t/ha) with the highest cost of cultivation of Rs. 33617/-. The lowest cost of cultivation was higher in irrigation at saturation (Rs. 31217/-). In clay soils of **Warangal**, the interaction effect on grain yield was found to be non-significant. Among crop establishment methods, the highest grain yield was recorded in direct wet seeding plots (4.5 t/ha). Among irrigation managements, all 3 treatments were resulted in the similar grain yield. However, alternate wetting and drying recorded numerically the highest grain yield (3.99 t/ha) with the highest total water input of 1225 mm. In clay loam soils of **Karaikal**, ADT 37 variety was grown. Interaction and main plot effect was found to be non-significant on grain yield. All crop establishment methods were found equally effective in producing grain yield ranging from 4.72 to 5.17 t/ha. Among water management practices, alternate wetting and drying resulted the highest grain yield (5.45 t/ha). Among establishment methods, mechanical transplanting required less water input (1050 mm/ha), similarly, among irrigation management practices, irrigation at saturation recorded the lowest water input (1000 mm/ha). In sandy loam soils of **Khudwani**, interaction, main plot and sub plot effects were found to be non-significant with respect to grain yield. The experimental mean grain yield was 6.35 t/ha. Among irrigation management, the lowest water input was recorded in alternate wetting and drying (993 mm/ha) with the lowest cost of cultivation (Rs. 61495/-). In sandy loam soils of **Ludhiana**, Interaction, main plots and sub plots effects on grain yield was non-significant. Among crop establishment methods, the grain yield was ranged from 9.17 t/ha to 9.40 t/ha. Similarly, among irrigation managements, the grain yield was ranged from 9.18 t/ha to 9.38 t/ha. The experimental mean cost of cultivation was (Rs. 54965/-). In red sandy loam soils of **Mandya**, interaction effect of crop establishment methods and irrigation management on grain yield was found to be non-significant. Effect of crop establishment methods on grain yield was also found to be non-significant. Among, irrigation management practices, the highest grain yield was recorded in the alternate wetting and drying plots (6.06 t/ha), however, at par with irrigation with saturation (6.02 t/ha). Similarly, alternate wetting and drying irrigated plots received less water (1280 mm/ha). The cost of cultivation was the lowest in alternate wetting and drying (Rs. 63584/-) than flooding (Rs. 65460/-). Overall, across the 7 locations, among crop establishment methods, the highest mean grain yield was recorded under direct wet seeding (5.55 t/ha). Similarly, among irrigation management practices, alternate wetting and drying method recorded the highest mean grain yield of 5.97 t/ha across all locations.

Table 4.2.1: Evaluation of Water management for enhancing Water use efficiency and productivity of mechanical transplanted rice, Kharif-2023.

Treatment		ADUTHURAI									
Main Plot-Irrigation management practices	Crop establishment methods	Grain yield (t/ha)	Rank	Plant height (cm)	Panicle/ m^2 (No.)	Panicle wt (g)	Test wt (g)	No of grains/ panicle	Total water input (mm)	Water productivity (kg/ha-mm)	Cost of cultivation (Rs/ha)
M1 - Mechanical Transplanting	I1	5.45	7	94.67	297.67	2.88	17.63	183	1245	4.38	50300
	I2	6.22	1	96.67	310.33	2.96	18.47	194	1245	5.00	48850
	I3	5.65	5	99.00	324.33	3.10	18.63	206	1245	4.54	53860
M2 - Direct wet seeding on puddled soil	I1	5.11	9	90.67	292.67	2.82	17.47	195	990	5.16	49840
	I2	5.48	6	97.00	326.67	3.17	18.53	207	990	5.54	48400
	I3	5.89	3	96.00	341.67	3.22	18.67	218	990	5.95	53500
M3 - Manual transplanting	I1	5.31	8	90.67	309.33	18.63	18.63	186	870	6.10	49350
	I2	5.66	4	93.67	333.67	18.67	18.67	204	870	6.51	47900
	I3	5.98	2	104.33	345.33	18.80	18.8	210	870	6.87	52840
Method of Methods											
M1		5.77	1	96.78	310.78	2.98	18.24	194	1245	4.63	51003
M2		5.49	3	94.56	320.33	3.07	18.22	207	990	5.55	50580
M3		5.65	2	96.22	329.44	18.70	18.7	200	870	6.49	50030
C.D. (0.05)		0.1		NS	3.62	0.05	0.07	2			
C.V. (%)		2.08		1.41	1.35	0.76	0.43	1			
Mean of Irrigation											
I1		5.29	3	92.00	299.89	8.11	17.91	188	1035	5.11	49830
I2		5.78	2	95.78	323.56	8.27	18.56	202	1035	5.58	48383
I3		5.84	1	99.78	337.11	8.37	18.7	211	1035	5.64	53400
CD (0.05)		0.23		2.53	5.49	0.08	0.11	2			
C.V. (%)		3.95		2.57	1.67	0.99	0.59	1			
Interaction											
I and M		0.4		4.38	9.51	0.15	0.19	NS			
M and I		0.33		3.62	7.99	0.12	0.16	NS			
Experimental Mean		5.64		95.85	320.19	8.25	18.39	200	1035	5.45	50538
Soil type		Clay soil									
pH		7.32									
EC		-									
Variety		-									
Available NPK kg/ha		265:40:450									

I1- Flooding throughout crop growth (3 +/- 2cm) after 15 days
I2- Irrigation at Saturation (No flooding)
I3- Alternate wetting and drying

Table 4.2.1: Contd.

Treatment		KARAIKAL										
Main Plot- Irrigation management practices	Crop establishment methods	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant height (cm)	Panicle /m^2 (No.)	Panicle wt (g)	Test wt (g)	Days to 50% flowering	No of grains/ panicle	Total water input (mm)	Water productivity (kg/ha-mm)
M1 - Mechanical Transplanting	I1	4.33	6	6.08	104.05	270	3.61	23.81	84	153	1150	3.77
	I2	4.55	5	5.92	109.03	322	3.39	20.63	83	182	950	4.79
	I3	5.28	2	7.17	106.03	358	3.88	22.23	83	144	1050	5.03
M2 - Direct wet seeding on puddled soil	I1	5.13	3	8.1	110.08	354	3.57	23.93	82	166	1200	4.28
	I2	4.77	4	6.02	107.77	163	4.15	24.25	82	160	1050	4.54
	I3	5.62	1	7.28	104.73	282	3.92	22.92	82	157	1130	4.97
M3 - Manual transplanting	I1											
	I2											
	I3											
Method of Methods												
M1		4.72	2	6.39	106.37	317	3.63	22.22	83	160	1050	4.50
M2		5.17	1	7.13	107.52	266	3.88	23.7	82	161	1126.67	4.59
M3												
C.D. (0.05)		NS		NS	NS	NS	NS	NS	NS	NS		
C.V. (%)		8.69		7.31	3.41	22.7	12.97	10.03	1.51	6.00		
Mean of Irrigation												
I1		4.73	2	7.09	107.07	312	3.59	23.87	83	160	1175	4.03
I2		4.66	3	5.97	108.4	243	3.77	22.44	82	171	1000	4.66
I3		5.45	1	7.22	105.38	320	3.9	22.58	83	151	1090	5.00
CD (0.05)		0.52		0.93	NS	51.29	NS	NS	NS	NS		
C.V. (%)		7.97		10.37	2.76	13.21	7.87	8.34	1.39	12.93		
Interaction												
I and M		NS		NS	NS	72.54	NS	NS	NS	NS		
M and I		NS		NS	NS	118.4	NS	NS	NS	NS		
Experimental Mean		4.95		6.76	106.95	292	3.75	22.96	82	160	1088	4.56
Soil type		Clay loam										
pH		-										
EC		-										
Variety		ADT 37										
Available NPK kg/ha		-										

I1- Flooding throughout crop growth (3 +/- 2cm) after 15 days
I2- Irrigation at Saturation (No flooding)
I3- Alternate wetting and drying

Table 4.2.1: Contd.

Treatment		KHUDWANI											
Main Plot- Irrigation management practices	Crop establishment methods	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant height (cm)	Panicle/m² (No.)	Panicle wt (g)	Test wt (g)	Days to 50% flowering	No of grains / panicle	Total water input (mm)	Water productivity (kg/ha-mm)	Cost of cultivation (Rs/ha)
M1 - Mechanical Transplanting	I1	6.27	4	6.70	129.20	408	2.79	29.17	99	95	1428	4.69	61320
	I2	5.97	5	6.40	128.47	462	3.08	28.93	99	98	1041	6.15	62590
	I3	5.57	6	5.77	127.73	374	3.00	29.07	99	98	1001	5.76	60650
M2 - Direct wet seeding on puddled soil	I1	6.57	2	6.97	133.67	527	3.19	27.70	95	101	1328	5.25	63280
	I2	7.30	1	7.47	132.97	514	3.31	29.13	95	109	1015	7.36	64520
	I3	6.43	3	6.57	130.43	490	3.25	28.76	93	94	985	6.67	62340
M3 - Manual transplanting	I1												
	I2												
	I3												
Method of Methods													
M1		5.93	2	6.29	128.47	415	2.95	29.06	99	97	1157	5.44	61520
M2		6.77	1	7.00	132.36	510	3.25	28.53	94	101	1109	6.31	63380
M3													
C.D. (0.05)		NS		NS	NS	NS	NS	NS	0.48	NS	NS		
C.V. (%)		21.91		16.42	1.52	22.68	11.37	4.30	0.24	16.13	4.22		
Mean of Irrigation													
I1		6.42	2	6.83	131.43	468	2.99	28.43	97	98	1378	4.96	62300
I2		6.63	1	6.93	130.72	488	3.19	29.03	97	103	1028	6.74	63555
I3		6.00	3	6.17	129.08	432	3.12	28.91	96	96	993	6.21	61495
CD (0.05)		NS		NS	NS	NS	NS	NS	0.74	NS	41.81		
C.V. (%)		8.44		7.52	1.51	10.67	14.31	3.87	0.57	13.94	2.77		
Interaction													
I and M		NS		NS	NS	NS	NS	NS	1.04	NS	NS		
M and I		NS		NS	NS	NS	NS	NS	0.93	NS	NS		
Experimental Mean		6.35		6.64	130.41	463	3.10	28.79	96.4	99.1	1133	5.97	62450
Soil type		Clay loam											
pH		6.50											
EC		0.45											
Variety		-											
Available NPK kg/ha		227:18:256											

I1- Flooding throughout crop growth (3 +/- 2cm) after 15 days
I2- Irrigation at Saturation (No flooding)
I3- Alternate wetting and drying

Table 4.2.1: Contd.

Treatment		LUDHIANA											
Main Plot-Irrigation management practices	Crop establishment methods	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant height (cm)	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days for 50% flowering	No of grains/panicle	Total water input (mm)	Water productivity (kg/ha-mm)	Cost of cultivation (Rs/ha)
M1 - Mechanical Transplanting	I1	9.34	3	12.69	100.47	346	4.59	22.57	95	177	1650	7.69	55800
	I2	9.38	2	12.09	97.53	337	4.79	22.53	94	196	1400	8.64	55150
	I3	9.48	1	11.38	96.73	346	4.83	22.67	93	203	1200	9.48	54500
M2 - Direct wet seeding on puddled soil	I1	9.01	6	12.11	97.33	412	3.59	22.53	90	145	1560	7.76	55430
	I2	9.21	5	11.81	95.2	407	3.7	22.5	88	148	1320	8.95	54780
	I3	9.28	4	11.58	92.27	402	3.69	22.47	88	156	1020	11.35	54130
M3 - Manual transplanting	I1												
	I2												
	I3												
Method of Methods													
M1		9.4	1	12.05	98.24	343	4.74	22.59	94	192	1417	8.51	55150
M2		9.17	2	11.83	94.93	407	3.66	22.5	89	150	1300	9.10	54780
M3													
C.D. (0.05)		NS		NS	2.83	52.16	0.65	NS	1.91	3.81			
C.V. (%)		1.79		8.52	1.45	6.86	7.67	1.21	1.03	1.1			
Mean of Irrigation													
I1		9.18	3	12.4	98.9	379	4.09	22.55	93	161	1605	7.73	55615
I2		9.3	2	11.95	96.37	372	4.25	22.52	91	172	1360	8.79	54965
I3		9.38	1	11.48	94.5	374	4.26	22.57	91	179	1110	10.34	54315
CD (0.05)		NS		0.57	NS	NS	NS	NS	0.63	8.07			
C.V. (%)		2.82		3.56	2.88	3.48	4.69	3.09	0.52	3.55			
Interaction													
I and M		NS		NS	NS	NS	NS	NS	NS	NS			
M and I		NS		NS	NS	NS	NS	NS	NS	NS			
Experimental Mean		9.28		11.94	96.59	375	4.2	22.54	91.28	170.9	1358	8.95	54965
Soil type		Sandy loam											
pH		7.70											
EC		0.43											
Variety		-											
Available NPK kg/ha		259:59:165											

I1- Flooding throughout crop growth (3 +/- 2cm) after 15 days
I2- Irrigation at Saturation (No flooding)
I3- Alternate wetting and drying

Table 4.2.1: Contd.

Treatment		MANDYA										
Main Plot-Irrigation management practices	Crop establishment methods	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant height (cm)	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	No of grains/ panicle	Total water input (mm)	Water productivity (kg/ha-mm)	Cost of cultivation (Rs/ha)
M1 - Mechanical Transplanting	I1	5.26	6	7.60	80.01	344	2.62	16.09	138	1970	2.67	67054
	I2	6.00	3	8.34	79.63	363	2.61	16.50	141	1590	3.77	66379
	I3	5.97	4	8.11	79.47	390	2.62	16.39	142	1345	4.44	65122
M2 - Direct wet seeding on puddled soil	I1	5.49	5	7.87	80.70	347	2.69	16.59	144	1870	2.94	63867
	I2	6.04	2	8.40	80.17	375	2.75	16.66	133	1433	4.22	62944
	I3	6.15	1	8.61	80.33	387	2.79	16.57	144	1215	5.06	62046
M3 - Manual transplanting	I1											
	I2											
	I3											
Method of Methods												
M1		5.74	2	8.01	79.70	366	2.62	16.33	140	1635	3.51	66185
M2		5.89	1	8.29	80.40	370	2.74	16.61	140	1506	3.91	62952
M3												
C.D. (0.05)		NS		NS	NS	NS	NS	NS	NS	56.38		
C.V. (%)		1.62		7.93	0.84	3.96	9.97	2.96	7.34	1.77		
Mean of Irrigation												
I1		5.37	3	7.73	80.35	346	2.65	16.34	141	1920	2.80	65460
I2		6.02	2	8.37	79.90	369	2.68	16.58	137	1511	3.98	64662
I3		6.06	1	8.36	79.90	388	2.71	16.48	143	1280	4.74	63584
CD (0.05)		0.52		NS	NS	NS	NS	NS	NS	45.57		
C.V. (%)		6.75		8.66	1.25	6.76	7.95	4.70	12.64	2.18		
Interaction												
I and M		NS		NS	NS	NS	NS	NS	NS	NS		
M and I		NS		NS	NS	NS	NS	NS	NS	NS		
Experimental Mean		5.82		8.15	80.05	368	2.68	16.47	140	1570	3.84	64569
Soil type		Red sandy loam										
pH		7.55										
EC		0.42										
Variety		MSN 99										
Available NPK kg/ha		298:87:244										

I1- Flooding throughout crop growth (3 +/- 2cm) after 15 days
I2- Irrigation at Saturation (No flooding)
I3- Alternate wetting and drying

Table 4.2.1: Contd.

Treatment		RANCHI						
Main Plot- Irrigation management practices	Crop establishment methods	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Panicle/m^2 (No.)	Test wt (g)	No of grains/ panicle	Cost of cultivation (Rs/ha)
M1 - Mechanical Transplanting	I1	4.78	6	7.26	245	25.06	104	31450
	I2	4.48	8	6.8	230	24.76	98	29650
	I3	4.90	3	7.3	252	25.10	108	32050
M2 - Direct wet seeding on puddled soil	I1	4.67	7	6.96	240	24.76	103	27800
	I2	4.31	9	6.44	222	24.53	95	26000
	I3	4.86	4	7.16	250	24.95	106	28400
M3 - Manual transplanting	I1	5.16	2	7.77	273	25.12	116	39800
	I2	4.85	5	7.23	249	24.96	107	38000
	I3	5.37	1	7.83	286	25.25	118	40400
Method of Methods								
M1		4.72	2	7.12	242	24.97	103	31050
M2		4.61	3	6.86	237	24.75	101	27400
M3		5.13	1	7.61	269	25.11	113	39400
C.D. (0.05)		0.25		0.36	12	NS	3	
C.V. (%)		6.13		5.95	6	5.22	3	
Mean of Irrigation								
I1		4.87	2	7.33	253	24.98	107	33017
I2		4.55	3	6.82	234	24.75	100	31217
I3		5.04	1	7.43	263	25.10	111	33617
CD (0.05)		0.31		0.4	18	NS	4	
C.V. (%)		6.19		5.47	7	4.15	4	
Interaction								
I and M		NS		NS	NS	NS	NS	
M and I		NS		NS	NS	NS	NS	
Experimental Mean		4.82		7.2	250	24.94	106	32617
Soil type		Clay loam						
pH		-						
EC		-						
Variety		Naveen						
Available NPK kg/ha		-						

I1- Flooding throughout crop growth (3 +/- 2cm) after 15 days
I2- Irrigation at Saturation (No flooding)
I3- Alternate wetting and drying

Table 4.2.1: Contd.

Treatment		WARANGAL										
Main Plot-Irrigation management practices	Crop establishment methods	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant height (cm)	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days to 50% flowering	No of grains/ panicle	Total water input (mm)	Water productivity (kg/ha-mm)
M1 - Mechanical Transplanting	I1	3.44	7	3.21	107.47	331	5.33	11.99	93	302	1122	3.07
	I2	3.3	8	4.24	110.47	349	5.87	12.13	93	322	1165	2.83
	I3	3.76	5	3.46	107.50	352	5.99	11.65	93	302	1260	2.98
M2 - Direct wet seeding on puddled soil	I1	4.27	3	6.47	113.83	350	5.70	12.37	84	328	1117	3.82
	I2	4.89	1	6.14	116.33	324	5.15	11.93	84	313	1137	4.30
	I3	4.34	2	6.08	116.67	350	5.53	12.19	85	324	1248	3.48
M3 - Manual transplanting	I1	2.83	9	4.95	94.17	350	5.65	11.80	95	299	1077	2.63
	I2	3.74	6	4.43	95.23	352	5.95	11.93	94	323	1089	3.44
	I3	3.86	4	4.14	95.63	428	5.72	12.00	94	314	1167	3.31
Method of Methods												
M1		3.5	2	3.64	108.48	344	5.73	11.92	93	308	1182	2.96
M2		4.5	1	6.23	115.61	341	5.46	12.16	84	322	1167	3.86
M3		3.48	3	4.51	95.01	377	5.77	11.91	95	312	1111	3.13
C.D. (0.05)		0.21		0.44	2.59	NS	NS	NS	0.52	NS	NS	
C.V. (%)		6.53		11.09	2.91	11.29	21.28	4.37	0.69	7.29	5.07	
Mean of Irrigation												
I1		3.51	3	4.88	105.16	344	5.56	12.05	91	310	1105	3.18
I2		3.97	2	4.94	107.34	342	5.66	12.00	90	319	1130	3.51
I3		3.99	1	4.56	106.60	377	5.75	11.94	91	313	1225	3.26
CD (0.05)		NS		NS	NS	25.76	NS	NS	NS	NS	38.72	
C.V. (%)		11.28		13.71	1.63	7.08	11.84	1.91	0.88	5.36	3.27	
Interaction												
I and M		NS		NS	NS	NS	NS	NS	NS	NS	NS	
M and I		NS		NS	NS	NS	NS	NS	NS	NS	NS	
Experimental Mean		3.82		4.79	106.37	354	5.65	12.00	91	314	1153	3.32
Soil type		Clay										
pH		8.53										
EC		-										
Variety		-										
Available NPK kg/ha		124:41:380										

I1- Flooding throughout crop growth (3 +/- 2cm) after 15 days
I2- Irrigation at Saturation (No flooding)
I3- Alternate wetting and drying

Table 4.2.1: Contd.

Treatment		Over all Mean Grain yield	Rank	Mean of Cost of cultivation	Rank	Water productivity (kg/ha-mm)	Rank
Main Plot- Irrigation management practices	Crop establishment methods						
M1 - Mechanical Transplanting	I1	5.55	6	53185	2	4.38	8
	I2	5.70	5	52524	3	5.20	4
	I3	5.80	3	53236	1	5.37	3
M2 - Direct wet seeding on puddled soil	I1	5.75	4	52043	5	4.87	7
	I2	6.00	2	51329	6	5.82	2
	I3	6.08	1	52083	4	6.25	1
M3 - Manual transplanting	I1	4.43	9	44575	8	4.37	9
	I2	4.75	8	42950	9	4.97	6
	I3	5.07	7	46620	7	5.09	5
Method of Methods							
M1		5.68	2	52982	1	4.92	2
M2		5.94	1	51818	2	5.55	1
M3		4.75	3	44715	3	4.81	3
C.D. (0.05)							
C.V. (%)							
Mean of Irrigation							
I1		5.62	3	53244	2	4.63	3
I2		5.84	2	52556	3	5.54	2
I3		5.97	1	53282	1	5.87	1
CD (0.05)							
C.V. (%)							
Interaction							
I and M							
M and I							
Experimental Mean		5.81					
Soil type							
pH							
EC							
Variety							
Available NPK kg/ha							

I1- Flooding throughout crop growth (3 +/- 2cm) after 15 days
I2- Irrigation at Saturation (No flooding)
I3- Alternate wetting and drying

4.2.2a. Identification of suitable sowing method of dry DSR for higher productivity in different zones

Imminent water crisis, labour scarcity and climate change threaten the sustainability and profitability of traditional transplanted rice. Direct-seeded rice (DSR) technology has been proposed to reduce water requirement, save labour demand, mitigate greenhouse gas emission and improve environmental sustainability. It involves three principal methods viz., dry seeding, wet seeding, and water seeding, among which dry DSR is gaining momentum due to relatively high grain yield, less water consumption, reduced labour intensity, facilitating to mechanization during crop establishment, and less greenhouse gases emission. The major challenges confronting the development of dry DSR in India are poor crop establishment, weed infestation, lodging susceptibility, yield decline under continuous cropping, and variety breeding; and the strategies which may help in mitigating the constraints to dry DSR. Hence the present trial is constituted to enhance the productivity of the wet DSR with the following objectives 1) To identify suitable and cost effective agronomic management practices to enhance the productivity of dry DSR and 2) To maximize the resource use efficiency. The trial was conducted at 13 locations (**Chatha, Gangavathi, Jagdalpur, Ludhiana, Mandya, Nagina, Nawagam, Pantnagar, Pusa, Raipur, Rewa, Vadgaon,** and **Varanasi)**. The trial was laid out in RBD with 7 treatments and replicated thrice. Treatments are S_1: Broadcasting of seeds and S_2: Mechanized line sowing of seeds (Dribbler, Happy seeder of any Drum seeder, spacing as per the equipment specifications), S_3: Raised bed sowing, S_4: Semi-dry system (sowing in dry soil and wet after one month of sowing) and S_5: Any improved system in that particular location, S_6: Location specific high yielding DSR method and S_7: Farmers' practice of the dry DSR method of the region. However, at Varanasi the trial was conducted in split plot design as per the 2022-23 technical programme instead of 2023-24. The results were summarized and presented in **Table 4.2.2a** and the salient findings are as followed.

Treatment effect on grain yield was found to be significant at all locations except at **Gangavathi, Ludhiana, Mandya and Nagina**. In sandy clay loam soils of **Chatha**, Basmati 370 variety resulted the highest grain yield under semi-dry system (3.20 t/ha). The lowest total weed dry matter at 45, 75 DAS and harvest were recorded in raised bed sowing. Similarly, the lowest cost of cultivation was found in broadcasting of seeds. However, the highest gross return was found under semi-dry system (Rs. 1,95,683/- per hectare). In black clay soils of Gangavathi, all dry sowing methods found to be equally effective in terms of grain yield (ranged from 3.39 to 3.88 t/ha). Similarly, gross return also varied from Rs. 93,633/- to Rs.1,02,704/-. In alfisols of **Jagdalpur**, improved system of that particular region (pre-emergence herbicide + 2 manual weedings) resulted in the highest grain yield (4.62 t/ha) followed by raised bed sowing of Dry DSR (4.42 t/ha). The experimental lowest cost of cultivation was recorded in farmers' practice (Rs. 42,200/-). In sandy clay loam soils of **Ludhiana**, all methods of dry sowing were found to be equally effective in terms of grain yield. The experimental mean grain yield was 7.35 t/ha. In red sandy loam soils of **Mandya**, results were similar to that of Ludhiana. The experimental mean grain yield was 4.98 t/ha. The cost of cultivation varied from Rs.55649 to Rs. 66944/ha. In red sandyloam soils of Nagina, the results of grain yield was similar to that of Ludhiana and Mandya. The grain yield ranged from 4.18 to 5.50 t/ha. The cost of cultivation also ranged from Rs.55649 to Rs.66944/ha. In clay loam soils of **Nawagam**, the highest grain yield was recorded under improved system of that particular region (aerobic rice with single seed of 25 cm row and 25 cm plant to plant spacing)(5.12 t/ha), however, at par with semi dry system (4.97 t/ha) and seed drill sowing, a location specific high yielding dry DSR method (4.97 t/ha). In silt loam soils of **Pantnagar,** Location specific high yielding dry DSR method resulted the highest grain yield (5.23 t/ha), however, at par with mechanized line sowing (5.17 t/ha). Cost of cultivation ranged from Rs. 33548 to Rs. 37508/ha. In sandy loam soil of **Pusa**, mechanized line sowing resulted the highest grain yield (4.80 t/ha) followed by improved system of that particular region (4.47 t/ha). In vertisols of **Raipur**, raised bed sowing resulted the highest grain yield (4.38 t/ha) followed by location specific high yielding dry DSR method (4.08 t/ha). In Rewa, the experimental mean grain yield was very low (1.53 t/ha). So, the results were only presented in table. In **Vadgaon**, raised bed system resulted in the highest grain yield (5.82 t/ha) followed by location specific high yielding dry DSR system (5.70 t/ha).

Across the 13 locations locatioin specific high yielding dry DSR system was found to be the best among all dry DSR establishment methods with mean grain yield of 4.79 t/ha.

4.2.2b. Identification of suitable varieties for dry DSR system

One of the major challenges confronting the development of dry DSR in India is poor choice of suitable varieties and variety breeding. Hence the present trial is constituted to enhance the productivity of the dry DSR with the following objectives 1) To identify the suitable and promising rice cultivars in dry direct seeded rice and 2) To assess the various agronomic parameters for suitability of rice cultivars in dry direct seeded rice establishment methods. The trial was conducted at 8 locations (**Gangavathi, Kota, Ludhiana, Mandya, Maruteru, Nawagam, Rajendranagar and Ranchi)**. The trial was laid out in RBD with 13 treatments and replicated thrice. Treatments are T_1: DRR Dhan 44 (early) T_2: Sahbhagidhan (very early) T_3: DRR Dhan 60 T_4: DRR Dhan 42 (Mid early) T_5: Vandana (rainfed upland), T_6: Anjali T_7: Varalu (Upland Wesern zone) T_8: IRRI 1 T_9: IRRI 2 T_{10}: IRRI 3 T_{11}: LC 1 T_{12}: LC 2 T_{13}: LC 3. The trial was initiated in 2023-24 kharif. The results were summarized and presented in **Table 4.2.2b** and the salient findings are as followed.

Location	**Grain yield (t/ha) of varieties**		
	1st rank	**2nd rank**	**3rd rank**
Gangavathi	IRRI 1 (5.34)	DRR Dhan 44 (4.26)	IRRI 2 (4.16)
Kota	IRRI 1 (4.75)	IRRI 2 (4.46)	DRR Dhan 44 (4.12)
Ludhiana	LC 2 (8.46)	LC 3 (8.46)	LC 1 (8.36)
Mandya	Varalu (7.69)	IRRI 2 (7.60)	LC 1 (7.06)
Maruteru	IRRI 1 (8.28)	DRR Dhan 42 (7.24)	IRRI 3 (6.42)
Nawagam	Sahbhagidhan (5.03)	IRRI 1 (4.58)	IRRI 2 (4.54)
Rajendranagar	DRR Dhan 44 (4.73)	LC 3 (4.30)	IRRI 3 (4.13)
Ranchi	LC 1 (4.20)	DRR Dhan 42 (4.12)	Sahbhagidhan (3.85)

Table 4.2.2a: Development of suitable sowing method of Dry DSR for higher productivity in different zones, Kharif-2023.

Methods of crop establishment	CHATHA										
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m^2		Plant height (cm)	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days for 50% flowering	Grains/panicle (No.)
				At 10 DAS	At 20 DAS						
S1	2.67	3	5.84	74.3	111.0	108.7	201	1.35	20.57	107.67	52.33
S2	3.11	2	6.74	87.3	120.3	137.3	208	1.43	21.3	104.67	60.33
S3	2.66	4	5.63	66.7	96.0	102.3	184	1.34	20.6	108.33	56
S4	3.20	1	7.1	93.7	124.7	147.3	219	1.52	21.6	103.33	62.67
S5	-		-	-	-	-	-	-	-	-	-
S6	-		-	-	-	-	-	-	-	-	-
S7	-		-	-	-	-	-	-	-	-	-
C.D. (0.05)	0.06		0.16	2.6	7.62	5.8	4.38	0.05	0.31	2.11	1.79
C.V. (%)	0.95		1.26	1.62	3.38	2.34	1.08	1.85	0.73	0.99	1.55
res(t)	**		**	**	**	**	**	**	**	**	**
Expt. Mean	2.91		6.33	80.5	113	123.92	203	1.41	21.02	106	57.83
Soil type	Sandy clay loam										
pH	8.03										
EC	0.21										
Variety & Duration	Basmati 370, 145-150 days										
Applied NPK kg/ha	30;20:10										
Available NPK kg/ha	245:14:146										

S1: Broadcasting of seeds
S2: line sowing of seeds (20cm spacing)
S3: Raised bed sowing
S4- Semi-Dry system (Sowing in dry soil and Wet after one month of sowing)
S5- Any improved system in that particular location
S6- Location specific high yielding Dry DSR method
S7- Farmers practice of the Dry DSR method of the region

Table 4.2.2a: Contd.

Methods of crop establishment	CHATHA Cntd.								
	Dry mater accumulation (g/m2)			Weed population (no/m^2)		Weed biomass (g/m^2)		Cost of cultivation Rs/ha	Gross returns Rs/ha
	45 DAS	75 DAS	Harvest	At Active tillering	At panicle initiation	AI stage	PI stage		
S1	137	336	643	13.33(3.72)	62.00(7.91)	5.73	79.67	35000	162516.7
S2	165	345	678	9.33(3.13)	46.33(6.84)	4.38	57.00	38000	189350
S3	128	326	632	9.33(3.13)	50.00(7.11)	4.99	57.67	43000	160983.3
S4	169	252	706	12.67(3.63)	39.67(6.34)	5.49	47.33	38000	195683.3
S5	-	-	-	-	-	-	-	-	-
S6	-	-	-	-	-	-	-	-	-
S7	-	-	-	-	-	-	-	-	-
C.D. (0.05)	8.9	219.55	6.4	0.2	0.27	7.62	0.2		3356.19
C.V. (%)	2.98	34.91	0.48	2.98	1.94	6.31	1.9		0.95
res(t)	**	NS	**	**	**	**	**		**
Expt. Mean	150	315	665	3.4	7.05	60.42	5.15		177133
Soil type									
pH									
EC									
Variety & Duration									
Applied NPK kg/ha									
Available NPK kg/ha									

S1: Broadcasting of seeds
S2: line sowing of seeds (20cm spacing)
S3: Raised bed sowing
S4- Semi-Dry system (Sowing in dry soil and Wet after one month of sowing)
S5- Any improved system in that particular location
S6- Location specific high yielding Dry DSR method
S7- Farmers practice of the Dry DSR method of the region

Table 4.2.2a: Contd.

Methods of crop establishment	GANGAVATHI							
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant height (cm)	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Gross returns Rs/ha
S1	3.88	1	5.42	96.33	79	8.88	14.26	102704
S2	3.53	3	5.10	104.00	68	8.90	14.18	93633
S3	3.39	4	5.00	100.67	76	8.62	13.84	89769
S4	3.67	2	5.73	95.67	68	8.78	14.07	97332
S5								
S6								
S7								
C.D. (0.05)	0.41		0.48	11.96	5.16	0.8	0.79	10841
C.V. (%)	5.66		4.49	6.03	3.55	4.56	2.8	5.66
res(t)	NS		*	NS	**	NS	NS	NS
Expt. Mean	3.62		5.31	99.17	72.68	8.8	14.09	95860
Soil type	Black clay							
pH	-							
EC	-							
Variety & Duration	-							
Applied NPK kg/ha	-							
Available NPK kg/ha	-							

S1: Broadcasting of seeds
S2: line sowing of seeds (20cm spacing)
S3: Raised bed sowing
S4- Semi-Dry system (Sowing in dry soil and Wet after one month of sowing)
S5- Any improved system in that particular location
S6- Location specific high yielding Dry DSR method
S7- Farmers practice of the Dry DSR method of the region

Table 4.2.2a: Contd.

Methods of crop establishment	JAGDALPUR									
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m^2		Plant height (cm)	Test wt (g)	Days for 50% flowering	Grains/panicle (No.)	Cost of cultivation Rs/ha
				At 10 DAS	At 20 DAS					
S1	2.40	7	3.31	101	108	98.13	24.37	75	167	45500
S2	4.13	3	5.15	52	58	101.27	25.32	76	198	46300
S3	4.42	2	5.62	51	57	93.96	25.10	78	202	50200
S4	3.65	5	4.65	51	55	93.63	25.21	76	178	45200
S5	4.62	1	5.80	48	59	98.73	24.91	77	201	48350
S6	3.93	4	5.48	55	65	93.05	25.08	76	186	45950
S7	3.29	6	4.43	107	118	90.93	24.88	75	172	42200
C.D. (0.05)	0.31		0.49	6.51	6.54	7.91	0.84	0.87	33.47	4.72
C.V. (%)	4.62		5.58	5.51	4.95	4.65	1.89	0.64	10.10	0.01
res(t)	**		**	**	**	NS	NS	**	NS	**
Experimental Mean	3.78		4.92	66.43	74.24	95.67	24.98	76	186	46243
Soil type	Alfisols									
pH	6.25									
EC	-									
Variety & Duration	-									
Applied NPK kg/ha	-									
Available NPK kg/ha	228:18:306									

S1: Broadcasting of seeds
S2: line sowing of seeds (20cm spacing)
S3: Raised bed sowing
S4- Semi-Dry system (Sowing in dry soil and Wet after one month of sowing)
S5- Any improved system in that particular location
S6- Location specific high yielding Dry DSR method
S7- Farmers practice of the Dry DSR method of the region

Table 4.2.2a: Contd.

Methods of crop establishment	LUDHIANA											
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m^2 AT 20DAS	Plant height (cm)	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days for 50% flowering	Grains/panicle (No.)	Dry mater accumulation (g/m2) AT 105DAS	Weed population (no/m^2) at AI
S1	7.43	3	9.69	45.67	90.90	410	3.25	21.83	83	158	1133	9.00(3.07)
S2	7.49	2	9.71	49.00	91.67	397	3.64	21.66	84	163	1218	6.67(2.67)
S3	7.30	4	9.65	47.00	92.67	392	3.51	21.92	83	160	1237	8.33(2.96)
S4	7.00	5	9.44	42.00	91.30	406	3.21	21.85	83	154	1122	9.00(3.07)
S5	7.53	1	9.68	38.67	92.33	415	3.39	21.83	87	162	1207	4.33(2.18)
S6												
S7												
C.D. (0.05)	0.97		0.92	4.86	3.54	36.42	0.39	1.32	2.09	7.46	120.72	0.57
C.V. (%)	7.03		5.09	5.80	2.05	4.79	6.04	3.21	1.32	2.49	5.42	10.92
res(t)	NS		NS	**	NS	NS	NS	NS	*	NS	NS	*
Expt. Mean	7.35		9.64	44.47	91.77	404	3.40	21.82	84	159	1183	2.79
Soil type	Sandy clay loam											
pH	8.03											
EC	0.21											
Variety & Duration	Basmati 370, 145-150 days											
Applied NPK kg/ha	30;20:10											
Available NPK kg/ha	245:14:146											

S1: Broadcasting of seeds
S2:Mechanized line sowing of seeds (Dry sowing followed by irrigation)
S3: Raised bed sowing (Broad bed 120 cm)
S3: Narrow Raised bed sowing (Broad bed 67.5 cm)
S5- Mechanized line sowing of seeds (Tar wattar sowing f.b. first irrigation at 21 DAS)

Table 4.2.2a: Contd.

Methods of crop establishment	MANDYA											
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m^2 At 20 DAS	Plant height (cm)	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days for 50% flowering	Grains/panicle (No.)	Dry mater accumulation (g/m2)	
											At 75 DAS	At 105 DAS
S1	4.18	7	7.83	91	67.7	283	4.18	22.89	77	183	700	1011
S2	5.23	3	8.86	91	51.0	327	4.72	21.52	79	202	817	1155
S3	5.50	1	9.62	96	42.7	349	4.99	22.92	77	224	881	1248
S4	5.32	2	8.88	92	56.7	351	4.74	22.38	78	201	814	1165
S5	4.85	5	8.32	90	56.7	319	4.81	22.27	82	222	772	1079
S6	4.99	4	8.93	93	16.3	331	4.97	22.14	78	208	802	1136
S7	4.77	6	8.79	92	56.3	312	4.79	22.50	79	205	790	1116
C.D. (0.05)	1.12		1.28	7.75	5.74	54.65	0.62	1.51	2.65	36.19	109.01	136.92
C.V. (%)	12.68		8.25	4.74	6.50	9.46	7.39	3.79	1.90	9.85	7.69	6.81
res(t)	NS		NS	NS	**	NS	NS	NS	*	NS	NS	NS
Expt. Mean	4.98		8.75	92	49.6	325	4.74	22.37	79	207	796	1130
Soil type	Red Sandy Loam											
pH	7.5											
EC	0.21											
Variety & Duration	KMP 175,125-130 days											
Applied NPK kg/ha	100:50:50:20											
Available NPK kg/ha	305:57:221											

S1: Broadcasting of seeds
S2: line sowing of seeds (20cm spacing)
S3: Raised bed sowing
S4- Semi-Dry system (Sowing in dry soil and Wet after one month of sowing)
S5- Any improved system in that particular location (Aerobic rice with single seed of 25 cm row and 25 cm pant to plant spacing)
S6- Location specific high yielding Dry DSR method (Seed drill sowing)
S7- Farmers practice of the Dry DSR method of the region (Manual line sowing with 25 cm row)

Table 4.2.2a: Contd.

Methods of crop establishment	MANDYA Cntd.					
	Weed population (no/m^2)		Weed biomass (g/m^2)		Cost of cultivation Rs/ha	Gross returns Rs/ha
	At active tillering	At panicle initiation	At active tillering	At panicle initiation		
S1	30.33(5.55)	32.67(5.76)	26.01	38.07	55649	114741
S2	16.33(4.08)	16.00(4.06)	18.71	24.57	57378	140657
S3	16.67(3.84)	15.00(3.91)	15.77	21.01	66944	148918
S4	22.67(4.76)	14.67(3.88)	19.25	20.88	58450	142854
S5	23.00(4.81)	17.33(4.17)	18.62	24.27	57987	130851
S6	20.67(4.57)	22.67(4.81)	21.15	22.21	57485	135735
S7	19.33(4.44)	20.67(4.60)	20.48	22.90	60466	130459
C.D. (0.05)	1.44	0.62	12.32	6.76	1053.26	25131.92
C.V. (%)	17.66	7.87	34.63	15.29	1.00	10.47
res(t)	NS	**	NS	**	**	NS
Expt. Mean	4.58	4.46	20.00	24.84	59194	134888
Soil type						
pH						
EC						
Variety & Duration						
Applied NPK kg/ha						
Available NPK kg/ha						

S1: Broadcasting of seeds
S2: line sowing of seeds (20cm spacing)
S3: Raised bed sowing
S4- Semi-Dry system (Sowing in dry soil and Wet after one month of sowing)
S5- Any improved system in that particular location (Aerobic rice with single seed of 25 cm row and 25 cm pant to plant spacing)
S6- Location specific high yielding Dry DSR method (Seed drill sowing)
S7- Farmers practice of the Dry DSR method of the region (Manual line sowing with 25 cm row)

Table 4.2.2a: Contd.

Methods of crop establishment	NAGINA											
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m^2 At 20 DAS	Plant height (cm)	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days for 50% flowering	Grains/panicle (No.)	Dry mater accumulation (g/m2)	
											At 75 DAS	At 105 DAS
S1	4.18	7	7.83	91	67.7	283	4.18	22.89	77	183	700	1011
S2	5.23	3	8.86	91	51.0	327	4.72	21.52	79	202	817	1155
S3	5.50	1	9.62	96	42.7	349	4.99	22.92	77	224	881	1248
S4	5.32	2	8.88	92	56.7	351	4.74	22.38	78	201	814	1165
S5	4.85	5	8.32	90	56.7	319	4.81	22.27	82	222	772	1079
S6	4.99	4	8.93	93	16.3	331	4.97	22.14	78	208	802	1136
S7	4.77	6	8.79	92	56.3	312	4.79	22.50	79	205	790	1116
C.D. (0.05)	1.12		1.28	7.75	5.74	54.65	0.62	1.51	2.65	36.19	109.01	136.92
C.V. (%)	12.68		8.25	4.74	6.50	9.46	7.39	3.79	1.90	9.85	7.69	6.81
res(t)	NS		NS	NS	**	NS	NS	NS	*	NS	NS	NS
Expt. Mean	4.98		8.75	92	49.6	325	4.74	22.37	79	207	796	1130
Soil type	Red Sandy Loam											
pH	7.5											
EC	0.21											
Variety & Duration	KMP 175,125-130 days											
Applied NPK kg/ha	100:50:50:20											
Available NPK kg/ha	305:57:221											

S1: Broadcasting of seeds
S2: line sowing of seeds (20cm spacing)
S3: Raised bed sowing
S4- Semi-Dry system (Sowing in dry soil and Wet after one month of sowing)
S5- Any improved system in that particular location
S6- Location specific high yielding Dry DSR method
S7- Farmers practice of the Dry DSR method of the region

Table 4.2.2a: Contd.

Methods of crop establishment	NAGINA Cntd.					
	Weed population (no/m^2)		Weed biomass (g/m^2)		Cost of cultivation Rs/ha	Gross returns Rs/ha
	At active tillering	At panicle initiation	At active tillering	At panicle initiation		
S1	30.33(5.55)	32.67(5.76)	26.01	38.07	55649	114741
S2	16.33(4.08)	16.00(4.06)	18.71	24.57	57378	140657
S3	16.67(3.84)	15.00(3.91)	15.77	21.01	66944	148918
S4	22.67(4.76)	14.67(3.88)	19.25	20.88	58450	142854
S5	23.00(4.81)	17.33(4.17)	18.62	24.27	57987	130851
S6	20.67(4.57)	22.67(4.81)	21.15	22.21	57485	135735
S7	19.33(4.44)	20.67(4.60)	20.48	22.90	60466	130459
C.D. (0.05)	1.44	0.62	12.32	6.76	1053.26	25131.92
C.V. (%)	17.66	7.87	34.63	15.29	1.00	10.47
res(t)	NS	**	NS	**	**	NS
Expt. Mean	4.58	4.46	20.00	24.84	59194	134888
Soil type						
pH	7.70					
EC	0.18					
Variety & Duration	Pusa Basmati 1509					
Applied NPK kg/ha	120:60:40					
Available NPK kg/ha	21:18:209					

S1: Broadcasting of seeds
S2: line sowing of seeds (20cm spacing)
S3: Raised bed sowing
S4- Semi-Dry system (Sowing in dry soil and Wet after one month of sowing)
S5- Any improved system in that particular location
S6- Location specific high yielding Dry DSR method
S7- Farmers practice of the Dry DSR method of the region

Table 4.2.2a: Contd.

Methods of crop establishment	NAWAGAM												
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m^2		Plant height (cm)	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days for 50% flowering	Grains/panicle (No.)	Weed population (no/m^2)	
				At 10 DAS	At 20 DAS							At active tillering	At panicle initiation
S1	4.12	7	4.57	33.33	63.81	100.5	166	4.32	17.10	74	248	56.67(7.38)	110.00(10.19)
S2	4.49	5	5.00	28.00	52.13	100.0	136	3.56	17.90	75	253	64.33(7.90)	123.67(10.81)
S3	4.42	6	5.08	36.33	61.57	95.2	153	3.85	17.43	76	258	35.33(5.91)	69.33(8.13)
S4	4.97	2	5.38	30.33	56.07	86.2	159	3.00	18.73	76	264	71.33(8.32)	122.67(10.74)
S5	5.12	1	5.64	30.00	58.75	91.1	186	4.34	18.13	74	275	64.67(7.74)	92.67(9.58)
S6	4.97	2	5.48	34.33	67.11	102.5	143	2.72	17.67	75	266	30.67(5.50)	67.67(8.13)
S7	4.74	4	5.13	35.67	60.24	88.7	181	3.95	17.80	76	248	78.67(8.80)	144.67(11.89)
C.D. (0.05)	0.53		0.62	5.97	9.23	3.81	29.01	0.57	2.05	2	36	2.35	4.14
C.V. (%)	6.36		6.71	10.30	8.65	2.26	10.15	8.74	6.45	1.30	7.83	17.93	23.47
res(t)	*		*	NS	NS	**	*	**	NS	NS	NS	NS	NS
Expt. Mean	4.69		5.18	32.57	59.95	94.9	161	3.68	17.82	75	259	7.36	9.92
Soil type	Caly loam												
pH	7.57												
EC	0.88												
Variety & Duration	Mahisagar 120 days												
Applied NPK kg/ha	100:25:0:25												
Available NPK kg/ha	203:85:204												

S1 - Broadcasting of seeds
S2 - Mechanized line sowing of seeds (Dibbler, Happy seeder or any Drum seeder: Spacing as per the equipment specifications)
S3 - Raised bed sowing (1 m raised bed and 4 rows of 20 cm spacing) (Details to be included)
S4 - Semi-Dry system (Sowing in dry soil and Wet/flooding after one month of sowing)
S5 - Any improved system like Tar Vattar method of DSR may be followed wherever feasible
S6 - Location specific high yielding Dry DSR method
S7 - Farmers practice of the Dry DSR method of the region

Table 4.2.2a: Contd.

Methods of crop establishment	NAWAGAM Cntd.						
	Weed biomass (g/m^2)		Soil available nutrients (kg/ha)			Cost of cultivation Rs/ha	Gross returns Rs/ha
	At active tillering	At panicle initiation	N	P	K		
S1	22.10	23.22	212.00	79.00	263.67	37731	103825
S2	24.50	23.75	214.67	80.00	265.33	36657	113162
S3	13.03	25.26	217.00	81.00	264.33	37713	111840
S4	26.03	21.67	218.33	81.00	264.33	38028	125111
S5	25.22	28.33	215.67	79.33	269.33	38267	129056
S6	11.96	20.67	215.00	81.33	264.67	37474	125213
S7	29.02	37.85	211.67	81.00	271.33	38553	119368
C.D. (0.05)	13.39	18.96	13.99	7.01	16.41	98	13235
C.V. (%)	34.69	41.26	3.66	4.90	3.47	0.15	6.29
res(t)	NS	NS	NS	NS	NS	**	*
Expt. Mean	21.69	25.82	214.90	80.38	266.14	37775	118225
Soil type							
pH							
EC							
Variety & Duration							
Applied NPK kg/ha							
Available NPK kg/ha							

S1 - Broadcasting of seeds
S2 - Mechanized line sowing of seeds (Dibbler, Happy seeder or any Drum seeder: Spacing as per the equipment specifications)
S3 - Raised bed sowing (1 m raised bed and 4 rows of 20 cm spacing) (Details to be included)
S4 - Semi-Dry system (Sowing in dry soil and Wet/flooding after one month of sowing)
S5 - Any improved system like Tar Vattar method of DSR may be followed wherever feasible
S6 - Location specific high yielding Dry DSR method
S7 - Farmers practice of the Dry DSR method of the region

Table 4.2.2a: Contd.

Methods of crop establishment	PANTNAGAR												
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m^2		Plant height (cm)	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days for 50% flowering	Dry mater accumulation (g/m2)		
				At 10 DAS	At 20 DAS						45 DAS	75 DAS	at 105 DAS
S1	4.63	3	5.51	123	199	102.33	263	1.94	88	27.52	127	223	302
S2	5.17	2	5.92	87	145	98.50	281	2.03	94	26.08	98	181	248
S3	4.56	5	5.36	107	156	101.67	283	1.81	93	26.82	104	189	241
S4	4.59	4	5.69	91	148	96.67	258	2.03	94	25.95	91	171	259
S5	4.31	6	5.13	107	141	98.33	253	1.94	96	26.27	88	179	238
S6	5.23	1	5.82	140	189	98.67	286	2.06	86	27.28	108	213	304
S7													
C.D. (0.05)	0.24		0.47	12.30	24.63	4.59	11.05	0.09	2.72	0.30	6.49	7.30	12.01
C.V. (%)	2.80		4.65	6.21	8.30	2.54	2.25	2.44	1.63	0.61	3.47	2.08	2.49
res(t)	**		*	**	**	NS	**	**	**	**	**	**	**
Expt. Mean	4.75		5.57	109	163	99.36	270	1.97	92	26.65	103	193	265
Soil type	Silt Loam												
pH	7.5												
EC	1.3												
Variety & Duration	PD -24 130 days												
Applied NPK kg/ha	120:60:40												
Available NPK kg/ha	-												

S1: Broadcasting of seeds
S2: line sowing of seeds (20cm spacing)
S3: Raised bed sowing
S4- Semi-Dry system (Sowing in dry soil and Wet after one month of sowing)
S5- Any improved system in that particular location
S6- Location specific high yielding Dry DSR method
S7- Farmers practice of the Dry DSR method of the region

Table 4.2.2a: Contd.

Methods of crop establishment	PANTNAGAR Cntd.														
	Weed population (no/m²)		Weed biomass (g/m²)		Total nutriets uptake (kg/ha)			Soil available nutriets (kg/ha) initial			Soil available nutriets (kg/ha) at harvest			Cost of cultivation Rs/ha	Gross returns Rs/ha
	At active tillering	At panicle initiation	At active tillering	At panicle initiation	N	P	K	N	P	K	N	P	K		
S1	17.33(4.18)	36.00(5.84)	48.59	36.45	122.0	25.2	118.2	209.0	32.9	210.0	198.2	29.5	207.5	33548	97779
S2	48.00(6.95)	13.33(3.71)	48.60	39.11	148.9	26.9	131.6	222.3	38.3	212.3	204.2	30.9	207.3	35348	109095
S3	28.00(5.31)	24.00(4.94)	49.49	39.12	92.2	24.2	79.5	219.0	31.6	210.1	204.9	28.7	200.3	37508	96230
S4	137.33(11.74)	97.33(9.89)	41.00	34.17	85.7	24.7	79.0	211.0	29.6	206.4	196.6	25.3	198.0	34628	97108
S5	62.67(7.94)	83.00(9.13)	35.65	28.53	81.3	20.7	74.4	211.4	29.4	209.1	203.4	29.3	199.7	34627	90991
S6	34.67(5.93)	22.67(4.80)	48.91	37.23	92.0	24.0	96.9	204.7	33.8	207.3	195.3	32.5	192.0	34177	110130
S7															
C.D. (0.05)	0.93	1.62	4.39	5.80	6.58	1.28	10.78	4.29	3.20	3.61	9.37	2.49	3.05	13.71	5068
C.V. (%)	7.26	13.96	5.32	8.91	3.49	2.89	6.14	1.11	5.39	0.95	2.57	4.67	0.84	0.02	2.78
res(t)	**	**	**	*	**	**	**	**	**	*	NS	**	**	**	**
Expt. Mean	7.01	6.38	45.37	35.77	104	24.29	96.60	212.91	32.61	209	200	29.36	201	34973	100222
Soil type															
pH															
EC															
Variety & Duration															
Applied NPK kg/ha															
Available NPK kg/ha															

S1: Broadcasting of seeds
S2: line sowing of seeds (20cm spacing)
S3: Raised bed sowing
S4- Semi-Dry system (Sowing in dry soil and Wet after one month of sowing)
S5- Any improved system in that particular location
S6- Location specific high yielding Dry DSR method
S7- Farmers practice of the Dry DSR method of the region

Table 4.2.2a: Contd.

Methods of crop establishment	PUSA										
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m^2		Plant height (cm)	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days for 50% flowering	Grains/panicle (No.)
				At 10 DAS	At 20 DAS						
S1	3.64	6	5.18	41	47	107	242	2.61	21.47	103	81
S2	4.80	1	6.18	36	50	114	288	2.73	21.50	119	80
S3	4.34	5	5.69	36	49	112	272	2.73	21.33	107	79
S4	4.42	4	5.97	38	48	113	259	2.43	21.43	111	81
S5	4.47	2	5.93	38	51	113	274	2.56	21.10	112	80
S6	4.45	3	5.84	37	49	111	268	2.52	21.23	113	82
S7	3.29	7	4.57	33	46	105	227	2.54	21.20	98	79
C.D. (0.05)	0.63		0.97	3.34	4.10	4.38	32.98	0.25	0.55	11.89	2.07
C.V. (%)	8.46		9.74	5.10	4.76	2.22	7.09	5.35	1.44	6.13	1.45
res(t)	**		*	**	NS	**	*	NS	NS	*	NS
Expt. Mean	4.20		5.62	37	48	111	262	2.59	21.32	109	80
Soil type	Sandy loam										
pH	8.7										
EC	0.52										
Variety & Duration	Rajendra Neelam 120-125 days										
Applied NPK kg/ha	-										
Available NPK kg/ha	-										

S1: Broadcasting of seeds
S2: Mechanized line sowing of seeds (Dribbler, Happy seeder or any Drum Seeder: Spacing as per the equipment specifications)
S3: Raised bed sowing
S4- Semi-Dry system (Sowing in dry soil and Wet after one month of sowing)
S5- Tar-vattar method
S6- Brown manuring
S7- Farmers practice of the Dry DSR method of the region

Table 4.2.2a: Contd.

Methods of crop establishment	PUSA Cntd.									
	Dry mater accumulation (g/m2)			Weed population (no/m^2)		Weed biomass (g/m^2)		Soil available nutriets (kg/ha) at harvest		
	45 DAS	75 DAS	105 DAS	At active tillering	At panicle initiation	At active tillering	At panicle initiation	N	P	K
S1	215	510	829	16.67(4.08)	18.33(4.29)	4.86	23.90	213.67	11.33	112.33
S2	231	597	887	9.00(3.04)	8.00(2.90)	2.58	9.67	210.67	11.20	109.33
S3	223	550	845	10.33(3.24)	10.00(3.18)	3.61	15.60	210.00	11.17	110.00
S4	222	552	845	12.33(3.47)	10.67(3.22)	3.23	14.63	209.33	11.13	109.67
S5	225	564	862	11.00(3.36)	9.00(3.03)	3.04	13.17	208.00	10.87	112.33
S6	221	550	852	6.00(2.52)	5.33(2.40)	2.08	7.07	211.67	11.27	112.00
S7	214	500	820	20.00(4.50)	21.00(4.62)	4.95	24.17	212.33	11.37	112.33
C.D. (0.05)	25.71	51.20	32.74	1.28	1.22	1.13	6.37	6.30	0.47	5.95
C.V. (%)	6.52	5.27	2.17	20.74	20.35	18.25	23.15	1.68	2.38	3.01
res(t)	NS	*	*	NS	*	**	**	NS	NS	NS
Expt. Mean	222	546	848	3.46	3.38	3.48	15.46	210.81	11.19	111.14
Soil type										
pH										
EC										
Variety & Duration										
Applied NPK kg/ha										
Available NPK kg/ha										

S1: Broadcasting of seeds
S2: Mechanized line sowing of seeds (Dribbler, Happy seeder or any Drum Seeder: Spacing as per the equipment specifications)
S3: Raised bed sowing
S4- Semi-Dry system (Sowing in dry soil and Wet after one month of sowing)
S5- Tar-vattar method
S6- Brown manuring
S7- Farmers practice of the Dry DSR method of the region

Table 4.2.2a: Contd.

Methods of crop establishment	RAIPUR										
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant height (cm)	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days for 50% flowering	Grains/panicle (No.)	Dry mater accumulation (g/m2)	
										45 DAS	75 DAS
S1	3.09	7	4.18	112.96	186	4.05	32.10	95	127	5.81	14.06
S2	3.25	5	4.27	113.79	197	4.67	33.30	95	138	6.40	16.57
S3	4.38	1	5.60	118.46	252	5.05	33.03	95	156	8.50	19.70
S4	3.74	4	4.89	113.66	218	4.43	32.63	95	134	6.82	16.54
S5	3.16	6	4.20	111.39	197	4.24	32.20	96	130	6.26	14.67
S6	4.08	2	5.24	116.46	243	4.80	33.33	95	148	7.40	17.27
S7	3.75	3	4.90	114.69	244	4.68	32.73	95	141	7.48	16.95
C.D. (0.05)	0.73		0.95	6.39	40.98	1.13	1.18	1.10	17.57	1.44	3.07
C.V. (%)	11.28		11.18	3.14	10.50	13.94	2.03	0.65	7.10	11.62	10.45
res(t)	*		*	NS	*	NS	NS	NS	*	*	*
Expt. Mean	3.64		4.75	114.49	219	4.56	32.76	95	139	6.95	16.54
Soil type	Vertisols										
pH	7.1										
EC	-										
Variety & Duration	IGKVR1 120-125 days										
Applied NPK kg/ha	100:60:40										
Available NPK kg/ha	272:19:370										

S1: Broadcasting of seeds
S2: line sowing of seeds (20cm spacing)
S3: Raised bed sowing
S4- Semi-Dry system (Sowing in dry soil and Wet after one month of sowing)
S5- Any improved system in that particular location
S6- Location specific high yielding Dry DSR method
S7- Farmers practice of the Dry DSR method of the region

Table 4.2.2a: Contd.

Methods of crop establishment	REWA						
	Grain yield (t/ha)	Rank	Plant height (cm)	Panicle/m² (No.)	Panicle lenght (cm)	Panicle wt (g)	Test wt (g)
S1	1.17	6	91.00	261	22.47	3.33	21.87
S2	1.22	5	92.10	263	26.97	3.47	23.07
S3	1.50	3	92.87	269	23.30	3.30	24.00
S4	1.37	4	95.83	272	24.63	3.87	22.53
S5	2.10	1	100.10	295	24.87	5.43	22.13
S6	-		-	-	-	-	-
S7	1.80	2	95.87	260	25.20	4.50	21.53
C.D. (0.05)	0.2		2.39	8.71	0.98	0.77	1.43
C.V. (%)	7.15		1.39	1.77	2.2	10.64	3.5
res(t)							
Expt. Mean	1.53		94.63	270	24.57	3.98	22.52
Soil type	-						
pH	-						
EC	-						
Variety & Duration	Hansraj						
Applied NPK kg/ha	-						
Available NPK kg/ha	-						

S1: Broadcasting of seeds
S2: line sowing of seeds (20cm spacing)
S3: Raised bed sowing
S4- Semi-Dry system (Sowing in dry soil and Wet after one month of sowing)
S5- Any improved system in that particular location
S6- Location specific high yielding Dry DSR method
S7- Farmers practice of the Dry DSR method of the region

Table 4.2.2a: Contd.

Methods of crop establishment	VADGAON										
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m^2		Tillers/m^2 (No.)	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days for 50% flowering	Grains/panicle (No.)
				At 10 DAS	At 20 DAS						
S1	3.49	7	3.73	37.62	67.8	157.05	154.71	3.42	19.2	97.88	147.07
S2	5.65	3	6.13	41.52	74.81	254.18	251.63	5.54	22.59	96.09	238.02
S3	5.82	1	6.32	42.8	77.13	262.05	259.43	5.71	23.29	97.6	245.4
S4	5.31	5	5.71	39.06	70.38	239.13	234.35	5.21	21.26	95.73	223.93
S5	5.42	4	5.85	39.84	71.79	243.92	239.04	5.31	21.68	95.7	228.41
S6	5.7	2	6.16	41.91	75.53	256.61	254.04	5.59	22.81	95.91	240.3
S7	4.11	6	4.39	36.21	65.11	184.77	181.07	4.02	20.94	97.88	173.03
C.D. (0.05)	0.21		0.22	1.66	3.3	9.28	9.13	0.2	0.93	1.96	8.69
C.V. (%)	2.29		2.28	2.34	2.59	2.29	2.28	2.29	2.41	1.14	2.29
res(t)				**	**						NS
Expt. Mean	5.07		5.47	39.85	71.79	228.24	224.9	4.97	21.68	96.68	213.74
Soil type	-										
pH	7.78										
EC	0.52										
Variety & Duration	Phule Samruddhi, 125-130 days										
Applied NPK kg/ha	100;50:50										
Available NPK kg/ha	-										

S1: Broadcasting of seeds
S2: line sowing of seeds (20cm spacing)
S3: Raised bed sowing
S4- Semi-Dry system (Sowing in dry soil and Wet after one month of sowing)
S5- Any improved system in that particular location
S6- Location specific high yielding Dry DSR method
S7- Farmers practice of the Dry DSR method of the region

Table 4.2.2a: Contd.

Methods of crop establishment	VADAGAON Cntd.													Over all Mean	Rank
	Dry mater accumulation (g/m2)			Weed population (no/m^2)		Weed biomass (g/m^2)		Soil available nutrients (kg/ha) initial			Soil available nutrients (kg/ha) at harvest				
	45 DAS	75 DAS	105 DAS	At active tillering	At panicle initiation	At active tillering	At panicle initiation	N	P	K	N	P	K		
S1	172	398	543	8.37(2.98)	17.33(4.22)	7.96	16.85	223.04	16.55	287.25	187.56	13.9	252.56	3.74	7
S2	279	644	879	3.58(2.01)	7.33(2.78)	3.4	7.11	292.1	20.86	319.03	249.34	16.62	278.19	4.44	4
S3	287	664	906	5.69(2.48)	11.67(3.48)	5.38	11.31	295.87	21.13	324.75	257.59	17.17	284.54	4.48	3
S4	262	606	827	4.75(2.28)	9.67(3.18)	4.46	9.32	282.69	18.24	302.8	242.67	14.83	262.71	4.38	5
S5	268	618	843	4.86(2.31)	10.00(3.24)	4.59	9.68	278.54	18.13	309.28	244.95	15.65	273.29	4.64	2
S6	281	650	887	3.84(2.08)	8.00(2.90)	3.67	7.82	286.18	19.08	311.65	250.96	16.03	271.68	4.79	1
S7	203	469	639	7.58(2.84)	15.67(4.02)	7.19	15.38	224.87	17.83	297.17	194.04	14.38	260.05	3.82	6
C.D. (0.05)	9.19	21.22	28.96	0.36	0.53	1.54	3.38	26.02	1.83	19.75	15.2	1.01	17.4		
C.V. (%)	2.06	2.06	2.06	8.29	8.78	16.5	17.18	5.44	5.46	3.61	3.68	3.66	3.64		
res(t)	**	**	**	**	**	**	*	**	**	*	NS	**	**		
Expt. Mean	250	578	789	2.43	3.4	5.24	11.07	269.04	18.83	307.42	232.44	15.51	269	4.29	
Soil type															
pH															
EC															
Variety & Duration															
Applied NPK kg/ha															
Available NPK kg/ha															

S1: Broadcasting of seeds
S2: line sowing of seeds (20cm spacing)
S3: Raised bed sowing
S4- Semi-Dry system (Sowing in dry soil and Wet after one month of sowing)
S5- Any improved system in that particular location
S6- Location specific high yielding Dry DSR method
S7- Farmers practice of the Dry DSR method of the region

Table 4.2.2a: Contd.

Methods of crop establishment	Sub plot	VARANASI											
		Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m^2		Panicle/ m^2 (No.)	Panicle wt (g)	Test wt (g)	Weed population (no/m^2)		Weed biomass (g/m^2)	
					At 10 DAS	At 20 DAS				At active tillering	At panicle initiation	At active tillering	At panicle initiation
S1	W1	3.16	20	10.50	195	192	273	1.20	21.63	280.33(16.76)	201.67(14.22)	132.81	73.94
	W2	3.63	16	8.91	202	200	248	1.68	21.13	297.00(17.25)	205.33(14.35)	134.18	71.51
	W3	5.39	2	10.71	193	189	277	1.71	21.67	294.00(16.98)	180.00(13.43)	118.71	62.87
	W4	5.45	1	9.99	166	141	261	1.63	21.37	335.67(17.96)	167.00(12.94)	156.86	52.83
S2	W1	4.44	8	7.69	120	123	263	1.74	21.80	295.33(17.20)	190.00(13.79)	117.97	55.84
	W2	3.23	19	8.29	129	123	270	1.72	21.70	257.67(16.06)	192.00(13.87)	115.79	56.37
	W3	3.88	12	9.05	140	137	300	1.80	21.50	238.67(15.46)	183.33(13.56)	106.28	56.63
	W4	3.88	12	8.68	109	99	308	1.79	22.73	229.00(15.15)	206.00(14.35)	98.68	55.59
S3	W1	4.78	6	6.81	136	122	310	1.80	20.80	310.67(17.64)	190.00(13.78)	124.31	48.15
	W2	4.92	5	9.39	123	123	242	2.04	21.70	276.33(16.47)	177.67(13.35)	117.28	49.49
	W3	5.33	3	9.25	106	101	275	1.85	22.07	400.33(19.99)	182.67(13.53)	144.26	49.79
	W4	4.52	7	8.66	127	125	185	1.82	21.97	380.33(19.46)	190.00(13.80)	149.97	49.56
S4	W1	2.23	24	7.94	124	123	165	1.10	21.73	299.33(17.31)	187.67(13.71)	114.55	50.06
	W2	2.68	22	8.46	116	113	156	1.18	22.03	331.33(18.22)	172.67(13.16)	125.12	47.51
	W3	3.32	18	8.31	119	120	152	1.16	22.10	548.67(22.66)	174.33(13.22)	129.17	50.25
	W4	3.82	14	7.73	158	156	171	1.10	22.25	356.00(18.88)	182.33(13.51)	129.05	53.91
S5	W1	4.03	11	8.25	156	148	169	1.72	21.47	648.33(25.44)	173.67(13.20)	236.41	50.63
	W2	3.55	17	9.18	184	181	164	1.93	22.93	753.00(27.32)	183.33(13.56)	238.68	51.84
	W3	2.98	21	9.21	128	126	202	1.88	22.47	554.33(23.55)	181.67(13.50)	189.12	46.07
	W4	2.59	23	8.53	147	143	131	2.09	21.27	413.00(20.33)	184.67(13.59)	169.50	46.35
S6	W1	4.32	9	10.87	128	121	223	2.05	21.40	87.67(9.39)	154.00(12.42)	29.08	47.53
	W2	5.28	4	8.69	179	155	244	2.12	22.23	90.33(9.53)	189.00(13.76)	33.05	53.52
	W3	4.16	10	9.40	184	185	269	1.97	22.47	85.67(9.27)	157.00(12.54)	30.93	46.93
	W4	3.67	15	8.90	172	154	242	1.86	22.00	101.00(10.04)	155.00(12.45)	35.10	44.48
Mean of Methods													
S1		4.41	2	10.03	189	180	265	1.55	21.45	301.75(17.24)	188.50(13.74)	135.64	65.29
S2		3.86	4	8.43	125	121	285	1.76	21.93	255.17(15.97)	192.83(13.89)	109.68	56.11
S3		4.89	1	8.53	123	118	253	1.88	21.63	341.92(18.39)	185.08(13.61)	133.96	49.25
S4		3.01	6	8.11	129	128	161	1.13	22.03	383.83(19.27)	179.25(13.40)	124.47	50.43
S5		3.29	5	8.79	154	150	167	1.91	22.03	592.17(24.16)	180.83(13.46)	208.43	48.72
S6		4.36	3	9.47	166	154	244	2.00	22.02	91.17(9.56)	163.75(12.79)	32.04	48.12
C.D. (0.05)		0.26		0.70	NS	NS	NS	0.18	NS	2.33	0.60	56.36	11.36
C.V. (%)		7.17		8.60	39.96	40.07	122.01	11.34	3.79	14.72	4.91	49.96	23.58

Table 4.2.2a: Contd.

Methods of crop establishment	Sub plot	VARANASI Cntd.											
		Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m^2		Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Weed population (no/m^2)		Weed biomass (g/m^2)	
					At 10 DAS	At 20 DAS				At active tillering	At panicle initiation	At active tillering	At panicle initiation
Mean of Varieties													
W1		3.83	4	8.68	143	138	228	1.60	21.47	320.28(17.29)	182.83(13.52)	125.85	54.36
W2		3.88	3	8.82	155	149	221	1.78	21.96	334.28(17.47)	186.67(13.67)	127.35	55.04
W3		4.17	1	9.32	145	143	246	1.73	22.04	353.61(17.99)	176.50(13.30)	119.75	52.09
W4		3.99	2	8.75	146	136	216	1.72	21.93	302.50(16.97)	180.83(13.44)	123.20	50.45
CD (0.05)		0.12		NS	NS	NS	NS	0.09	NS	NS	NS	NS	2.36
C.V. (%)		4.51		9.71	10.75	10.94	122.91	7.74	4.13	11.13	3.42	26.21	6.61
Interaction													
M and S		0.30		1.42	26.16	25.58	NS	0.22	NS	3.20	0.76	NS	5.78
S and M		0.32		1.34	44.64	43.19	NS	0.23	NS	3.27	0.80	NS	9.57
Experimental Mean		3.97		8.89	147.51	141.69	229	1.71	21.85	17.43	13.48	124.04	52.99
Soil type		Sandy clay loam											
pH		8.03											
EC		0.21											
Variety & Duration		Basmati 370, 145-150 days											
Applied NPK kg/ha		30;20:10											
Available NPK kg/ha		245.15;14.34:146.31											

S1: Broadcasting of seeds
S2: Mechanized line sowing of seeds (Dribbler, Happy seeder or any Drum Seeder: Spacing as per the equipment specifications)
S3: Raised bed sowing
S4- Semi-Dry system (Sowing in dry soil and Wet after one month of sowing)
S5- Any improved system in that particular location
S6- Zero till DSR

W1: Manual weeding (three times)
W2: Pre + post-emergence herbicide
W3: Pre-emergence herbicide + Manual weeding (two times)
W4: Mulching with paddy straw @ 5 t/ha at the time of sowing fb post emergence herbicide application of bispyribac sodium @ 250 ml /ha @ 2500ml/ha or (penoxsulam + cyhalofopbyutyl)

Table 4.2.2b: Evaluation of varieties for their suitability and enhancement of the productivity in dry direct seeded rice (un-puddle soil), Kharif-2023.

Cultivars	GANGAVATHI						KOTA							
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Grain yield (t/ha)	Ran k	Straw yield (t/ha)	Plant populatio n no/m2 (20DAS)	Panicle/m ^{2} (No.)	Panicle wt (g)	Test wt (g)	Days for 50% flowerin g
1. DRR Dhan 44 (early)	4.26	2	5.42	292	2.14	20.28	4.12	3	5.08	47	265	3.03	21.39	81
2.Sabhagidhan (very early)	3.39	9	5.42	269	2.59	23.30	3.86	5	4.43	49	272	2.81	20.56	76
3. DRR Dhan 60	3.48	8	5.83	311	1.94	17.87	1.06	10	6.71	45	189	1.12	11.34	102
4. DRR Dhan 42 (Mid early)	2.77	13	6.25	302	2.39	25.49	4.04	4	6.77	51	280	2.53	24.00	80
5. Vandana (rainfed upland)	4.14	4	5.83	271	2.59	24.20	2.45	9	3.97	47	205	2.30	24.33	62
6. Anjali	2.89	12	5.42	257	2.69	23.57	2.75	8	4.01	49	220	2.37	23.27	63
7. Varalu (Upland-western zone)	3.9	6	5.42	298	3.10	21.61	3.67	7	5.03	50	259	2.81	18.52	84
8. IRRI 1	5.34	1	5.00	364	2.30	25.01	4.75	1	5.56	47	294	2.16	23.63	79
9.IRRI 2	4.16	3	5.00	257	3.03	25.01	4.46	2	5.66	49	253	3.22	21.84	80
10. IRRI 3	4.1	5	6.25	322	2.81	24.04	3.71	6	5.73	46	278	2.61	22.48	79
11.LC 1	3.33	10	6.25	351	1.98	13.99	-		-	-	-	-	-	-
12. LC 2	3.56	7	6.25	406	2.48	20.56	-		-	-	-	-	-	-
13. LC 3	3.11	11	5.83	342	2.35	25.65	-		-	-	-	-	-	-
C.D. (0.05)	0.53		1.32	52.29	0.28	5.73	0.40		0.62	6.30	16.05	0.34	1.31	1.27
C.V. (%)	8.51		13.7	9.98	6.75	15.21	6.70		6.84	7.64	3.72	7.83	3.60	0.94
res(t)	**		NS	**	**	**	**		**	NS	**	**	**	**
Expt. Mean	3.73		5.71	311	2.49	22.35	3.49		5.29	48	252	2.50	21.14	79
Soil type	-						Clay							
pH	7.8						7.78							
EC	-						0.52							
Applied NPK kg/ha	150:75:75						120:60:40							
Available NPK kg/ha	-						203:20:348							

11. Local Check 1 (RNR-15048)
12. Local Check 2 (GNV-10 89)
13. Local Check 3 (GNV 11 07)

Table 4.2.2b: Contd.

Cultivars	LUDHIANA							
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m2 (20DAS)	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days for 50% flowering
1. DRR Dhan 44 (early)	-		-	-	-	-	-	-
2.Sabhagidhan (very early)	-		-	-	-	-	-	-
3. DRR Dhan 60	-		-	-	-	-	-	-
4. DRR Dhan 42 (Mid early)	7.18	4	11.33	54	442	4.28	23.09	85
5. Vandana (rainfed upland)	-		-	-	-	-	-	-
6. Anjali	-		-	-	-	-	-	-
7. Varalu (Upland-western zone)	-		-	-	-	-	-	-
8. IRRI 1	-		-	-	-	-	-	-
9.IRRI 2	-		-	-	-	-	-	-
10. IRRI 3	-		-	-	-	-	-	-
11.LC 1	8.36	3	10.67	53	367	3.40	21.64	85
12. LC 2	8.46	1	10.18	50	382	3.56	23.57	105
13. LC 3	8.46	1	9.96	53	412	3.76	23.51	107
C.D. (0.05)	0.21		0.58	6.36	32.11	0.41	1.36	1.49
C.V. (%)	1.31		2.75	6.07	4.01	5.45	2.97	0.78
res(t)	**		**	NS	**	**	*	**
Expt. Mean	8.11		10.54	52	400	3.75	22.95	96
Soil type	-							
pH	7.7							
EC	-							
Applied NPK kg/ha	150:30:30							
Available NPK kg/ha	265:28:185							

V11. Local check 1 PR 126
V12. Local check 1 PR 128
V13. Local check 1 PR 131

Table 4.2.2b: Contd.

Cultivars	MANDYA							
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m2 (20DAS)	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days for 50% flowering
1. DRR Dhan 44 (early)	5.58	9	8.52	45	325	3.90	25.11	83
2.Sabhagidhan (very early)	5.66	8	6.52	45	315	2.90	25.11	77
3. DRR Dhan 60	5.53	10	9.47	46	381	2.41	14.93	96
4. DRR Dhan 42 (Mid early)	6.45	6	7.47	43	388	2.59	27.04	78
5. Vandana (rainfed upland)	6.74	4	6.83	45	314	2.17	24.84	63
6. Anjali	4.08	11	7.60	48	308	2.90	26.63	68
7. Varalu (Upland-western zone)	7.69	1	9.92	46	395	3.98	22.36	83
8. IRRI 1	6.53	5	7.24	47	390	2.95	27.43	78
9.IRRI 2	7.60	2	9.98	46	359	3.90	26.28	84
10. IRRI 3	6.34	7	9.85	47	331	4.17	26.10	81
11.LC 1	7.06	3	10.04	46	365	4.09	22.62	77
12. LC 2	-		-	-	-	-	-	-
13. LC 3	-		-	-	-	-	-	-
C.D. (0.05)	1.16		1.14	7.98	47.41	0.66	1.47	1.90
C.V. (%)	10.80		7.90	10.20	7.91	11.86	3.54	1.42
res(t)	**		**	NS	**	**	**	**
Expt. Mean	6.30		8.49	46	352	3.27	24.41	79
Soil type	Clay							
pH	7.78							
EC	0.52							
Applied NPK kg/ha	120:60:40							
Available NPK kg/ha	203:20:348							

V11. Local check 1 KMP 175

Table 4.2.2b: Contd.

Cultivars	MARUTERU							
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m2 (20DAS)	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days for 50% flowering
1. DRR Dhan 44 (early)	6.30	4	8.00	67	329	4.53	25.29	76
2.Sabhagidhan (very early)	6.12	5	8.35	44	309	4.17	24.27	84
3. DRR Dhan 60	5.15	6	6.83	49	295	4.00	25.38	85
4. DRR Dhan 42 (Mid early)	7.24	2	8.19	68	293	3.99	28.93	80
5. Vandana (rainfed upland)	3.73	10	3.90	73	238	2.99	25.40	74
6. Anjali	4.31	9	5.26	41	242	4.16	18.88	71
7. Varalu (Upland-western zone)	4.52	8	6.28	70	311	3.85	25.69	71
8. IRRI 1	8.28	1	8.02	111	320	3.84	25.62	72
9.IRRI 2	5.11	7	7.49	89	385	4.71	25.29	75
10. IRRI 3	6.42	3	8.08	73	343	4.29	24.89	77
11.LC 1	-		-	-	-	-	-	-
12. LC 2	-		-	-	-	-	-	-
13. LC 3	-		-	-	-	-	-	-
C.D. (0.05)	0.62		1.71	9.19	42.57	0.54	0.68	9.55
C.V. (%)	6.34		14.15	7.83	8.09	7.76	1.58	7.28
res(t)	**		**	**	**	**	**	NS
Expt. Mean	5.72		7.04	68	307	4.05	24.96	76
Soil type	Clay							
pH	-							
EC	-							
Applied NPK kg/ha	120:60:40							
Available NPK kg/ha	-							

Table 4.2.2b: Contd.

Cultivars	NAWAGAM							
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m2 (20DAS)	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days for 50% flowering
1. DRR Dhan 44 (early)	4.45	4	5.38	32	139	2.78	21.5	76
2.Sabhagidhan (very early)	5.03	1	5.32	36	151	2.56	22.3	65
3. DRR Dhan 60	3.11	10	5.81	40	107	2.24	13.0	80
4. DRR Dhan 42 (Mid early)	4.31	6	4.84	38	142	3.3	26.0	72
5. Vandana (rainfed upland)	3.31	9	5.06	37	123	2.82	24.3	55
6. Anjali	4.18	7	3.82	38	133	3.71	27.4	56
7. Varalu (Upland-western zone)	4.12	8	4.99	36	118	2.75	18.4	72
8. IRRI 1	4.58	2	5.35	32	142	2.58	25.0	72
9.IRRI 2	4.54	3	5.54	37	135	3.36	24.1	77
10. IRRI 3	4.41	5	5.17	31	141	3.62	24.1	76
11.LC 1	-		-	-	-	-	-	-
12. LC 2	-		-	-	-	-	-	-
13. LC 3	-		-	-	-	-	-	-
C.D. (0.05)	0.84		0.99	6.11	23.74	0.57	1.37	1.3
C.V. (%)	11.58		11.23	9.92	10.39	11.18	3.54	1.08
res(t)	**		*	NS	*	**	**	**
Expt. Mean	4.2		5.13	36	133	2.97	22.61	70
Soil type	Clay							
pH	7.57							
EC	0.88							
Applied NPK kg/ha	100:25:00:25							
Available NPK kg/ha	203:85:284							

Table 4.2.2b: Contd.

Cultivars	NAWAGAM Contd.				
	Weed population (no/m^2)		Weed biomass (g/m^2)		Cost of cultivation Rs/ha
	At active tillering	At panicle initiation	At active tillering	At panicle initiation	
1. DRR Dhan 44 (early)	84.00(9.16)	110.00(10.47)	34.74	33.03	41299
2.Sabhagidhan (very early)	62.33(7.86)	92.00(9.59)	22.9	27.52	41232
3. DRR Dhan 60	84.67(9.22)	84.00(9.12)	28.6	23.49	41373
4. DRR Dhan 42 (Mid early)	79.67(8.86)	93.67(9.70)	28.33	30.27	41233
5. Vandana (rainfed upland)	65.33(8.10)	104.33(10.22)	26.39	30.73	41313
6. Anjali	54.67(7.22)	73.67(8.51)	15.24	22.64	41250
7. Varalu (Upland-western zone)	63.00(7.79)	78.33(8.71)	19.29	25.27	41315
8. IRRI 1	74.33(8.63)	73.33(8.44)	18.62	22.81	41263
9.IRRI 2	89.67(9.48)	104.67(10.24)	36.89	36.36	41294
10. IRRI 3	74.00(8.52)	99.33(9.80)	28.2	30.02	41256
11.LC 1	-	-	-	-	-
12. LC 2	-	-	-	-	-
13. LC 3	-	-	-	-	-
C.D. (0.05)	2.43	1.94	17.79	13.61	176
C.V. (%)	16.66	11.94	39.98	28.1	0.25
res(t)	NS	NS	NS	NS	NS
Expt. Mean	8.48	9.48	25.92	28.22	41283
Soil type					
pH					
EC					
Applied NPK kg/ha					
Available NPK kg/ha					

Table 4.2.2b: Contd.

Cultivars	RAJENDRANAGAR					
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)
1. DRR Dhan 44 (early)	4.73	1	12.65	565	2.38	23.47
2.Sabhagidhan (very early)	2.58	11	8.44	357	2.19	22.53
3. DRR Dhan 60	3.82	6	11.54	412	1.88	13.87
4. DRR Dhan 42 (Mid early)	3.02	10	9.99	392	2.09	22.17
5. Vandana (rainfed upland)	1.08	13	3.77	299	2.04	22.50
6. Anjali	1.76	12	5.99	318	2.48	23.70
7. Varalu (Upland-western zone)	3.44	8	11.77	407	2.05	20.67
8. IRRI 1	4.03	4	9.10	451	1.42	23.07
9.IRRI 2	3.61	7	8.21	407	3.00	24.03
10. IRRI 3	4.13	3	7.99	494	2.16	23.37
11.LC 1	3.24	9	12.65	404	1.70	21.03
12. LC 2	4.03	4	10.88	478	2.64	21.87
13. LC 3	4.30	2	12.88	553	1.95	11.10
C.D. (0.05)	0.67		1.74	79.44	0.7	0.51
C.V. (%)	11.82		10.66	11.07	19.32	1.45
res(t)	**		**	**	*	**
Expt. Mean	3.37		9.68	426	2.15	21.03
Soil type	Clay					
pH	-					
EC	-					
Applied NPK kg/ha	150:60:40					
Available NPK kg/ha	203:85:284					

V11. Local check 1 RNR 15048
V12. Local check 1 RNR 29325
V13. Local check 1 RNR 28361

Table 4.2.2b: Contd.

Cultivars	RAJENDRANAGAR Contd.			
	Weed population (no/m^2)		Weed biomass (g/m^2)	
	At active tillering	At panicle initiation	At active tillering	At panicle initiation
1. DRR Dhan 44 (early)	2.89(2.89)	2.89(2.89)	5.00	5.07
2.Sabhagidhan (very early)	5.67(5.67)	6.93(6.93)	35.33	9.63
3. DRR Dhan 60	3.98(3.98)	4.84(4.84)	18.00	7.00
4. DRR Dhan 42 (Mid early)	4.88(4.88)	6.54(6.54)	26.67	8.97
5. Vandana (rainfed upland)	7.12(7.12)	9.29(9.29)	55.00	13.07
6. Anjali	6.52(6.52)	7.60(7.60)	46.00	10.80
7. Varalu (Upland-western zone)	4.45(4.45)	5.46(5.46)	23.00	8.27
8. IRRI 1	3.67(3.67)	4.25(4.25)	15.33	6.37
9.IRRI 2	4.34(4.34)	5.24(5.24)	20.67	7.80
10. IRRI 3	3.51(3.51)	3.59(3.59)	8.33	5.83
11.LC 1	4.67(4.67)	5.90(5.90)	25.33	8.77
12. LC 2	3.67(3.67)	4.02(4.02)	14.00	6.10
13. LC 3	3.38(3.38)	3.18(3.18)	7.67	5.40
C.D. (0.05)	0.57	0.73	4.63	1.63
C.V. (%)	7.49	8.06	11.89	12.18
res(t)	**	**	**	**
Expt. Mean	4.52	5.36	23.10	7.93
Soil type				
pH				
EC				
Applied NPK kg/ha				
Available NPK kg/ha				

V11. Local check 1 RNR 15048
V12. Local check 1 RNR 29325
V13. Local check 1 RNR 28361

Table 4.2.2b: Contd.

Cultivars	RANCHI					Over all Mean	Rank
	Grain yield (t/ha)	Rank	Panicle/m^2 (No.)	Test wt (g)	Grains/panicle (No)		
1. DRR Dhan 44 (early)	3.66	4	229	24.6	86	4.73	8
2.Sabhagidhan (very early)	3.85	3	240	24.8	90	4.36	9
3. DRR Dhan 60	-	-	-	-	-	3.69	11
4. DRR Dhan 42 (Mid early)	4.12	2	256	24.6	93	4.89	6
5. Vandana (rainfed upland)	2.86	6	177	23.8	75	3.47	12
6. Anjali	3.05	5	192	24.7	78	3.29	13
7. Varalu (Upland-western zone)	2.56	7	162	24.1	103	4.27	10
8. IRRI 1	-	-	-	-	-	5.59	1
9.IRRI 2	-	-	-	-	-	4.91	5
10. IRRI 3	-	-	-	-	-	4.85	7
11.LC 1	4.20	1	261	24.5	96	5.24	4
12. LC 2	-	-	-	-	-	5.35	2
13. LC 3	-	-	-	-	-	5.29	3
C.D. (0.05)	0.47		30.29	0.25	7.99		
C.V. (%)	7.57		7.86	0.58	5.07		
res(t)	**		**	**	**		
Expt. Mean	3.47		217	24.5	89	4.80	
Soil type	Clay						
pH	-						
EC	-						
Applied NPK kg/ha	120:60:40						
Available NPK kg/ha	-						

V11. Local check 1 RNR Lalat

4.2.2c. Seed priming in Dry DSR for proper establishment and productivity

In dry direct seeding, the good crop establishment is constrained by subsurface soil drying associated with high temperature. Besides, poor germination under aerobic soil condition results in sparse and patchy stands, which encourages weed growth and reduces the competitive ability of rice against weeds. Since seedling vigour is an agronomical trait that predicts the possibility of seed germination, seedling growth, and climate tolerance, there are a few agronomic interventions that can promote seedling vigour as well, which include seed invigoration/priming, a simple, yet effective technique. Seed priming is one of the most important developments to help rapid, uniform germination and emergence of seeds and to increase seed tolerance to adverse environmental conditions. Invigoration /Priming of seeds has been shown to have positive effects on the emergence, yield, and quality of dry direct-seeded rice. With this back ground the trial is initiated to evaluate different seed invigoraters in crop establishment, growth and yield of dry DSR and to identify the suitable, cost effective and promising seed invigoration in dry DSR.

The trial was conducted at six locations viz., **Chatha**, **Coimbatore**, **Jagdalpur**, **ICAR-IIRR, Ludhaina** and **Mandya**. The trial included six priming treatments and control viz., hydro-priming, hardening, priming with NaCl @1%, seed treatment with CPB-1 (Chitinolytic bacterium), seed treatment with Trichoderma asperellum, seed treatment with Bacillus and control(Without seed priming) in replicated Randomized Block Design. Three locations viz., Coimbatore, ICAR-IIRR, Mandya have recorded root weight, shoot weight, leaf area index. The data on seedling vigor index, dry matter production at critical stages of crop growth from all the test locations is necessary to assess the performance of different priming treatments and derive meaningful conclusion. In this first year study, the mean grain yield varied from 3.02 t/ha at **Jagdalpur** to 6.99 t/ha at **Chatha** with variety DRRDhan48. At **Coimbatore** and **Mandya,** all the seed priming treatments were significantly superior to control and at **Jagdalpur** there was no significant difference among the treatments and control. At **Chatha**, hydro-priming was significantly superior over all other priming treatments. At ICAR-IIRR, hydropriming, hardening, priming with NaCl @1%, seed treatment with CPB-1 (Chitinolytic bacterium) recorded significantly higher grain yields, comparable to each other statistically; and superior over other seed treatments and control. At **Ludhiana**, hardening, priming with NaCl @1% and seed treatment with CPB-1 (Chitinolytic bacterium) were significantly superior over other priming treatments and were comparable to each other. The straw yield followed similar trend as that of grain yield. The yield attributes supported in realization of yields in the respective priming treatments.(Table 4.2.2c). The data analyses showed that Seedling Vigor Index at three locations reported was significantly superior with seed hardening and seed treatment with Chitinolytic Bacterium at 14 and 21 DAS. At five locations, priming treatments have resulted in significantly higher yield attributes, grain yield and straw yield over control. The trial has to continue for 2/3 seasons to arrive meaningful conclusions.

Trial 2.2.c: Yield parameters and grain yield of Seed priming in Dry DSR for proper establishment and productivity Kharif-2023

Treatment details	Grian yield t/ha						Straw yield t/ha					
	Chatha	Coimbatore	ICAR-IIRR	Jagdalpur	Ludhiana	Mandya	Chatha	Coimbatore	ICAR-IIRR	Jagdalpur	Ludhiana	Mandya
T1 - Hydropriming	8.61	4.47	5.19	3.09	4.90	4.88	10.76	5.86	7.634	4.51	9.94	7.10
T2 - Hardening	6.62	4.5	4.82	3.07	5.15	4.77	8.28	5.94	7.046	4.31	9.87	6.83
T3 - Priming with NaCl 1%	7.05	4.49	4.96	3.04	5.24	5.00	8.82	5.92	7.328	4.51	10.16	7.23
T4 - Seed treatment with CPB-1 (Chitinolytic bacterium)	7.32	4.6	5.02	3.04	5.4	4.72	9.16	5.95	7.216	4.31	10.66	6.00
T5 - Seed treatment with Trichoderma asperellum	6.36	4.28	4.69	2.83	4.73	4.85	7.95	5.65	6.846	4.32	9.44	6.87
T6 - Seed treatment with Bacillus subtilis	5.39	4.37	4.61	2.96	4.75	5.05	6.74	5.75	6.822	4.5	9.9	7.22
T7 - Control	7.57	3.81	4.5	3.09	4.68	4.32	9.46	3.5	6.532	4.37	9.16	6.17
Exp. mean	6.99	4.36	4.83	3.02	4.98	4.80	8.74	5.51	7.064	4.41	9.88	6.78
CD(0.05)	0.64	0.13	0.40	0.42	0.29	0.54	0.80	2.05	1.03	0.45	0.63	1.24
CV	5.15	1.63	4.848	7.88	3.23	6.35	5.15	20.92	9.14	5.78	3.6	10.25
Applied N:P:K:Zn Kg/ha	120:60:40 kg/ha	150:50:50	120:60:40	-	105:30:30	100:50:50:20						
Avail N:P:K (kg/ha)	245.15:14.34:146.31	242:25:468	-	-	265-28-187	264.4:58.34:261.4						
Soil type	Sandy clay loam	Clay loam	Clay	-	-	Red sandy loam						
pH	8.03	8.3	6.5	-	7.7	7.82						
EC (dsm-1)	0.21		-	-	0.2	-						
Organic carbon	0.57	0.45	-	-	0.43	-						

Trial 2.2.c: Contd.

Treatment details	No of Panicles/m^2						Panicle Weight(g)					Test Weight(g)			
	Chatha	Coimbatore	ICAR-IIRR	Jagdalpur	Ludhiana	Mandya	Chatha	Coimbatore	ICAR-IIRR	Ludhiana	Mandya	Chatha	ICAR-IIRR	Ludhiana	Mandya
T1	392	263	345	288	457	323	2.23	2.33	2.39	2.32	2.69	26.07	22.91	26.87	15.80
T2	312	278	346	301	495	343	2.12	2.55	2.47	2.35	2.85	24.8	22.42	26.93	15.52
T3	320	271	341	293	482	340	2.16	2.45	2.49	2.31	3.05	25.37	22.66	26.93	15.67
T4	337	285	347	288	498	325	2.19	2.72	2.60	2.35	3.13	25.67	22.78	27.00	15.68
T5	306	247	336	309	460	356	2.06	2.18	2.39	2.28	3.02	24.6	22.37	26.97	15.55
T6	267	258	328	311	468	337	2.02	2.29	2.38	2.31	2.91	24.23	22.26	27.00	15.56
T7	361	213	326	285	453	319	2.22	1.96	2.30	2.29	2.74	25.97	22.61	26.87	14.98
Exp. mean	328	259	338	296	473	335	2.14	2.35	2.43	2.32	2.91	25.24	22.57	26.94	15.54
CD(0.05)	8	11	36	98	29	34	0.01	0.1	0.23	0.2	0.59	0.17	0.69	0.93	0.97
CV	1	2	6	19	3	6	0.19	2.44	4.74	4.95	11.37	0.38	1.95	1.95	3.53

Treatments:

T1 - Hydropriming

T2 - Hardening

T3 - Priming with NaCl 1%

T4 - Seed treatment with CPB-1 (Chitinolytic bacterium)

T5 - Seed treatment with Trichoderma asperellum

T6 - Seed treatment with Bacillus subtilis

T7 - Control

Trial 2.2.c: Contd.

Treatment details	Plant height(cm) at harvest						Filled grain %			Seedling Vigor Index					
										Jagdalpur		Ludhiana		ICAR-IIRR	
	Chatha	Coimbatore	ICAR-IIRR	Jagdalpur	Ludhiana	Mandya	ICAR-IIRR	Ludhiana	Mandya	14DAS	21DAS	14DAS	21DAS	14DAS	21DAS
T1	91.81	89.87	85.49	90.47	89.87	65.41	89.52	89.83	89.21	1237.16	1855.74	782.42	1698.94	1009.79	1777.34
T2	76.08	92.37	83.78	94.78	92.33	63.35	90.48	90.53	90.42	1282.55	1870.76	982.09	2292.58	1132.32	2081.67
T3	77.67	90.57	83.99	93.13	91.4	67.19	90.29	90.4	90.17	1020.72	1524.76	1137.52	2720.00	1079.12	2122.38
T4	80.33	94.73	85.45	97.44	91.67	63.09	90.13	90.37	89.88	1300.66	1944.19	1117.12	2414.70	1208.89	2179.45
T5	73.67	88.43	82.71	96.39	90.27	64.81	86.95	88.01	85.89	1308.62	1956.38	613.85	1354.55	961.24	1655.47
T6	72.33	89.07	81.85	92.58	90.2	65.08	89.45	90.72	88.17	1257.39	1879.47	668.53	1476.82	962.96	1678.15
T7	85.87	87.37	83.21	90.84	88.8	63.16	89.75	88.22	91.28	1228.91	1805.21	611.82	1348.94	920.37	1577.08
Exp. mean	79.68	90.34	83.78	93.66	90.65	64.58	89.51	89.73	89.29	1233.71	1833.78	844.76	1900.93	1039.24	1867.36
CD(0.05)	2.73	1.80	3.34	3.76	4.53	3.86	4.85	4.79	4.91	47.88	78.26	192.78	534.72	120.33	306.49
CV	1.92	1.12	2.29	2.26	2.81	3.36	3.05	3	3.09	2.18	2.4	12.83	15.81	7.51	9.11

Treatments:

T1 - Hydropriming

T2 - Hardening

T3 - Priming with NaCl 1%

T4 - Seed treatment with CPB-1 (Chitinolytic bacterium)

T5 - Seed treatment with Trichoderma asperellum

T6 - Seed treatment with Bacillus subtilis

T7 - Control

4.2.3a. Identification of suitable sowing method of wet DSR for higher productivity in different zones

Direct wet seeding offers the advantage of faster and easier planting, reduced labour and less drudgery, 7-10 days earlier crop maturity, more efficient water use and higher tolerance to water deficit, less methane emission, and often higher profit in areas with assured water supply. This method of seeding in the past has received relatively less attention than transplanting. Sowing of sprouted rice seed or wet-seeded rice in puddled soil though becoming increasingly important as a method of crop establishment under lowland rice is beset with weed problems, particularly grassy weeds besides other management practices. Weeds emerge at about the same time that the rice seeds germinate, and therefore the yield losses caused by weeds will become greater with the trend towards wet seeding. Effective weed control is one of the key issue and major requirements to ensure a successful wet-seeded rice crop. Furthermore, varieties must be improved for early seeding vigour, weed competitiveness, submergence tolerance to survive untimely rainfall during stand establishment and drought tolerance to survive dry conditions during germination and later growth stages, and for lodging resistance at maturity. Hence the present trial is constituted to enhance the productivity of the wet DSR with the following objectives 1) To identify suitable and cost effective agronomic management practices to enhance the productivity of wet-DSR) To maximize the resource use efficiency. The trial was conducted at 13 locations (**Chatha, Chiplima, Coimbatore, Mandya, Moncompu, Navasari, Nawagam, Pattambi, Pusa, Titabar, Rewa, Vadagaon and Warangal**). The trial was conducted in RBD and replicated thrice. The treatments were S_1: Broadcasting of seeds and S_2: Manual line sowing, S_3: Mechanized line sowing of seeds (Dribbler, Happy seeder of any Drum seeder, spacing as per the equipment specifications) S_4: Raised bed sowing, S_5: Any improved system in that particular location and S_6: Location specific high yielding wet DSR method, and S_7: Farmers' practice of the wet DSR method of the region. The results were summarized and presented in **Table 4.2.3a** and the salient findings are as followed.

In sandy clay loam soils of **Chatha**, manual line sowing resulted in the highest grain yield (3.18 t/ha), however, at par with mechanized line sowing (3.15 t/ha). The lowest weed population at active tillering (3.13 no./m^2) and panicle initiation (6.12 no./m^2) stages also observed under manual line sowing. Similar trend of result were also reflected in weed biomass at both stages of crop. At **Chiplima**, mechanized line sowing of seeds resulted the highest grain yield (5.40 t/ha), at par with manual line sowing (5.03 t/ha). The lowest weed population at active tillering (6.12 no./m^2) and panicle initiation (6.38 no./m^2) stages also observed under mechanized line sowing. At **Coimbatore**, Paddy + Dhaincha drum seeder treatment resulted in the highest grain yield (5.81 t/ha) at par with paddy drum seeder (5.74 t/ha). The lowest weed population at active tillering (3.36 no./m^2) and panicle initiation (3.04 no./m^2) stages also observedin plots treated with Paddy + Dhaincha drum seeder. At active tillering stage, weed biomass also recorded the lowest (4.33 g/m^2) under same treatment. In red sandy loam soils of **Mandya**, raised bed sowing resulted the highest grain yield (5.81 t/ha), however, at par with mechanized line sowing (5.65 t/ha). The lowest weed population at active tillering (3.41 no./m^2) and panicle initiation (3.21 no./m^2) stages also observed in plots treated with raised bed sowing. Similarly, at active tillering and panicle initiation stages weed biomass also recorded the lowest (7.93 g/m^2 and 9.53 g/m^2, respectively) under the same treatment. In clay loam soils of **Moncompu**, Farmers' wet DSR method (broadcasting with high seed rate @ 125 kg/ha) resulted in the highest grain yield (4.40 t/ha), however, at par with improved system of that particular location (drum seeding with higher seed rate and spacing of 20 x 5 cm) (4.29 t/ha). Weed population and biomass did not show any clear trend with respect to grain yield. In clay soils of Navasari, all methods of establishment were found to be similar with respect to grain yield. However, mechanized line sowing of seeds resulted in the highest grain yield (5.20 t/ha) followed by farmers practice of wet DSR method (5.10 t/ha). The lowest cost of cultivation was recorded in broadcasting of seeds (Rs. 61, 237/-). At **Nawagam**, raised bed sowing resulted in the highest grain yield (5.22 t/ha), at par with manual line sowing (5.06 t/ha). Weed population and biomass were found to be non-significant among the treatments. In Pattambi, the mean experimental grain yield was very low. The highest grain yield was recorded under improved system of that particular region (2.03 t/ha). At Pusa, Mechanized line sowing resulted in the highest grain yield (5.11 t/ha) followed by manual line sowing (5.00 t/ha). Weed population at active tillering stage was found to be non-significant among treatments. Gross returns under mechanized line sowing was Rs. 1,18,243/-. In clay loam soils of **Titabar**, raised bed sowing of seeds resulted in the highest grain yield (3.05 t/ha) followed by mechanized line sowing (2.94 t/ha). At Rewa, Improved system of that particular region resulted in the highest grain yield (3.10 t/ha) followed by mechanized line sowing (2.63 t/ha). At **Vadagaon**, raised bed sowing resulted in the highest grain yield (6.11 t/ha), however at par with location specific high yielding wet DSR method (6.01 t/ha). Similarly, the lowest weed population and biomass was observed under raised bed sowing. In clay soils of **Warangal**, grain yield did not differ significantly among the treatments. The CV of the experiment was very high (32.92%). Weed population and biomass was found to be non-significant among the treatments.

Across 13 locations mechanized line sowing resulted in the highest grain yield (4.04 t/ha).

Table 4.2.3a: Identification of suitable sowing method of Wet DSR for higher productivity in different zones (Puddle soil).

Methods of crop establishment	CHATHA										
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m^2		Plant height (cm)	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days for 50% flowering	Grains/panicle (No.)
				At 15 DAS	At 30 DAS						
S1	2.74	3	5.94	83	133	116	209	1.37	20.47	108	53
S2	3.18	1	6.94	93	154	148	214	1.51	21.67	104	62
S3	3.15	2	6.67	87	144	142	210	1.47	21.37	104	63
S4	2.67	4	5.88	80	120	105	195	1.43	20.83	109	57
S5	-	-	-	-	-	-	-	-	-	-	-
S6	-	-	-	-	-	-	-	-	-	-	-
S7	-	-	-	-	-	-	-	-	-	-	-
C.D. (0.05)	0.02		0.05	3.66	5.3	2	2.49	0.03	0.13	1.6	1.37
C.V. (%)	0.29		0.42	2.14	1.92	0.78	0.6	1.2	0.31	0.75	1.17
res(t)	**		**	**	**	**	**	**	**	**	**
Expt. Mean	2.93		6.36	85.75	137.75	127.83	206.92	1.45	21.08	106	58.67
Soil type	Sandy clay loam										
pH	-										
EC	-										
Variety	Basmati 140-150 days										
Applied NPK kg/ha	30:20:10 kg/ha (as per package and practices of SKUAST-Jammu)										
Available NPK kg/ha	245:14:147										

S1: Broadcasting of seeds

S2: Manual line sowing

S3: Mechanized line sowing of seeds (Dribbler, Happy seeder or any Drum Seeder: Spacing as per the equipment specifications)

S4: Raised bed sowing

Table 4.2.3a: Contd.

Methods of crop establishment	CHATHA Cntd.						
	Dry mater accumulation (g/m2)			Weed population (no/m^2)		Weed biomass (g/m^2)	
	45 DAS	75 DAS	105das	At Active tillering	At PI	AI stage	PI stage
S1	136.7	337.3	536.0	13.67(3.76)	60.33(7.80)	5.8	78.3
S2	174.0	371.7	576.3	9.33(3.13)	37.00(6.12)	5.3	41.9
S3	167.0	359.7	563.7	10.33(3.29)	43.33(6.62)	5.5	54.3
S4	128.3	324.7	534.0	10.67(3.34)	48.67(7.01)	5.5	57.3
S5	-	-	-	-	-	-	-
S6	-	-	-	-	-	-	-
S7	-	-	-	-	-	-	-
C.D. (0.05)	5.96	2.09	3.03	0.33	0.37	0.27	7.51
C.V. (%)	1.97	0.3	0.27	4.88	2.67	2.42	6.49
res(t)	**	**	**	*	**	*	**
Expt. Mean	151.5	348.33	552.5	3.38	6.89	5.54	57.97
Soil type							
pH							
EC							
Variety							
Applied NPK kg/ha							
Available NPK kg/ha							

S1: Broadcasting of seeds

S2: Manual line sowing

S3: Mechanized line sowing of seeds (Dribbler, Happy seeder or any Drum Seeder: Spacing as per the equipment specifications)

S4: Raised bed sowing

Table 4.2.3a: Contd.

Methods of crop establishment	CHIPLIMA														
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m^2		Plant height (cm)	Panicle/m^2 (No.)	Panicle lenth (cm)	Test wt (g)	Days for 50% flowering	Dry mater accumulation (g/m2)			Weed population (no/m^2)	
				At 15 DAS	At 30 DAS						45 DAS	75 DAS	Harvest	At Active tillering	At panicle initiation
S1	4.77	5	5.67	39.00	41.00	109.20	200	24.33	20.47	90.33	25.13	87.73	180.33	44.67(6.12)	50.33(6.74)
S2	5.03	2	6.10	42.00	43.67	107.83	205	21.17	20.80	91.00	27.63	92.33	189.23	37.00(5.08)	45.00(5.76)
S3	5.40	1	6.30	44.00	45.67	101.20	237	21.53	21.13	90.00	28.7	96.83	197.6	25.33(6.12)	32.67(6.38)
S4	4.37	7	5.10	37.00	38.00	105.50	186	23.37	20.53	89.00	25.3	86.97	179.3	37.00(5.88)	40.33(6.11)
S5	5.00	3	5.87	39.00	41.00	102.90	201	22.30	21.17	89.67	27.5	91.77	188.87	34.33(6.34)	37.00(6.53)
S6	4.83	4	5.60	39.33	41.33	109.50	178	21.50	21.00	90.67	25.43	85.87	176.43	40.00(6.50)	42.33(6.76)
S7	4.70	6	5.87	38.33	40.00	76.90	206	23.23	20.93	91.00	26.83	83.83	174.33	42.15 (6.24)	45.33 (7.82)
C.D. (0.05)	0.61		0.64	3.22	2.78	39.39	26.65	2.33	0.59	1.77	1.62	4.32	8.98	0.71	0.68
C.V. (%)	7.09		6.17	4.54	3.77	21.74	7.43	5.82	1.59	1.10	3.43	2.72	2.75	6.51	5.87
res(t)	NS		*	**	**	NS	*	NS	NS	NS	**	**	**	**	*
Expt. Mean	4.87		5.79	39.81	41.52	101.86	201.57	22.49	20.86	90.24	26.65	89.33	183.73	6.11	6.49
Soil type															
pH	5.4														
EC	0.1														
OC	17.00%														
Variety & Duration	MTU-1156 (115 Days)														
Applied NPK kg/ha	120:60:40														
Available NPK kg/ha	-														

S1: Broadcasting of seeds

S2: Manual line sowing

S3: Mechanized line sowing of seeds (Dribbler, Happy seeder or any Drum Seeder: Spacing as per the equipment specifications)

S4: Raised bed sowing

S5- Any improved system in that particular location

S6- Location specific high yielding Wet DSR method

S7- Farmers practice of the Wet DSR method of the region

Table 4.2.3a: Contd.

Methods of crop establishment	COIMBATORE											
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m^2 at 15DAS	Plant height (cm)	Tillers/m^2 (No.)	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Weed population (no/m^2)		Weed biomass (g/m^2)
										At Active tillering	At panicle initiation	AT stage
S1	4.36	5	5.83	50.33	85.30	299	266	2.02	16.30	31.23(5.63)	15.40(3.99)	6.4
S2	5.36	3	6.85	66.33	88.53	367	332	2.66	16.23	24.40(4.99)	13.83(3.79)	5.7
S3	5.74	2	7.36	63.67	91.53	372	341	2.95	16.27	18.40(4.35)	9.70(3.19)	5.3
S4	-	-	-	-	-	-	-	-	-	-	-	-
S5	5.81	1	7.62	53.67	94.33	383	355	3.12	16.40	10.80(3.36)	8.77(3.04)	4.33
S6	5.11	4	6.45	56.00	87.70	348	318	2.44	16.23	16.33(4.10)	11.90(3.52)	5.23
S7	4.14	6	5.64	46.67	83.17	282	255	1.95	16.27	35.60(6.01)	20.40(4.57)	6.8
C.D. (0.05)	0.14		0.13	5.43	1.49	9.98	11.62	0.12	0.09	0.24	0.12	0.48
C.V. (%)	1.51		1.07	5.32	0.93	1.61	2.05	2.66	0.30	2.79	1.79	4.69
res(t)	**		**	**	**	**	**	**	*	**	**	**
Expt. Mean	5.09		6.63	56.11	88.43	342	311	2.52	16.28	4.74	3.68	5.63
Soil type	-											
pH	8.3											
EC	-											
Variety & Duration	CO 52:130 days											
Applied NPK kg/ha	150:50:50											
Available NPK kg/ha	245:26:478											

S1: Broadcasting of seeds

S2: Manual line sowing

S3: Paddy drum seeder

S5 Paddy + Daincha drum seeder

S6- Direct planting system

S7- Farmers practice of the Wet DSR method of the region

Table 4.2.3a: Cntd.

Methods of crop establishment	MANDYA										
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m^2 At 15 DAS	Plant height (cm)	Tillers/m^2 (No.)	Panicle/m^2 (No.)	Panicle wt (g)	Panicle lenth (cm)	Test wt (g)	Days for 50% flowering
S1	5.15	3	7.41	69.33	92.78	409	369	3.29	26.16	26.34	134
S2	4.59	5	7.26	40.67	99.60	394	351	3.68	27.42	26.65	146
S3	5.65	2	7.59	53.33	99.14	483	431	3.96	27.53	25.93	149
S4	5.81	1	7.75	50.67	96.11	476	424	3.95	27.57	26.28	140
S5	4.63	4	7.01	45.67	96.12	446	381	3.83	27.28	25.17	144
S6	4.35	6	7.16	51.67	95.73	387	349	3.53	27.30	26.59	146
S7	4.19	7	6.85	49.33	94.27	325	327	3.32	27.94	25.57	143
C.D. (0.05)	0.67		1.19	5.48	5.86	18.94	43.80	0.77	27.31	1.94	24.65
C.V. (%)	7.61		9.20	5.97	3.42	2.55	6.55	11.82	1.89	4.18	9.68
res(t)	**		NS	**	NS	**	**	NS	3.89	NS	NS
Expt. Mean	4.91		7.29	51.52	96.25	417	376	3.65	NS	26.08	143
Soil type	Red sandy loam										
pH	7.65										
EC	0.26										
OC	1.1										
Variety & Duration	KMP 220&125TO130 days										
Applied NPK kg/ha	100:50:50										
Available NPK kg/ha	249:74: 273										

S1: Broadcasting of seeds (Sprouted seed)

S2: Manual line sowing (Drum Seeding with dry seed)

S3: Mechanized line sowing of seeds (Drum Seeding with sproted seed)

S4: Raised bed sowing

S5- Any improved system in that particular location (Drum seeding with 24 hours water soaked seed)

S6- Location specific high yielding Wet DSR method (Broadcasting of 24 hours water soaked seed)

S7- Farmers practice of the Wet DSR method of the region (Broadcasting of dry seed)

Table 4.2.3a: Cntd.

Methods of crop establishment	Mandya Contd.						
	Dry matter accumulation(g/m^2)		Weed population (no/m^2)		Weed biomass (g/m^2)		Cost of cultivation Rs/ha
	75 DAS	Harvest	At Active tillering	At panicle initiation	AI stage	PI stage	
S1	701	999	16.00(4.04)	13.33(3.67)	16.88	16.40	57488
S2	669	953	23.33(4.87)	17.33(4.19)	25.05	19.45	57405
S3	747	1060	12.67(3.62)	8.67(2.97)	10.20	12.12	58360
S4	755	1096	11.33(3.41)	10.00(3.21)	7.93	9.53	63184
S5	652	943	20.00(4.48)	19.33(4.41)	20.67	16.17	57260
S6	653	821	23.33(4.85)	20.00(4.45)	26.67	16.67	56767
S7	626	888	28.00(5.26)	24.67(4.98)	28.67	16.00	56438
C.D. (0.05)	89.12	236.98	1.23	1.35	10.06	8.12	
C.V. (%)	7.30	13.79	15.85	18.98	29.10	30.05	
res(t)	NS	NS	*	NS	**	NS	
Expt. Mean	686	966	4.36	3.98	19.44	15.19	58129
Soil type							
pH							
EC							
Variety & Duration							
Applied NPK kg/ha							
Available NPK kg/ha							

S1: Broadcasting of seeds (Sprouted seed)

S2: Manual line sowing (Drum Seeding with dry seed)

S3: Mechanized line sowing of seeds (Drum Seeding with sproted seed)

S4: Raised bed sowing

S5- Any improved system in that particular location (Drum seeding with 24 hours water soaked seed)

S6- Location specific high yielding Wet DSR method (Broadcasting of 24 hours water soaked seed)

S7- Farmers practice of the Wet DSR method of the region (Broadcasting of dry seed)

Table 4.2.3a: Cntd.

Methods of crop establishment	MONUCOMPU										
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m^2		Plant height (cm)	Tillers/m^2 (No.)	Panicle/m^2 (No.)	Panicle wt (g)	Panicle lenth (cm)	Grains/panicle (No.)
				At 15 DAS	At 30 DAS						
S1	4.23	3	5.35	171.7	159.3	92.10	199	187	2.07	20.10	95
S2	3.86	5	5.85	28.0	25.7	93.33	173	152	2.56	20.53	107
S3	3.90	4	4.72	56.0	37.3	95.53	193	195	2.54	20.63	109
S4	3.68	6	4.35	58.0	30.7	89.97	153	129	1.70	19.17	111
S5	4.29	2	6.23	61.0	46.0	91.53	213	193	1.94	21.87	88
S6	2.77	7	3.53	16.3	17.3	86.53	103	93	3.38	22.77	133
S7	4.40	1	5.75	191.7	154.7	101.60	182	177	2.51	20.73	111
C.D. (0.05)	0.76		1.82	10.79	7.12	12.88	23.61	28.76	0.45	2.15	43.78
C.V. (%)	11.04		20.01	7.29	5.94	7.79	7.63	10.05	10.66	5.81	22.86
res(t)	**		NS	**	**	NS	**	**	**	NS	NS
Expt. Mean	3.88		5.11	83.2	67.3	92.94	174	161	2.39	20.83	108
Soil type	Clay loam										
pH	-										
EC	-										
Variety & Duration	-										
Applied NPK kg/ha	90:45:45 NPK kg/ha										
Available NPK kg/ha	200:14:100										

S1: Broadcasting of seeds

S2: Manual line sowing of seeds (20-25 cm row spacing sown in solid row)

S3: Mechanized line sowing of seeds (Dribbler, Happy seeder of any Drum Seeder: Spacing as per the equipment specifications)

S4:Any improved system in that particular location - Raised bed sowing

S5:Any improved system in that particular location - Drum seeding with higher seed rate ie., 20x5 cm

S6: SRI

S7- Famers wet DSR - broadcasting with high seed rate @ 125 kg/ha

Table 4.2.3a: Cntd.

Methods of crop establishment	MONUCOMPU Cntd.						
	Dry mater accumulation (g/m2)			Weed population (no/m^2)		Weed biomass (g/m^2)	
	45 DAS	75 DAS	105 DAS	At Active tillering	At panicle initiation	AI stage	PI stage
S1	328	1754	1704	21.33(4.52)	32.00(5.29)	32.08	27.45
S2	87	248	482	48.00(6.86)	6.67(2.59)	83.65	7.71
S3	107	294	666	44.00(6.58)	9.33(3.12)	55.12	9.44
S4	49	155	305	34.67(5.82)	30.67(5.37)	21.20	10.15
S5	181	131	361	25.33(5.02)	10.67(3.19)	36.87	12.13
S6	101	220	487	38.67(6.09)	4.00(1.91)	86.32	3.09
S7	305	426	1655	33.33(5.69)	29.33(5.00)	26.01	19.45
C.D. (0.05)	105.59	381.77	343.86	2.74	2.70	32.45	13.22
C.V. (%)	35.87	46.51	23.91	26.58	40.16	37.42	58.18
res(t)	**	**	**	NS	NS	**	*
Expt. Mean	165	461	808	5.80	3.78	48.75	12.78
Soil type							
pH							
EC							
Variety & Duration							
Applied NPK kg/ha							
Available NPK kg/ha							

S1: Broadcasting of seeds

S2: Manual line sowing of seeds (20-25 cm row spacing sown in solid row)

S3: Mechanized line sowing of seeds (Dribbler, Happy seeder of any Drum Seeder: Spacing as per the equipment specifications)

S4:Any improved system in that particular location - Raised bed sowing

S5:Any improved system in that particular location - Drum seeding with higher seed rate ie., 20x5 cm

S6: SRI

S7- Famers wet DSR - broadcasting with high seed rate @ 125 kg/ha

Table 4.2.3a: Cntd.

Methods of crop establishment	NAVASARI												
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m^2		Plant height (cm)	Tillers/m^2 (No.)	Panicle/m^2 (No.)	Panicle wt (g)	Panicle lenth (cm)	Test wt (g)	Days for 50% flowering	GraiNS/panicle (No.)
				At 15 DAS	At 30 DAS								
S1	4.81	5	6.21	95	98	102.13	351	225	4.68	22.00	30.60	89.33	322
S2	4.84	4	6.44	99	102	104.33	351	250	4.27	23.00	30.93	91.00	329
S3	5.20	1	6.67	108	110	113.33	354	254	4.83	22.53	33.03	89.33	336
S4	4.36	7	6.79	95	96	107.47	316	227	4.82	22.87	29.53	92.00	293
S5	4.72	6	6.17	96	97	103.00	374	252	4.86	22.40	28.60	91.33	351
S6	4.96	3	6.10	102	103	105.27	354	259	4.51	23.60	29.93	90.00	338
S7	5.10	2	6.60	105	106	108.73	357	252	4.72	23.60	29.97	90.33	335
C.D. (0.05)	0.48		0.65	15.66	15.03	6.85	48.15	26.65	0.67	2.05	4.29	1.74	47.46
C.V. (%)	5.60		5.71	8.79	8.31	3.62	7.71	6.10	8.12	5.05	7.95	1.08	8.10
res(t)	*		NS	NS	NS	*	NS	NS	NS	NS	NS	*	NS
Expt. Mean	4.86		6.43	100	102	106.32	351	245	4.67	22.86	30.37	90.48	329
Soil type	Clay												
pH	7.86												
EC	0.52 ds/m												
OC	0.57												
Variety & Duration	GNR-3&125 days												
Applied NPK kg/ha	4.1875												
Available NPK kg/ha	-												

S1: Broadcasting of seeds

S2: Manual line sowing

S3: Mechanized line sowing of seeds (Dribbler, Happy seeder or any Drum Seeder: Spacing as per the equipment specifications)

S4: Raised bed sowing

S5- Aerobic rice system (Any improved system in that particular location)

S6- Transplanted rice (Location specific high yielding method)

S7- Farmers practice of the Wet DSR method of the region

Table 4.2.3a: Cntd.

Methods of crop establishment	NAVASARI Cntd.								
	Dry mater accumulation (g/m2)			Weed population (no/m^2)		Weed biomass (g/m^2)		Cost of cultivation Rs/ha	Gross returns Rs/ha
	45 DAS	75 DAS	105 DAS	At Active tillering	At panicle initiation	AI stage	PI stage		
S1	394	819	895	13.67(3.76)	42.00(6.52)	25.37	65.31	61236.82	109001
S2	413	837	894	11.33(3.44)	38.67(6.25)	24.79	58.91	62609.63	110454
S3	422	861	924	13.00(3.67)	36.33(6.06)	25.5	58.4	62609.63	117612
S4	389	769	836	14.33(3.85)	39.33(6.31)	25.9	57.01	63489.63	103491
S5	397	796	871	11.00(3.39)	34.67(5.93)	24.74	49.51	62609.63	107215
S6	411	848	924	8.33(2.97)	30.67(5.57)	19.57	47.4	77497.99	111283
S7	410	853	923	12.33(3.58)	40.33(6.39)	24.44	63.82	62762.16	115719
C.D. (0.05)	71.05	88.59	103.35	0.29	0.55	3.35	9.77	94.21	9775
C.V. (%)	9.86	6.03	6.49	4.61	5.05	7.74	9.6	0.08	4.96
res(t)	NS	NS	NS	**	*	*	*	**	NS
Expt. Mean	405	826	895	3.52	6.15	24.33	57.19	64687.93	110682
Soil type									
pH									
EC									
Variety & Duration									
Applied NPK kg/ha									
Available NPK kg/ha									

S1: Broadcasting of seeds

S2: Manual line sowing

S3: Mechanized line sowing of seeds (Dribbler, Happy seeder or any Drum Seeder: Spacing as per the equipment specifications)

S4: Raised bed sowing

S5- Aerobic rice system (Any improved system in that particular location)

S6- Transplanted rice (Location specific high yielding method)

S7- Farmers practice of the Wet DSR method of the region

Table 4.2.3a: Cntd.

Methods of crop establishment	NAVASARI Cntd.							
	Soil available nutrients (kg/ha) initital			Total nutrient uptake (kg/ha)		Soil available nutrients (kg/ha) at harvest		
	N	P	K	N	P	N	P	K
S1	251.6	40.2	652.1	75.1	23.5	250.1	36.5	647.7
S2	252.6	35.3	642.6	81.5	23.9	255.1	35.8	645.6
S3	259.7	37.9	653.9	83.9	24.1	255.2	41.0	655.2
S4	251.7	37.8	648.7	81.0	22.5	259.3	35.2	650.3
S5	264.3	30.5	703.7	83.5	24.3	264.4	33.0	703.6
S6	262.0	31.8	665.5	80.0	24.3	259.4	32.4	666.8
S7	0.0	35.9	660.6	91.0	26.8	253.8	35.4	661.7
C.D. (0.05)	14.1	7.3	40.7	8.7	2.8	14.3	5.0	35.7
C.V. (%)	3.6	11.5	3.5	5.9	6.4	3.1	7.8	3.0
res(t)	**	NS	NS	NS	NS	NS	*	NS
Expt. Mean	220.3	35.6	661.0	82.3	24.2	256.8	35.6	661.6
Soil type								
pH								
EC								
Variety & Duration								
Applied NPK kg/ha								
Available NPK kg/ha								

S1: Broadcasting of seeds

S2: Manual line sowing

S3: Mechanized line sowing of seeds (Dribbler, Happy seeder or any Drum Seeder: Spacing as per the equipment specifications)

S4: Raised bed sowing

S5- Aerobic rice system (Any improved system in that particular location)

S6- Transplanted rice (Location specific high yielding method)

S7- Farmers practice of the Wet DSR method of the region

Table 4.2.3a: Cntd.

Methods of crop establishment	NAWAGAM												
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m^2		Plant height (cm)	Tillers/m^2 (No.)	Panicle/m^2 (No.)	Panicle wt (g)	Panicle lenth (cm)	Test wt (g)	Days for 50% flowering	Grains/panicle (No.)
				At 15 DAS	At 30 DAS								
S1	4.22	5	5.02	42.3	87.0	93.00	196	139	2.71	18.20	18.83	75	237
S2	5.06	2	5.51	39.7	81.0	95.93	168	153	3.93	20.40	18.52	76	255
S3	4.92	4	5.33	37.0	75.0	99.20	185	155	2.86	20.80	18.90	76	258
S4	5.22	1	5.81	39.7	80.0	104.27	196	166	2.73	21.73	18.80	76	263
S5	3.88	7	4.71	41.0	85.0	97.40	196	159	3.59	20.60	19.07	77	275
S6	5.05	3	5.71	39.7	81.0	99.67	180	161	2.31	22.42	18.85	77	260
S7	4.18	6	4.88	40.3	85.0	93.93	192	132	2.57	18.42	18.22	76	213
C.D. (0.05)	0.71		0.74	4.91	11.25	3.57	24.36	21.15	0.53	2.75	0.96	2.59	36.02
C.V. (%)	8.6		7.87	6.90	7.71	2.06	7.30	7.82	10.10	7.60	2.87	1.91	8.05
res(t)	**		*	NS	NS	**	NS	*	**	*	NS	NS	*
Expt. Mean	4.65		5.28	40.0	82.0	97.63	188	152	2.96	20.37	18.74	76	252
Soil type	-												
pH	-												
EC	-												
Variety & Duration	-												
Applied NPK kg/ha	-												
Available NPK kg/ha	-												

S1: Broadcasting of seeds

S2: Manual line sowing

S3: Mechanized line sowing of seeds (Dribbler, Happy seeder or any Drum Seeder: Spacing as per the equipment specifications)

S4: Raised bed sowing

S5- Any improved system in that particular location

S6- Location specific high yielding Wet DSR method

S7- Farmers practice of the Wet DSR method of the region

Table 4.2.3a: Cntd.

Methods of crop establishment	NAWAGAM Cntd.					
	Weed population (no/m²)		Weed biomass (g/m²)		Cost of cultivation Rs/ha	Gross returns Rs/ha
	At Active tillering	At panicle initiation	AI stage	PI stage		
S1	6.93(6.93)	9.49(9.49)	15.16	25.09	42335	107173
S2	7.62(7.62)	11.00(11.00)	19.39	33.85	42264	127447
S3	6.31(6.31)	9.82(9.82)	14.58	26.74	42356	123714
S4	7.73(7.73)	10.26(10.26)	18.30	29.09	43157	131599
S5	7.93(7.93)	10.89(10.89)	20.98	32.75	42726	98550
S6	6.31(6.31)	10.45(10.45)	14.23	28.75	42506	127666
S7	8.13(8.13)	11.18(11.18)	22.58	33.78	42528	105830
C.D. (0.05)	2.89	2.69	11.94	17.71	407.55	17717.34
C.V. (%)	22.29	14.46	37.53	33.17	0.54	8.48
res(t)	NS	NS	NS	NS	**	**
Expt. Mean	7.28	10.44	17.89	30.01	42553	117425
Soil type						
pH						
EC						
Variety & Duration						
Applied NPK kg/ha						
Available NPK kg/ha						

S1: Broadcasting of seeds

S2: Manual line sowing

S3: Mechanized line sowing of seeds (Dribbler, Happy seeder or any Drum Seeder: Spacing as per the equipment specifications)

S4: Raised bed sowing

S5- Any improved system in that particular location

S6- Location specific high yielding Wet DSR method

S7- Farmers practice of the Wet DSR method of the region

Table 4.2.3a: Cntd.

Methods of crop establishment	PATTAMBI											
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population At 30 DAS	Plant height (cm)	Tillers/m^2 (No.)	Panicle/m^2 (No.)	Panicle wt (g)	Panicle lenth (cm)	Test wt (g)	Days for 50% flowering	Grains/panicle (No.)
S1	2.13	1	6.27	35.0	41.0	204	227	8.17	20.00	22.33	87	149
S2	1.73	3	6.40	32.3	42.0	236	306	8.17	19.67	20.00	89	149
S3	1.03	6	2.50	28.3	41.0	207	269	8.20	19.67	17.67	87	149
S4	1.47	4	4.23	32.7	45.7	201	297	9.00	19.17	20.00	88	151
S5	2.03	2	5.60	40.0	40.3	274	289	8.00	19.00	21.00	85	149
S6	1.43	5	6.53	41.3	40.3	114	289	9.00	20.33	16.67	89	155
S7	-	-	-	-	-	-	-	-	-	-	-	-
C.D. (0.05)	0.31		1.20	13.54	7.21	49.54	78.84	1.15	1.72	7.81	4.13	6.85
C.V. (%)	10.55		12.51	21.30	9.50	13.22	15.50	7.51	4.82	21.89	2.60	2.50
res(t)	**		**	NS	NS	**	NS	NS	NS	NS	NS	NS
Expt. Mean	1.64		5.26	34.9	41.7	206	280	8.42	19.64	19.61	88	151
Soil type	-											
pH	-											
EC	-											
Variety & Duration	-											
Applied NPK kg/ha	-											
Available NPK kg/ha	-											

S1: Broadcasting of seeds

S2: Manual line sowing

S3: Mechanized line sowing of seeds (Dribbler, Happy seeder or any Drum Seeder: Spacing as per the equipment specifications)

S4: Raised bed sowing

S5- Any improved system in that particular location

S6- Location specific high yielding Wet DSR method

Table 4.2.3a: Cntd.

Methods of crop establishment	PATTAMBI Contd.				
	Weed population (no/m²)		Weed bio mass (g/m²)		Gross returns Rs/ha
	At Active tillering	At panicle initiation	AT stage	PI stage	
S1	112.00(10.60)	24.33(4.93)	38.7	30.0	78533
S2	86.33(9.30)	26.33(5.15)	57.7	28.7	67733
S3	273.33(16.54)	22.67(4.73)	87.3	18.7	36433
S4	254.33(15.95)	19.33(4.44)	61.3	14.0	53767
S5	127.67(11.32)	44.33(6.69)	38.3	44.3	73733
S6	86.33(9.32)	5.33(2.39)	33.7	2.7	59733
S7	-	-	-	-	-
C.D. (0.05)	0.81	0.72	16.2	11.8	10014
C.V. (%)	3.65	8.44	16.9	28.14	8.93
res(t)	**	**	**	**	**
Expt. Mean	12.17	4.72	38.67	23.06	61656
Soil type					
pH					
EC					
Variety & Duration					
Applied NPK kg/ha					
Available NPK kg/ha					

S1: Broadcasting of seeds

S2: Manual line sowing

S3: Mechanized line sowing of seeds (Dribbler, Happy seeder or any Drum Seeder: Spacing as per the equipment specifications)

S4: Raised bed sowing

S5- Any improved system in that particular location

S6- Location specific high yielding Wet DSR method

Table 4.2.3a: Cntd.

Methods of crop establishment	PUSA											
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m^2		Plant height (cm)	Tillers/m^2 (No.)	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days for 50% flowering	Grains/panicle (No.)
				At 15 DAS	At 30 DAS							
S1	3.43	6	4.85	43	53	109.33	241	245	2.63	21.53	80	101
S2	5.00	2	6.45	39	52	117.00	250	294	2.75	21.43	82	119
S3	5.11	1	6.69	42	53	119.67	299	297	2.76	21.47	82	123
S4	4.18	5	5.65	40	52	116.00	303	262	2.48	21.67	81	111
S5	4.35	4	5.74	41	52	117.00	270	277	2.58	21.40	81	111
S6	4.44	3	5.84	40	52	115.33	283	270	2.55	21.43	81	114
S7	3.26	7	4.52	40	51	106.67	275	235	2.56	21.40	80	101
C.D. (0.05)	0.66		1.10	3.58	2.64	11.26	33.40	32.28	0.23	0.51	2.86	12.20
C.V. (%)	8.77		10.90	4.95	2.85	5.53	6.84	6.76	4.89	1.33	1.98	6.15
res(t)	**		**	NS	NS	NS	*	**	NS	NS	NS	*
Expt. Mean	4.25		5.68	41	52	114.43	274	269	2.62	21.48	81	112
Soil type	Sandy loam											
pH	8.5											
EC	-											
OC	0.41											
Variety & Duration	Rajendra Nilam; 120-125 days											
Applied NPK kg/ha	-											
Available NPK kg/ha	-											

S1: Broadcasting of seeds

S2: Manual line sowing

S3: Mechanized line sowing of seeds (Dribbler, Happy seeder or any Drum Seeder: Spacing as per the equipment specifications)

S4: Raised bed sowing

S5- Any improved system (Tar-vattar)

S6- Location specific high yielding Wet DSR method (Brown manuring)

S7- Farmers practice of the Wet DSR method of the region

Table 4.2.3a: Cntd.

Methods of crop establishment	PUSA Cntd.										
	Dry mater accumulation (g/m2)			Weed population (no/m^2)		Weed biomass (g/m^2)		Gross returns Rs/ha	Soil available nutrients (kg/ha)		
	45 DAS	75 DAS	105 DAS	At Active tillering	At panicle initiation	AI stage	PI stage		N	P	K
S1	218	512	838	14.33(2.88)	16.33(4.04)	4.64	23.60	79661	215.0	11.7	114.3
S2	236	603	897	8.00(2.90)	8.67(3.02)	2.51	9.20	115678	212.3	11.4	111.7
S3	250	608	907	8.33(3.36)	9.33(3.08)	3.54	9.27	118243	212.3	11.4	113.7
S4	228	555	855	11.33(3.15)	12.67(3.55)	3.16	13.97	96917	211.7	11.5	113.0
S5	232	568	867	9.67(2.46)	11.33(3.41)	2.99	12.60	100648	212.0	11.3	112.3
S6	228	560	858	5.67(4.32)	6.00(2.53)	2.01	6.60	102712	214.7	11.5	113.7
S7	216	505	825	18.33	20.67(4.59)	4.84	23.17	75736	214.0	11.6	114.3
C.D. (0.05)	28.59	72.82	35.86	1.14	1.08	1.06	6.15	15365	6.1	0.4	5.2
C.V. (%)	7.00	7.33	2.33	19.64	17.56	17.58	24.57	8.77	1.6	2.1	2.6
res(t)	NS	NS	**	NS	*	**	**	**	NS	NS	NS
Expt. Mean	230	559	864	3.27	3.46	3.38	14.06	98514	213.1	11.5	113.3
Soil type											
pH											
EC											
Variety & Duration											
Applied NPK kg/ha											
Available NPK kg/ha											

S1: Broadcasting of seeds

S2: Manual line sowing

S3: Mechanized line sowing of seeds (Dribbler, Happy seeder or any Drum Seeder: Spacing as per the equipment specifications)

S4: Raised bed sowing

S5- Any improved system (Tar-vattar)

S6- Location specific high yielding Wet DSR method (Brown manuring)

S7- Farmers practice of the Wet DSR method of the region

Table 4.2.3a: Cntd.

Methods of crop establishment	TITABAR							
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population (no/m^2) At 30 DAS	Plant height (cm)	Tillers/m^2 (No.)	Panicle/m^2 (No.)	Days for 50% flowering
S1	2.58	5	7.14	100.00	114.67	296.00	285.00	103.67
S2	2.66	4	7.62	142.33	120.00	305.00	292.33	105.33
S3	2.94	2	7.81	157.67	130.00	304.33	291.00	105.67
S4	3.05	1	6.70	142.33	120.67	310.00	298.00	104.33
S5	2.93	3	4.83	112.00	124.67	301.00	288.67	105.67
S6	-	-	-	-	-	-	-	-
S7	-	-	-	-	-	-	-	-
C.D. (0.05)	0.77		1.71	52.83	11.15	8.39	10.49	2.76
C.V. (%)	12.22		11.55	21.44	4.86	1.47	1.91	1.40
res(t)	NS		NS	NS	NS	*	NS	NS
Expt. Mean	3.37		7.85	130.87	122.00	303.27	291.00	104.93
Soil type	Clay loam							
pH	5.6							
EC	-							
Variety & Duration	TTB404 (135 Days)							
Applied NPK kg/ha	120:60:40							
Available NPK kg/ha	-							

S1: Broadcasting of seeds

S2: Manual line sowing

S3: Mechanized line sowing of seeds (Drum seeding)

S4: Raised bed sowing

S5- Local system

Table 4.2.3a: Cntd.

Methods of crop establishment	REWA						
	Grain yield (t/ha)	Rank	Plant height (cm)	Panicle/m^2 (No.)	Panicle wt (g)	Panicle lenth (cm)	Test wt (g)
S1	0.99	6	89.33	192	4.17	19.30	18.80
S2	1.08	5	94.40	212	3.97	19.30	19.80
S3	2.63	2	77.67	262	4.77	16.53	20.80
S4	1.89	4	90.87	245	4.07	17.07	21.60
S5	3.10	1	90.67	275	6.17	21.30	21.53
S6	2.10	3	83.63	262	5.30	21.53	20.07
S7	-	-	-	-	-	-	-
C.D. (0.05)	0.19		7.78	11.05	0.82	1.72	1.24
C.V. (%)	5.23		4.87	2.52	9.56	4.92	3.34
res(t)	**		**	**	**	**	**
Expt. Mean	1.96		87.76	241	4.74	19.17	20.43
Soil type	-						
pH	-						
EC	-						
	-						
Variety & Duration	Hansraj						
Applied NPK kg/ha	-						
Available NPK kg/ha	-						

S1: Broadcasting of seeds

S2: Manual line sowing

S3: Mechanized line sowing of seeds (Dribbler, Happy seeder or any Drum Seeder: Spacing as per the equipment specifications)

S4: Raised bed sowing

S5- Any improved system in that particular location

S6- Location specific high yielding Wet DSR method

Table 4.2.3a: Cntd.

Methods of crop establishment	VADAGAON												
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m^2		Plant height (cm)	Tillers/m^2 (No.)	Panicle/m^2 (No.)	Panicle wt (g)	Panicle lenth (cm)	Test wt (g)	Days for 50% flowering	GraiNS/panicle (No.)
				At 15 DAS	At 30 DAS								
S1	3.66	7	3.88	39.5	71.15	85.37	165	162	3.59	16.61	20.15	98	144
S2	5.61	5	6	41.21	74.25	91.38	252	250	5.49	25.41	22.43	96	221
S3	5.93	3	6.4	43.59	78.51	96.66	267	264	5.81	26.88	23.72	97	234
S4	6.11	1	6.6	44.94	80.95	99.65	275	270	5.99	27.71	24.45	96	241
S5	5.69	4	6.15	41.83	75.34	92.76	256	251	5.58	25.79	22.76	97	224
S6	6.01	2	6.46	44.14	79.54	97.9	270	268	5.89	27.23	24.02	97	237
S7	4.31	6	4.57	38.04	68.36	87.54	194	190	4.23	19.54	21.99	97	170
C.D. (0.05)	0.22		0.23	1.78	3.52	4.03	9.82	9.66	0.21	1.03	1	1.73	9.01
C.V. (%)	2.3		2.29	2.38	2.62	2.43	2.3	2.3	2.3	2.39	2.47	1.01	2.41
res(t)	**		**	**	**	**	**	**	**	**	**	NS	**
Expt. Mean	5.33		5.72	41.89	75.44	93.04	240	236	5.23	24.17	22.79	97	210
Soil type													
pH	7.73												
EC	0.13												
OC	0.51												
Variety & Duration	Phule Samruddhi-125 to 130 days												
Applied NPK kg/ha	100:50:50												
Available NPK kg/ha	-												

S1: Broadcasting of seeds	Seed rate = 50kg/ha,
S2: Manual line sowing	Sowing at 20cm, Seed rate = 50kg/ha,
S3: Mechanized line sowing of seeds (Dribbler, Happy seeder or any Drum Seeder: Spacing as per the equipment specifications)	Seed rate = 25kg/ha, Spacing -23 cm
S4: Raised bed sowing	1 m raised bed and 4 rows of 20cm spacing , Seed rate = 25kg/ha,
S5- Any improved system in that particular location	Sowing at 30cm distance, Seed rate = 50kg/ha
S6- Location specific high yielding Wet DSR method	Dibbling at 20 x 20 cm , Seed rate = 25kg/ha
S7- Farmers practice of the Wet DSR method of the region	Broadcasting of seed, Seed rate = 75kg/ha,

Table 4.2.3a: Cntd.

Methods of crop establishment	VADAGAON Cntd.												
	Dry mater accumulation (g/m2)		Weed population (no/m^2)			Weed biomass (g/m^2)		Soil available nutrients (kg/ha) Initial			Soil available nutrients (kg/ha) Harvest		
	45 DAS	75 DAS	105 DAS	At Active tillering	At panicle initiation	AI stage	PI stage	N	P	K	N	P	K
S1	185	427	573	7.02(2.73)	14.33(3.84)	6.61	13.83	214.83	15.77	268.06	182.53	13.39	230.64
S2	283	654	877	5.48(2.44)	11.33(3.44)	5.20	11.00	284.98	20.14	303.05	250.68	16.54	259.84
S3	299	692	928	4.39(2.20)	9.00(3.07)	4.13	8.69	272.29	17.38	282.57	236.17	14.28	239.90
S4	309	713	950	3.06(1.88)	6.33(2.60)	2.90	6.15	281.35	19.89	297.71	242.66	16.01	254.05
S5	287	664	891	4.86(2.31)	10.00(3.24)	4.59	9.68	268.28	17.28	288.62	238.38	15.07	249.57
S6	303	701	940	3.69(2.04)	7.67(2.85)	3.52	7.48	275.65	18.19	290.83	244.24	15.44	248.10
S7	217	502	674	6.50(2.64)	13.33(3.71)	6.12	12.88	216.60	17.00	277.32	188.84	13.85	237.48
C.D. (0.05)	13.46	31.08	38.74	0.30	0.42	1.32	2.53	25.06	1.74	18.43	14.79	0.97	15.89
C.V. (%)	2.81	2.81	2.61	7.30	7.23	15.71	14.30	5.44	5.46	3.61	3.68	3.66	3.64
res(t)	**	**	**	**	**	**	**	**	**	*	**	**	*
Expt. Mean	269	622	833	2.32	3.25	4.72	9.96	259.14	17.95	286.88	226.21	14.94	245.65
Soil type													
pH													
EC													
Variety & Duration													
Applied NPK kg/ha													
Available NPK kg/ha													

S1: Broadcasting of seeds	Seed rate = 50kg/ha,
S2: Manual line sowing	Sowing at 20cm, Seed rate = 50kg/ha,
S3: Mechanized line sowing of seeds (Dribbler, Happy seeder or any Drum Seeder: Spacing as per the equipment specifications)	Seed rate = 25kg/ha, Spacing -23 cm
S4: Raised bed sowing	1 m raised bed and 4 rows of 20cm spacing , Seed rate = 25kg/ha,
S5- Any improved system in that particular location	Sowing at 30cm distance, Seed rate = 50kg/ha
S6- Location specific high yielding Wet DSR method	Dibbling at 20 x 20 cm , Seed rate = 25kg/ha
S7- Farmers practice of the Wet DSR method of the region	Broadcasting of seed, Seed rate = 75kg/ha,

Table 4.2.3a: Contd.

Methods of crop establishment	WARANGAL												
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m^2		Plant height (cm)	Tillers/m^2 (No.)	Panicle/m^2 (No.)	Panicle wt (g)	Panicle lenth (cm)	Test wt (g)	Days for 50% flowering	Grains/panicle (No.)
				At 15 DAS	At 30 DAS								
S1	4.11	3	5.56	47.67	47.67	107.87	368	354	6.09	19.13	13.77	74.33	314
S2	3.90	4	5.23	66.33	66.33	93.60	837	811	5.49	17.33	15.47	80.33	305
S3	4.93	1	5.76	38.33	38.33	103.10	348	335	5.26	19.47	14.57	77.67	317
S4	-	-	-	-	-	-	-	-	-	-	-	-	-
S5	4.43	2	5.60	29.00	29.00	96.73	320	305	6.05	20.87	14.83	85.33	317
S6	3.88	5	4.94	39.33	39.33	93.80	371	359	6.16	20.80	14.47	87.33	325
S7	-	-	-	-	-	-	-	-	-	-	-	-	-
C.D. (0.05)	2.63		1.02	4.64	4.64	11.64	83.28	89.57	0.98	1.65	1.19	1.14	39.05
C.V. (%)	32.92		9.97	5.58	5.58	6.24	9.85	10.99	8.94	4.49	4.31	0.75	6.57
res(t)	NS		NS	**	**	NS	**	**	NS	**	NS	**	NS
Expt. Mean	4.25		5.42	44.13	44.13	99.02	449	433	5.81	19.52	14.62	81.00	316
Soil type	Clay												
pH	-												
EC	-												
Variety & Duration	WGL 962, 125 Days duration												
Applied NPK kg/ha	120:60:40: 50												
Available NPK kg/ha	105:41:333												

S1: Broadcasting of seeds

S2: Manual line sowing

S3: Mechanized line sowing of seeds (Dribbler, Happy seeder or any Drum Seeder: Spacing as per the equipment specifications)

S4: Mechine transplanting

S5- Manual transplanting

Table 4.2.3a: Contd.

Methods of crop establishment	WARANGAL Cntd.									Over all Mean	Rank
	Dry mater accumulation (g/m2)			Weed population (no/m^2)		Weed biomass (g/m^2)		Cost of cultivation Rs/ha	Gross returns Rs/ha		
	45 DAS	75 DAS	105 DAS	At Active tillering	At panicle initiation	AI stage	PI stage				
S1	26.67	51.33	74.67	61.00(7.82)	51.33(7.17)	45.33	29.33	42000	114996	3.37	7
S2	34.67	49.33	83.67	47.00(6.87)	23.33(4.88)	23.33	15.57	43000	109235	3.71	5
S3	21.00	55.33	89.00	63.00(7.96)	45.00(6.04)	48.00	23.00	42500	137926	4.04	1
S4	23.00	52.00	70.00	68.00(8.27)	40.67(5.30)	32.00	33.01	61500	124099	3.57	6
S5	22.33	39.67	70.00	53.00(7.21)	84.00(8.46)	19.33	41.31	63630	108774	3.91	2
S6	-	-	-	-	-	-	-	-	-	3.74	4
S7	-	-	-	-	-	-	-	-	-	3.81	3
C.D. (0.05)	5.78	8.28	7.55	1.75	5.85	27.63	50.97	26.66	73770.90		
C.V. (%)	12.03	8.87	5.18	12.22	48.74	43.68	95.17	0.03	32.92		
res(t)	**	*	**	NS	NS	NS	NS	**	NS		
Expt. Mean	25.53	49.53	77.47	7.62	6.37	33.60	28.44	50526	119006	3.71	
Soil type											
pH											
EC											
Variety & Duration											
Applied NPK kg/ha											
Available NPK kg/ha											

S1: Broadcasting of seeds

S2: Manual line sowing

S3: Mechanized line sowing of seeds (Dribbler, Happy seeder or any Drum Seeder: Spacing as per the equipment specifications)

S4: Mechine transplanting

S5- Manual transplanting

4.2.3b. Identification of suitable varieties for wet DSR system

One of the major challenges confronting the development of wet DSR in India is poor choice of suitable varieties and variety breeding. Hence the present trial is constituted to enhance the productivity of the wet DSR with the following objectives 1) To identify the suitable and promising rice cultivars in dry direct seeded rice and 2) To assess the various agronomic parameters for suitability of rice cultivars in wet direct seeded rice establishment methods. The trial was conducted at 8 locations (**Kota, Mandya, Nawagam, Puducherry, Bankura and Pattambi)**. The trial was laid out in RBD with 13 treatments and replicated thrice. Treatments are T_1: DRR Dhan 44 (early) T_2: Sahbhagidhan (very early) T_3: DRR Dhan 60 T_4: DRR Dhan 42 (Mid early) T_5: Vandana (rainfed upland), T_6: Anjali T_7: Varalu (Upland Wesern zone) T_8: IRRI 1 T_9: IRRI 2 T_{10}: IRRI 3 T_{11}: LC 1 T_{12}: LC 2 T_{13}: LC 3. However, at Bankura and Pattambi suggested varieties were not tested as per the technical programme 2023-24. The trial was initiated in 2023-24 *kharif*. The results were summarized and presented in **Table 4.2.3b** and the salient findings are as followed.

Location	**Grain yield (t/ha) of varieties**		
	1st rank	**2nd rank**	**3rd rank**
Kota	Sahbhagidhan (6.00)	DRR Dhan 42 (5.74)	DRR Dhan 44 (5.69)
Mandya	IRRI 1 (7.15)	IRRI 2 (7.04)	DRR Dhan 42 (6.73)
Nawagam	Sahbhagidhan (5.40)	IRRI 2 (5.22)	DRR Dhan 42 (5.06)
Puducherry	DRR Dhan 42 (5.81)	Varalu (5.61)	IRRI 2 (5.59)
Bankura	Dhiren (6.48)	Dhruba (6.04)	IET 23135 (5.73)
Pattambi	Uma (3.84)	Aiswarya (2.63)	Sreyas (2.53)

Table 4.2.3b: Evaluation of varieties for their suitability and enhancement of the productivity in wet direct seeded rice (un-puddle soil), Kharif-2023.

Cultivars	KOTA							
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m2 (20DAS)	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days for 50% flowering
1. DRR Dhan 44 (early)	5.69	3	6.64	39	252	4.74	24.56	73
2. Sabhagidhan (very early)	6.00	1	6.32	37	294	3.40	23.59	65
3. DRR Dhan 60	5.17	7	8.84	38	312	2.56	14.22	86
4. DRR Dhan 42 (Mid early)	5.74	2	7.55	40	288	3.31	26.32	69
5. Vandana (rainfed upland)	2.96	13	4.89	37	193	3.05	25.78	55
6. Anjali	3.99	12	5.30	38	241	3.31	25.57	56
7. Varalu (Upland-western zone)	4.77	11	6.98	37	287	3.09	20.46	76
8. IRRI 1	5.59	4	6.60	37	305	3.10	25.87	69
9.IRRI 2	5.56	5	6.52	39	249	4.00	22.74	71
10. IRRI 3	5.06	8	6.78	40	291	3.12	24.80	70
11.LC 1	4.99	9	5.98	36	264	3.46	24.58	71
12. LC 2	5.32	6	6.08	36	284	3.28	21.80	71
13. LC 3	4.82	10	6.44	37	262	3.24	26.75	70
C.D. (0.05)	0.49		0.62	4.21	18.77	0.44	1.05	0.97
C.V. (%)	5.71		5.62	6.59	4.12	7.84	2.63	0.83
res(t)	**		**	NS	**	**	**	**
Expt. Mean	5.05		6.53	38	271	3.36	23.62	69
Soil type	Clay							
pH	7.6							
EC	0.58							
Applied NPK kg/ha	120:60:40							
Available NPK kg/ha	218:30:398							

11. Local Check 1(CR DHAN 201)
12. Local Check 2(CR DHAN 202)
13. Local Check 3(RATNA)

Table 4.2.3b: Contd.

Cultivars	MANDYA								
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m2 (20DAS)	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days for 50% flowering	Cost of cultivation Rs/ha
1. DRR Dhan 44 (early)	5.79	9	8.82	61	353	5.05	24.27	78	55992
2. Sabhagidhan (very early)	6.34	6	8.54	58	384	3.82	24.39	70	56137
3. DRR Dhan 60	6.24	7	8.74	55	378	2.82	16.07	86	56192
4. DRR Dhan 42 (Mid early)	6.73	3	9.36	57	397	3.76	29.09	77	56798
5. Vandana (rainfed upland)	4.58	11	7.61	58	331	3.01	26.99	59	54670
6. Anjali	4.98	10	9.14	54	344	4.08	27.38	68	55721
7. Varalu (Upland-western zone)	6.68	4	9.63	60	412	4.35	21.24	78	56920
8. IRRI 1	7.15	1	8.83	58	423	3.88	26.50	78	56737
9.IRRI 2	7.04	2	9.06	60	404	4.73	25.87	80	56805
10. IRRI 3	5.95	8	9.09	57	373	5.12	24.64	78	56227
11.LC 1	6.58	5	9.18	59	378	5.38	21.45	76	56623
12. LC 2									
13. LC 3									
C.D. (0.05)	0.94		1.56	7.12	54.51	0.70	2.22	3.85	1259
C.V. (%)	8.89		10.31	7.24	8.43	9.84	5.36	3.01	1.31
res(t)	**		NS	NS	*	**	**	**	*
Expt. Mean	6.19		8.91	58	380	4.18	24.35	75	56257
Soil type	Red sandy loam								
pH	7.63								
EC	0.29								
Applied NPK kg/ha	100:50:50								
Available NPK kg/ha	274:81:263								

V11. Local check 1 KMP 175

Table 4.2.3b: Contd.

Cultivars	NAWAGAM							
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m2 (20DAS)	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days for 50% flowering
1. DRR Dhan 44 (early)	4.83	8	5.23	38	148	2.54	22.00	77
2. Sabhagidhan (very early)	5.40	1	5.62	38	136	2.67	21.03	65
3. DRR Dhan 60	3.89	11	4.32	48	163	2.58	13.83	81
4. DRR Dhan 42 (Mid early)	5.06	3	5.37	45	158	3.20	25.23	72
5. Vandana (rainfed upland)	4.28	10	4.57	41	143	2.61	26.07	57
6. Anjali	4.92	7	5.27	46	128	3.09	26.70	59
7. Varalu (Upland-western zone)	5.03	4	4.88	45	153	3.17	21.50	72
8. IRRI 1	4.98	6	5.46	40	136	2.47	23.87	71
9.IRRI 2	5.22	2	5.60	45	142	2.95	22.60	78
10. IRRI 3	5.03	5	5.53	41	140	3.41	23.87	77
11.LC 1	4.72		5.36	41	158	3.56	17.80	83
12. LC 2								
13. LC 3								
C.D. (0.05)	0.68		0.77	8.76	19.56	0.49	3.07	2.24
C.V. (%)	7.95		8.56	12.09	7.87	9.91	8.10	1.82
res(t)	*		*	NS	*	**	**	**
Expt. Mean	4.85		5.20	43	146	2.93	22.23	72
Soil type	Clay							
pH	7.57							
EC	0.88							
Applied NPK kg/ha	100:25:00:25							
Available NPK kg/ha	203:85:284							

V11. Local check 1 Mahisagar 120 days

Table 4.2.3b: Contd.

Cultivars	NAWAGAM Contd.				
	Weed population (no/m^2)		Weed biomass (g/m^2)		Cost of cultivation Rs/ha
	At active tillering	At panicle initiation	At active tillering	At panicle initiation	
1. DRR Dhan 44 (early)	77.67(8.71)	96.00(9.70)	29.48	31.46	42799
2. Sabhagidhan (very early)	56.67(7.36)	82.00(8.98)	20.11	25.04	42765
3. DRR Dhan 60	65.00(7.94)	87.33(9.28)	24.06	28.09	42907
4. DRR Dhan 42 (Mid early)	58.33(7.46)	95.67(9.73)	22.26	39.26	42767
5. Vandana (rainfed upland)	61.33(7.54)	90.33(9.49)	24.47	36.86	42813
6. Anjali	68.00(8.13)	89.67(9.33)	26.12	36.03	42783
7. Varalu (Upland-western zone)	69.67(8.19)	84.67(9.11)	25.99	30.77	42823
8. IRRI 1	72.67(8.40)	97.00(9.75)	26.11	33.16	42763
9.IRRI 2	67.67(8.17)	85.67(9.20)	23.89	29.98	42794
10. IRRI 3	80.00(8.88)	89.67(9.32)	30.84	34.07	42789
11.LC 1	66.00(7.95)	82.33(9.03)	25.65	29.35	36837
12. LC 2					
13. LC 3					
C.D. (0.05)	3.51	2.99	21.61	22.03	5335
C.V. (%)	25.54	18.76	50.02	40.19	7.41
res(t)	NS	NS	NS	NS	NS
Expt. Mean	8.07	9.36	25	32	42258
Soil type					
pH					
EC					
Applied NPK kg/ha					
Available NPK kg/ha					

V11. Local check 1 Mahisagar 120 days

Table 4.2.3b: Contd.

Cultivars	PUDUCHERRY						
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m2 (20DAS)	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)
1. DRR Dhan 44 (early)	5.20	5	7.69	43	221	3.89	26.9
2. Sabhagidhan (very early)	5.04	6	7.46	42	210	2.32	20.23
3. DRR Dhan 60	5.03	7	7.34	40	261	2.09	16.51
4. DRR Dhan 42 (Mid early)	5.81	1	8.68	48	284	4.31	27.7
5. Vandana (rainfed upland)	4.86	9	7.03	36	203	1.95	29.16
6. Anjali	4.92	8	7.12	39	205	2.57	29.22
7. Varalu (Upland-western zone)	5.61	2	8.27	46	259	4.29	20.9
8. IRRI 1	5.42	4	8.12	44	228	2.76	25.93
9.IRRI 2	5.59	3	8.36	45	229	3.87	25.52
10. IRRI 3	4.78	10	7.07	36	228	2.43	26.22
11.LC 1	4.64	12	6.90	35	257	2.83	15.81
12. LC 2	4.71	11	6.99	35	249	2.17	19.85
13. LC 3							
C.D. (0.05)	0.21		0.28	0.49	20.1	0.06	0.47
C.V. (%)	2.34		2.22	0.71	5.03	1.12	1.17
res(t)	**		**	**	**	**	**
Expt. Mean	5.14		7.58	41	236	2.96	23.66
Soil type	Clay Loam						
pH	6.82						
EC	0.13						
Applied NPK kg/ha	120:40:40						
Available NPK kg/ha	157:31:125						

V11. Local check 1 ADT 56

V12. Local check 1 ADT 58

Table 4.2.3b: Contd.

Cultivars	PUDUCHERRY Cntd.					Over all Mean	Rank
	Weed population (no/m^2)		Weed biomass (g/m^2)		Cost of cultivation Rs/ha		
	At active tillering	At panicle initiation	At active tillering	At panicle initiation			
1. DRR Dhan 44 (early)	70.93(8.45)	49.42(7.06)	26.95	18.90	57135	5.38	6
2.Sabhagidhan (very early)	72.48(8.54)	51.83(7.23)	27.54	19.56	57135	5.69	4
3. DRR Dhan 60	75.50(8.72)	58.45(7.68)	28.69	22.14	57135	5.08	9
4. DRR Dhan 42 (Mid early)	58.97(7.71)	33.32(5.81)	22.40	12.65	57135	5.83	2
5. Vandana (rainfed upland)	80.53(9.00)	66.10(8.16)	30.60	25.24	57135	4.17	13
6. Anjali	77.51(8.83)	61.81(7.89)	29.45	23.63	57135	4.70	12
7. Varalu (Upland-western zone)	61.41(7.87)	36.93(6.12)	23.33	14.04	57135	5.52	5
8. IRRI 1	68.12(8.28)	45.60(6.79)	25.88	17.41	57135	5.79	3
9.IRRI 2	65.00(8.09)	40.54(6.41)	24.70	15.54	57135	5.85	1
10. IRRI 3	83.09(9.14)	69.20(8.35)	31.57	26.55	57135	5.21	8
11.LC 1	88.00(9.41)	76.57(8.78)	33.43	29.31	57135	5.23	7
12. LC 2	84.00(9.19)	71.53(8.49)	31.91	27.18	57135	5.02	10
13. LC 3						4.82	11
C.D. (0.05)	0.2	0.04	1.31	0.7	6.74		
C.V. (%)	1.38	0.34	2.77	1.98	0.01		
res(t)	**	**	**	**	NS		
Expt. Mean	8.6	7.4	28.04	21.01	57135	5.31	
Soil type							
pH							
EC							
Applied NPK kg/ha							
Available NPK kg/ha							

V11. Local check 1 ADT 56
V12. Local check 1 ADT 58

Table 4.2.3b: Contd.

Cultivars	BANKURA									
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m2 (20DAS)	Panicle/m^2 (No.)	Test wt (g)	Days for 50% flowering	Dry matter accumulation (g/m^2)		
								at 45 DAS	at 75 DAS	at 105 DAS
V1. Dhiren (Long duration)	6.48	1	7.82	87.25	330	22.85	104.75	28.4	608.5	1046.0
V2. Dhruba (Long Duration)	6.04	2	7.3	84.25	318.5	22.75	102.5	25.9	584.7	1037.1
V3. IET 23640 (Long Duration)	5.43	4	6.68	82.25	298.25	24.3	102.75	25.2	565.9	981.6
V4. IET 23135 (Long Duration)	5.73	3	7.03	82.25	305.5	24.08	102.25	25.7	566.6	959.5
V5. MTU 7029 (Swarna) (Check)	5.24	5	6.38	78.25	302.75	18.9	106.5	23.0	546.5	899.0
C.D. (0.05)	0.72		0.67	3.38	9.85	0.21	1.65	1.6	8.24	20.55
C.V. (%)	8.06		6.22	2.64	2.06	0.59	1.03	4.05	0.93	1.35
res(t)	*		*	*	**	**	**	**	**	**
Expt. Mean	5.78		7.04	82.85	311	22.58	103.75	25.6	574.4	984.6
Soil type	Sandy loam									
pH	-									
EC	-									
Applied NPK kg/ha	80:40:40									
Available NPK kg/ha	-									

Table 4.2.3b: Contd.

Cultivars	PATTAMBI										
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m2 (20DAS)	Panicle/m^2 (No.)	Panicle wt (g)	Weed population (no/m^2)		Weed biomass (g/m^2)		Cost of cultivation Rs/ha
							At active tillering	At panicle initiation	At active tillering	At panicle initiation	
V1. Aiswarya (check)	2.63	2	5.07	32	297	7.83	112.00(10.59)	21.67(4.66)	38.67	25.67	68350
V2. Uma	3.84	1	9.60	43	306	9.83	86.33(9.29)	26.33(5.15)	44.00	28.67	70120
V3. Sreyas	2.53	3	6.15	40	392	9.33	278.00(16.68)	22.67(4.73)	87.33	18.67	68900
V4. Jyothi	1.93	5	4.27	41	212	12.17	221.00(14.87)	19.33(4.42)	61.33	9.33	71000
V5. Prathyasa	2.17	4	7.56	46	280	12.17	127.67(11.32)	44.33(6.69)	38.67	44.33	69620
V6. Pournami	1.80	6	3.99	37	341	9.17	0.00(0.71)	6.67(2.65)	0.00	2.67	70460
C.D. (0.05)	0.52		1.21	12.43	125.23	1.90	0.94	1.22	19.78	15.41	
C.V. (%)	11.53		10.89	17.14	22.60	10.36	4.86	14.20	24.16	39.31	
res(t)	**		**	NS	NS	**	**	**	**	**	
Expt. Mean	2.48		6.10	40	305	10.08	10.58	4.72	45.00	21.56	
Soil type	-										
pH	-										
EC	-										
Applied NPK kg/ha	-										
Available NPK kg/ha	-										

RICE BASED CROP DIVERSIFICATION SYSTEM TRIALS

4.3 RICE BASED CROP DIVERSIFICATION SYSTEM TRIALS (RBCDTs)

4.3.1. Conversation Agriculture/system based management practices in rice and rice-based cropping systems (crop diversification) for higher profitability

Conservation agriculture is the farming system that can prevent losses of aerable land while regenerating degraded lands. It is the production of crops with the aim of reducing excessive mixing of the soil and maintain crop residues on the soil surface to minimize damage to the environment. **The three principles** of CA are: minimum tillage and soil disturbance, permanent soil cover with crop residues as live mulches and crop rotation and intercropping.

Among the various cropping systems being practiced in India, Rice-based cropping systems is considered to be the most important because of its large area coverage and contribution to overall food grain production. Transplanting is the most dominant and traditional method of establishment in irrigated lowland rice. However, due to the non-availability of irrigation water, shortage of labour during the peak period of transplanting and escalating labour costs make the transplanting technique more expensive which invariably leads to delay in transplanting and resulting in a reduction of yield. Crop residue especially Rice-Straw containing about 1-2% of 'K' a good source of nutrient especially for intensively cropped soils. Residue incorporation is known to help *Rabi* crops in rice-based cropping systems. To address this problem, alternate methods of crop establishment need to be evolved to substitute manual transplanting methods under various agro-ecologies. Hence, this trial was initiated to evaluate systems of rice crop establishment under different residue management during 2017 and continued in *Kharif* 2023, to realize the production potential of alternate systems of crop establishment under different residue retention.

The trial was laid out in split-plot design during *Kharif* 2023 at four locations continued at **Karjat, Vadagaon** and **Titabar** to assess the effect of different crop establishment methods under various residue/straw management practices. Main plot treatments comprised of three different crop establishment methods (M_1: Transplanting, M_2: Wet seeding (line sowing under puddled conditions) and M3: Aerobic rice – Dry rice cultivation). The subplot treatments comprised of two different tillage practices (S_1Conventional tillage, S_2: Minimum tillage) to be superimposed for *Rabi* crops during rabi season. The results are summarized and presented in Table 4.4.1 and the salient findings are summarized below.

Wet season 2023

Crop establishment methods influenced the grain yield significantly at all locations. At **Karjat**, results revealed that $M_{1:}$ Transplanting of rice recorded significantly higher yield attributes and grain yield (4.65 t/ha) as compared to other crop establishment methods (3.84 to 4.29 t/ha). Similarly, the grain yields were higher at **Vadagaon** (5.57 t/ha) and **Titabar** (4.25 t/ha) during Kharif 2023. The results are in accordance to earlier two *Kharif* seasons. The transplanting method showed superiority in minimizing the weed population and weed dry biomass at 30 and 60 DAS over wet seeding at most of the locations and recorded better yields. Among the tillage management practices, conventional tillage practice gave better yields of

5.56 t/ha over minimum tillage (5.27 t/ha) at **Vadagoan,** with significant reduction in weed population and weed dry matter. Similar trend of the higher grain yield with conventional tillage (3.98 t/ha) was found over minimum tillage at **Titabar** also.

The system productivity analysis (Kharif and rabi) indicated the superiority of transplanting at **Karjat** (7.66 t/ha) and **Vadagaon** (7.81 t/ha). The tillage system S-1 conventional tillage found promising at **Karjat** with higher yiled (5.40 t/ha).

The REY of the system productivity indicated superiority of the conventional tillage system with transplanting at both **Karjat** and **Vadagaon** with higher rice equivalent system (7.66 and 7.81 t/ha).

Table 4.3.1(R): Conservation Agriculture/System based management practices in rice and rice-based cropping systems (crop diversification) for higher profitability (Interdisciplinary with Entomology and Pathology) Rabi 2022-23.

Crop Establishment Methods	Sub plots	Sub-Sub plot	KARJAT													
			Kharif 2022 Rice	Grain Yield (t/ha) Rb 22-23 Systems	Straw Yield (t/ha)	Days to 50% flowering	Test weight (g)	Weed population at 30DAS (no/m2)	Transformed	Weed population at 60DAS (no/m2)	Transformed	Weed dry weight at 30DAS (g/m2)	Weed dry weight at 60 DAS (no/m2)	Cost of cultivation (Rs./ ha)	REY	REY (K + R)
M1: Transplanting	S1- Conventional tillage	C1	4.68	4.08	4.57	63.67	185.7	15.32	4.03	18.02	4.31	5.59	4.48	156260	3.93	8.61
		C2		1.07	1.62	45.67	2.4	16.56	4.17	19.57	4.40	3.68	4.97	136320	2.99	7.67
		C3		2.57	2.27	53.00	30.1	9.22	3.19	13.36	3.74	3.69	4.54	154150	2.81	7.49
		C4		1.35	0.92	58.67	146.2	14.62	3.95	15.47	4.04	3.46	3.86	146002	3.54	8.22
	S2-Minimum tillage	C1		3.13	3.42	61.67	184.6	35.73	6.00	16.16	4.13	9.11	5.30	152560	3.01	7.69
		C2		0.95	1.41	46.00	2.1	27.40	5.25	18.93	4.46	6.56	5.96	132620	2.67	7.35
		C3		1.78	1.91	53.67	28.7	18.88	4.45	25.86	5.18	12.06	22.00	149850	1.95	6.63
		C4		1.12	0.87	57.33	145.3	20.84	4.62	17.63	4.31	8.58	12.71	143202	2.95	7.63
M2: Wet seeding (Line sowing under puddle condition)	S1- Conventional tillage	C1	4.34	3.99	4.47	65.33	185.6	27.27	5.29	15.35	4.01	9.51	6.84	145764	3.85	8.19
		C2		1.04	1.57	46.33	2.4	20.79	4.64	14.62	3.93	4.36	4.57	125824	2.93	7.27
		C3		2.55	2.25	53.00	29.6	20.19	4.44	21.07	4.65	12.92	13.99	143654	2.79	7.13
		C4		1.25	0.91	59.33	145.4	17.10	4.23	10.54	3.40	12.95	2.37	135506	3.28	7.62
	S2-Minimum tillage	C1		3.00	3.29	63.00	184.5	43.03	6.60	22.80	4.88	10.14	13.34	142064	2.90	7.24
		C2		0.93	1.34	44.00	2.1	29.01	5.45	24.22	5.01	5.49	7.03	122124	2.61	6.95
		C3		1.67	1.50	52.67	28.5	22.82	4.85	27.79	5.35	19.49	17.64	139354	1.83	6.17
		C4		1.11	0.81	58.33	145.1	26.05	5.12	21.62	4.75	8.84	11.31	132706	2.92	7.26
M3: Aerobic rice - Dry rice cultivation	S1- Conventional tillage	C1	3.98	3.97	4.45	63.67	185.2	29.01	5.31	18.06	4.34	8.20	8.15	145864	3.83	7.81
		C2		0.97	1.56	45.67	2.3	22.94	4.88	21.97	4.75	4.69	9.82	125924	2.73	6.71
		C3		2.50	2.19	52.33	29.4	26.92	5.13	22.19	4.81	9.21	7.14	143754	2.74	6.72
		C4		1.20	0.89	56.67	145.1	31.86	5.70	16.83	4.21	6.05	11.38	135606	3.14	7.12
	S2-Minimum tillage	C1		2.98	3.26	63.67	184.3	34.54	5.95	25.49	5.14	15.56	13.14	142164	2.87	6.85
		C2		0.92	1.29	43.67	2.1	22.70	4.84	30.89	5.61	8.95	18.72	122224	2.59	6.57
		C3		1.59	1.31	52.00	28.1	29.44	5.41	29.85	5.51	24.10	14.68	139454	1.74	5.72
		C4		1.02	0.78	58.67	144.9	21.73	4.63	22.01	4.78	9.82	13.60	132806	2.68	6.66

Table 4.3.1(R): Contd.

Crop Establishment Methods / Sub plots / Sub-Sub plot	KARJAT													
	Kharif 2022 Rice	Grain Yield (t/ha) Rb 22-23 Systems	Straw Yield (t/ha)	Days to 50% flowering	Test weight (g)	Weed population at 30DAS (no/m2)	Transformed	Weed population at 60DAS (no/m2)	Transformed	Weed dry weight at 30DAS (g/m2)	Weed dry weight at 60 DAS (no/m2)	Cost of cultivation (Rs./ ha)	REY	REY (K + R)
Mean of methods														
M1	4.68	2.00	2.12	54.96	90.63	19.82	4.46	18.12	4.32	6.59	7.98	146371	2.98	7.66
M2	4.34	1.94	2.02	55.25	90.40	25.78	5.08	19.75	4.50	10.46	9.64	135875	2.89	7.23
M3	3.98	1.89	1.97	54.54	90.18	27.39	5.23	23.41	4.89	10.83	12.08	135975	2.79	6.77
C.D.		NS	NS	0.514	NS		0.56		0.43	3.1	1.96			
SE(m)		0.05	0.11	0.132	0.3		0.14		0.11	0.82	0.5			
Mean of sub plot														
S1-Conventional tillage		2.21	2.31	55.28	90.79	20.98	4.58	17.25	4.21	7.03	6.84	141219	3.21	7.55
S2-Minimum tillage		1.68	1.77	54.56	90.03	27.68	5.26	23.60	4.93	11.56	12.95	137594	2.56	6.89
C.D.		0.16	0.28	0.571	0.728		0.4		0.27	2.19	3.14			
SE(m)		0.05	0.08	0.166	0.211		0.12		0.08	0.63	0.91			
Mean of sub plot														
C1-Maize		3.53	3.91	63.50	185.0	30.82	5.53	19.31	4.47	9.69	8.54	147446	3.40	7.73
C2-Mustard		0.98	1.47	45.22	2.2	23.23	4.87	21.70	4.69	5.62	8.51	127506	2.75	7.09
C3-Wheat		2.11	1.90	52.78	29.1	21.24	4.58	23.35	4.87	13.58	13.33	145036	2.31	6.64
C4-Chickpea		1.17	0.86	58.17	145.3	22.03	4.71	17.35	4.25	8.29	9.20	137638	3.09	7.42
C.D.		0.17	0.27	0.794	1.379		0.63		0.4	4.27	3.74			
SE(m)		0.06	0.01	0.277	0.481		0.22		0.14	1.49	1.3			
Interaction														
Interaction A X B		NS	NS	NS	NS		0.67		NS	NS	NS			
Interaction A X C		NS	NS	NS	NS		NS		NS	NS	NS			
Interaction B X C		0.24	0.39	NS	NS		NS		NS	NS	NS			
Interaction A X B X C		NS	NS	NS	NS		NS		NS	NS	NS			

Maize MSP 1870/q
Mustard MSP 5450/q
Wheat MSP 2125/q
Chickpea MSP 5100/q

Table 4.3.1(R): Contd.

Crop Establishment Methods	Sub plots	Sub-Sub plot	VADAGAON				Over all mean	Rank
			Kharif 2022	Grain Yield (t/ha) Rabi 22-23 Systems	REY	REY (K + R)		
M1: Transplanting	S1-Conventional tillage	C1	5.54	1.03	2.85	8.39	2.56	1
		C2		0.97	2.76	8.30	1.02	19
		C3		0.62	1.73	7.27	1.59	7
		C4		1.74	1.91	7.45	1.54	9
	S2-Minimum tillage	C1	5.33	1.09	2.99	8.32	2.11	4
		C2		1.03	2.91	8.24	0.99	20
		C3		0.65	1.83	7.16	1.22	16
		C4		1.83	2.01	7.34	1.48	11
M2: Wet seeding (Line sowing under puddle condition)	S1-Conventional tillage	C1	5.38	0.96	2.65	8.03	2.48	2
		C2		0.91	2.57	7.95	0.97	21
		C3		0.57	1.61	6.99	1.56	8
		C4		1.62	1.77	7.15	1.43	12
	S2-Minimum tillage	C1	5.07	1.01	2.79	7.86	2.01	5
		C2		0.95	2.70	7.77	0.94	22
		C3		0.60	1.70	6.77	1.14	17
		C4		1.70	1.87	6.94	1.41	13
M3: Aerobic rice - Dry rice cultivation	S1-Conventional tillage	C1	5.27	0.91	2.50	7.77	2.44	3
		C2		0.86	2.43	7.70	0.91	23
		C3		0.54	1.53	6.80	1.52	10
		C4		1.53	1.68	6.95	1.36	14
	S2-Minimum tillage	C1	4.98	0.96	2.64	7.62	1.97	6
		C2		0.90	2.56	7.54	0.91	24
		C3		0.57	1.61	6.59	1.08	18
		C4		1.61	1.77	6.75	1.32	15

Table 4.3.1(R): Contd.

Crop Establishment Methods	Sub plots	Sub-Sub plot	VADAGAON				Over all mean	Rank
			Kharif 2022	Grain Yield (t/ha) Rabi 22-23	REY	REY (K + R)		
Mean of methods								
M1			5.44	1.12	2.37	7.81	1.56	1
M2			5.23	1.04	2.21	7.43	1.49	2
M3			5.13	0.99	2.09	7.21	1.44	3
C.D.				0.008				
SE(m)				0.002				
Mean of sub plot								
S1-Conventional tillage			5.40	1.02	2.17	7.56	1.62	1
S2-Minimum tillage			5.13	1.08	2.28	7.41	1.38	2
C.D.				0.002				
SE(m)				0.001				
Mean of sub ub plot								
C1-Gram				0.99	2.73	8.00	2.26	1
C2-Lentil				0.94	2.65	7.92	0.96	4
C3-Mustard				0.59	1.67	6.93	1.35	3
C4-Wheat				1.67	1.83	7.09	1.42	2
C.D.				0.05				
SE(m)				0.02				
Interaction								
Interaction A X B				NS				
Interaction A X C				NS				
Interaction B X C				0.24				
Interaction A X B X C				NS				

Gram MSP 5335/q
Lentil MSP 5500/q
Mustard MSP 5450/q
Wheat MSP 2125/q

Table 4.3.1(K): Contd.

Main Methods	KARJAT Kharif 2023											Over all mean	Rank
	Grain Yield (t/ha)	Straw Yield (t/ha)	Panicle/m2 (No.)	Panicle weight (g)	Test weight (g)	Days 50% flowering	Weed population at 30 DAS (No/m2)	Weed population at 60 DAS (No/m2)	Weed Dry wt at 30 DAS (g/m2)	Weed Dry wt at 60 DAS (g/m2)	Cost of cultivation (Rs/ha)		
M1- Transplanting	4.65	6.47	299	2.55	24.73	93	17.12(4.20)	16.18(4.08)	5.56	7.13	102482	4.65	1
M2- Wet seeding (Line sowing under puddle condition)	4.29	5.88	291	2.43	23.56	90	22.28(4.76)	17.64(4.26)	8.82	8.62	91741	4.29	2
M3- Aerobic rice - - Dry rice cultivation	3.84	5.37	286	2.35	23.39	92	23.67(4.91)	20.91(4.63)	9.13	10.80	91841	3.84	3
Exp. mean	4.26	5.91	292	2.44	23.89	91	4.62	4.32	7.83	8.85		4.26	
CD(0.05)	0.19	0.27	NS	NS	0.63	0.39	0.28	0.26	1.73	1.13			
CV	3.10	3.10	9.67	5.89	1.81	0.29	4.20	4.08	15.26	8.78			
Variety	-												
Soil type	-												
pH	-												
RDF N:P:K (kg/ha)	100:50:50												
Aval. NPK of soil (kg/ha)	-												

Table 4.3.1(K): Contd.

Main plot	Sub plots	VADAGAON Kharif 2023											
		Grain Yield (t/ha)	Straw yield (t/ha)	Panicle/m 2 (No.)	Panicle weight (g)	Days for 50% flowering	Dry matter accumulatio n 45 DAS (g/m2)	Dry matter accumulatio n 75 DAS (g/m2)	Dry matter accumulatio n 105 DAS (g/m2)	Weed population at 30 DAS (No/m2)	Weed population at 60 DAS (No/m2)	Weed Dry wt at 30 DAS (g/m2)	Weed Dry wt at 60 DAS (g/m2)
M1- Transplanting	S1	5.67	6.07	274	3.69	97.01	311.85	734.72	968.6	6.82(2.69)	8.31(2.96)	9.55	11.63
	S2	5.48	5.86	267	3.56	96.69	301.37	710.02	936.05	8.52(2.99)	10.38(3.29)	11.93	17.02
M2- Wet seeding	S1	5.54	5.91	270	3.6	96.74	304.96	718.48	947.2	9.43(3.15)	12.00(3.53)	13.68	17.39
	S2	5.23	5.53	252	3.4	97.34	287.39	677.1	892.65	11.79(3.50)	14.99(3.93)	17.57	22.34
M3- Aerobic rice	S1	5.46	5.8	262	3.55	96.36	300.08	706.99	932.05	10.80(3.35)	13.50(3.74)	16.09	20.11
	S2	5.11	5.47	239	3.32	96.69	281.32	662.79	873.78	13.50(3.73)	16.87(4.16)	20.11	25.14
Mean of main plots													
M1		5.57	5.96	270	3.62	96.85	306.61	722.37	952.32	7.67(2.84)	9.34(3.12)	10.74	14.33
M2		5.39	5.72	261	3.5	97.04	296.18	697.79	919.92	10.61(3.33)	13.49(3.73)	15.62	19.87
M3		5.29	5.63	251	3.44	96.52	290.7	684.89	902.91	12.15(3.54)	15.18(3.95)	18.1	22.62
C.D.(0.05)		0.06	0.08	2.78	0.04	NS	3.09	7.29	9.61	0.17	0.13	1.52	1.06
C.V.(%)		1.01	1.28	1.04	1.01	1.39	1.01	1.01	1.01	5.23	3.45	10.03	5.44
Mean of Sub plots													
S1-Conventional tillage		5.56	5.92	268.77	3.61	96.7	305.63	720.06	949.28	9.02(3.06)	11.27(3.41)	13.1	16.38
S2-Minimum tillage		5.27	5.62	252.9	3.43	96.91	290.03	683.3	900.82	11.27(3.41)	14.08(3.79)	16.54	21.5
C.D.(0.05)		0.06	0.07	2.96	0.04	NS	3.4	8	10.55	0.03	0.03	0.53	1.97
C.V. (%)		0.99	1.11	0.98	0.99	0.73	0.99	0.99	0.99	0.79	0.64	3.09	9.03
Interaction													
N at same V		NS	NS	5.12	NS	NS	NS	NS	NS	NS	0.05	0.92	NS
V at same N		NS	NS	3.87	NS	NS	NS	NS	NS	NS	0.09	1.21	NS
Expt. Mean		5.42	5.77	260.84	3.52	96.8	297.83	701.68	925.05	3.23	3.6	14.82	18.94
Variety		Phule Samruddhi 125 days											
Soil type		-											
pH		7.78											
RDF N:P:K (kg/ha)		100:50:50											
Aval. N:P:K of soil (kg/ha)		200:18:24 7											

S1-Conventional tillage
S2-Minimum tillage

Table 4.3.1(K): Contd.

Main plot	Sub plots	TITABAR Kharif 2023							Over all mean	Rank
		Grain Yield (t/ha)	Panicle/m2 (No.)	Panicle weight (g)	Test weight (g)	Days for 50% flowering	Weed population at 30 DAS (No/m2)	Weed population at 60 DAS (No/m2)		
M1-Transplanting	S1	4.40	247	4.87	26.67	106	42.00(6.51)	51.00(7.17)	5.04	1
	S2	4.10	239	4.63	25.63	105	45.00(6.74)	61.33(7.86)	4.79	3
M2- Wet seeding	S1	4.17	259	4.37	28.07	105	42.00(6.52)	49.67(7.07)	4.86	2
	S2	4.00	249	4.03	28.33	105	40.67(6.40)	40.00(6.35)	4.62	4
M3- Aerobic rice	S1	3.37	238	4.20	25.50	104	55.00(7.45)	69.67(8.37)	4.42	5
	S2	3.10	226	3.57	19.97	103	41.33(6.46)	57.67(7.62)	4.11	6
Mean of main plots										
M1		4.25	243	4.75	26.15	105	43.50(6.63)	56.17(7.52)	4.91	1
M2		4.08	254	4.20	28.20	105	41.33(6.46)	44.83(6.71)	4.74	2
M3		3.23	232	3.88	22.73	104	48.17(6.96)	63.67(8.00)	4.26	3
C.D.(0.05)		0.30	NS	0.17	NS	NS	NS	0.54		
C.V.(%)		7.47	7.06	3.80	14.13	1.50	6.31	7.09		
Mean of Sub plots										
S1-Conventional tillage		3.98	248	4.48	26.74	105	46.33(6.83)	56.78(7.54)	4.77	1
S2-Minimum tillage		3.73	238	4.08	24.64	104	42.33(6.54)	53.00(7.27)	4.50	2
C.D.(0.05)		0.14	NS	0.09	NS	NS	0.29	NS		
C.V. (%)		3.12	3.91	1.91	7.79	1.27	3.73	5.44		
Interaction										
N at same V		NS	NS	0.16	NS	NS	0.50	0.80		
V at same N		NS	NS	0.16	NS	NS	0.44	0.64		
Expt. Mean		3.86	242.94	4.28	25.69	104.61	6.68	7.41	4.64	
Variety		-								
Soil type		-								
pH		-								
RDF N:P:K (kg/ha)		60:20:40								
Aval. N:P:K of soil (kg/ha)		269:14"163								

S1-Conventional tillage
S2-Minimum tillage

4.3.2 Assessing the performance and yielding ability of Sorghum hybrids in Rice fallows

Kharif data was reported by only one center **Jagdalpur**, none of the centers reported the soughum hybrids data. Since, the trial is about the sorghum hybrids in rice fallows the report could not be made.

4.3.2. Long term trial on weed dynamics in rice based cropping systems under different establishment methods *Kharif 2023*

Weeds are endemic in crops and a constant problem in crop production because of their dynamic nature. Despite modern control practices aimed at weed elimination, weed continues to be a ubiquitous and recurrent threat for crop production due to its ability to shift in response to management practices and environmental conditions. Further, long term continuous use of selective herbicides in rice may cause a shift in weed flora, from annuals to perennials, which are difficult to control. With these aspects in view, a long term trial (semi permanent) plot initiated during *Kharif* 2020 has been continued during *Kharif* season 2023 with the objective of assessing the weed dynamics in different establishment methods, and was conducted at 16 locations viz., **Aduthurai, Chatha, Chiplima, Ghaghraghat, Jagdalpur, Karaikal Malan, Moncompu, Nagina, Nawagam, Pantnagar, Pusa, Puducherry, ARI-Rajendranagar, Titabar** and **Varanasi** in replicated split plot design. **Gangavathi, Pattambi** locations have not reported weed information. No information from seven locations viz., **Chinsurah, Coimbatore**, **NRRI-Cuttack, Parbhani, Ranchi, Rewa, &Tuljapur**.The treatments consisted of 3 main plots M1 – Mechanised planting or hand transplanting, M2 – Puddled direct seeding, M3 – Unpuddled dry direct seeding and three sub plots S1 – Weedy check, S2 – Mechanical weeding using weeder and S3 – Chemical weed control *(Herbicide recommendation of respective University). The data on crop growth parameters, yield attributes, grain yield and weed parameters viz., weed population and weed biomass recorded by the test locations are summarized after statistical analyses and presented in **Tables 4.3.3.**

The weed flora reported in the test locations

Grasses: *Cynodon dactylon, Echinochloa colona, Echinochloa crusgalli, Isachne miliacea, , Leptochloa chinensis, Panicum repens.*

Sedges: *Cyperus difformis, Cyperus iria, Cyperus rotundus, Fimbristylis miliacea.*

BLW: *Ammania baccifera, Alternanthera spp, Bergia capensis, Caesulia axillaris, Eclipta alba, Euphorbia prostrata, Hydrolea zeylanica, Lindernia spp, Ludwigia hyssopifolia, Marselia quadrifolia, Monochoria vaginalis, Sphaeranthus indicus.*

Weed population

The Genus and Species wise weed population was reported by 12 locations viz., **Aduthurai, Chatha, Chiplima, Jagdalpur, Karaikal, Malan**, **Moncompu, Nawagam, Pantnagar, Pusa, Titabar** and **Varanasi** (Table-4.3.3) and the efforts in deriving weed shifts in changing establishment methods are appreciable. Weed population showed progressive increase from active tillering stage to panicle initiation stage. The data on relative dominance of group wise weeds (Table 4.3.3) was worked out at active tillering stage and panicle initiation stage and reported by nine locations viz., **Aduthurai, Chatha, Jagdalpur, Malan, Moncompu, Nawagam, Pantnagar, Pusa and Varanasi**. At Active Tillering stage, the common and prevalent group wise weed population is in the order of Grasses > Sedges > Broad

Leaf Weeds (BLW) at **Chatha, Malan** and **Nawagam;** whereas Grasses > BLW > Sedges at **Aduthurai**, **Jagdalpur**; Sedges > Grasses > BLW at **Moncompu, Pantnagar** and **Varanasi,** indicating the increase in BLW and Sedge groups population, shift within the Grass group. At Panicle Initiation stage, dominance of Grasses > Sedges > Broad Leaf Weeds (BLW) at **Chatha, Nawagam;** Grasses > BLW > Sedges at **Malan, Pusa**; Sedges > Grasses > BLW at **Jagdalpur, Moncompu, Pantnagar**; BLW> Grasses > Sedges at **Karaikal,** indicating the shift from Grasses to Sedges at **Jagdalpur** and from Sedges to BLW at **Malan.**

Table: The location wise dominant weeds based on analysis of Genus and species wise weed population at Critical crop stages

Centre	Groups	Active Tillering Stage	Panicle Initiation Stage
		Species	Species
Aduthurai	**Grasses**	*Echinochloa colona, Cynodon dactylon, Leptochloa chinensis, Echinochloa crusgalli, Panicum repens*	-
Chatha		*Echinochloa Spp, Dactylactenium aegyptium, Cynodon dactylon*	*Echinochloa Spp, Dactylactenium aegyptium, Eleusine indica*
Chiplima		*Echinochloa colona, Echinochloa crusgalli,Ischaemum rugosum*	-
Jagdalpur		*Echinochloa Spp, Cynodon dactylon, Paspalum Dilatatum*	*Echinochloa Spp, Cynodon dactylon, Paspalum Dilatatum*
Karaikal		-	*Echinochloa colona, Leptochloa chinensis*
Malan		*Echinochloa colona, Echinochloa crusgalli, Panicum repens*	*Echinochloa colona, Echinochloa crusgalli, Panicum repens*
Moncompu		*Ischaemum rugosum*	*Isahcne miliacea, Echinochloa crusgalli, Leptochloa chinensis*
Nawagam		*Digitaria sanguinalis, Echinochloa colona, Cynodon dactylon, Chloris barbata, Echinochloa crusgalli*	*Echinochloa colona, Cynodon dactylon, Chloris barbata, Echinochloa crusgalli, Digitaria sanguinalis*
Pantnagar		*Echinochloa colona*	*Echinochloa colona*
Pusa		*Echinochloa colona, Leptochloa chinensis, Echinochloa spp*	*Echinochloa colona, Leptochloa chinensis, Echinochloa crusgalli, Paspalum spp*
Titabar		*Echinochloa crusgalli, Leersia hexandra*	*Echinochloa crusgalli, Leersia hexandra*
Varanasi		*Cynodon dactylon,Echinochloa crusgalli*	*Cynodon dactylon, Echinochloa colona, Echinochloa crusgalli*
Aduthurai	**Sedges**	*Cyperus rotundus, Cyperus difformis, Fimbristylis miliacea*	-
Chatha		*Cyperus spp*	*Cyperus spp*
Chiplima		*Cyperus iria, Cyperus rotundus, Cyperus difformis, Fimbristylis miliacea*	-
Jagdalpur		*Cyperus spp*	*Cyperus iria, Cyperus difformis*
Karaikal		-	*Cyperus difformis*

Malan		*Cyperus rotundus, Cyperus difformis, Cyperus iria*	*Cyperus rotundus, Cyperus difformis, Cyperus iria*
Moncompu		*Fimbristylis miliacea, Cyperus difformis, Cyperus haspan*	*Fimbristylis miliacea, Cyperus difformis, Cyperus haspan*
Nawagam		*Cyperus iria, Cyperus esculentus, Cyperus rotundus*	-
Pantnagar		*Cyperus rotundus, Fimbristylis miliacea*	*Cyperus iria, Cyperus esculentus, Cyperus rotundus*
Pusa		*Cyperus difformis, Cyperus iria*	*Cyperus rotundus, Fimbristylis miliacea*
Titabar		*Cyperus iria*	*Cyperus iria*
Varanasi		*Cyperus rotundus, Cyperus difformis*	*Cyperus rotundus, Cyperus difformis*
Aduthurai	**BLW**	*Eclipta alba, Ammania baccifera, Euphorbia prostrata, Marsilea quadrifolia, Bergia capensis*	-
Chatha		*Physalis minima, Solanum nigrum*	*Physalis minima, Solanum nigrum*
Chiplima		*Marsilea quadrifolia, Sphenoclea zeylanica*	-
Jagdalpur		*Ludwigia parviflora, Ageratum conyzoides*	*Ludwigia parviflora*
Karaikal		-	*Hydrolea zeylanica, Sphaeranthus indicus, Bergia capensis, Ludwigia parviflora*
Malan		*Monochoria vaginalis, Alternanthera spp, Eclipta alba*	*Monochoria vaginalis, Alternanthera spp, Eclipta alba*
Moncompu		*Sphenoclea zeylanica*	*Ludwigia hyssopifolia*
Nawagam		*Physalis minima, Trianthema portulacastrum, Ipomoea aquatic, Eclipta alba*	*Caesulia axillaris*
Pantnagar		*Caesulia axillaris*	*Physalis minima, Trianthema portulacastrum, Ipomoea aquatic, Eclipta alba*
Pusa		*Caesulia axillaris, Eclipta alba, Ludwigia parviflora, Ammania baccifera*	*Caesulia axillaris, Eclipta alba, Ludwigia parviflora, Ammania baccifera*
Titabar		*Alternanthera spp*	*Alternanthera spp*
Varanasi		*Phyllanthus niruri, Parthenium hysterophorus, Euphorbia hirta*	*Phyllanthus niruri, Solanum nigrum, Eclipta prostrata*

At Active tillering stage, in majority of the locations, un-puddled direct seeding system recorded highest group wise weed population and mechanical or hand transplanting system recorded lowest and all the three systems are significantly different. In both mechanical transplanting and wet DSR systems, **Grasses were dominant followed by Sedges**. Both mechanical, weed control and chemical weed control were statistically on par at **Chiplima, Pantnagar, Pusa.**

The fourth year study results from majority of the locations confirmed that the system of crop establishment influences the quantity of group wise, genus and species wise population and shift in weed flora was within the same Genus (*Echinochloa crusgalli* to *colona*); shift to different genus of same group (Echinochloa crusgalli to *Leptochloa chinensis*).

Weed Dry Biomass

At active tillering and panicle initiation stages of the crop, the weed dry biomass Group wise was reported by nine locations viz., **Karaikal, Puducherry, Malan, Moncompu, Nawagam, Pusa, ARI-Rajendranagar, Titabar and Varanasi**, and this information is essential in deriving the status of individual weeds or species or groups or shifts if any in different crop establishment The order of dominance was Grasses>BLW>Sedges at Nawagam, **Pusa** and **Titabar;** Sedges>Grasses>BLW at **Moncompu, Puducherry**, **Varanasi**; BLW>Grasses>Sedges and Grasses-Sedges-BLW at one location each. The dry DSR system recorded significantly high group wise and total dry weed biomass at the test locations except **Nawagam.** The group wise and total dry weed biomass was significantly low with chemical weed control at the test locations except **Pusa**.

The species wise weed biomass was reported by five locations viz., **Karaikal, Moncompu, Malan, Nawagam** and **Titabar**. At active tillering stage, High weed biomass of *Echinochloa colona*, **Nawagam** has *Cynodon dactylon* fb *Echinochloa colona* and **Moncompu** has *Isachne miliaceae.* Among sedges, *Cyperus iria* recorded highest biomass at **Malan**, **Titabar**, **Nawagam** and *Fimbristylis miliaceae* at **Moncompu**. The BLW weed biomass varied as no commonality in genus/species occurrence.

Weed Control Efficiency

Weed control efficiency of different treatments was reported by four locations viz., **Malan**, **Moncompu**, **Pantnagar** and **Pusa**. At both, active tillering, panicle initiation stages, mechanical and chemical weed control under all methods of establishment recorded higher weed control efficiency at **Pantnagar** and **Pusa**. At **Moncompu** and **Malan,** Unpuddled Dry DSR system recorded highest efficiency.

Crop Dry Matter Production

Crop Dry Matter Production was reported by 10 loactions viz; **Chatha, Chiplima, Jagdalpur, Karaikal, Malan, Moncompu, Pantnagar, Pusa, ARI-Rajendranagar** and **Varanasi**. At the test locations methods of establishment and weed control treatments were significant by different except **Chiplima, Jagdalpur** at active tillering stage. At PI stage, all locations recorded significant differences among main treatments and sub treatments. At Active tillering stage, mechanical weeding treatment recorded highest crop dry matter at **Chatha, Jagdalpur, Pantnagar**, **Varanasi** whereas chemical weed control was superior at **Chiplima, Malan, Moncompu, Pusa, ARI- Rajendranagar**. At panicle initiation stage except at **Chatha** other locations recorded significant superiority of chemical weed control. At **Pusa** and **ARI-Rajendranagar** mechanical and chemical weed control treatments were on par. At **Chatha, Pantnagar** and **Varanasi,** dry DSR was significantly superior over other methods at Active Tillering; whereas at **Malan**, **Moncompu, Pusa** and **ARI-Rajendranagar**, mechanical/hand transplanting was superior. At Panicle initiation stage **Chatha, Pantnagar** and **Varanasi** recorded significantly high crop dry matter. **Jagdalpur, Karaikal, ARI- Rajendranagar** showed comparable crop biomass with mechanical, hand transplanting & wet DSR indicating the comparable crop performance of different establishment methods.

Yield attributes and Yield

The data was reported on growth and yield attributes viz., tillers/ no/m^2, panicle no/m^2, panicle weight(g), test weight(g), grain and straw yield t/ha (Table 4.3.3)**. Grain yield** data analysis revealed that the mean grain yield across the locations varied from 1.25 t/ha at **Moncompu** to 5.32 t/ha at **Puducherry** and 5.15 t/ha at **Varanasi.** The crop establishment methods influenced the grain yield significantly at 11 locations and no significant difference at **Chiplima, Nawagam**, **Pusa** and **Varanasi.** At 11 locations the transplanting systems recorded significantly higher yields and two locations viz; **Moncompu** and **Pantnagar** dry DSR was proved superior and at one location transplanting and wet DSR were on par Similar trends was recorded in straw yield the growth and yield attributes also showed similar trend as that of grain yield.

At eight locations, mechanical/hand transplanting was significantly superior over wet or Dry DSR. At two locations viz. **Moncoupu, Malan**, dry DSR was comparable to mechanical/hand transplanting and superior over wet DSR; and at one location, Mechanized transplanting/hand Transplanting and dry DSR were comparable. Among the weed control practices, chemical weed control was significantly superior at 11 test locations. Mechanical weed control was significantly superior over chemical weed control at **Aduthurai, Chatha**, At **Ghaghraghat, and Nawagam,** mechanical weed control and chemical weed control were comparable. The straw yield, yield attributes were significantly superior with mechanized/hand transplanting, mechanical weed control and chemical weed control and the trend followed was similar to the grain yield.

Economics

Economics of the experiment was worked out and reported by five locations viz., locations viz., **Aduthurai, Jagdalpur, Moncompu, Nawagam and Pantnagar**. The cost of cultivation was lowest in dry DSR with weedy check at Pantnagar (Rs29600)/ha and highest at **Moncompu** (Rs.92060/ha). At all the locations, cost of cultivation was high under mechanical transplanting with mechanical weed control. The benefit-cost ratios of different treatments reported were statistically analysed and data is presented in Table---. The Benefit-Cost ratio was significantly different among establishment methods except **Pantnagar.** At two locations viz., **Jagdalpur and Nawagam**, dry DSR recorded significantly high B-C ratio, whereas at **Aduthurai**, mechanical/hand transplanting and wet DSR were comparable and superior over dry DSR. At **Moncompu** mechanical/hand transplanting recorded significantly high B-C ratio than other establishment methods. Among the weed management treatments, chemical weed control has recorded significantly higher B:C ratio and superior at **Jagdalpur, Moncompu** and **Pantnagar**. At **Nawagam** no difference in the B:C ratios of treatments. At **Aduthurai,** mechanical weed control was found to be beneficial with significant superiority.

Rabi Season 2022-23

The trial was conducted at **Puducherry,** in replicated split plot design with 3 main plot treatments and four sub plot treatments with variety ADT56. The order of group wise dominance was Grasses>Sedges>BLW and maximum weed population and dry biomass was recorded in that order. The species wise weed information is not reported for changes in weed flora.

In summary, the 4th year study was conducted at 16 locations viz., **Aduthurai, Chatha, Chiplima, Ghaghraghat, Jagdalpur, Karaikal, Malan, Moncompu, Nagina, Nawagam, Pantnagar, Pusa, Puducherry, ARI-Rajendranagar, Titabar and Varanasi** during ***Kharif*** season, and at **Puducherry** during ***Rabi*** season in split plot design. The Genus and Species wise weed population reported by 12 locations showed that at all the test locations, the direct seeding system recorded higher weed population (group wise and total) and biomass compared to mechanical transplanting. At majority of test locations, dry direct seeding system recorded higher weed population (group wise and total) and biomass compared to wet direct seeded system. The weed dry biomass was significantly low with chemical weed control treatments.

The 4th year results are clearly showing the shift was noticed in species within the weed groups. In all establishment methods, among the grasses, *Echinochloa colona* and *Leptochloa chinensis* were reported dominant rather than usual *Echinochloa crusgalli* and *Leptochloa chinensis* was reported as difficult to control weed; among sedges, *Cyperus iria* and *Cyperus rotundus* have increased than usual *Cyperus difformis*. Among BLW, no commonality in dominating Genus and Species, but increase in BLW population.

The mean grain yield over the locations ranged from 1.25t/ha at **Moncompu** to 5.32 & 5.15 t/ha at **Puducherry** and **Varanasi.** The method of establishment had no significant difference at **Chiplima, Nawagam, Pusa and Varanasi**. At 11 locations the transplanting systems recorded significantly higher yields and at two locations viz; **Moncompu** and **Pantnagar** dry DSR was proved superior and at one location transplanting and wet DSR were on par Similar trend was recorded with straw yield. The growth and yield attributes also showed similar trend as that of grain yield.

Table 4.3.3: Evaluation of long term trial on weed dynamics in rice based cropping systems under different establishment methods, Kharif 2023.

Main plot Treatments	Sub plot Treatments	Grain Yield t/ha							
		Aduthurai	Chatha	Chiplima	Ghaghraghat	Jagdalpur	Karaikal	Malan	Moncompu
M1	S1	3.77	1.33	4.10	3.20	2.37	3.80	2.88	1.72
	S2	5.99	3.24	4.67	4.62	4.37	5.83	3.26	1.84
	S3	5.00	3.02	5.23	4.37	5.2	6.00	4.25	3.41
M2	S1	3.41	1.13	4.30	3.12	2.13	2.30	2.18	0.34
	S2	5.37	3.05	4.43	4.02	4.27	6.02	3.19	0.23
	S3	5.11	2.91	5.10	3.47	4.73	5.12	4.34	0.49
M3	S1	3.27	0.98	3.97	2.35	1.98	1.97	2.50	0.85
	S2	4.21	2.91	4.63	3.17	3.28	5.43	3.39	0.93
	S3	4.30	2.77	4.77	2.95	4.82	4.60	4.23	1.49
Mean of Factor-1									
1		4.92	2.53	4.67	4.06	3.98	5.21	3.46	2.32
2		4.63	2.37	4.61	3.54	3.71	4.48	3.23	0.35
3		3.93	2.22	4.46	2.82	3.36	4.00	3.37	1.09
CD(0.05)		0.16	0.03	NS	0.15	0.06	NS	0.04	0.64
CV		4.14	1.52	4.83	5.21	2.05	17.13	1.59	60.61
Mean of Factor-2									
S1		3.48	1.15	4.12	2.89	2.16	2.69	2.52	0.97
S2		5.19	3.07	4.58	3.94	3.97	5.76	3.28	1.00
S3		4.80	2.90	5.03	3.60	4.92	5.24	4.27	1.79
CD(0.05)		0.17	0.02	0.17	0.34	0.08	0.68	0.12	0.47
CV		3.70	0.90	3.69	9.45	2.12	14.55	3.38	36.82
Interaction									
M and T		0.30	0.04	0.30	NS	0.14	NS	0.20	NS
T and M		0.26	0.04	0.27	NS	0.12	NS	0.17	NS
Experimental Mean		4.49	2.37	4.58	3.47	3.68	4.56	3.36	1.25
Applied N:P:K:Zn Kg/ha		150:50:50	30:20:10	120:60:40		100:60:40	150:50:50	90:40:40	
Avail N:P:K (kg/ha)		285:48:460	245.15:14.34: 146.31		120:60:25			295-46.5-231	0:20.13:123.0
Name of the variety		ADT 56-115 DAYS	Basmati 370	MTU-1156		CV. Samaleshwari		HPR 1068	Uma (M016)
Soil type		Clay soil	Sandy clay loam		Sandy loam	Alfisols		Clay loam	
pH		7.32	8.03	5.6	7.4	6.5		5.6	4.16
EC (dsm-1)			0.21						
Soil Organic carbon			0.57	0.18	0.3	0.48		8.4	1.73

M1- Mechanised transplanting/Transplanting (if transplanters not available)
M2-Puddled direct seeding (preferably line sowing by drum seeder)
M3-Un-puddled dry direct seeding (line sowing)

S1-Weedy check
S2-Mechanical weeding using weeder
S3-Chemical weed control* (Herbicide recommendation of respective University may be followed)

Table 4.3.3: Contd.

Main plot Treatments	Sub plot Treatments	Grain Yield t/ha							
		Nagina	Nawagam	Pantnagar	Puducherry	Pusa	ARI-Rajendra nagar	Titabar	Varanasi
M1	S1	2.04	3.98	4.61	4.95	3.70	4.24	2.50	4.26
	S2	4.49	4.3	5.39	5.72	4.29	5.50	4.20	5.47
	S3	4.82	4.78	5.63	5.96	4.51	5.95	4.77	5.82
M2	S1	1.98	4.51	3.68	4.69	3.12	3.60	2.27	4.04
	S2	4.13	4.94	4.53	5.01	4.29	5.77	3.60	5.51
	S3	4.46	4.55	5.00	5.58	4.55	6.03	4.23	5.92
M3	S1	1.82	4.52	2.96	-	2.92	1.58	1.77	3.98
	S2	4.06	5.54	5.29	-	4.28	3.45	2.70	5.61
	S3	4.32	4.5	5.39	-	4.31	4.55	2.53	5.74
Mean of Factor-1									
M1		3.78	4.35	5.21	5.54	4.17	5.23	3.82	5.19
M2		3.52	4.67	4.40	5.09	3.99	5.13	3.37	5.16
M3		3.4	4.85	4.54	-	3.83	3.19	2.33	5.11
CD(0.05)		0.06	NS	0.07	0.19	NS	0.42	0.25	NS
CV		2.07	11.32	1.79	1.73	4.84	11.04	9.24	3.74
Mean of Factor-2									
S1		1.95	4.33	3.75	4.82	3.25	3.14	2.18	4.09
S2		4.23	4.93	5.07	5.36	4.29	4.91	3.50	5.53
S3		4.53	4.61	5.34	5.77	4.46	5.51	3.84	5.83
CD(0.05)		0.09	0.44	0.07	0.11	0.22	0.34	0.33	0.24
CV		2.35	9.21	1.55	1.53	5.35	7.35	10.12	4.48
Interaction									
M and T		0.15	NS	0.13	0.15	NS	0.59	0.57	NS
T and M		0.13	NS	0.11	0.19	NS	0.54	0.48	NS
Experimental Mean		3.57	4.62	4.72	5.32	4.00	4.52	3.17	5.15
Applied N:P:K:Zn Kg/ha		120:60:40:25	100:25:25	120:60:40:10	120:40:40	120:60:40:25		60:20:40	
Avail N:P:K (kg/ha)		21-18.3-209		230-21.1-220	134.4:47.4:124	212-14.2-122			191.3:17.28:211.8
Name of the variety		Pusa Basmati 1509	GAR 14	PD-24	Rp Bip 226	Rajendra Bhagwati	RNR150 48	TTB-404	
Soil type				Silt loam	Clay loam	Sandy loam	Clay loam		Loam
pH		7.7	7.88	7.8	6.87	8.5	7.1	5.76	7.6
EC (dsm-1)		0.18			0.13				
Soil Organic carbon			0.52	1.17		0.45		0.57	0.34

M1- Mechanised transplanting/Transplanting (if transplanters not available)
M2-Puddled direct seeding (preferably line sowing by drum seeder)
M3-Un-puddled dry direct seeding (line sowing)

S1-Weedy check
S2-Mechanical weeding using weeder
S3-Chemical weed control* (Herbicide recommendation of respective University may be followed)

Table 4.3.3: Contd.

Main plot Treatments	Sub plot Treatments	Straw yield t/ha														
		Aduthurai	Chatha	Chiplima	Ghaghraghat	Jagdalpur	Karaikal	Malan	Moncompu	Nawagam	Pantnagar	Puducherry	Pusa	ARI-Rajendranagar	Titabar	Varanasi
M1	S1	5.68	2.66	4.70	4.43	2.97	6.73	3.53	1.79	4.42	4.80	7.51	4.71	7.30	4.17	9.23
	S2	8.32	6.47	5.30	5.83	5.35	7.57	4.36	2.33	4.75	5.62	8.61	5.32	8.27	5.37	10.12
	S3	7.25	6.04	5.83	5.50	6.61	7.79	5.14	6.01	5.26	5.71	8.82	5.51	8.58	5.53	10.14
M2	S1	4.97	2.27	5.03	4.18	2.85	3.79	2.69	0.70	4.72	4.52	7.09	4.09	7.29	3.5	8.93
	S2	7.83	6.11	5.27	5.06	5.64	7.07	4.11	0.98	5.19	4.78	7.64	5.39	8.77	5.37	10.87
	S3	7.14	5.83	5.70	4.37	6.36	8.29	5.55	0.96	4.78	5.50	8.41	6.03	8.67	5.4	11.73
M3	S1	4.62	1.95	4.70	2.97	2.62	3.31	3.07	1.50	4.91	3.01	-	3.87	3.59	3.4	10.2
	S2	5.94	5.83	5.27	3.99	4.31	7.13	4.23	1.31	5.99	5.73	-	5.67	5.58	3.53	10.35
	S3	6.10	5.53	5.30	3.72	6.2	7.14	5.47	2.46	4.91	6.00	-	5.71	6.61	3.87	10.77
Mean of Factor-1																
M1		7.09	5.06	5.28	5.25	4.98	7.36	4.34	3.37	4.81	5.37	8.31	5.18	8.05	5.02	9.83
M2		6.65	4.73	5.33	4.54	4.95	6.38	4.11	0.88	4.9	4.93	7.71	5.17	8.24	4.76	10.51
M3		5.55	4.44	5.09	3.56	4.38	5.86	4.26	1.76	5.27	4.91	-	5.08	5.26	3.6	10.44
CD(0.05)		0.24	0.06	NS	0.14	0.11	0.65	NS	0.79	NS	0.13	0.08	NS	0.75	0.38	0.23
CV		4.54	1.52	5.10	3.79	2.8	11.91	8.83	47.34	12.7	2.98	0.5	3.4	12.53	10.27	2.63
Mean of Factor-2																
S1		5.09	2.29	4.81	3.86	2.82	4.61	3.10	1.33	4.68	4.11	7.3	4.22	6.06	3.69	9.46
S2		7.36	6.14	5.28	4.96	5.1	7.25	4.23	1.54	5.31	5.38	8.13	5.46	7.54	4.76	10.45
S3		6.83	5.80	5.61	4.53	6.39	7.74	5.39	3.14	4.98	5.73	8.61	5.75	7.95	4.93	10.88
CD(0.05)		0.39	0.04	0.19	0.24	0.16	0.68	0.22	0.64	0.49	0.31	0.07	0.33	0.79	0.44	0.68
CV		5.96	0.90	3.47	5.24	3.2	10.08	4.94	31.19	9.5	5.93	0.69	6.31	10.76	9.55	6.43
Interaction																
M and T		0.68	0.08	NS	NS	0.27	1.17	0.37	1.11	NS	0.54	0.1	0.58	NS	0.76	NS
T and M		0.57	0.07	NS	NS	0.23	1.03	0.36	1.03	NS	0.44	0.11	0.48	NS	0.65	NS
Experimental Mean		6.43	4.74	5.23	4.45	4.77	6.53	4.24	2.00	4.99	5.07	8.01	5.15	7.19	4.46	10.26

M1- Mechanised transplanting/Transplanting (if transplanters not available)
M2-Puddled direct seeding (preferably line sowing by drum seeder)
M3-Un-puddled dry direct seeding (line sowing)

S1-Weedy check
S2-Mechanical weeding using weeder
S3-Chemical weed control (Herbicide recommendation of respective University may be followed)

able 4.3.3: Contd.

Main plot Treatments	Sub plot Treatments	No of Tillers /m^2 at Maximum Tillering stage												
		Chatha	Chiplima	Ghaghraghat	Jagdalpur	Malan	Moncompu	Nagina	Nawagam	Pantnagar	Puducherry	Pusa	Titabar	Varanasi
M1	S1	155	210	105	132	162	141	217	170	201	287	274	248	306
	S2	277	217	127	216	223	179	312	175	240	330	311	263	312
	S3	210	237	119	220	227	268	314	201	242	331	309	297	312
M2	S1	205	202	83	123	151	60	207	115	241	280	223	213	399
	S2	236	207	106	176	215	44	305	137	289	299	293	220	417
	S3	250	218	105	213	211	55	316	128	298	320	303	251	394
M3	S1	205	198	79	90	142	79	203	105	328	-	217	152	400
	S2	267	212	100	167	211	85	288	133	318	-	279	173	417
	S3	238	209	100	230	215	143	319	119	337	-	288	180	418
Mean of Factor-1														
M1		214	221	117	189	204	196	281	182	228	316	298	269	310
M2		230	209	98	171	192	53	276	127	276	300	273	228	403
M3		237	207	93	162	189	103	270	119	327		262	168	412
CD(0.05)		4	4	1	NS	3	22	NS	12	3	11	13	19	6
CV		2	2	1	9	2	23	5	10	2	2	6	10	2
Mean of Factor-2														
S1		188	203	89	115	152	93	209	130	256	283	238	204	369
S2		260	212	111	186	216	103	302	148	282	314	295	218	382
S3		233	222	108	221	218	155	317	150	292	326	300	243	375
CD(0.05)		3	9	3	22	4	26	8	12	8	10	14	22	NS
CV		1	4	3	12	2	22	3	8	3	2	5	10	3
Interaction														
M and T		5	NS	NS	NS	NS	45	NS	NS	13	14	NS	NS	NS
T and M		5	NS	NS	NS	NS	39	NS	NS	11	15	NS	NS	NS
Experimental Mean		227	212	103	174	195	117	276	143	277	308	278	222	375

M1- Mechanised transplanting/Transplanting (if transplanters not available)
M2-Puddled direct seeding (preferably line sowing by drum seeder)
M3-Un-puddled dry direct seeding (line sowing)

S1-Weedy check
S2-Mechanical weeding using weeder
S3-Chemical weed control (Herbicide recommendation of respective University may be followed)

Table 4.3.3: Contd.

Main plot Treatments	Sub plot Treatments	No of Tillers /m^2 at Panicle Initiation stage														
		Aduthurai	Chatha	Chiplima	Ghaghraghat	Jagdalpur	Karaikal	Malan	Moncompu	Nawagam	Pantnagar	Puducherry	Pusa	ARI-Rajendranagar	Titabar	Varanasi
M1	S1	205	166	214	183	136	293	147	132	219	199	304	233	384	216	347
	S2	291	295	222	241	143	480	213	175	251	231	338	274	392	259	348
	S3	271	226	243	225	224	488	230	235	258	240	345	284	409	292	351
M2	S1	222	220	209	171	129	317	145	54	148	243	288	208	309	220	455
	S2	296	251	214	212	184	464	212	39	176	296	313	273	330	223	472
	S3	286	272	223	202	218	460	214	46	164	289	331	289	370	250	466
M3	S1	181	221	208	154	96	102	141	103	135	313	-	192	275	170	465
	S2	221	291	217	177	171	406	207	84	170	315	-	278	289	153	475
	S3	235	269	214	162	236	376	214	145	153	310	-	273	305	179	479
Mean of Factor-1																
M1		255	229	226	216	168	420	197	180	243	223	329	263	395	256	349
M2		268	248	216	195	177	414	190	47	163	276	311	257	336	231	464
M3		212	260	213	164	168	295	187	111	152	313		248	289	167	473
CD(0.05)		5	1	4	16	NS	36	1	27	18	5	11	4	35	6	12
CV		2	1	2	10	24	11	1	29	12	2	2	2	12	3	3
Mean of Factor-2																
S1		202	203	210	169	120	237	145	96	167	252	296	211	322	202	422
S2		269	279	218	210	166	450	211	99	199	281	325	275	337	212	432
S3		264	255	227	196	226	441	219	142	192	280	338	282	361	240	432
CD(0.05)		6	2	10	21	46	72	3	26	21	6	11	13	27	12	ns
CV		2	1	4	11	26	19	1	22	11	2	2	5	8	5	3
Interaction																
M and T		10	3	NS	NS	NS	NS	5	45	NS	11	NS	NS	NS	20	NS
T and M		8	3	NS	NS	NS	NS	4	40	NS	9	NS	NS	NS	17	NS
Experimental Mean		245	246	218	192	171	376	191	113	186	271	320	256	340	218	429

M1- Mechanised transplanting/Transplanting (if transplanters not available)

M2-Puddled direct seeding (preferably line sowing by drum seeder)

M3-Un-puddled dry direct seeding (line sowing)

S1-Weedy check

S2-Mechanical weeding using weeder

S3-Chemical weed control (Herbicide recommendation of respective University may be followed)

Table 4.3.3: Contd.

Main plot Treatments	Sub plot Treatments	No of Panicles/m^2														
		Aduthurai	Chatha	Chiplima	Ghaghraghat	Karaikal	Malan	Moncompu	Nawagam	Nagina	Pantnagar	Puducherry	Pusa	ARI-Rajendranagar	Titabar	Varanasi
M1	S1	186	102	200	207	146	159	143	190	181	209	272	230	207	214	278
	S2	275	238	186	235	372	210	155	227	315	223	301	271	283	239	283
	S3	256	205	231	219	342	218	241	233	320	224	311	281	299	288	295
M2	S1	205	136	209	164	142	135	52	124	205	210	253	205	217	210	328
	S2	281	225	187	206	332	209	35	152	307	247	268	270	269	218	354
	S3	274	214	207	189	332	214	43	140	314	279	280	286	278	242	339
M3	S1	163	135	190	147	107	138	85	111	201	259	-	189	188	148	344
	S2	207	215	196	172	288	204	73	149	277	298	-	274	226	166	356
	S3	220	207	199	151	368	191	81	134	271	307	-	270	239	177	360
Mean of Factor-1																
M1		239	182	205	221	287	196	180	217	272	219	295	261	263	247	285
M2		253	192	201	186	269	186	43	139	275	245	267	254	255	223	340
M3		197	186	195	157	254	178	79	131	250	288		245	218	164	353
CD(0.05)		3	1	NS	6	NS	3	35	15	NS	3	3	5	18	6	17
CV		2	1	3	4	9	2	41	11	7	1	0	2	9	4	6
Mean of Factor-2																
S1		185	124	200	173	132	144	93	142	196	226	262	208	204	191	316
S2		254	226	190	205	331	207	88	176	300	256	285	272	259	208	331
S3		250	209	212	186	347	208	122	169	302	270	295	279	272	236	331
CD(0.05)		6	3	11	7	28	3	14	16	21	8	1	13	29	3	NS
CV		2	2	5	4	10	1	14	9	8	3	0	5	11	2	5
Interaction																
M and T		10	5	19	NS	49	4	24	NS	NS	14	2	NS	NS	6	NS
T and M		8	4	16	NS	42	4	31	NS	NS	12	3	NS	NS	6	NS
Experimental Mean		230	186	200	188	270	186	101	162	266	251	281	253	245	211	326

M1- Mechanised transplanting/Transplanting (if transplanters not available)
M2-Puddled direct seeding (preferably line sowing by drum seeder)
M3-Un-puddled dry direct seeding (line sowing)

S1-Weedy check
S2-Mechanical weeding using weeder
S3-Chemical weed control (Herbicide recommendation of respective University may be followed)

Table 4.3.3: Contd.

Main plot Treatments	Sub plot Treatments	Panicle weight (g)												
		Aduthurai	Ghaghraghat	Karaikal	Malan	Moncompu	Nagina	Nawagam	Pantnagar	Puducherry	Pusa	ARI-Rajendranagar	Titabar	Varanasi
M1	S1	0.92	3.61	3.40	2.93	2.32	2.82	4.01	2.52	2.83	2.29	3.07	3.77	1.52
	S2	2.17	4.35	4.35	4.35	2.52	2.83	4.04	2.68	3.03	2.80	3.31	4.53	1.74
	S3	2.08	4.06	4.00	4.53	2.85	2.84	3.52	2.77	3.04	3.02	3.44	4.53	1.62
M2	S1	0.88	3.11	3.49	2.23	1.87	2.79	3.20	2.02	2.76	2.27	2.71	4.00	1.45
	S2	2.14	4.07	3.46	4.34	1.90	2.82	3.59	2.09	2.86	3.02	3.29	4.63	1.79
	S3	1.98	3.65	3.85	4.44	2.44	2.84	3.05	2.06	2.94	2.97	3.36	4.57	1.93
M3	S1	0.77	2.67	3.10	2.21	2.68	2.78	3.15	1.37	-	1.98	2.01	3.53	1.61
	S2	2.08	3.52	3.46	4.21	2.37	2.82	3.20	2.00	-	2.96	2.08	3.63	1.65
	S3	1.97	2.57	3.36	4.33	2.58	2.83	3.06	1.93	-	2.90	2.16	3.40	1.69
Mean of Factor-1														
M1		1.72	4.01	3.92	3.93	2.56	2.83	3.85	2.65	2.97	2.70	3.27	4.28	1.63
M2		1.67	3.61	3.60	3.67	2.07	2.82	3.28	2.06	2.85	2.75	3.12	4.40	1.72
M3		1.60	2.92	3.31	3.58	2.54	2.81	3.13	1.77		2.62	2.08	3.52	1.65
CD(0.05)		0.02	0.10	NS	0.07	NS	0.01	0.22	0.04	0.08	NS	0.19	0.27	NS
CV		1.31	3.44	10.60	2.16	30.36	0.31	7.55	2.20	1.40	6.19	7.92	7.80	8.25
Mean of Factor-2														
S1		0.85	3.13	3.33	2.46	2.29	2.80	3.45	1.97	2.79	2.18	2.60	3.77	1.53
S2		2.13	3.98	3.76	4.30	2.26	2.82	3.61	2.25	2.94	2.93	2.89	4.27	1.73
S3		2.01	3.43	3.74	4.43	2.62	2.84	3.21	2.25	2.99	2.96	2.99	4.17	1.75
CD(0.05)		0.01	0.18	NS	0.11	NS	0.01	0.21	0.07	0.03	0.21	0.19	0.20	0.12
CV		0.57	4.95	10.26	2.77	26.15	0.50	6.11	3.33	0.85	7.49	6.47	4.90	7.22
Interaction														
M and T		0.02	0.31	NS	0.18	NS	NS	NS	0.13	0.05	NS	NS	0.35	NS
T and M		0.02	0.26	NS	0.15	NS	NS	NS	0.11	0.07	NS	NS	0.33	NS
Experimental Mean		1.66	3.51	3.61	3.73	2.39	2.82	3.42	2.16	2.91	2.69	2.83	4.07	1.67

M1- Mechanised transplanting/Transplanting (if transplanters not available)
M2-Puddled direct seeding (preferably line sowing by drum seeder)
M3-Un-puddled dry direct seeding (line sowing)

S1-Weedy check
S2-Mechanical weeding using weeder
S3-Chemical weed control (Herbicide recommendation of respective University may be followed)

Table 4.3.3: Contd.

Main plot Treatments	Sub plot Treatments	Test weight(g)														
		Aduthurai	Chatha	Chiplima	Ghaghraghat	Jagdalpur	Karaikal	Malan	Moncompu	Nagina	Nawagam	Pantnagar	Puducherry	Pusa	ARI-Rajendranagar	Varanasi
M1	S1	17.53	19.13	20.27	25.91	26.76	27.21	24.59	24.57	23.37	18.50	28.75	13.23	21.50	11.10	20.90
	S2	18.47	21.30	21.30	26.26	27.96	27.22	27.42	25.57	23.64	18.67	29.45	13.67	21.10	12.37	21.77
	S3	18.20	20.90	21.60	25.26	28.32	26.59	26.53	26.23	23.69	19.00	29.30	13.93	21.33	12.57	22.17
M2	S1	18.17	18.97	20.13	24.15	26.67	26.48	23.83	23.50	23.35	18.17	26.83	12.85	20.37	11.10	21.33
	S2	18.53	20.97	20.90	25.10	27.70	27.03	26.40	24.00	23.63	18.13	28.62	13.09	21.20	12.50	22.73
	S3	18.20	20.53	20.87	23.47	27.89	26.83	28.08	23.43	23.66	17.93	27.08	13.37	21.23	12.50	22.37
M3	S1	17.10	19.13	19.60	23.38	26.55	25.78	24.72	24.30	23.37	18.10	26.37	-	20.53	10.87	21.87
	S2	17.47	20.77	19.97	23.74	27.17	27.05	25.92	24.17	23.63	18.67	28.35	-	20.80	12.57	22.73
	S3	17.57	20.23	20.30	22.68	27.72	26.52	27.20	25.20	23.70	18.70	27.18	-	21.27	12.67	22.13
Mean of Factor-1																
M1		18.07	20.44	21.06	25.81	27.68	27.01	26.18	25.46	23.56	18.72	29.17	13.61	21.31	12.01	21.61
M2		18.30	20.16	20.63	24.24	27.42	26.78	26.10	23.64	23.55	18.08	27.51	13.10	20.93	12.03	22.14
M3		17.38	20.04	19.96	23.27	27.15	26.45	25.95	24.56	23.57	18.49	27.30	-	20.87	12.03	22.24
CD(0.05)		0.13	0.03	NS	0.40	NS	NS	NS	0.72	0.01	NS	0.85	NS	NS	NS	NS
CV		0.90	0.19	4.03	1.97	1.52	5.00	0.83	3.49	0.05	4.34	3.62	2.75	4.91	2.58	1.95
Mean of Factor-2																
S1		17.60	19.08	20.00	24.48	26.66	26.49	24.38	24.12	23.36	18.26	27.32	13.04	20.80	11.02	21.37
S2		18.16	21.01	20.72	25.03	27.61	27.10	26.58	24.58	23.63	18.49	28.81	13.38	21.03	12.48	22.41
S3		17.99	20.56	20.92	23.80	27.98	26.65	27.27	24.96	23.68	18.54	27.86	13.65	21.28	12.58	22.22
CD(0.05)		0.16	0.06	NS	0.59	0.40	NS	0.32	NS	0.02	NS	1.17	0.27	NS	0.26	0.49
CV		0.85	0.29	3.74	2.35	1.41	2.25	1.21	2.96	0.10	4.41	4.06	1.50	2.54	2.08	2.16
Interaction																
M and T		0.27	0.10	NS	NS	NS	NS	0.56	NS	NS	NS	NS	NS	NS	NS	NS
T and M		0.23	0.09	NS	NS	NS	NS	0.47	NS	NS	NS	NS	NS	NS	NS	NS
Experimental Mean		17.91	20.21	20.55	24.44	27.42	26.74	26.08	24.55	23.56	18.43	27.99	13.36	21.04	12.03	22.00

M1- Mechanised transplanting/Transplanting (if transplanters not available)
M2-Puddled direct seeding (preferably line sowing by drum seeder)
M3-Un-puddled dry direct seeding (line sowing)

S1-Weedy check
S2-Mechanical weeding using weeder
S3-Chemical weed control (Herbicide recommendation of respective University may be followed)

Table 4.3.3: Contd.

Main plot Treatments	Sub plot Treatments	Crop total dry matter g/m^2 at Active Tillering stage								
		Chatha	Chiplima	Jagdalpur	Malan	Moncompu	Pantnagar	Pusa	ARI-Rajendranagar	Varanasi
M1	S1	136.00	222.90	401.10	52.43	310.89	96.90	104.33	202.00	125.96
	S2	261.67	230.70	495.70	64.07	732.95	127.97	132.67	343.67	130.68
	S3	202.67	275.93	214.10	71.63	1284.87	109.67	147.33	345.43	93.04
M2	S1	195.00	214.93	423.30	49.13	99.03	135.77	87.00	110.87	147.42
	S2	219.33	218.13	477.00	62.50	110.13	163.20	128.00	295.00	159.24
	S3	228.33	872.90	196.50	64.60	367.11	127.57	127.00	318.00	159.97
M3	S1	199.33	217.40	323.30	51.00	53.77	172.70	83.33	91.07	168.54
	S2	247.33	238.03	464.70	62.07	178.17	183.57	110.33	106.67	170.58
	S3	221.67	222.97	263.00	66.30	589.52	153.47	121.33	118.83	179.30
Mean of Factor-1										
M1		200.11	243.18	370.30	62.71	776.24	111.51	128.11	297.03	116.56
M2		214.22	435.32	365.60	58.74	192.09	142.18	114.00	241.29	155.54
M3		222.78	226.13	350.33	59.79	273.82	169.91	105.00	105.52	172.81
CD(0.05)		1.79	NS	NS	0.75	95.64	19.55	5.45	20.73	18.42
CV		1.01	119.98	9.79	1.48	27.59	16.53	5.63	11.54	14.84
Mean of Factor-2										
S1		176.78	218.41	382.57	50.86	154.56	135.12	91.56	134.64	147.31
S2		242.78	228.96	479.13	62.88	340.42	158.24	123.67	248.44	153.50
S3		217.56	457.27	224.53	67.51	747.17	130.23	131.89	260.76	144.10
CD(0.05)		5.45	NS	24.60	0.95	131.03	18.65	7.41	20.70	NS
CV		2.50	120.13	6.61	1.54	30.81	12.86	6.23	9.39	15.47
Interaction										
M and T		9.44	NS	42.60	1.65	226.96	NS	NS	35.85	NS
T and M		7.76	NS	39.09	1.41	192.29	NS	NS	31.62	NS
Experimental Mean		212.37	301.54	362.08	60.41	414.05	141.20	115.70	214.61	148.30

M1- Mechanised transplanting/Transplanting (if transplanters not available)
M2-Puddled direct seeding (preferably line sowing by drum seeder)
M3-Un-puddled dry direct seeding (line sowing)

S1-Weedy check
S2-Mechanical weeding using weeder
S3-Chemical weed control (Herbicide recommendation of respective University may be followed)

Table 4.3.3: Contd.

Main plot Treatments	Sub plot Treatments	Crop total dry matter g/m² at Panicle Initiation stage									
		Chatha	Chiplima	Jagdalpur	Karaikal	Malan	Moncompu	Pantnagar	Pusa	ARI-Rajendranagar	Varanasi
M1	S1	165.67	233.27	356.80	743.89	281.43	459.30	190.84	326.00	473.10	258.97
	S2	452.00	239.90	641.76	857.44	347.03	961.43	229.32	483.33	681.00	280.62
	S3	402.67	284.67	793.12	1157.49	351.00	1361.60	202.28	486.33	737.70	283.79
M2	S1	299.33	222.93	342.56	682.93	250.00	140.41	210.60	293.00	367.97	286.13
	S2	426.00	225.43	677.28	977.87	348.33	161.16	262.08	446.00	660.00	320.06
	S3	432.33	243.60	763.20	949.07	341.67	389.35	237.64	441.33	774.60	323.44
M3	S1	303.67	224.10	314.40	492.11	242.00	211.61	363.48	274.67	233.00	309.21
	S2	436.67	246.27	517.28	802.93	320.00	253.39	276.64	388.33	378.33	326.80
	S3	426.33	230.93	743.52	789.12	330.67	765.69	279.76	400.00	434.60	339.31
Mean of Factor-1											
M1		340.11	252.61	597.23	919.61	326.49	927.44	207.48	431.89	630.60	274.46
M2		385.89	230.66	594.35	869.96	313.33	230.31	236.77	393.44	600.86	309.88
M3		388.89	233.77	525.07	694.72	297.56	410.23	306.63	354.33	348.64	325.11
CD(0.05)		1.51	7.05	13.41	90.13	2.96	260.40	6.96	13.57	88.06	2.74
CV		0.49	3.52	2.80	13.00	1.13	59.51	3.32	4.12	19.97	1.08
Mean of Factor-2											
S1		256.22	226.77	337.92	639.64	257.81	270.44	254.97	297.89	358.02	284.77
S2		438.22	237.20	612.11	879.41	338.46	458.66	256.01	439.22	573.11	309.16
S3		420.44	253.07	766.61	965.23	341.11	838.88	239.89	442.56	648.97	315.51
CD(0.05)		2.94	17.57	18.78	129.52	3.15	253.40	8.46	20.07	78.48	2.68
CV		0.77	7.16	3.20	15.23	0.98	47.20	3.29	4.97	14.51	0.86
Interaction											
M and T		5.08	NS	32.53	NS	5.46	NS	14.65	NS	NS	4.64
T and M		4.22	NS	27.51	NS	4.77	NS	12.56	NS	NS	4.11
Experimental Mean		371.63	239.01	572.21	828.09	312.46	522.66	250.29	393.22	526.70	303.15

M1- Mechanised transplanting/Transplanting (if transplanters not available)
M2-Puddled direct seeding (preferably line sowing by drum seeder)
M3-Un-puddled dry direct seeding (line sowing)

S1-Weedy check
S2-Mechanical weeding using weeder
S3-Chemical weed control (Herbicide recommendation of respective University may be followed)

Table 4.3.3: Contd.

Main plot Treatments	Sub plot Treatments	Benefit -Cost Ratio					Cost of cultivation Rs/ha				
		Aduthurai	Jagdalpur	Moncompu	Pantnagar	Nawagam	Aduthurai	Jagdalpur	Moncompu	Pantnagar	Nawagam
M1	S1	1.69	0.72	0.79	2.7	2.32	45682	42800	64060	35468	44846
	S2	2.53	1.79	0.59	2.86	2.43	48457	48600	92060	39788	46360
	S3	2.08	2.59	1.43	3.22	2.7	49262	44900	72060	38005	46485
M2	S1	1.62	0.63	0.18	2.51	2.92	43027	40500	56560	29960	40304
	S2	2.41	1.83	0.14	2.76	3.07	45801	46800	84560	34280	41978
	S3	2.23	2.45	0.23	3.25	2.84	46886	42500	64560	33547	41849
M3	S1	1.67	0.48	0.46	1.85	2.84	40144	41600	56370	29600	41569
	S2	2.00	1.69	0.34	3.44	3.37	43016	37800	84370	33920	42983
	S3	2.00	3.49	0.70	3.39	2.73	44218	33300	64370	34987	43134
Mean of Factor-1											
M1		2.10	1.7	0.94	2.93	2.48					
M2		2.09	1.64	0.18	2.84	2.94					
M3		1.89	1.88	0.50	2.89	2.98					
CD(0.05)		0.07	0.04	0.29	NS	0.26					
CV		4.24	2.97	64.65	2.57	11.11					
Mean of Factor-2											
S1		1.66	0.61	0.48	2.35	2.7					
S2		2.31	1.77	0.36	3.02	2.96					
S3		2.10	2.84	0.79	3.29	2.76					
CD(0.05)		0.08	0.06	0.20	0.06	NS					
CV		3.81	3.49	36.18	2.07	9.36					
Interaction											
M and T		0.14	0.11	NS	0.11	NS					
T and M		0.12	0.09	NS	0.09	NS					
Experimental Mean		2.03	1.74	0.54	2.89	2.8					

M1- Mechanised transplanting/Transplanting (if transplanters not available)
M2-Puddled direct seeding (preferably line sowing by drum seeder)
M3-Un-puddled dry direct seeding (line sowing)

S1-Weedy check
S2-Mechanical weeding using weeder
S3-Chemical weed control (Herbicide recommendation of respective University may be followed)

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	Aduthurai				Chatha							
		Weed population no/m^2 at Active tillering stage				Weed population no/m^2 at Active tillering stage				Weed population no/m^2 at Panicle initiation stage			
		Grasses	Sedges	BLW	Total weed population	Grasses	Sedges	BLW	Total weed population	Grasses	Sedges	BLW	Total weed population
M1	S1	96.67(9.86)	19.00(4.41)	82.33(9.10)	198.00(14.09)	45.00(6.74)	35.33(5.99)	1.67(1.46)	82.00(9.08)	84.33(9.20)	66.67(8.19)	5.67(2.48)	156.67(12.54)
	S2	27.00(5.24)	7.33(2.80)	13.33(3.71)	47.67(6.94)	7.33(2.78)	1.33(1.34)	1.67(1.44)	10.33(3.28)	18.00(4.30)	5.00(2.35)	3.00(1.86)	26.00(5.15)
	S3	21.33(4.67)	6.67(2.68)	16.00(4.06)	44.00(6.67)	5.33(2.41)	29.33(5.46)	0.67(1.00)	35.33(5.98)	14.67(3.89)	7.67(2.86)	1.00(1.22)	23.33(4.88)
M2	S1	126.33(11.26)	24.33(4.98)	88.67(9.44)	239.33(15.49)	49.33(7.05)	46.00(6.82)	2.67(1.77)	98.00(9.92)	109.33(10.48)	75.33(8.71)	12.00(3.53)	196.67(14.04)
	S2	48.00(6.96)	11.00(3.39)	21.00(4.64)	80.00(8.97)	7.33(2.78)	2.33(1.68)	2.67(1.77)	12.33(3.57)	25.00(5.05)	7.67(2.85)	3.33(1.95)	36.00(6.04)
	S3	31.00(5.61)	7.00(2.73)	15.67(4.02)	53.67(7.36)	6.67(2.68)	35.00(5.96)	1.00(1.17)	42.67(6.57)	22.00(4.74)	11.00(3.39)	2.33(1.68)	35.33(5.98)
M3	S1	150.00(12.27)	30.00(5.52)	110.00(10.51)	290.00(17.04)	53.00(7.31)	45.33(6.77)	4.00(2.11)	102.33(10.14)	118.33(10.90)	80.67(9.01)	14.00(3.81)	213.00(14.61)
	S2	50.00(7.10)	13.33(3.72)	31.00(5.61)	94.33(9.74)	7.33(2.79)	1.33(1.34)	3.67(2.04)	12.33(3.58)	29.33(5.46)	9.33(3.13)	3.33(1.94)	42.00(6.52)
	S3	39.33(6.31)	9.33(3.13)	22.33(4.78)	71.00(8.45)	7.33(2.80)	40.33(6.39)	3.00(1.87)	50.67(7.15)	23.33(4.88)	10.67(3.33)	3.33(1.95)	37.33(6.15)
Mean of Factor-1													
M1		48.33(6.59)	11.00(3.30)	37.22(5.62)	96.56(9.23)	19.22(3.98)	22.00(4.26)	1.33(1.30)	42.56(6.11)	39.00(5.80)	26.44(4.47)	3.22(1.85)	68.67(7.52)
M2		68.44(7.94)	14.11(3.70)	41.78(6.03)	124.33(10.60)	21.11(4.17)	27.78(4.82)	2.11(1.57)	51.00(6.69)	52.11(6.76)	31.33(4.98)	5.89(2.39)	89.33(8.69)
M3		79.78(8.56)	17.56(4.12)	54.44(6.97)	151.78(11.74)	22.56(4.30)	29.00(4.83)	3.56(2.01)	55.11(6.96)	57.00(7.08)	33.56(5.16)	6.89(2.57)	97.44(9.09)
CD(0.05)		0.14	0.12	0.13	0.12	NS	0.03	0.13	0.22	0.15	0.26	0.12	0.20
CV		2.1	3.72	2.55	1.36	5.37	0.79	9.52	4.02	2.73	6.37	6.07	2.79
Mean of Factor-2													
S1		124.33(11.13)	24.44(4.97)	93.67(9.68)	242.44(15.54)	49.11(7.04)	42.22(6.52)	2.78(1.78)	94.11(9.71)	104.00(10.19)	74.22(8.64)	10.56(3.27)	188.78(13.73)
S2		41.67(6.44)	10.56(3.30)	21.78(4.65)	74.00(8.55)	7.33(2.78)	1.67(1.45)	2.67(1.75)	11.67(3.48)	24.11(4.94)	7.33(2.78)	3.22(1.92)	34.67(5.90)
S3		30.56(5.53)	7.67(2.85)	18.00(4.29)	56.22(7.49)	6.44(2.63)	34.89(5.93)	1.56(1.35)	42.89(6.57)	20.00(4.50)	9.78(3.19)	2.22(1.62)	32.00(5.67)
CD(0.05)		0.15	0.15	0.14	0.15	0.24	0.20	0.33	0.20	0.23	0.15	0.19	0.17
CV		1.90	4.02	2.13	1.42	5.72	4.20	19.85	3.02	3.43	3.06	7.94	1.99
Interaction													
M and T		0.26	0.27	0.23	0.27	NS	0.35	NS	0.35	NS	NS	0.32	0.3
T and M		0.23	0.23	0.21	0.23	NS	0.28	NS	0.32	NS	NS	0.27	0.27
Experimentl Mean		7.70	3.71	6.21	10.53	4.15	4.64	1.63	6.59	6.54	4.87	2.27	8.43

*(Values in parentheses are transformed values)

M1- Mechanised transplanting/Transplanting (if transplanters not available)

M2-Puddled direct seeding (preferably line sowing by drum seeder)

M3-Un-puddled dry direct seeding (line sowing)

S1-Weedy check

S2-Mechanical weeding using weeder

S3-Chemical weed control (Herbicide recommendation of respective University may be followed)

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	Chiplima				Jagdalpur							
		Weed population no/m2 at Active tillering stage				Weed population no/m^2 at Active tillering stage				Weed population no/m^2 at Panicle initiation stage			
		Grasses	Sedges	BLW	Total weed population	Grasses	Sedges	BLW	Total weed population	Grasses	Sedges	BLW	Total weed population
M1	S1	24.67(5.00)	31.67(5.66)	24.00(4.94)	80.33(8.98)	10.98(3.35)	2.80(1.79)	10.49(3.30)	24.27(4.94)	16.63(4.13)	18.90(4.35)	12.90(3.65)	48.43(6.98)
	S2	15.33(3.95)	23.33(4.88)	15.00(3.93)	53.67(7.36)	5.78(2.50)	1.73(1.48)	7.00(2.73)	14.51(3.87)	7.93(2.90)	11.92(3.46)	4.20(2.14)	24.05(4.94)
	S3	14.67(3.88)	19.67(4.48)	12.33(3.58)	46.67(6.87)	1.17(1.28)	0.23(0.85)	0.95(1.20)	2.35(1.68)	1.17(1.28)	4.48(2.22)	0.38(0.92)	6.03(2.54)
M2	S1	28.33(5.34)	39.00(6.28)	28.33(5.37)	95.67(9.80)	11.45(3.44)	3.63(2.02)	16.20(4.07)	31.28(5.63)	13.52(3.73)	19.45(4.45)	17.32(4.18)	50.28(7.11)
	S2	15.33(3.97)	27.67(5.30)	22.67(4.81)	65.67(8.13)	10.71(3.35)	2.60(1.74)	10.57(3.32)	23.88(4.93)	10.85(3.35)	13.72(3.75)	11.13(3.40)	35.70(6.02)
	S3	18.33(4.33)	23.67(4.90)	18.00(4.27)	60.00(7.75)	3.57(2.00)	0.68(1.07)	1.68(1.45)	5.93(2.54)	3.83(2.01)	4.32(2.18)	1.10(1.15)	9.25(3.12)
M3	S1	33.00(5.78)	38.00(6.20)	33.67(5.84)	104.67(10.25)	29.97(5.50)	8.20(2.93)	31.15(5.61)	69.32(8.35)	24.64(4.97)	36.83(6.10)	21.27(4.64)	82.74(9.12)
	S2	19.00(4.39)	23.00(4.85)	19.33(4.44)	61.33(7.86)	15.53(4.00)	4.53(2.23)	12.78(3.60)	32.85(5.77)	14.13(3.82)	22.27(4.74)	10.10(3.24)	46.51(6.83)
	S3	25.67(5.06)	30.67(5.58)	16.33(4.09)	72.67(8.54)	10.12(3.25)	2.25(1.66)	4.42(2.21)	16.78(4.15)	9.23(3.11)	9.07(3.03)	2.88(1.73)	21.18(4.64)
Mean of Factor-1													
M1		18.22(4.28)	24.89(5.01)	17.11(4.15)	60.22(7.74)	5.98(2.37)	1.59(1.37)	6.15(2.41)	13.71(3.50)	8.58(2.77)	11.77(3.34)	5.83(2.24)	26.17(4.82)
M2		20.67(4.54)	30.11(5.49)	23.00(4.82)	73.78(8.56)	8.58(2.93)	2.31(1.61)	9.48(2.95)	20.36(4.37)	9.40(3.03)	12.49(3.46)	9.85(2.91)	31.75(5.41)
M3		25.89(5.07)	30.56(5.54)	23.11(4.79)	79.56(8.88)	18.54(4.25)	4.99(2.27)	16.12(3.81)	39.65(6.09)	16.00(3.97)	22.72(4.63)	11.42(3.20)	50.14(6.86)
CD(0.05)		NS	NS	0.17	0.45	0.36	0.21	0.40	0.37	0.49	0.48	0.22	0.50
CV		11.03	9.57	4.54	6.34	13.33	14.02	15.64	9.42	17.95	15.14	9.56	10.49
Mean of Factor-2													
S1		28.67(5.37)	36.22(6.05)	28.67(5.39)	93.56(9.68)	17.47(4.10)	4.88(2.25)	19.28(4.33)	41.62(6.31)	18.26(4.28)	25.06(4.97)	17.16(4.16)	60.48(7.74)
S2		16.56(4.10)	24.67(5.01)	19.00(4.39)	60.22(7.78)	10.68(3.28)	2.96(1.82)	10.12(3.22)	23.75(4.86)	10.97(3.35)	15.97(3.99)	8.48(2.93)	35.42(5.93)
S3		19.56(4.42)	24.67(4.99)	15.56(3.98)	59.78(7.72)	4.95(2.18)	1.06(1.19)	2.35(1.62)	8.36(2.79)	4.74(2.13)	5.96(2.48)	1.46(1.27)	12.15(3.43)
CD(0.05)		0.64	0.25	0.39	0.44	0.40	0.27	0.37	0.36	0.42	0.60	0.53	0.42
CV		13.38	4.49	8.2	5.07	12.16	14.82	11.7	7.57	12.51	15.32	18.57	7.17
Interaction													
M and T		NS	0.43	NS	NS	NS	NS	0.64	0.63	NS	NS	NS	NS
T and M		NS	0.44	NS	NS	NS	NS	0.57	0.55	NS	NS	NS	NS
Experimental Mean		4.63	5.35	4.59	8.39	3.26	1.75	3.06	4.65	3.26	3.81	2.78	5.7

*(Values in parentheses are transformed values)

M1- Mechanised transplanting/Transplanting (if transplanters not available)

M2-Puddled direct seeding (preferably line sowing by drum seeder)

M3-Un-puddled dry direct seeding (line sowing)

S1-Weedy check

S2-Mechanical weeding using weeder

S3-Chemical weed control (Herbicide recommendation of respective University may be followed)

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	Karaikal				Malan							
		Weed population no/m² at Panicle initiation stage				Weed population no/m² at Active tillering stage				Weed population no/m² at Panicle initiation stage			
		Grasses	Sedges	BLW	Total weed population	Grasses	Sedges	BLW	Total weed population	Grasses	Sedges	BLW	Total weed population
M1	S1	22.67(4.78)	11.67(3.48)	67.33(8.23)	101.67(10.11)	26.67(5.18)	9.33(3.13)	8.67(3.02)	44.67(6.70)	29.00(5.42)	14.33(3.83)	17.67(4.26)	61.00(7.84)
	S2	5.33(2.39)	5.33(2.39)	31.33(5.64)	42.00(6.52)	17.33(4.20)	6.00(2.53)	7.00(2.74)	30.33(5.54)	22.00(4.74)	7.00(2.73)	13.67(3.75)	42.67(6.57)
	S3	6.67(2.30)	0.00(0.71)	8.33(2.91)	15.00(3.71)	7.67(2.85)	5.33(2.41)	4.67(2.27)	17.67(4.26)	6.00(2.54)	4.67(2.27)	5.33(2.41)	16.00(4.06)
M2	S1	77.33(8.77)	10.67(3.32)	87.67(9.39)	175.67(13.27)	39.00(6.27)	28.00(5.33)	36.67(6.08)	103.67(10.20)	29.67(5.47)	20.00(4.52)	24.33(4.97)	74.00(8.61)
	S2	4.00(1.91)	4.67(2.27)	43.33(6.61)	52.00(7.22)	23.00(4.81)	15.33(3.97)	17.33(4.20)	55.67(7.49)	17.67(4.24)	15.67(3.98)	16.33(4.10)	49.67(7.07)
	S3	2.00(1.52)	0.00(0.71)	25.33(5.08)	27.33(5.27)	5.33(2.41)	8.33(2.97)	6.33(2.60)	20.00(4.52)	6.67(2.67)	5.00(2.34)	8.67(3.03)	20.33(4.56)
M3	S1	109.33(10.40)	20.67(4.57)	167.33(12.95)	297.33(17.25)	46.00(6.81)	57.00(7.58)	46.00(6.80)	149.00(12.21)	42.00(6.51)	51.00(7.16)	53.33(7.32)	146.33(12.11)
	S2	5.33(2.39)	2.67(1.65)	55.67(7.49)	63.67(8.01)	27.67(5.30)	26.33(5.18)	22.00(4.71)	76.00(8.74)	30.00(5.48)	20.33(4.55)	19.00(4.41)	69.33(8.35)
	S3	20.00(4.26)	0.00(0.71)	38.67(6.26)	58.67(7.66)	7.33(2.79)	8.67(3.02)	5.00(2.32)	21.00(4.63)	7.67(2.85)	5.33(2.41)	9.67(3.19)	22.67(4.81)
Mean of Factor-1													
M1		11.56(3.16)	5.67(2.19)	35.67(5.59)	52.89(6.78)	17.22(4.08)	6.89(2.69)	6.78(2.68)	30.89(5.50)	19.00(4.24)	8.67(2.94)	12.22(3.47)	39.89(6.15)
M2		27.78(4.07)	5.11(2.10)	52.11(7.02)	85.00(8.59)	22.44(4.50)	17.22(4.09)	20.11(4.30)	59.78(7.40)	18.00(4.13)	13.56(3.61)	16.44(4.03)	48.00(6.75)
M3		44.89(5.68)	7.78(2.31)	87.22(8.90)	139.89(10.97)	27.00(4.97)	30.67(5.26)	24.33(4.61)	82.00(8.52)	26.56(4.95)	25.56(4.71)	27.33(4.97)	79.44(8.42)
CD(0.05)		0.67	NS	0.35	0.5	0.26	0.24	0.29	0.31	0.40	0.52	0.17	0.35
CV		18.55	12.8	5.89	6.79	6.89	7.17	8.85	5.11	10.74	16.7	4.92	5.9
Mean of Factor-2													
S1		69.78(7.99)	14.33(3.79)	107.44(10.19)	191.56(13.54)	37.22(6.09)	31.44(5.35)	30.44(5.30)	99.11(9.71)	33.56(5.80)	28.44(5.17)	31.78(5.52)	93.78(9.52)
S2		4.89(2.23)	4.22(2.10)	43.44(6.58)	52.56(7.25)	22.67(4.77)	15.89(3.89)	15.44(3.89)	54.00(7.25)	23.22(4.82)	14.33(3.75)	16.33(4.09)	53.89(7.33)
S3		9.56(2.69)	0.00(0.71)	24.11(4.75)	33.67(5.54)	6.78(2.68)	7.44(2.80)	5.33(2.40)	19.56(4.47)	6.78(2.69)	5.00(2.34)	7.89(2.87)	19.67(4.48)
CD(0.05)		1.40	0.46	0.4	0.83	0.29	0.28	0.43	0.36	0.45	0.35	0.34	0.39
CV		31.6	20.44	5.42	9.2	6.22	6.85	10.78	4.89	9.9	9.14	7.91	5.38
Interaction													
M and T		2.42	0.8	0.69	1.44	0.5	0.49	0.74	0.62	NS	0.61	0.59	0.68
T and M		2	0.66	0.6	1.2	0.43	0.42	0.62	0.53	NS	0.6	0.49	0.59
Experimental Mean		4.30	2.20	7.17	8.78	4.51	4.01	3.86	7.14	4.44	3.75	4.16	7.11

*(Values in parentheses are transformed values)

M1- Mechanised transplanting/Transplanting (if transplanters not available)
M2-Puddled direct seeding (preferably line sowing by drum seeder)
M3-Un-puddled dry direct seeding (line sowing)

S1-Weedy check
S2-Mechanical weeding using weeder
S3-Chemical weed control (Herbicide recommendation of respective University may be followed)

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	Moncompu							
		Weed population no/m^2 at Active tillering stage				Weed population no/m^2 at Panicle initiation stage			
		Grasses	Sedges	BLW	Total weed population	Grasses	Sedges	BLW	Total weed population
M1	S1	0.00(0.71)	265.33(16.27)	0.00(0.71)	265.33(16.27)	80.00(8.84)	125.33(10.94)	16.00(3.49)	221.33(14.62)
	S2	40.00(5.42)	272.00(16.43)	1.33(1.18)	313.33(17.69)	114.67(10.70)	0.00(0.71)	0.00(0.71)	114.67(10.70)
	S3	40.00(5.42)	54.67(6.69)	0.00(0.71)	94.67(9.62)	184.00(13.54)	29.33(3.61)	2.67(1.44)	216.00(14.55)
M2	S1	0.00(0.71)	273.33(16.47)	125.33(9.03)	398.67(19.72)	129.33(11.39)	200.00(14.07)	0.00(0.71)	329.33(18.11)
	S2	13.33(2.59)	324.00(17.92)	0.00(0.71)	337.33(18.31)	240.00(15.46)	185.33(12.62)	6.67(2.39)	432.00(20.68)
	S3	93.33(7.53)	224.00(14.58)	0.00(0.71)	317.33(16.87)	240.00(15.48)	197.33(14.03)	0.00(0.71)	437.33(20.90)
M3	S1	180.00(13.07)	213.33(14.39)	0.00(0.71)	393.33(19.45)	116.00(9.58)	118.67(10.06)	9.33(2.77)	244.00(15.26)
	S2	153.33(10.15)	176.00(12.13)	0.00(0.71)	329.33(17.74)	166.67(12.83)	108.00(9.36)	12.00(3.06)	286.67(16.51)
	S3	226.67(14.57)	70.67(6.13)	0.00(0.71)	297.33(16.24)	177.33(13.11)	117.33(9.19)	5.33(1.83)	300.00(17.09)
Mean of Factor-1									
M1		26.67(3.85)	197.33(13.13)	0.44(0.86)	224.44(14.53)	126.22(11.03)	51.56(5.08)	6.22(1.88)	184.00(13.29)
M2		35.56(3.61)	273.78(16.32)	41.78(3.48)	351.11(18.30)	203.11(14.11)	194.22(13.57)	2.22(1.27)	399.56(19.90)
M3		186.67(12.60)	153.33(10.88)	0.00(0.71)	340.00(17.81)	153.33(11.84)	114.67(9.53)	8.89(2.55)	276.89(16.28)
CD(0.05)		2.98	NS	NS	NS	NS	2.72	NS	1.84
CV		53.31	32.69	155.04	29.58	15.8	34.58	44.36	13.35
Mean of Factor-2									
S1		60.00(4.83)	250.67(15.71)	41.78(3.48)	352.44(18.48)	108.44(9.94)	148.00(11.69)	8.44(2.32)	264.89(15.99)
S2		68.89(6.06)	257.33(15.49)	0.44(0.86)	326.67(17.91)	173.78(13.00)	97.78(7.56)	6.22(2.05)	277.78(15.96)
S3		120.00(9.17)	116.44(9.14)	0.00(0.71)	236.44(14.24)	200.44(14.05)	114.67(8.94)	2.67(1.33)	317.78(17.51)
CD(0.05)		ns	3.73	ns	2.41	2.54	ns	ns	ns
CV		56.94	27.03	161.98	13.93	20.03	53.73	83.35	21.17
Interaction									
M and T		NS	NS	NS	NS	NS	NS	NS	NS
T and M		NS	NS	NS	NS	NS	NS	NS	NS
Experimental Mean		6.69	13.45	1.68	16.88	12.33	9.40	1.90	16.49

*(Values in parentheses are transformed values)

M1- Mechanised transplanting/Transplanting (if transplanters not available)
M2-Puddled direct seeding (preferably line sowing by drum seeder)
M3-Un-puddled dry direct seeding (line sowing)

S1-Weedy check
S2-Mechanical weeding using weeder
S3-Chemical weed control (Herbicide recommendation of respective University may be followed)

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	Nagina							
		Weed population no/m² at Active tillering stage				Weed population no/m² at Panicle initiation stage			
		Grasses	Sedges	BLW	Total weed population	Grasses	Sedges	BLW	Total weed population
M1	S1	3.84(2.08)	1.63(1.45)	3.20(1.92)	8.68(3.03)	3.28(1.94)	4.02(2.12)	3.00(1.86)	10.30(3.29)
	S2	2.84(1.82)	2.41(1.70)	1.89(1.54)	7.14(2.76)	2.84(1.82)	3.12(1.90)	2.80(1.80)	8.76(3.04)
	S3	1.83(1.52)	1.13(1.28)	1.88(1.50)	4.84(2.29)	2.02(1.59)	1.72(1.48)	1.70(1.47)	5.43(2.43)
M2	S1	4.29(2.19)	2.90(1.84)	2.62(1.76)	9.80(3.20)	3.56(2.01)	4.32(2.19)	3.59(2.01)	11.47(3.46)
	S2	2.94(1.85)	2.61(1.76)	2.50(1.72)	8.04(2.92)	2.75(1.80)	3.31(1.95)	3.00(1.86)	9.05(3.09)
	S3	2.22(1.65)	2.18(1.64)	1.76(1.50)	6.16(2.58)	1.95(1.56)	2.08(1.61)	2.27(1.66)	6.30(2.60)
M3	S1	5.12(2.37)	6.32(2.61)	4.46(2.22)	15.90(4.05)	5.15(2.37)	7.73(2.87)	4.31(2.19)	17.20(4.20)
	S2	2.83(1.82)	4.01(2.10)	2.93(1.85)	9.76(3.19)	3.59(2.02)	3.51(2.00)	2.89(1.84)	9.98(3.24)
	S3	2.37(1.69)	2.46(1.72)	2.47(1.72)	7.31(2.79)	2.47(1.72)	2.31(1.68)	2.45(1.72)	7.24(2.78)
Mean of Factor-1									
M1		2.84(1.81)	1.73(1.48)	2.32(1.66)	6.89(2.69)	2.71(1.78)	2.95(1.83)	2.50(1.71)	8.16(2.92)
M2		3.15(1.90)	2.56(1.74)	2.29(1.66)	8.00(2.90)	2.75(1.79)	3.23(1.91)	2.95(1.84)	8.94(3.05)
M3		3.44(1.96)	4.26(2.14)	3.29(1.93)	10.99(3.34)	3.74(2.04)	4.52(2.18)	3.22(1.91)	11.47(3.41)
CD(0.05)		NS	0.09	NS	0.19	NS	0.10	NS	0.08
CV		7.51	5.7	12.45	7.62	13.86	6.1	11.25	3.14
Mean of Factor-2									
S1		4.42(2.21)	3.62(1.97)	3.43(1.97)	11.46(3.43)	4.00(2.11)	5.36(2.39)	3.63(2.02)	12.99(3.65)
S2		2.87(1.83)	3.01(1.85)	2.44(1.71)	8.32(2.96)	3.06(1.88)	3.31(1.95)	2.89(1.83)	9.26(3.12)
S3		2.14(1.62)	1.93(1.54)	2.04(1.57)	6.10(2.55)	2.15(1.62)	2.04(1.59)	2.14(1.61)	6.32(2.60)
CD(0.05)		0.13	0.21	0.20	0.25	0.15	0.17	0.15	0.16
CV		6.45	11.35	11.23	8.24	7.57	8.38	8.15	5.11
Interaction									
M and T		NS	0.36	NS	NS	NS	0.29	NS	0.28
T and M		NS	0.3	NS	NS	NS	0.25	NS	0.24
Experimental Mean		1.89	1.79	1.75	2.98	1.87	1.98	1.82	3.12

*(Values in parentheses are transformed values)

M1- Mechanised transplanting/Transplanting (if transplanters not available)
M2-Puddled direct seeding (preferably line sowing by drum seeder)
M3-Un-puddled dry direct seeding (line sowing)

S1-Weedy check
S2-Mechanical weeding using weeder
S3-Chemical weed control (Herbicide recommendation of respective University may be followed)

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	Nawagam							
		Weed population no/m² at Active tillering stage				Weed population no/m² at Panicle initiation stage			
		Grasses	Sedges	BLW	Total weed population	Grasses	Sedges	BLW	Total weed population
M1	S1	503.00(22.41)	303.67(17.36)	269.33(16.38)	1076.00(32.80)	1134.67(33.59)	560.00(23.44)	367.00(19.16)	2061.67(45.35)
	S2	239.67(15.48)	263.33(16.20)	220.67(14.84)	723.67(26.89)	592.67(24.08)	349.00(18.47)	251.67(15.86)	1193.33(34.46)
	S3	175.00(13.21)	222.33(14.92)	147.00(12.11)	544.33(23.32)	339.00(18.33)	244.67(15.60)	181.00(13.45)	764.67(27.58)
M2	S1	490.33(22.15)	289.33(17.02)	263.67(16.10)	1043.33(32.29)	897.33(29.86)	399.67(19.98)	328.00(18.12)	1625.00(40.29)
	S2	223.67(14.74)	188.00(13.70)	94.00(9.72)	505.67(22.41)	658.67(25.65)	240.67(15.49)	155.00(12.36)	1054.33(32.45)
	S3	171.67(13.06)	144.33(11.90)	87.00(9.26)	403.00(20.02)	336.00(18.29)	177.33(13.32)	121.33(11.02)	634.67(25.15)
M3	S1	584.67(24.15)	281.67(16.79)	226.67(15.06)	1093.00(33.04)	1029.33(32.07)	451.67(21.18)	364.00(18.98)	1845.00(42.95)
	S2	241.00(15.44)	212.33(14.57)	104.67(10.22)	558.00(23.61)	418.67(20.47)	325.33(18.04)	302.33(17.17)	1046.33(32.34)
	S3	187.67(13.70)	163.00(12.78)	81.00(8.92)	431.67(20.79)	303.00(17.41)	191.67(13.86)	220.33(14.65)	715.00(26.72)
Mean of Factor-1									
M1		305.89(17.03)	263.11(16.16)	212.33(14.45)	781.33(27.67)	688.78(25.34)	384.56(19.17)	266.56(16.16)	1339.89(35.79)
M2		295.22(16.65)	207.22(14.21)	148.22(11.70)	650.67(24.91)	630.67(24.60)	272.56(16.26)	201.44(13.83)	1104.67(32.63)
M3		337.78(17.76)	219.00(14.72)	137.44(11.40)	694.22(25.81)	583.67(23.32)	322.89(17.69)	295.56(16.93)	1202.11(34.00)
CD(0.05)		NS	NS	NS	NS	NS	NS	0.40	NS
CV		10.44	9.29	16.44	7.75	13.27	14.06	3.06	6.79
Mean of Factor-2									
S1		526.00(22.91)	291.56(17.06)	253.22(15.85)	1070.78(32.71)	1020.44(31.84)	470.44(21.53)	353.00(18.75)	1843.89(42.86)
S2		234.78(15.22)	221.22(14.82)	139.78(11.59)	595.78(24.31)	556.67(23.40)	305.00(17.33)	236.33(15.13)	1098.00(33.08)
S3		178.11(13.32)	176.56(13.20)	105.00(10.10)	459.67(21.38)	326.00(18.01)	204.56(14.26)	174.22(13.04)	704.78(26.49)
CD(0.05)		1.78	1.27	1.27	1.25	1.87	2.28	2.36	2.20
CV		10.12	8.25	9.84	4.64	7.45	12.53	14.7	6.27
Interaction									
M and T		NS	NS	NS	NS	3.24	NS	NS	NS
T and M		NS	NS	NS	NS	3.14	NS	NS	NS
Experimental Mean		17.15	15.03	12.51	26.13	24.42	17.71	15.64	34.14

*(Values in parentheses are transformed values)

M1- Mechanised transplanting/Transplanting (if transplanters not available)
M2-Puddled direct seeding (preferably line sowing by drum seeder)
M3-Un-puddled dry direct seeding (line sowing)

S1-Weedy check
S2-Mechanical weeding using weeder
S3-Chemical weed control (Herbicide recommendation of respective University may be followed)

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	Pantnagar							
		Weed population no/m² at Active tillering stage				Weed population no/m² at Panicle initiation stage			
		Grasses	Sedges	BLW	Total weed population	Grasses	Sedges	BLW	Total weed population
M1	S1	22.67(4.81)	33.65(5.84)	7.28(2.79)	63.60(8.00)	32.00(5.69)	57.33(7.60)	22.67(4.76)	112.00(10.61)
	S2	2.67(1.65)	6.37(2.58)	4.16(2.15)	13.20(3.70)	6.67(2.65)	10.67(3.30)	5.33(2.39)	22.67(4.81)
	S3	2.67(1.65)	4.23(1.98)	2.08(1.59)	8.97(3.05)	4.00(1.91)	12.00(3.50)	5.33(2.39)	21.33(4.64)
M2	S1	22.67(4.79)	52.00(7.23)	16.67(4.14)	91.33(9.56)	64.00(8.02)	89.33(9.47)	29.33(5.46)	182.67(13.53)
	S2	2.67(1.76)	8.00(2.90)	2.67(1.76)	13.33(3.70)	6.67(2.65)	13.33(3.66)	6.67(2.65)	26.67(5.20)
	S3	2.67(1.76)	6.67(2.64)	2.00(1.47)	11.33(3.41)	5.33(2.39)	9.33(3.06)	5.33(2.12)	20.00(4.38)
M3	S1	25.83(5.12)	46.50(6.85)	16.67(4.13)	89.00(9.46)	45.33(6.74)	84.00(9.18)	30.67(5.57)	160.00(12.67)
	S2	3.33(1.94)	8.67(3.01)	6.67(2.67)	18.67(4.36)	5.33(2.39)	10.67(3.33)	8.00(2.86)	24.00(4.91)
	S3	1.67(1.39)	6.50(2.37)	5.00(2.30)	13.17(3.59)	5.33(2.39)	8.00(2.86)	6.67(2.65)	20.00(4.48)
Mean of Factor-1									
M1		9.33(2.70)	14.75(3.47)	4.51(2.18)	28.59(4.92)	14.22(3.42)	26.67(4.80)	11.11(3.18)	52.00(6.69)
M2		9.33(2.77)	22.22(4.26)	7.11(2.46)	38.67(5.56)	25.33(4.35)	37.33(5.40)	13.78(3.41)	76.44(7.70)
M3		10.28(2.82)	20.56(4.08)	9.44(3.03)	40.28(5.80)	18.67(3.84)	34.22(5.12)	15.11(3.69)	68.00(7.35)
CD(0.05)		NS	NS	0.41	NS	NS	NS	NS	0.46
CV		18.25	19.7	19.27	11.1	14.1	8.65	14.81	7.59
Mean of Factor-2									
S1		23.72(4.91)	44.05(6.64)	13.54(3.69)	81.31(9.01)	47.11(6.82)	76.89(8.75)	27.56(5.27)	151.56(12.27)
S2		2.89(1.78)	7.68(2.83)	4.50(2.19)	15.07(3.92)	6.22(2.56)	11.56(3.43)	6.67(2.63)	24.44(4.97)
S3		2.33(1.60)	5.80(2.33)	3.03(1.79)	11.16(3.35)	4.89(2.23)	9.78(3.14)	5.78(2.39)	20.44(4.50)
CD(0.05)		0.56	0.72	0.34	0.58	0.63	0.70	0.70	0.74
CV		19.6	17.8	12.89	10.38	15.89	13.34	19.89	10
Interaction									
M and T		NS	NS	0.59	NS	NS	NS	NS	1.29
T and M		NS	NS	0.54	NS	NS	NS	NS	1.08
Experimental Mean		2.76	3.93	2.56	5.43	3.87	5.11	3.43	7.25

*(Values in parentheses are transformed values)

M1- Mechanised transplanting/Transplanting (if transplanters not available)
M2-Puddled direct seeding (preferably line sowing by drum seeder)
M3-Un-puddled dry direct seeding (line sowing)

S1-Weedy check
S2-Mechanical weeding using weeder
S3-Chemical weed control (Herbicide recommendation of respective University may be followed)

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	Puducherry							
		Weed population no/m^2 at Active tillering stage				Weed population no/m^2 at panicle initiation stage			
		Grasses	Sedges	BLW	Total weed population	Grasses	Sedges	BLW	Total weed population
M1	S1	57.90(7.64)	35.70(6.02)	29.03(5.43)	122.63(11.10)	66.87(8.21)	39.67(6.34)	33.03(5.79)	139.57(11.83)
	S2	33.30(5.81)	26.49(5.19)	21.31(4.67)	81.10(9.03)	25.48(5.10)	21.40(4.68)	17.25(4.21)	64.12(8.04)
	S3	24.06(4.96)	19.00(4.41)	18.05(4.31)	61.11(7.85)	18.85(4.40)	15.00(3.94)	13.03(3.68)	46.88(6.88)
M2	S1	79.79(8.96)	53.97(7.38)	36.38(6.07)	170.15(13.06)	90.60(9.54)	44.81(6.73)	41.44(6.48)	176.85(13.32)
	S2	55.89(7.51)	39.22(6.30)	28.10(5.35)	123.21(11.12)	39.76(6.34)	30.17(5.54)	19.07(4.42)	89.00(9.46)
	S3	41.31(6.47)	27.48(5.29)	24.55(5.00)	93.34(9.69)	38.16(6.22)	23.41(4.89)	15.10(3.95)	76.68(8.78)
M3	S1	-	-	-	-	-	-	-	-
	S2	-	-	-	-	-	-	-	-
	S3	-	-	-	-	-	-	-	-
Mean of Factor-1									
M1		38.42(6.14)	27.06(5.21)	22.80(4.80)	88.28(9.33)	37.06(5.90)	25.36(4.98)	21.11(4.56)	83.52(8.92)
M2		59.00(7.64)	40.22(6.32)	29.68(5.48)	128.90(11.29)	56.18(7.37)	32.79(5.72)	25.20(4.95)	114.17(10.52)
M3		-	-	-	-	-	-	-	-
CD(0.05)		0.11	0.09	0.09	0.15	0.13	0.08	0.12	0.17
CV		0.81	0.75	0.86	0.71	0.96	0.76	1.25	0.86
Mean of Factor-2									
S1		68.85(8.30)	44.84(6.70)	32.71(5.75)	146.39(12.08)	78.73(8.88)	42.24(6.53)	37.24(6.13)	158.21(12.58)
S2		44.59(6.66)	32.86(5.75)	24.71(5.01)	102.16(10.08)	32.62(5.72)	25.78(5.11)	18.16(4.32)	76.56(8.75)
S3		32.69(5.71)	23.24(4.85)	21.30(4.66)	77.23(8.77)	28.51(5.31)	19.20(4.41)	14.07(3.81)	61.78(7.83)
CD(0.05)		0.13	0.08	0.05	0.13	0.08	0.08	0.04	0.10
CV		1.37	1.06	0.66	0.97	0.87	1.1	0.64	0.78
Interaction									
M and T		0.18	0.12	NS	NS	0.11	0.11	0.06	0.14
T and M		0.17	0.12	NS	NS	0.13	0.11	0.1	0.18
Experimental Mean		6.89	5.77	5.14	10.31	6.63	5.35	4.75	9.72

*(Values in parentheses are transformed values)

M1- Mechanised transplanting/Transplanting (if transplanters not available)

M2-Puddled direct seeding (preferably line sowing by drum seeder)

M3-Un-puddled dry direct seeding (line sowing)

S1-Weedy check

S2-Mechanical weeding using weeder

S3-Chemical weed control (Herbicide recommendation of respective University may be followed)

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	Pusa							
		Weed population no/m^2 at Active tillering stage				Weed population no/m^2 at Panicle initiation stage			
		Grasses	Sedges	BLW	Total weed population	Grasses	Sedges	BLW	Total weed population
M1	S1	56.33(7.53)	14.67(3.87)	31.33(5.60)	102.33(10.14)	29.33(5.45)	14.67(3.82)	27.67(5.24)	71.67(8.48)
	S2	24.00(4.95)	5.00(2.32)	15.00(3.93)	44.00(6.67)	18.00(4.28)	6.67(2.68)	13.33(3.72)	38.00(6.20)
	S3	23.67(4.85)	5.67(2.45)	15.33(3.98)	44.67(6.68)	19.33(4.44)	10.33(3.16)	12.33(3.56)	42.00(6.49)
M2	S1	52.33(7.27)	12.33(3.51)	33.33(5.81)	98.00(9.92)	31.33(5.64)	14.00(3.71)	27.00(5.23)	72.33(8.52)
	S2	27.00(5.23)	6.33(2.53)	17.00(4.17)	50.33(7.13)	25.67(5.09)	7.67(2.82)	14.33(3.84)	47.67(6.94)
	S3	24.67(5.01)	3.67(2.00)	21.67(4.64)	50.00(7.09)	18.67(4.37)	5.00(2.30)	22.67(4.77)	46.33(6.84)
M3	S1	87.33(9.36)	22.67(4.79)	39.33(6.30)	149.33(12.23)	54.33(7.38)	24.33(4.95)	35.00(5.95)	113.67(10.67)
	S2	31.33(5.64)	10.67(3.26)	17.33(4.18)	59.33(7.71)	25.00(5.05)	14.00(3.76)	15.33(3.95)	54.33(7.39)
	S3	27.00(5.24)	6.33(2.59)	20.00(4.52)	53.33(7.33)	25.33(5.08)	7.33(2.76)	15.33(3.95)	48.00(6.95)
Mean of Factor-1									
M1		34.67(5.78)	8.44(2.88)	20.56(4.50)	63.67(7.83)	22.22(4.72)	10.56(3.22)	17.78(4.17)	50.56(7.06)
M2		34.67(5.84)	7.44(2.68)	24.00(4.87)	66.11(8.04)	25.22(5.03)	8.89(2.95)	21.33(4.61)	55.44(7.43)
M3		48.56(6.75)	13.22(3.55)	25.56(5.00)	87.33(9.09)	34.89(5.84)	15.22(3.82)	21.89(4.62)	72.00(8.34)
CD(0.05)		0.22	NS	NS	0.49	0.24	NS	NS	0.17
CV		4.29	25.14	9.71	7.01	5.45	18.83	10.36	2.62
Mean of Factor-2									
S1		65.33(8.05)	16.56(4.05)	34.67(5.90)	116.56(10.76)	38.33(6.16)	17.67(4.16)	29.89(5.47)	85.89(9.22)
S2		27.44(5.27)	7.33(2.70)	16.44(4.10)	51.22(7.17)	22.89(4.81)	9.44(3.09)	14.33(3.84)	46.67(6.84)
S3		25.11(5.03)	5.22(2.35)	19.00(4.38)	49.33(7.03)	21.11(4.63)	7.56(2.74)	16.78(4.09)	45.44(6.76)
CD(0.05)		0.48	0.55	0.64	0.49	0.48	0.78	0.69	0.54
CV		7.56	17.58	13.03	5.7	9.07	22.92	14.93	6.97
Interaction									
M and T		0.82	NS	NS	0.84	0.84	NS	NS	0.94
T and M		0.68	NS	NS	0.74	0.69	NS	NS	0.77
Experimental Mean		6.12	3.03	4.79	8.32	5.2	3.33	4.47	7.61

*(Values in parentheses are transformed values)

M1- Mechanised transplanting/Transplanting (if transplanters not available)

M2-Puddled direct seeding (preferably line sowing by drum seeder)

M3-Un-puddled dry direct seeding (line sowing)

S1-Weedy check

S2-Mechanical weeding using weeder

S3-Chemical weed control (Herbicide recommendation of respective University may be followed)

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	ARI-Rajendranagar							
		Weed population no/m^2 at Active tillering stage				Weed population no/m^2 at Panicle initiation stage			
		Grasses	Sedges	BLW	Total weed population	Grasses	Sedges	BLW	Total weed population
M1	S1	62.67(7.89)	47.33(6.91)	13.33(3.70)	123.33(11.11)	39.33(6.29)	41.67(6.48)	22.67(4.81)	103.67(10.19)
	S2	23.00(4.83)	22.00(4.72)	6.67(2.67)	51.67(7.22)	25.33(5.08)	21.67(4.70)	12.33(3.55)	59.33(7.73)
	S3	13.00(3.64)	11.33(3.43)	6.00(2.54)	30.33(5.55)	15.33(3.97)	16.33(4.08)	10.67(3.34)	42.33(6.54)
M2	S1	79.33(8.90)	80.33(8.98)	21.00(4.63)	180.67(13.44)	46.33(6.84)	58.33(7.66)	34.33(5.90)	139.00(11.81)
	S2	41.00(6.43)	30.00(5.50)	14.67(3.88)	85.67(9.28)	32.67(5.75)	28.33(5.37)	23.00(4.84)	84.00(9.19)
	S3	41.33(6.46)	18.33(4.33)	12.00(3.53)	71.67(8.49)	19.00(4.41)	18.67(4.37)	10.67(3.33)	48.33(6.99)
M3	S1	83.67(9.16)	116.00(10.77)	22.67(4.81)	222.33(14.91)	67.00(8.21)	59.33(7.73)	37.67(6.17)	164.00(12.82)
	S2	49.00(7.02)	71.67(8.49)	14.33(3.85)	135.00(11.63)	28.67(5.39)	43.00(6.59)	26.67(5.14)	98.33(9.93)
	S3	35.00(5.95)	40.00(6.36)	13.67(3.75)	88.67(9.44)	28.33(5.35)	33.33(5.81)	18.00(4.30)	79.67(8.94)
Mean of Factor-1									
M1		32.89(5.46)	26.89(5.02)	8.67(2.97)	68.44(7.96)	26.67(5.11)	26.56(5.09)	15.22(3.90)	68.44(8.16)
M2		53.89(7.27)	42.89(6.27)	15.89(4.02)	112.67(10.40)	32.67(5.67)	35.11(5.80)	22.67(4.69)	90.44(9.33)
M3		55.89(7.38)	75.89(8.54)	16.89(4.14)	148.67(11.99)	41.33(6.32)	45.22(6.71)	27.44(5.20)	114.00(10.57)
CD(0.05)		0.36	0.29	0.33	0.21	0.39	0.37	0.59	0.43
CV		6.38	5.32	10.53	2.46	8.28	7.51	15.37	5.47
Mean of Factor-2									
S1		75.22(8.65)	81.22(8.89)	19.00(4.38)	175.44(13.15)	50.89(7.11)	53.11(7.29)	31.56(5.63)	135.56(11.61)
S2		37.67(6.10)	41.22(6.24)	11.89(3.47)	90.78(9.38)	28.89(5.41)	31.00(5.55)	20.67(4.51)	80.56(8.95)
S3		29.78(5.35)	23.22(4.71)	10.56(3.27)	63.56(7.83)	20.89(4.58)	22.78(4.76)	13.11(3.66)	56.78(7.49)
CD(0.05)		0.73	0.52	0.28	0.62	0.41	0.29	0.36	0.38
CV		10.56	7.62	7.38	5.97	6.95	4.88	7.69	3.98
Interaction									
M and T		NS	NS	NS	NS	0.7	0.51	NS	NS
T and M		NS	NS	NS	NS	0.62	0.47	NS	NS
Experimental Mean		6.7	6.61	3.71	10.12	5.7	5.87	4.6	9.35

*(Values in parentheses are transformed values)

M1- Mechanised transplanting/Transplanting (if transplanters not available)
M2-Puddled direct seeding (preferably line sowing by drum seeder)
M3-Un-puddled dry direct seeding (line sowing)

S1-Weedy check
S2-Mechanical weeding using weeder
S3-Chemical weed control (Herbicide recommendation of respective University may be followed)

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	Titabar							
		Weed population no/m^2 at Active tillering stage				Weed population no/m^2 at Panicle initiation stage			
		Grasses	Sedges	BLW	Total weed population	Grasses	Sedges	BLW	Total weed population
M1	S1	32.00(5.67)	12.33(3.56)	9.67(3.17)	54.00(7.36)	39.00(6.28)	15.00(3.92)	12.00(3.53)	66.00(8.15)
	S2	24.00(4.93)	5.67(2.48)	6.33(2.61)	36.00(6.03)	37.67(6.14)	9.00(3.08)	8.67(2.99)	55.33(7.43)
	S3	17.00(4.18)	5.33(2.41)	4.67(2.27)	27.00(5.24)	26.33(5.17)	7.67(2.84)	7.00(2.73)	41.00(6.44)
M2	S1	32.67(5.74)	11.67(3.48)	13.33(3.71)	57.67(7.63)	39.67(6.32)	14.33(3.83)	16.33(4.08)	70.33(8.42)
	S2	26.33(5.18)	7.33(2.79)	11.67(3.48)	45.33(6.77)	33.00(5.79)	10.33(3.27)	14.00(3.79)	57.33(7.60)
	S3	20.33(4.56)	6.33(2.61)	7.33(2.79)	34.00(5.87)	30.33(5.54)	9.67(3.17)	9.33(3.11)	49.33(7.04)
M3	S1	42.00(6.51)	13.00(3.64)	14.67(3.89)	69.67(8.38)	52.33(7.27)	16.33(4.07)	16.67(4.13)	85.33(9.26)
	S2	28.33(5.37)	4.33(2.20)	11.67(3.48)	44.33(6.69)	42.00(6.52)	6.00(2.54)	16.67(4.14)	64.67(8.07)
	S3	23.00(4.85)	5.00(2.34)	8.67(3.03)	36.67(6.10)	35.00(5.96)	6.33(2.60)	12.00(3.52)	53.33(7.34)
Mean of Factor-1									
M1		24.33(4.93)	7.78(2.82)	6.89(2.68)	39.00(6.21)	34.33(5.86)	10.56(3.28)	9.22(3.09)	54.11(7.34)
M2		26.44(5.16)	8.44(2.96)	10.78(3.33)	45.67(6.76)	34.33(5.88)	11.44(3.42)	13.22(3.66)	59.00(7.68)
M3		31.11(5.57)	7.44(2.72)	11.67(3.47)	50.22(7.05)	43.11(6.58)	9.56(3.07)	15.11(3.93)	67.78(8.22)
CD(0.05)		NS	NS	0.09	0.33	0.33	NS	0.26	0.27
CV		9.28	12.68	3.28	5.82	6.4	13.21	8.57	4.18
Mean of Factor-2									
S1		35.56(5.98)	12.33(3.56)	12.56(3.59)	60.44(7.79)	43.67(6.62)	15.22(3.94)	15.00(3.92)	73.89(8.61)
S2		26.22(5.16)	5.78(2.49)	9.89(3.19)	41.89(6.50)	37.56(6.15)	8.44(2.96)	13.11(3.64)	59.11(7.70)
S3		20.11(4.53)	5.56(2.45)	6.89(2.70)	32.56(5.74)	30.56(5.56)	7.89(2.87)	9.44(3.12)	47.89(6.94)
CD(0.05)		0.36	0.33	0.31	0.30	0.37	0.41	0.38	0.36
CV		6.77	11.39	9.66	4.43	5.85	12.12	10.48	4.51
Interaction									
M and T		NS	NS	NS	NS	NS	NS	NS	NS
T and M		NS	NS	NS	NS	NS	NS	NS	NS
Experimental Mean		5.22	2.83	3.16	6.67	6.11	3.26	3.56	7.75

*(Values in parentheses are transformed values)

M1- Mechanised transplanting/Transplanting (if transplanters not available)

M2-Puddled direct seeding (preferably line sowing by drum seeder)

M3-Un-puddled dry direct seeding (line sowing)

S1-Weedy check

S2-Mechanical weeding using weeder

S3-Chemical weed control (Herbicide recommendation of respective University may be followed)

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	Varanasi							
		Weed population no/m² at Active tillering stage				Weed population no/m² at panicle initiation stage			
		Grasses	Sedges	BLW	Total weed population	Grasses	Sedges	BLW	Total weed population
M1	S1	18.67(4.37)	25.33(5.07)	18.33(4.31)	62.33(7.91)	68.00(8.23)	36.33(6.05)	15.67(3.92)	120.00(10.92)
	S2	15.00(3.94)	26.00(5.11)	10.67(3.32)	51.67(7.20)	22.33(4.77)	14.00(3.80)	9.67(3.13)	46.00(6.81)
	S3	17.33(4.20)	16.00(4.06)	8.00(2.91)	41.33(6.47)	18.00(4.27)	15.33(3.92)	6.00(2.50)	39.33(6.25)
M2	S1	57.00(7.56)	121.33(10.63)	23.67(4.90)	202.00(14.03)	84.33(9.18)	33.67(5.84)	18.67(4.36)	136.67(11.68)
	S2	43.33(6.61)	48.33(6.87)	11.33(3.41)	103.00(10.13)	37.00(6.11)	14.67(3.88)	7.67(2.81)	59.33(7.70)
	S3	31.33(5.64)	45.33(6.76)	9.00(3.06)	85.67(9.27)	21.67(4.70)	16.33(4.02)	5.33(2.40)	43.33(6.58)
M3	S1	53.00(7.31)	132.00(11.19)	25.33(5.07)	210.33(14.38)	61.33(7.85)	36.67(6.09)	20.67(4.58)	118.67(10.90)
	S2	34.00(5.87)	67.33(8.11)	19.67(4.47)	121.00(10.98)	21.00(4.60)	11.33(3.43)	8.33(2.94)	40.67(6.38)
	S3	27.67(5.26)	40.33(6.27)	13.33(3.70)	81.33(9.03)	18.67(4.36)	11.00(3.37)	6.00(2.53)	35.67(6.00)
Mean of Factor-1									
M1		17.00(4.17)	22.44(4.75)	12.33(3.51)	51.78(7.19)	36.11(5.76)	21.89(4.59)	10.44(3.19)	68.44(7.99)
M2		43.89(6.60)	71.67(8.09)	14.67(3.79)	130.22(11.14)	47.67(6.66)	21.56(4.58)	10.56(3.19)	79.78(8.65)
M3		38.22(6.15)	79.89(8.53)	19.44(4.42)	137.56(11.46)	33.67(5.60)	19.67(4.30)	11.67(3.35)	65.00(7.76)
CD(0.05)		0.41	NS	0.27	1.55	0.35	NS	NS	NS
CV		8.64	33.56	8.41	18.59	6.96	12.17	14.36	6.72
Mean of Factor-2									
S1		42.89(6.41)	92.89(8.96)	22.44(4.76)	158.22(12.11)	71.22(8.42)	35.56(5.99)	18.33(4.29)	125.11(11.17)
S2		30.78(5.47)	47.22(6.70)	13.89(3.73)	91.89(9.44)	26.78(5.16)	13.33(3.70)	8.56(2.96)	48.67(6.96)
S3		25.44(5.03)	33.89(5.70)	10.11(3.22)	69.44(8.26)	19.44(4.44)	14.22(3.77)	5.78(2.48)	39.44(6.27)
CD(0.05)		0.44	1.51	0.34	1.11	0.41	0.38	0.28	0.36
CV		7.57	20.6	8.42	10.85	6.71	8.16	8.42	4.33
Interaction									
M and T		0.76	NS	NS	1.92	NS	NS	NS	NS
T and M		0.66	NS	NS	1.83	NS	NS	NS	NS
Experimental Mean		5.64	7.12	3.91	9.93	6.01	4.49	3.24	8.14

*(Values in parentheses are transformed values)

M1- Mechanised transplanting/Transplanting (if transplanters not available)
M2-Puddled direct seeding (preferably line sowing by drum seeder)
M3-Un-puddled dry direct seeding (line sowing)

S1-Weedy check
S2-Mechanical weeding using weeder
S3-Chemical weed control (Herbicide recommendation of respective University may be followed)

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	ADUTHURAI													
		Weed population no/m^2 at Active tillering stage													
		Grasses					sedges			BLW					Total weed population
		Cynodon dactylon	***Echinochloa colona***	***Echinochloa crusgalli***	***Leptochloa chinensis***	***Panicum repens***	Cyperus difformis	Cyperus rotundus	***Fimbristylis miliacea***	***Ammania baccifera***	***Bergia capensis***	***Eclipta alba***	***Euphorbia prostrata***	***Marselia quadrifolia***	
M1	S1	7.00(2.73)	18.23(4.33)	7.50(2.83)	10.17(3.27)	3.47(1.99)	5.67(2.48)	10.67(3.34)	2.67(1.77)	11.67(3.49)	3.67(2.04)	39.33(6.31)	22.00(4.74)	5.67(2.48)	198.00(14.09)
	S2	3.33(1.95)	3.37(1.97)	1.40(1.38)	2.50(1.73)	1.70(1.48)	2.67(1.77)	4.67(2.27)	0.00(0.71)	3.33(1.95)	0.00(0.71)	4.33(2.20)	3.33(1.95)	2.33(1.68)	47.67(6.94)
	S3	2.33(1.68)	2.17(1.63)	1.07(1.25)	2.17(1.63)	1.57(1.44)	2.00(1.58)	3.67(2.04)	1.00(1.22)	3.00(1.87)	1.00(1.22)	5.67(2.48)	4.33(2.20)	2.00(1.58)	44.00(6.67)
M2	S1	12.00(3.53)	21.50(4.69)	10.60(3.33)	13.50(3.74)	6.53(2.65)	7.67(2.86)	12.00(3.53)	4.67(2.27)	12.00(3.53)	4.67(2.27)	41.33(6.47)	23.33(4.88)	7.33(2.80)	239.33(15.49)
	S2	5.33(2.41)	3.20(1.92)	9.17(3.11)	3.23(1.93)	3.37(1.97)	4.33(2.20)	6.67(2.68)	0.00(0.71)	4.67(2.27)	1.67(1.46)	6.67(2.68)	3.67(2.04)	4.33(2.20)	80.00(8.97)
	S3	4.00(2.12)	4.40(2.21)	3.13(1.91)	3.47(1.99)	2.50(1.73)	2.33(1.68)	3.33(1.95)	1.33(1.34)	4.00(2.12)	1.67(1.46)	5.67(2.48)	2.67(1.77)	1.67(1.46)	53.67(7.36)
M3	S1	16.00(4.06)	25.43(5.09)	13.50(3.74)	16.30(4.10)	9.27(3.13)	9.00(3.08)	14.33(3.85)	6.67(2.68)	16.33(4.10)	7.67(2.86)	46.67(6.87)	28.67(5.40)	10.67(3.34)	290.00(17.04)
	S2	6.67(2.68)	7.37(2.80)	5.27(2.40)	4.30(2.19)	3.67(2.04)	4.67(2.27)	7.67(2.86)	1.00(1.22)	6.67(2.68)	4.33(2.20)	8.67(3.03)	5.67(2.48)	5.67(2.48)	94.33(9.74)
	S3	5.33(2.41)	5.27(2.40)	3.23(1.93)	2.70(1.79)	2.50(1.73)	2.67(1.77)	5.67(2.48)	1.00(1.22)	4.67(2.27)	1.67(1.46)	7.67(2.86)	4.67(2.27)	3.67(2.04)	71.00(8.45)
Mean of Factor-1															
M1		4.22(2.12)	7.92(2.64)	3.32(1.82)	4.94(2.21)	2.24(1.64)	3.44(1.95)	6.33(2.55)	1.22(1.24)	6.00(2.44)	1.56(1.32)	16.44(3.66)	9.89(2.96)	3.33(1.91)	96.56(9.23)
M2		7.11(2.69)	9.70(2.94)	7.63(2.78)	6.73(2.56)	4.13(2.12)	4.78(2.24)	7.33(2.72)	2.00(1.44)	6.89(2.64)	2.67(1.73)	17.89(3.87)	9.89(2.90)	4.44(2.15)	124.33(10.60)
M3		9.33(3.05)	12.69(3.43)	7.33(2.69)	7.77(2.69)	5.14(2.30)	5.44(2.37)	9.22(3.06)	2.89(1.71)	9.22(3.02)	4.56(2.17)	21.00(4.25)	13.00(3.38)	6.67(2.62)	151.78(11.74)
CD(0.05)		0.08	0.02	0.02	0.02	0.01	0.12	0.03	0.06	0.06	0.1	0.08	0.12	0.11	0.12
CV		3.65	0.74	1.04	0.76	0.6	6.44	1.25	4.74	2.78	7.13	2.42	4.84	5.94	1.36
Mean of Factor-2															
S1		11.67(3.44)	21.72(4.70)	10.53(3.30)	13.32(3.70)	6.42(2.59)	7.44(2.81)	12.33(3.58)	4.67(2.24)	13.33(3.71)	5.33(2.39)	42.44(6.55)	24.67(5.01)	7.89(2.87)	242.44(15.54)
S2		5.11(2.35)	4.64(2.23)	5.28(2.30)	3.34(1.95)	2.91(1.83)	3.89(2.08)	6.33(2.60)	0.33(0.88)	4.89(2.30)	2.00(1.46)	6.56(2.63)	4.22(2.16)	4.11(2.12)	74.00(8.55)
S3		3.89(2.07)	3.94(2.08)	2.48(1.70)	2.78(1.80)	2.19(1.63)	2.33(1.68)	4.22(2.16)	1.11(1.26)	3.89(2.09)	1.44(1.38)	6.33(2.61)	3.89(2.08)	2.44(1.69)	56.22(7.49)
CD(0.05)		0.15	0.02	0.02	0.02	0.03	0.14	0.13	0.1	0.1	0.16	0.09	0.13	0.14	0.15
CV		5.71	0.67	0.74	0.96	1.38	6.33	4.65	6.68	3.66	8.77	2.25	3.95	6.22	1.42
Interaction															
M and T		0.27	0.04	0.03	0.04	0.05	NS	NS	0.17	0.18	0.27	0.16	0.22	0.25	0.27
T and M		0.22	0.03	0.03	0.04	0.04	NS	NS	0.14	0.15	0.23	0.14	0.19	0.21	0.23
Experimental Mean		2.62	3.01	2.43	2.49	2.02	2.19	2.78	1.46	2.7	1.74	3.93	3.08	2.23	10.53

*(Values in parentheses are transformed values)

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	CHATHA							
		Weed population no/m^2 at Active tillering stage							
		Grasses				sedges	BLW		Total weed population
		Cynodon dactylon	***Dactylactenium aegyptium***	***Echinochloa spp***	***Eleusine indica***	***Cyperus spp***	***Physalis minima***	***Solanum nigrum***	
M1	S1	10.00(3.24)	12.67(3.63)	21.33(4.67)	1.00(1.17)	35.33(5.99)	1.00(1.22)	0.67(1.05)	82.00(9.08)
	S2	1.67(1.46)	2.33(1.68)	2.67(1.74)	0.67(1.05)	1.33(1.34)	0.67(1.05)	1.00(1.17)	10.33(3.28)
	S3	1.00(1.17)	1.67(1.46)	2.33(1.66)	0.33(0.88)	29.33(5.46)	0.33(0.88)	0.33(0.88)	35.33(5.98)
M2	S1	10.00(3.22)	13.67(3.76)	23.67(4.91)	2.00(1.56)	46.00(6.82)	1.33(1.34)	1.33(1.34)	98.00(9.92)
	S2	1.67(1.46)	2.33(1.68)	2.67(1.77)	0.67(1.05)	2.33(1.68)	1.33(1.34)	1.33(1.34)	12.33(3.57)
	S3	1.67(1.46)	1.33(1.34)	3.00(1.86)	0.67(1.05)	35.00(5.96)	0.67(1.05)	0.33(0.88)	42.67(6.57)
M3	S1	11.33(3.44)	15.00(3.94)	24.67(5.01)	2.00(1.58)	45.33(6.77)	2.33(1.68)	1.67(1.46)	102.33(10.14)
	S2	2.00(1.56)	2.33(1.68)	2.33(1.68)	0.67(1.05)	1.33(1.34)	2.00(1.58)	1.67(1.46)	12.33(3.58)
	S3	1.33(1.34)	2.00(1.56)	2.33(1.68)	1.67(1.46)	40.33(6.39)	1.00(1.22)	2.00(1.58)	50.67(7.15)
Mean of Factor-1									
M1		4.22(1.96)	5.56(2.26)	8.78(2.69)	0.67(1.03)	22.00(4.26)	0.67(1.05)	0.67(1.03)	42.56(6.11)
M2		4.44(2.05)	5.78(2.26)	9.78(2.85)	1.11(1.22)	27.78(4.82)	1.11(1.25)	1.00(1.19)	51.00(6.69)
M3		4.89(2.11)	6.44(2.39)	9.78(2.79)	1.44(1.37)	29.00(4.83)	1.78(1.49)	1.78(1.50)	55.11(6.96)
CD(0.05)		NS	0.05	NS	NS	0.03	0.09	0.12	0.22
CV		10.91	2.66	7.63	26.67	0.79	8.65	11.27	4.02
Mean of Factor-2									
S1		10.44(3.30)	13.78(3.77)	23.22(4.87)	1.67(1.44)	42.22(6.52)	1.56(1.42)	1.22(1.29)	94.11(9.71)
S2		1.78(1.49)	2.33(1.68)	2.56(1.73)	0.67(1.05)	1.67(1.45)	1.33(1.33)	1.33(1.33)	11.67(3.48)
S3		1.33(1.33)	1.67(1.45)	2.56(1.73)	0.89(1.13)	34.89(5.93)	0.67(1.05)	0.89(1.11)	42.89(6.57)
CD(0.05)		0.3	0.14	0.29	0.22	0.2	0.25	NS	0.2
CV		14.41	5.85	10.32	17.86	4.2	19.04	22.96	3.02
Interaction									
M and T		NS	NS	NS	NS	0.35	NS	NS	0.35
T and M		NS	NS	NS	NS	0.28	NS	NS	0.32
Experimental Mean		2.04	2.3	2.78	1.21	4.64	1.26	1.24	6.59

*(Values in parentheses are transformed values)

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	CHATHA							
		Weed population no/m^2 at panicle initiation stage							
		Grasses				Sedges	BLW		Total weed population
		Cynodon dactylon	***Dactylactenium aegyptium***	***Echinochloa spp***	***Eleusine indica***	***Cyperus spp***	***Physalis minima***	***Solanum nigrum***	
M1	S1	18.67(4.38)	28.00(5.33)	34.67(5.92)	3.00(1.86)	66.67(8.19)	2.67(1.77)	3.00(1.86)	156.67(12.54)
	S2	6.00(2.54)	6.00(2.54)	4.67(2.27)	1.33(1.34)	5.00(2.35)	1.33(1.34)	1.67(1.46)	26.00(5.15)
	S3	4.00(2.11)	6.33(2.61)	3.67(2.04)	0.67(1.05)	7.67(2.86)	0.33(0.88)	0.67(1.05)	23.33(4.88)
M2	S1	22.33(4.78)	33.00(5.79)	47.00(6.89)	7.00(2.73)	75.33(8.71)	6.67(2.68)	5.33(2.41)	196.67(14.04)
	S2	8.33(2.97)	8.33(2.96)	6.67(2.68)	1.67(1.46)	7.67(2.85)	1.33(1.34)	2.00(1.58)	36.00(6.04)
	S3	8.00(2.92)	7.67(2.86)	5.33(2.40)	1.00(1.17)	11.00(3.39)	1.00(1.22)	1.33(1.34)	35.33(5.98)
M3	S1	19.33(4.45)	36.33(6.06)	54.67(7.43)	8.00(2.91)	80.67(9.01)	7.67(2.86)	6.33(2.61)	213.00(14.61)
	S2	9.67(3.19)	8.67(3.02)	8.67(3.03)	2.33(1.68)	9.33(3.13)	1.67(1.46)	1.67(1.46)	42.00(6.52)
	S3	8.00(2.91)	7.00(2.73)	7.00(2.73)	1.33(1.34)	10.67(3.33)	1.67(1.46)	1.67(1.46)	37.33(6.15)
Mean of Factor-1									
M1		9.56(3.01)	13.44(3.50)	14.33(3.41)	1.67(1.42)	26.44(4.47)	1.44(1.33)	1.78(1.46)	68.67(7.52)
M2		12.89(3.55)	16.33(3.87)	19.67(3.99)	3.22(1.79)	31.33(4.98)	3.00(1.75)	2.89(1.78)	89.33(8.69)
M3		12.33(3.52)	17.33(3.94)	23.44(4.40)	3.89(1.98)	33.56(5.16)	3.67(1.93)	3.22(1.85)	97.44(9.09)
CD(0.05)		0.05	0.15	0.16	0.24	0.26	0.12	0.19	0.2
CV		1.86	4.73	4.78	16.85	6.37	8.55	13.21	2.79
Mean of Factor-2									
S1		20.11(4.53)	32.44(5.73)	45.44(6.75)	6.00(2.50)	74.22(8.64)	5.67(2.44)	4.89(2.29)	188.78(13.73)
S2		8.00(2.90)	7.67(2.84)	6.67(2.66)	1.78(1.49)	7.33(2.78)	1.44(1.38)	1.78(1.50)	34.67(5.90)
S3		6.67(2.65)	7.00(2.73)	5.33(2.39)	1.00(1.19)	9.78(3.19)	1.00(1.19)	1.22(1.29)	32.00(5.67)
CD(0.05)		0.19	0.23	0.22	0.22	0.15	0.21	0.19	0.17
CV		5.52	5.83	5.39	12.33	3.06	12.18	10.95	1.99
Interaction									
M and T		0.33	NS	0.38	0.38	NS	0.36	NS	0.3
T and M		0.27	NS	0.32	0.34	NS	0.3	NS	0.27
Experimental Mean		3.36	3.77	3.93	1.73	4.87	1.67	1.69	8.43

*(Values in parentheses are transformed values)

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	CHIPLIMA									
		Weed population no/m^2 at Active tillering stage									
		Grasses			Sedges			BLW			Total weed population
		Echinochloa colona	***Echinochloa crusgalli***	Ischaemum rugosum	Cyperus difformis	Cyperus iria	Fimbristylis miliacea	Marselia quadrifolia	Monochoria vaginalis	Sphenoclea zeylanica	
M1	S1	11.67(3.48)	9.00(3.05)	4.00(2.11)	9.67(3.18)	10.67(3.33)	11.33(3.42)	10.00(3.23)	6.67(2.67)	7.33(2.76)	80.33(8.98)
	S2	8.00(2.87)	4.67(2.24)	2.67(1.74)	7.33(2.78)	10.33(3.29)	5.67(2.48)	6.00(2.54)	5.00(2.32)	4.00(2.11)	53.67(7.36)
	S3	7.00(2.72)	4.00(2.11)	3.67(2.00)	5.67(2.48)	8.00(2.91)	6.00(2.47)	5.67(2.46)	3.33(1.94)	3.33(1.93)	46.67(6.87)
M2	S1	13.67(3.74)	9.67(3.13)	5.00(2.33)	11.33(3.39)	13.33(3.70)	14.33(3.84)	12.67(3.62)	5.67(2.47)	10.00(3.24)	95.67(9.80)
	S2	8.00(2.88)	4.33(2.18)	3.00(1.84)	10.00(3.22)	11.33(3.43)	6.33(2.60)	9.00(3.08)	5.67(2.45)	8.00(2.91)	65.67(8.13)
	S3	9.00(3.06)	5.67(2.48)	3.67(2.00)	9.33(3.09)	9.00(3.08)	5.33(2.39)	9.00(3.07)	3.00(1.86)	6.00(2.51)	60.00(7.75)
M3	S1	15.33(3.98)	10.67(3.29)	7.00(2.71)	13.00(3.64)	11.67(3.48)	13.33(3.70)	12.67(3.62)	7.67(2.85)	13.33(3.72)	104.67(10.25)
	S2	9.33(3.12)	7.00(2.71)	2.67(1.72)	8.00(2.90)	9.67(3.17)	5.33(2.40)	8.67(3.02)	4.33(2.20)	6.33(2.59)	61.33(7.86)
	S3	11.33(3.43)	9.33(3.05)	5.00(2.32)	9.33(3.12)	11.33(3.43)	10.00(3.23)	6.33(2.58)	4.67(2.23)	5.33(2.39)	72.67(8.54)
Mean of Factor-1											
M1		8.89(3.03)	5.89(2.47)	3.44(1.95)	7.56(2.81)	9.67(3.18)	7.67(2.79)	7.22(2.75)	5.00(2.31)	4.89(2.27)	60.22(7.74)
M2		10.22(3.23)	6.56(2.60)	3.89(2.05)	10.22(3.23)	11.22(3.40)	8.67(2.94)	10.22(3.26)	4.78(2.26)	8.00(2.89)	73.78(8.56)
M3		12.00(3.51)	9.00(3.02)	4.89(2.25)	10.11(3.22)	10.89(3.36)	9.56(3.11)	9.22(3.08)	5.56(2.42)	8.33(2.90)	79.56(8.88)
CD(0.05)		NS	NS	NS	NS	NS	NS	0.13	NS	0.22	0.45
CV		10.65	21.13	16.18	23.87	10.47	15.44	5.26	6.55	9.87	6.34
Mean of Factor-2											
S1		13.56(3.73)	9.78(3.16)	5.33(2.38)	11.33(3.40)	11.89(3.51)	13.00(3.66)	11.78(3.49)	6.67(2.66)	10.22(3.24)	93.56(9.68)
S2		8.44(2.96)	5.33(2.38)	2.78(1.76)	8.44(2.97)	10.44(3.30)	5.78(2.50)	7.89(2.88)	5.00(2.32)	6.11(2.54)	60.22(7.78)
S3		9.11(3.07)	6.33(2.55)	4.11(2.11)	8.11(2.90)	9.44(3.14)	7.11(2.69)	7.00(2.71)	3.67(2.01)	4.89(2.28)	59.78(7.72)
CD(0.05)		0.46	0.58	NS	0.36	NS	0.45	0.25	0.3	0.42	0.44
CV		13.74	21.12	23.67	11.4	9.67	14.88	8.19	12.49	15.3	5.07
Interaction											
M and T		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
T and M		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Experimental Mean		3.25	2.69	2.08	3.09	3.31	2.95	3.03	2.33	2.68	8.39

*(Values in parentheses are transformed values)

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	JAGDALPUR													
		Weed population no/m² at Active tillering stage							Weed population no/m² at Panicle initiation stage						
		Grasses			Sedges	BLW		Total weed population	Grasses			Sedges		BLW	Total weed population
		Cynodon dactylon	***Echinochloa spp***	***Paspalum dilatatum***	***Cyperus spp***	***Aegeratum conyzoides***	***Ludwigia parviflora***		***Cynodon dactylon***	***Echinochloa spp***	***Paspalum dilatatum***	***Cyperus difformis***	***Cyperus iria***	***Ludwigia parviflora***	
M1	S1	0.42(0.93)	9.33(3.11)	1.23(1.25)	2.80(1.79)	0.00(0.71)	10.49(3.30)	24.27(4.94)	0.00(0.71)	14.00(3.79)	2.63(1.76)	3.73(2.05)	15.17(3.90)	12.90(3.65)	48.43(6.98)
	S2	0.00(0.71)	5.37(2.42)	0.42(0.93)	1.73(1.48)	0.00(0.71)	7.00(2.73)	14.51(3.87)	0.00(0.71)	7.43(2.81)	0.50(0.99)	2.48(1.71)	9.43(3.09)	4.20(2.14)	24.05(4.94)
	S3	0.10(0.77)	0.90(1.14)	0.17(0.80)	0.23(0.85)	0.00(0.71)	0.95(1.20)	2.35(1.68)	0.10(0.77)	0.90(1.18)	0.17(0.80)	0.68(1.07)	3.80(2.04)	0.38(0.92)	6.03(2.54)
M2	S1	0.55(0.98)	10.12(3.25)	0.78(1.05)	3.63(2.02)	0.00(0.71)	16.20(4.07)	31.28(5.63)	0.00(0.71)	12.67(3.62)	0.85(1.13)	4.58(2.23)	14.87(3.90)	17.32(4.18)	50.28(7.11)
	S2	0.08(0.76)	9.57(3.17)	1.07(1.20)	2.60(1.74)	0.00(0.71)	10.57(3.32)	23.88(4.93)	0.00(0.71)	10.04(3.23)	0.82(1.12)	3.60(2.02)	10.12(3.24)	11.13(3.40)	35.70(6.02)
	S3	0.07(0.75)	3.17(1.88)	0.33(0.88)	0.68(1.07)	0.00(0.71)	1.68(1.45)	5.93(2.54)	0.07(0.75)	3.77(2.00)	0.00(0.71)	1.47(1.39)	2.85(1.79)	1.10(1.15)	9.25(3.12)
M3	S1	5.50(2.42)	17.97(4.29)	6.50(2.59)	8.20(2.93)	5.20(1.81)	18.28(4.33)	69.32(8.35)	2.60(1.75)	19.54(4.43)	2.50(1.71)	10.53(3.31)	26.30(5.17)	21.27(4.64)	82.74(9.12)
	S2	2.40(1.68)	9.97(3.23)	3.17(1.91)	4.53(2.23)	2.27(1.37)	8.15(2.92)	32.85(5.77)	2.47(1.70)	10.25(3.27)	1.42(1.34)	6.14(2.57)	16.13(4.03)	10.10(3.24)	46.51(6.83)
	S3	3.63(1.99)	5.28(2.39)	1.20(1.30)	2.25(1.66)	0.40(0.91)	3.18(1.88)	16.78(4.15)	1.83(1.52)	6.43(2.62)	0.97(1.20)	3.35(1.91)	5.72(2.46)	2.88(1.73)	21.18(4.64)
Mean of Factor-1															
M1		0.17(0.80)	5.20(2.22)	0.61(1.00)	1.59(1.37)	0.00(0.71)	6.15(2.41)	13.71(3.50)	0.03(0.73)	7.44(2.59)	1.10(1.18)	2.30(1.61)	9.47(3.01)	5.83(2.24)	26.17(4.82)
M2		0.23(0.83)	7.62(2.77)	0.73(1.04)	2.31(1.61)	0.00(0.71)	9.48(2.95)	20.36(4.37)	0.02(0.72)	8.82(2.95)	0.56(0.99)	3.22(1.88)	9.28(2.98)	9.85(2.91)	31.75(5.41)
M3		3.84(2.03)	11.07(3.30)	3.62(1.94)	4.99(2.27)	2.62(1.36)	9.87(3.04)	39.65(6.09)	2.30(1.66)	12.07(3.44)	1.63(1.41)	6.67(2.60)	16.05(3.89)	11.42(3.20)	50.14(6.86)
CD(0.05)		0.27	0.26	0.44	0.21	NS	NS	0.37	0.21	NS	NS	0.3	NS	0.22	0.5
CV		26.8	11.24	39.53	14.02	122.62	17.12	9.42	24.16	20.25	27.49	17.59	19.49	9.56	10.49
Mean of Factor-2															
S1		2.16(1.45)	12.47(3.55)	2.84(1.63)	4.88(2.25)	1.73(1.07)	14.99(3.90)	41.62(6.31)	0.87(1.05)	15.40(3.95)	1.99(1.53)	6.28(2.53)	18.78(4.32)	17.16(4.16)	60.48(7.74)
S2		0.83(1.05)	8.30(2.94)	1.55(1.35)	2.96(1.82)	0.76(0.93)	8.57(2.99)	23.75(4.86)	0.82(1.04)	9.24(3.10)	0.91(1.15)	4.07(2.10)	11.89(3.46)	8.48(2.93)	35.42(5.93)
S3		1.27(1.17)	3.12(1.81)	0.57(0.99)	1.06(1.19)	0.13(0.77)	1.94(1.51)	8.36(2.79)	0.67(1.01)	3.70(1.93)	0.38(0.90)	1.83(1.46)	4.12(2.10)	1.46(1.27)	12.15(3.43)
CD(0.05)		0.32	0.37	0.32	0.27	NS	0.33	0.36	NS	0.39	0.29	0.32	0.57	0.53	0.42
CV		25.32	12.9	23.87	14.82	48.79	11.33	7.57	10.2	12.54	23.83	15.52	16.82	18.57	7.17
Interaction															
M and T		NS	NS	NS	NS	NS	NS	0.63	NS	NS	NS	NS	NS	NS	NS
T and M		NS	NS	NS	NS	NS	NS	0.55	NS	NS	NS	NS	NS	NS	NS
Experimental Mean		1.22	2.76	1.32	1.75	0.93	2.8	4.65	1.03	2.99	1.19	2.03	3.29	2.78	5.7

*(Values in parentheses are transformed values)

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	KARAIKAL							
		Weed population no/m² at panicle initiation stage							
		Grasses		Sedges	BLW				Total weed population
		Echinochloa colona	***Leptochloa chinensis***	***Cyperus difformis***	***Bergia capensis***	***Hydrolea zeylanica***	***Ludwigia parviflora***	***Sphaeranthus indicus***	
M1	S1	20.00(4.51)	2.67(1.65)	11.67(3.48)	5.33(2.39)	28.00(5.31)	1.33(1.18)	32.67(5.74)	101.67(10.11)
	S2	5.33(2.39)	0.00(0.71)	5.33(2.39)	4.00(2.12)	17.33(4.21)	4.00(2.08)	6.00(2.53)	42.00(6.52)
	S3	5.33(1.83)	1.33(1.18)	0.00(0.71)	0.00(0.71)	3.00(1.72)	5.33(2.39)	0.00(0.71)	15.00(3.71)
M2	S1	76.00(8.70)	1.33(1.18)	10.67(3.32)	21.33(4.64)	42.67(6.56)	10.67(3.33)	13.00(3.67)	175.67(13.27)
	S2	4.00(1.91)	0.00(0.71)	4.67(2.27)	0.00(0.71)	27.33(5.23)	1.33(1.18)	14.67(3.86)	52.00(7.22)
	S3	0.00(0.71)	2.00(1.52)	0.00(0.71)	6.67(2.65)	2.67(1.44)	0.00(0.71)	16.00(4.04)	27.33(5.27)
M3	S1	97.33(9.83)	12.00(3.45)	20.67(4.57)	25.33(5.03)	94.00(9.72)	22.00(4.74)	26.00(5.13)	297.33(17.25)
	S2	5.33(2.39)	0.00(0.71)	2.67(1.65)	6.67(2.65)	30.00(5.52)	1.33(1.18)	17.67(4.23)	63.67(8.01)
	S3	9.33(2.77)	10.67(3.24)	0.00(0.71)	18.67(4.35)	4.00(1.91)	0.00(0.71)	16.00(4.06)	58.67(7.66)
Mean of Factor-1									
M1		10.22(2.91)	1.33(1.18)	5.67(2.19)	3.11(1.74)	16.11(3.75)	3.56(1.88)	12.89(2.99)	52.89(6.78)
M2		26.67(3.77)	1.11(1.14)	5.11(2.10)	9.33(2.67)	24.22(4.41)	4.00(1.74)	14.56(3.86)	85.00(8.59)
M3		37.33(4.99)	7.56(2.47)	7.78(2.31)	16.89(4.01)	42.67(5.72)	7.78(2.21)	19.89(4.47)	139.89(10.97)
CD(0.05)		0.55	0.42	NS	0.56	0.94	NS	0.31	0.5
CV		16.78	31.13	12.8	23.86	24.3	20.17	9.88	6.79
Mean of Factor-2									
S1		64.44(7.68)	5.33(2.09)	14.33(3.79)	17.33(4.02)	54.89(7.20)	11.33(3.08)	23.89(4.85)	191.56(13.54)
S2		4.89(2.23)	0.00(0.71)	4.22(2.10)	3.56(1.83)	24.89(4.99)	2.22(1.48)	12.78(3.54)	52.56(7.25)
S3		4.89(1.77)	4.67(1.98)	0.00(0.71)	8.44(2.57)	3.22(1.69)	1.78(1.27)	10.67(2.94)	33.67(5.54)
CD(0.05)		1.36	0.76	0.46	0.42	0.68	0.59	0.5	0.83
CV		34.08	46.39	20.44	14.59	14.36	29.7	12.85	9.2
Interaction									
M and T		2.36	NS	0.8	0.73	1.18	1.03	0.86	1.44
T and M		1.94	NS	0.66	0.69	1.13	0.85	0.72	1.2
Experimental Mean		3.89	1.59	2.2	2.81	4.63	1.94	3.77	8.78

*(Values in parentheses are transformed values)

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	MALAN									
		Weed population no/m2 at Active tillering stage									
		Grasses			Sedges			BLW			Total weed population
		Echinochloa colona	***Echinochloa crusgalli***	***Panicum repens***	***Cyperus iria***	***Cyperus difformis***	***Cyperus rotundus***	***Alternanthera spp.***	***Eclipta alba***	***Monochoria vaginalis***	
M1	S1	14.00(3.80)	8.33(2.84)	4.33(2.20)	2.33(1.68)	3.33(1.95)	3.67(2.04)	3.00(1.86)	2.00(1.52)	3.67(2.04)	44.67(6.70)
	S2	8.33(2.96)	6.00(2.49)	3.00(1.86)	2.00(1.56)	2.00(1.58)	2.00(1.56)	3.33(1.95)	2.00(1.58)	1.67(1.46)	30.33(5.54)
	S3	3.33(1.95)	2.67(1.77)	1.67(1.46)	1.67(1.46)	1.67(1.46)	2.00(1.56)	1.67(1.44)	1.67(1.46)	1.33(1.34)	17.67(4.26)
M2	S1	17.33(4.22)	12.67(3.56)	9.00(3.06)	8.00(2.90)	10.67(3.34)	9.33(3.12)	11.67(3.48)	6.33(2.59)	18.67(4.37)	103.67(10.20)
	S2	13.67(3.76)	7.33(2.64)	2.00(1.56)	6.33(2.55)	4.00(2.08)	5.00(2.30)	6.67(2.66)	6.33(2.61)	4.33(2.18)	55.67(7.49)
	S3	2.67(1.77)	1.33(1.34)	1.33(1.34)	2.33(1.68)	3.33(1.93)	2.67(1.77)	1.67(1.46)	1.67(1.46)	3.00(1.86)	20.00(4.52)
M3	S1	21.00(4.63)	15.33(3.95)	9.67(3.18)	19.33(4.44)	18.67(4.37)	19.00(4.40)	14.00(3.80)	10.67(3.29)	21.33(4.66)	149.00(12.21)
	S2	12.67(3.62)	9.67(3.17)	5.33(2.39)	9.33(3.13)	10.00(3.23)	7.00(2.73)	11.00(3.37)	5.00(2.33)	6.00(2.53)	76.00(8.74)
	S3	3.00(1.87)	2.00(1.56)	2.33(1.68)	2.67(1.77)	3.00(1.86)	3.00(1.86)	1.67(1.46)	1.33(1.34)	2.00(1.56)	21.00(4.63)
Mean of Factor-1											
M1		8.56(2.91)	5.67(2.37)	3.00(1.84)	2.00(1.57)	2.33(1.67)	2.56(1.72)	2.67(1.75)	1.89(1.52)	2.22(1.61)	30.89(5.50)
M2		11.22(3.25)	7.11(2.52)	4.11(1.99)	5.56(2.38)	6.00(2.45)	5.67(2.40)	6.67(2.53)	4.78(2.22)	8.67(2.80)	59.78(7.40)
M3		12.22(3.38)	9.00(2.89)	5.78(2.41)	10.44(3.12)	10.56(3.15)	9.67(3.00)	8.89(2.88)	5.67(2.32)	9.78(2.92)	82.00(8.52)
CD(0.05)		0.15	NS	0.27	0.36	0.21	0.28	0.26	0.17	0.21	0.31
CV		5.67	13.49	15.51	18.12	10.22	14.16	12.97	10.32	10.22	5.11
Mean of Factor-2											
S1		17.44(4.22)	12.11(3.45)	7.67(2.81)	9.89(3.01)	10.89(3.22)	10.67(3.19)	9.56(3.04)	6.33(2.47)	14.56(3.69)	99.11(9.71)
S2		11.56(3.45)	7.67(2.77)	3.44(1.93)	5.89(2.41)	5.33(2.30)	4.67(2.20)	7.00(2.66)	4.44(2.17)	4.00(2.06)	54.00(7.25)
S3		3.00(1.87)	2.00(1.56)	1.78(1.49)	2.22(1.64)	2.67(1.75)	2.56(1.73)	1.67(1.45)	1.56(1.42)	2.11(1.59)	19.56(4.47)
CD(0.05)		0.21	0.42	0.3	0.31	0.31	0.37	0.33	0.4	0.24	0.36
CV		6.41	15.72	13.86	12.76	12.55	15.19	13.53	19.22	9.54	4.89
Interaction											
M and T		0.36	NS	0.51	0.53	0.54	0.64	0.57	0.69	0.42	0.62
T and M		0.31	NS	0.45	0.49	0.46	0.54	0.49	0.57	0.36	0.53
Experimental Mean		3.18	2.59	2.08	2.35	2.42	2.37	2.39	2.02	2.45	7.14

*(Values in parentheses are transformed values)

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	MALAN									
		Weed population no/m2 at panicle initiation stage									
		Grasses			Sedges			BLW			Total weed population
		Echinochloa colona	***Echinochloa crusgalli***	***Panicum repens***	***Cyperus iria***	***Cyperus difformis***	***Cyperus rotundus***	***Alternanthera spp.***	***Eclipta alba***	***Monochoria vaginalis***	
M1	S1	17.67(4.26)	6.00(2.53)	5.33(2.40)	3.00(1.86)	6.00(2.51)	5.33(2.41)	8.00(2.91)	5.00(2.34)	4.67(2.26)	61.00(7.84)
	S2	11.33(3.44)	4.33(2.20)	6.33(2.59)	2.00(1.56)	2.67(1.74)	2.33(1.68)	5.33(2.39)	4.67(2.24)	3.67(2.02)	42.67(6.57)
	S3	2.33(1.68)	2.00(1.56)	1.67(1.46)	1.67(1.46)	1.67(1.46)	1.33(1.34)	2.33(1.64)	1.67(1.46)	1.33(1.34)	16.00(4.06)
M2	S1	18.67(4.37)	5.50(2.44)	7.33(2.80)	7.00(2.70)	6.00(2.52)	7.00(2.72)	8.67(3.02)	7.33(2.80)	8.33(2.96)	74.00(8.61)
	S2	12.00(3.52)	3.33(1.94)	2.33(1.66)	5.33(2.38)	5.33(2.39)	5.00(2.34)	5.33(2.40)	6.33(2.61)	4.67(2.26)	49.67(7.07)
	S3	3.67(2.02)	1.33(1.34)	1.67(1.46)	2.33(1.68)	1.67(1.46)	1.00(1.22)	3.00(1.86)	2.33(1.68)	3.33(1.95)	20.33(4.56)
M3	S1	23.00(4.84)	10.33(3.29)	8.67(3.02)	16.00(4.04)	20.67(4.56)	14.33(3.83)	20.67(4.60)	11.67(3.47)	21.00(4.63)	146.33(12.11)
	S2	16.00(4.05)	7.33(2.76)	6.67(2.65)	5.67(2.47)	6.33(2.46)	8.33(2.96)	6.33(2.60)	6.67(2.65)	6.00(2.53)	69.33(8.35)
	S3	4.33(2.15)	1.67(1.46)	1.67(1.46)	1.67(1.46)	2.33(1.68)	1.33(1.34)	3.33(1.95)	3.67(2.04)	2.67(1.77)	22.67(4.81)
Mean of Factor-1											
M1		10.44(3.12)	4.11(2.10)	4.44(2.15)	2.22(1.63)	3.44(1.90)	3.00(1.81)	5.22(2.31)	3.78(2.01)	3.22(1.87)	39.89(6.15)
M2		11.44(3.30)	3.39(1.91)	3.78(1.97)	4.89(2.25)	4.33(2.12)	4.33(2.10)	5.67(2.43)	5.33(2.36)	5.44(2.39)	48.00(6.75)
M3		14.44(3.68)	6.44(2.50)	5.67(2.37)	7.78(2.66)	9.78(2.90)	8.00(2.71)	10.11(3.05)	7.33(2.72)	9.89(2.98)	79.44(8.42)
CD(0.05)		NS	NS	NS	0.15	NS	0.19	0.29	0.18	0.33	0.35
CV		9.91	16.33	17.43	8.02	33.93	10.18	13.5	9.14	16.36	5.9
Mean of Factor-2											
S1		19.78(4.49)	7.28(2.75)	7.11(2.74)	8.67(2.87)	10.89(3.19)	8.89(2.99)	12.44(3.51)	8.00(2.87)	11.33(3.28)	93.78(9.52)
S2		13.11(3.67)	5.00(2.30)	5.11(2.30)	4.33(2.14)	4.78(2.20)	5.22(2.32)	5.67(2.46)	5.89(2.50)	4.78(2.27)	53.89(7.33)
S3		3.44(1.95)	1.67(1.45)	1.67(1.46)	1.89(1.53)	1.89(1.53)	1.22(1.30)	2.89(1.82)	2.56(1.73)	2.44(1.69)	19.67(4.48)
CD(0.05)		0.35	0.31	0.32	0.43	0.52	0.31	0.27	0.35	0.29	0.39
CV		10.13	14.13	14.42	19.16	22.09	13.6	10.19	14.27	11.63	5.38
Interaction											
M and T		NS	NS	0.56	0.74	0.91	0.53	0.47	NS	0.5	0.68
T and M		NS	NS	0.49	0.61	0.84	0.45	0.42	NS	0.45	0.59
Experimental Mean		3.37	2.17	2.17	2.18	2.31	2.21	2.6	2.37	2.41	7.11

*(Values in parentheses are transformed values)

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	MONCOMPU													
		Weed population no/m² at Active tillering stage						Weed population no/m2 at panicle initiation stage							
		Grasses	Sedges			BLW	Total weed population	Grasses			Sedges			BLW	Total weed population
		Isachnae miliaceae	***Cyperus difformis***	Cyperus haspan	***Fimbrystylis miliaceae***	***Sphaenochlea zeylanica***		***Echinochloa spp***	***Isachnae miliaceae***	***Leptoclhoa chinensis***	***Cyperus difformis***	Cyperus haspan	***Fimbrystylis miliaceae***	***Ludwigia hyssopifolia***	
M1	S1	0.00(0.71)	18.67(4.07)	0.00(0.71)	246.67(15.67)	0.00(0.71)	265.33(16.27)	0.00(0.71)	80.00(8.84)	0.00(0.71)	0.00(0.71)	0.00(0.71)	125.33(10.94)	16.00(3.49)	221.33(14.62)
	S2	40.00(5.42)	21.33(3.91)	0.00(0.71)	250.67(15.69)	1.33(1.18)	313.33(17.69)	0.00(0.71)	112.00(10.56)	2.67(1.44)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	114.67(10.70)
	S3	40.00(5.42)	1.33(1.18)	0.00(0.71)	53.33(6.22)	0.00(0.71)	94.67(9.62)	0.00(0.71)	176.00(13.21)	8.00(2.12)	0.00(0.71)	0.00(0.71)	29.33(3.61)	2.67(1.44)	216.00(14.55)
M2	S1	0.00(0.71)	33.33(3.81)	0.00(0.71)	240.00(15.45)	125.33(9.03)	398.67(19.72)	2.67(1.44)	126.67(11.27)	0.00(0.71)	0.00(0.71)	0.00(0.71)	200.00(14.07)	0.00(0.71)	329.33(18.11)
	S2	13.33(2.59)	57.33(7.59)	0.00(0.71)	266.67(16.22)	0.00(0.71)	337.33(18.31)	2.67(1.44)	237.33(15.36)	0.00(0.71)	0.00(0.71)	0.00(0.71)	185.33(12.62)	6.67(2.39)	432.00(20.68)
	S3	93.33(7.53)	30.67(5.42)	0.00(0.71)	193.33(13.53)	0.00(0.71)	317.33(16.87)	0.00(0.71)	240.00(15.48)	0.00(0.71)	0.00(0.71)	0.00(0.71)	197.33(14.03)	0.00(0.71)	437.33(20.90)
M3	S1	180.00(13.07)	1.33(1.18)	42.67(6.49)	169.33(12.53)	0.00(0.71)	393.33(19.45)	2.67(1.44)	113.33(8.84)	0.00(0.71)	5.33(1.83)	17.33(2.89)	96.00(8.19)	9.33(2.77)	244.00(15.26)
	S2	153.33(10.15)	100.00(6.25)	8.00(2.12)	68.00(6.36)	0.00(0.71)	329.33(17.74)	0.00(0.71)	166.67(12.83)	0.00(0.71)	0.00(0.71)	1.33(1.18)	106.67(9.23)	12.00(3.06)	286.67(16.51)
	S3	226.67(14.57)	0.00(0.71)	8.00(2.59)	62.67(5.05)	0.00(0.71)	297.33(16.24)	0.00(0.71)	177.33(13.11)	0.00(0.71)	10.67(2.86)	0.00(0.71)	106.67(8.21)	5.33(1.83)	300.00(17.09)
Mean of Factor-1															
M1		26.67(3.85)	13.78(3.05)	0.00(0.71)	183.56(12.53)	0.44(0.86)	224.44(14.53)	0.00(0.71)	122.67(10.87)	3.56(1.42)	0.00(0.71)	0.00(0.71)	51.56(5.08)	6.22(1.88)	184.00(13.29)
M2		35.56(3.61)	40.44(5.61)	0.00(0.71)	233.33(15.07)	41.78(3.48)	351.11(18.30)	1.78(1.20)	201.33(14.04)	0.00(0.71)	0.00(0.71)	0.00(0.71)	194.22(13.57)	2.22(1.27)	399.56(19.90)
M3		186.67(12.60)	33.78(2.71)	19.56(3.74)	100.00(7.98)	0.00(0.71)	340.00(17.81)	0.89(0.95)	152.44(11.60)	0.00(0.71)	5.33(1.80)	6.22(1.59)	103.11(8.54)	8.89(2.55)	276.89(16.28)
CD(0.05)		2.98	NS	0.39	NS	NS	NS	NS	NS	NS	NS	NS	2.72	NS	1.84
CV		53.31	91.28	27.35	48.6	155.04	29.58	54.65	18.73	74.77	90.53	152.8	35.82	44.36	13.35
Mean of Factor-2															
S1		60.00(4.83)	17.78(3.02)	14.22(2.64)	218.67(14.55)	41.78(3.48)	352.44(18.48)	1.78(1.20)	106.67(9.65)	0.00(0.71)	1.78(1.08)	5.78(1.43)	140.44(11.07)	8.44(2.32)	264.89(15.99)
S2		68.89(6.06)	59.56(5.92)	2.67(1.18)	195.11(12.76)	0.44(0.86)	326.67(17.91)	0.89(0.95)	172.00(12.92)	0.89(0.95)	0.00(0.71)	0.44(0.86)	97.33(7.52)	6.22(2.05)	277.78(15.96)
S3		120.00(9.17)	10.67(2.44)	2.67(1.34)	103.11(8.27)	0.00(0.71)	236.44(14.24)	0.00(0.71)	197.78(13.93)	2.67(1.18)	3.56(1.42)	0.00(0.71)	111.11(8.61)	2.67(1.33)	317.78(17.51)
CD(0.05)		NS	NS	NS	3.05	NS	2.41	NS	2.9	NS	NS	NS	NS	NS	NS
CV		56.94	108.81	73.32	25.02	161.98	13.93	83.48	23.17	106.8	88.95	114.49	59.54	83.35	21.17
Interaction															
M and T		NS	NS	2.24	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
T and M		NS	NS	1.84	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Experimental Mean		6.69	3.79	1.72	11.86	1.68	16.88	0.95	12.17	0.95	1.07	1	9.07	1.9	16.49

*(Values in parentheses are transformed values)

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	PANTNAGAR									
		Weed population no/m² at Active tillering stage					Weed population no/m² at Panicle initiation stage				
		Grasses	Sedges		BLW	Total weed population	Grasses	Sedges		BLW	Total weed population
		Echinochloa colona	***Cyperus rotundus***	***Fimbristylis miliacea***	***Caesulia auxilaris***		***Echinochloa colona***	***Cyperus rotundus***	***Fimbristylis miliacea***	***Caesulia auxilaris***	
M1	S1	22.67(4.81)	25.33(5.07)	8.32(2.97)	7.28(2.79)	63.60(8.00)	32.00(5.69)	25.33(5.08)	32.00(5.69)	22.67(4.76)	112.00(10.61)
	S2	2.67(1.65)	5.33(2.39)	1.04(1.19)	4.16(2.15)	13.20(3.70)	6.67(2.65)	5.33(2.39)	5.33(2.39)	5.33(2.39)	22.67(4.81)
	S3	2.67(1.65)	2.67(1.65)	1.56(1.35)	2.08(1.59)	8.97(3.05)	4.00(1.91)	5.33(2.39)	6.67(2.65)	5.33(2.39)	21.33(4.64)
M2	S1	22.67(4.79)	34.67(5.90)	17.33(4.22)	16.67(4.14)	91.33(9.56)	64.00(8.02)	44.00(6.67)	45.33(6.76)	29.33(5.46)	182.67(13.53)
	S2	2.67(1.76)	5.33(2.39)	2.67(1.76)	2.67(1.76)	13.33(3.70)	6.67(2.65)	8.00(2.86)	5.33(2.39)	6.67(2.65)	26.67(5.20)
	S3	2.67(1.76)	5.33(2.39)	1.33(1.29)	2.00(1.47)	11.33(3.41)	5.33(2.39)	5.33(2.39)	4.00(1.91)	5.33(2.12)	20.00(4.38)
M3	S1	25.83(5.12)	24.00(4.94)	22.50(4.79)	16.67(4.13)	89.00(9.46)	45.33(6.74)	44.00(6.65)	40.00(6.36)	30.67(5.57)	160.00(12.67)
	S2	3.33(1.94)	5.33(2.39)	3.33(1.94)	6.67(2.67)	18.67(4.36)	5.33(2.39)	5.33(2.39)	5.33(2.39)	8.00(2.86)	24.00(4.91)
	S3	1.67(1.39)	4.00(1.91)	2.50(1.59)	5.00(2.30)	13.17(3.59)	5.33(2.39)	5.33(2.39)	2.67(1.65)	6.67(2.65)	20.00(4.48)
Mean of Factor-1											
M1		9.33(2.70)	11.11(3.03)	3.64(1.84)	4.51(2.18)	28.59(4.92)	14.22(3.42)	12.00(3.28)	14.67(3.58)	11.11(3.18)	52.00(6.69)
M2		9.33(2.77)	15.11(3.56)	7.11(2.42)	7.11(2.46)	38.67(5.56)	25.33(4.35)	19.11(3.97)	18.22(3.69)	13.78(3.41)	76.44(7.70)
M3		10.28(2.82)	11.11(3.08)	9.44(2.77)	9.44(3.03)	40.28(5.80)	18.67(3.84)	18.22(3.81)	16.00(3.46)	15.11(3.69)	68.00(7.35)
CD(0.05)		NS	NS	0.41	0.41	NS	NS	0.19	NS	NS	0.46
CV		18.25	18.53	20.82	19.27	11.1	14.1	6.29	14.61	14.81	7.59
Mean of Factor-2											
S1		23.72(4.91)	28.00(5.30)	16.05(3.99)	13.54(3.69)	81.31(9.01)	47.11(6.82)	37.78(6.13)	39.11(6.27)	27.56(5.27)	151.56(12.27)
S2		2.89(1.78)	5.33(2.39)	2.35(1.63)	4.50(2.19)	15.07(3.92)	6.22(2.56)	6.22(2.54)	5.33(2.39)	6.67(2.63)	24.44(4.97)
S3		2.33(1.60)	4.00(1.98)	1.80(1.41)	3.03(1.79)	11.16(3.35)	4.89(2.23)	5.33(2.39)	4.44(2.07)	5.78(2.39)	20.44(4.50)
CD(0.05)		0.56	0.66	0.45	0.34	0.58	0.63	0.56	0.65	0.7	0.74
CV		19.6	19.91	18.67	12.89	10.38	15.89	14.79	17.74	19.89	10
Interaction											
M and T		NS	NS	NS	0.59	NS	NS	NS	NS	NS	1.29
T and M		NS	NS	NS	0.54	NS	NS	NS	NS	NS	1.08
Experimental Mean		2.76	3.22	2.34	2.56	5.43	3.87	3.69	3.58	3.43	7.25

*(Values in parentheses are transformed values)

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	PUSA										
		Weed population no/m^2 at Active tillering stage										
		Grasses				Sedges		BLW				Total weed population
		Echinochloa colona	***Echinochloa crusgalli***	***Leptochloa chinensis***	***Paspalum***	***Cyperus iria***	***Cyperus difformis***	***Ammania baccifera***	***Caesulia axillaris***	***Eclipta alba***	***Ludwigia parviflora***	
M1	S1	23.67(4.90)	11.67(3.47)	17.00(4.17)	4.00(2.04)	6.33(2.61)	8.33(2.92)	5.33(2.39)	10.00(3.20)	7.33(2.76)	8.67(2.99)	102.33(10.14)
	S2	8.33(2.96)	5.00(2.28)	8.33(2.96)	2.33(1.68)	3.00(1.81)	2.00(1.56)	1.00(1.17)	4.67(2.26)	6.33(2.55)	3.00(1.79)	44.00(6.67)
	S3	8.67(2.99)	5.67(2.39)	5.67(2.32)	3.67(2.02)	3.67(2.00)	2.00(1.56)	2.33(1.60)	5.67(2.45)	3.00(1.79)	4.33(2.16)	44.67(6.68)
M2	S1	26.33(5.14)	13.00(3.66)	10.00(3.20)	3.00(1.81)	6.33(2.45)	6.00(2.54)	5.00(2.34)	8.00(2.90)	11.33(3.40)	9.00(2.97)	98.00(9.92)
	S2	9.00(3.04)	8.33(2.95)	6.00(2.50)	3.67(2.00)	3.00(1.79)	3.33(1.88)	1.67(1.44)	6.33(2.55)	4.67(2.26)	4.33(2.16)	50.33(7.13)
	S3	5.00(2.28)	12.00(3.52)	4.33(2.16)	3.33(1.93)	1.67(1.44)	2.00(1.56)	4.00(2.04)	7.67(2.84)	5.00(2.29)	5.00(2.23)	50.00(7.09)
M3	S1	40.67(6.36)	14.67(3.85)	29.33(5.45)	2.67(1.72)	12.33(3.57)	10.33(3.26)	7.33(2.77)	14.33(3.83)	11.67(3.48)	6.00(2.49)	149.33(12.23)
	S2	11.67(3.48)	5.67(2.34)	12.00(3.52)	2.00(1.56)	4.00(2.06)	6.67(2.62)	2.67(1.72)	5.33(2.39)	3.67(2.00)	5.67(2.36)	59.33(7.71)
	S3	12.00(3.52)	5.33(2.38)	7.67(2.84)	2.00(1.56)	2.67(1.72)	3.67(2.00)	4.67(2.26)	5.33(2.39)	5.33(2.39)	4.67(2.26)	53.33(7.33)
Mean of Factor-1												
M1		13.56(3.62)	7.44(2.71)	10.33(3.15)	3.33(1.91)	4.33(2.14)	4.11(2.01)	2.89(1.72)	6.78(2.63)	5.56(2.37)	5.33(2.31)	63.67(7.83)
M2		13.44(3.49)	11.11(3.38)	6.78(2.62)	3.33(1.92)	3.67(1.89)	3.78(2.00)	3.56(1.94)	7.33(2.77)	7.00(2.65)	6.11(2.45)	66.11(8.04)
M3		21.44(4.45)	8.56(2.86)	16.33(3.94)	2.22(1.61)	6.33(2.45)	6.89(2.63)	4.89(2.25)	8.33(2.87)	6.89(2.62)	5.44(2.37)	87.33(9.09)
CD(0.05)		0.25	0.33	0.47	NS	NS	NS	NS	NS	0.13	NS	0.49
CV		7.84	13.27	17.51	18.43	34.44	25.25	24.1	21.58	6.25	19.56	7.01
Mean of Factor-2												
S1		30.22(5.47)	13.11(3.66)	18.78(4.27)	3.22(1.86)	8.33(2.88)	8.22(2.91)	5.89(2.50)	10.78(3.31)	10.11(3.21)	7.89(2.82)	116.56(10.76)
S2		9.67(3.16)	6.33(2.52)	8.78(2.99)	2.67(1.75)	3.33(1.89)	4.00(2.02)	1.78(1.44)	5.44(2.40)	4.89(2.27)	4.33(2.10)	51.22(7.17)
S3		8.56(2.93)	7.67(2.76)	5.89(2.44)	3.00(1.84)	2.67(1.72)	2.56(1.71)	3.67(1.96)	6.22(2.56)	4.44(2.15)	4.67(2.21)	49.33(7.03)
CD(0.05)		0.72	0.69	0.55	NS	0.39	0.49	0.4	0.44	0.64	NS	0.49
CV		18.13	22.61	16.52	29.46	17.62	21.53	19.85	15.59	24.51	33.13	5.7
Interaction												
M and T		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	0.84
T and M		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	0.74
Experimental Mean		3.85	2.98	3.24	1.81	2.16	2.21	1.97	2.76	2.55	2.38	8.32

*(Values in parentheses are transformed values)

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	PUSA										
		Weed population no/m² at Panicle initiation stage										
		Grasses				Sedges		BLW				Total weed population
		Echinochloa colona	***Echinochloa crusgalli***	***Leptochloa chinensis***	***Paspalum spp***	***Cyperus iria***	***Cyperus difformis***	***Ammania baccifera***	***Caesulia axillaris***	***Eclipta alba***	***Ludwigia parviflora***	
M1	S1	7.33(2.77)	8.67(2.99)	9.33(3.08)	4.00(2.04)	8.00(2.86)	6.67(2.57)	2.67(1.72)	11.33(3.42)	5.00(2.22)	8.67(2.99)	71.67(8.48)
	S2	5.67(2.43)	4.33(2.16)	5.33(2.29)	2.67(1.72)	4.67(2.26)	2.00(1.56)	2.00(1.56)	4.33(2.16)	4.00(2.04)	3.00(1.79)	38.00(6.20)
	S3	7.00(2.69)	4.67(2.26)	4.67(2.26)	3.00(1.84)	7.67(2.74)	2.67(1.72)	1.00(1.17)	3.67(2.00)	3.00(1.79)	4.67(2.26)	42.00(6.49)
M2	S1	12.00(3.52)	6.00(2.49)	9.67(3.15)	3.67(1.97)	9.33(3.02)	4.67(2.26)	2.67(1.72)	7.00(2.71)	8.67(2.99)	8.67(2.88)	72.33(8.52)
	S2	9.00(3.06)	7.67(2.84)	5.67(2.39)	3.33(1.93)	5.00(2.23)	2.67(1.72)	1.00(1.17)	6.00(2.49)	2.67(1.72)	4.67(2.26)	47.67(6.94)
	S3	4.67(2.26)	7.00(2.71)	5.00(2.29)	2.00(1.56)	3.00(1.79)	2.00(1.56)	3.00(1.81)	7.00(2.71)	5.00(2.23)	7.67(2.74)	46.33(6.84)
M3	S1	22.67(4.79)	9.33(3.02)	17.00(4.17)	5.33(2.27)	14.00(3.79)	10.33(3.26)	5.00(2.23)	13.33(3.71)	11.00(3.39)	5.67(2.40)	113.67(10.67)
	S2	8.67(2.99)	5.33(2.39)	8.67(2.99)	2.33(1.60)	9.00(3.06)	5.00(2.29)	1.33(1.27)	4.33(2.16)	4.67(2.11)	5.00(2.23)	54.33(7.39)
	S3	10.67(3.33)	6.33(2.54)	5.67(2.39)	2.67(1.72)	4.33(2.10)	3.00(1.81)	2.33(1.64)	5.00(2.32)	4.00(2.04)	4.00(2.04)	48.00(6.95)
Mean of Factor-1												
M1		6.67(2.63)	5.89(2.47)	6.44(2.54)	3.22(1.86)	6.78(2.62)	3.78(1.95)	1.89(1.48)	6.44(2.53)	4.00(2.01)	5.44(2.34)	50.56(7.06)
M2		8.56(2.95)	6.89(2.68)	6.78(2.61)	3.00(1.82)	5.78(2.34)	3.11(1.84)	2.22(1.57)	6.67(2.64)	5.44(2.31)	7.00(2.62)	55.44(7.43)
M3		14.00(3.71)	7.00(2.65)	10.44(3.19)	3.44(1.86)	9.11(2.98)	6.11(2.46)	2.89(1.71)	7.56(2.73)	6.56(2.51)	4.89(2.22)	72.00(8.34)
CD(0.05)		NS	NS	NS	NS	NS	0.31	NS	NS	NS	NS	0.17
CV		21.78	23.66	23.19	27	32.35	17.76	38.62	25.55	16.96	31	2.62
Mean of Factor-2												
S1		14.00(3.70)	8.00(2.83)	12.00(3.47)	4.33(2.09)	10.44(3.22)	7.22(2.70)	3.44(1.89)	10.56(3.28)	8.22(2.87)	7.67(2.76)	85.89(9.22)
S2		7.78(2.83)	5.78(2.46)	6.56(2.56)	2.78(1.75)	6.22(2.52)	3.22(1.86)	1.44(1.33)	4.89(2.27)	3.78(1.96)	4.22(2.09)	46.67(6.84)
S3		7.44(2.76)	6.00(2.50)	5.11(2.31)	2.56(1.70)	5.00(2.21)	2.56(1.70)	2.11(1.54)	5.22(2.34)	4.00(2.02)	5.44(2.34)	45.44(6.76)
CD(0.05)		0.46	NS	0.71	NS	0.64	0.66	0.42	0.47	NS	NS	0.54
CV		14.33	24.57	24.93	36.79	23.4	30.63	25.89	17.36	37.7	33.1	6.97
Interaction												
M and T		0.79	NS	NS	NS	NS	NS	NS	NS	NS	NS	0.94
T and M		0.73	NS	NS	NS	NS	NS	NS	NS	NS	NS	0.77
Experimental Mean		3.1	2.6	2.78	1.85	2.65	2.08	1.59	2.63	2.28	2.4	7.61

*(Values in parentheses are transformed values)

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	NAWAGAM												
		Weed population no/m^2 at Active tillering stage												
		Grasses					Sedges			BLW				Total weed population
		Cynodon dactylon	***Chloris barbata***	***Digtaria sanguinalis***	***Echinochloa colona***	***Echinochloa crusgalli***	***Cyperus esculentus***	***Cyperus iria***	***Cyperus rotundus***	***Eclipta alba***	***Ipomoea aquatic***	Physalis minima	***Trianthema monogyna***	
M1	S1	121.00(10.99)	96.67(9.59)	97.00(9.82)	96.67(9.76)	91.67(9.49)	99.00(9.89)	98.67(9.87)	106.00(10.31)	68.00(8.27)	63.00(7.79)	66.00(8.01)	72.33(8.45)	1076.00(32.80)
	S2	35.00(5.94)	39.33(6.23)	89.00(9.45)	39.00(6.24)	37.33(6.11)	72.33(8.48)	84.67(9.14)	106.33(10.16)	56.33(7.40)	36.00(6.01)	78.33(8.84)	50.00(6.91)	723.67(26.89)
	S3	42.67(6.55)	29.67(5.46)	67.33(8.12)	21.33(4.66)	14.00(3.78)	88.67(9.43)	70.33(8.40)	63.33(7.90)	26.00(5.02)	33.67(5.56)	54.00(7.25)	33.33(5.70)	544.33(23.32)
M2	S1	106.00(10.29)	76.67(8.72)	96.00(9.81)	119.67(10.94)	92.00(9.60)	99.33(9.97)	111.00(10.55)	79.00(8.88)	78.67(8.87)	50.33(6.80)	65.33(7.72)	69.33(8.32)	1043.33(32.29)
	S2	32.00(5.57)	36.67(5.90)	81.00(8.93)	60.67(7.45)	13.33(3.65)	69.67(8.37)	62.67(7.84)	55.67(7.35)	20.33(4.53)	26.67(5.16)	26.67(5.16)	20.33(4.53)	505.67(22.41)
	S3	30.00(5.12)	36.33(5.90)	50.33(7.08)	41.00(6.39)	14.00(3.77)	42.00(6.20)	51.33(7.16)	51.00(6.90)	15.33(3.87)	28.33(5.37)	15.67(3.86)	27.67(5.18)	403.00(20.02)
M3	S1	156.67(12.51)	84.00(9.13)	98.33(9.93)	123.67(11.06)	122.00(10.98)	91.33(9.53)	92.67(9.55)	97.67(9.89)	51.67(7.05)	67.00(8.09)	53.67(7.33)	54.33(7.23)	1093.00(33.04)
	S2	56.67(7.35)	29.33(5.42)	58.67(7.65)	40.33(6.31)	56.00(7.24)	65.00(8.04)	79.67(8.92)	67.67(8.25)	20.67(4.35)	24.00(4.91)	31.67(5.46)	28.33(5.27)	558.00(23.61)
	S3	35.67(5.86)	37.00(5.98)	35.67(5.97)	55.33(7.39)	24.00(4.93)	52.67(7.16)	56.00(7.37)	54.33(7.29)	17.00(4.03)	26.67(5.15)	21.33(4.57)	16.00(3.96)	431.67(20.79)
Mean of Factor-1														
M1		66.22(7.83)	55.22(7.09)	84.44(9.13)	52.33(6.89)	47.67(6.46)	86.67(9.26)	84.56(9.14)	91.89(9.46)	50.11(6.89)	44.22(6.45)	66.11(8.03)	51.89(7.02)	781.33(27.67)
M2		56.00(7.00)	49.89(6.84)	75.78(8.61)	73.78(8.26)	39.78(5.67)	70.33(8.18)	75.00(8.52)	61.89(7.71)	38.11(5.75)	35.11(5.77)	35.89(5.58)	39.11(6.01)	650.67(24.91)
M3		83.00(8.57)	50.11(6.85)	64.22(7.85)	73.11(8.25)	67.33(7.71)	69.67(8.24)	76.11(8.61)	73.22(8.48)	29.78(5.14)	39.22(6.05)	35.56(5.79)	32.89(5.49)	694.22(25.81)
CD(0.05)		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	1.11	NS	NS
CV		23.36	19.12	14.25	20.11	18.22	21.62	17.23	20.04	36.71	18.76	20.58	16.22	7.75
Mean of Factor-2														
S1		127.89(11.27)	85.78(9.15)	97.11(9.85)	113.33(10.58)	101.89(10.02)	96.56(9.79)	100.78(9.99)	94.22(9.69)	66.11(8.06)	60.11(7.56)	61.67(7.69)	65.33(8.00)	1070.78(32.71)
S2		41.22(6.29)	35.11(5.85)	76.22(8.67)	46.67(6.66)	35.56(5.66)	69.00(8.30)	75.67(8.63)	76.56(8.59)	32.44(5.43)	28.89(5.36)	45.56(6.49)	32.89(5.57)	595.78(24.31)
S3		36.11(5.85)	34.33(5.78)	51.11(7.06)	39.22(6.15)	17.33(4.16)	61.11(7.60)	59.22(7.64)	56.22(7.36)	19.44(4.31)	29.56(5.36)	30.33(5.23)	25.67(4.94)	459.67(21.38)
CD(0.05)		1.4	1.63	1.13	1.66	1.22	1.28	1.19	1.61	1.1	1.53	1.82	1.66	1.25
CV		17.52	22.92	12.9	20.71	17.98	14.6	13.27	18.3	18.11	24.42	27.4	26.12	4.64
Interaction														
M and T		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
T and M		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Experimental Mean		7.8	6.93	8.53	7.8	6.61	8.56	8.76	8.55	5.93	6.09	6.47	6.17	26.13

*(Values in parentheses are transformed values)

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	NAWAGAM												
		Weed population no/m^2 at Panicle initiation stage												
		Grasses					Sedges			BLW				Total weed population
		Cynodon dactylon	***Chloris barbata***	***Digtaria sanguinalis***	***Echinochloa colona***	***Echinochloa crusgalli***	***Cyperus esculentus***	***Cyperus iria***	***Cyperus rotundus***	***Eclipta alba***	***Ipomoea aquatic***	Physalis minima	***Trianthema monogyna***	
M1	S1	286.67(16.94)	247.33(15.34)	123.33(10.96)	250.33(15.63)	227.00(14.91)	183.67(13.46)	177.67(13.05)	198.67(14.04)	79.67(8.94)	105.33(10.27)	92.33(9.42)	89.67(9.41)	2061.67(45.35)
	S2	131.67(11.12)	78.33(8.80)	95.33(9.61)	110.00(10.49)	177.33(13.15)	87.67(9.34)	131.67(11.25)	129.67(10.95)	68.33(8.18)	45.67(6.69)	80.67(8.94)	57.00(7.36)	1193.33(34.46)
	S3	77.67(8.76)	48.67(6.94)	82.67(8.82)	58.67(7.65)	71.33(8.21)	100.33(9.99)	77.67(8.82)	66.67(8.16)	40.33(6.18)	37.67(5.88)	65.00(7.95)	38.00(6.09)	764.67(27.58)
M2	S1	167.00(12.80)	159.00(12.45)	159.33(12.50)	219.33(14.54)	192.67(13.88)	159.33(12.44)	117.67(10.85)	122.67(11.02)	58.67(7.35)	106.00(10.29)	94.00(9.69)	69.33(8.29)	1625.00(40.29)
	S2	161.67(12.55)	117.67(10.72)	92.00(9.48)	170.00(12.96)	117.33(10.80)	78.67(8.85)	69.00(8.28)	93.00(9.62)	19.00(4.37)	46.33(6.59)	54.00(7.26)	35.67(5.93)	1054.33(32.45)
	S3	65.00(7.93)	83.33(9.11)	62.67(7.74)	89.33(9.33)	35.67(5.98)	56.67(7.19)	50.67(7.10)	70.00(8.29)	35.33(5.84)	30.33(5.55)	30.33(5.55)	25.33(5.05)	634.67(25.15)
M3	S1	239.67(15.37)	152.00(12.33)	208.00(14.40)	211.00(14.11)	218.67(14.59)	178.33(13.31)	125.33(10.92)	148.00(12.09)	83.67(9.11)	84.67(9.14)	100.67(9.84)	95.00(9.75)	1845.00(42.95)
	S2	89.00(9.20)	64.00(7.95)	72.67(8.54)	104.00(10.12)	89.00(9.21)	104.00(10.12)	124.33(11.10)	97.00(9.86)	77.33(8.66)	86.00(9.16)	86.33(9.18)	52.67(7.24)	1046.33(32.34)
	S3	61.00(7.65)	59.33(7.57)	37.00(6.07)	103.00(10.03)	42.67(6.51)	82.67(9.09)	52.33(7.18)	56.67(7.37)	32.00(5.58)	54.00(7.17)	82.00(9.02)	52.33(7.17)	715.00(26.72)
Mean of Factor-1														
M1		165.33(12.27)	124.78(10.36)	100.44(9.80)	139.67(11.26)	158.56(12.09)	123.89(10.93)	129.00(11.04)	131.67(11.05)	62.78(7.77)	62.89(7.61)	79.33(8.77)	61.56(7.62)	1339.89(35.79)
M2		131.22(11.09)	120.00(10.76)	104.67(9.91)	159.56(12.28)	115.22(10.22)	98.22(9.49)	79.11(8.74)	95.22(9.64)	37.67(5.85)	60.89(7.47)	59.44(7.50)	43.44(6.42)	1104.67(32.63)
M3		129.89(10.74)	91.78(9.28)	105.89(9.67)	139.33(11.42)	116.78(10.10)	121.67(10.84)	100.67(9.74)	100.56(9.78)	64.33(7.78)	74.89(8.49)	89.67(9.35)	66.67(8.05)	1202.11(34.00)
CD(0.05)		NS	NS	NS	NS	NS	NS	NS	NS	0.68	NS	NS	0.45	NS
CV		31.58	18.03	21.92	19.52	19.44	28.07	23.18	9.58	11.46	11.79	15.39	7.35	6.79
Mean of Factor-2														
S1		231.11(15.04)	186.11(13.37)	163.56(12.62)	226.89(14.76)	212.78(14.46)	173.78(13.07)	140.22(11.61)	156.44(12.38)	74.00(8.47)	98.67(9.90)	95.67(9.65)	84.67(9.15)	1843.89(42.86)
S2		127.44(10.96)	86.67(9.15)	86.67(9.21)	128.00(11.19)	127.89(11.05)	90.11(9.44)	108.33(10.21)	106.56(10.15)	54.89(7.07)	59.33(7.48)	73.67(8.46)	48.44(6.85)	1098.00(33.08)
S3		67.89(8.12)	63.78(7.87)	60.78(7.54)	83.67(9.00)	49.89(6.90)	79.89(8.76)	60.22(7.70)	64.44(7.94)	35.89(5.87)	40.67(6.20)	59.11(7.51)	38.56(6.10)	704.78(26.49)
CD(0.05)		1.83	1.98	2.13	2.8	2.23	1.54	2.06	2.2	NS	1.82	NS	1.71	2.2
CV		15.69	19.05	21.18	23.38	20.11	14.37	20.4	21.05	27.94	22.52	22.45	22.59	6.27
Interaction														
M and T		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
T and M		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Experimental Mean		11.37	10.13	9.79	11.65	10.8	10.42	9.84	10.16	7.13	7.86	8.54	7.37	34.14

*(Values in parentheses are transformed values)

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	TITABAR									
		Weed population no/m^2 at Active tillering stage					Weed population no/m^2 at Panicle initiation stage				
		Grasses		Sedges	BLW	Total weed population	Grasses		Sedges	BLW	Total weed population
		Echinochloa crugalli	***Leersia hexandra***	***Cyperus iria***	***Alternanthera spp.***		***Echinochloa crugalli***	***Leersia hexandra***	***Cyperus iria***	***Alternanthera sp.***	
M1	S1	16.67(4.12)	15.33(3.94)	12.33(3.56)	9.67(3.17)	54.00(7.36)	21.33(4.67)	17.67(4.24)	15.00(3.92)	12.00(3.53)	66.00(8.15)
	S2	13.00(3.65)	11.00(3.38)	5.67(2.48)	6.33(2.61)	36.00(6.03)	20.00(4.49)	17.67(4.24)	9.00(3.08)	8.67(2.99)	55.33(7.43)
	S3	9.00(3.08)	8.00(2.92)	5.33(2.41)	4.67(2.27)	27.00(5.24)	13.00(3.65)	13.33(3.71)	7.67(2.84)	7.00(2.73)	41.00(6.44)
M2	S1	20.33(4.56)	12.33(3.55)	11.67(3.48)	13.33(3.71)	57.67(7.63)	22.33(4.77)	17.33(4.21)	14.33(3.83)	16.33(4.08)	70.33(8.42)
	S2	15.67(4.02)	10.67(3.33)	7.33(2.79)	11.67(3.48)	45.33(6.77)	19.67(4.49)	13.33(3.72)	10.33(3.27)	14.00(3.79)	57.33(7.60)
	S3	11.00(3.38)	9.33(3.13)	6.33(2.61)	7.33(2.79)	34.00(5.87)	16.67(4.14)	13.67(3.75)	9.67(3.17)	9.33(3.11)	49.33(7.04)
M3	S1	19.00(4.41)	23.00(4.84)	13.00(3.64)	14.67(3.89)	69.67(8.38)	25.00(5.05)	27.33(5.27)	16.33(4.07)	16.67(4.13)	85.33(9.26)
	S2	16.33(4.08)	12.00(3.52)	4.33(2.20)	11.67(3.48)	44.33(6.69)	22.00(4.72)	20.00(4.52)	6.00(2.54)	16.67(4.14)	64.67(8.07)
	S3	13.00(3.67)	10.00(3.24)	5.00(2.34)	8.67(3.03)	36.67(6.10)	18.00(4.30)	17.00(4.18)	6.33(2.60)	12.00(3.52)	53.33(7.34)
Mean of Factor-1											
M1		12.89(3.62)	11.44(3.41)	7.78(2.82)	6.89(2.68)	39.00(6.21)	18.11(4.27)	16.22(4.06)	10.56(3.28)	9.22(3.09)	54.11(7.34)
M2		15.67(3.99)	10.78(3.34)	8.44(2.96)	10.78(3.33)	45.67(6.76)	19.56(4.46)	14.78(3.89)	11.44(3.42)	13.22(3.66)	59.00(7.68)
M3		16.11(4.05)	15.00(3.87)	7.44(2.72)	11.67(3.47)	50.22(7.05)	21.67(4.69)	21.44(4.66)	9.56(3.07)	15.11(3.93)	67.78(8.22)
CD(0.05)		NS	NS	NS	0.09	0.33	NS	0.27	NS	0.26	0.27
CV		10.53	10.72	12.68	3.28	5.82	5.8	7.69	13.21	8.57	4.18
Mean of Factor-2											
S1		18.67(4.36)	16.89(4.11)	12.33(3.56)	12.56(3.59)	60.44(7.79)	22.89(4.83)	20.78(4.58)	15.22(3.94)	15.00(3.92)	73.89(8.61)
S2		15.00(3.92)	11.22(3.41)	5.78(2.49)	9.89(3.19)	41.89(6.50)	20.56(4.57)	17.00(4.16)	8.44(2.96)	13.11(3.64)	59.11(7.70)
S3		11.00(3.38)	9.11(3.10)	5.56(2.45)	6.89(2.70)	32.56(5.74)	15.89(4.03)	14.67(3.88)	7.89(2.87)	9.44(3.12)	47.89(6.94)
CD(0.05)		0.32	0.38	0.33	0.31	0.3	0.42	0.29	0.41	0.38	0.36
CV		8.03	10.47	11.39	9.66	4.43	9.19	6.79	12.12	10.48	4.51
Interaction											
M and T		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
T and M		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Experimental Mean		3.89	3.54	2.83	3.16	6.67	4.47	4.2	3.26	3.56	7.75

*(Values in parentheses are transformed values)

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	VARANASI							
		Weed population no/m² at Active tillering stage							
		Grasses		Sedges		BLW			Total weed population
		Cynodon dactylon	***Echinochloa crusgalli***	***Cyperus difformis***	***Cyperus rotundus***	***Euphorbia hirta***	***Parthenium hysterophorus***	***Phyllanthus niruri***	
M1	S1	17.33(4.22)	1.33(1.18)	2.00(1.48)	23.33(4.87)	5.00(2.33)	6.33(2.56)	7.00(2.73)	62.33(7.91)
	S2	12.67(3.62)	2.33(1.57)	7.00(2.44)	19.00(4.41)	1.67(1.46)	4.67(2.22)	4.33(2.20)	51.67(7.20)
	S3	16.33(4.08)	1.00(1.17)	3.00(1.84)	13.00(3.67)	2.33(1.57)	3.00(1.81)	2.67(1.77)	41.33(6.47)
M2	S1	51.33(7.18)	5.67(2.43)	13.00(3.61)	108.33(10.02)	5.33(2.39)	6.33(2.60)	12.00(3.48)	202.00(14.03)
	S2	41.67(6.48)	1.67(1.39)	7.33(2.76)	41.00(6.33)	2.33(1.57)	3.67(2.02)	5.33(2.39)	103.00(10.13)
	S3	29.67(5.49)	1.67(1.46)	3.00(1.71)	42.33(6.51)	2.33(1.68)	2.67(1.74)	4.00(2.06)	85.67(9.27)
M3	S1	46.67(6.86)	6.33(2.51)	9.67(3.17)	122.33(10.74)	6.67(2.67)	8.00(2.91)	10.67(3.33)	210.33(14.38)
	S2	30.00(5.50)	4.00(1.94)	7.33(2.66)	60.00(7.68)	5.33(2.40)	5.67(2.48)	8.67(3.01)	121.00(10.98)
	S3	27.00(5.20)	0.67(1.00)	3.67(2.02)	36.67(5.98)	2.67(1.77)	4.00(2.11)	6.67(2.64)	81.33(9.03)
Mean of Factor-1									
M1		15.44(3.98)	1.56(1.31)	4.00(1.92)	18.44(4.32)	3.00(1.79)	4.67(2.20)	4.67(2.23)	51.78(7.19)
M2		40.89(6.38)	3.00(1.76)	7.78(2.69)	63.89(7.62)	3.33(1.88)	4.22(2.12)	7.11(2.64)	130.22(11.14)
M3		34.56(5.85)	3.67(1.81)	6.89(2.62)	73.00(8.13)	4.89(2.28)	5.89(2.50)	8.67(2.99)	137.56(11.46)
CD(0.05)		0.38	NS	NS	1.83	NS	NS	0.31	1.55
CV		8.46	43.39	41.95	32.6	30.35	23.57	14.23	18.59
Mean of Factor-2									
S1		38.44(6.09)	4.44(2.04)	8.22(2.76)	84.67(8.55)	5.67(2.46)	6.89(2.69)	9.89(3.18)	158.22(12.11)
S2		28.11(5.20)	2.67(1.63)	7.22(2.62)	40.00(6.14)	3.11(1.81)	4.67(2.24)	6.11(2.53)	91.89(9.44)
S3		24.33(4.92)	1.11(1.21)	3.22(1.85)	30.67(5.39)	2.44(1.67)	3.22(1.89)	4.44(2.16)	69.44(8.26)
CD(0.05)		0.52	NS	NS	1.43	0.38	0.1	0.33	1.11
CV		9.35	46.03	34.18	20.79	18.63	4.44	12.35	10.85
Interaction									
M and T		NS	NS	NS	NS	NS	NS	NS	1.92
T and M		NS	NS	NS	NS	NS	NS	NS	1.83
Experimental Mean		5.4	1.63	2.41	6.69	1.98	2.27	2.62	9.93

*(Values in parentheses are transformed values)

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	VARANASI								
		Weed population no/m^2 at panicle initiation stage								
		Grasses			Sedges		BLW			Total weed population
		Cynodon dactylon	***Echinocloa colona***	***Echinocloa crusgalli***	***Cyperus difformis***	***Cyperus rotundus***	***Eclipta prostrata***	***phyllantus niruri***	***Solanum nigrum***	
M1	S1	59.33(7.69)	5.33(2.35)	3.33(1.95)	3.00(1.86)	33.33(5.80)	2.67(1.74)	7.33(2.73)	5.67(2.45)	120.00(10.92)
	S2	14.67(3.88)	5.00(2.32)	2.67(1.77)	2.00(1.56)	12.00(3.53)	1.00(1.17)	4.67(2.23)	4.00(2.03)	46.00(6.81)
	S3	14.33(3.84)	2.67(1.72)	1.00(1.22)	1.33(1.34)	14.00(3.75)	2.33(1.64)	2.33(1.64)	1.33(1.27)	39.33(6.25)
M2	S1	75.67(8.69)	5.33(2.40)	3.33(1.93)	2.00(1.56)	31.67(5.66)	4.00(2.08)	8.33(2.96)	6.33(2.56)	136.67(11.68)
	S2	32.00(5.69)	3.00(1.81)	2.00(1.56)	2.67(1.76)	12.00(3.52)	2.33(1.66)	3.67(2.02)	1.67(1.44)	59.33(7.70)
	S3	17.67(4.25)	2.00(1.56)	2.00(1.58)	1.33(1.34)	15.00(3.85)	1.33(1.34)	2.00(1.56)	2.00(1.52)	43.33(6.58)
M3	S1	52.67(7.28)	6.33(2.59)	2.33(1.64)	4.67(2.26)	32.00(5.70)	6.33(2.61)	9.00(3.06)	5.33(2.39)	118.67(10.90)
	S2	16.00(4.03)	3.00(1.79)	2.00(1.56)	2.33(1.64)	9.00(3.06)	1.67(1.46)	5.33(2.36)	1.33(1.34)	40.67(6.38)
	S3	15.00(3.92)	1.67(1.46)	2.00(1.56)	2.67(1.74)	8.33(2.95)	2.33(1.66)	1.67(1.44)	2.00(1.56)	35.67(6.00)
Mean of Factor-1										
M1		29.44(5.13)	4.33(2.13)	2.33(1.65)	2.11(1.59)	19.78(4.36)	2.00(1.52)	4.78(2.20)	3.67(1.91)	68.44(7.99)
M2		41.78(6.21)	3.44(1.92)	2.44(1.69)	2.00(1.55)	19.56(4.35)	2.56(1.69)	4.67(2.18)	3.33(1.84)	79.78(8.65)
M3		27.89(5.08)	3.67(1.95)	2.11(1.59)	3.22(1.88)	16.44(3.90)	3.44(1.91)	5.33(2.29)	2.89(1.76)	65.00(7.76)
CD(0.05)		0.32	NS	NS	NS	NS	0.06	NS	NS	NS
CV		7.09	9.56	9.09	19.42	13.39	4.22	15.11	30.14	6.72
Mean of Factor-2										
S1		62.56(7.89)	5.67(2.45)	3.00(1.84)	3.22(1.89)	32.33(5.72)	4.33(2.15)	8.22(2.92)	5.78(2.47)	125.11(11.17)
S2		20.89(4.53)	3.67(1.97)	2.22(1.63)	2.33(1.65)	11.00(3.37)	1.67(1.43)	4.56(2.20)	2.33(1.60)	48.67(6.96)
S3		15.67(4.00)	2.11(1.58)	1.67(1.45)	1.78(1.48)	12.44(3.52)	2.00(1.55)	2.00(1.55)	1.78(1.45)	39.44(6.27)
CD(0.05)		0.43	0.39	NS	0.28	0.41	0.42	0.32	0.37	0.36
CV		7.72	19.11	20.11	16.23	9.44	23.82	14.2	19.4	4.33
Interaction										
M and T		NS	NS	NS	NS	NS	NS	NS	NS	NS
T and M		NS	NS	NS	NS	NS	NS	NS	NS	NS
Experimental Mean		5.48	2	1.64	1.67	4.2	1.71	2.22	1.84	8.14

*(Values in parentheses are transformed values)

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	Relative Weed Density																	
		Active tillering stage																	
		Aduthurai			Chatha			Jagdalpur			Malan			Moncompu			Nawagam		
		Grasses	Sedges	BLW	Grasses	Sedges	BLW	Grasses	Sedges	BLW	Grasses	Sedges	BLW	Grasses	Sedges	BLW	Grasses	Sedges	BLW
M1	S1	48.82	9.59	41.59	54.83	43.14	2.03	44.43	11.36	44.21	59.10	21.17	19.72	0.00	100.00	0.00	46.74	28.32	24.94
	S2	56.71	15.44	27.85	70.58	14.23	15.19	39.81	12.37	47.82	56.79	19.75	23.46	13.42	86.19	0.40	33.33	36.20	30.47
	S3	48.48	15.14	36.38	15.10	83.19	1.71	47.17	10.82	42.01	43.15	30.37	26.48	45.54	54.46	0.00	32.12	40.85	27.03
M2	S1	52.79	10.16	37.05	50.23	47.05	2.72	36.90	11.58	51.52	37.51	27.13	35.36	0.00	73.49	26.51	47.23	27.81	24.95
	S2	59.97	13.77	26.25	58.61	19.89	21.50	45.16	10.68	44.17	41.13	27.89	30.98	4.39	95.61	0.00	42.96	37.99	19.05
	S3	57.69	13.11	29.20	15.64	81.96	2.40	60.42	11.29	28.29	26.83	41.77	31.40	18.89	81.11	0.00	43.49	35.24	21.27
M3	S1	51.73	10.34	37.93	51.81	44.29	3.90	43.01	11.88	45.11	30.88	38.46	30.66	44.78	55.22	0.00	53.36	25.86	20.78
	S2	52.98	14.14	32.88	59.05	10.97	29.98	47.49	13.89	38.61	36.48	34.93	28.59	49.79	50.21	0.00	42.75	38.56	18.69
	S3	55.38	13.18	31.44	14.48	79.60	5.92	60.08	13.43	26.49	35.12	41.57	23.31	86.26	13.74	0.00	43.43	37.75	18.83

Main plot	Sub plot Treatments	Relative Weed Density								
		Active tillering stage								
		Pantnagar			Pusa			Varanasi		
		Grasses	Sedges	BLW	Grasses	Sedges	BLW	Grasses	Sedges	BLW
M1	S1	35.61	51.28	11.54	55.33	14.34	30.33	29.98	40.56	29.45
	S2	21.35	46.67	31.26	54.55	11.36	34.09	30.05	49.63	20.32
	S3	35.97	57.38	24.19	51.54	12.25	36.21	41.71	38.84	19.45
M2	S1	24.69	48.84	18.41	53.76	12.29	33.95	30.77	55.89	13.34
	S2	20.36	48.61	19.76	53.95	12.39	33.67	42.78	45.52	11.70
	S3	25.83	49.17	15.00	50.34	7.42	42.24	36.67	52.77	10.56
M3	S1	29.02	52.46	18.84	58.38	15.04	26.58	27.73	59.39	12.88
	S2	17.58	45.24	35.93	53.83	17.26	28.91	29.42	53.99	16.59
	S3	21.72	38.89	40.66	50.73	11.87	37.40	35.59	48.14	16.27

Table 4.3.3: Contd.

Relative Weed Density																
	Panicle initation stage															
Main plot	Subplot	Chatha			Jagdalpur			Karaikal			Malan			Moncompu		
		Grasses	Sedges	BLW	Grasses	Sedges	BLW	Grasses	Sedges	BLW	Grasses	Sedges	BLW	Grasses	Sedges	BLW
M1	S1	53.76	42.63	3.62	35.16	38.32	26.52	22.22	11.52	66.26	47.61	23.25	29.14	37.02	55.50	7.48
	S2	69.29	19.29	11.42	33.15	47.78	19.07	12.57	12.57	74.86	51.85	16.30	31.85	100.00	0.00	0.00
	S3	62.75	32.95	4.29	18.86	73.74	7.40	29.30	0.00	70.70	37.41	29.26	33.33	89.06	9.52	1.42
M2	S1	55.59	38.31	6.11	27.47	38.42	34.12	43.61	6.18	50.20	41.71	26.33	31.96	39.94	60.06	0.00
	S2	69.56	21.23	9.22	30.17	38.81	31.03	6.84	9.27	83.89	35.64	31.28	33.08	59.22	38.92	1.87
	S3	62.28	31.17	6.55	42.04	46.70	11.26	6.83	0.00	93.17	32.70	24.68	42.62	54.92	45.08	0.00
M3	S1	55.56	37.87	6.57	29.78	44.64	25.57	36.37	6.98	56.65	28.62	34.85	36.53	46.81	47.59	5.60
	S2	69.83	22.19	7.98	30.71	47.46	21.82	8.37	4.23	87.40	42.91	29.38	27.72	64.48	30.52	5.00
	S3	62.67	28.42	8.91	46.63	41.04	12.33	31.17	0.00	68.83	33.71	23.58	42.71	63.86	34.34	1.80

Relative Weed Density										
Panicle initation stage										
Main plot	Sub plot	Nawagam			Pantnagar			Pusa		
		Grasses	Sedges	BLW	Grasses	Sedges	BLW	Grasses	Sedges	BLW
M1	S1	55.07	26.94	17.99	28.64	52.84	20.09	40.93	21.32	37.75
	S2	49.04	29.16	21.80	30.00	47.38	23.33	46.95	17.65	35.40
	S3	44.04	32.07	23.89	16.19	39.84	26.43	46.33	22.90	30.78
M2	S1	54.86	24.81	20.33	35.01	56.90	16.15	43.98	18.67	37.36
	S2	62.59	22.70	14.70	25.00	59.88	26.39	53.69	16.04	30.27
	S3	52.75	28.07	19.18	31.67	59.17	19.17	40.58	11.06	48.35
M3	S1	55.72	24.38	19.90	28.26	52.14	19.28	47.59	21.41	31.00
	S2	40.22	31.35	28.42	22.62	46.48	32.14	46.47	25.43	28.11
	S3	42.93	26.89	30.18	27.78	37.63	33.33	53.53	14.87	31.60

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	Aduthurai												
		Relative Weed Density at Active tillering stage												
		Grasses					sedges			BLW				
		Cynodon dactylon	***Echinochloa colona***	***Echinochloa crusgalli***	***Leptochloa chinensis***	***Panicum repens***	Cyperus difformis	Cyperus rotundus	***Fimbristylis miliacea***	***Ammania baccifera***	***Bergia capensis***	***Eclipta alba***	***Euphorbia prostrata***	***Marselia quadrifolia***
M1	S1	3.53	20.20	8.58	11.62	4.88	2.86	5.39	1.34	5.89	1.85	19.88	11.11	2.86
	S2	7.03	16.75	9.79	11.89	11.24	5.66	9.79	0.00	6.96	0.00	9.07	6.96	4.86
	S3	5.32	14.38	8.34	10.59	9.85	4.55	8.32	2.27	6.82	2.27	12.88	9.85	4.55
M2	S1	5.01	19.08	9.33	13.10	6.27	3.20	5.01	1.95	5.01	1.95	17.28	9.75	3.07
	S2	6.68	10.41	25.44	8.72	8.72	5.43	8.35	0.00	5.84	2.07	8.33	4.57	5.45
	S3	7.47	16.07	11.18	12.41	10.55	4.35	6.27	2.49	7.47	3.07	10.55	4.99	3.12
M3	S1	5.52	18.05	9.66	11.73	6.78	3.10	4.94	2.30	5.63	2.64	16.10	9.89	3.68
	S2	7.06	15.89	10.95	10.25	8.83	4.95	8.13	1.06	7.07	4.61	9.19	6.00	6.01
	S3	7.53	16.88	10.79	10.79	9.38	3.76	8.00	1.41	6.56	2.35	10.79	6.56	5.18

Main plot	Sub plot Treatments	Chatha													
		Relative Weed Density at Active tillering stage							Relative Weed Density at Panicle initation stage						
		Grasses				sedges	BLW		Grasses				sedges	BLW	
		Cynodon dactylon	***Dactylacteni um aegyptium***	***Echinochlo a spp***	***Eleusin e indica***	***Cyperu s spp***	***Physali s minima***	***Solanu m nigrum***	***Cynodo n dactylon***	***Dactylacteniu m aegyptium***	***Echinochlo a spp***	***Eleusin e indica***	***Cyperu s spp***	***Physalis minima***	***Solanu m nigrum***
M1	S1	12.18	15.43	26.04	1.19	43.14	1.22	0.81	11.90	17.85	22.09	1.91	42.63	1.71	1.91
	S2	16.79	22.69	25.19	5.90	14.23	6.73	8.46	22.99	22.99	18.06	5.25	19.29	5.09	6.33
	S3	2.66	4.84	6.64	0.95	83.19	0.85	0.85	17.05	27.27	15.66	2.78	32.95	1.39	2.90
M2	S1	10.13	13.93	24.17	2.01	47.05	1.38	1.34	11.35	16.79	23.89	3.56	38.31	3.39	2.71
	S2	13.22	18.94	21.50	4.95	19.89	10.66	10.84	23.19	23.04	18.58	4.75	21.23	3.63	5.59
	S3	3.90	3.14	6.99	1.61	81.96	1.61	0.79	22.76	21.91	14.93	2.69	31.17	2.85	3.70
M3	S1	11.08	14.65	24.12	1.95	44.29	2.28	1.62	9.08	17.06	25.67	3.76	37.87	3.60	2.97
	S2	16.13	18.76	18.76	5.41	10.97	16.38	13.60	23.01	20.61	20.64	5.58	22.19	3.99	3.99
	S3	2.66	3.92	4.63	3.27	79.60	1.97	3.95	21.45	18.89	18.69	3.64	28.42	4.42	4.49

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	Jagdalpur											
		Relative Weed Density at Active tillering stage						Relative Weed Density at Panicle initation stage					
		Grasses			Sedges	BLW		Grasses			Sedges		BLW
		Cynodon dactylon	***Echinochloa spp***	***Paspalum dilatatum***	***Cyperus spp***	***Aegeratum conyzoides***	***Ludwigia parviflora***	***Cynodon dactylon***	***Echinochloa spp***	***Paspalum dilatatum***	***Cyperus difformis***	***Cyperus iria***	***Ludwigia parviflora***
M1	S1	1.78	38.14	4.51	11.36	0.00	44.21	0.00	29.50	5.66	7.77	30.56	26.52
	S2	0.00	37.21	2.59	12.37	0.00	47.82	0.00	31.15	2.00	10.07	37.71	19.07
	S3	3.70	32.36	11.11	10.82	0.00	42.01	1.30	14.61	2.95	13.04	60.70	7.40
M2	S1	1.58	32.74	2.59	11.58	0.00	51.52	0.00	25.64	1.83	8.98	29.44	34.12
	S2	0.35	40.58	4.23	10.68	0.00	44.17	0.00	27.95	2.22	10.15	28.65	31.03
	S3	1.12	53.92	5.38	11.29	0.00	28.29	0.65	41.39	0.00	16.69	30.01	11.26
M3	S1	7.81	26.04	9.16	11.88	18.65	26.46	3.11	23.59	3.08	12.88	31.77	25.57
	S2	7.35	30.48	9.66	13.89	13.84	24.77	5.11	22.27	3.33	13.54	33.92	21.82
	S3	21.38	31.31	7.38	13.43	7.05	19.43	9.03	32.46	5.14	14.89	26.15	12.33

Main plot	Sub plot Treatments	Karaikal						
		Relative Weed Density at Panicle initation stage						
		Grasses		Sedges	BLW			
		Echinochloa colonum	***Leptochloa chinensis***	***Cyperus difformis***	***Bergia capensis***	***Hydrolea zeylanica***	***Ludwigia parviflora***	***Sphaeranthus indicus***
M1	S1	19.61	2.60	11.52	5.28	27.40	1.33	32.24
	S2	12.57	0.00	12.57	9.54	41.48	9.61	14.24
	S3	19.05	10.26	0.00	0.00	17.58	53.11	0.00
M2	S1	42.90	0.72	6.18	12.19	24.56	6.03	7.42
	S2	6.84	0.00	9.27	0.00	52.16	3.25	28.48
	S3	0.00	6.83	0.00	24.33	10.67	0.00	58.17
M3	S1	32.42	3.95	6.98	8.67	31.73	7.41	8.84
	S2	8.37	0.00	4.23	10.52	47.06	2.05	27.77
	S3	14.07	17.10	0.00	32.55	7.40	0.00	28.88

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	Malan																	
		Relative Weed Density at Active tillering stage									Relative Weed Density at Panicle initiation stage								
		Grasses			sedges			BLW			Grasses			sedges			BLW		
		Echinochloa colona	***Echinochloa crusgalli***	***Panicum repens***	***Cyperus iria***	***Cyperus difformis***	***Cyperus rotundus***	***Alternanthera sp.***	***Eclipta alba***	***Monochoria vaginalis***	***Echinochloa colona***	***Echinochloa crusgalli***	***Panicum repens***	***Cyperus iria***	***Cyperus difformis***	***Cyperus rotundus***	***Alternanthera sp.***	***Eclipta alba***	***Monochoria vaginalis***
M1	S1	31.76	17.38	9.97	5.19	7.69	8.30	6.64	4.78	8.30	28.97	9.93	8.72	4.85	9.62	8.78	13.22	8.34	7.57
	S2	28.09	18.96	9.74	6.66	6.70	6.39	11.24	6.70	5.51	26.49	10.19	15.16	4.58	6.24	5.48	12.29	10.74	8.82
	S3	18.89	15.00	9.26	9.81	9.63	10.93	9.44	9.63	7.41	14.81	12.22	10.37	10.37	10.37	8.52	14.81	10.37	8.15
M2	S1	16.80	12.02	8.69	7.79	10.37	8.97	11.22	6.14	18.00	24.56	7.47	9.68	9.40	7.73	9.20	11.39	9.72	10.86
	S2	24.58	12.78	3.77	11.42	7.00	9.47	11.99	11.32	7.68	24.48	6.60	4.56	10.64	10.53	10.11	10.71	12.89	9.48
	S3	13.27	6.53	7.04	11.82	16.17	13.78	8.49	8.19	14.72	17.94	6.59	8.17	11.51	8.25	4.92	14.76	11.43	16.43
M3	S1	14.13	10.15	6.60	12.95	12.71	12.80	9.38	7.00	14.29	15.71	7.04	5.87	10.93	13.94	9.98	14.14	7.99	14.40
	S2	16.91	12.66	6.90	12.33	13.43	9.17	14.30	6.51	7.79	23.02	10.40	9.49	8.08	9.40	11.90	9.34	9.83	8.55
	S3	14.59	9.28	11.24	12.63	14.47	14.47	7.77	6.25	9.28	18.81	7.45	7.45	7.45	10.23	5.90	14.68	16.35	11.68

Main plot	Sub plot Treatments	Moncompu											
		Relative Weed Density at Active tillering stage					Relative Weed Density at Panicle initiation stage						
		Grasses	sedges			BLW	Grasses			sedges			BLW
		Isachnae miliaceae	***Cyperus difformis***	Cyperus haspan	***Fimbrystylis miliaceae***	***Sphaenochlea zeylanica***	***Echinochloa spp***	***Isachnae miliaceae***	***Leptoclhoa chinensis***	***Cyperus difformis***	Cyperus haspan	***Fimbrystylis miliaceae***	***Ludwigia hyssopifolia***
M1	S1	0.00	7.32	0.00	92.68	0.00	0.00	37.02	0.00	0.00	0.00	55.50	7.48
	S2	13.42	7.56	0.00	78.63	0.40	0.00	97.22	2.78	0.00	0.00	0.00	0.00
	S3	45.54	2.08	0.00	52.38	0.00	0.00	83.79	5.26	0.00	0.00	9.52	1.42
M2	S1	0.00	10.42	0.00	63.07	26.51	0.72	39.22	0.00	0.00	0.00	60.06	0.00
	S2	4.39	17.34	0.00	78.28	0.00	0.58	58.63	0.00	0.00	0.00	38.92	1.87
	S3	18.89	11.35	0.00	69.76	0.00	0.00	54.92	0.00	0.00	0.00	45.08	0.00
M3	S1	44.78	0.22	14.35	40.65	0.00	1.45	45.36	0.00	3.60	9.42	34.57	5.60
	S2	49.79	30.86	2.47	16.88	0.00	0.00	64.48	0.00	0.00	0.71	29.81	5.00
	S3	86.26	0.00	3.30	10.44	0.00	0.00	63.86	0.00	2.79	0.00	31.55	1.80

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	Nawagam											
		Relative Weed Density at Active tillering stage											
		Grasses					Sedges			BLW			
		Cynodon dactylon	***Chloris barbata***	***Digtaria sanguinalis***	***Echinochloa colona***	***Echinochloa crusgalli***	***Cyperus esculentus***	***Cyperus iria***	***Cyperus rotundus***	***Eclipta alba***	***Ipomoea aquatic***	Physalis minima	***Trianthema monogyna***
M1	S1	11.23	8.88	9.01	9.00	8.62	9.22	9.23	9.87	6.32	5.81	6.13	6.68
	S2	4.82	5.36	12.39	5.52	5.23	10.23	11.57	14.41	7.60	4.96	10.76	7.14
	S3	7.82	5.40	12.31	3.97	2.63	16.32	12.92	11.61	4.79	6.06	9.91	6.28
M2	S1	10.28	7.43	9.29	11.43	8.80	9.48	10.69	7.64	7.53	4.68	6.08	6.66
	S2	6.07	7.06	15.66	11.23	2.94	14.07	12.08	11.85	4.35	5.17	5.17	4.35
	S3	6.80	9.67	13.25	10.37	3.40	10.71	12.65	11.88	3.81	7.16	3.65	6.65
M3	S1	14.29	7.59	8.99	11.37	11.11	8.50	8.46	8.91	4.59	6.26	5.02	4.90
	S2	10.23	5.21	10.47	7.13	9.71	11.94	14.47	12.15	3.59	4.37	5.52	5.21
	S3	8.21	8.57	8.24	12.83	5.58	12.13	13.05	12.56	3.97	6.19	4.92	3.74

Main plot	Sub plot Treatments	Nawagam											
		Relative Weed Density at Panicle initiation stage											
		Grasses					Sedges			BLW			
		Cynodon dactylon	***Chloris barbata***	***Digtaria sanguinalis***	***Echinochloa colona***	***Echinochloa crusgalli***	***Cyperus esculentus***	***Cyperus iria***	***Cyperus rotundus***	***Eclipta alba***	***Ipomoea aquatic***	Physalis minima	***Trianthema monogyna***
M1	S1	14.03	12.24	5.86	12.11	10.83	8.88	8.38	9.68	3.95	5.12	4.44	4.48
	S2	10.61	6.48	7.86	9.44	14.63	7.69	10.80	10.67	5.79	3.91	6.83	5.28
	S3	10.58	6.37	10.35	7.65	9.09	13.17	10.21	8.69	5.00	4.75	8.97	5.16
M2	S1	10.13	9.61	9.68	13.45	11.98	9.74	7.35	7.71	3.73	6.49	5.75	4.36
	S2	15.15	10.94	8.63	16.58	11.29	7.38	6.53	8.80	1.86	4.48	5.00	3.36
	S3	9.91	13.18	10.16	13.81	5.69	8.43	8.33	11.32	5.36	4.82	4.82	4.17
M3	S1	12.90	8.21	11.34	11.30	11.97	9.62	6.70	8.06	4.56	4.62	5.54	5.17
	S2	8.75	6.14	7.01	9.85	8.46	10.18	11.80	9.37	7.24	8.07	8.12	4.99
	S3	8.65	8.61	5.10	14.69	5.88	11.79	7.33	7.77	4.35	7.32	11.33	7.18

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	Pantnagar							
		Relative Weed Density at Active tillering stage				Relative Weed Density at Panicle initiation stage			
		Grasses	sedges		BLW	Grasses	sedges		BLW
		Echinochloa colona	***Cyperus rotundus***	***Fimbristylis miliacea***	***Caesulia auxillaris***	***Echinochloa colona***	***Cyperus rotundus***	***Fimbristylis miliacea***	***Caesulia auxillaris***
M1	S1	35.61	39.60	13.24	11.54	28.64	22.64	28.64	20.09
	S2	21.35	40.08	7.30	31.26	30.00	23.33	23.33	23.33
	S3	35.97	25.01	14.83	24.19	16.19	24.52	32.86	26.43
M2	S1	24.69	37.70	19.20	18.41	35.01	24.10	24.74	16.15
	S2	20.36	39.52	20.36	19.76	25.00	29.17	19.44	26.39
	S3	25.83	46.67	12.50	15.00	31.67	34.17	15.00	19.17
M3	S1	29.02	26.87	25.27	18.84	28.26	27.46	25.00	19.28
	S2	17.58	28.14	18.35	35.93	22.62	22.62	22.62	32.14
	S3	21.72	22.90	14.73	40.66	27.78	27.78	11.11	33.33

Main plot	Sub plot Treatments	Pusa									
		Relative Weed Density at Active tillering stage									
		Grasses				Sedges		BLW			
		Echinochloa colona	***Echinochloa crusgalli***	***Leptochloa chinensis***	***Paspalum spp***	***Cyperus iria***	***Cyperus difformis***	***Ammania baccifera***	***Caesulia axillaris***	***Eclipta alba***	***Ludwigia pariflora***
M1	S1	23.34	11.53	16.55	3.91	6.16	8.18	5.16	9.73	7.06	8.37
	S2	18.94	11.36	18.94	5.30	6.82	4.55	2.27	10.61	14.39	6.82
	S3	18.97	12.91	11.64	8.02	7.90	4.35	5.09	13.43	8.43	9.26
M2	S1	27.16	13.17	10.47	2.96	6.19	6.10	5.12	8.09	11.82	8.92
	S2	18.01	16.59	12.06	7.29	5.85	6.54	3.30	12.47	9.28	8.63
	S3	9.50	24.94	8.93	6.96	3.43	3.99	7.60	15.28	10.04	9.33
M3	S1	26.84	10.02	19.73	1.79	8.23	6.81	4.91	9.57	7.91	4.18
	S2	20.90	8.78	20.43	3.72	6.51	10.76	4.24	8.74	6.95	8.97
	S3	22.66	9.83	14.48	3.76	4.83	7.03	8.91	9.91	9.91	8.68

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	Pusa									
		Relative Weed Density at Panicle initiation stage									
		Grasses				Sedges		BLW			
		Echinochloa colona	***Echinochloa crusgalli***	***Leptochloa chinensis***	***Paspalum spp***	***Cyperus iria***	***Cyperus difformis***	***Ammania baccifera***	***Caesulia axillaris***	***Eclipta alba***	***Ludwigia pariflora***
M1	S1	10.66	11.82	12.69	5.76	11.87	9.45	3.58	15.74	6.61	11.82
	S2	14.83	11.56	13.64	6.93	12.49	5.16	5.38	11.65	10.62	7.75
	S3	16.40	11.87	10.91	7.15	16.97	5.92	2.52	8.93	8.41	10.91
M2	S1	16.56	8.70	13.70	5.02	12.30	6.36	3.91	9.50	12.15	11.80
	S2	18.70	16.34	11.65	7.01	10.22	5.82	2.18	12.95	5.45	9.69
	S3	10.21	15.39	10.58	4.41	6.73	4.33	6.49	15.07	10.66	16.13
M3	S1	19.78	8.05	15.10	4.65	12.30	9.11	4.17	11.99	9.75	5.10
	S2	16.21	9.74	15.81	4.71	16.51	8.91	2.27	7.75	9.54	8.55
	S3	22.44	13.14	11.86	6.09	8.53	6.35	4.87	10.19	8.65	7.88

Main plot	Sub plot Treatments	Varanasi						
		Relative Weed Density at Active tillering stage						
		Grasses		Sedges		BLW		
		Cynodon dactylon	***Echinochloa crusgalli***	***Cyperus difformis***	***Cyperus rotundus***	***Euphorbia hirta***	***Parthenium hysterophorus***	***Phyllanthus niruri***
M1	S1	28.13	1.85	3.48	37.36	8.16	9.87	11.41
	S2	25.14	4.91	5.00	37.41	3.16	8.60	8.56
	S3	39.31	2.40	4.84	31.56	5.66	7.34	6.45
M2	S1	27.59	3.18	8.97	49.56	2.74	3.83	6.77
	S2	40.95	1.82	9.03	38.61	2.23	3.88	5.59
	S3	34.77	1.91	2.19	48.94	2.73	3.24	4.58
M3	S1	24.58	3.15	5.70	54.68	3.26	4.12	5.50
	S2	26.46	2.96	8.93	48.34	4.40	4.76	7.43
	S3	34.75	0.84	3.34	43.68	3.40	4.92	7.95

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	Weed control efficiency %						
		Active tillering stage				Panicle initiation stage		
		Malan	Moncompu	Pantnagar	Pusa	Malan	Pantnagar	Pusa
M1	S1	0	0	0	0	0	0	0
	S2	46	13	80	57	33	80	46
	S3	88	63	86	57	83	81	42
M2	S1	0	0	0	0	0	0	0
	S2	58	15	85	48	50	85	33
	S3	80	30	87	48	86	89	34
M3	S1	0	0	0	0	0	0	0
	S2	59	17	79	60	37	85	52
	S3	92	32	85	64	72	87	57

M1- Mechanised transplanting/Transplanting (if transplanters not available)
M2-Puddled direct seeding (preferably line sowing by drumseeder)
M3-Un-puddled dry direct seeding (line sowing)

S1-Weedy check
S2-Mechanical weeding using weeder
S3-Chemical weed control (Herbicide recommendation of respective University may be followed)

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	Karaikal				Malan							
		Weed dry biomass g/m² at Pagcle initiation stage				Weed dry biomass g/m² at Active tillering stage				Weed dry biomass g/m² at Panicle initiation stage			
		Grasses	Sedges	BLW	Total weed dry biomass	Grasses	Sedges	BLW	Total weed dry biomass	Grasses	Sedges	BLW	Total weed dry biomass
M1	S1	13.05	4.93	9.16	27.14	31.17	13.07	14.10	58.33	28.77	11.47	13.57	53.80
	S2	4.17	2.52	5.52	12.21	12.53	4.93	12.53	30.00	22.57	7.93	12.70	43.20
	S3	1.99	0.00	2.49	4.48	2.37	1.60	1.70	5.67	3.93	3.17	3.23	10.33
M2	S1	65.82	9.16	15.82	90.80	33.60	27.53	46.33	107.47	42.70	24.67	25.83	93.20
	S2	7.01	6.31	5.64	18.96	21.33	15.93	20.77	58.03	18.93	7.43	16.47	42.83
	S3	1.69	0.00	6.65	8.34	2.30	7.17	13.60	23.07	4.40	2.53	3.97	10.90
M3	S1	84.70	9.04	47.02	140.76	42.63	62.93	52.07	157.63	40.40	40.93	51.43	132.77
	S2	2.99	1.80	24.41	29.20	25.67	27.97	22.90	76.53	27.13	23.93	23.87	74.93
	S3	19.92	0.00	12.59	32.51	4.13	3.47	8.60	16.20	4.50	2.57	4.23	11.30
Mean of Factor-1													
M1		6.40	2.48	5.73	14.61	15.36	6.53	9.44	31.33	18.42	7.52	9.83	35.78
M2		24.84	5.16	9.37	39.37	19.08	16.88	26.90	62.86	22.01	11.54	15.42	48.98
M3		35.87	3.61	28.01	67.49	24.14	31.46	27.86	83.46	24.01	22.48	26.51	73.00
CD(0.05)		4.73	1.23	2.83	3.80	0.80	2.67	0.59	2.61	2.33	2.74	1.64	5.01
CV		25.24	39.21	23.54	11.21	4.91	17.45	3.27	5.26	12.96	23.60	11.37	11.38
Mean of Factor-2													
S1		54.52	7.71	24.00	86.23	35.80	34.51	37.50	107.81	37.29	25.69	30.28	93.26
S2		4.72	3.54	11.86	20.12	19.84	16.28	18.73	54.86	22.88	13.10	17.68	53.66
S3		7.87	0.00	7.24	15.11	2.93	4.08	7.97	14.98	4.28	2.76	3.81	10.84
CD(0.05)		10.20	1.40	2.37	9.49	0.77	3.26	2.44	2.91	2.41	2.12	2.41	2.84
CV		44.37	36.27	16.06	22.82	3.84	17.33	11.09	4.78	10.91	14.89	13.58	5.26
Interaction													
M and T		17.66	2.42	4.11	16.44	1.33	5.64	4.22	5.04	4.17	3.67	4.17	4.92
T and M		14.61	2.09	3.76	13.55	1.18	4.83	3.46	4.37	3.66	3.43	3.51	5.15
Experimental Mean		22.37	3.75	14.37	40.49	19.53	18.29	21.40	59.21	21.48	13.85	17.26	52.59

M1- Mechanised transplanting/Transplanting (if transplanters not available)
M2-Puddled direct seeding (preferably line sowing by drum seeder)
M3-Un-puddled dry direct seeding (line sowing)

S1-Weedy check
S2-Mechanical weeding using weeder
S3-Chemical weed control (Herbicide recommendation of respective University may be followed)

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	Moncompu							
		Weed dry biomass g/m² at Active tillering stage				Weed dry biomass g/m² at Panicle initiation stage			
		Grasses	Sedges	BLW	Total weed dry biomass	Grasses	Sedges	BLW	Total weed dry biomass
M1	S1	0.00	125.32	0.00	125.32	49.13	51.68	5.01	105.83
	S2	18.29	97.93	0.12	116.35	59.05	0.00	0.00	59.05
	S3	19.07	40.25	0.00	59.32	70.57	21.64	2.04	94.25
M2	S1	0.00	154.16	66.89	221.05	68.96	43.65	0.00	112.61
	S2	2.57	151.17	0.00	153.75	90.09	48.11	9.08	147.28
	S3	36.77	118.05	0.00	154.83	73.43	67.35	0.00	140.77
M3	S1	50.19	105.39	0.00	155.57	67.16	34.89	8.29	110.35
	S2	47.85	72.48	0.00	120.33	67.01	46.47	6.45	119.93
	S3	78.09	37.16	0.00	115.25	51.35	38.60	3.27	93.21
Mean of Factor-1									
M1		12.45	87.84	0.04	100.33	59.59	24.44	2.35	86.38
M2		13.12	141.13	22.30	176.54	77.49	53.04	3.03	133.56
M3		58.71	71.68	0.00	130.39	61.84	39.99	6.00	107.83
CD(0.05)		NS	31.28	NS	NS	NS	7.70	NS	NS
CV		137.04	37.29	285.41	51.33	35.15	23.49	93.99	25.01
Mean of Factor-2									
S1		16.73	128.29	22.30	167.32	61.75	43.41	4.44	109.60
S2		22.91	107.20	0.04	130.14	72.05	31.52	5.18	108.76
S3		44.64	65.16	0.00	109.80	65.12	42.53	1.77	109.41
CD(0.05)		NS	47.81	NS	NS	NS	NS	NS	NS
CV		83.28	46.45	285.79	36.32	17.13	88.97	129.98	33.37
Interaction									
M and T		NS	NS	37.86	NS	NS	NS	NS	NS
T and M		NS	NS	32.43	NS	NS	NS	NS	NS
Experimental Mean		28.09	100.21	7.45	135.75	66.31	39.15	3.79	109.25

M1- Mechanised transplanting/Transplanting (if transplanters not available)
M2-Puddled direct seeding (preferably line sowing by drum seeder)
M3-Un-puddled dry direct seeding (line sowing)

S1-Weedy check
S2-Mechanical weeding using weeder
S3-Chemical weed control (Herbicide recommendation of respective University may be followed)

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	Nawagam							
		Weed dry biomass g/m^2 at Active tillering stage				Weed dry biomass g/m^2 at Panicle initiation stage			
		Grasses	Sedges	BLW	Total weed dry biomass	Grasses	Sedges	BLW	Total weed dry biomass
M1	S1	152.64	77.44	155.14	385.22	503.20	206.08	185.31	894.59
	S2	70.17	67.16	127.10	264.43	256.98	128.43	124.45	509.86
	S3	51.10	56.70	84.67	192.47	146.19	90.04	91.92	328.14
M2	S1	156.05	78.12	151.87	386.04	326.20	125.90	176.71	628.81
	S2	68.95	50.76	54.18	173.89	240.92	75.82	85.98	402.72
	S3	53.63	38.97	50.11	142.71	121.97	55.87	62.99	240.83
M3	S1	194.35	76.05	130.56	400.96	348.54	120.14	164.54	633.22
	S2	78.76	57.33	60.28	196.37	142.85	86.54	137.85	367.24
	S3	62.07	44.01	46.66	152.74	104.80	50.98	102.86	258.65
Mean of Factor-1									
M1		91.30	67.10	122.30	280.71	302.12	141.52	133.89	577.53
M2		92.88	55.95	85.39	234.21	229.70	85.86	108.56	424.12
M3		111.73	59.13	79.17	250.02	198.73	85.89	135.08	419.70
CD(0.05)		NS	NS	NS	NS	NS	29.69	7.22	55.88
CV		19.87	17.87	31.45	17.68	29.09	33.96	6.86	14.09
Mean of Factor-2									
S1		167.68	77.20	145.86	390.74	392.65	150.71	175.52	718.87
S2		72.63	58.42	80.52	211.56	213.58	96.93	116.09	426.60
S3		55.60	46.56	60.48	162.64	124.32	65.63	85.92	275.87
CD(0.05)		18.41	9.98	19.64	25.07	39.94	34.73	34.65	63.43
CV		18.17	16.00	20.00	9.57	15.97	32.38	26.81	13.03
Interaction									
M and T		NS	NS	NS	43.42	69.18	NS	NS	NS
T and M		NS	NS	NS	42.63	67.59	NS	NS	NS
Experimental Mean		98.64	60.73	95.62	254.98	243.52	104.42	125.85	473.78

M1- Mechanised transplanting/Transplanting (if transplanters not available)
M2-Puddled direct seeding (preferably line sowing by drum seeder)
M3-Un-puddled dry direct seeding (line sowing)

S1-Weedy check
S2-Mechanical weeding using weeder
S3-Chemical weed control (Herbicide recommendation of respective University may be followed)

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	Puducherry							
		Weeddry biomass g/m^2 at Active tillering stage				Weed dry biomass g/m^2 at Panicle initiation stage			
		Grasses	Sedges	BLW	Total weed dry biomass	Grasses	Sedges	BLW	Total weed dry biomass
M1	S1	41.66	35.7	20.02	97.38	44.27	26.62	22.8	93.70
	S2	22.67	26.49	13.43	62.59	21.91	14.65	12.07	48.63
	S3	16.71	19	11.24	46.95	13.49	10.2	9.01	32.71
M2	S1	54.19	53.97	23.85	132.02	63.42	30.68	28.88	122.98
	S2	37.82	39.22	17.52	94.56	31.24	20.52	13.2	64.96
	S3	28.62	27.48	15.6	71.7	26.61	16.03	10.49	53.13
M3	S1	-	-	-	-	-	-	-	-
	S2	-	-	-	-	-	-	-	-
	S3	-	-	-	-	-	-	-	-
Mean of Factor-1									
M1		27.01	27.06	14.9	68.97	26.56	17.16	14.63	58.35
M2		40.21	40.22	18.99	99.43	40.42	22.41	17.52	80.36
M3		-	-	-	-	-	-	-	-
CD(0.05)		1.21	1.64	0.64	2.56	1.62	1.38	0.83	3.20
CV		1.77	2.41	1.87	1.5	2.38	3.43	2.55	2.27
Mean of Factor-2									
S1		47.93	44.84	21.94	114.7	53.85	28.65	25.84	108.34
S2		30.24	32.86	15.47	78.58	26.57	17.59	12.64	56.79
S3		22.66	23.24	13.42	59.32	20.05	13.11	9.75	42.92
CD(0.05)		1.34	1.16	0.32	2.45	0.93	1.00	0.36	1.87
CV		2.99	2.6	1.41	2.19	2.08	3.81	1.68	2.03
Interaction									
M and T		NS	1.65	NS	3.47	1.31	NS	0.51	2.65
T and M		NS	1.87	NS	3.49	1.66	NS	0.76	3.31
Experimental Mean		33.61	33.64	16.94	84.20	33.49	19.78	16.08	69.35

M1- Mechanised transplanting/Transplanting (if transplanters not available)
M2-Puddled direct seeding (preferably line sowing by drum seeder)
M3-Un-puddled dry direct seeding (line sowing)

S1-Weedy check
S2-Mechanical weeding using weeder
S3-Chemical weed control (Herbicide recommendation of respective University may be followed)

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	Pusa							
		Weed dry biomass g/m² at Active tillering stage				Weed dry biomass g/m² at Panicle initiation stage			
		Grasses	Sedges	BLW	Total weed dry biomass	Grasses	Sedges	BLW	Total weed dry biomass
M1	S1	20.73	6.6	10.43	37.77	21.37	13.67	26.13	61.17
	S2	9.2	2.7	5.1	17	13.73	5.57	11.17	30.47
	S3	7.23	3.13	4.73	15.1	13.1	7.03	12.13	32.27
M2	S1	16.5	5.4	12.93	34.83	22.57	14.5	29.23	66.3
	S2	9.97	3.2	4.4	17.57	16.77	8.67	13.67	39.1
	S3	7.3	2.03	6	15.33	10.4	5.03	20.87	36.3
M3	S1	28.33	11.27	14.23	53.83	37.73	25.07	36.67	99.47
	S2	8.97	5.6	4.57	19.13	18.03	13.77	13.03	44.83
	S3	7.9	3.48	6.07	17.45	15.83	9.53	12.67	38.03
Mean of Factor-1									
M1		12.39	4.14	6.76	23.29	16.07	8.76	16.48	41.3
M2		11.26	3.54	7.78	22.58	16.58	9.4	21.26	47.23
M3		15.07	6.78	8.29	30.14	23.87	16.12	20.79	60.78
CD(0.05)		NS	1.55	NS	2.67	3.87	3.85	NS	5.44
CV		26.51	38.26	47.89	12.58	24.56	40.22	29.24	13.05
Mean of Factor-2									
S1		21.86	7.76	12.53	42.14	27.22	17.74	30.68	75.64
S2		9.38	3.83	4.69	17.9	16.18	9.33	12.62	38.13
S3		7.48	2.88	5.6	15.96	13.11	7.2	15.22	35.53
CD(0.05)		3.04	1.91	2.81	4.13	4.64	4.85	6.07	8.06
CV		22.95	38.45	36.02	15.87	23.97	41.34	30.29	15.76
Interaction									
M and T		5.27	NS	NS	7.16	NS	NS	NS	13.95
T and M		4.6	NS	NS	6.01	NS	NS	NS	11.75
Experimental Mean		12.9	4.82	7.61	25.34	18.84	11.43	19.51	49.77

M1- Mechanised transplanting/Transplanting (if transplanters not available)
M2-Puddled direct seeding (preferably line sowing by drum seeder)
M3-Un-puddled dry direct seeding (line sowing)

S1-Weedy check
S2-Mechanical weeding using weeder
S3-Chemical weed control (Herbicide recommendation of respective University may be followed)

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	ARI-Rajendranagar							
		Weed dry biomass g/m^2 at Active tillering stage				Weed dry biomass g/m^2 at Panicle initiation stage			
		Grasses	Sedges	BLW	Total weed dry biomass	Grasses	Sedges	BLW	Total weed dry biomass
M1	S1	4.87	6	1.7	12.57	41.67	25.00	29.67	96.33
	S2	1.83	2.9	1.33	6.07	18.67	16.00	15.00	49.67
	S3	1.53	1.97	1.07	4.57	16.33	12.33	7.67	36.33
M2	S1	13.83	11.2	1.4	26.43	45.00	32.67	35.00	112.67
	S2	6.3	3.83	1.07	11.2	31.00	13.67	11.00	55.67
	S3	4.87	2.2	0.8	7.87	13.33	9.00	5.33	27.67
M3	S1	14.37	11.63	4.57	30.57	71.33	56.33	53.67	181.33
	S2	8.97	8.2	3.5	20.67	34.33	35.33	35.67	105.33
	S3	3.2	5.6	1.63	10.43	23.00	23.33	24.33	70.67
Mean of Factor-1									
M1		2.74	3.62	1.37	7.73	25.56	17.78	17.44	60.78
M2		8.33	5.74	1.09	15.17	29.78	18.44	17.11	65.33
M3		8.84	8.48	3.23	20.56	42.89	38.33	37.89	119.11
CD(0.05)		0.66	0.58	0.13	0.99	3.23	1.98	1.39	3.70
CV		11.91	11.56	8.49	8.15	11.80	9.52	6.88	5.40
Mean of Factor-2									
S1		11.02	9.61	2.56	23.19	52.67	38.00	39.44	130.11
S2		5.7	4.98	1.97	12.64	28.00	21.67	20.56	70.22
S3		3.2	3.26	1.17	7.62	17.56	14.89	12.44	44.89
CD(0.05)		0.48	0.60	0.21	0.74	5.23	2.33	2.75	5.74
CV		7.04	9.83	10.81	5	15.56	9.11	11.09	6.84
Interaction									
M and T		0.83	1.04	0.36	1.29	9.06	4.03	4.76	9.94
T and M		0.79	0.91	0.31	1.21	7.59	3.47	3.95	8.35
Experimental Mean		6.64	5.95	1.9	14.49	32.74	24.85	24.15	81.74

M1- Mechanised transplanting/Transplanting (if transplanters not available)
M2-Puddled direct seeding (preferably line sowing by drum seeder)
M3-Un-puddled dry direct seeding (line sowing)

S1-Weedy check
S2-Mechanical weeding using weeder
S3-Chemical weed control (Herbicide recommendation of respective University may be followed)

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	Titabar							
		Weed dry biomass g/m^2 at Active tillering stage				Weed dry biomass g/m^2 at Panicle initiation stage			
		Grasses	Sedges	BLW	Total weed dry biomass	Grasses	Sedges	BLW	Total weed dry biomass
M1	S1	8.20	1.27	4.07	13.53	9.73	1.53	4.70	15.97
	S2	7.40	0.83	3.63	11.87	8.7	1.00	4.13	13.83
	S3	4.23	0.50	1.73	6.47	5.13	0.62	2.07	7.82
M2	S1	8.77	1.23	5.63	15.63	10.3	1.60	6.33	18.23
	S2	7.77	1.00	5.33	14.10	9.03	1.37	6.17	16.57
	S3	5.30	0.87	2.90	9.07	6.5	0.97	3.67	11.13
M3	S1	12.13	1.53	8.13	21.80	14.97	1.73	10.80	27.50
	S2	9.27	0.50	5.03	14.80	10.13	0.67	5.67	16.47
	S3	6.60	0.47	3.63	10.70	7.5	0.65	4.40	12.55
Mean of Factor-1									
M1		6.61	0.87	3.14	10.62	7.85	1.05	3.63	12.54
M2		7.28	1.03	4.62	12.93	8.61	1.31	5.39	15.31
M3		9.33	0.83	5.60	15.77	10.87	1.02	6.96	18.84
CD(0.05)		0.79	0.10	0.66	0.80	1.17	0.10	0.50	1.47
CV		12.25	12.67	17.61	7.31	15.32	10.89	11.12	11.26
Mean of Factor-2									
S1		9.70	1.34	5.94	16.99	11.67	1.62	7.28	20.57
S2		8.14	0.78	4.67	13.59	9.29	1.01	5.32	15.62
S3		5.38	0.61	2.76	8.74	6.38	0.74	3.38	10.50
CD(0.05)		0.72	0.18	0.62	1.06	0.96	0.21	0.96	1.52
CV		9.02	19.70	13.66	7.91	10.26	18.43	17.51	9.52
Interaction									
M and T		NS	0.32	1.08	1.84	1.66	NS	1.66	2.63
T and M		NS	0.27	0.96	1.57	1.53	NS	1.38	2.31
Experimental Mean		7.74	0.91	4.46	13.11	9.11	1.13	5.33	15.56

M1- Mechanised transplanting/Transplanting (if transplanters not available)
M2-Puddled direct seeding (preferably line sowing by drum seeder)
M3-Un-puddled dry direct seeding (line sowing)

S1-Weedy check
S2-Mechanical weeding using weeder
S3-Chemical weed control (Herbicide recommendation of respective University may be followed)

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	Varanasi			
		Weed dry biomass g/m^2 at Active tillering stage			
		Grasses	Sedges	BLW	Total weed dry biomass
M1	S1	7.97	11.3	5.23	24.50
	S2	6.3	9.7	4.13	20.13
	S3	4.73	8.33	2.8	15.87
M2	S1	16.63	46.2	7.13	69.97
	S2	11.53	31.7	4.8	48.03
	S3	9.53	28.23	3.23	41
M3	S1	18.43	45.07	8.73	72.23
	S2	13.83	23.93	4.67	42.43
	S3	10	31.63	4.23	45.87
Mean of Factor-1					
M1		6.33	9.78	4.06	20.17
M2		12.57	35.38	5.06	53
M3		14.09	33.54	5.88	53.51
CD(0.05)		0.89	2.34	0.51	2.98
CV		9.71	10.67	12.19	8.42
Mean of Factor-2					
S1		14.34	34.19	7.03	55.57
S2		10.56	21.78	4.53	36.87
S3		8.09	22.73	3.42	34.24
CD(0.05)		1.44	2.5	1.02	3.23
CV		12.71	9.27	19.93	7.45
Interaction					
M and T		NS	4.33	NS	5.6
T and M		NS	3.77	NS	4.87
Experimental Mean		11	26.23	5	42.23

M1- Mechanised transplanting/Transplanting (if transplanters not available)
M2-Puddled direct seeding (preferably line sowing by drum seeder)
M3-Un-puddled dry direct seeding (line sowing)

S1-Weedy check
S2-Mechanical weeding using weeder
S3-Chemical weed control (Herbicide recommendation of respective University may be followed)

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	Karaikal							
		Weed dry biomass g/m^2 at Panicle initiation stage							
		Grasses		sedges	BLW				Total weed biomass
		Echinochloa colona	***Leptochloa chinensis***	***Cyperus difformis***	***Bergia capensis***	***Hydrolea zeylanica***	***Ludwigia parviflora***	***Sphaeranthus indicus***	
M1	S1	11.41	1.63	4.93	2.88	3.47	0.20	2.61	27.14
	S2	4.17	0.00	2.52	1.91	0.39	1.59	1.64	12.21
	S3	1.03	0.96	0.00	0.00	0.85	1.64	0.00	4.48
M2	S1	64.93	0.88	9.16	3.87	7.04	3.37	1.53	90.80
	S2	7.01	0.00	6.31	0.00	2.48	0.67	2.49	18.96
	S3	0.00	1.69	0.00	4.46	0.10	0.00	2.09	8.34
M3	S1	74.69	10.00	9.04	22.07	9.60	9.60	5.76	140.76
	S2	2.99	0.00	1.80	15.87	4.52	0.93	3.09	29.20
	S3	15.25	4.67	0.00	8.43	2.06	0.00	2.10	32.51
Mean of Factor-1									
M1		5.54	0.87	2.48	1.60	1.57	1.14	1.42	14.61
M2		23.98	0.86	5.16	2.78	3.21	1.35	2.04	39.37
M3		30.98	4.89	3.61	15.46	5.39	3.51	3.65	67.49
CD(0.05)		4.09	0.90	1.23	1.30	1.67	0.63	0.71	3.80
CV%		24.22	48.95	39.21	23.48	58.68	37.46	35.65	11.21
Mean of Factor-2									
S1		50.35	4.17	7.71	9.61	6.70	4.39	3.30	86.23
S2		4.72	0.00	3.54	5.92	2.46	1.06	2.41	20.12
S3		5.43	2.44	0.00	4.30	1.00	0.55	1.40	15.11
CD(0.05)		9.82	0.93	1.40	2.95	1.94	1.25	0.81	9.49
CV%		47.41	40.86	36.27	43.44	55.78	60.65	33.33	22.82
Interaction									
M and T		17.01	1.60	2.42	5.11	NS	2.16	1.40	16.44
T and M		14.03	1.41	2.09	4.22	NS	1.79	1.21	13.55
Experimental Mean		20.17	2.21	3.75	6.61	3.39	2.00	2.37	40.49

M1- Mechanised transplanting/Transplanting (if transplanters not available)
M2-Puddled direct seeding (preferably line sowing by drum seeder)
M3-Un-puddled dry direct seeding (line sowing)

S1-Weedy check
S2-Mechanical weeding using weeder
S3-Chemical weed control (Herbicide recommendation of respective University may be followed)

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	Malan									
		Weed dry biomass g/m^2 at Active tillering stage									
		Grasses			sedges			BLW			Total weed biomass
		Echinochloa colona	***Echinochloa crusgalli***	***Panicum repens***	***Cyperus iria***	***Cyperus difformis***	***Cyperus rotundus***	***Alternanthera sp.***	***Eclipta alba***	***Monochoria vaginalis***	
M1	S1	17.70	6.87	6.60	4.87	4.03	4.17	4.93	4.17	5.00	58.33
	S2	7.30	2.47	2.77	1.67	1.30	1.97	3.87	4.40	4.27	30.00
	S3	1.67	0.43	0.27	0.60	0.37	0.63	0.43	0.83	0.43	5.67
M2	S1	18.53	7.47	7.60	11.17	6.07	10.30	14.10	14.47	17.77	107.47
	S2	12.13	4.60	4.60	5.70	5.30	4.93	5.57	7.57	7.63	58.03
	S3	1.57	0.33	0.40	2.00	3.73	1.43	0.97	10.60	2.03	23.07
M3	S1	23.80	9.53	9.30	21.53	19.40	22.00	17.47	18.40	16.20	157.63
	S2	13.73	5.70	6.23	9.93	8.67	9.37	7.70	6.90	8.30	76.53
	S3	2.83	0.70	0.60	1.53	1.00	0.93	2.03	3.03	3.53	16.20
Mean of Factor-1											
M1		8.89	3.26	3.21	2.38	1.90	2.26	3.08	3.13	3.23	31.33
M2		10.74	4.13	4.20	6.29	5.03	5.56	6.88	10.88	9.14	62.86
M3		13.46	5.31	5.38	11.00	9.69	10.77	9.07	9.44	9.34	83.46
CD(0.05)		0.41	0.44	0.11	0.69	0.80	1.75	0.46	0.72	0.85	2.61
CV%		4.42	12.37	3.11	12.58	17.25	33.74	8.73	10.99	13.96	5.26
Mean of Factor-2											
S1		20.01	7.96	7.83	12.52	9.83	12.16	12.17	12.34	12.99	107.81
S2		11.06	4.26	4.53	5.77	5.09	5.42	5.71	6.29	6.73	54.86
S3		2.02	0.49	0.42	1.38	1.70	1.00	1.14	4.82	2.00	14.98
CD(0.05)		0.54	0.44	0.42	0.38	2.51	2.15	0.73	0.85	1.94	2.91
		4.78	10.15	9.68	5.61	44.09	33.81	11.26	10.63	26.09	4.78
Interaction											
M and T		0.94	0.76	0.73	0.65	4.35	3.72	1.27	1.48	3.36	5.04
T and M		0.80	0.67	0.60	0.70	3.57	3.19	1.07	1.27	2.78	4.37
Experimental Mean		11.03	4.23	4.26	6.56	5.54	6.19	6.34	7.82	7.24	59.21

M1- Mechanised transplanting/Transplanting (if transplanters not available)
M2-Puddled direct seeding (preferably line sowing by drum seeder)
M3-Un-puddled dry direct seeding (line sowing)

S1-Weedy check
S2-Mechanical weeding using weeder
S3-Chemical weed control (Herbicide recommendation of respective University may be followed)

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	Malan									
		Weed dry biomass g/m^2 at Panicle initiation stage									
		Grasses			sedges			BLW			Total weed biomass
		Echinochloa colona	***Echinochloa crusgalli***	***Panicum repens***	***Cyperus iria***	***Cyperus difformis***	***Cyperus rotundus***	***Alternanthera spp.***	***Eclipta alba***	***Monochoria vaginalis***	
M1	S1	15.47	6.63	6.67	4.27	3.87	3.33	4.47	4.43	4.67	53.80
	S2	12.97	5.27	4.33	2.30	3.03	2.60	4.73	3.70	4.27	43.20
	S3	1.97	1.33	0.63	1.27	1.00	0.90	0.83	1.23	1.17	10.33
M2	S1	21.90	11.33	9.47	9.57	7.90	7.20	8.07	8.27	9.50	93.20
	S2	9.17	4.93	4.83	3.63	0.53	3.27	7.37	4.67	4.43	42.83
	S3	0.97	0.63	2.80	0.70	1.03	0.80	1.93	0.53	1.50	10.90
M3	S1	18.47	12.07	9.87	15.57	12.43	12.93	15.83	14.83	20.77	132.77
	S2	10.20	8.60	8.33	7.57	7.47	8.90	7.23	5.97	10.67	74.93
	S3	2.17	1.67	0.67	1.23	0.83	0.50	1.00	0.93	2.30	11.30
Mean of Factor-1											
M1		10.13	4.41	3.88	2.61	2.63	2.28	3.34	3.12	3.37	35.78
M2		10.68	5.63	5.70	4.63	3.16	3.76	5.79	4.49	5.14	48.98
M3		10.28	7.44	6.29	8.12	6.91	7.44	8.02	7.24	11.24	73.00
CD(0.05)		NS	1.19	NS	1.60	0.13	2.27	1.39	0.86	0.87	5.01
CV%		13.71	24.39	30.28	37.28	3.69	60.48	29.13	20.75	15.71	11.38
Mean of Factor-2											
S1		18.61	10.01	8.67	9.80	8.07	7.82	9.46	9.18	11.64	93.26
S2		10.78	6.27	5.83	4.50	3.68	4.92	6.44	4.78	6.46	53.66
S3		1.70	1.21	1.37	1.07	0.96	0.73	1.26	0.90	1.66	10.84
CD(0.05)		0.88	1.57	1.58	1.51	0.71	1.79	1.28	1.68	0.93	2.84
		8.31	26.18	29.12	28.76	16.40	38.89	21.75	32.94	13.72	5.26
Interaction											
M and T		1.53	2.72	NS	2.62	1.24	3.11	2.21	2.90	1.61	4.92
T and M		1.45	2.31	NS	2.33	1.01	2.89	1.98	2.41	1.40	5.15
Experimental Mean		10.36	5.83	5.29	5.12	4.23	4.49	5.72	4.95	6.59	52.59

M1- Mechanised transplanting/Transplanting (if transplanters not available)
M2-Puddled direct seeding (preferably line sowing by drum seeder)
M3-Un-puddled dry direct seeding (line sowing)

S1-Weedy check
S2-Mechanical weeding using weeder
S3-Chemical weed control (Herbicide recommendation of respective University may be followed)

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	Moncompu													
		Weed dry biomass g/m² at Active tillering stage						Weed dry biomass g/m² at Panicle initiation stage							
		Grasses	Sedges			BLW	Total weed biomass	Grasses			Sedges			BLW	Total weed biomass
		Isachnae miliaceae	***Cyperus difformis***	Cyperus haspan	***Fimbrystylis miliaceae***	***Sphaenochlea zeylanica***		***Echinochloa spp***	***Isachnae miliaceae***	***Leptoclhoa chinensis***	***Cyperus difformis***	Cyperus haspan	***Fimbrystylis miliaceae***	***Ludwigia hyssopifolia***	
M1	S1	0.00	24.40	0.00	100.92	0.00	125.32	4.19	44.95	0.00	0.00	0.00	51.68	5.01	105.83
	S2	18.29	13.87	0.00	84.07	0.12	116.35	6.23	52.83	0.00	0.00	0.00	0.00	0.00	59.05
	S3	19.07	0.44	0.00	39.81	0.00	59.32	0.00	64.93	5.64	0.00	0.00	21.64	2.04	94.25
M2	S1	0.00	44.33	0.00	109.83	66.89	221.05	1.51	67.45	0.00	0.00	0.00	43.65	0.00	112.61
	S2	2.57	35.49	0.00	115.68	0.00	153.75	2.39	87.71	0.00	0.00	0.00	48.11	9.08	147.28
	S3	36.77	12.99	0.00	105.07	0.00	154.83	0.00	73.43	0.00	0.00	0.00	67.35	0.00	140.77
M3	S1	50.19	0.68	32.49	72.21	0.00	155.57	4.80	62.36	0.00	2.53	3.24	29.12	8.29	110.35
	S2	47.85	31.48	4.60	36.40	0.00	120.33	0.00	67.01	0.00	0.00	1.31	45.16	6.45	119.93
	S3	78.09	0.00	5.53	31.63	0.00	115.25	0.00	51.35	0.00	8.97	0.00	29.63	3.27	93.21
Mean of Factor-1															
M1		12.45	12.90	0.00	74.93	0.04	100.33	3.47	54.24	1.88	0.00	0.00	24.44	2.35	86.38
M2		13.12	30.94	0.00	110.19	22.30	176.54	1.30	76.20	0.00	0.00	0.00	53.04	3.03	133.56
M3		58.71	10.72	14.21	46.75	0.00	130.39	1.60	60.24	0.00	3.84	1.52	34.64	6.00	107.83
CD(0.05)		NS	NS	3.34	18.89	NS	NS	NS	NS	NS	NS	NS	7.38	NS	NS
CV%		137.04	122.23	84.28	29.20	285.41	51.33	146.17	40.45	519.62	331.55	519.62	23.57	93.99	25.01
Mean of Factor-2															
S1		16.73	23.14	10.83	94.32	22.30	167.32	3.50	58.25	0.00	0.84	1.08	41.48	4.44	109.60
S2		22.91	26.95	1.53	78.72	0.04	130.14	2.87	69.18	0.00	0.00	0.44	31.09	5.18	108.76
S3		44.64	4.48	1.84	58.84	0.00	109.80	0.00	63.24	1.88	2.99	0.00	39.54	1.77	109.41
CD(0.05)		NS	NS	6.32	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
		83.28	141.93	129.82	50.64	285.79	36.32	234.60	18.21	519.62	407.21	322.67	90.36	129.98	33.37
Interaction															
M and T		NS	NS	10.94	NS	37.86	NS	NS	NS	NS	NS	NS	NS	NS	NS
T and M		NS	NS	9.09	NS	32.43	NS	NS	NS	NS	NS	NS	NS	NS	NS
Experimental Mean		28.09	18.19	4.74	77.29	7.45	135.75	2.12	63.56	0.63	1.28	0.51	37.37	3.79	109.25

M1- Mechanised transplanting/Transplanting (if transplanters not available)
M2-Puddled direct seeding (preferably line sowing by drum seeder)
M3-Un-puddled dry direct seeding (line sowing)

S1-Weedy check
S2-Mechanical weeding using weeder
S3-Chemical weed control (Herbicide recommendation of respective University may be followed)

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	Nawagam												
		Weed dry biomass g/m² at Active tillering stage												
		Grasses					Sedges			BLW				Total weed biomass
		Cynodon dactylon	***Chloris barbata***	***Digtaria sanguinalis***	***Echinochloa colona***	***Echinochloa crusgalli***	***Cyperus esculentus***	***Cyperus iria***	***Cyperus rotundus***	***Eclipta alba***	***Ipomoea aquatic***	Physalis minima	***Trianthema monogyna***	
M1	S1	38.1	30.5	24.7	30.5	28.9	25.3	25.2	27.0	39.2	36.3	38.0	41.7	385.2
	S2	11.0	12.4	22.7	12.3	11.8	18.5	21.6	27.1	32.5	20.7	45.1	28.8	264.4
	S3	13.4	9.4	17.2	6.7	4.4	22.6	17.9	16.2	15.0	19.4	31.1	19.2	192.5
M2	S1	35.0	25.3	25.9	39.5	30.4	26.8	30.0	21.3	45.3	29.0	37.6	39.9	386.0
	S2	10.6	12.1	21.9	20.0	4.4	18.8	16.9	15.0	11.8	15.3	15.3	11.8	173.9
	S3	9.9	12.0	13.6	13.5	4.6	11.3	13.9	13.8	8.8	16.3	9.0	15.9	142.7
M3	S1	54.1	29.0	26.6	42.7	42.1	24.7	25.0	26.4	29.8	38.6	30.9	31.3	401.0
	S2	19.6	10.1	15.8	13.9	19.3	17.6	21.5	18.3	11.9	13.8	18.2	16.3	196.4
	S3	12.3	12.8	9.6	19.1	8.3	14.2	15.1	14.7	9.8	15.4	12.3	9.2	152.7
Mean of Factor-1														
M1		20.9	17.4	21.5	16.5	15.0	22.1	21.6	23.4	28.9	25.5	38.1	29.9	280.7
M2		18.5	16.5	20.5	24.4	13.1	19.0	20.3	16.7	22.0	20.2	20.7	22.5	234.2
M3		28.6	17.3	17.3	25.2	23.2	18.8	20.6	19.8	17.2	22.6	20.5	18.9	250.0
CD(0.05)		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	7.4	NS	NS
CV(%)		34.5	38.6	28.7	40.9	39.1	39.1	34.3	41.3	66.4	33.8	33.5	31.2	17.7
Mean of Factor-2														
S1		42.4	28.3	25.7	37.5	33.8	25.6	26.7	24.9	38.1	34.6	35.5	37.6	390.7
S2		13.7	11.5	20.1	15.4	11.8	18.3	20.0	20.1	18.7	16.6	26.2	19.0	211.6
S3		11.9	11.4	13.5	13.1	5.8	16.1	15.6	14.9	11.2	17.0	17.5	14.8	162.6
		7.3	7.9	4.9	9.0	7.0	5.5	5.6	7.0	8.2	11.7	14.1	12.8	25.1
CD(0.05)		31.2	45.2	24.2	40.0	39.9	26.6	26.2	34.1	35.1	49.9	52.0	52.2	9.6
Interaction														
M and T		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	43.4
T and M		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	42.6
Experimental Mean		22.7	17.1	19.8	22.0	17.1	20.0	20.8	20.0	22.7	22.8	26.4	23.8	255.0

M1- Mechanised transplanting/Transplanting (if transplanters not available)
M2-Puddled direct seeding (preferably line sowing by drum seeder)
M3-Un-puddled dry direct seeding (line sowing)

S1-Weedy check
S2-Mechanical weeding using weeder
S3-Chemical weed control (Herbicide recommendation of respective University may be followed)

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	Nawagam												
		Weed dry biomass g/m² at panicle initiation stage												
		Grasses					Sedges			BLW				Total weed biomass
		Cynodon dactylon	*Chloris barbata*	*Digtaria sanguinalis*	*Echinochloa colona*	*Echinochloa crusgalli*	*Cyperus esculentus*	*Cyperus iria*	*Cyperus rotundus*	*Eclipta alba*	*Ipomoea aquatic*	Physalis minima	*Trianthema monogyna*	
M1	S1	135.93	115.97	45.39	109.42	96.48	67.59	65.38	73.11	30.4	62.01	54.79	38.11	894.59
	S2	61.38	37.37	35.08	47.78	75.37	32.26	48.45	47.71	25.9	27.31	47.02	24.22	509.86
	S3	36.72	23.2	30.42	25.53	30.32	36.92	28.58	24.53	15.33	22.31	38.13	16.15	328.14
M2	S1	62.46	59.46	50.19	82.03	72.06	50.19	37.07	38.64	24.29	64.86	57.39	30.17	628.81
	S2	60.46	44.01	28.98	63.58	43.88	24.78	21.74	29.3	7.87	28.55	33.18	16.37	402.72
	S3	24.31	31.17	19.74	33.41	13.34	17.85	15.96	22.05	14.63	18.37	18.37	11.63	240.83
M3	S1	85.56	54.26	55.33	75.33	78.06	47.43	33.34	39.37	30.12	43.18	51.34	39.9	633.22
	S2	31.77	22.85	19.33	37.13	31.77	27.67	33.07	25.8	27.84	43.86	44.03	22.12	367.24
	S3	21.78	21.18	9.84	36.77	15.23	21.99	13.92	15.07	11.52	27.54	41.82	21.98	258.65
Mean of Factor-1														
M1		78.01	58.85	36.96	60.91	67.39	45.59	47.47	48.45	23.88	37.21	46.64	26.16	577.53
M2		49.08	44.88	32.97	59.67	43.09	30.94	24.92	30	15.59	37.26	36.31	19.39	424.12
M3		46.37	32.76	28.17	49.74	41.69	32.36	26.78	26.75	23.16	38.19	45.73	28	419.7
CD(0.05)		NS	NS	NS	NS	NS	NS	NS	8.99	NS	NS	NS	2.96	55.88
CV(%)		48.49	43.55	51.57	48.76	43.44	57.22	48.81	30.62	28.66	22.94	29.39	14.44	14.09
Mean of Factor-2														
S1		94.65	76.57	50.3	88.93	82.2	55.07	45.26	50.37	28.27	56.68	54.5	36.06	718.87
S2		51.2	34.74	27.8	49.5	50.34	28.24	34.42	34.27	20.54	33.24	41.41	20.91	426.6
S3		27.6	25.18	20	31.9	19.63	25.59	19.49	20.55	13.82	22.74	32.77	16.59	275.87
		17.67	22.83	14.55	27.65	23.18	10.4	18.15	16.41	NS	14.94	NS	10.96	63.43
CD(0.05)		29.75	48.84	43.33	47.41	44.48	27.9	53.45	45.56	54.72	38.73	43.75	43.53	13.03
Interaction														
M and T		30.6	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
T and M		28.83	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Experimental Mean		57.82	45.5	32.7	56.78	50.72	36.3	33.06	35.07	20.88	37.56	42.9	24.52	473.78

M1- Mechanised transplanting/Transplanting (if transplanters not available)
M2-Puddled direct seeding (preferably line sowing by drum seeder)
M3-Un-puddled dry direct seeding (line sowing)

S1-Weedy check
S2-Mechanical weeding using weeder
S3-Chemical weed control (Herbicide recommendation of respective University may be followed)

Table 4.3.3: Contd.

Main plot	Sub plot Treatments	Titabar									
		Weed dry biomass g/m² at Active tillering stage					Weed dry biomass g/m² at panicle initiation stage				
		Grasses		Sedges	BLW	Total weed biomass	Grasses		Sedges	BLW	Total weed biomass
		Echinochloa crugalli	***Leersia hexandra***	***cyperus iria***	***Alternanthera spp.***		***Echinochloa crugalli***	***Leersia hexandra***	***Cyperus iria***	***Alternanthera spp.***	
M1	S1	4.07	4.13	1.27	4.07	13.53	5.10	4.63	1.53	4.70	15.97
	S2	4.10	3.30	0.83	3.63	11.87	5.10	3.60	1.00	4.13	13.83
	S3	2.37	1.87	0.50	1.73	6.47	2.81	2.33	0.62	2.07	7.82
M2	S1	5.37	3.40	1.23	5.63	15.63	6.47	3.83	1.60	6.33	18.23
	S2	4.80	2.97	1.00	5.33	14.10	5.67	3.37	1.37	6.17	16.57
	S3	2.93	2.37	0.87	2.90	9.07	3.67	2.83	0.97	3.67	11.13
M3	S1	5.97	6.17	1.53	8.13	21.80	7.70	7.27	1.73	10.80	27.50
	S2	5.53	3.73	0.50	5.03	14.80	5.93	4.20	0.67	5.67	16.47
	S3	3.97	2.63	0.47	3.63	10.70	4.53	2.97	0.65	4.40	12.55
Mean of Factor-1											
M1		3.51	3.10	0.87	3.14	10.62	4.33	3.52	1.05	3.63	12.54
M2		4.37	2.91	1.03	4.62	12.93	5.27	3.34	1.31	5.39	15.31
M3		5.16	4.18	0.83	5.60	15.77	6.06	4.81	1.02	6.96	18.84
CD(0.05)		0.53	0.44	0.10	0.66	0.80	NS	0.53	0.10	0.50	1.47
CV(%)		14.60	15.39	12.67	17.61	7.31	19.53	16.33	10.89	11.12	11.26
Mean of Factor-2											
S1		5.13	4.57	1.34	5.94	16.99	6.42	5.24	1.62	7.28	20.57
S2		4.81	3.33	0.78	4.67	13.59	5.57	3.72	1.01	5.32	15.62
S3		3.09	2.29	0.61	2.76	8.74	3.67	2.71	0.74	3.38	10.50
		0.65	0.38	0.18	0.62	1.06	0.90	0.41	0.21	0.96	1.52
CD(0.05)		14.67	11.02	19.70	13.66	7.91	16.76	10.28	18.43	17.51	9.52
Interaction											
M and T		NS	0.67	0.32	1.08	1.84	NS	0.71	NS	1.66	2.63
T and M		NS	0.60	0.27	0.96	1.57	NS	0.67	NS	1.38	2.31
Experimental Mean		4.34	3.40	0.91	4.46	13.11	5.22	3.89	1.13	5.33	15.56

M1- Mechanised transplanting/Transplanting (if transplanters not available)
M2-Puddled direct seeding (preferably line sowing by drum seeder)
M3-Un-puddled dry direct seeding (line sowing)

S1-Weedy check
S2-Mechanical weeding using weeder
S3-Chemical weed control (Herbicide recommendation of respective University may be followed)

4.3.4. Weed survey in different Rice systems

In view of changing climate, changing resource abundance, paddy cultivation is shifting to different establishment methods especially direct seeded rice and resultant increase in weed problems. The research studies aid in understanding of weed biology, its interference with crop and resulting losses, as well as suitable control methods. Systematic evaluation of the weed population is therefore indispensable in crop areas as a guide for the control measures to be implemented. With the objective of obtaining information on changes in weed flora, data on the level of infestation, herbicide effectivity or resistance etc. through surveys of weeds in representative fields of different establishment systems like transplanted rice, Wet Direct Sown Rice, Dry Direct Sown Rice, the trial was initiated in kharif 2023. The Survey was conducted by ten locations viz**., ICAR-IIRR, Karaikal**, **Kaul, Ludhiana, Moncompu, Navsari, Pantnagar, Raipur, Titabar, Vytilla** in *kharif* 2023, in a systematic proforma. No weed information was received from 29 locations. The data received is summarized and the results are presented.

ICAR-IIRR has reported weed survey information from 25 rice farmers of Sarabhavaram, Mukkollu, Gajjanapudi, Yedidah Savaram, Yedidah Seethanagaram, Kothhuru, Vemulapalli, Pekatipadu, Dwarapudi, Kesavaram, Arthamuru, Medapadu villages in West Godavari District of Andhra Pradesh State. In Wet DSR system, the problematic weeds in order of dominance were *Leptochloa chinensis, Cyperus difformis, Echinochloa colona, Echinochloa crusgalli, Panicum flavidum, Marselia quadrifolia, Monochoria vaginalis*. All the farmers have applied pre-emergence herbicide like pyrazosulfuronethyl, pyrazosulfuronethyl+pretilachlor. Few farmers have applied bispyribacsodium or 2,4-D Amine or triafamone+ethoxysulfuron as early pre-emergence application. All the farmers have applied post emergence herbicides like, bispyribacsodium or 2,4-D Amine or triafamone+ethoxysulfuron, chlorpyroxifenbenzyl etc at recommended or higher than recommended doses. All the farmers are doing manual weeding once or twice costing around Rs 5000 to 9000/ha. Total cost of weed control ranged from Rs 5125 to 9000. Based on this survey, it was found that the farmers are applying herbicides 2 times or 3 times and additionally doing manual weeding amounting to higher cost of weed control which in turn is increasing cost of cultivation.

Karaikal has reported weed survey information from 25 rice farmers in Pandaravadai, Muppaithangudi, Thennangudi, Kottapadi, Sethur, Kumarakudi, Thirunallar, Kandhan gudi, Surakudy, Puthakudi villages. The soils are clay and sandy loam soils. The problematic weeds in order of dominance were *Echinochloa colona, Leptochloa chinensis, Cyperus iria, Cyperus difformis, Cyperus rotundus, Marselia quadrifolia, Bergia capensis, Fimbristylis miliacea*. The farmers have not applied pre emergence herbicides but 96% farmers applied post emergence herbicide Bispyribac sodium @125 to 300 ml/ha. 16% farmers applied 2nd post emergence herbicide @2,4-D 125 to 700 g/ha, Rice star (125-200 ml/ha) respectively. Total cost of weed control ranged from Rs 3890/ha with chemical weed control to Rs 10000/ha with manual weeding. Based on this survey, it was found that the farmers need to know and understand about the correct herbicide dosage which is must to follow technology to avoid additional expenditure overuse of resources and environmental pollution.

Kaul has reported weed survey information collected from rice farmers in the villages of Majra Roran, Janjhari, Garhi Multan, Bastada, Kachwa , Nighdu, Nilokheri, Patanpura, Karsadod, Andhgarh, Khaupur Roran, Samani, Kanpur Keliyan, Dola Majra, Ratanghar, Bhateri, Hamira, Ishak, Fatehpur, Jatehdi, Bhana, Dhand , Siwan, Sinh, Pabnawa, Karnal, Kurukshetra and Khaital Districts of Haryana State. The problematic rice weeds in order of dominance are are *Echinochloa crusgalli, Cyperus difformis, Echinochloa colona, Leptochloa chinensis, Cyperus iria, Dactyloctenium Aegyptium*. All the farmers have applied pre emergence herbicide Pretilachlor or Butachlor within 2 days of transplanting and 64 % farmers are not applying an post emergence herbicides; instead they are practicing the method of allowing standing water in the field for one month during tillering stage. Others are applying Bispyribacsodium as need based. Manual weeding is also adopted as need based only. The total cost of weed control is Rs 2500 to 4000/ha. Based on this survey it was found that farmers in the survey area are aware of integrated weed management, correct chemicals for weed control in rice.

Ludhiana has reported the weed survey in Ghuguma, Bathinda, Bachala, Uhina, Hareshi, Sehjomaju, Kapurwala, Bhilwarma, Sehjonegra, Saidwal, Saron, Sahalpur, Manaspur, Bhaad aluku, Mahadia, Katahi, Bahadapur sangratpur villages in Punjab State. The surveyed rice soils are clay loam type. The problematic weeds in the dominance are *Echinochloa crusgalli, Cyperus iria,Cyperus difformis, Leptochloa chinensis,Echinochloa colona, Elusine indica, Digitaria , Cyperus rotundus , Panicum spp, Eragrostis tenella, Sphenoclea zeylanica*. 96% of the farmers are applying pre emergence herbicides like Pendimethalin, Butachlor, Anilophos. Manual weeding is not opted by 82% farmers. Post-emergence herbicides like Bispyribac sodium, Fenoxaproppethyl were applied as per the recommendation. The cost of weed control varied from Rs 3000 to 15000/ha (higher cost is depending on the manual weeding adopted). From this survey it was found that major weed problem is due to grasses and sedges and farmers are applying right chemicals in right dose at right time in the surveyed rice areas.

Moncompu has reported the weed survey information of the rice bowl of Kerala from the villages of Vazhappally K.B., Kainakary, Kari**a**mpalli Padam, Illimury Thekkethollayiram, Nedumudy, Manathrakkal, Ezhukadu, Mannooparambil, Kainakary, Paikandam Padam. The soils are silty clay loam and the problematic weeds in order of dominance are *Fimbristylis miliacea, Cyperus difformis, Leptochloa chinesis, Oryza sativa spontanea, Echinochloa stagnina, Monochoria vaginalis, Isachne miliacea*. Farmers in the surveyed area are not adopting pre emergence herbicide application. 25% farmers are not doing manual weeding. 75% farmer are applying post-emergence herbicides like Penoxsulam+Cyhalopop butyl, Florpyrauxifen-benzyl, Carfentrazone ethyl etc is recommended dose at right time. Combination of Carfentrazone ethyl and insecticides Monocrotophos was also applied as post emergence by some farmers. The total cost of weed control is Rs 4750 to 10,200/ha for manual weeding. The organic farmers for manual weeding has spent Rs 16,200/ha. From this survey it was found that sedges, wild rice, aquatic weeds are major concern and farmers are applying latest chemicals, combinations.

Navsari has reported weed survey in Bhinar, Dhantej, Dharampur, Sarpore, Mandir, Zervavra, Velanpur, Parijan, Navagam, Jesiya, Chapaldhara, Talavchora, Kotha, Eru, Vandardevi, Kalakava, Vadapada, Dabhlai, Vanzana, Satem, Mora, Singod ,Khergam, Dhamdhua villages in Gujarat state. The rice soils are clayey in nature. The problematic weeds in the order of dominance are *Echinchloa colona, Echinochloa crusgalli, Cyperus iria, Cyperus difformis, Marselia quadrifolia, Eclipta alba, Dactylactenium aegyptium*. The surveyed farmers are not using chemical weed control method. Only manual weeding is being practiced and higher expenditure is incurred towards weed control. The total cost of weed control is ranging from Rs 11225 to 13375/ha. From this survey it was found that in this part of Gujarat, only manual weeding is adopted with higher expenditure.

Pantnagar has reported weed survey from Gangapur, Ganneshpur villages in U.S. Nagar Distict, Uttarakhand State. The rice soil type is Sandy loam. The problematic weeds in the order of dominance are *Echinochloa colona, Echinochloa crusgalli, Echinochloa indica, Cyperus iria, Cyperus difformis and Cyperus rotundus*. All the farmers are applying pre-emergence herbicides Pretilachlor and post emergence herbicides Bispyribacsodium or Penoxasulam+Cyhalofop butyl. Pre-emergence herbicide was applied at recommended dosage. Post-emergence combination dosage was lower than the recommended dose but based on the package size available. The cost of chemical weed control was ranging from Rs 2500 to Rs3600. Addtionally, all the farmers are doing one hand weeding costing around Rs 3600 to 6800/- per ha. The total cost of weed control was ranging from Rs 6900 to Rs 9300 indicating the higher intensity of weed problem and increase use of chemical and manual weeding methods.

Raipur has reported the weed survey in Kosamuda, Hathidob, Khapari, Bhokramuda, Aalesur, Ghokhali, Karetha, Mujgahan, Sankardah, Shyamtarai, Bagteri, Shvadabri, Sambalpur, Khairjhiti Khurd, Thuhadih, Bendarchi, Chimara, kutkipara villages of Chattisgarh. The rice soils are vertisols. The problematic weeds be the order of dominance are *Echinochloa colona, Cyperus difformis, Cyperus iria, Cyperus rotundus, Echinochloa crusgalli, Fimbristylis miliacea, Cynodon dactylon, Cyanotis axillaris, Ischaemum rugosum, Alternanthera triandra, Euphorbia hirta, Physalis minima, Digera arvensis* 84% farmers have not applied pre emergence herbicides and other farmers have applied pretilachlor for post emergence weed control at recommended dose. The herbicides like Bispyribacsodium alone or combination Chlorimuronethyl+metsulfuronmethyl. 96% farmers adopted Manual /Mechanical weeding one time or two times costing around Rs 2250 to 8500/ha. One farmer has done Biasi (Beushening) with plough at 40DAS costing Rs 3500/ha and one hand weeding costing around Rs 3250/ha without any chemical herbicide usage. From this survey it was found that in Chattisgarh state the hand weeding is still practice though it is expensive. Some farmers are applying chemical herbicides and also doing manual weeding and hence the total cost of weed control is higher than other rice growing States ranging from Rs 2500 to 9750/ha.

Titabar reported weed survey in Phalengichuk, Elengmora, Lalung, Kalandi, Nasalaria Goan, Borholla, Chowdang pathar, Dihingia, Tilabar, Deogharia, Merapani, Gomariguri villages. The rice soils are clay loam. Problematic weeds in the order of dominance were *Echinochloa crusgalli, Amaranthus, Cyperus, scirpus, Marselia , Eleocharis, Ceratophyllum*. Only 8% farmers have applied pre-emergence herbicide i.e. pretilachlor. 24% farmers applied post-emergence herbicide Bispyribacsodium. All the farmers have done manual weeding once or twice costing from Rs 800 to 3600/ha. The total weed control cost was around Rs 800 to 3900/ha. Based on the survey it was found that manual weeding is prevalent and common practice due to timely and cheaper availability of labour. Chemical herbicides usage is very low and can be encouraged at right time and right dose to farmers reduce cost of weed control.

Vytilla has reported weed survey conducted in Pokkali a naturally organic saline ecosystem where no herbicides are applied. Weeds of Pokkali ecosystem have adoptive mechanism in the order of dominance are *Diplachnae fusca, Eleocharis dulcis, Echinochloa crusgalli, Schoenoplectus lateriflorus, and Schoenoclea zeylanica, Cyperus exaltatus. Also aquatic weeds like Najas graminea, Hydrilla verticillata, Ceratopteris thalictroides, Eichhornia crassipes.* The centre also reported weed survey in low lying laterite soils with acidity of pH 3-5.5. The problematic weeds in the order of dominance are *Echinochloa crusgalli*, *wild rice*, *Cyperus iria, Monochoria vaginalis* and *Fimbristylis mieliacea*. The farmers are applying pre emergence herbicide Pyrazosulfuron ethyl or Bensulfuron-methyl+Pretilachlor. Post emergence herbicide Bispyribac sodium and 2,4-D farmers do natural weeding only when post emergence herbicide is not applied. The average total cost of weed control is Rs 7250/ha. From this survey it was found that in the survey area, due to the crisis of manual labour & also expensive native farmers are adopting chemical weed control.

The results of the survey of 25 farmers from each location revealed that, in Assam, Gujarat, Kerala (Pokkali system), farmers are practicing manual weeding to control weeds. In Andhra Pradesh, Punjab, Haryana, Kerala, UT of Puduchhery, Utter Pradesh herbicide application two times (pre and post-emergence) is in practice. In Chattisgarh, farmers are applying single time post-emergence herbicides. On an average, these rice farmers are spending Rs 800 to 16,200/ha for total weed control.

Table 4.3.4: Weed survey in different zones

Centre	Villages	District	State	Dominant weeds
ICAR-IIRR	Sarabhavaram, Mukkollu, Gajjanapudi, Yedidah Savaram, Yedidah Seethanagaram, Kothhuru, Vemulapalli, Pekatipadu, Dwarapudi, Kesavaram, Arthamuru, Medapadu	West Godavari	Andhra Praesh	*Leptochloa chinensis, Cyperus difformis, Echinochloa colona, Echinochloa crusgalli, Panicum flavidum, Marselia quadrifolia, Monochoria vaginalis*
KARAIKAL	Pandaravadai, Muppaithangudi, Thennangudi, Kottapadi, Sethur, Kumarakudi, Thirunallar, Kandhan gudi, Surakudy, Puthakudi	Karaikal	UT of Puducherry	*Echinochloa colona, Leptochloa chinensis, Cyperus iria, Cyperus difformis, Cyperus rotundus, Marselia quadrifolia ,Bergia capensis, Fimbristylis miliacea*
KAUL	Majra Roran, Janjhari, Garhi Multan, Bastada, Kachwa , Nighdu, Nilokheri, Patanpura, Karsadod, Andhgarh, Khaupur Roran, Samani, Kanpur Keliyan, Dola Majra, Ratanghar, Bhateri, Hamira, Ishak, Fatehpur, Jatehdi, Bhana, Dhand , Siwan, Sinh, Pabnawa	Karnal, Kurukshetra, Khaital	Haryana	*Echinochloa crusgalli, Cyperus difformis, Echinochloa colona, Leptochloa chinensis, Cyperus iria, Dactyloctenium Aegyptium*
LUDHIANA	Ghuguma, Bathinda, Bachala, Uhina, Hareshi, Sehjomaju, Kapurwala, Bhilwarma, Sehjonegra, Saidwal, Saron, Sahalpur, Manaspur, Bhaad aluku, Mahadia, Katahi, Bahadapur sangratpur	Ludhiana,Bathinda, Amritsar, Sangrur, Kapurthala, Moga, Fatehgarh Sahib, Firozpur	Punjab	*Echinochloa crusgalli, Cyperus iria, Cyperus difformis,Leptochloa chinensis,Echinochloa colona, Elusine indica, Digitaria , Cyperus rotundus, Panicum spp, Eragrostis tenella, Sphenoclea zeylanica*
MONCOMPU	Vazhappally K.B., Kainakary, Kariampalli Padam, Illimury Thekkethollayiram, Nedumudy, Manathrakkal, Ezhukadu, Mannooparambil , Kainakary, Paikandam Padam	Kottayam, Alappuzha	Kerala	*Fimbristylis miliacea, Cyperus difformis, Leptochloa chinesis, Oryza sativa spontanea, Echinochloa stagnina, Monochoria vaginalis, Isachne miliacea*
NAVSARI	Bhinar, Dhantej, Dharampur, Sarpore, Mandir, Zervavra, Velanpur, Parijan, Navagam, Jesiya, Chapaldhara, Talavchora, Kotha, Eru, Vandardevi, Kalakava, Vadapada, Dabhlai, Vanzana, Satem, Mora, Singod ,Khergam, Dhamdhua	Navsari, Valsad, Surat, Tapi	Gujarat	*Echinchloa colona, Echinochloa crusgalli, Cyperus iria, Cyperus difformis, Marselia quadrifolia, Eclipta alba, Dactylactenium aegyptium*
PANTNAGAR	Gangapur, Ganneshpur	U.S. Nagar	Uttarakhand	*Echinochloa colona, Echinochloa crusgalli, Echinochloa indica, Cyperus iria,Cyperus difformis and Cyperus rotundus*
RAIPUR	Kosamuda, Hathidob , Khapari , Bhokramuda, Aalesur, Ghokhali, Karetha , Mujgahan, Sankardah, Shyamtarai, Bagteri, Shvadabri , Sambalpur, Khairjhiti Khurd , Thuhadih, Bendarchi, Chimara, kutkipara	Kabirdham, Bemetara, Mahasamund, Bhatapar, Dhamtari	Chattisgarh	*Echinochloa colona, Cyperus difformis, Cyperus iria, Cyperus rotundus,Echinochloa crusgalli, Fimbristylis miliacea, Cynodon dactylon, Cyanotis axillaris, Ischaemum rugosum, Alternanthera triandra, Euphorbia hirta, Physalis minima, Digera arvensis*
TITABAR	Phalengichuk, Elengmora, Lalung, Kalandi, Nasalaria Goan, Borholla, Chowdang pathar, Dihingia, Tilabar, Deogharia, Merapani, Gomariguri	Jorhat	Assam	*Echinochloa crusgalli, Amaranthus, Cyperus, scirpus, Marselia , Eleocharis, Ceratophyllum*
VYTILLA	Pokkali		Kerala	*Diplachnae fusca, Eleocharis dulcis, Echinochloa crusgalli, Schoenoplectus lateriflorus, and Schoenoclea zeylanica, Cyperus exaltatus. Aquatic weeds like Najas graminea, Hydrilla verticillata, Ceratopteris thalictroides, Eichhornia crassipes*

INTER DISCIPLINARY TRIALS

4.4 INTER DISCIPLINARY TRIALS

4.4.1(K) Yield maximization of rice in different zones (new trial initiated in *kharif* 2020)

Rice (*Oryza sativa* L.) is grown in India over a gross area of 44 million hectares (ha). The total production in 2019 was about 107 million ones. However, India would need to produce at least 200 million ones of paddy to meet its ever-growing population requirements, and this figure would have to increase by almost 75% by 2050. Rice occupies a pivotal position concerning food security in India. The future of food security in this region will depend on its ability to improve rice productivity continuously on an ecologically sustainable basis. One of the main reasons for low rice productivity in India is the variation in fertilizer usage between the country's different agro-climatic zones and between states in each region. Low input use in general is a further factor accounting for the plateau or declining trend of grain yields. To evaluate the suitable, promising and best management practices in rice crop, a new trial was formulated with the following objectives 1. To maximize the yield in different zones 2. To compare yield and economics of the best management practices. The trial consisted of 8 treatments and laid out in RBD design with 3 replications. Treatments are T_1: RDF as per site-specific nutrient management; T_2: T_1 + FYM @ 5 t/ha; T_3: T_1 + sampoorna (KAU) @ 10g/L (250 L/ha/application); T_4: 125% RDF of T_1; T_5: 125% RDF of T_1 + FYM @ 5 t/ha; T_6: T_1 + application of micronutrient; T_7: T_1 + Geoxol @ 40 kg/ha and T_8: Optional (location specific). The trial was conducted at 21 locations (**Bankura, Gangavathi, Khudwani, Malan, Mandya, Pantnagar, Pattambi, Raipur, Ranchi, Titabar, Kota, Chinsurah, Chiplima, Faizabad, Kanpur, Kaul, Karaikal, Maruteru, Moncompu, Puducherry and Pusa).** The results were summarized and presented in **Table 4.4.1(a)** and the salient findings are as followed.

In sandy loam soils of **Bankura**, RDF + sampoorna (KAU) @ 10g/L (250 L/ha) resulted in the highest grain yield (5.74 t/ha) followed by 125% RDF of T_1 (5.49 t/ha). In **Gangavathi**, 125% RDF of T_1 + FYM @ 5 t/ha resulted in the highest grain yield (5.7 t/ha) followed by T_1 + application of micronutrient (5.30 t/ha). Similarly, gross return was also the highest (Rs. 1,50,885/-) under same treatment. At **Khudwani**, location specific best treatment resulted the highest grain yield (7.87 t/ha) followed by T_1+ application of micronutrient (7.63 t/ha). Similarly, N and K uptake was the highest under same treatment. Soil available N and K was also the highest under same treatment. In clay loam soil of **Malan**, 125% RDF of T_1 + FYM @ 5 t/ha resulted in the highest grain yield (6.73 t/ha) followed by T_1+ application of micronutrient (6.48 t/ha). In red sandy loam soils of **Mandya**, 125% RDF of T_1 + FYM @ 5 t/ha resulted in the highest grain yield (7.19 t/ha) followed by and at par with 125% RDF of T_1 (6.99 t/ha). The highest gross return (Rs. 1,86,305/-) was under same treatment though cost of cultivation was high (Rs. 75,968/-). In silt loam soils of **Pantnagar**, 125% RDF of T_1 + FYM @ 5 t/ha resulted in the highest grain yield (6.03 t/ha) followed by and at par with T_1 + FYM @ 5 t/ha (5.94 t/ha). Higher gross returns also followed the similar trend. At **Pattambi**, RDF + sampoorna (KAU) @ 10g/L (250 L/ha) resulted in the highest grain yield (5.47 t/ha) followed by 125% RDF of T_1 + FYM @ 5 t/ha (4.80 t/ha). The highest gross returns also recorded in RDF + sampoorna (KAU) @ 10g/L (250 L/ha) (Rs.1,80,997/-). In vertisols of **Raipur**, 125% RDF of T_1 + FYM @ 5 t/ha resulted in the highest grain yield (5.07 t/ha) followed by and at par with 125% RDF of T_1 (4.72 t/ha). In **Ranchi**, 125% RDF of T_1 resulted the highest grain yield (6.78 t/ha) followed by RDF + sampoorna (KAU) @ 10g/L (250 L/ha) (6.21 t/ha). In **Titabar**, T_1 + Geoxol @ 40 kg/ha resulted in the highest grain yield (5.28 t/ha) followed by

125% RDF of T_1 + FYM @ 5 t/ha (5.10 t/ha). In clay soils of **Kota**, 125% RDF of T_1 + FYM @ 5 t/ha resulted the highest grain yield (6.42 t/ha) followed by 125% RDF of T_1 (6.23 t/ha).

Across the 11 locations 125% RDF of T_1 + FYM @ 5 t/ha resulted the highest grain mean yield (5.94 t/ha).

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In **Chinsura**, RDF + FYM @ 5 t/ha resulted in the highest grain yield (5.93 t/ha) closely followed and at par with 125% RDF of T_1 + FYM @ 5 t/ha (5.88 t/ha). In **Chiplima** also RDF + FYM @ 5 t/ha resulted in the highest grain yield (6.13 t/ha) closely followed and at par with 125% RDF of T_1 + FYM @ 5 t/ha (6.01 t/ha). In **Faizabad**, 125% RDF of T_1 + FYM @ 5 t/ha resulted the highest grain yield (5.34 t/ha) followed by RDF + sampoorna (KAU) @ 10g/L (250 L/ha) (4.86 t/ha). In **Kanpur**, effect of treatments on grain yield was found to be non-significant. However, 125% RDF of T_1 + FYM @ 5 t/ha resulted the highest grain yield (5.79 t/ha) followed by 125% RDF of T_1 (5.48 t/ha). In **Kaul**, 125% RDF of T_1 + FYM @ 5 t/ha resulted the highest grain yield (7.80 t/ha) followed by 125% RDF of T_1 (7.64 t/ha). In **Karaikal**, RDF + FYM @ 5 t/ha resulted the highest grain yield (5.16 t/ha) followed by 125% RDF of T_1 + FYM @ 5 t/ha (5.09 t/ha). In **Maruteru**, RDF + sampoorna (KAU) @ 10g/L (250 L/ha) resulted in the highest grain yield (9.74 t/ha) followed by 125% RDF (8.94 t/ha). In **Moncompu**, 125% RDF of T_1 + FYM @ 5 t/ha resulted the highest grain yield (5.93 t/ha) followed by 125% RDF of T_1 (5.29 t/ha). In **Puducherry**, 125% RDF of T_1 + FYM @ 5 t/ha resulted the highest grain yield (6.31 t/ha) followed by RDF + FYM @ 5 t/ha (6.19 t/ha). In **Pusa,** 125% RDF of T_1 + FYM @ 5 t/ha resulted the highest grain yield (5.16 t/ha) followed by 125% RDF (4.75 t/ha).

Across the 10 locations, 125% RDF of T_1 + FYM @ 5 t/ha resulted the highest grain mean yield (6.28 t/ha).

Across 21 locations, 125% RDF of T_1 + FYM @ 5 t/ha resulted the highest grain mean yield (6.09 t/ha).

4.4.1(R) Yield maximization of rice in different zones (new trial initiated in *kharif* 2020)

At **Pattambi**, RDF + sampoorna (KAU) @ 10g/L (250 L/ha) resulted in the highest grain yield (5.02 t/ha) followed by 125% RDF of T_1 (4.81 t/ha). The highest gross returns also recorded in RDF + sampoorna (KAU) @ 10g/L (250 L/ha) (Rs.1,57,473/-).

In clay loam soil of **Chinsurah**, Muktashree variety at 125% of recommended dose (N-P_2O_5-K_2O 130-70-70 kg/ha) resulted significantly the highest grain yield (6.83 t/ha). In sandy loam soils of **Faizabad**, 125% of RDF of T_1 + FYM @ 5 t/ha resulted in the highest grain yield (5.36 t/ha). In sandy loam soils of **Kanpur**, 125% of RDF of T_1 + FYM @ 5 t/ha resulted in the highest grain yield (6.68 t/ha). Similarly, total uptake of N (145.33 kg/ha), P (46.67 kg/ha) and K (149.33 kg/ha) were the highest under the same treatment. In clay loam soils of **Kaul**, 125% of RDF of T_1 + FYM @ 5 t/ha resulted in the highest grain yield (6.50 t/ha). Total uptake of N (133.33 kg/ha), P (39.00 kg/ha) and K (134.33 kg/ha) were the highest under the same treatment. In silty clay loam soils of **Khudwani**, all treatments performed well in terms of grain yield (ranged from 7.20 to 7.93 t/ha). There was no significance difference among the treatments. The highest grain yield was recorded under location specific practice (7.93 t/ha). In red sandy loam soils of **Mandya**, 125% of RDF of T_1 + FYM @ 5 t/ha resulted in the highest grain yield (6.00 t/ha). Total uptake of N (119.0 kg/ha), P (11.0 kg/ha) and K (121.0 kg/ha) were the highest under the same treatment. The highest soil available N, P and K was also recorded under the same treatment. In red sandy loam soils of **Moncompu**, Uma variety applied with 125% of RDF of T_1 + FYM @ 5 t/ha resulted in the highest grain yield (5.32 t/ha). Total uptake of N (120.6 kg/ha), P (56.83 kg/ha) and K (136.53 kg/ha) were the highest under the same treatment. In silt loam soils of **Pantnagar**, RDF + FYM @ 5 t/ha resulted in the highest grain yield (5.91 t/ha). Total uptake of N (106.0 kg/ha) and K (101.67 kg/ha) were the highest under the same treatment. In sandy loam soils of **Pusa**, Rajendra Bhagwati variety applied with 125% of RDF of T_1 + FYM @ 5 t/ha resulted in the highest grain yield (5.03 t/ha). Total uptake of N (90.73 kg/ha), P (22.17 kg/ha) and K (118.9 kg/ha) were the highest under the same treatment. In sandy loam soils of **Titabar**, Numoli variety applied with RDF + application of micronutrient resulted in the highest grain yield (6.20 t/ha). In clay loam soils of **Maruteru**, MTU-1064 variety applied with RDF + Sampoorna (KAU) @ 10 g/L resulted in the highest grain yield (7.43 t/ha). In clay loam soils of **Puducherry**, location specific treatment (RDF + FYM @ 5 t/ha + Mn @ 5 kg/ha) resulted in the highest grain yield (6.40 t/ha).

Table 4.4.1: Yield maximization of rice in different Zones in kharif 2023.

Treatment	BANKURA								GANGAVATHI						
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Tillers/m^2 (No.)	Panicle/m^2 (No.)	Test wt (g)	Filled grains/ panicle	Un-Filled grains/ panicle	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Tillers/m^2 (No.)	Panicle/m^2 (No.)	Test wt (g)	Gross returns /ha
T1	4.55	7	5.64	221	183	23.01	188	26	4.75	4	5.63	363	308	14.58	125792
T2	5.10	5	6.21	262	223	23.21	212	24	4.88	3	5.63	412	367	15.28	129271
T3	5.74	1	7.19	291	251	24.74	252	17	4.63	5	5.63	393	335	14.93	122811
T4	5.49	2	6.89	284	247	23.55	241	19	4.56	7	5.31	371	312	14.95	120576
T5	5.28	3	6.68	278	241	23.30	221	22	5.70	1	5.63	371	319	15.05	150885
T6	4.95	6	5.87	259	214	23.22	203	26	5.30	2	6.56	381	318	15.45	140367
T7	-		-	-	-	-	-	-	4.59	6	5.94	347	288	15.58	121569
T8	5.21	4	6.62	276	238	23.29	216	23	4.19	8	6.25	383	342	15.35	110886
T9	-		-	-	-	-	-	-	3.58	9	3.44	351	303	13.98	94820
Exp. mean	5.19		6.44	267	228	23.47	219	22	4.69		5.56	375	321	15.02	124108
CD(0.05)	0.12		0.08	10.31	9.29	1.43	35.82	4.33	0.71		1.1	36.37	19.03	1.28	18844.71
CV	1.28		0.73	2.17	2.29	3.44	9.2	10.89	10.4		13.6	6.65	4.06	5.85	10.4
Soil type	Red & Lateritic (Sandy Loam)								-						
pH	-								-						
EC	-								-						
Variety	-								-						
Applied NPK	70:35:35								150:75:75						
Available NPK	-								-						

T_1: Location specific recommended dose of fertilizer (RDF)
T_2: T_1 + FYM@ 5t/ha
T_3: T_1 + Sampoorna (KAU) @10 g per litre of water twice in the cropping season (250 litre/hectare/application)
T_4: 125% RDF of T_1
T_5: 125% RDF of T_1 + FYM@5 t/ha
T_6: T_1+ Application of micro nutrient (deficient to that location)
T_7 : T1+ Geoxol.com @ 40 kg/ha during basal fertilizer application
T_8: Optional (According to location)
T_9: No NPK control

Table 4.4.1: Contd.

Treatment	KHUDWANI															
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Tillers/m^2 (No.)	Panicle/m^2 (No.)	Test wt (g)	Filled grains/panicle	Un-Filled grains/ panicle	Total uptake (kg/ha) in plant			Soil available kg/ha			Cost of cultivation/ha	Gross returns /ha
									N	P	K	N	P	K		
T1	6.90	7	7.97	352	294	27.40	106	11	110.66	20.65	97.00	354.67	17.30	213.67	61675	181804
T2	7.43	4	8.30	369	310	27.47	111	15	117.79	23.39	106.07	380.33	18.03	223.67	77675	192403
T3	7.50	3	8.53	378	302	27.75	116	13	120.10	24.09	105.67	338.33	18.17	229.00	62825	196072
T4	7.13	6	7.97	362	304	26.90	105	18	119.17	21.67	102.60	356.00	18.90	215.67	63047	184658
T5	7.43	4	8.33	389	309	27.33	113	13	124.49	23.51	105.85	399.33	18.10	236.33	79047	192811
T6	7.63	2	8.60	386	310	28.00	121	15	121.80	23.42	109.49	346.33	18.10	210.67	62975	198517
T7	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-
T8	7.87	1	9.17	405	313	27.93	124	13	130.66	23.99	111.74	427.33	18.27	243.67	78975	208301
T9	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exp. mean	7.41		8.41	377	306	27.54	114	14	120.67	22.96	105.49	371.76	18.12	224.67	60777	169321
CD(0.05)	0.72		0.81	34.14	28.67	1.88	13.74	5.8	14.45	5.83	12.24	32.65	2.52	23.44		
CV	5.45		5.4	5.09	5.27	3.84	6.79	23.11	6.73	14.28	6.52	4.94	7.83	5.86		
Soil type	-															
pH	-															
EC	-															
Variety	-															
Applied NPK	120:60:30															
Available NPK	342:17.3;221															

T_1: Location specific recommended dose of fertilizer (RDF)
T_2: T_1 + FYM@ 5t/ha
T_3: T_1 + Sampoorna (KAU) @10 g per litre of water twice in the cropping season (250 litre/hectare/application)
T_4: 125% RDF of T_1
T_5: 125% RDF of T_1 + FYM@5 t/ha
T_6: T_1+ Application of micro nutrient (deficient to that location)
T_7 : T1+ Geoxol.com @ 40 kg/ha during basal fertilizer application
T_8: Optional (According to location)
T_9: No NPK control

Table 4.4.1: Contd.

Treatment	KOTA									
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Tillers/m^2 (No.)	Panicle/m^2 (No.)	Test wt (g)	Filled grains/ panicle	Un-Filled grains/ panicle	Cost of cultivation/ha	Gross returns /ha
T1	5.52	8	6.78	286	270	25.93	147	14	59646	182050
T2	6.09	3	7.42	307	292	26.71	162	12	62346	200915
T3	5.98	6	7.10	291	282	26.08	152	14	61346	197175
T4	6.23	2	7.62	314	293	26.78	159	15	60792	205700
T5	6.42	1	7.93	318	298	26.74	168	17	63792	212025
T6	6.03	4	7.23	297	283	26.50	160	14	59346	198825
T7	5.86		7.22	292	280	26.44	156	14	61568	193325
T8	6.03	4	7.15	289	282	26.81	168	12	62196	199210
T9	-		-	-	-	-	-	-	-	-
Exp. mean	6.02		7.31	299	285	26.50	159	14	61379	198653
CD(0.05)	0.38		0.58	18.95	15.78	0.56	12.85	3.05		
CV	3.6		4.51	3.61	3.16	1.21	4.62	12.39		
Soil type	Clay									
pH	-									
EC	-									
Variety	-									
Applied NPK	120:60:40									
Available NPK	218.42:29.58:397.6									

T_1: Location specific recommended dose of fertilizer (RDF)
T_2: T_1 + FYM@ 5t/ha
T_3: T_1 + Sampoorna (KAU) @10 g per litre of water twice in the cropping season (250 litre/hectare/application)
T_4: 125% RDF of T_1
T_5: 125% RDF of T_1 + FYM@5 t/ha
T_6: T_1+ Application of micro nutrient (Soil application of ZnSO4@25 kg/ha)
T_7 : T1+ Sulphur @ 40 kg/ha as basal
T_8: Optional (According to location) - T1 + two foliar sprays of NPK 19:19:19 at maximum tillering and PI stage
T_9: -

Table 4.4.1: Contd.

Treatment	MALAN								MANDYA								
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Tillers/m^2 (No.)	Panicle /m^2 (No.)	Test wt (g)	Filled grains/ panicle	Un-Filled grains/ panicle	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Tillers/m^2 (No.)	Panicle/m^2 (No.)	Test wt (g)	Un-Filled grains/ panicle	Cost of cultivation /ha	Gross returns /ha
T1	5.20	6	5.49	241	237	26.63	136	13	5.86	8	8.20	370	298	12.50	45	59350	152567
T2	5.39	5	6.39	249	251	27.23	143	14	6.74	4	8.92	385	316	12.82	51	72782	173968
T3	5.65	4	6.52	274	272	27.10	150	15	6.83	3	8.68	362	322	13.44	51	63355	175166
T4	5.78	3	6.43	279	270	26.07	152	19	6.99	2	9.39	408	330	12.83	42	63066	180756
T5	6.73	1	6.10	278	283	28.40	149	14	7.19	1	9.77	409	330	12.97	41	75968	186305
T6	6.48	2	7.12	283	278	28.63	146	14	6.61	6	8.67	393	314	12.90	35	63235	170370
T7	3.67	7	4.09	209	212	25.77	118	16	6.30	7	8.81	386	305	12.79	49	69796	164013
T8	-		-	-	-	-	-	-	6.70	5	8.94	408	320	12.88	54	60243	173147
T9	-		-	-	-	-	-	-	-		-	-	-	-	-	-	-
Exp. mean	5.56		6.02	259	257	27.12	142	15	6.65		8.92	390	317	12.89	46	65974	172036
CD(0.05)	0.22		0.58	4.61	6.22	0.54	4.62	0.84	0.86		0.75	38.08	38.17	0.7	23.85		
CV	2.21		5.45	1	1.36	1.11	1.83	3.16	7.36		4.78	5.57	6.88	3.11	29.7		
Soil type	Clay loam								Red sandy loam								
pH	-								7.93								
EC	-								0.35								
Variety	HPR 2143(120 days)								IET 26241 (93-R)(120 to 125 days)								
Applied NPK kg/ha	120:60:40								100:50:50:20								
Available NPK kg/ha	295:43.5;225								268.4:74.6:246.8								

T_1: Location specific recommended dose of fertilizer (RDF)

T_2: T_1 + FYM@ 5t/ha

T_3: T_1 + Sampoorna (KAU) @10 g per litre of water twice in the cropping season (250 litre/hectare/application)

T_4: 125% RDF of T_1

T_5: 125% RDF of T_1 + FYM@5 t/ha

T_6: T_1+ Application of micro nutrient (deficient to that location)

T_7 : T1+ Geoxol.com @ 40 kg/ha during basal fertilizer application

T_8: Optional (According to location)

T_9: No NPK control

T_1: Location specific recommended dose of fertilizer (RDF)

T_2: T_1 + FYM@ 5t/ha

T_3: T_1 + Sampoorna (KAU) @10 g per litre of water twice in the cropping season (250 litre/hectare/application)

T_4: 125% RDF of T_1

T_5: 125% RDF of T_1 + FYM@5 t/ha

T_6: T_1+ Application of micro nutrient (deficient to that location)

T_7 : T1+ Geoxol.com @ 40 kg/ha during basal fertilizer application

T_8: Optional (According to location) - Farmers application dose:150 : 30:75 Kg/ha N: P2O5:K2O

T_9: No NPK control

Table 4.4.1: Contd.

Treatment	PANTNAGAR													
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Tillers/m^2 (No.)	Panicle/m^2 (No.)	Filled grains/ panicle	Total uptake (kg/ha) in plant			Soil available kg/ha			Cost of cultivation /ha	Gross returns /ha
							N	P	K	N	P	K		
T1	5.51	8	6.24	240.24	227.24	95.33	105.63	29.7	94.47	213.6	22.63	190.73	39367	157165.6
T2	5.94	2	6.26	260.52	242.32	80	109.93	34.87	105.6	232.43	26.97	212.47	44367	169159.4
T3	5.86	3	5.95	250.12	233.48	90	105.43	34.57	102.5	228.73	25.4	208.37	41223	167081.3
T4	5.74	4	6.13	240.76	231.92	79.67	102.5	36.4	101.43	228.83	25.83	198.23	43131	163578.1
T5	6.03	1	5.96	259.48	244.4	81.67	105.07	34.8	97.7	225.77	23.77	196.93	40647	171950
T6	5.74	4	6.33	241.28	229.32	87.33	104.9	31.2	98.7	221.3	25.6	194.63	40717	163637.5
T7	5.7	6	5.48	235.56	229.32	79	96.83	31.03	88.1	219.57	23.23	193.43	43567	162450
T8	5.68	7	6.32	234	227.76	79	100.67	30.7	96.2	219.63	24.47	193.03	43838	161678.1
T9	-		-	-	-	-	-	-	-	-	-	-	-	-
Exp. mean	5.775		6.08375	245.24	233.22	84	103.87	32.90875	98.0875	223.7325	24.7375	198.4775	42107	164587.5
CD(0.05)	0.16		0.72	9.06	7.57	3.13	6.26	2.59	8	2.62	2.05	3.77	0	4535.42
CV	1.58		6.78	2.11	1.85	2.13	3.44	4.49	4.66	0.67	4.73	1.09	0	1.57
Soil type	Silt loam													
pH	7.60													
EC	-													
Variety	-													
Applied NPK	-													
Available NPK	212.0;20.9:190.3													

T_1: Location specific recommended dose of fertilizer (RDF)
T_2: T_1 + FYM@ 5t/ha
T_3: T_1 + Sampoorna (KAU) @10 g per litre of water twice in the cropping season (250 litre/hectare/application)
T_4: 125% RDF of T_1
T_5: 125% RDF of T_1 + FYM@5 t/ha
T_6: T_1+ Application of micro nutrient (deficient to that location)
T_7 : T1+ Geoxol.com @ 40 kg/ha during basal fertilizer application
T_8: Optional (According to location)
T_9: No NPK control

Table 4.4.1: Contd.

Treatment	PATTAMBI										RAIPUR									
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Tillers /m^2 (No.)	Panicle /m^2 (No.)	Test wt (g)	Filled grains/ panicle	Un-Filled grains/ panicle	Cost of cultivation /ha	Gross returns /ha	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Tillers/ m^2 (No.)	Panicle /m^2 (No.)	Test wt (g)	Filled grains/ panicle	Un-filled grains /panicle	Cost of cultivation /ha	Gross returns /ha
T1	3.23	7	8.60	343	337	28.67	46	14	67310	115300	4.16	8	5.38	241	211	20.23	112	27	39325	102481
T2	3.50	6	8.10	365	363	26.00	68	18	96980	120800	4.37	6	6.01	263	236	20.67	126	29	41825	108218
T3	5.47	1	9.27	394	389	33.67	81	12	69300	180997	4.44	4	6.12	277	248	21.13	130	26	40475	110050
T4	4.20	4	7.83	369	274	28.67	57	11	70125	141610	4.72	2	6.41	312	287	21.30	145	20	41581	116793
T5	4.80	2	10.07	378	374	28.67	65	19	99855	163567	5.07	1	6.98	332	301	21.67	149	20	44081	125656
T6	4.23	3	8.93	365	358	30.00	54	14	69260	144300	4.35	7	5.63	258	229	20.37	120	29	40575	107188
T7	3.77	5	8.83	295	288	30.67	60	15	45100	131400	4.43	5	6.06	267	238	21.03	127	23	42725	109807
T8	-		-	-	-	-	-	-	-	-	4.51	3	6.23	281	248	21.27	147	24	40245	111881
T9	-		-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-
Exp. mean	4.17		8.80	358	340	29.48	62	15	73990	142568	4.51		6.10	279	250	20.96	132	25	41354	111509
CD(0.05)	0.4		0.69	23.83	117.08	5.03	11.61	5.12	8.41	10872.2	0.5		0.86	50.22	51.6	1.6	23.45	6.1	20.8	10380
CV	5.4		4.42	3.74	19.34	9.59	10.56	19.68	0.01	4.29	6.28		8.01	10.28	11.8	4.37	10.13	13.96	0.03	5.32
Soil type	-										Vertisols									
pH	-										7.20									
EC	-										-									
Variety	-										Vikram TCR(122 days)									
Applied NPK	-										100:60:40									
Available NPK	-										175.6:22.2:351.8									

T_1: Location specific recommended dose of fertilizer (RDF)
T_2: T_1 + FYM@ 5t/ha
T_3: T_1 + Sampoorna (KAU) @10 g per litre of water twice in the cropping season (250 litre/hectare/application)
T_4: 125% RDF of T_1
T_5: 125% RDF of T_1 + FYM@5 t/ha
T_6: T_1+ Application of micro nutrient (deficient to that location)
T_7 : T1+ Geoxol.com @ 40 kg/ha during basal fertilizer application
T_8: Optional (According to location)
T_9: No NPK control

Table 4.4.1: Contd.

Treatment	RANCHI							TITABAR													Over all Mean	Rank
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Panicle /m² (No.)	Filled grains/ panicle	Total uptake (kg/ha) in plant		Grain yield (t/ha)	Rank	Straw yield (t/ha)	Tillers/ m² (No.)	Panicle/ m² (No.)	Test wt (g)	Filled grains/ panicle	Total uptake (kg/ha) in plant			Soil available kg/ha				
						N	P								N	P	K	N	P	K		
T1	5.85	6	8.48	275	103	78.50	32.10	3.30	7	7.63	176	234	25.90	179	137.13	24.71	135.26	253.58	122.78	16.53	4.93	7
T2	6.16	3	8.82	294	111	87.60	34.20	4.25	5	7.70	222	280	27.90	233	138.01	19.64	135.95	266.47	129.06	18.78	5.38	5
T3	6.21	2	8.70	291	110	86.60	35.20	4.00	6	10.00	237	293	28.83	253	140.07	21.29	139.41	255.02	132.58	17.93	5.63	3
T4	6.78	1	9.80	329	121	102.33	40.20	4.70	4	8.60	262	313	30.40	287	140.19	21.98	139.17	268.98	128.93	16.93	5.61	4
T5	6.02	5	8.70	288	106	82.30	33.20	5.10	2	10.37	266	342	30.43	262	141.87	23.93	140.80	277.62	132.92	19.80	5.94	1
T6	6.05	4	8.77	289	107	80.57	32.50	5.00	3	8.80	253	341	30.00	272	141.38	25.05	140.63	268.77	132.30	18.48	5.63	2
T7	4.47	7	6.80	212	81	72.47	30.20	5.28	1	11.10	255	332	29.73	269	141.61	23.95	139.72	266.50	129.60	17.73	4.78	8
T8	1.89	8	3.02	101	42	68.63	29.50	-		-	-	-	-	-	-	-	-	-	-	-	5.15	6
T9	-		-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	3.58	9
Exp. mean	5.43		7.89	260	98	82.38	33.39	4.52		9.17	239	305	29.03	251	140.04	22.93	138.70	265.28	129.74	18.02	5.39	
CD(0.05)	0.9		0.94	46.25	12.04	10.03	5.28	0.06		0.42	8.02	26.03	1.95	12.57	2.21	2.12	3.47	10.7	8.46	0.88		
CV	9.41		6.83	10.16	7.04	6.95	9.02	0.92		2.54	2.26	4.8	3.77	3.38	1.06	6.21	1.68	2.71	4.39	3.3		
Soil type	-							Clay loam														
pH	-							-														
EC	-							-														
Variety	Arize 6444 Gold							-														
Applied NPK	150:60:6							60;20:40														
Available NPK	234:48:173							263.50:15.60:212.30														

T_1: Location specific recommended dose of fertilizer (RDF)
T_2: T_1 + FYM@ 5t/ha
T_3: T_1 + Sampoorna (KAU) @10 g per litre of water twice in the cropping season (250 litre/hectare/application)
T_4: 125% RDF of T_1
T_5: 125% RDF of T_1 + FYM@5 t/ha
T_6: T_1+ Application of micro nutrient (deficient to that location)
T_7 : T1+ Geoxol.com @ 40 kg/ha during basal fertilizer application
T_8: Optional (According to location)
T_9: No NPK control

Table 4.4.1(R): Contd.

Treatment	PATTAMBI (Rabi)								
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Tillers/m^2 (No.)	Panicle/m^2 (No.)	Filled grains/panicle	Un-Filled grains/ panicle	Cost of cultivation/ha	Gross returns/ha
T1	3.83	6	4.72	253	253	56	46	67310	121410
T2	4.37	5	5.36	259	259	62	45	96980	138450
T3	5.02	1	5.61	280	288	63	40	69300	157473
T4	4.81	2	5.68	276	276	60	42	70125	151730
T5	4.59	3	5.62	253	263	60	43	99855	145380
T6	4.49	4	5.40	263	263	59	43	69260	141910
T7	3.37	7	4.26	227	227	46	46	45100	107233
T8	-		-	-	-	-	-	-	-
Exp. mean	4.36		5.24	259	261	58	44	73990	137655
CD(0.05)	0.38		0.37	31.1	26.72	4.7	5.3	8.41	11259.53
CV	4.9		3.93	6.76	5.75	4.55	6.84	0.01	4.6
Soil type	-								
pH	-								
EC	-								
Variety	-								
Applied NPK kg/ha	-								
Available NPK kg/ha	-								

T_1: Location specific recommended dose of fertilizer (RDF)
T_2: T_1 + FYM@ 5t/ha
T_3: T_1 + Sampoorna (KAU) @10 g per litre of water twice in the cropping season (250 litre/hectare/application)
T_4: 125% RDF of T_1
T_5: 125% RDF of T_1 + FYM@5 t/ha
T_6: T_1+ Application of micro nutrient (deficient to that location)
T_7: T1+ Geoxol.com @ 40 kg/ha during basal fertilizer application
T_8: -Optional (According to location)

Table 4.4.1: Contd.

Treatment	Straw yield (t/ha)											
	Chinsurah	Chiplima	Faizabad	Kanpur	Kaul	Karaikal	Khudwani	Maruteru	Moncompu	Puducherry	Pusa	Titabar
T1: RDF (location specific)	3.87	5.40	4.39	6.63	8.96	5.83	7.95	8.93	6.84	7.78	5.21	5.73
T2: RDF + FYM @ 5t/ha	6.05	6.68	5.09	7.29	9.38	6.37	8.30	9.57	9.06	8.99	5.47	5.78
T3: RDF + Sampoorna (KAU) @ 10 g per litre	4.86	-	5.55	7.05	9.28	6.29	8.54	9.52	7.83	9.11	5.45	7.50
T4: 125% RDF	5.97	5.46	4.64	7.58	9.69	6.78	7.95	10.00	9.05	8.61	6.02	6.45
T5: 125% RDF + FYM @ 5t/ha	5.99	6.49	6.10	8.17	9.83	6.44	8.35	9.60	10.04	9.54	6.15	7.78
T6: RDF + Micronutrient application	5.24	5.64	5.06	6.90	9.47	6.12	8.56	9.03	7.02	9.03	5.62	6.60
T7: RDF + Geoxol.com @ 40 kg/ha during basal	5.89	5.61	-	7.21	-	6.53	-	8.66	7.80	-	5.55	8.33
T8: Optional	-	4.96	-	6.81	-	5.86	9.16	8.47		9.69	4.03	-
Mean	5.41	5.75	5.14	7.20	9.43	6.28	8.40	9.22	8.23	8.96	5.44	6.88
LSD (p=0.05)	0.24	0.98	0.25	NS	0.30	NS	NS	0.70	1.12	0.81	0.66	1.04
CV%	3.0	9.6	3.2	7.5	1.8	9.0	5.4	4.4	7.6	5.1	6.9	10.2

Table 4.4.1: Contd.

Treatment	Grain yield (t/ha)											
	Chinsurah	Chiplima	Faizabad	Kanpur	Kaul	Karaikal	Khudwani	Maruteru	Moncompu	Puducherry	Pusa	Titabar
T1: RDF (location specific)	3.75	5.27	3.83	4.83	6.94	4.37	6.91	8.54	4.03	5.25	4.33	3.30
T2: RDF + FYM @ 5t/ha	5.94	6.14	4.44	5.28	7.32	5.16	7.42	8.82	5.28	6.19	4.53	4.25
T3: RDF + Sampoorna (KAU) @ 10 g per litre	4.75	-	4.86	5.13	7.40	5.05	7.49	9.74	4.53	6.14	4.25	4.00
T4: 125% RDF	5.87	5.32	4.04	5.48	7.64	5.09	7.13	8.94	5.29	5.70	4.75	4.70
T5: 125% RDF + FYM @ 5t/ha	5.89	6.01	5.34	5.79	7.81	5.09	7.43	8.82	5.93	6.31	5.16	5.10
T6: RDF + Micronutrient application	5.13	5.49	4.40	5.02	7.42	4.68	7.62	8.98	4.11	5.83	4.72	5.00
T7: RDF + Geoxol.com @ 40 kg/ha during basal	5.78	5.38	-	5.23	-	4.65	0.00	7.68	4.53	-	4.36	5.28
T8: Optional	-	5.12	-	4.94	-	4.87	7.85	6.83	-	6.23	2.78	-
Mean	5.30	5.53	4.49	5.21	7.42	4.87	7.41	8.55	4.81	5.95	4.29	4.52
LSD (p=0.05)	0.24	0.45	0.24	NS	0.24	NS	NS	0.59	0.73	0.55	0.45	0.06
CV%	3.1	4.5	3.6	7.3	1.8	7.8	5.4	4.0	8.6	5.2	6.0	0.92

Table 4.4.1: Contd.

Treatment	Tillers/m^2 (No.)									
	Chinsurah	Chiplima	Faizabad	Kanpur	Karaikal	Khudwani	Moncompu	Puducherry	Pusa	Titabar
T1: RDF (location specific)	387	237	212	492	400	352	162	415	274	176
T2: RDF + FYM @ 5t/ha	426	282	249	499	478	369	207	476	281	222
T3: RDF + Sampoorna (KAU) @ 10 g per litre	388	ND	283	481	430	378	188	458	276	237
T4: 125% RDF	406	246	226	518	462	362	204	474	308	262
T5: 125% RDF + FYM @ 5t/ha	429	258	310	524	466	389	214	522	325	266
T6: RDF + Micronutrient application	379	252	257	489	458	386	167	425	279	253
T7: RDF + Geoxol.com @ 40 kg/ha during basal	371	251	-	501	466	-	191	-	271	255
T8: Optional	-	242	-	496	444	405	-	526	213	-
Mean	398	253	256	500	451	377	190	471	278	239
LSD (p=0.05)	33.35	NS	7.1	NS	NS	NS	17.7	61	35	8.0
CV%	5.6	10.5	1.9	3.2	8.1	5.1	5.2	7.3	7.3	2.26

Table 4.4.1: Contd.

Treatment	Panicles/m2 (No.)											
	Chinsurah	Chiplima	Faizabad	Kanpur	Kaul	Karaikal	Khudwani	Maruteru	Moncompu	Puducherry	Pusa	Titabar
T1: RDF (location specific)	345	208	209	311	284	360	294	287	146	357	251	176
T2: RDF + FYM @ 5t/ha	387	242	247	321	292	426	310	267	181	432	256	210
T3: RDF + Sampoorna (KAU) @ 10 g per litre	344	ND	280	318	285	402	302	285	161	416	253	220
T4: 125% RDF	366	216	223	229	295	376	304	299	166	424	294	235
T5: 125% RDF + FYM @ 5t/ha	390	236.33	307	333	297	436	309	271	183	464	308	257
T6: RDF + Micronutrient application	342	227.67	255	315	291	410	310	318	145	395	256	256
T7: RDF + Geoxol.com @ 40 kg/ha during basal	333	223	-	320	-	408	-	285	158	-	252	249
T8: Optional	-	196.33	-	317	-	396	313	269	-	478	194	-
Mean	358	221	253	308	291	402	306	285	163	424	258	229
LSD (p=0.05)	33.4	NS	7.9	NS	6.2	NS	NS	NS	14.8	62	35	34.1
CV%	6.3	7.9	2.8	20.4	1.2	10.0	5.3	8.0	5.1	8.2	7.8	10.03

Table 4.4.1: Contd.

Treatment	Test weight (g)							
	Chinsurah	Chiplima	Kaul	Karaikal	Khudwani	Moncompu	Pusa	Titabar
T1: RDF (location specific)	19.7	11.3	23.9	25.8	27.4	27.8	25.9	19.43
T2: RDF + FYM @ 5t/ha	19.8	13.9	24.0	26.4	27.5	28.1	26.5	20.93
T3: RDF + Sampoorna (KAU) @ 10 g per litre	19.9	ND	23.9	26.8	27.8	27.6	26.2	21.63
T4: 125% RDF	19.8	11.6	24.0	26.7	26.9	28.3	27.3	22.80
T5: 125% RDF + FYM @ 5t/ha	19.5	13.5	24.0	26.4	27.3	28.0	27.4	22.83
T6: RDF + Micronutrient application	19.7	13.1	24.0	26.3	28.0	27.6	26.2	22.50
T7: RDF + Geoxol.com @ 40 kg/ha during basal	19.3	13.0	-	26.7	-	28.2	26.8	22.30
T8: Optional	-	10.9	-	26.7	27.9	-	25.6	-
Mean	19.7	12.4	24	26.5	27.5	28.0	26.5	21.77
LSD (p=0.05)	0.49	1.70	NS	NS	NS	NS	0.78	1.8
CV%	1.7	7.7	0.1	2.1	3.8	6.4	1.7	5.59

Table 4.4.1: Contd.

Treatment	Filled grain (No.)		
	Khudwani	Moncompu	Titabar
T1: RDF (location specific)	106	88	179
T2: RDF + FYM @ 5t/ha	111	118	233
T3: RDF + Sampoorna (KAU) @ 10 g per litre	116	106	253
T4: 125% RDF	105	115	287
T5: 125% RDF + FYM @ 5t/ha	113	123	262
T6: RDF + Micronutrient application	121	98	272
T7: RDF + Geoxol.com @ 40 kg/ha during basal	-	104	269
T8: Optional	124	-	-
Mean	113.7	107	251
LSD (p=0.05)	NS	18.1	12.6
CV%	6.8	9.5	3.38

Table 4.4.1: Contd.

Treatment	Nitrogen Use Efficiency																				
	Faizabad			Kanpur			Kaul			Karaikal			Khudwani			Mandya			Maruteru		
	N	P	K	N	P	K	N	P	K	N	P	K	N	P	K	N	P	K	N	P	K
T1: RDF (location specific)	52	31	37	49	159	47	48	159	48	53	583	25	63	336	71	66	569	56	81	206	59
T2: RDF + FYM @ 5t/ha	53	36	39	47	147	46	47	147	45	47	556	24	63	320	70	53	550	50	80	187	54
T3: RDF + Sampoorna (KAU) @ 10 g per litre	52	37	40	48	155	47	48	155	47	56	433	25	62	313	71	54	508	52	71	215	54
T4: 125% RDF	54	33	38	47	143	45	47	143	45	46	397	21	60	329	70	51	478	50	78	219	54
T5: 125% RDF + FYM @ 5t/ha	52	42	41	45	135	44	45	135	44	48	360	25	60	321	70	48	449	45	74	202	49
T6: RDF + Micronutrient application	53	36	38	48	153	46	47	153	46	50	401	25	63	328	70	49	527	52	72	284	52
T7: RDF + Geoxol.com @ 40 kg/ha during basal	-	-	-	48	152	46	48	152	46	47	220	23	-	-	-	56	621	51	71	207	47
T8: Optional	-	-	-	48	156	47	48	156	47	49	213	30	60	334	70	58	628	56	66	249	41
Mean	52.5	35.6	39.0	47.4	150.0	46.0	47	150	46	49.42	395.33	24.71	62	326	70	54	541	52	74	221	51
LSD (p=0.05)	0.9	2.0	1.1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	5.7	NS	NS	7.2	NS	7.5
CV%	1.1	3.6	1.8	3013	6.4	5.3	3.2	6.3	5.3	7.86	40.79	16.68	3.5	10.9	3.2	6.0	14.0	8.6	5.5	28.5	8.4

Table 4.4.1: Contd.

Treatment	Nitrogen Use Efficiency (Contd.)										
	Moncompu		Puducherry			Pusa			Titabar		
	P	K	N	P	K	N	P	K	N	P	K
T1: RDF (location specific)	119	44	59	186	46	50	215	46	24	134	24
T2: RDF + FYM @ 5t/ha	102	39	54	173	46	46	196	46	31	219	31
T3: RDF + Sampoorna (KAU) @ 10 g per litre	111	40	52	178	45	44	181	39	29	189	29
T4: 125% RDF	99	39	50	149	42	42	181	39	34	214	34
T5: 125% RDF + FYM @ 5t/ha	95	39	49	145	41	43	185	39	36	215	36
T6: RDF + Micronutrient application	108	43	52	168	44	47	202	42	35	200	36
T7: RDF + Geoxol.com @ 40 kg/ha during basal	114	40	-	-	-	44	190	41	37	222	38
T8: Optional	-	-	50	161	41	48	198	42	-	-	-
Mean	107	41	52	166	44	45.7	193.4	41.8	32	199	33
LSD (p=0.05)	NS	3.62	5.5	NS	NS	NS	NS	4.6	0.9	19.8	1.2
CV%	10.0	5.0	5.9	9.5	9.8	8.2	8.3	6.3	1.96	6.69	2.38

Table 4.4.1: Contd.

Treatment	Zinc Use Efficiency				
	Kanpur	Karaikal	Moncompu	Pusa	Mandya
T1: RDF (location specific)	16188	16188	18908	27457	39297
T2: RDF + FYM @ 5t/ha	15092	15092	16508	26431	37946
T3: RDF + Sampoorna (KAU) @ 10 g per litre	14317	14317	16286	20608	34951
T4: 125% RDF	14733	14733	16460	23055	34457
T5: 125% RDF + FYM @ 5t/ha	13789	13788	16465	23473	28068
T6: RDF + Micronutrient application	13202	13202	17925	20987	31713
T7: RDF + Geoxol.com @ 40 kg/ha during basal	14128	14128	17582	24087	33775
T8: Optional	13742	13742	-	23322	38006
Mean	14399	14399	17162	23678	34777
LSD (p=0.05)	1157	1157	NS	2716	6545
CV%	4.6	4.6	7.7	6.6	10.8

Table 4.4.1: Contd.

Treatment	Total nutrient uptake (kg/ha)																				
	Faizabad			Kanpur				Kaul			Karaikal				Khudwani			Mandya			
	N	P	K	N	P	K	Zn	N	P	K	N	P	K	Zn	N	P	K	N	P	K	Zn
T1: RDF (location specific)	74	124	104	99	31	102	0.30	126	32	137	90	9	190	0.30	111	21	97	89	10	105	0.15
T2: RDF + FYM @ 5t/ha	84	124	113	112	36	116	0.35	141	38	154	116	12	231	0.35	118	23	106	128	12	135	0.18
T3: RDF + Sampoorna (KAU) @ 10 g per litre	94	132	122	107	33	110	0.36	135	36	145	87	13	197	0.36	120	24	106	127	13	131	0.20
T4: 125% RDF	75	123	106	118	38	122	0.37	154	42	165	107	13	234	0.37	119	22	103	138	15	141	0.20
T5: 125% RDF + FYM @ 5t/ha	104	128	130	127	43	133	0.42	161	45	173	106	14	201	0.42	125	23	106	151	16	158	0.26
T6: RDF + Micronutrient application	83	125	116	105	33	109	0.38	147	39	156	85	13	170	0.38	122	23	110	134	13	127	0.21
T7: RDF + Geoxol.com @ 40 kg/ha during basal	-	-	-	110	34	113	0.37	-	-	-	89	20	200	0.37	-	-	-	113	10	124	0.19
T8: Optional	-	-	-	103	32	106	0.36	-	-	-	97	22	160	0.36	131	24	112	115	11	118	0.18
Mean	86	126	115	110	35	114	0.4	144	39	155	97	15	198	0.36	121	23	106	124	13	130	0.1954
LSD (p=0.05)	4.27	7.93	4.67	14.8	6.7	16.2	0.05	5.01	2.14	9.91	12.8	NS	NS	NS	NS	NS	NS	19.9	2.9	16.3	0.04
CV%	3.3	4.2	2.7	7.68	10.94	8.15	7.1	1.9	3.0	3.5	7.5	37.8	14.9	7.1	6.6	14.7	6.5	9.1	13.2	7.2	11.16

Table 4.4.1: Contd.

Treatment	Total nutrient uptake (kg/ha) (Contd.)															
	Maruteru			Moncompu			Puducherry			Pusa				Titabar		
	N	P	K	P	K	Zn	N	P	K	N	P	K	Zn	N	P	K
T1: RDF (location specific)	105	42	144	34	91	0.22	89	28	114	82	19	89	0.15	137	25	136
T2: RDF + FYM @ 5t/ha	111	47	166	52	135	0.32	115	36	137	96	23	97	0.17	138	20	136
T3: RDF + Sampoorna (KAU) @ 10 g per litre	137	46	180	41	113	0.28	119	34	136	99	24	112	0.21	140	21	140
T4: 125% RDF	115	41	167	54	136	0.32	114	38	136	111	26	120	0.20	140	22	139
T5: 125% RDF + FYM @ 5t/ha	120	44	181	63	155	0.37	129	44	153	117	27	128	0.21	142	24	141
T6: RDF + Micronutrient application	124	37	173	38	98	0.23	113	35	133	97	23	108	0.22	142	25	141
T7: RDF + Geoxol.com @ 40 kg/ha during basal	109	38	166	41	113	0.26	-	-	-	99	23	106	0.18	142	24	140
T8: Optional	104	32	168	-	-	-	123.7	39	151	59	14	68	0.12	-	-	-
Mean	115	41	168	46	120	0.29	114.7	36	137	95.0	22.5	103.7	0.18	140	23	139
LSD (p=0.05)	10.0	NS	NS	10.7	21.8	0.05	10.5	6.1	21.9	6.1	2.5	5.5	0.0	2.4	NS	3.5
CV%	4.9	16.8	8.2	13.1	10.2	9.6	5.2	9.4	9.0	3.7	6.3	3.0	4.5	1.16	6.48	1.71

4.4.2 Assessment of yield gap analysis (Agronomy & Economics)

4.4.3. Evaluation of Organic fertilizers and Natural farming practices for enhancing the productivity and soil heath

Organic farming is rapidly gaining recognition worldwide as a promising means to offer healthier food and to ensure environmental sustainability. Currently, organic produce including organic rice is in huge demand owing to its potential to fetch premium prices in the global market. Even though rice performs well under organic production system, a set of constraints including nitrogen stress at critical growth stages, unavailability of rapidly mineralizable organic amendments, lack of appropriate varieties and intense crop–weed competition pose major challenges to realize the potential yield. Use of diverse organic nutrient sources including the split application of fast mineralizable nutrient-rich manures (vermicompost, poultry manure), green manures and bio-fertilizers can supply optimum nutrients in organic rice system. In parallel, development and deployment of rice varieties having a response to organic nutrient inputs, resistance to diseases/insects and the ability to compete with weeds can help minimize the risk of crop failure. Further, higher emission of greenhouse gases (GHGs) in the organic rice field deserves greater attention because of environmental sustainability. Strategic water management and selection of appropriate organic amendments could help address this issue. However, a substantial research gap still exists demanding a deeper understanding of the organic rice system to register higher yield gains. There is urgency for the alignment of modern agricultural techniques with organic rice production to improve both the system productivity and the product quality along with effectively avoiding the risks associated with indiscriminate use of chemicals in agriculture. A new trial on organic rice was initiated with the following objectives: 1. To maximize the yield in organic rice through management practices 2. To compare yield and economics of the different organic management practices 3. To assess the soil health, pest dynamics and seed quality parameters in organic rice. The trial was conducted at 7 locations (Chatha, Gangavathi, Ghaghraghat, Khudwani, Pattambi, Raipur and Titabar). There were five treatments T_1: Control (No addition of any inputs except labours for operations including weeding) T_2: Complete NF, T_3: AI-NPOF package, T_4: Integrated Crop Management (50% nutrient through organic and 50% nutrient through inorganic source) and T_5: Integrated Crop Management (50% nutrient through organic and 50% nutrient through inorganic source with application of need based pest management). The results were summarized and presented in Table 4.4.3 and the salient findings are as followed.

At **Chatha**, AI-NPOF treatment produced the highest grain yield of 3.28 t/ha followed by Integrated crop management with need based pest management (3.05 t/ha). Nitrogen (47.82 kg/ha), P (13.04 kg/ha) and K (74.18 kg/ha) uptake by rice crop was also the highest under the same treatment. Soil available N, P and K was found to be higher after harvest under same treatment compared to those under other treatments. In **Gangavathi**, Integrated crop management (T_4) resulted the highest grain yield (4.06 t/ha). Gross return was also the highest (Rs.1,07,326) under same treatment. In **Ghaghraghat**, Integrated crop management (T_4) resulted the highest grain yield (4.42 t/ha). In **Khudwani**, Integrated crop management (T_4) resulted the highest grain yield (6.93 t/ha), however, at par with Integrated Crop Management (6.84 t/ha) (50% nutrient through organic and 50% nutrient through inorganic source with application of need based pest management). In **Pattambi**, Integrated crop management (T_5) (50% nutrient through organic and 50% nutrient through inorganic source with application of need based pest management) resulted the highest grain yield (5.10 t/ha). In **Raipur** also Integrated crop management (T_5) (50% nutrient through organic and 50% nutrient through inorganic source with application of need based pest management) resulted the highest grain yield (4.58 t/ha), however at par with (T_4) Integrated Crop Management (50% nutrient through organic and 50% nutrient through inorganic source) (4.35 t/ha). In **Titabar**, Integrated crop management (T_5) (50% nutrient through organic and 50% nutrient through inorganic source with application of need based pest management) resulted the highest grain yield (4.70 t/ha), followed by (T_4) Integrated Crop Management (50% nutrient through organic and 50% nutrient through inorganic source) (3.48 t/ha).

Across the 7 locations, T_5 (50% nutrient through organic and 50% nutrient through inorganic source with application of need based pest management) resulted the highest mean grain yield (4.55 t/ha).

Rabi:

Enhancing productivity of organic rice cultivation (rabi 2022-23)

In Pattambi, T_5 (50% nutrient through organic and 50% nutrient through inorganic source with application of need based pest management) resulted the highest mean grain yield (3.96 t/ha).

Table 4.4.3: Evaluation of Organic fertilizers and Natural farming practices for enhancing the productivity and soil heath, Kharif-2023.

Treatment	CHATHA												
	Grain yield (t/ha)	Straw yield (t/ha)	Panicle/m^2 (No.)	Test wt (g)	Filled grains/ panicle	Unfilled grains/ panicle	N uptake (kg/ha) in plant	P uptake (kg/ha) in plant	K uptake (kg/ha) in plant	Soil Organic carbon %	Soil available N	Soil available P	Soil available K
T1	2.18	4.25	140	19.13	39.67	7.33	34.00	9.16	51.20	0.48	221.23	12.67	128.40
T2	2.58	5.07	190	20.43	56.00	4.33	37.58	10.58	58.66	0.52	228.23	13.03	132.60
T3	3.28	6.31	235	21.47	67.67	4.00	47.82	13.04	74.18	0.51	242.27	14.11	136.77
T4	2.92	5.61	205	20.87	59.33	2.67	42.00	11.55	61.29	0.51	233.97	13.40	134.17
T5	3.05	6.13	216	21.10	62.67	3.33	44.27	12.25	63.94	0.50	237.40	13.91	135.23
Exp. mean	2.80	5.47	197	20.60	57.07	4.33	41.13	11.32	61.85	0.50	232.62	13.42	133.43
CD(0.05)	0.07	0.20	1.75	0.14	2.96	1.42	0.62	0.17	0.36	0.01	1.48	0.14	0.89
CV	1.41	1.89	0.47	0.37	2.75	17.38	0.81	0.79	0.31	1.06	0.34	0.56	0.36
Soil type	-												
Variety	Basmati 370												
Applied NPK kg/ha	30:20:10												
Available NPK kg/ha	245:14:146												

T_1: Absolute Control (No NPK)
T_2: Natural farming
T_3: AI-NPOF package
T_4: Integrated Crop Management (50% manure through Organic + 50% by Inorganic & rest of the operations as Natural Farming
T_5: Integrated Crop Management (50% manure through Organic + 50% by Inorganic with application of need based pesticides for pest management

Table 4.4.3: Contd.

Treatment	GANGAVATHI					GHAGHRAGHAT					
	Grain yield (t/ha)	Straw yield (t/ha)	Panicle/m^2 (No.)	Test wt (g)	Gross return Rs/ha	Grain yield (t/ha)	Straw yield (t/ha)	Panicle/m^2 (No.)	Test wt (g)	Filled grains/panicle	Unfilled grains/panicle
T1	2.38	3.13	109	13.02	62938	2.99	3.64	169	22.73	183	27
T2	2.89	3.13	122	13.08	76684	3.23	3.94	178	23.75	192	25
T3	3.23	4.69	124	13.83	85463	3.99	4.87	186	25.00	200	23
T4	4.06	5.63	138	14.17	107326	4.42	5.39	200	25.67	210	15
T5	3.53	5.94	143	13.49	93330	4.06	4.95	216	25.52	221	19
Exp. mean	3.22	4.50	127	13.52	85148	3.74	4.56	190	24.53	201	22
CD(0.05)	0.28	1.07	11.37	NS	7422	0.16	0.19	4.58	0.77	4.57	2.67
CV	5.66	15.41	5.81	5.17	5.66	2.69	2.72	1.57	2.04	1.47	7.96
Soil type	Black clay					Sandy loam					
Variety	-					-					
Applied NPK kg/ha	-					120:60:60:25					
Available NPK kg/ha	-					205.4:23.5:232.5					

T_1: Absolute Control (No NPK)

T_2: Natural farming

T_3: AI-NPOF package

T_4: Integrated Crop Management (50% manure through Organic + 50% by Inorganic & rest of the operations as Natural Farming

T_5: Integrated Crop Management (50% manure through Organic + 50% by Inorganic with application of need based pesticides for pest management

Table 4.4.3: Contd.

Treatment	KHUDWANI														
	Grain yield (t/ha)	Straw yield (t/ha)	Panicle/m^2 (No.)	Test wt (g)	Filled grains/ panicle	Unfilled grains/ panicle	N uptake (kg/ha) in plant	P uptake (kg/ha) in plant	K uptake (kg/ha) in plant	Soil Organic carbon %	Soil available N	Soil available P	Soil available K	Cost of cultivation Rs/ha	Gross return Rs/ha
T1	4.93	5.91	268	81.0	11.8	24.15	60.95	12.69	108.75	0.5	220.5	9.85	145.0	42293	101161
T2	5.73	6.56	284	89.0	11.8	24.5	68.58	14.63	117.7	0.55	217.75	9.98	156.9	44356	110621
T3	6.29	7.48	301	96.3	11.0	26.18	76.5	17.6	127.53	0.59	252	11.38	170.0	66293	124347
T4	6.93	8.25	317	104.3	13.3	27.2	87.83	17.91	132.33	0.57	248.5	12.35	176.4	31225	131493
T5	6.84	8.23	324	106.5	13.0	27.08	88.12	19.08	132.28	0.57	245	12.53	176.4	34600	134877
Exp. mean	6.144	7.286	299	95.4	12.2	25.822	76.396	16.382	123.718	0.556	236.75	11.218	165.0	43753	120500
CD(0.05)	0.87	0.96	29.74	10.23	3.8	2.08	16.59	3.55	14.7	0.08	28.82	1.62	15.32	14077.53	24197.41
CV	9.23	8.53	6.47	6.96	20.29	5.23	14.09	14.08	7.71	8.81	7.9	9.38	4.30	20.88	13.03
Soil type	Silty loam														
Variety	-														
Applied NPK kg/ha	120:60:30														
Available NPK kg/ha	336:16:163														

T_1: Absolute Control (No NPK)
T_2: Natural farming
T_3: AI-NPOF package
T_4: Integrated Crop Management (50% manure through Organic + 50% by Inorganic & rest of the operations as Natural Farming
T_5: Integrated Crop Management (50% manure through Organic + 50% by Inorganic with application of need based pesticides for pest management

Table 4.4.3: Contd.

Treatment	PATTAMBI								RAIPUR					
	Grain yield (t/ha)	Straw yield (t/ha)	Panicle/m^2 (No.)	Test wt (g)	Filled grains/panicle	Unfilled grains/panicle	Cost of cultivation Rs/ha	Gross return Rs/ha	Grain yield (t/ha)	Straw yield (t/ha)	Panicle/m^2 (No.)	Test wt (g)	Filled grains/ panicle	Unfilled grains/ panicle
T1	2.78	5.35	147	23.58	49.0	14.3	34960	93403	1.82	2.35	185	18.98	81.25	44.60
T2	3.80	9.68	166	27.63	44.8	19.0	58200	134795	2.50	3.20	232	19.65	96.00	44.30
T3	4.15	11.53	199	27.18	58.3	20.0	110220	150350	3.31	4.17	244	19.98	120.00	43.45
T4	4.58	12.18	204	30.43	80.0	16.3	85500	163855	4.35	5.36	274	20.20	144.00	42.40
T5	5.10	13.35	208	29.80	80.5	12.5	88350	182953	4.58	5.60	289	20.23	157.00	41.30
Exp. mean	4.08	10.42	185	27.72	62.5	16.4	75446	145071	3.31	4.14	245	19.81	119.65	43.21
CD(0.05)	0.27	0.67	12.27	1.76	10.32	3.84	14126	7276	0.56	0.73	38.74	0.75	20.79	6.90
CV	4.34	4.18	4.32	4.13	10.72	15.19	12.15	3.26	11.01	11.53	10.28	2.45	11.28	10.36
Soil type	Sandy loam								Vertisols					
Variety	-								CG Devbhog					
Applied NPK kg/ha	120:60:60:25								80:50:30					
Available NPK kg/ha	205.4:23.5:232.5								208:22.4;322					

T_1: Absolute Control (No NPK)
T_2: Natural farming
T_3: AI-NPOF package
T_4: Integrated Crop Management (50% manure through Organic + 50% by Inorganic & rest of the operations as Natural Farming
T_5: Integrated Crop Management (50% manure through Organic + 50% by Inorganic with application of need based pesticides for pest management

Table 4.4.3: Contd.

Treatment	TITABAR													Over all Mean	Rank
	Grain yield (t/ha)	Straw yield (t/ha)	Panicle/m^2 (No.)	Test wt (g)	Filled grains/ panicle	Unfilled grains/ panicle	N uptake (kg/ha) in plant	P uptake (kg/ha) in plant	K uptake (kg/ha) in plant	Soil Organic carbon %	Soil available N	Soil available P	Soil available K		
T1	2.48	6.10	216	37.73	87.0	45.8	133.20	22.25	138.40	0.58	257.73	19.23	114.88	2.79	5
T2	3.13	7.45	247	11.60	127.0	38.0	133.28	22.60	140.10	0.50	248.75	18.55	110.93	3.41	4
T3	3.35	7.15	299	12.53	134.0	41.0	134.00	22.60	140.48	0.50	246.63	17.93	114.33	3.94	3
T4	3.48	7.40	253	11.48	140.5	33.0	134.53	22.65	141.30	0.45	235.13	16.78	112.13	4.39	2
T5	4.70	9.18	300	12.33	164.8	37.3	138.25	23.30	144.13	0.48	234.13	16.73	105.53	4.55	1
Exp. mean	3.43	7.46	263	17.13	130.7	39.0	134.65	22.68	140.88	0.50	244.47	17.84	111.56	3.82	
CD(0.05)	0.73	1.39	45.60	NS	35.63	NS	2.34	0.40	2.40	0.06	12.82	1.59	NS		
CV	13.82	12.14	11.26	136.07	17.70	29.34	1.13	1.14	1.10	8.33	3.40	5.80	6.02		
Soil type	Clay loam														
Variety	Keteki Joha														
Applied NPK kg/ha	-														
Available NPK kg/ha	-														

T_1: Absolute Control (No NPK)
T_2: Natural farming
T_3: AI-NPOF package
T_4: Integrated Crop Management (50% manure through Organic + 50% by Inorganic & rest of the operations as Natural Farming
T_5: Integrated Crop Management (50% manure through Organic + 50% by Inorganic with application of need based pesticides for pest management

Table 4.4.3: Contd.

Treatment	PATTAMBI (Rabi 2022-23)								Rank
	Grain yield (t/ha)	Straw yield (t/ha)	Panicle/m^2 (No.)	Test wt (g)	Filled grains/panicle	Unfilled grains/panicle	Cost of cultivation Rs/ha	Gross return Rs/ha	
T1	1.85	1.54	167	26.80	74.50	22.00	34960	56420	5
T2	2.08	2.16	177	27.25	83.75	19.00	58200	64588	4
T3	2.66	2.42	192	28.10	85.00	18.00	110220	81600	3
T4	2.85	2.77	202	29.33	92.25	16.25	85500	88118	2
T5	3.96	3.64	214	30.48	99.75	17.00	88350	121870	1
Exp. mean	2.68	2.51	190	28.39	87.05	18.45	75446	82519	
CD(0.05)	0.19	0.47	19.34	1.34	12.63	NS	14122	4857	
CV	4.65	12.17	6.60	3.07	9.42	15.31	12.15	3.82	
Soil type	-								
Variety	Basmati 370								
Applied NPK kg/ha	30:20:10								
Available NPK kg/ha	245:14:146								

T_1: Absolute Control (No NPK)
T_2: Natural farming
T_3: AI-NPOF package
T_4: Integrated Crop Management (50% manure through Organic + 50% by Inorganic & rest of the operations as Natural Farming
T_5: Integrated Crop Management (50% manure through Organic + 50% by Inorganic with application of need based pesticides for pest management

4.4.4 Nano-fertilizers for increasing nutrient use efficiency, yield and economic returns in transplanted rice

For detailed report refer Soil Science Progress Report.

4.4.5 Integrated Pest Management– on farm management of insects, diseases and weeds IPM (Entomology, Pathology and Agronomy) special interdisciplinary trial, *Kharif 2023*

In recent years, intensive cultivation of rice has resulted in the frequent occurrence of biotic stresses that formed major constraint in rice production. Although, IPM has been accepted as the most effective option for protection of crops from the ravages of pests, however, its implementation at the farmer's level has been limited. As IPM involves a number of components, farmers must have capability of taking decisions and selecting IPM options accordingly for economical and long term management. Most of these options also need to be refined at individual farm level keeping in view the availability of resources and feasibility of farmers. Therefore, IPM involves working with the farmers in their fields and devising technologies suitable to their conditions. Keeping this in view, IPM special trial was conducted with an aim to manage pests (including insects, diseases and weeds) in a holistic way in farmers' fields involving them in a participatory way and allowing them to select IPM practices from a basket of options available.

During *Kharif* 2023, the trial was conducted Zone-wise at 15 locations viz.**, Malan, Kaul, Ludhiana, Chiplima, Masodha Pusa, Titabar, Jagdalpur, Navasari, Nawagam, Vadagaon, Aduthurai, Gangavathi, Mandya, Puducherry.** The data on weed population and weed dry biomass in critical period of crop weed competition (Active Tillering and Panicle Initiation stage) and grain yields were reported, and the results of analysed data are summarized and presented in **Tables 4(4.4).**

Species wise weed data reported by 5 locations **Mandya, Malan, Navasari, Titabar and Vadagaon.**

The weed flora reported in the test locations included **Grasses***: Dactylactenium aegyptium, Echinochloa colona, Echinochloa crusgalli, Leptochloa chinensis, Leersia hexandra, Panicum repens and Panicum tripheron.* **Sedges:** *Cyperus difformis, Cyperus iria, Cyperus rotundus, Cyperus procerus, Eleocharis dulcis, Fimbristylis miliacea and Scirpus maritimus.* **BLW:***, Alternanthera philoxeroides, Alternanthera sessilis, Alternanthera spp,,Bergia capensis, Eclipta alba, , Ludwigia parviflora, Marsilea quadrifolia, Monochoria vaginalis, Glinus oppositifolius, Monochoria vaginalis, Rotala densiflora, Spilanthus acmella, and Sphenoclea zeylanica.*

<u>Zone I – Hilly Regions</u>

Himachal Pradesh-Malan: IPM trial was conducted in the village Jia, Kangra District, Himachal Pradesh State. The IPM practices were followed as per the technical program. In this Zone, the weed population at Active Tillering and Panicle Initiation stage in IPM plots was lower than farmers practice by 4.65 and 16.27% respectively. The dry weed biomass was lower in IPM implemented fields by 59.82 and 19.28 % respectively. The mean grain yield advantage was 49.07 in IPM adopted plots.

Zone II – North West

Haryana -Kaul: IPM trial was conducted by, Kaul, Khaital District, Haryana State. At this location, the weed population at Active Tillering and Panicle Initiation stage in IPM plots was lower than farmers practice by 40 and 75% respectively. The mean grain yield advantage was 7.19 in IPM adopted plots.

Punjab-Ludhiana: In the IPMs trial conducted by Ludhiana, the weed population at Panicle Initiation stage in IPM plots was lower than farmers practice by 19.23% respectively. The mean grain yield advantage was 1.53 in IPM adopted plots.

Zone III – Eastern

Orissa- Chiplima: In the IPM trial conducted by Chiplima, the data on weed population recorded at Panicle Initiation stage showed significant decrease in weed population by 25.21. IPM implemented fields, resulted in higher growth, yield attributes and grain yield advantage increase by 22% of the variety Swarna.

UtterPradesh- Masodha: In the IPM trial conducted by Masodha, Faizabad, the data on weed population recorded at Active Tillering and Panicle Initiation stage showed significant decrease in weed population by 77.21 and 37.81% respectively. The dry weed biomass was lower in IPM implemented fields by 77.20 and 35.21 % respectively. IPM implemented fields, resulted in higher growth, yield attributes and grain yield advantage increase by 33.68%.

Bihar-Pusa: In the IPM field trial conducted, the weed population at Active Tillering and Panicle Initiation stage was lower than farmers practice by 17.15 and 9.70 % respectively. The dry weed biomass also was lower in IPM implemented fields by 18.19 and 13.29 respectively. The mean grain yield advantage was 20.81% in IPM adopted plots.

Zone IV – North-Eastern

Assam – Titabar: IPMs trial was conducted in Titabar, Jorhat district of Assam. Ranjit sub-1 variety was grown in both IPM and FP plots. Practices followed in IPM and farmers' practices were given in the table. Weed population and biomass were reported for Panicle Initiation only. Significant reduction in weed population (49.55%) and dry weed biomass (45.11%) in IPM fields was recorded. The grain yield advantage of 20.65 % was recorded in IPM adopted fields.

Zone V – Central

Chatthisgarh- Jagdalpur: In the IPM trial, the weed population was recorded at Active Tillering and Panicle Initiation stage, was lower than farmers practice by 40.66 & 36.31% respectively. The mean grain yield advantage was 18.77% in IPM adopted plots.

Zone VI – Western

Gujarat- Navsari: The IPM trial conducted showed significant reduction in weed population 59.77 and 48.03% and dry weed biomass 58.47 and 42.63% at Active Tillering and Panicle Initiation stages. Significant improvement in grain yield advantage was noticed with 6.48% in IPM adopted fields.

Gujarat-Nawagam: The IPM trial conducted showed significant reduction in weed population by 39.76 and 46.96%, and dry weed biomass by 72.67 and 30.52% at Active Tillering and

Panicle Initiation stages respectively. The grain yield advantage was 11.51% in IPM adopted fields.

Maharastra- Vadgaon: The weed population at Active Tillering and Panicle Initiation stages was lower than farmers practice by 76.94 and 69.24% and weed dry biomass by 76.35 and 69.91% respectively. The mean grain yield advantage was 45.12 % in IPM adopted plots.

<u>Zone VII – Southern</u>

Tamil Nadu- Aduthurai: The field trial was conducted in the village Thiruneelakudi, Thanjavur District using the variety ADT51. The weed population at Active Tillering and Panicle Initiation stages was lower than farmers practice by 60.43 and 61.26% respectively. The weed dry biomass at Active Tillering and Panicle Initiation stages in IPM plots was lower than farmers practice by 17.89 and 43.43% respectively and contributed to the mean grain yield advantage of 16.14 % in IPM adopted plots.

Karnataka- Gangavathi: The IPM field trial was conducted in the Research Farm of Agriculture Research Station, Gangavathi in Karnataka using the varietyBPT-5204. The weed population at Active Tillering and Panicle Initiation stages in IPM plots was lower than farmers practice by 53.42 and 57.53% respectively, and the weed dry biomass was lower than farmers practice by 26.31and 47.31% . The mean grain yield advantage of 10.74 % was recorded in IPM adopted plots.

Karnataka-Mandya: The IPM field trial was conducted at Mandya, Mandya District, Karnataka state with variety MSN99. The weed population at Active Tillering and Panicle Initiation stages in IPM plots was lower than farmers practice by 80.45 and 68.24% respectively. The weed dry biomass at in IPM plots was lower by 80.07 and 89.70% respectively and contributed to the mean grain yield advantage of 16.89 %.

Union Territory of Puducherry- Puducherry: The IPM field trial was conducted in the villages of Thondamanatham, Katterikuppam with variety ADT 58. The weed population at Active Tillering and Panicle Initiation stages in IPM plots was lower than farmers practice by 48.83 and 52.70% respectively; with lower weed biomass in IPM implemented fields by 43.20 and 52.29%. The mean grain yield advantage was14.33% in IPM adopted plots.

The Integrated Pest Management special (IPMs) trial was conducted at 15 locations during *Kharif* 2023 with an objective of managing all pests i.e., weeds, insects, diseases in a holistic way in farmer's fields involving them in a participatory mode. Across the locations, weeds, insect pests and disease incidence were significantly low in IPM plots. IPM implemented plots resulted mean grain yield advantage was 49.07%, 4.36%, 25.50%, 20.65%, 18.77%,21.04% and 14.53% respectively in Zone-I, II, III, IV, V, VI and VII over the farmer practices. In IPM adopted fields, the mean weed population reduction over the Zones ranged from 4.65 % in Zone-I (Hills) to 80.45% in Zone-VII (Southern) at Active Tillering stage and from 9.70 % in Zone-III (Eastern) to 69.24% in Zone-VI (Western) at Panicle Initiation stage respectively. The dry weed biomass reported by 10 locations showed that, both Active Tillering AND Panicle Initiation stages were significantly reduced by 18.19% in Zone III (Eastern) to

80.07% in Zone-VII (Southern); 13.29% in Zone III (Eastern) to 89.70% in Zone-VII (Southern) respectively.

Table 4.4.5: Yield parameters and Grain yield & weed population no/m2,weed biomass g/m2 of Integrated Pest Management - on farm management of insects, diseases and weeds IPMs (Entomology, Pathology and Agronomy)-Special Interdisciplinary trial, Kharif 2023.

Location	Treatments	Panicle No/m^2	Panicle wt (g)	Grain Yield t/ha	Yield advantage	Straw Yield t/ha	Weed population no/m^2		Weed dry biomass g/m^2	
							Active tillering stage	Panicle initiation stage	Active tillering stage	Panicle initiation stage
ZONE-I										
MALAN	IPM	224	1.96	3.26		3.82	41.00(6.44)	36.00(6.03)	30.47	55.53
	Farmers Practice	183	1.38	1.66	49.07	1.84	43.00(6.50)	43.00(6.59)	75.84	68.80
	Exp. mean	203	1.67	2.46		2.83	6.47	6.31	53.15	62.17
	CD(0.05)	9	0.3	0.35		0.47	2.65	0.08	54.96	19.97
ZONE-II										
KAUL	IPM			4.45			1.00(1.03)	0.40(0.88)		
	Farmers Practice			4.13	7.19		0.60(0.99)	0.10(0.76)		
	Exp. mean			4.29			1.01	0.82		
	CD(0.05)			0.53			0.76	0.32		
LUDHIANA	IPM	357	3.49	8.45		10.48		5.25(2.31)		
	Farmers Practice	349	3.43	8.32	1.53	10.36		6.50(2.53)		
	Exp. mean	353	3.46	8.38		10.42		2.42		
	CD(0.05)	3	0.03	0.12		0.05		0.59		
ZONE-III										
CHIPLIMA	IPM	239	25.9	4.66		5.62		106.80(10.34)		
	Farmers Practice	209	19.7	4.44	22	5.16		142.80(11.95)		
	Exp. mean	224	22.8	4.55		5.39		11.15		
	CD(0.05)	15	1.56	0.31		0.35		0.3		
MASODHA	IPM			5.44			2.98(1.86)	6.20(2.56)	0.44	0.92
	Farmers Practice			3.61	33.68		13.03(3.67)	9.97(3.23)	1.93	1.42
	Exp. mean			4.52			2.76	2.9	1.19	1.17
	CD(0.05)			0.28			0.26	0.34	0.25	0.26
PUSA	IPM			5.91			11.21(3.41)	12.74(3.64)	12.95	14.87
	Farmers Practice			4.68	20.81		13.58(3.75)	14.11(3.82)	15.83	17.15
	Exp. mean			5.30			3.58	3.73	14.39	16.01
	CD(0.05)			0.28			0.36	0.15	1.95	1

Table 4.4.5: Contd.

Location	Treatments	Panicle No/m²	Panicle wt (g)	Grain Yield t/ha	Yield advantage	Straw Yield t/ha	Weed population no/m²		Weed dry biomass g/m²	
							Active tillering stage	Panicle initiation stage	Active tillering stage	Panicle initiation stage
ZONE-IV										
TITABAR	IPM	228	5.74	4.26	20.65	9.98		33.80(5.84)		17.3
	Farmers Practice	194	4.36	3.38		7.58		67.00(8.12)		31.52
	Exp. mean	211	5.05	3.82		8.78		6.98		24.41
	CD(0.05)	6	0.52	0.13		1.02		0.89		9.86
ZONE-V										
JAGDALPUR	IPM			4.58	18.77		3.40(1.93)	7.47(2.78)		
	Farmers Practice			3.72			5.73(2.46)	11.73(3.47)		
	Exp. mean			4.15			2.19	3.13		
	CD(0.05)			0.39			0.16	0.34		
ZONE-VI										
NAVSARI	IPM	339	5.02	5.40	6.48	7.80	7.00(2.70)	10.60(3.31)	8.84	13.68
	Farmers Practice	313	4.54	5.05		7.48	17.40(4.23)	20.40(4.57)	21.29	24.16
	Exp. mean	326	4.78	5.23		7.64	3.47	3.94	15.06	18.92
	CD(0.05)	9	0.45	0.08		0.22	0.44	0.32	2.68	3.49
NAWAGAM	IPM			4.69	11.51		78.45(8.65)	81.53(9.03)	33.7	48.91
	Farmers Practice			4.15			130.25(11.33)	153.74(12.28)	121.67	70.4
	Exp. mean			4.42			9.99	10.65	77.69	59.65
	CD(0.05)			6.95			1.34	1.11	111.3	14.49
VADAGOAN	IPM	265	5.77	6.36	45.12	6.7	11.88(3.51)	18.93(4.40)	21.72	30.96
	Farmers Practice	188	3.24	3.49		4.37	51.53(7.21)	61.55(7.87)	91.85	102.91
	Exp. mean	226	4.5	4.92		5.53	5.36	6.14	56.78	66.94
	CD(0.05)	10	0.2	0.1		0.21	0.33	0.19	6.32	6.03

Table 4.4.5: Contd.

Location	Treatments	Panicle No/m²	Panicle wt (g)	Grain Yield t/ha	Yield advantage	Straw Yield t/ha	Weed population no/m²		Weed dry biomass g/m²	
							Active tillering stage	Panicle initiation stage	Active tillering stage	Panicle initiation stage
ZONE-VII										
ADUTHURAI	IPM			6.44			7.20(2.75)	8.60(2.99)	9.1	7.2
	Farmers Practice			5.4	16.14		18.20(4.21)	22.20(4.73)	11.14	13.02
	Exp. mean			5.92			3.48	3.86	10.12	10.11
	CD(0.05)			0.13			1.06	0.42	2.75	3.17
GANGAVATHI	IPM	381	2.99	7.26		8.76	212.00(14.57)	233.40(15.27)	1548.2	1164.09
	Farmers Practice	264	2.46	6.48	10.74	7.91	455.20(21.33)	549.60(23.43)	2101	2209.42
	Exp. mean	322	2.72	6.87		8.33	17.95	19.35	1824.6	1686.75
	CD(0.05)	118	0.19	0.55		0.49	0.79	0.77	281.38	254.21
MANDYA	IPM	372	3.09	7.34		9.27	3.40(1.91)	9.40(3.14)	1.55	7.41
	Farmers Practice	352	2.98	6.1	16.89	8.48	17.40(4.22)	29.60(5.41)	7.78	71.95
	Exp. mean	362	3.04	6.72		8.87	3.07	4.27	4.66	39.68
	CD(0.05)	9	0.13	1.59		1.45	0.51	0.86	1.41	71.14
PUDUCHERRY	IPM	289	2.64	6.35		9.24	52.46(7.26)	36.67(6.08)	32.58	22.4
	Farmers Practice	253	2.47	5.44	14.33	7.72	102.53(10.14)	77.53(8.82)	57.4	47.42
	Exp. mean	271	2.55	5.9		8.48	8.7	7.45	44.99	34.91
	CD(0.05)	1	0.01	0.03		0.05	0.25	0.12	1.51	2.91

Table 4.4.5: Contd.

ZONES	CENTERS	Weed Population (% reduction in IPM)		Weed dry biomass (% reduction in IPM)	
		Active tillering stage	Panicle initiation stage	Active tillering stage	Panicle initiation stage
ZONE-I	MALAN	4.65	16.27	59.82	19.28
ZONE-II	KAUL	40.00	75.00	-	-
	LUDHIANA	-	19.23	-	-
ZONE-III	CHIPLIMA	-	25.21	-	-
	MASODHA	77.21	37.81	77.20	35.21
	PUSA	17.45	9.70	18.19	13.29
ZONE-IV	TITABAR	-	49.55	-	45.11
ZONE-V	JAGDALPUR	40.66	36.31	-	-
ZONE-VI	NAVASARI	59.77	48.03	58.47	42.63
	NAWAGAM	39.76	46.96	72.67	30.52
	VADAGOAN	76.94	69.24	76.35	69.91
ZONE-VII	ADUTHURAI	60.43	61.26	17.89	43.93
	GANGAVATHI	53.42	57.53	26.31	47.31
	MANDYA	80.45	68.24	80.07	89.70
	PUDUCHERRY	48.83	52.70	43.20	52.29

Influence of Establishment Methods on Pest Incidence (IEMP)

During *Kharif* 2023, the trial was conducted at 12 locations, *viz*. Aduthurai, Chinsurah, Ghaghraghat, Jagdalpur, Malan, Moncompu, Nawagam, Pantnagar, Pusa, Pattambi, Rajendranagar and Titabar.

Across locations, the incidence of stem borer, gall midge, leaf folder, whorl maggot, hispa, caseworm, thrips, blue beetle, brown planthopper and white-backed planthopper was observed in all the crop establishment methods during *Kharif* 2023. The incidence of dead hearts was high in puddled direct seeding (12.9% DH) and was at par with direct seeding (12.1% DH) and aerobic rice as compared to other methods (**Figure…**). The incidence of white ears was significantly higher in aerobic rice (11.4% WE) followed by mechanical transplanting (10% WE). White ear incidence was low in semi-dry rice, normal transplanting and puddled direct seeding. Gall midge incidence was significantly high in semi-dry rice (14.1% SS) and very low in puddled direct seeding, mechanical transplanting, normal transplanting and aerobic rice.

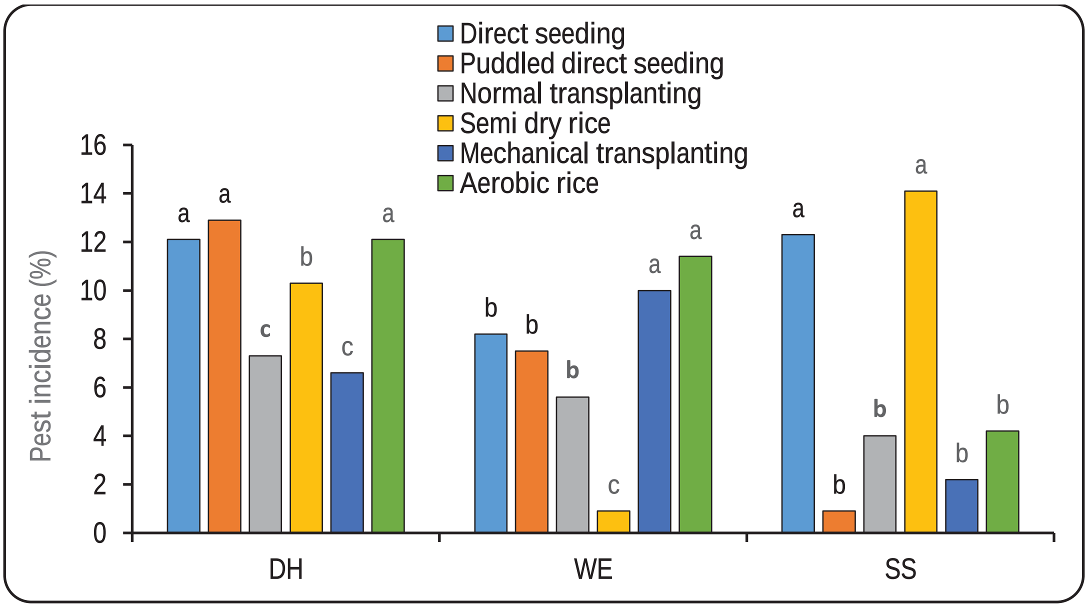

Figure 1. Incidence of stem borer and gall midge in different crop establishment methods across locations

Among the foliage-feeding insects, leaf folder incidence was significantly high in semi-dry rice (14.2% LFDL) and low in mechanical transplanting (2.6% LFDL). The incidence of whorl maggot (4.5% WMDL), hispa (7.3% HDL) and caseworm (3.8% CWDL) were significantly high in direct seeding as compared to other establishment methods (**Figure….**). The incidence of thrips was significantly high in puddled direct seeding (11.7% THDL) and was at par with normal transplanting (11.2% THDL) compared to direct seeding (0.8% THDL). Incidence of blue beetle was low in normal transplanting and semi-dry rice (<1% BBDL).

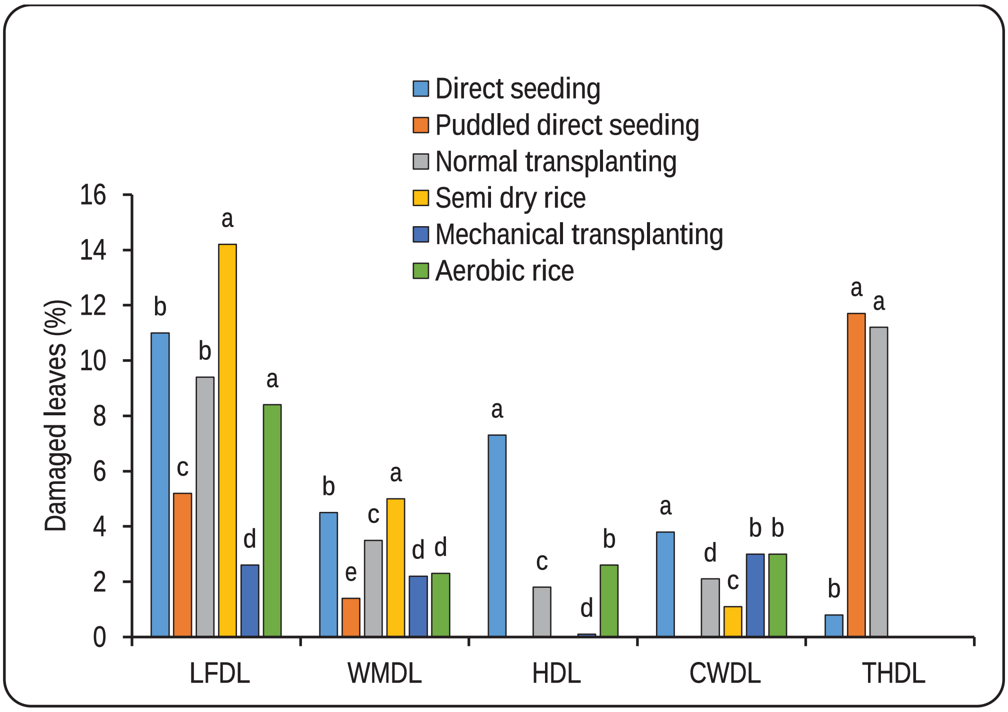

Figure 2. Incidence of foliage-feeding insects in different crop establishment methods across locations

Among the sucking pests, a low incidence of BPH (<4/5 hills) and WBPH (<6/5 hills) was observed in all four-crop establishment methods such as direct seeding, normal transplanting, mechanical transplanting and aerobic rice (**Figure 3**).

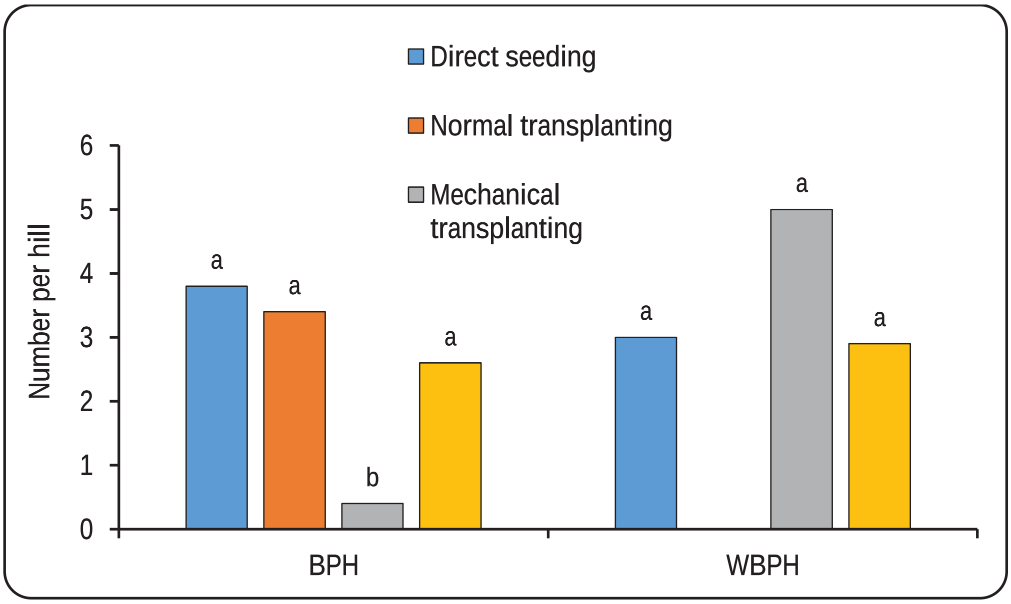

Figure 3. Incidence of sucking pests in different crop establishment methods across locations

Influence of crop establishment methods on pest incidence (IEMP), a collaborative trial with Agronomy, was conducted at 12 locations during Kharif 2023. Across the locations, the incidence of dead hearts (12.1%) and white ears (11.4%) caused by stem borer was significantly high in aerobic rice followed by direct seeding and puddled direct seeding. Gall midge (14.1% SS) and leaf folder (14.2% LFDL) incidence was significantly high in semi-dry rice followed by direct seeding. The incidence of thrips was significantly high in puddled direct seeding (11.7% THDL) and was at par with normal transplanting (11.2% THDL). The incidence of caseworm, blue beetle, BPH and WBPH was low in all the establishment methods. Overall, the incidence of insect pests was high in aerobic rice followed by direct seeding and semi-dry rice while the incidence was low in normal transplanting and mechanical transplanting methods of crop establishment.

ANNEXURES

Annexure - I

Major weeds observed during *Kharif* - 2023

Grasses	Sedges	BLW
Cynodon dactylon	*Cyperus difformis*	*Ammania baccifera*
Dactylactenium aegyptium	*Cyperus iria*	*Alternanthera philxeroides*
Echinochloa colona	*Cyperus procerus*	*Alternanthera sessilis*
Echinochloa crusgalli	*Cyperus rotundus*	*Alternanthera spp.*
Hymenachne spp	*Eleocharis dulcis*	*Bergia capensis*
Isachne miliacea	*Fimbristylis miliacea*	*Caesulia axillaris*
Leptochloa chinensis	*Scirpus maritimus*	*Eclipta alba*
Leersia hexandra		*Euphorbia prostrata*
Panicum repens		*Glinus oppositifolius*
Panicum tripheron		*Hydrolea zylamica*
		Ludwigia hyssopifolia
		Ludwigia parviflora
		Lindernia spp.
		Marsilea quadrifolia
		Monochoria vaginalis
		Rotala densiflora
		Sphaeranthus indicus
		Sphaeranthus zeylanica
		Spilanthus acmella

Annexure - II

WEATHER DATA – KHARIF 2023

ADUTHURAI							
Latitude :	11^{o} N		Longitude:	79.3^{O}E		Elevation(m) :	19.47 MSL
Soil type:	Clay		Soil pH :	7.2		Soil texture :	Clay Loam
	June	July	Aug	Sept	Oct	Total / Range	
No. of Rainy days	3	2	6	6	3	20	
Total Rainfall (mm)	79.8	14.8	120.9	31.4	17.2	264.1	
Avg. Max. Temp. (^{0}C)	36.4	35.6	36.5	34.8	34.2	34.2-36.5	
Avg. Mini. Temp. (^{0}C)	25.6	25.6	27.1	24.6	24.6	24.6-27.1	
Avg. Sunshine hours	5.5	3.8	5.8	7.5	4.2	5.36	
Avg. wind velocity (kmph)	3.8	8.1	6.2	6.5	3.7	5.66	

ALMORA							
Latitude :	29^{0}.36'N		Longitude:	79^{0}.40'E		Elevation(m) :	1250
Soil type:	Clay loam		Soil pH :	6.5		Soil texture :	clay
	May	June	July	Aug	Sep	Oct	Total / Range
No. of Rainy days	8	8	20	14	9	2	61
Total Rainfall (mm)	41.0	47.5	219.65	111.95	165.5	22.2	607.8
Avg. Max. Temp. (^{0}C)	28.6	32.1	29.4	29.7	30.0	28.6	28.6-32.1
Avg. Mini. Temp. (^{0}C)	12.3	17.2	20.6	20.4	19.0	10.4	10.4-20.6
Avg. Sunshine hours	8.17	5.55	2.98	3.87	5.57	7.80	5.656

BANKURA							
Latitude :	23.24185		Longitude:	87.05715		Elevation (m):	84 MSL
Soil type:	Red & Lateritic		Soil pH :	4.5 – 6.0		Soil texture	Sandy Loam
	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Total / Range
No. of rainy days	9	11	7	6	3	4	40
Total rainfall (mm)	7.42	23.1	18.7	54.2	1.02	77.98	182.42
Avg. Max Temp. (°C)	35.29	33.87	35.06	34.76	30.02	25.8	25.8-35.29
Avg. Min.Temp. (°C)	27.70	28.06	26.58	26.65	17.7	13.4	13.4-28.06
* Avg. Sunshine hours	13.24	12.54	12.18	11.36	11.3	10.45	11.84
* Avg. wind velocity	1.5	1.1	1.0	0.5	0.8	0.9	0.98

CANNING							
Latitude :	22.30489° N		Longitude:	88.6656° E		Elevation (m) :	6 m
Soil type:	Saline		Soil pH :	7.0-8.0		Soil texture	Heavy texture
	July	Aug	Sep	Oct	Nov	Dec	Total / Range
No. of Rainy days	19	19	17	6	1	0	62
Total Rainfall (mm)	278.4	470.8	295.2	140.4	4.6	1.6	1191
Avg. Max. Temp. (^{0}C)	33.1	32.8	32.7	33.0	31.0	26.1	26.1-33.1
Avg. Mini. Temp. (^{0}C)	27.2	26.8	26.2	25.0	19.6	15.3	15.3-27.2
Avg. Sunshine hours	5.3	3.2	3.5	5.7	6.5	5.8	5.00
Avg. wind velocity	7.8	6.2	5.0	3.3	2.1	2.4	4.47

CHATHA							
Latitude:	32^{0} 40'N		Longitude:	74^{0} 48'E		Elevation (m) :	293
Soil type:	-		Soil pH :	-		Soil texture:	Clay loam
	June	July	Aug	Sept	Oct	Nov	Total / Range
No. of Rainy days	06	10	12	8	4	3	43
Total Rainfall (mm)	182.06	388.8	356.2	114.6	100.0	66.8	1208.46
Avg. Max. Temp. (^{0}C)	36.20	33.6	34.8	33.9	30.3	26.2	26.2-36.2
Avg. Mini. Temp. (^{0}C)	24.2	25.5	25.2	23.1	16.3	10.9	10.9-25.5
Avg. Sunshine hours	6.3	4.8	6.3	6.4	7.6	6.0	6.23

CHINSURAH							
Latitude :	22°52´ N		Longitude	88°24´ E		Elevation:	8.62 m MSL
Soil type:	Clay Loam		Soil pH :	7.3		Soil texture:	Gangetic Alluvial
	June	July	Aug	Sep	Oct	Nov	Total/Range
No. of Rainy days	12	20	21	20	8	1	82
Total Rainfall (mm)	168.4	148.4	249.3	157.3	153.4	3.4	880.2
Avg. Max. Temp. ('0C)	36.7	34.8	33.0	33.6	31.5	29.8	29.8-36.7
Avg. Mini. Temp. ('0C)	26.4	27.1	26.1	27.1	23.6	18.0	18.0-27.1

CHIPLIMA							
Latitude :	20⁰21'N		Longitude:	80⁰55'E		Elevation (m) :	178.8 m MSL
Soil type:	Mixed Red, Black &Lateritic		Soil pH :	-		Soil texture:	-
	July	Aug	Sep	Oct	Nov	Dec	Total / Range
No. of Rainy days	20	17	14	3	-	3	57
Total Rainfall (mm)	331.8	347.4	242	86.6	-	37.2	1045
Avg. Max. Temp. (⁰C)	32.8	30.9	31.2	31.5	29.6	25.8	25.8-32.8
Avg. Mini. Temp. (⁰C)	25.8	25.4	25.2	21.8	18.2	13.4	13.4-25.8

COIMBATORE						
Latitude:	11˚N		Longitude:	77˚E	Elevation (m):	426.72
Soil type:	Clay		Soil pH:	7.8	Soil texture:	Heavy
	Aug	Sep	Oct	Nov	Dec	Total / Range
No. of Rainy days	1	2	4	13	-	20
Total Rainfall (mm)	6.6	11.8	34.5	391.7	-	444.6
Avg. Max. Temp. (⁰C)	31.5	32.5	32.9	30.0	30.4	30-32.9
Avg. Mini. Temp. (⁰C)	23.4	23.8	23.6	22.9	23.3	22.9-23.8
* Solar radiation (CAL/CM²)	315.1	314.0	322.5	313.0	343.7	321.66
Avg. Sunshine hours	4.7	5.0	6.1	5.4	6.8	5.60
Avg. wind velocity	12.0	8.0	4.4	4.4	3.9	6.54

DHANGAIN							
Latitude:	-		Longitude:			Elevation (m):	-
Soil type:	Clay		Soil pH :	7.2-7.5		Soil texture	Clay and fine
	June	July	Aug	Sep	Oct	Nov	Total / Range
No. of rainy days	05	09	08	10	06	0	38
Total rainfall (mm)	85.8	178.0	123.6	158.8	213.6	0	759.8
Avg. Max Temp. (°C)	43.2	35.5	34.2	33.2	31.6	29.3	29.3-43.2
Avg. Min.Temp. (°C)	32.5	28.7	25.3	24.9	20.8	17.9	17.9-32.5

GANGAVATHI							
Latitude:	15'15'40''		Longitude:	76'31'40''		Elevation (m):	-
Soil type:	Medium black		Soil pH:	6.5 to 7.5		Soil texture:	-
	July	Aug	Sep	Oct	Nov	Dec	Total / Range
No. of Rainy days	11	2	6	0	2	0	21
Total Rainfall (mm)	104.5	13.0	52.2	0	38.50	0	208.2
Avg. Max. Temp. (⁰C)	30.78	32.93	31.29	32.15	30.15	29.77	29.77-32.93
Avg. Mini. Temp. (⁰C)	24.01	23.86	23.77	21.93	21.54	18.23	18.23-24.01

JAGDALPUR							
Latitude:	19.05 ⁰N		Longitude:	82.02⁰E		Elevation (m):	552
Soil type:	Alfisol		Soil pH:	6.5		Soil texture:	Sandy loam
	June	July	Aug	Sep	Oct	Nov	Total / Range
No. of Rainy days	9	16	16	14	1	1	57
Total Rainfall (mm)	232.9	398.3	213.3	232.3	6.2	15.8	1098.8
Avg. Max. Temp. (⁰C)	35.7	29.5	29.9	29.4	31.7	30.4	29.4-35.7
Avg. Mini. Temp. (⁰C)	22.7	22.6	22.1	22.1	17.9	16.1	16.1-22.7
Avg. Sunshine hours	5.2	2.8	2.5	3.0	7.6	5.8	4.48
Avg. wind velocity	3.4	4.2	3.4	2.6	1.5	1.5	2.77

KARJAT							
Latitude:	18⁰ 55' N		Longitude:	73⁰ 18' N		Elevation (m):	51 m
Soil type:	Medium Black		Soil pH:	6.2		Soil texture:	Clay Loam
	June	July	Aug	Sep	Oct	Nov	Total / Range
No. of Rainy days	10	31	25	22	2	2	92
Total Rainfall (mm)	462.8	2238.1	392.9	612.6	83	41.8	3831.2
Avg. Max. Temp. (⁰C)	35.16	27.4	30.29	30.15	34.35	34.2	27.4-35.16
Avg. Mini. Temp. (⁰C)	26.07	24.4	24.63	24.16	23.02	19.92	19.92-26.07
Avg. Sunshine hours	00	0.5	2.67	4.76	6.08	5.88	3.32
Avg. wind velocity	6.85	4.1	2.87	1.7	0.72	0.56	2.80

KAUL							
Latitude:	29^0 51' 29.5"N		Longitude:	76^0 39' 24.3" E		Elevation (m):	230.7
Soil type:	Clay Loam		Soil pH:	8.04		Soil texture:	Clay
	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Total / Range
No. of Rainy days	8	13	3	3	2	1	30
Total Rainfall (mm)	166.9	388.5	20.0	52.9	30.6	11.3	670.2
Avg. Max. Temp. (^{0}C)	36.1	27.0	34.3	34.3	32.2	27.8	27-36.1
Avg. Mini. Temp. (^{0}C)	24.6	20.5	26.2	23.9	16.8	11.9	11.9-26.2
Pan evaporation (mm)	6.5	-	2.3	2.4	2.4	1.5	
Avg. Sunshine hours	6.8	2.7	6.5	7.4	7.8	4.8	6.00
Avg. wind velocity	5.7	3.9	2.8	1.9	1.7	0.9	2.82

KHUDWANI								
Latitude:	34^0 N		Longitude:	73^{0}E		Elevation (m):		1560 m amsl
Soil type:	Clayey loam		Soil pH:	Neutral		Soil texture:		Silty clay loam
	Apr	May	June	July)	Aug	Sep	Oct	Total / Range
No. of Rainy days	9	8	4	8	1	1	2	33
Total Rainfall (mm)	146.4	85.7	62.4	187.1	9.2	27.6	44.4	562.8
Avg. Max. Temp. (^{0}C)	19.8	22.4	29.1	28.5	31.4	30.0	22.6	19.8-31.4
Avg. Mini. Temp. (^{0}C)	7.3	10.2	15.9	18.5	18.5	15.1	7.2	7.2-18.5

LUCKNOW							
Latitude:	27.47		Longitude:	80.21		Elevation (m):	126
Soil type:	Alkali		Soil pH:	~9.6, 0.89 dSm^{-1}		Soil texture:	Loam (sandy to clayey)
	June	July	Aug	Sep	Oct	Nov	Total / Range
No. of Rainy days	4	12	12	6	1	2	37
Total Rainfall (mm)	51	315	306	288	7	7	974
Avg. Max. Temp. (^{0}C)	39	35	34	34	34	29	29-39
Avg. Mini. Temp. (^{0}C)	28	28	27	26	20	14	14-28
Avg. Sunshine hours	8	5	4	6	8	5	6.00
Avg. wind velocity	7	2	4	2	2	1	3.00

LUDHIANA								
Latitude:	30° 54'N		Longitude:	75° 48'E		Elevation (m):		247 MSL
Soil type:	Loamy Sand		Soil pH:	7.7		Soil texture:		-
	May	June	July	Aug	Sep	Oct	Nov	Total / Range
No. of Rainy days	9	6	13	6	7	4	2	47
Total Rainfall (mm)	48.40	94.00	212.4	77.60	55.00	34.00	28.60	550
Avg. Max. Temp. (^{0}C)	35.59	36.83	33.09	34.63	33.21	30.77	26.25	26.25-36.83
Avg. Mini. Temp. (^{0}C)	21.27	26.34	27.34	27.41	25.04	17.81	13.14	13.14-27.41
Avg. Sunshine hours	8.60	8.17	4.59	6.78	7.30	8.75	5.47	7.09
Avg. wind velocity	5.16	5.35	4.64	3.34	2.28	2.18	1.55	3.50

MALAN						
Latitude :	32^0 1' N		Longitude:	76^0 20' E	Elevation(m) :	950 M
Soil type:	Alfisol		Soil pH :	5.6-5.8	Soil texture :	Silty Clay Loam
	June	July	Aug.	Sep.	Oct.	Total / Range
No. of Rainy days	3	16	13	6	4	42
Total Rainfall (mm)	30.8	174.58	133.2	83.40	14.80	43.7
Avg. Max. Temp. (^{0}C)	33.66	30.92	30.15	29.90	30.01	29.90-33.66
Avg. Mini. Temp. (^{0}C)	16.42	16.32	17.00	16.95	16.36	16.32-17.00

MANDYA								
Latitude :	12.45-13.57 N			Longitude:	76.48 - 78.24 E	Elevation(m) :		695 M
Soil type:	Sandy loam			Soil pH :	6.5 – 7.1	Soil texture		Sandy loam
	July	Aug	Sep	Oct.	Nov	Dec		Total / Range
No. of Rainy days	5	2	6	4	5	0		22
Total Rainfall (mm)	40.00	45.70	65.60	89.50	56.60	0		297.4
Avg. Max. Temp. (^{0}C)	28.60	32.30	28.20	31.30	29.70	29.80		28.20-32.30
Avg. Mini. Temp. (^{0}C)	19.50	19.40	20.60	19.40	19.40	18.00		18.00-20.60
* Avg. Sunshine hours	0.0	0.50	6.70	7.10	6.40	6.50		4.53
*Avg. wind velocity	6.70	4.70	4.30	1.90	2.00	2.10		3.61

MARUTERU							
Latitude :	16.38° N		Longitude:	81.44° E		Elevation (m):		5m
Soil type:	Black alluvial clay		Soil pH :	6.5-7.5		Soil texture		Delta alluvial
	June	July	Aug	Sep	Oct	Nov	Dec	Total / Range
No. of rainy days	7	17	8	9	1	4	3	49
Total rainfall (mm)	71.1	197.3	119.3	79.4	8.1	25.2	275.8	776.2
Avg. Max Temp. (°C)	35.1	31.4	30.5	31.2	33.4	30.6	28.7	28.7-35.1
Avg. Min.Temp. (°C)	22.9	24.8	27.1	27.1	26.9	22.3	20.8	20.8-27.1
* Solar radiation (CAL/CM^2)	83.9	85.4	84.0	87.6	80.3	86.4	85.2	84.69
* Avg. Sunshine hours	5.32	3.04	4.55	2.79	2.98	2.31	2.21	3.31
* Avg. wind velocity	15.25	9.42	6.04	3.77	1.96	2.04	2.8	5.89

MONCOMPU							
Latitude :	9°26'15"N		Longitude:	76°25'42"E		Elevation(m) :	1-2.5m below MSL
Soil type:	Alluvial clay		Soil pH :	5.5		Soil texture :	Silty Clay Loam
	June	July	Aug	Sep	Oct	Nov	Total / Range
No. of Rainy days	21	19	4	23	16	13	96
Total Rainfall (mm)	316.1	506.3	90.6	442.5	348.7	290.4	1994.6
Avg. Max. Temp. (^{0}C)	32.7	30.5	33.0	32.1	32.5	32.7	30.5-33.0
Avg. Mini. Temp. (^{0}C)	25.9	24.2	26.9	26.6	26.6	26.9	24.2-26.9

NAGINA							
Latitude :	29^0 28'N		Longitude:	78^0 32'E		Elevation(m) :	450
Soil type:	Sandy loam		Soil pH :	7.5		Soil texture :	
	June	July	Aug	Sep	Oct	Nov	Total / Range
No. of Rainy days	05	13	10	06	02	00	36
Total Rainfall (mm)	290.6	522.6	224.6	341.6	32.6	00	1412
Avg. Max. Temp. (^{0}C)	34.5	31.6	32.8	32.9	31.4	27.4	27.4-34.5
Avg. Mini. Temp. (^{0}C)	23.5	19.4	25.1	23.4	15.9	10.0	10.0-25.1
Avg. Sunshine hours	5.9	7.4	5.3	4.8	7.2	6.1	6.11
Avg. wind velocity	5.1	4.4	4.4	2.9	1.8	1.7	3.38

NAVASARI								
Latitude:	20° 29'		Longitude:	73o 29'		Elevation (m):		105 m
Soil type:	Clayey		Soil pH :	7.5		Soil texture		Loamy
	June	July	Aug	Sep	Oct	Nov	Dec	Total / Range
No. of rainy days	9	26	7	12	0	2	0	56
Total rainfall (mm)	306	1130.7	40	289	0	42	0	1807.7
Avg. Max Temp. (°C)	33.8	29.5	30.6	31.8	35.1	33.7	30.9	29.5-35.1
Avg. Min.Temp. (°C)	26.9	24.8	25.2	24.3	21.8	19.1	17.1	26.9-17.1
* Avg. Sunshine hours	6.2	0.9	3.2	4.5	8.2	7.3	6.1	5.2
* Avg. wind velocity	7.9	4.4	6.0	2.1	0.7	1.6	2.0	3.52

NAWAGAM							
Latitude:	22^0 48'		Longitude:	71^0 3'		Elevation (m):	32.4
Soil type:	Medium Black		Soil pH :	7.8		Soil texture	Sandy Clay loam
	May	June	July	Aug	Sep	Oct	Total / Range
No. of rainy days	02	07	15	03	06	00	33
Total rainfall (mm)	40.0	214.8	334.4	19.0	126.1	00	734.3
Avg. Max Temp. (°C)	41.0	36.0	32.2	31.4	32.3	34.8	31.4 -41.0
Avg. Min.Temp. (°C)	24.9	25.1	24.9	24.3	25.2	21.1	21.1-25.2
* Avg. Sunshine hours	10.9	6.2	3.8	4.6	6.0	8.9	6.73
* Avg. wind velocity	5.5	8.3	3.5	2.7	2.1	0.3	3.73

NRRI CUTTACK							
Latitude	20.5N		Longitude:	86.0N		Elevation (m):	23.48
Soil type:	Clay loam		Soil pH :	6.9		Soil texture	
	July	Aug	Sep	Oct	Nov	DEC	Total / Range
No. of rainy days	7	7	14	3	0	1	32
Total rainfall (mm)	128	90.8	297	142.0	0	20	677.8
Avg. Max Temp. (°C)	32	33.2	31.9	31	31.0	27.6	27.6-33.2
Avg. Min.Temp. (°C)	27.5	25.9	25.0	25.2	23.9	16.9	16.9-27.5
* Avg. Sunshine hours	3.9	2.7	4.0	1.9	5.7	4.8	3.83
* Avg. wind velocity	-	-	5.0	-	-	-	5.0

PANTNAGAR						
Latitude:	29 degree North		Longitude:	79 degree 30'' East		Elevation (m):	243.84 m,
Soil type:	Clay-loam		Soil pH:	8.06		Soil texture:	Clay-loam
	June	July	Aug	Sep	Oct	Nov	Total / Range
No. of Rainy days	5	15	15	8	1	0	44
Total Rainfall (mm)	119.6	603.6	395.2	301.8	7.4	0	1427.6
Avg. Max. Temp. (^{0}C)	37.1	32.3	32.3	32.9	31.7	28.2	28.2-37.1
Avg. Mini. Temp. (^{0}C)	24.2	26.2	25.9	24.8	17.9	13	13-26.2
Avg. Sunshine hours	8.3	4.5	3.8	6.3	8.6	6.9	6.40
Avg. wind velocity	6.4	3.9	2.4	1	0.4	0.8	2.48

PANVEL							
Latitude:	18^o 59'		Longitude:	73^0 10'E		Elevation (m) :	5 m MSL
Soil type:	Coastal saline		Soil pH :	7 - 8		Soil texture :	Silty clay
	June	July	Aug	Sep	Oct	Nov	Total / Range
No. of Rainy days	10	28	29	19	2	3	91
Total Rainfall (mm)	626.2	1909.4	378.8	559.4	25.4	11.0	3510.2
Avg. Max. Temp. (^{0}C)	29.72	28.57	31.54	31.72	36.75	36.17	28.57-36.75

PATTAMBI							
Latitude:	10.770388		Longitude:	76.37706		Elevation (m):	63M
Soil type:	LATERITE		Soil pH:			Soil texture:	
	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Total / Range
No. of Rainy days	14	18	4	20	11	9	76
Total Rainfall (mm)	304.9	545.7	48.5	461.5	249	351	1960.6
Avg. Max. Temp. (^{0}C)	31.4	29.1	31.0	30.2	31.0	32.7	29.1-32.7
Avg. Mini. Temp. (^{0}C)	22.8	21.7	33.4	22.6	22.1	21.6	21.6-33.4
Avg. Sunshine hours	113.3/3.7	92.3/2.9	193/6.2	99.8/3.3	143.1/4.6	196.8/6.5	
Avg. wind velocity	94.4/3.1	82.3/2.6	80.3/2.5	83.9/2.7	56.4/1.8	69.4/2.3	

PUSA							
Latitude:	25.97 N		Longitude:	85.64 E		Elevation (m):	52.0
Soil type:	calcareous		Soil pH:	8.2-8.4		Soil texture:	Sandy-loam
	June	July	Aug	Sep	Oct	Nov	Total / Range
No. of Rainy days	05	07	17	12	07	00	48
Total Rainfall (mm)	92.6	146.2	532.9	434.6	39.6	0.0	1245.9
Avg. Max. Temp. (^{0}C)	38.3	33.9	32.2	32.7	31.9	29.8	29.8-38.3
Avg. Mini. Temp. (^{0}C)	24.6	25.4	24.7	24.4	21.9	16.3	16.3-25.4
Avg. Sunshine hours	7.3	5.0	3.2	4.3	7.3	5.2	5.38
Avg. wind velocity	6.8	5.5	3.7	2.2	1.4	1.6	3.53

RAIPUR							
Latitude:	21^{o}16' N		Longitude:	80^o 36' E		Elevation (m):	298
Soil type:	Sandy loam		Soil pH:	-		Soil texture:	Clay loam
	July	Aug	Sep	Oct	Nov	Dec	Total / Range
No. of Rainy days	18	14	15	01	01	02	51
Total Rainfall (mm)	501.8	348.6	479.6	9.4	5.0	17.8	1362.2
Avg. Max. Temp. (^{0}C)	32.2	31.7	31.4	32.5	29.9	27.3	27.3-32.5
Avg. Mini. Temp. (^{0}C)	25.7	25.1	25.0	20.9	13.8	13.8	13.8-25.7
Avg. Sunshine hours	3.9	3.9	3.3	7.9	7.5	5.3	5.30
Avg. wind velocity	2.5	2.5	2.2	0.5	0.8	0.9	1.57

RAJENDRANAGAR							
Latitude:	17.32510^o		Longitude:	78.39912^o		Elevation (m):	586.60
Soil type:	Loamy		Soil pH:	-		Soil texture:	-
	July	Aug	Sep	Oct	Nov	Dec	Total / Range
No. of Rainy days	14	3	13	01	01	0	32
Total Rainfall (mm)	378.4	42.1	270.8	3.0	10.6	3.8	708.7
Avg. Max. Temp. (^{0}C)	29.2	31.1	30.0	32.0	30.2	28.3	28.3-32
Avg. Mini. Temp. (^{0}C)	23.3	23.2	22.5	19.9	19.8	15.0	15-23.3
Avg. Sunshine hours	2.7	5.8	4.2	7.6	5.1	6.6	5.33
Avg. wind velocity	10.4	7.0	5.9	3.3	3.6	3.2	5.57

RANCHI							
Latitude:	27^0 17' N		Longitude:	$85^0$19' E		Elevation (m):	625 m
Soil type:	Red Lateritic		Soil pH:	5.6		Soil texture:	Sandy loam
	June	July	Aug	Sep	Oct	Nov	Total / Range
No. of Rainy days	7.0	15.0	11.0	17.0	5.0	0.0	55
Total Rainfall (mm)	91.6	276.8	193.8	497.8	223.7	2.0	1285.7
Avg. Max. Temp. (^{0}C)	37.9	32.9	31.5	31.3	29.1	26.0	26-37.9
Avg. Mini. Temp. (^{0}C)	27.1	23.2	22.5	22.0	18.9	14.5	14.5-27.1
Avg. Sunshine hours	NA	NA	NA	NA	NA	NA	
Avg. wind velocity	2.8	2.3	2.3	2.3	2.3	2.2	2.37

REWA							
Latitude:	24^0 30' N		Longitude:	81^0 2' E		Elevation (m):	360 msl
Soil type:	Clay loam		Soil pH:	7.3		Soil texture:	Silty Clay loam
	Jun	Jul	Aug	Sep	Oct	Nov	Total / Range
No. of Rainy days	4	8	10	7	1	1	31
Total Rainfall (mm)	100.6	286.6	315.2	67.4	3.2	7.4	780.4
Avg. Max. Temp. (^{0}C)	38.0	35.0	32.0	34.0	34.0	29.0	29-38
Avg. Mini. Temp. (^{0}C)	26.0	25.0	24.0	25.0	18.0	14.0	14-26

TITABAR							
Latitude:	-		Longitude:	-		Elevation (m):	-
Soil type:	-		Soil pH:	-		Soil texture:	-
	Jun	Jul	Aug	Sep	Oct	Nov	Total / Range
No. of Rainy days	13	15	16	8	17	2	71
Total Rainfall (mm)	280.2	169.4	204.8	102.8	306.5	22.0	1085.7
Avg. Max. Temp. (^{0}C)	33.26	33.88	33.25	34.67	32.43	29.18	29.18-34.67
Avg. Mini. Temp. (^{0}C)	22.13	23.44	22.95	22.84	20.54	12.93	12.93-23.44
Avg. Sunshine hours	3.71	3.76	3.21	5.74	5.68	6.65	4.79

VADGAON MAVAL								
Latitude:	187-45 North		Longitude:		73 – 41 East		Elevation (m):	677.9 m
Soil type:	Medium		Soil pH:		6.5-7.5		Soil texture:	Clay-loam
	Upto May	June	July	Aug	Sep	Oct	Nov	Dec	Total / Range
No. of Rainy days	8	6	24	17	16	2	2	0	75
Total Rainfall (mm)	62.6	103.2	509.8	137.2	255.6	68.2	54.0	0.0	1190.6
Avg. Max. Temp. (^{0}C)	-	37.7	29.4	29.4	28.6	33.3	33.1	32.1	28.6-37.7
Avg. Mini. Temp. (^{0}C)	-	22.1	22.1	21.0	20.6	16.0	15.0	13.3	15.0-22.1

VARANASI							
Latitude:	25.18 N		Longitude:	80.30 E		Elevation (m):	-
Soil type:	-		Soil pH:	-		Soil texture:	-
	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Total / Range
No. of Rainy days	6	13	14	16	5	2	56
Total Rainfall (mm)	103.2	155.4	139.6	83.3	130.8	4.4	616.7
Avg. Max. Temp. (^{0}C)	39.83	35.74	32.95	33.86	32.71	29.49	29.49-39.83
Avg. Mini. Temp. (^{0}C)	24.43	26.44	23.95	25.90	21.13	16.52	16.52-26.44
Avg. Sunshine hours	8.9	6.6	3.1	5.4	7.3	4.3	5.93
Avg. wind velocity	5.9	5.3	4.5	3.9	1.9	0.98	3.75

WANGBAL							
Latitude:	24.8^0N		Longitude:	94^0E		Elevation (m):	781m
Soil type:	Clay loam		Soil pH:	5.5		Soil texture:	Fine
	Jun	Jul	Aug	Sep	Oct	Nov	Total / Range
No. of Rainy days	16	13	22	15	8	3	77
Total Rainfall (mm)	109.8	106	184.8	164.8	30.4	44.4	640.2
Avg. Max. Temp. (^{0}C)	35 ^{0}C	36^0C	35^0C	36^0C	33^0C	31^0C	31-36
Avg. Mini. Temp. (^{0}C)	19^0C	20 ^{0}C	19^0C	20 ^{0}C	16^0C	13^0C	13-20

Annexure - III

Details of product/material provided byprivate company/organization in *Rabi*- 2021-22 and *Kharif* - 2022

S.No.	Name of the product	Agro-Input-Agency
1	Sampoorna	Agricultural Research Station, Kerala Agricultural University, Trissur - 680656
2	Geoxol.com	Privi Life Sciences, Mumbai, Maharashtra 400709

Annexure - IV

ABBREVIATIONS

ADT	Aduthurai	**MDZ**	Medziphema
ALM	Almora (VPKAS)	**MNC**	Moncompu
ARD	Arundhutinagar	**MND**	Mandya
BNK	Bankura	**MTU**	Maruteru
CBT	Coimbatore	**NGN**	Nagina
CHN	Chinsura	**NLR**	Nellore
CHP	Chiplima	**NVS**	Navsari
CHT	Chatha	**NWG**	Nawagam
CKD	Chakdha	**PDG**	Phondaghat
CNG	Canning (CSSRI)	**PNT**	Pantnagar
CTK	Cuttak (NRRI)	**PNV**	Panvel
DNG	Dhangain	**POB**	Port Blair (CIARI)
FZB	Faizabad(Masodha)	**PSA**	Pusa
GER	Gerua (NRRI)	**PTB**	Pattambi
GGT	Ghaghraghat	**PTN**	Patna (Dhangain)
GNV	Gangavati	**PDC**	Puducherry
GRD	Giridih	**RCI**	Ranchi
HZB	Hazaribagh (NRRI)	**REW**	Rewa
JDP	Jagadalpur	**RGL**	Ragolu
KHD	Khudwani	**RNR**	Rajendranagar
KJT	Karjat	**RPR**	Raipur
KNP	Kanpur	**SBR**	Sabour
KRK	Karaikal	**TLJ**	Tuljapur
KRL	Karnal(CSSRI)	**TTB**	Titabar
KTA	Kota	**USG**	Upper Shillong
KUL	Kaul	**VDG**	Vadagaon
LCK	Lucknow	**VRN**	Varanasi
LDN	Ludhiana	**VTL**	Vytilla
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Soil Science

Progress Report of Soil Science Coordinated Program

(*Rabi* and *Kharif* - 2023)

SOIL SCIENCE

CONTENTS

Summary

5.1 Long term soil fertility management in rice-based cropping systems (RBCS)

From the study on long term soil fertility management in RBCS, 35th year results indicated superior performance of RDF + FYM in recording maximum grain yield at all three locations but was significantly superior to RDF at TTB and MND during *Kharif* only. FYM alone treatment was on par to RDF during rabi at TTB and *Kharif* at MND. Nutrient omission and reduction of NPK to 50% resulted in yield reduction at all three centers in both seasons. Fifty per cent (50%) reduction in NPK resulted in more loss at TTB compared to other two centres in both seasons. Addition of organics improved soil fertility in general. Considerable reduction of soil available NPK was observed in omission plots compared to RDF at all three locations. Supplementary dose of FYM along with RDF recorded higher growth rate in productivity with 80, 72 and 55 kg/ha/year at MTU, TTB and MND, respectively, over a period of 35 years.

5. 2. Soil quality and productivity assessment for bridging the yield gaps in farmers' Fields

This trial was, conducted in farmers' fields around a few selected centres – Chinsurah (pool of 31 farmers), Pantnagar (pool of 40 farmers), Kanpur (pool of 21 farmers) and Kaul (pool of 20 farmers) to assess the variability in soil nutrient supply, its relationship with rice yields at current recommended and farmers' fertilizer practices in some new farm sites and fine-tune the fertilizer nutrient requirement for specific target yields in a given environment and validation of fertilizer recommendations for targeted yields. The basic hypothesis aimed was that by systematically assessing soil quality and productivity and implementing appropriate management strategies, farmers can bridge yield gaps and achieve sustainable agricultural production in their fields. The *kharif* 2023 data received representing the irrigated and shallow lowland rice ecosystems. Sharp variations in mean grain yields recorded varied from 2.12 t/ha among low yielders to 4.74 t /ha among high yielders at Chinsurah, varied from 5.07 t/ha among low yielders to 6.97t /ha among high yielders at Kanpur, varied from 4.5 t/ha among low yielders to 5.8 t/ha among high yielders at Pantnagar, from 3.1 t/ha among low yielders to 5.8 t/ha among high yielders at Kaul. Soil Parameters data were pooled in different categories and the resulting soil quality index generated showed variations in the quality and health of the soil across different farmers categories. Fertilizer prescriptions were worked out for all the farm sites and specific fertilizer recommendations were suggested or target yield: Chinsurah – 4.76 t/ha Pantnagar - 6.0 t/ha, Kaul – 6.6 t/ha, Kanpur – 7.0 t/ha (being the highest yield recorded at the test sites) with reference to grain yields and average uptake of nutrients and nutrient requirement per ton grain yield recorded at the test sites. The poorest soil quality index was calculated for farmers from Chinsurah due to considerable variation among the farm sites and soil test values. The highest level of yield gap (49.7 %) was recorded at Chinsurah, followed 27.7 at Kaul, 27.2 % at Kanpur, 17.3% at Pantnagar. This shows a wide gap in grain harvest existed. However, ample scope existed at these centres to increase yields.

5.3. Management of Sodic Soils Using Nano Zinc Formulations

In a study on "Management of Sodic soils using nano zinc formulations", two genotypes were evaluated with six different set of nutrient management practices at four different locations. Significant genotypic and location-specific differences in yield parameters and yield were observed at all four locations. At Kanpur, soil application of $ZnSO_4$ @ 50 kg/ha registered higher grain (4.30 t/ha) and straw (5.82 t/ha) yields whereas at Mandya, foliar application of nano Zn @ 50 ppm recorded significantly higher grain (5.99 t/ha) and straw yields (6.74 t/ha). Foliar spray of silicic acid @ 80 ppm has recorded higher grain yields (3.62 and 3.76 t/ha) at Pusa and Faizabad respectively. In case of Varieties, DRR Dhan 48 found superior at Pusa and Faizabad and CSR23 performed better at Kanpur and Mandya. Nutrient uptake also followed similar trend as that of grain and straw yields. The variety DRR Dhan 48 has accumulated higher amount of NPK and Zn at Pusa and Faizabad and CSR 23 recorded significantly higher nutrient uptake at Kanpur and Mandya.

5.4. Management of acid soils

Application of RDF + dolomite + potassium silicate increased yields both at Moncompu (48.87%) and Titabar (19.89%) when compared to sole RDF application, while RDF + dolomite + Silixol recorded highest yields at Titabar with an increase of 24.58% over control treatment. At both Moncompu and Titabar, the variety Uma yielded significantly higher than Vasundhara, recording an increase of 6.83% at Moncompu and 7.36% at Titabar. RDF + dolomite applied in combination with either RHA, potassium silicate or Silixol produced an ameliorative effect at Titabar by significantly increasing soil pH. RDF + dolomite when combined with potassium silicate increased the uptake of PKZn by 78.98, 67.75 and 65.48% at Moncompu over sole RDF application while RDF + dolomite in combination with Silixol at Titabar recorded the highest increase uptake of NPK by 61.15, 84.42 and 69.85% respectively under control RDF application.

5.5. Residue management in rice-based cropping systems

The disposal of huge quantities of paddy residues is a big problem, particularly in North-West Indian states, resulting in farmers preferring to burn the residues *in situ* leading to air pollution, smog and loss of appreciable amounts of plant essential nutrients besides being deleterious to soil microbes. The trial was conducted this year at eight centres. The results showed that the crop residues can be deployed to substitute half of the recommended nitrogen without yield penalty. The crop residue treatments were at par with each other and lower than RDF in terms of nutrient uptake and also maintained higher nutrient use efficiencies over RDF. Post-harvest soil nutrient status was not influenced much by various residue treatments which were at par with each other.

5.6. Nano-fertilizers for increasing nutrient use efficiency, yield, and economic returns in transplanted rice

The trial on "Nano-fertilizers for increasing nutrient use efficiency, yield and economic returns in transplanted rice" was continued in the second year at 24 locations with seven treatments (in collaboration with Agronomy). The results indicated that additional application of nano urea with 100% RDN improved the yield, yield parameters and N uptake at Jagdalpur, Kaul, Kanpur, Coimbatore, Khudwani, NRRI and Sabour. At Bankura, Khudwani and Karaikal, the higher NUE was observed with 75% RDN + two sprays of nano urea treatment, but 100% RDN + two sprays of nano urea treatment registered a higher NUE at the rest of the locations. Replacement of 25 and 50% of RDN with nano urea spray at two intervals recorded a declining trend in the grain yield to the tune of -2 to 25.9% at the majority of the locations. While two sprays of nano urea in addition to 100% RDN, improved the grain yield to the tune of 0.7% (Ludhiana) to 33.5% (Khudwani). However, nano urea treatment alone registered, a yield decline to -10.6% (Chiplima), -20.0% (NRRI), -13.6% (Karaikal), -36.2 (Ludhiana) and -28.8% (Gangavati).

5.7. Yield maximization of rice in different zones

-Included in the Agronomy Report-

5.8. Evaluation of Organic fertilizers and Natural farming practices for enhancing productivity and soil health

In the second year of study on "Evaluation of Organic fertilizers and Natural farming practices for enhancing productivity and soil health", out of five treatments, Integrated Crop Management (pest management) was significantly superior as compared to other treatments at

MNC, MND, PNT, PUSA, PUD and TTB in terms of grain yield and yield parameters. At CHN, MNC, MND, PNT and PUSA most of the soil properties improved with Integrated Crop Management ((pest management)) while at TTB, soil properties improved with AI-NPOF package compared to other treatments.

5.9. Assessment of bio fortified rice genotypes response to Zn application and assessing agronomic bio fortification potential

In the first year study, "Assessment of bio fortified rice genotypes response to Zn application and assessing agronomic bio fortification potential" was experimented in five locations with five varieties and three Zn treatments. The application of 0.5% Zn at different growth stages led to higher grain yield and elevation in Zn content in grains in bio fortified varieties at majority of the locations.

DETAILED REPORT

5.1 Long term soil fertility management in rice-based cropping systems (RBCS)

Long term studies with well-defined nutrient management treatments and cropping systems were initiated in 1989-90 at four selected locations representing major rice growing regions and cropping systems *viz*., Mandya (MND) in Karnataka (rice-cowpea, Deccan Plateau), Maruteru (MTU) in Andhra Pradesh (rice-rice, Delta system), Titabar (TTB) in Assam (rice-rice, Alluvial soils) and Faizabad (FZB) in Uttar Pradesh (rice-wheat, Indo Gangetic plains) to study the dynamics of soil and crop productivity in relation to management for identifying the constraints that affect the sustainability of a given production system. The trial at Faizabad was discontinued during 2007-08 for lack of manpower support and being continued at 3 centers only. Hence, the results of 35th year of cropping *i.e., Rabi* 2022-23 and *Kharif*-2023 are presented in Tables 5.1.1 to 5.1.11.

Crop productivity and soil fertility during *Rabi* 2022-23

Grain and straw yields of rice at MTU and TTB and cowpea at MND are presented in Table 5.1.2. At MTU, grain yield ranged from 2.87 (control) to 6.96 t/ha (RDF+FYM) with a mean of 5.48 t/ha. RDF, RDF + FYM and 50% NPK substituted with FYM treatments were at par and significantly superior to other treatments. Omission of N, P, K, Zn and S resulted in yield reduction by 1.19 t/ha in -S to 2.21 t/ha in -N plots over RDF. FYM alone treatment was on par to STCR recommendation. At Titabar, grain yield ranged from 1.27 t/ha in control to 4.58 t/ha in RDF+FYM which was on par to RDF (4.35 t/ha). Here also, omission of nutrients resulted in grain yield reduction by 0.28 t/ha in -Zn to 0.86 t/ha in - N plots over RDF. Here, at TTB, FYM alone treatment was on par to RDF and RDF+FYM and was significantly superior to NPK omission plots. Fifty per cent (50%) reduction in RDF resulted in 29% yield reduction in silty clay soil of TTB compared to 14% reduction in clay loam soil of MTU over RDF. Straw yields followed the similar trend as that of grain yield at both locations. At MND, in cowpea, grown on residual nutrient content, grain yield ranged from 194 kg/ha in control plot to 433 kg/ha in 50%NPK+25%FYM+25%GM plot with a mean of 310 kg/ha.

Total nutrient (NPK) uptake followed almost similar trend as that of grain yield with minor variations among the treatments and control recorded minimum uptake at both TTB and MTU (Table 5.1.3). With regard to soil fertility status after harvest at MTU, soil organic carbon content was significantly higher where organics were added along with RDF and in FYM alone treatment (1.41%) compared to RDF (1.02%) which was 38% higher than RDF treatment. No definite trend was observed in case of other soil parameters though there was an improvement with addition of organics (Table 5.1.4). At TTB, almost all soil parameters were maximum in RDF+FYM treatment. Here, in nutrient omission plots, there was a significant reduction in all soil fertility parameters compared to plots with RDF and RDF+FYM (Table 5.1.4 a).

Crop productivity and soil fertility status during *Kharif*-2023

At MTU, the treatment, RDF+FYM recorded maximum yield (7.65 t/ha) that was significantly superior to all treatments except RDF (7.24 t/ha) which was at par to RDF+FYM (Table 5.1.5). Omission of all nutrients resulted in significant yield loss (1.14 t/ha in -K and 1.70 t/ha in -N plots) compared to RDF. At TTB, RDF+FYM (5.63 t/ha) recorded significantly higher yield than all other treatments. Here also, significant yield loss due to omission of major and micro nutrients was observed. At MND, RDF+FYM recorded maximum yield (5.73 t/ha) which was significantly superior to all other treatments and on par when 50% NPK was replaced by 25% GM-N+ 25% FYM-N (5.41 t/ha). Significant yield reduction to an extent of 1.07 t/ha in –S plots to 2.78 t/ha in –N plots was observed. With regard to FYM alone treatment, it recorded significantly lower yield compared to RDF at MTU and TTB but on par to RDF at MND. With regard to straw yield, the trend was almost similar to grain yield trend at all locations with higher yields recorded where organics were added. The total nutrients (NPK) uptake by the above ground biomass was almost similar to that of grain yield trend at all locations with minimum uptake in control and maximum in RDF+FYM closely followed by RDF and the treatments where organics were added (Table 5.1.6). Soil fertility status at the end of *Kharif*-2023 (Tables 5.1.7 and 5.1.8) indicated an improvement in most of the soil properties with addition of organics and higher values were recorded in RDF+FYM and FYM alone treatments for most of the properties at all 3 locations. Omission plots recorded reduction in NPK values compared to RDF at all 3 locations. Organic carbon values were significantly higher in FYM alone and RDF+FYM than all other treatments followed by the treatments where organics were added and control recorded the lowest values at all 3 locations.

Long term changes in crop productivity and soil fertility over a period of 35 years

The trends in mean grain yields over 35 years (1989-2023) of *Kharif* and *Rabi* rice at MND, MTU and TTB by fitting to linear function using actual yields and the per cent change in important soil properties in some important treatments were analyzed and presented below.

Linear trends in crop productivity

During *Kharif* 2023 (Table 5.1.9), the treatment, RDF+5t FYM/ha recorded maximum mean yield at all 3 locations (MND- 5.31; MTU-5.34 and TTB- 5.06 t/ha) with an average increase of 12.3, 4.1 and 13.2%, respectively, at MND, MTU and TTB by this treatment over RDF. Linear trends of productivity over the years with current RDF indicated positive growth in the delta soils of MTU and acid alluvial soils of TTB (21 and 43 kg grain/ha/year, respectively) and negative growth in the sandy loam of MND (-23 kg grain/ha/year). Additional dose of FYM @ 5t/ha along with RDF improved the growth rate substantially with 80, 72 and 55 kg/ha/year at MTU, TTB and MND, respectively. Next to this treatment, FYM alone treatment recorded more positive growth rate compared to RDF at TTB and MND.

During *Rabi* also, RDF+5t FYM recorded maximum mean grain yield both at MTU (6.34 t/ha) and TTB (4.39 t/ha) and this treatment recorded growth rate of 12 and 41 kg/ha/year at MTU and TTB, respectively compared to RDF where growth rate was 4 and 34 kg/ha/year, respectively (Table 5.1.10).

Changes in soil fertility compared to initial values (Table 5.1.11)

More positive change in organic carbon (OC) content was observed in the treatments with organics at all 3 locations compared to RDF over 35 years' period. At TTB and MND, negative change was observed in control. Maximum increase in OC was in FYM alone treatment at MTU and TTB; and with RDF+FYM at MND. Available N decreased in all treatments at MTU but at MND, it decreased in control with a marginal increase in INM and FYM alone treatments compared to RDF. With regard to available P, there was a buildup in all treatments compared to initial value at all locations except in control at TTB where the per cent change was negative. In case of available K, at MTU, there was a decrease and negative change in all treatments compared to initial value. At MND and TTB, there was a negative change in control and positive change in other treatments where the increase was to a greater extent at MND and to a lesser extent at TTB.

Summary

In the 35th year of study on long term soil fertility management in RBCS, RDF+FYM recorded maximum yield but this treatment was on par to RDF at TTB and MTU in *rabi* and significantly superior to RDF at TTB and MND in *kharif*. FYM alone treatment was on par to RDF during *rabi* at TTB and *kharif* at MND. Omission of major and micro nutrients resulted in yield reduction at all three locations. In general, INM and organics alone treatments resulted

in improvement of soil fertility parameters and OC was significantly higher in FYM and RDF+FYM treatments. Additional dose of FYM @ 5 t/ha along with RDF resulted in higher growth rate than RDF at all three locations. Over a period of 35 years, changes in soil fertility showed significant accumulation of OC and P at all 3 locations and K at TTB in INM and organics alone treatments over RDF.

Table 5.1.1: Long-term soil fertility management in RBCS, 2023
Soil and crop characteristics

Cropping system	Maruteru		Titabar	Mandya
	Rice-Rice		Rice-Rice	Rice-Cowpea
Variety - *Kharif*	MTU 1061		Gitesh	Rice- KMP 220
Rabi	MTU 1010		Disang	Cowpea- KBC-9
Recommended Fertilizer Dose (kg NPK /ha)				
Kharif	90:60:60:50		40:20:20:20	100:50:50:20
Rabi	180:90:60:50		40:20:20	-
STCR based dose				
Kharif	-		-	-
Rabi	-		-	-
Crop growth: *Kharif*	-		-	-
Rabi	-		-	-
% Clay	38		42	11.1
% Silt	28		28.5	18.1
% Sand	34		29.5	62.8
Texture	Clay Loam		Silty Clay	Sandy loam
pH (1:2)	6.63 (Kharif)	4.95 (Rabi)	5.4	5.87
Organic carbon (%)	1.07	1.23	1.1	0.30
CEC (cmol (p^+)/kg)	48.9	48.9	12.5	-
EC (dS/m)	0.69	0.91	0.028	0.28
Avail. N (kg/ha)	184	230	495	208
Avail. P_2O_5 (kg/ha)	33.9	42.0	22.4	19.7
Avail. K_2O (kg/ha)	397	395	112	117.6

Table 5.1.2: Long-term soil fertility management in RBCS, *Rabi* 2023
Grain and straw yields of rice and cowpea

Treatments	Grain yield (t/ha)			Straw yield (t/ha)	
	Maruteru	Titabar	Mandya (Cowpea- kg/ha)	Maruteru	Titabar
Control	2.87	1.27	193.9	3.99	1.51
100% PK	4.49	3.49	248.8	4.4	4.12
100% NK	5	3.65	225.5	5.27	4.31
STCR recommendation	5.27	4.12	264.5	6.45	4.87
100% NP	5.32	3.74	260.8	6.42	4.4
100% NPKZnS	6.7	4.35	293.8	6.82	5.15
100% NPKZnS + FYM/PM @ 5t/ha	6.96	4.58	412.6	7.02	5.42
100% NPK –Zn	5.34	4.07	266.1	6.56	4.81
100% NPK – S	5.51	3.64	259.8	6.59	4.28
100%NPK-S+1tlime/ha	-	4.19	-	-	4.97
100% N+50% PK	5.85	3.38	292.5	6.04	4
50 % NPK	4.51	2.58	298.9	5.66	3.05
50 % NPK + Biofertilizer	5.76	3.34	270.4	6.74	3.93
50%NPK+ 50% GM-N	6	3.9	379.2	6.71	4.61
50% NPK + 50% FYM-N	6.76	4.13	382.8	7.12	4.9
50% NPK + 25% GM-N+25% FYM-N	5.99	4.21	433.2	6.64	4.98
FYM @ 10 t/ha	5.13	4.39	393.9	6.51	5.21
FYM @ 10 t/ha + VC+Oil Cakes	5.67	-	390.7	6.07	-
Expt. Mean	5.48	3.71	309.8	6.18	4.38
CD (0.05)	0.7	0.3	37.0	0.68	0.4
CV (%)	7.76	5.72	5.6	6.69	6.39

Table 5.1.3: Long-term soil fertility management in RBCS, *Rabi* 2023- Total Nutrient uptake (kg/ha)

Treatments	Maruteru			Titabar		
	N	P	K	N	P	K
Control	26.86	11.24	63.69	18.87	3.83	26.68
100% PK	36.4	16.67	68.5	52.35	11.54	80.13
100% NK	52.42	15.63	86.06	56.37	10.74	83.99
STCR recommendation	52.86	19.03	92.86	64.49	13.83	96.12
100% NP	67.7	20.53	103.01	58	12.39	78.68
100% NPKZnS	77.56	27.33	111.43	70.39	16.07	108.62
100% NPKZnS + FYM/PM @ 5t/ha	68.88	30.37	105.17	74.89	17.86	121.95
100% NPK – Zn	63.41	21.45	103.38	64.58	14.58	102.04
100% NPK – S	58.37	23.49	110.35	59.93	11.79	90.01
100%NPK-S+1tlime/ha	-	-	-	76.5	13.4	105.84
100% N+50% PK	58.04	22.86	99.23	52.91	10.35	85.58
50 % NPK	52.28	19.07	68.3	38.88	7.84	54.29
50% NPK + Biofertilizer	54.71	23.02	94.29	54.73	12.64	85.54
50% NPK+ 50% GM-N	63.19	23.96	102.88	61.83	13.36	98.51
50% NPK + 50% FYM-N	62.49	26.63	118.38	66.24	15.45	104.26
50% NPK + 25% GM-N+ 25% FYM-N	58.6	23.96	116.26	68.28	15.3	104.84
FYM @ 10 t/ha	42.89	21.96	93.38	-	-	-
FYM @ 10 t/ha + VC + Oil Cakes	56.74	23.9	84.2	-	-	-
Expt. Mean	56.08	21.83	95.37	58.70	12.56	89.19
CD (0.05)	12.24	8.04	42.99	5.5	1.73	9.2
CV (%)	13.22	22.31	27.32	6.63	9.76	7.29

Table 5.1.4: Long-term soil fertility management in RBCS, *Rabi* 2023
Soil fertility status at harvest

Treatments	Maruteru					
	pH	EC	Org C (%)	Avail. N (kg/ha)	Avail. P_2O_5 (kg/ha)	Avail. K_2O (kg/ha)
Control	5.94	1.05	MTU	163.3	49.7	383.3
100% PK	5.66	0.91	0.87	147.3	74.3	445.0
100% NK	5.86	1.21	1.09	184.0	58.7	466.7
STCR recommendation	5.6	1.00	1.12	209.3	69.6	448.7
100% NP	5.79	1.16	1.14	195.0	70.2	344.7
100% NPKZnS	5.8	1.00	1.02	152.0	74.7	448.7
100% NPKZnS + FYM/PM @ 5t/ha	5.67	0.96	1.41	177.7	77.1	480.7
100% NPK – Zn	5.68	0.95	1.38	204.7	65.2	433.3
100% NPK – S	5.65	0.95	1.17	152.0	66.9	412.0
100%NPK-S+1t lime/ha	-	-	-	-	-	-
100% N+50% PK	5.72	1.00	0.87	164.7	68.3	368.7
50 % NPK	5.69	1.12	0.89	129.3	64.9	420.7
50% NPK + Biofertilizer	5.64	0.89	1.06	190.3	60.0	394.7
50% NPK+ 50% GM-N	5.73	1.06	1.41	173.0	65.8	408.7
50% NPK + 50% FYM-N	5.71	0.87	1.05	192.0	78.2	447.7
50% NPK + 25% GM-N+ 25% FYM-N	5.7	0.92	1.41	176.0	69.5	420.3
FYM @ 10 t/ha	5.68	0.89	1.41	161.3	70.9	482.0
FYM@10 t/ha + VC + Oil Cakes	5.6	0.85	1.41	158.3	72.8	557.3
Expt. Mean	5.71	0.99	1.16	172.4	68.0	433.1
CD (0.05)	0.27	0.41	0.24	62.0	10.4	119.7
CV (%)	2.85	25.01	12.80	21.8	9.3	16.8

Table 5.1.4 a: Long-term soil fertility management in RBCS, *Rabi* 2023
Soil fertility status at harvest

Treatments	TTB					
	Org C (%)	Avail. N (kg/ha)	Avail. P_2O_5 (kg/ha)	Avail. K_2O (kg/ha)	Avail. S (kg/ha)	Avail. Zn (kg/ha)
Control	0.57	140.3	11.6	78.0	10.7	0.56
100% PK	0.98	255.0	23.17	94.4	12.4	0.70
100% NK	1.19	176.3	26.57	112.3	14.6	0.83
STCR recommendation	1.23	284.0	35.17	95.7	15.9	0.87
100% NP	1.03	177.3	34.27	94.2	20.2	0.82
100% NPKZnS	1.58	346.3	39.23	151.0	22.3	0.95
100% NPKZnS + FYM/PM @ 5t/ha	1.79	385.0	41.23	161.0	27.9	1.22
100% NPK – Zn	1.06	284.3	37.67	148.3	24.5	0.82
100% NPK – S	1.14	352.7	36.5	150.7	24.3	0.88
100%NPK-S+1t lime/ha	1.19	361.0	33.57	157.1	24.3	0.87
100% N+50% PK	1.03	277.0	26.77	161.0	23.2	0.75
50 % NPK	0.8	218.7	36.17	158.3	25.3	0.83
50% NPK + Biofertilizer	1.3	348.0	36.4	168.1	30.7	0.85
50% NPK+ 50% GM-N	1.65	383.3	36.83	160.1	32.3	0.88
50% NPK + 50% FYM-N	1.58	346.3	38	168.3	29.7	0.91
50% NPK + 25% GM-N+ 25% FYM-N	1.61	367.7	38.83	168.3	35.3	1.00
FYM @ 10 t/ha	-	-	-	-	-	-
FYM@10 t/ha + VC + Oil Cakes	-	-	-	-	-	-
Expt. Mean	1.233125	294.0	33.24875	139.2	23.3	0.86
CD (0.05)	0.1	36.0	1.62	9.1	2.6	0.09
CV (%)	5.93	8.7	3.44	4.6	7.8	7.58

Table 5.1.5: Long-term soil fertility management in RBCS, *Kharif* -2023
Grain and straw yields of rice

Treatments	Grain yield (t/ha)			Straw yield (t/ha)		
	MTU	TTB	MND	MTU	TTB	MND
Control	3.43	1.55	1.96	3.48	2.15	2.73
100% PK	5.54	4.09	2.31	8.09	5.56	3.12
100% NK	5.91	4.21	2.64	7.38	5.84	3.68
STCR recommendation	5.79	4.77	3.77	8.45	6.63	4.44
100% NP	6.10	4.25	2.68	9.10	5.86	3.64
100% NPKZnS	7.24	5.35	5.09	9.56	7.43	5.82
100% NPKZnS + FYM/PM @ 5 t/ha	7.65	5.63	5.73	9.64	7.80	6.62
100% NPK –Zn	5.92	4.59	3.87	7.45	6.34	4.93
100% NPK – S	5.76	4.46	4.02	8.77	6.18	4.33
100%NPK-S+ 1timelime/ha	-	4.53	-	-	6.27	-
100% N+50% PK	6.29	3.80	4.44	8.39	5.23	5.34
50 % NPK	6.59	2.78	3.43	7.24	3.81	3.37
50 % NPK + Bio fertilizer	6.01	4.25	3.68	7.52	5.88	4.73
50% NPK+ 50% GM-N	5.34	4.81	4.78	8.12	6.67	5.70
50% NPK + 50% FYM-N	6.68	4.81	4.53	8.59	6.69	5.57
50% NPK + 25% GM-N+25% FYM-N	6.72	5.09	5.41	9.56	7.03	5.39
FYM @ 10 t/ha	6.19	4.99	4.98	8.23	6.89	5.94
FYM@10 t/ha + VC + Oil Cakes	6.59	-	4.58	9.89	-	5.57
Expt. Mean	6.10	4.35	3.99	8.20	6.02	4.76
CD (0.05)	0.86	0.19	0.35	0.95	0.38	0.43
CV (%)	8.55	3.11	3.97	7.04	4.50	4.27

Table 5.1.6: Long-term soil fertility management in RBCS, *Kharif 2023*
Total Nutrient uptake(kg/ha)

Treatments	Maruteru			Titabar			Mandya		
	N (kg /ha)	**P (kg /ha)**	**K (kg /ha)**	**N (kg /ha)**	**P (kg /ha)**	**K (kg /ha)**	**N (kg /ha)**	**P (kg /ha)**	**K (kg /ha)**
Control	24.8	9.7	46.1	18.9	4.1	29.3	10.9	2.6	16.7
100% PK	55.9	23.9	145.9	54.8	12.3	85.6	16.6	2.9	11.8
100% NK	45.2	13.4	121.6	53.8	11.4	89.2	19.6	3.5	7.7
STCR recommendation	56.9	25.3	143.0	66.7	13.7	102.6	28.6	5.7	33.0
100% NP	58.4	29.5	134.6	59.5	10.8	82.1	21.7	5.0	27.4
100% NPK + Zn + S	66.2	34.5	149.1	78.9	17.0	122.9	43.1	8.9	46.4
100% NPK + Zn + S + FYM/PM @ 5 t/ha	77.4	37.9	175.0	83.6	17.4	137.6	52.9	11.6	53.6
100% NPK –Zn	53.1	21.0	115.2	67.2	14.7	106.0	30.9	7.2	37.8
100% NPK – S	52.5	22.4	144.3	69.7	12.0	101.8	32.5	7.5	34.7
100%NPK-S+ 1timelime/ha	-	-	-	73.6	11.3	104.5	-	-	-
100% N+50% PK	56.7	23.1	132.6	54.0	9.7	88.4	38.0	7.6	37.6
50 % NPK	52.7	25.6	102.0	38.8	7.5	53.6	27.4	5.8	24.8
50 % NPK + Biofertilizer	54.6	22.7	123.8	63.9	13.1	100.3	32.1	6.6	34.0
50% NPK+ 50% GM-N	46.9	22.1	134.7	68.2	13.7	112.5	38.1	8.6	42.0
50% NPK+ 50% FYM-N	65.4	28.0	134.0	72.8	14.7	112.1	35.5	9.0	1799.2
50% NPK +25% GM-N +25% FYM-N	60.1	28.6	163.2	74.7	15.2	116.3	46.5	9.8	43.6
FYM @ 10 t/ha	53.4	31.5	120.7	72.6	16.1	117.3	44.0	8.9	42.7
FYM@10t/ha +3.0 t/ha Vermi+200 kg/ha oil cakes	67.7	24.0	169.1				40.0	7.9	38.8
Expt. Mean	55.7	24.9	132.6	63.0	12.6	97.8	32.8	7.0	137.2
CD (0.05)	15.1	8.0	30.0	4.7	1.7	7.8	9.8	2.5	2556.4
CV (%)	16.5	19.4	13.7	5.2	9.3	5.6	14.1	16.6	879.2

Table 5.1.7: Long-term soil fertility management in RBCS, *Kharif*-2023
Soil fertility status at harvest

Treatments	Maruteru				Titabar			
	Org. C (%)	Avail. N (kg/ha)	Avail. P_2O_5 (kg/ha)	Avail. K_2O (kg/ha)	Org. C (%)	Avail N (Kg/ha)	Avail. P_2O_5 (kg/ha)	Avail. K_2O (kg/ha)
Control	1.18	163.7	57.0	361.0	0.54	143.6	11.1	67.2
100% PK	1.33	178.3	71.6	402.7	0.93	260.2	18.7	77.5
100% NK	1.30	187.3	65.8	342.0	1.14	180.0	21.4	92.5
STCR recommendation	1.33	190.3	68.5	348.3	1.17	291.3	27.9	99.3
100%NP	1.15	187.0	75.4	301.3	0.99	181.0	29.3	90.2
100% NPKZnS	1.14	198.0	69.6	403.3	1.51	356.3	37.2	154.8
100% NPKZnS + FYM/PM @ 5t/ha	1.37	178.3	84.4	369.0	1.70	396.6	38.1	183.5
100% NPK –Zn	1.25	189.3	62.0	349.0	1.01	292.0	27.1	157.7
100% NPK – S	1.34	182.3	74.1	359.3	1.10	362.6	32.7	148.5
100%NPK-S+ 1timelime/ha	-	-	-	-	1.13	371.2	31.2	152.2
100% N+50% PK	1.23	267.0	70.5	371.0	0.98	285.1	26.5	85.6
50 % NPK	1.28	173.7	65.2	347.7	0.77	223.7	26.6	85.8
50 % NPK + Biofertilizer	1.26	214.7	74.5	352.7	1.22	357.4	34.2	157.5
373.750% NPK+ 50% GM-N	1.24	185.7	65.8	352.3	1.58	394.5	32.0	142.1
50% NPK + 50% FYM-N	1.29	200.3	68.5	339.0	1.53	355.6	32.7	159.3
50% NPK + 25%GM-N+25%FYM-N	1.39	180.3	72.9	419.3	1.55	378.7	33.0	159.7
FYM @ 10 t/ha	1.43	180.7	71.4	415.7	1.73	401.2	38.5	175.1
FYM@10 t/ha +3.0 t/ha Vermicompost +200 kg/ha oil cakes	1.36	206.7	72.2	394.7	-	-	-	-
Expt. Mean	1.29	192.0	70.0	366.4	1.21	307.7	29.3	128.7
CD (0.05)	0.15	40.5	9.5	36.2	0.10	37.9	4.4	11.4
CV (%)	6.87	12.8	8.2	6.0	5.99	8.7	10.5	6.3

Table 5.1.8: Long-term soil fertility management in RBCS, *Kharif* 2023
Soil fertility status at harvest (Mandya)

Treatments	Mandya			
	Org. C (%)	Avail. N (kg/ha)	Avail. P_2O_5 (kg/ha)	Avail. K_2O (kg/ha)
Control	0.23	218.8	37.7	97.1
100% PK	0.35	220.5	45.9	129.0
100% NK	0.35	248.8	42.2	139.0
STCR recommendation	0.41	253.9	49.2	143.7
100%NP	0.44	259.2	48.4	126.0
100% NPKZnS	0.55	273.8	52.7	214.6
100% NPKZnS + FYM/PM @ 5t/ha	0.66	252.0	60.7	253.9
100% NPK –Zn	0.34	262.9	50.3	222.8
100% NPK – S	0.36	267.3	52.7	235.7
100%NPK-S+ 1timelime/ha	-	-	-	-
100% N+50% PK	0.45	259.8	49.9	237.7
50 % NPK	0.54	236.4	46.3	243.4
50 % NPK + Biofertilizer	0.57	278.3	51.8	228.4
373.750% NPK+ 50% GM-N	0.61	292.8	52.2	233.0
50% NPK + 50% FYM-N	0.69	299.8	52.2	245.1
50% NPK + 25%GM-N+25%FYM-N	0.64	314.7	62.3	254.0
FYM @ 10 t/ha	0.63	320.7	53.3	243.2
FYM@10 t/ha +3.0 t/ha Vermicompost +200 kg/ha oil cakes	0.59	312.2	54.4	233.2
Expt. Mean	0.49	268.9	50.7	204.7
CD (0.05)	0.05	17.0	5.3	9.6
CV (%)	4.62	3.0	4.9	2.2

Table 5.1.9: Long-term soil fertility management in RBCS
Linear trends of changes in *Kharif rice* yields (t/ha) from 1989 to 2023

Treatments	MTU			TTB			MND		
	Mean yield (t/ha)	Slope (kg/ha/yr)	Intercept (t/ha)	Mean yield (t/ha)	Slope (kg/ha/yr)	Intercept (t/ha)	Mean yield (t/ha)	Slope (kg/ha/yr)	Intercept (t/ha)
Control	2.87	12	2.57	1.96	-50	2.88	2.20	-51	3.09
100% PK	3.58	44	2.78	3.29	43	2.51	2.70	-36	3.33
100% NK	4.13	6	4.02	3.60	27	3.12	3.35	-73	3.35
100% NP	4.52	-3	4.58	3.79	22	3.39	3.76	-81	3.76
100% NPK + Zn + S	5.13	21	4.75	4.47	43	3.71	4.73	-23	4.73
100% NPKZnS + FYM	5.34	80	3.46	5.06	72	3.38	5.31	55	5.31
100% NPK – Zn	4.72	0	4.73	4.20	22	3.79	4.47	-50	4.47
100% NPK – S	4.79	8	4.65	4.16	7	4.02	4.38	-46	4.38
100% N + 50% PK	4.52	11	4.31	3.67	-2	3.70	4.05	-55	4.05
50% NPK	4.38	14	4.13	3.20	-26	3.67	3.72	-41	3.72
50% NPK + 50% GM-N	4.55	18	4.22	3.88	29	3.35	4.75	-7	4.75
50% NPK + 50% FYM-N	4.83	23	4.41	4.03	37	3.37	4.82	2	4.82
50% NPK + 25% GM-N + 25%FYM-N	4.64	25	4.19	4.10	37	3.44	5.39	8	5.39
FYM @ 10 t/ha	4.52	20	4.15	4.15	54	3.19	4.18	22	4.18

Table 5.1.10: Long-term soil fertility management in RBCS
Linear trends of changes in *Rabi* rice yields (t/ha) from 1989 to 2023

Treatments	MTU			TTB		
	Mean yield (t/ha)	Slope (kg/ha/yr)	Intercept (t/ha)	Mean yield (t/ha)	Slope (kg/ha/yr)	Intercept (t/ha)
Control	2.32	41	1.42	1.66	-32	2.20
100% PK	3.09	72	1.75	3.02	48	2.23
100% NK	4.12	29	3.59	3.27	23	2.89
100% NP	4.96	6	4.85	3.43	15	3.19
100% NPK + Zn + S	5.76	4	5.00	3.93	34	3.38
100% NPKZnS + FYM/PM	6.34	12	6.29	4.39	41	3.52
100% NPK – Zn	5.21	22	4.81	3.70	21	3.35
100% NPK – S	5.33	25	4.86	3.58	17	3.29
100% N + 50% PK	5.17	17	4.85	3.41	15	3.16
50% NPK	4.29	18	3.96	2.83	-1	2.85
50% NPK + 50% GM-N	4.96	12	4.72	3.39	23	3.01
50% NPK + 50% FYM-N	5.24	39	4.52	3.50	33	2.95
50% NPK + 25% GM-N + 25% FYM-N	5.03	14	4.77	3.53	34	2.96
FYM @ 10 t/ha	4.21	45	3.39	3.56	41	2.88

Table: 5.1.11: Long-term soil fertility management in RBCS
Changes (%) in soil fertility parameters over 1989 to 2023

Treatments	Maruteru			Titabar			Mandya			
	OC	N	K	OC	P	K	OC	N	P	K
Control	-	-45.1	-11.1	-43.2	-15.9	-54.0	-34.3	-53.3	91.4	-17.0
100% NPK + Zn + S	28.1	-33.6	-0.7	58.9	181.8	6.0	57.1	3.2	167.5	83.4
100% NPK + Zn + S + 5 t/ha FYM	53.9	-40.2	-9.1	78.9	188.6	25.7	88.6	22.1	208.1	117.0
50% NPK + 25% GM-N + 25% FYM-N	56.2	-39.5	3.2	63.2	150.6	9.4	82.9	22.1	216.2	117.1
FYM @ 10 t/ha	60.7	-39.6	2.2	82.1	191.7	19.9	80.0	16.9	170.6	107.9

5.2. *Soil quality and productivity assessment for bridging the yield gaps in farmers' Fields (kharif)*

Sustainable rice production is essential to meet future food requirements while ensuring environmental stewardship and social equity. Adopting sustainable practices involves optimizing resource use, minimizing environmental impacts, and enhancing resilience to climate change. By embracing sustainability principles in rice production, we can not only meet the growing demand for rice but also safeguard the environment, conserve natural resources, and support the livelihoods of millions of farmers worldwide, thereby securing food security for future generations. Assessing soil quality and productivity is crucial for bridging yield gaps in farmers' fields. Ecology-wise and region wise yield gap analysis is a useful method to examine how large the ranges are between potential, desirable rice yields and those realized in farmers' fields. Proper and balanced nutrient application is must to meet the growth requirements of a genotype for realizing the yield potential of several contemporary genotypes. Current fertilizer management practices are age-old, in general, and are not tailored to site-specific soil nutrient supply capacities and crop demand. Blanket fertilizer recommendations are still being followed in large domains with less importance being given to management-induced site variations of soil nutrient supply capacities, and crop demand more so when new high-yielding cultures with increasing yield potential are being regularly introduced. This has been the major reason for reported nutrient imbalances and un-sustainability in realizing yields. This trial was, therefore, conducted in farmers' fields around a few selected centres – Chinsurah (pool of 31 farmers), Pantnagar (pool of 40 farmers), Kanpur (pool of 21 farmers), Kaul (pool of 20 farmers). The specific aim was to assess the variability in soil nutrient supply, its relationship with rice yields at current recommended and farmers' fertilizer practices in some new farm sites and fine-tune the fertilizer nutrient requirement for specific target yields in a given environment and validate fertilizer recommendations for targeted yields. The *kharif* 2023 data received representing the irrigated and shallow lowland rice ecosystems are presented in Tables 5.2.1 to 5.2.5. The test varieties were Swarna, Khitish, Shatabdi at Chinsurah, CSR 30, PB 1847, VNR 2222, PR 114, PB 1718, PB 1509, PB 1121at Kaul, Pioneer 3727, Kaveri 9090, Arize 6449, Arize 6450, JK, Sudha, Arize 6444 Pioneer 273037, Pioneer 203031 and Pioneer 203037 at Kanpur and Pusa 150, PD 10, PD18, PD 12, Hybrid, Local, HR47, Sarbat at Pantnagar. The methodology involved as conduction of a survey in nearby villages during *Kharif* 2023 involving data collection from various farmers' fields at different locations across different rice ecologies. The farmers' fields were grouped into two categories of 'low' and 'high' yield. Soil and plant samples were collected from the field after harvest and analysed for their nutrient contents, and soil quality indexes were calculated. For next season's crop, site-specific recommendations to the farmers have been generated and are being given for higher productivity and soil health improvement. The details of crop, soil and weather parameters of the experimental sites, presented in Table 5.2.1, show variation in soil characteristics with reference to pH, organic carbon content, soil texture and available nutrient status.

Table 5.2.2 gives information collected in the new farm sites on yields obtained, nutrient uptake and Soil quality index calculated from all the soil samples collected from the farmers' fields. Sharp variations in mean grain yields recorded varied from 2.12 t /ha among low yielders to 4.74 t /ha among high yielders at Chinsurah, varied from 5.07 t /ha among low yielders to 6.97t /ha among high yielders at Kanpur, varied from 4.5 t /ha among low yielders to 5.8 t /ha among high yielders at Pantnagar from 3.1 t /ha among low yielders to 5.8 t/ha among high yielders at Kaul. Soil parameters data were pooled in different categories and the resulting soil quality index generated showed variations in the quality and health of the soil across different farmer's categories. The poorest soil quality index was calculated for farmers from chinsurah due to considerable variation among the farm sites and soil test values. The soil quality index was much superior at Kanpur, Pantnagar and Kaul. Table 5.2.3 recorded the nutrient requirement per ton grain yield variations obtained at all the centres. Nutrient requirement calculations were useful to know how the responses were for fertilizers applied per ton of the grain yield and were worked out for all the farm sites and varied as : Pantnagar – 8.31,1.02,5.96 kg/t grain for N, P, K respectively for low yielders group of farmers and 8.18,1.46,4.92 kg/t grain for N, P, K respectively for high yielders group of farmers respectively, Kaul – 16.29,5.90,1.95 kg/t grain for N, P, K respectively for low yielders group of farmers and 17.28,6.76,2.26 kg/t grain for N, P, K respectively for high yielders group of farmers respectively, Kanpur – 23.4,6.6,14 kg/t grain for N, P, K respectively for low yielders group of farmers and 22.71,40.85,22.42 kg/t grain for N, P, K respectively for high yielders group of farmers at these locations Large variations were seen for nutrient uptake between low yielders and high yields across the centres. Soil nutrient uptake for major nutrients varied widely among the sites. Nutrient requirement values proved that large variations were recorded among the two different groups of farmers and also among the NPK nutrients. (Table 5.2.3), while soil test values did not match the yields recorded with rice yield and nutrient uptake at both locations, suggesting perhaps less suitability of current soil testing methods for flooded soils. Fertilizer prescriptions were worked out for all the farm sites and specific fertilizer recommendations were suggested for target yield: Chinsurah – 4.76 t/ha, Pantnagar - 6.0 t/ha**,** Kaul – 6.6 t/ha, Kanpur – 7.0 t/ha at these locations (being the highest yield recorded at the test sites) with reference to grain yields and average uptake of nutrients and nutrient requirement per ton grain yield recorded at the test sites. The target yields were the maximum recorded at the test sites under recommended fertilizer practice (RDF). The fertilizer recommendations presented show a range of fertilizer doses of major nutrients to achieve the targeted productivity which has already been harvested. High estimates of P and K fertilizer requirements are due to the lower recovery efficiency of applied P and higher accumulation of potassium per ton of grain. The study, thus indicated ample scope for improvement in nutrient use efficiency, and an attempt has been made to refine the current blanket recommended dose of fertilizer based on site-specific nutrient supply, nutrient use efficiency and crop demand. The yields had considerable variation with the farmers' fertilizer practices, respectively with corresponding variations in soil test values and uptake patterns followed. Wide variations in yields were recorded under recommended fertilizer practices and with all the nutrients under farmers' practice indicating a mismatch of the fertilizer doses.

However, some centres reported soil quality index at par with their resulting grain yield and nutrient uptake patterns.

Yield Gap analysis

Yield gap analysis was done for all farm fields. The need was assessed to ascertain the gaps in technology and compare the yield variations among low yielders and high yielders vis-a-vis uptake, and soil quality index gaps. Yield Gap was estimated based on the existing gaps in yields which were recorded between the low yielders and the high yielders and what was the prevalent grain yield in those farmers' sites across the region. The results have been enlisted in the table no.5.2.4. The highest level of yield gap (49.7 %) was recorded at Chinsurah followed 27.7 at Kaul, 27.2 % at Kanpur, 17.3% at Pantnagar. This shows a wide gap of grain harvest existed. However, ample scope existed at these centre to increase yields.

Summary: This trial was, conducted in farmers' fields around a few selected centres – Chinsurah (pool of 31 farmers), Pantnagar (pool of 40 farmers), Kanpur (pool of 21 farmers) and Kaul(pool of 20 farmers) to assess the variability in soil nutrient supply, its relationship with rice yields at current recommended and farmers' fertilizer practices in some new farm sites and fine-tune the fertilizer nutrient requirement for specific target yields in a given environment and validation of fertilizer recommendations for targeted yields. The basic hypothesis aimed was that systematically assessing soil quality and productivity and implementing appropriate management strategies, farmers can bridge yield gaps and achieve sustainable agricultural production in their fields. The *kharif* 2023 data received representing

the irrigated and shallow lowland rice ecosystems. Sharp variations in mean grain yields recorded varied from 2.12 t /ha among low yielders to 4.74 t /ha among high yielders at Chinsurah, varied from 5.07 t /ha among low yielders to 6.97t /ha among high yielders at Kanpur, varied from 4.5 t /ha among low yielders to 5.8 t /ha among high yielders at Pantnagar, from 3.81 t /ha among low yielders to 5.8 t/ha among high yielders at Kaul. Soil Parameters data were pooled in different categories and the resulting soil quality index generated showed variations in the quality and health of the soil across different farmer's categories. Fertilizer prescriptions were worked out for all the farm sites and specific fertilizer recommendations were suggested for target yield: Chinsurah – 4.76 t/ha Pantnagar - 6.0 t/ha, Kaul – 6.6 t/ha, Kanpur – 7.0 t/ha (being the highest yield recorded at the test sites) with reference to grain yields and average uptake of nutrients and nutrient requirement per ton grain yield recorded at the test sites. The poorest soil quality index was calculated for farmers from Chinsurah due to considerable variation among the farm sites and soil test values. The highest level of yield gap (49.7 %) was recorded at Chinsurah, followed by 27.7 at Kaul, 27.2 % at Kanpur, and 17.3% at Pantnagar. This shows a wide gap in grain harvest existed. However, ample scope existed at these centres to increase yields.

Table 5.2.1. Rice productivity in relation to internal supply capacity of nutrients in farmers' fields, K*harif* 2023

Soil, crop and weather data

Parameter	Chinsurah	Kanpur	Kaul	Pantnagar
Variety	Swarna , Khitish, Shatabdi	Pioneer 3727 Kaveri 9090 Arize 6449 Arize 6450 JK Sudha Arize 6444 Pioneer 273037 Pioneer 203031 Pioneer 203067	CSR 30 PB 1847 VNR 2222 PR 114 PB 1718 PB 1509 PB 1121	Pusa 150 PD 10 PD18 PD 12 Hybrid Local HR47 Sarbati
Crop growth	Good	Good	Good	good
RFD (kg NPK/ha)	Varying- 48-24-24, 50-25-25, 60-30-30, 70-35-35, 80-40-40	Varying 120,60,60 150,60,60 120,60,40 150,60,40 120,60,60 120,60,40	-	190:60:40 150:60:40 150:50:30 150:60:50 200:60:40 200:70:45
% Clay	-	-	-	
% Silt	-	-	-	
% Sand	-	-	-	
Soil Texture	-	-	-	
pH	6.49-7.20	7.98-8.82	7.84-8.98	7.0-8.0
EC(mmhos/cm)	0.18-0.44	0.85-1.41	0.19-0.66	0.17-0.54
Org. carbon (%)	0.85-1.28	0.43-0.78	0.44-0.67	0.28-0.72
Avail. N (kg/ha)	378-507	220-289	145-194	118-215
Avail. P_2O_5 (kg/ha)	85-103	14-25	26-44	6.9-17.3
Avail. K_2O (kg/ha)	265-320	185-274	323-398	138-219

Table 5.2.2. Rice productivity in relation to internal supply capacity of nutrients in farmers' fields, *Kharif*-2023
- Soil nutrient supply potential vis a vis nutrient uptake assessed among different farmers' categories

Categories/ Nutrient	**Chinsurah (total of 31 sites,** 12 low yielders and 19 high yielder sites)			**Kanpur (total of 30 sites, 2**1 low yielders and 9 high yielder sites)		
	Minimum	**Maximum**	**Mean***	**Minimum**	**Maximum**	**Mean****
Grain yield (t/ha)						
Low Yielders	1.79	2.33	2.12	4.72	5.43	5.07
High Yielders	4.27	4.98	4.74	6.18	7.37	6.97
Nutrient uptake (kg/ha)						
	Low Yielders					
N	-	-	-	107.1	127.56	117.33
P	-	-	-	25.93	45.04	33.48
K	-	-	-	13.06	126.84	69.95
	High Yielders					
N	-	-	-	137.1	180.5	158.9
P	-	-	-	43.59	320.59	286.9
K	-	-	-	128.1	182.5	157.3

Categories/ Nutrient	**Kaul**(Out of 20,14 low yielders, 6 high yielders)			**Pantnagar**(Out of 40,14 low yielders, 26 high yielders)		
	Minimum	**Maximum**	**Mean***	**Minimum**	**Maximum**	**Mean****
Grain yield (t/ha)						
Low Yielders	2.8	3.3	3.1	4.3	4.9	4.5
High Yielders	4.8	8.8	5.8	5.0	6.8	5.8
Nutrient uptake (kg/ha)						
	Low Yielders					
N			77.57	49.45	80.84	63.83
P			28.13	8.17	12.22	10.01
K			9.30	48.6	72.85	58.31
	High Yielders					
N			113.93	69.5	9	55
P			44.59	115.91	15.86	97.02
K			14.93	85.70	12.43	78.99

Table 5.2.3. Rice productivity in relation to internal supply capacity of nutrients in farmers' fields, *kharif* 2023
- Nutrient Requirement per ton grain yield

Farmers categories	Chinsurah			Kanpur		
	Mean yield (t/ha)	**Mean uptake (kg/ha)**	**Nutrient Requirement (kg/t grain)**	**Mean yield (t/ha)**	**Mean uptake (kg/ha)**	**Nutrient Requirement (kg/t grain)**
Low Yielders (12 sites)	2.38	-	-	5.07		-
N		-	-		117.33	23.4
P		-	-		33.48	6.6
K		-	-		69.95	14
High Yielders (34 sites)	4.73	-	-	6.97	-	-
N		-	-		158.9	22.71
P		-	-		286.9	40.85
K		-	-		157.3	22.42

Farmers categories	Kaul			Pantnagar		
	Mean yield (t/ha)	**Mean uptake (kg/ha)**	**Nutrient Requirement (kg/t grain)**	**Mean yield (t/ha)**	**Mean uptake (kg/ha)**	**Nutrient Requirement (kg/t grain)**
Low yielders						
N	4.76	77.57	16.29	4.83	63.83	8.31
P		28.13	5.90		10.01	1.02
K		9.30	1.95		58.31	5.96
High yielders						
N	6.59	113.93	17.28	5.84	**47.8**	8.18
P		44.59	6.76		**8.58**	1.46
K		14.93	2.26		**28.69**	4.92

Table 5.2.4 Rice productivity in relation to internal supply capacity of nutrients in farmers' fields, *kharif* 2023
Site-specific fertilizer recommendation (kg/ha) for a target yield

Site /centres	Current yield low yielders group (t/ha)	Current yield High Yielders group (t/ha)	Per cent increase in yield over low yielders groups	Fertilizer recommendation for the target yield (t/ha) Chinsurah-4.75 Kaul-6.6,Kanpur-7.0,Pantnagar-6.0		
				N (Urea)	P_2O_5 (SSP)	K_2O (Potash)
Chinsurah	2.38	4.73	49.7	95	24	53
Pantnagar	4.83	5.84	17.3	49	12	30
Kaul	4.76	6.59	27.7	114	44	20
Kanpur	5.07	6.97	27.2	158	42	156

Table 5.2.5 Rice productivity in relation to internal supply capacity of nutrients in farmers' fields, *kharif* 2023
Soil Quality Indices

Site /centres.	Soil Quality Indices low yielders group	Soil Quality Indices Yielders group (high yielders)
Chinsurah	0.72	0.45
Pantnagar	0.37	0.5
Kaul	0.5	0.67
Kanpur	0.46	0.88

5.3. Management of Sodic Soils Using Nano Zinc Formulations

Sodic soils have high soil pH (8.5 - 11.0) and exchangeable sodium percentage (ESP) of greater or equal to 15, electrical conductivity of less than 4 dS/m, low organic matter and nutrient content and a preponderance of carbonates and bicarbonates of sodium or excess salt content. These soil characteristics strongly modify the availability of micronutrients and thereby crop productivity. These soils can be managed by either growing a crop variety suitable for a particular soil or by applying suitable chemical material to withstand the crop in adverse conditions. Sodic soil is deficient in micronutrients like Zn, Fe, Mn and Cu, among these Zn present in the level less than 0.5 ppm. Keeping these points in view, this trial was conducted with nano Zn material to enhance the Zn availability to the plants with various concentration in sodic soils. This trial has started in *Kharif-2021* with the nano Zn chemicals in a different concentration (20 and 50 ppm). In the current year, this trial was conducted at four different locations viz., *Kanpur, Mandya, Pusa and Faizabad*. The selected genotypes (CSR 23 and DRR Dhan 48) were evaluated under different set of nutrient management practices (Control; $ZnSO_4$ @ 0.5 % foliar spray; Nano Zn @ 20 ppm foliar spray; Nano Zn @ 50 ppm foliar spray; Soil application of $ZnSO_4$ @ 50 kg/ha; Silicic acid @ 40 ppm and Silicic acid @ 80 ppm). The experimental results are presented in tables 5.3.1- 5.3.14 and briefly discussed.

Yield Parameters

Yield parameters like tiller number and panicle number per meter square were represented in the table 5.3.2 and 5.3.3. Significant differences were observed in the tiller number due to varieties and treatments at all the centers except Pusa. Among the treatments, soil application of $ZnSO_4$ @ 50 kg/ha has produced highest tiller number (416) at Kanpur; foliar spray of silicic acid 80 ppm has recorded significantly higher tiller number (312) at Pusa; whereas foliar application of nano Zn @ 50 ppm has produced highest tiller number at Mandya (427) and Faizabad (304). In case of Varieties, DRR Dhan 48 registered significantly higher tiller number at all the locations except Mandya where CSR 23 registered higher tiller number per square meter. Panicles/m^2 differed significantly among the varieties and treatments at all locations except Pusa. Among the treatments, foliar application of nano Zn @ 50 ppm has registered higher panicle number at Mandya (304) and Faizabad (300) whereas soil application of $ZnSO_4$ @ 50 kg/ha has recorded higher panicle number at Kanpur (287). With respect to varieties, CSR 23 produced higher panicles at Kanpur (262) and Mandya (270) where as DRR Dhan 48 produced higher panicle number at Pusa (278) and Faizabad (297).

Grain and Straw yields

Grain and straw yields showed significant differences between the genotypes and treatments and depicted in table 5.3.4 and 5.3.5. At Kanpur, soil application of $ZnSO_4$ @ 50 kg/ha registered higher grain (4.30 t/ha) and straw (5.82 t/ha) yields whereas foliar application of nano Zn @ 50 ppm recorded on par grain (4.02 t/ha) and straw yields (5.38 t/ha). Between the varieties, CSR 23 has recorded significantly higher grain (3.71 t/ha) and straw (4.89 t/ha) yields compared to DRR Dhan 48.

In case of Mandya, foliar application of nano Zn @ 50 ppm recorded significantly higher grain (5.99 t/ha) and straw yields (6.74 t/ha) compared to all other treatments. With respect to varieties, CSR23 produced significantly higher grain (5.48 t/ha) and straw yields (6.22 t/ha) than CSR23.

At Pusa, foliar spray of silicic acid spray @ 80 ppm has produced significantly higher grain yield (3.62 t/ha) which was on par with soil application of $ZnSO_4$ @ 50 kg/ha (3.47 t/ha), foliar spray of nano Zn @ 50 ppm (3.40 t/ha) and silicic acid spray of 40 ppm (3.36 t/ha). Whereas, soil application of $ZnSO_4$ @ 50 kg/ha has registered higher straw yield (5.3 t/ha) which was on par with foliar spray of nano Zn @ 50 ppm (5.28 t/ha) and silicic acid spray of 80 ppm (5.14 t/ha). Between the varieties, DRR Dhan 48 has recorded significantly higher grain (3.45 t/ha) and straw (4.61 t/ha) yields compared to CSR 23.

In Faizabad, foliar spray of silicic acid spray @ 80 ppm has produced significantly higher grain yield (3.76 t/ha) and straw yield (4.45 t/ha) which was on par with foliar spray of nano Zn @ 50 ppm and silicic acid spray of 40 ppm. With respect to varieties, DRR Dhan 48 was significantly superior to CSR 23. Interaction between treatments and genotypes was found to be non-significant at most of the locations.

Nutrient uptake

Significant differences in nutrient uptake of NPK and Zn were observed at all the locations (Table 5.3.7 to 5.3.10). At Kanpur, soil application of $ZnSO_4$ @ 50 kg/ha has recorded higher NPKZn uptake; at Mandya, foliar spray of nano Zn @ 50 ppm has recorded higher NPK uptake whereas soil application of $ZnSO_4$ @ 50 kg/ha has recorded higher Zn uptake (265 g/ha). In case of Pusa, higher N and P uptake was noticed in Silicic acid 80 ppm spray and higher potassium and Zn uptake was recorded with soil application of $ZnSO_4$ @ 50 kg/ha. Whereas at Faizabad, foliar spray of nano Zn @ 50 ppm has recorded higher NP uptake and maximum k uptake was noticed with silicic acid 80 ppm spray. In case of varieties, DRR Dhan 48 has accumulated higher amount of NPKZn at Pusa and Faizabad and CSR 23 recorded significantly higher nutrient uptake at Mandya and Kanpur.

Uptake of Zn in Grain and straw: Zinc accumulation in grain and straw significantly differed among the treatments at all the locations however, varietal difference was non-significant (Table 5.3.11 - 5.3.13). Uptake of Zinc was more in straw compared to grain at all the locations due to higher concentration of Zn and higher straw yields. Soil application of $ZnSO_4$ @ 50 kg/ha has registered higher grain and straw Zn uptake at Kanpur and Pusa, Grain Zn uptake at Mandya. Whereas Nano Zn @ 50 ppm foliar spray accumulated more amount of Zn in and straw at Mandya.

Post-harvest soil Zn status: The available Zn status in soil after harvest was significantly differed among the treatments but not between the varieties (Table 5.3.14). Application of $ZnSO_4$ @ 50 kg/ha has recorded significantly higher Zn status in Mandya (1.89 mg/kg) and Pusa (0.76 mg/kg) compared to rest of the treatments.

Summary:

Significant genotypic and location-specific differences in yield parameters and yield were observed at all four locations. At Kanpur, soil application of $ZnSO_4$ @ 50 kg/ha registered higher grain (4.30 t/ha) and straw (5.82 t/ha) yields whereas at Mandya, foliar application of nano Zn @ 50 ppm recorded significantly higher grain (5.99 t/ha) and straw yields (6.74 t/ha). Foliar spray of silicic acid @ 80 ppm has recorded higher grain yields (3.62 and 3.76 t/ha) at Pusa and Faizabad respectively. In case of Varieties, DRR Dhan 48 found superior at Pusa and Faizabad and CSR23 performed better at Kanpur and Mandya. Nutrient uptake also followed similar trend as that of grain and straw yields. The variety DRR Dhan 48 has accumulated higher amount of NPK and Zn at Pusa and Faizabad and CSR 23 recorded significantly higher nutrient uptake at Kanpur and Mandya.

Table 5.3.1: Management of Sodic soil using nano zinc formulations

(Crop and soil characteristics)

Parameters	Kanpur	Mandya	Pusa	Faizabad
Season	***Kharif* -2023**	***Kharif* -2023**	***Kharif* -2023**	***Kharif* -2023**
Varieties	CSR 23, DRR Dhan 48	CSR 23, DRR Dhan 48	CSR 23 DRR Dhan 48	CSR 23 DRR Dhan 48
Fertilizer dose	150:60:60	125:62.5:50	120:60:40:50	120:60:60:2
Soil pH	9.90	8.67	9.71	9.6
Soil EC (dS/m)	0.23	0.39	0.67	2.85
Available N (kg/ha)	147	269	168	210
Available P (kg/ha)	12.4	34.1	17.4	25
Available K (kg/ha)	208	280	113	235
Texture	Sandy Clay Loam	Sandy Loam	Sandy Loam	Sandy Loam
OC (%)	0.21	0.57	0.38	0.39
DTPA-Zn (mg/kg)	0.48	0.65	0.48	-

Table 5.3.2: Management of Sodic soils using nano Zn formulations, Tillers /m^2 of rice at different locations

Treatments/ Varieties	Kanpur			Mandya			Pusa			Faizabad		
	CSR 23	DRR Dhan 48	Mean	CSR 23	DRR Dhan 48	Mean	CSR 23	DRR Dhan 48	Mean	CSR 23	DRR Dhan 48	Mean
Control	286	291	288	362	335	348	218	275	247	245	285	265
$ZnSO_4$ @ 0.5 % foliar spray	332	346	339	374	365	369	265	311	288	266	272	269
Nano Zn @ 20 ppm foliar spray	355	367	361	426	416	421	267	318	292	280	299	289
Nano Zn @ 50 ppm foliar spray	376	391	384	431	422	427	273	313	293	293	315	304
Soil application of $ZnSO_4$ @ 50 kg/ha	396	437	416	420	394	407	283	325	304	279	308	294
Silicic acid @ 40 ppm	324	348	336	399	394	397	264	308	286	273	315	294
Silicic acid @ 80 ppm	334	349	342	405	403	404	295	329	312	288	317	302
Mean	343	361	352	402	389	396	266	311	289	275	301	288
CD M	28.5			23.0			NS			6.27		
CD S	15.2			7.52			8.35			2.97		
M X S	NS			NS			NS			7.85		
S XM	NS			NS			NS			7.12		
CV (%) M	6.4			4.63			14.5			2.07		
CV (%) S	6.50			2.87			4.87			1.85		

Table 5.3.3: Management of Sodic soils using nano Zn formulations, panicles /m^2 of rice at different locations

Treatments/ Varieties	Kanpur			Mandya			Pusa			Faizabad		
	CSR 23	DRR Dhan 48	Mean	CSR 23	DRR Dhan 48	Mean	CSR 23	DRR Dhan 48	Mean	CSR 23	DRR Dhan 48	Mean
Control	221	216	219	224	223	224	196	249	222	241	281	261
ZnSO4 @ 0.5 % foliar spray	259	246	253	256	245	251	238	278	258	263	268	265
Nano Zn @ 20 ppm foliar spray	267	258	263	276	267	272	242	285	264	276	295	285
Nano Zn @ 50 ppm foliar spray	279	261	270	312	296	304	243	281	262	290	310	300
Soil application of $ZnSO_4$ @ 50 kg/ha	291	283	287	281	275	278	254	291	273	276	304	290
Silicic acid @ 40 ppm	253	241	247	268	265	267	236	274	255	268	310	289
Silicic acid @ 80 ppm	265	252	259	275	274	275	266	293	280	284	313	298
Mean	262	251	256	270	263	267	239	278	259	271	297	284
CD M	9.23			18.0			NS			6.14		
CD S	5.71			NS			8.35			3.11		
M X S	NS			NS			NS			8.24		
S XM	NS			NS			NS			7.28		
CV (%) M	2.86			5.38			14.7			2.06		
CV (%) S	3.36			6.92			4.87			1.97		

Table 5.3.4: Management of Sodic soils using nano Zn formulations, Grain yields (t/ha) of rice at different locations

Treatments/ Varieties	Kanpur			Mandya			Pusa			Faizabad		
	CSR 23	DRR Dhan 48	Mean	CSR 23	DRR Dhan 48	Mean	CSR 23	DRR Dhan 48	Mean	CSR 23	DRR Dhan 48	Mean
Control	2.88	2.61	2.74	4.59	4.52	4.56	2.53	3.02	2.78	2.22	3.04	2.63
$ZnSO_4$ @ 0.5 % foliar spray	3.52	3.25	3.38	5.31	5.27	5.29	2.78	3.32	3.05	2.64	3.69	3.16
Nano Zn @ 20 ppm foliar spray	3.88	3.52	3.7	5.65	5.62	5.64	2.89	3.39	3.14	2.86	3.96	3.41
Nano Zn @ 50 ppm foliar spray	4.17	3.87	4.02	6.02	5.96	5.99	3.22	3.57	3.4	3.25	4.20	3.72
Soil application of $ZnSO_4$ @ 50 kg/ha	4.43	4.17	4.30	5.73	5.64	5.68	3.32	3.62	3.47	3.09	4.11	3.6
Silicic acid @ 40 ppm	3.42	3.18	3.30	5.44	5.34	5.39	3.22	3.51	3.36	3.06	4.25	3.66
Silicic acid @ 80 ppm	3.68	3.43	3.56	5.63	5.57	5.6	3.52	3.72	3.62	3.19	4.34	3.76
Mean	3.71	3.43	3.57	5.48	5.42	5.45	3.07	3.45	3.26	2.90	3.94	3.42
CD M	0.43			0.25			0.32			0.11		
CD S	0.20			NS			0.16			0.05		
M X S	NS			NS			NS			0.14		
S XM	NS			NS			NS			0.13		
CV (%) M	9.57			3.67			7.71			3.19		
CV (%) S	8.63			3.75			7.50			2.77		

Table 5.3.5: Management of Sodic soils using nano Zn formulations, Straw yields (t/ha) of rice at different locations

Treatments/ Varieties	Kanpur			Mandya			Pusa			Faizabad		
	CSR 23	DRR Dhan 48	Mean	CSR 23	DRR Dhan 48	Mean	CSR 23	DRR Dhan 48	Mean	CSR 23	DRR Dhan 48	Mean
Control	3.72	3.41	3.56	5.65	5.23	5.44	3.88	4.61	4.24	2.62	3.58	3.1
ZnSO4 @ 0.5 % foliar spray	4.58	4.28	4.43	5.94	5.89	5.92	4.36	5.1	4.73	3.11	4.35	3.73
Nano Zn @ 20 ppm foliar spray	5.09	4.69	4.89	6.35	6.27	6.31	4.41	5.14	4.78	3.39	4.69	4.04
Nano Zn @ 50 ppm foliar spray	5.54	5.22	5.38	6.82	6.65	6.74	4.93	5.62	5.28	3.83	4.97	4.4
Soil application of $ZnSO_4$ @ 50 kg/ha	5.98	5.67	5.82	6.48	6.24	6.36	4.89	5.71	5.3	3.66	4.63	4.14
Silicic acid @ 40 ppm	4.45	4.19	4.32	5.99	5.94	5.96	4.58	4.98	4.78	3.62	5.06	4.34
Silicic acid @ 80 ppm	4.85	4.57	4.71	6.33	6.23	6.28	5.00	5.28	5.14	3.77	5.13	4.45
Mean	4.89	4.58	4.73	6.22	6.06	6.14	4.58	4.61	4.89	3.43	4.63	4.03
CD M	0.58			0.24			0.37			0.19		
CD S	0.27			0.12			0.3			0.11		
M X S	NS			NS			NS			NS		
S XM	NS			NS			NS			NS		
CV (%) M	9.81			3.13			6.05			4.56		
CV (%) S	8.52			2.9			9.25			4.80		

Table 5.3.7: Management of Sodic soils using nano Zn formulations, Total nutrient uptake of rice at Kanpur

Treatments/ Varieties	N uptake (kg/ha)			P uptake (kg/ha)			K uptake (kg/ha)			Zn uptake (g/ha)		
	CSR 23	DRR Dhan 48	Mean	CSR 23	DRR Dhan 48	Mean	CSR 23	DRR Dhan 48	Mean	CSR 23	DRR Dhan 48	Mean
Control	37.5	35.1	36.3	12.9	11.9	12.4	48.1	45.0	46.6	112	109	111
$ZnSO_4$ @ 0.5 % foliar spray	51.0	48.5	49.8	17.6	16.9	17.3	63.9	60.5	62.2	194	184	189
Nano Zn @ 20 ppm foliar spray	60.1	55.0	57.6	19.7	18.9	19.3	72.1	67.8	69.9	227	215	221
Nano Zn @ 50 ppm foliar spray	66.8	64.2	65.5	22.5	22.2	22.4	79.5	77.4	78.4	271	260	266
Soil application of $ZnSO_4$ @ 50 kg/ha	74.2	71.2	72.7	25.1	24.7	24.9	87.7	85.7	86.7	309	299	304
Silicic acid @ 40 ppm	49.5	47.2	48.3	17.0	16.2	16.6	61.1	59.1	60.1	165	166	166
Silicic acid @ 80 ppm	54.8	52.0	53.4	18.5	17.6	18.1	67.6	65.0	66.3	189	180	185
Mean	56.2	53.2	54.7	19.0	18.3	18.6	68.5	65.7	67.1	209	202	206
CD M	10.5			2.57			9.27			35.8		
CD S	2.80			NS			NS			NS		
M X S	NS			NS			NS			NS		
S XM	NS			NS			NS			NS		
CV (%) M	15.2			10.9			10.9			13.8		
CV (%) S	7.71			9.05			8.53			8.57		

Table 5.3.8: Management of Sodic soils using nano Zn formulations, Total nutrient uptake of rice at Mandya

Treatments/ Varieties	N uptake (kg/ha)			P uptake (kg/ha)			K uptake (kg/ha)			Zn uptake (g/ha)		
	CSR 23	DRR Dhan 48	Mean	CSR 23	DRR Dhan 48	Mean	CSR 23	DRR Dhan 48	Mean	CSR 23	DRR Dhan 48	Mean
Control	76.7	69.9	73.3	12.6	10.9	11.8	59.9	54.2	57.0	121	127	124
$ZnSO_4$ @ 0.5 % foliar spray	93.1	94.3	93.7	15.4	17.3	16.4	67.9	70.0	69.0	184	182	183
Nano Zn @ 20 ppm foliar spray	103.3	104.6	103.9	20.9	21.8	21.3	88.6	87.4	88.0	203	210	207
Nano Zn @ 50 ppm foliar spray	120.3	117.3	118.8	27.2	25.9	26.5	102.6	97.0	99.8	252	254	253
Soil application of $ZnSO_4$ @ 50 kg/ha	100.8	97.4	99.1	20.3	19.8	20.0	77.7	74.8	76.2	263	267	265
Silicic acid @ 40 ppm	89.9	89.9	89.9	18.9	19.7	19.3	69.0	67.5	68.3	179	182	180
Silicic acid @ 80 ppm	96.7	96.3	96.5	22.9	21.2	22.1	72.0	71.5	71.7	193	197	195
Mean	97.2	95.6	96.4	19.7	19.5	19.6	76.8	74.6	75.7	199	202	200
CD M	4.30			2.73			7.59			7.5		
CD S	NS			NS			2.10			NS		
M X S	NS			1.7			NS			NS		
S XM	NS			2.28			NS			NS		
CV (%) M	3.54			11.0			7.97			2.97		
CV (%) S	2.74			4.94			4.18			3.62		

Table 5.3.9: Management of Sodic soils using nano Zn formulations, Total nutrient uptake of rice at Pusa

Treatments/ Varieties	N uptake (kg/ha)			P uptake (kg/ha)			K uptake (kg/ha)			Zn uptake (g/ha)		
	CSR 23	DRR Dhan 48	Mean	CSR 23	DRR Dhan 48	Mean	CSR 23	DRR Dhan 48	Mean	CSR 23	DRR Dhan 48	Mean
Control	38.6	51.6	45.1	11.6	11.7	11.7	46.3	69.0	57.6	189	285	237
$ZnSO_4$ @ 0.5 % foliar spray	47.9	62.5	55.2	12.7	11.9	12.3	53.7	81.0	67.3	233	332	282
Nano Zn @ 20 ppm foliar spray	55.4	63.1	59.2	12.4	11.9	12.2	56.5	84.3	70.4	280	360	320
Nano Zn @ 50 ppm foliar spray	62.5	72.2	67.3	13.0	12.4	12.7	68.3	95.0	81.6	334	428	381
Soil application of $ZnSO_4$ @ 50 kg/ha	67.7	76.0	71.8	12.9	12.1	12.5	69.4	98.2	83.8	358	451	405
Silicic acid @ 40 ppm	59.5	65.6	62.5	14.1	13.3	13.7	62.8	75.9	69.4	235	325	280
Silicic acid @ 80 ppm	69.9	75.4	72.7	16.3	14.0	15.1	71.5	91.5	81.5	280	362	321
Mean	57.3	66.6	61.9	13.2	12.4	12.8	61.2	84.9		273	363	318
CD M	5.65			1.15			11.4			18.3		
CD S	2.94			0.75			4.94			21.9		
M X S	NS			NS			NS			NS		
S XM	NS			NS			NS			NS		
CV (%) M	7.25			7.09			12.4			4.60		
CV (%) S	7.17			8.85			10.2			10.4		

Table 5.3.10: Management of Sodic soils using nano Zn formulations, Total nutrient uptake of rice at Faizabad

Treatments/ Varieties	N uptake (kg/ha)			P uptake (kg/ha)			K uptake (kg/ha)		
	CSR 23	DRR Dhan 48	Mean	CSR 23	DRR Dhan 48	Mean	CSR 23	DRR Dhan 48	Mean
Control	38.7	58.9	48.8	20.0	32.2	26.1	27.4	40.4	33.9
$ZnSO_4$ @ 0.5 % foliar spray	47.9	80.5	64.2	26.4	43.7	35.1	36.2	53.5	44.8
Nano Zn @ 20 ppm foliar spray	56.4	85.1	70.7	32.0	50.8	41.4	41.4	62.5	52.0
Nano Zn @ 50 ppm foliar spray	68.2	97.9	83.1	38.8	57.6	48.2	49.6	68.4	59.0
Soil application of $ZnSO_4$ @ 50 kg/ha	61.0	84.8	72.9	33.7	48.0	40.9	43.4	59.3	51.3
Silicic acid @ 40 ppm	61.9	93.9	77.9	35.4	57.6	46.5	46.2	69.9	58.0
Silicic acid @ 80 ppm	66.0	96.3	81.1	36.3	58.4	47.3	48.1	72.4	60.2
Mean	57.1	85.3	71.2	31.8	49.8	40.7	41.7	60.9	65.0
CD M	4.24			2.86			3.12		
CD S	2.09			1.43			1.67		
M X S	5.54			3.71			4.41		
S XM	4.94			3.32			3.82		
CV (%) M	5.66			6.69			5.78		
CV (%) S	5.29			6.18			5.84		

Table 5.3.11: Management of Sodic soils using nano Zn formulations, uptake of Zinc in grain and straw of rice at Kanpur

Treatments/ Varieties	Grain Zn uptake			Straw Zn uptake		
	CSR 23	DRR Dhan 48	Mean	CSR 23	DRR Dhan 48	Mean
Control	37	35	36	74	75	75
$ZnSO_4$ @ 0.5 % foliar spray	75	70	73	119	114	116
Nano Zn @ 20 ppm foliar spray	89	83	86	138	132	135
Nano Zn @ 50 ppm foliar spray	106	101	103	165	160	163
Soil application of $ZnSO_4$ @ 50 kg/ha	123	118	120	187	182	184
Silicic acid @ 40 ppm	67	66	67	98	99	99
Silicic acid @ 80 ppm	74	72	73	115	109	112
Mean	82	78	80	128	124	126
CD M	13.5			2.5		
CD S	NS			NS		
M X S	NS			NS		
S XM	NS			NS		
CV (%) M	13.4			16.2		
CV (%) S	13.2			9.59		

Table 5.3.12: Management of Sodic soils using nano Zn formulations, uptake of Zinc in grain and straw of rice at Mandya

Treatments/ Varieties	Grain Zn uptake			Straw Zn uptake		
	CSR 23	DRR Dhan 48	Mean	CSR 23	DRR Dhan 48	Mean
Control	36	37	36	86	90	88
$ZnSO_4$ @ 0.5 % foliar spray	68	69	68	117	114	115
Nano Zn @ 20 ppm foliar spray	75	80	78	128	130	129
Nano Zn @ 50 ppm foliar spray	99	98	98	153	156	155
Soil application of $ZnSO_4$ @ 50kg/ha	111	115	113	153	153	153
Silicic acid @ 40 ppm	68	73	70	112	109	110
Silicic acid @ 80 ppm	75	77	76	118	119	119
Mean	76	78	77	124	124	124
CD M	4.3			5.1		
CD S	NS			NS		
M X S	NS			NS		
S XM	NS			NS		
CV (%) M	4.47			3.32		
CV (%) S	6.19			3.28		

Table 5.3.13: Management of Sodic soils using nano Zn formulations, uptake of Zinc in grain and straw of rice at Pusa

Treatments/ Varieties	Grain Zn uptake			Straw Zn uptake		
	CSR 23	DRR Dhan 48	Mean	CSR 23	DRR Dhan 48	Mean
Control	62	101	82	128	184	156
$ZnSO_4$ @ 0.5 % foliar spray	83	119	101	150	213	182
Nano Zn @ 20 ppm foliar spray	103	139	121	177	221	199
Nano Zn @ 50 ppm foliar spray	119	158	139	215	270	242
Soil application of $ZnSO_4$ @ 50 kg/ha	125	162	143	234	289	261
Silicic acid @ 40 ppm	82	119	100	154	206	180
Silicic acid @ 80 ppm	99	132	116	182	229	205
Mean	96	133	115	177	230	204
CD M	13			22		
CD S	8			17		
M X S	NS			NS		
S XM	NS			NS		
CV (%) M	9.13			8.70		
CV (%) S	10.6			12.6		

Table 5.3.14: Management of Sodic soils using nano Zn formulations, Post-harvest soil zinc status

Treatments/ Varieties	Mandya			Pusa		
	CSR 23	DRR Dhan 48	Mean	CSR 23	DRR Dhan 48	Mean
Control	0.79	0.88	0.84	0.57	0.53	0.55
ZnSO4 @ 0.5 % foliar spray	0.96	0.91	0.94	0.6	0.6	0.6
Nano Zn @ 20 ppm foliar spray	0.98	0.98	0.98	0.59	0.58	0.58
Nano Zn @ 50 ppm foliar spray	1.02	1.11	1.06	0.61	0.58	0.6
Soil application of $ZnSO_4$ @ 50 kg/ha	1.94	1.84	1.89	0.77	0.74	0.76
Silicic acid @ 40 ppm	0.78	0.88	0.83	0.59	0.58	0.58
Silicic acid @ 80 ppm	0.87	0.83	0.85	0.61	0.6	0.6
Mean	1.05	1.06	1.05	0.62	0.60	0.61
CD M	0.06			0.05		
CD S	NS			NS		
M X S	NS			NS		
S XM	NS			NS		
CV (%) M	4.18			6.68		
CV (%) S	5.82			7.86		

5.4 Management of Acid Soils (*Kharif*)

Acid soils are widespread in Eastern, North Eastern and coastal regions of the Indian Peninsula and are poor in soil fertility and are associated with toxicity of iron in lowlands, aluminium in the uplands, with depletion of Ca, Mg and K, and deficiency of B, Mo and Si. The soils also fix large quantities of soluble P, which leads to sub-optimal productivity of crops. Management options include liming to correct soil acidity, balanced application of P, K, and silicates and organic manuring besides growing tolerant cultures. In addition, the identification of suitable genotypes with high yield potential helps stabilize rice productivity. The trial was, therefore, conducted at two centres *viz*., Moncompu (Kuttanad, Kerala, soil pH 4.46) and Titabar (Assam, soil pH 5.3) under irrigated conditions during *Kharif* 2023. The genotypes Uma and Vasundhara were evaluated under eight sets of nutrient management treatments *viz*., i) RDF, ii) RDF + Silixol spray (at vegetative, booting and grain filling stage), iii) RDF + Rice husk ash, 500 kg/ha (300 kg/ha basal and 200 kg/ha 30 days after transplanting), iv) RDF + Dolomite, 500 kg/ha (300 kg/ha basal and 200 kg/ha 30 days after transplanting), v) RDF + Silixol spray (at vegetative, booting and grain filling stage) + Dolomite 250 kg/ha, 30 days after transplanting, vi) RDF + Rice husk ash, 250 kg/ha during land preparation + Dolomite 250 kg/ha, 30 days after transplanting, vii) RDF + Potassium Silicate Solution- Four sprays at 15 days interval starting from 15 DAT (days after transplanting) and viii) RDF + Dolomite + Potassium Silicate Solution- Four sprays at 15 days intervals starting from 15 DAT (days after transplanting). The details of crop, soil, and weather parameters of the experimental sites (Table 5.4.1) show variations in soil characteristics with reference to pH, organic carbon content, soil texture and available nutrient status. The experimental results are presented in Tables 5.4.2 – 5.4.11 and briefly discussed.

Yield and yield parameters

At Moncompu (MCP), the application of dolomite + potassium silicate in combination with RDF (4.60 t/ha) and application of RDF + dolomite (4.35t/ha) yielded significantly higher than other treatments (Table 5.4.4). The yields obtained with RDF + RHA (4.14 t/ha) and RDF + Dolomite + RHA (4.06 t/ha) application were on par, while the treatment that received only the recommended dose of fertilizer (RDF) recorded the lowest yield of 3.09 t/ha. Among varieties, the yield of Uma (3.91 t/ha) was significantly higher than Vasundhara (3.66 t/ha) at MCP. Straw yields recorded with RDF + dolomite + potassium silicate (7.74 t/ha) and RDF + dolomite (7.45 t/ha) were on par and significantly higher than other treatments. The highest number of tillers/m^2, panicles/m^2 and filled grain/panicle were recorded in RDF + dolomite

(207, 155, 115 respectively) which was on par with RDF + dolomite + potassium silicate (204, 158, 117 respectively) and RDF + dolomite + RHA (198, 151, 108 respectively) which were significantly higher in comparison to other treatments (Table 5.4.2). Similar to grain yield, the variety Uma recorded significantly higher tillers/m^2 (192), and filled grain/panicle (105). Thousand-grain weight was not significantly influenced by both nutrient management and varieties.

At Titabar (TTB), significant differences were observed in nutrient management treatments (Table 5.4.5), with the highest yield recorded in RDF + dolomite + Silixol spray treatment (4.51 t/ha), which was on par with RDF + dolomite + potassium silicate (4.34). The other treatments recorded comparable on-par yields ranging from 4.19 t/ha to 3.98 t/ha, while the lowest yields were observed in the treatments with RDF + RHA (3.89 t/ha) and sole RDF application (3.62 t/ha). Between the varieties, the genotype Uma recorded significantly superior yields (4.23 t/ha) compared to Vasundhara (3.94 t/ha). Straw yields followed similar trends as grain yields at Titabar for both nutrient management and varieties. A significantly higher number of tillers/hill (16), panicles/hill (14) and filled grain/ panicle (114) were observed following the application of RDF + dolomite + Silixol spray (Table 5.4.3). Significantly higher tillers/hill (14), panicles/hill (12) and filled grain/ panicle (105) were observed in the variety Uma.

Total nutrient uptake

Different nutrient management practices significantly influenced total NPK uptake at Moncompu (Table 5.4.6). Among the treatments, RDF + dolomite + potassium silicate recorded significantly higher phosphorus uptake (44.01kg/ha), potassium uptake (111.84 kg/ha) and zinc uptake (281.29 g/ha) compared to the rest of the treatments. No significant differences were observed between genotypes for nutrient uptake. RDF + dolomite + Silixol spray recorded significantly higher nitrogen, phosphorus and potassium uptake (74.37 kg/ha, 13.85 kg/ha and 100.72 kg/ha, respectively) at Titabar (Table 5.4.7) compared to other treatments, while the variety Uma recorded significantly higher NPK uptake (63.51kg/ha, 11.31kg/ha and 87.46 kg/ha respectively) than Vasundhara.

Post-harvest soil properties

No significant effect of nutrient management was observed for soil pH and EC and soil OC% at Moncompu (Table 5.4.8). Between the varieties, soil EC was significantly higher in Vasundhara (0.13). The available N and P in soil were significantly higher under treatments with RDF + RHA (317.10 and 53.87 kg/ha respectively) and RDF + dolomite

(316.35 and 56.25 kg/ha respectively). No treatment differences were observed for soil-available potassium and zinc due to nutrient management practices (Table 5.4.9. No significant differences between varieties were observed for soil available nutrients. At Titabar, application of RDF + dolomite + RHA (6.15), RDF + dolomite + potassium silicate (6.13) and RDF + dolomite + Silixol (6.12) significantly increased the soil pH (Table 5.4.10). The soils grown with genotype Uma recorded significantly higher pH (5.68) compared to the soils with Vasundhara (5.66). Significantly higher accumulation of organic carbon was observed in the treatments with RDF + RHA (0.89%) and RDF + dolomite + RHA (0.88%). The available nitrogen status in soil showed a significant increase due to RDF + dolomite + RHA (319.83 kg/ha) and RDF + dolomite + Silixol (317.00 kg/ha) compared to other treatments. All treatments except RDF, RDF + Silixol and RDF + potassium silicate significantly increased soil available phosphorus (20.10-23.00 kg/ha). The available potassium in soil showed a significant increase due to RDF + dolomite + RHA (164.67 kg/ha), RDF + dolomite (162.67 kg/ha) and RDF + dolomite + potassium silicate (162.00 kg/ha) compared to other treatments (Table 5.4.11). No significant differences between varieties were observed for soil available nutrients at Titabar.

Summary

In comparison to the sole RDF application, RDF + dolomite + Silixol significantly improved the yield at Titabar by 24.58%, while the treatment RDF + dolomite + potassium silicate improved yields significantly at both at Moncompu (48.87%) and Titabar (19.89 %). The variety Uma recorded significantly higher yields over Vasundhara at both locations ranging from 6.83% from Moncompu to 7.36% at Titabar. Application of RDF + dolomite + RHA, RDF + dolomite + potassium silicate and RDF + dolomite + Silixol at Titabar, resulted in a significant increase in soil pH (6.15, 6.13 and 6.12 respectively) over control RDF treatment (5.2) indicating the improved ameliorative potential of application of RDF + dolomite (5.17) in combination with RHA, potassium silicate and Silixol. The effect of nutrient management on NPKZn uptakes varied with locations. At Moncompu, RDF + dolomite + potassium silicate increased the uptake of PKZn by 78.98, 67.75 and 65.48% respectively while at Titabar, RDF + dolomite + Silixol increased the uptake of NPK by 61.15, 84.42 and 69.85% respectively over sole RDF application.

Table 5.4.1: Management of acid soils (*Kharif*-2023)

Soil and crop characteristics

Parameter	**Moncompu**	**Titabar**
Cropping system	Rice - Rice	Rice -Fallow
Rice Variety	Vasundhara, Uma	Vasundhara, Uma
RDF (kg NPK/ha)	90:45:45	60:20:40
Crop growth	Good	Good
Soil Characteristics		
pH (1:2.5)	4.46	5.3
Org. carbon (%)	3.12	0.85
CEC [cmol (p+)/kg]		12.1
EC (ds/m)	0.09	
Avail.N (kg/ha)	322.8	311
Avail. P_2O_5 (kg/ha)	56.2	21.1
Avail. K_2O (kg/ha)	242.6	161.5
Avail S (mg/kg)	12.4	-
DTPA –Zn (mg/kg)	1.32	-
DTPA –Fe (mg/kg)	283	-
DTPA –Mn (mg/kg)	1.94	-
DTPA –Cu (mg/kg)	1.58	-

Table 5.4.2: Management of acid soils (*Kharif*-2023)

Yield parameters at Moncompu

Treatments	Tillers m^{-2}			Panicles m^{-2}			Filled grains/panicles			1000 grain weight (g)		
	Vasundhara	Uma	Mean	Vasundhara	Uma	Mean	Vasundhara	Uma	Mean	Vasundhara	Uma	Mean
RDF	164	171	168	124	131	128	91	93	92	26.87	27.20	27.03
RDF + Silixol	173	179	176	132	136	134	88	93	90	26.73	26.90	26.82
RDF + RHA*	184	192	188	142	148	145	98	103	101	27.10	27.90	27.50
RDF + Dolomite	201	213	207	152	159	155	113	118	115	27.23	27.70	27.47
RDF + Dolomite + Silixol	185	189	187	140	144	142	97	102	100	27.47	27.87	27.67
RDF + Dolomite + RHA	194	202	198	148	153	151	104	113	108	27.07	27.60	27.33
RDF + K-Silicate	182	186	184	139	140	140	88	97	93	26.37	26.80	26.58
RDF + Dolomite +K-Silicate	201	207	204	153	164	158	115	119	117	27.17	27.70	27.43
Mean	**185**	**192**	**189**	**141**	**147**	**144**	**99**	**105**	**102**	**27.00**	**27.46**	**27.23**
Nutrient management												
CD (0.05)	13.23			10.66			13.26			NS		
CV%	5.60			5.92			10.40			4.44		
Varieties												
CD (0.05)	6.02			NS			4.04			NS		
CV%	5.17			6.74			6.43			3.17		
Interaction -M X S	NS			NS			NS			NS		
Interaction -S X M	NS			NS			NS			NS		

*Rice husk ash, M – Main plot (Nutrient management), S – Subplot (Varieties)

Table 5.4.3: Management of acid soils (*Kharif*-2023)

Yield parameters at Titabar

Treatments	**Tillers/hill**			**Panicles/hill**			**Filled grains/panicle**		
	Vasundhara	**Uma**	**Mean**	**Vasundhara**	**Uma**	**Mean**	**Vasundhara**	**Uma**	**Mean**
RDF	12	11	11	9	9	9	82	94	88
RDF + Silixol	15	15	15	12	13	12	96	106	101
RDF + RHA*	12	13	13	11	11	11	94	97	96
RDF + Dolomite	13	13	13	11	11	11	93	97	95
RDF + Dolomite + Silixol	16	16	16	14	14	14	110	119	114
RDF + Dolomite + RHA	13	14	14	11	12	12	107	109	108
RDF + K-Silicate	13	14	14	12	12	12	98	101	99
RDF + Dolomite +K-Silicate	15	15	15	13	13	13	107	115	111
Mean	**14**	**14**	**14**	**11.5**	**12**	**12**	**98**	**105**	**102**
Nutrient management									
CD (0.05)	1.25			1.40			12.96		
CV%	7.32			9.56			10.31		
Varieties									
CD (0.05)	NS			0.44			5.33		
CV%	7.07			6.11			8.57		
Interaction -M X S	NS			NS			NS		
Interaction -S X M	NS			NS			NS		

*Rice husk ash, M – Main plot (Nutrient management), S – Subplot (Varieties)

Table 5.4.4: Management of acid soils (*Kharif*-2023)

Grain and straw yields at Moncompu

Treatments	Grain yield (t/ha)			Straw yield (t/ha)		
	Vasundhara	Uma	Mean	Vasundhara	Uma	Mean
RDF	3.01	3.17	3.09	5.15	5.43	5.29
RDF + Silixol	3.04	3.22	3.13	5.20	5.52	5.36
RDF + RHA*	4.00	4.28	4.14	6.85	7.38	7.12
RDF + Dolomite	4.25	4.44	4.35	7.30	7.60	7.45
RDF + Dolomite + Silixol	3.55	3.74	3.65	6.12	6.40	6.26
RDF + Dolomite + RHA	3.87	4.25	4.06	6.62	7.25	6.93
RDF + K-Silicate	3.14	3.39	3.27	5.40	5.77	5.58
RDF + Dolomite +K-Silicate	4.44	4.75	4.60	7.62	7.87	7.74
Mean	**3.66**	**3.91**	**3.78**	**6.28**	**6.65**	**6.47**
Nutrient management						
CD (0.05)	0.39			0.63		
CV%	8.34			7.77		
Varieties						
CD (0.05)	0.23			NS		
CV%	10.08			10.48		
Interaction -M X S	NS			NS		
Interaction -S X M	NS			NS		

*Rice husk ash, M – Main plot (Nutrient management), S – Subplot (Varieties)

Table 5.4.5: Management of acid soils (*Kharif*-2023)

Grain and straw yields at Titabar

Treatments	**Grain yield (t/ha)**			**Straw yield (t/ha)**		
	Vasundhara	**Uma**	**Mean**	**Vasundhara**	**Uma**	**Mean**
RDF	3.46	3.79	3.62	3.77	4.13	3.95
RDF + Silixol	4.11	4.27	4.19	4.51	4.65	4.58
RDF + RHA*	3.73	4.04	3.89	4.07	4.41	4.24
RDF + Dolomite	3.84	4.12	3.98	4.19	4.50	4.34
RDF + Dolomite + Silixol	4.37	4.64	4.51	4.78	4.91	4.84
RDF + Dolomite + RHA	3.93	4.24	4.08	4.29	4.65	4.47
RDF + K-Silicate	3.88	4.22	4.05	4.23	4.61	4.42
RDF + Dolomite +K-Silicate	4.20	4.48	4.34	4.65	4.83	4.74
Mean	**3.94**	**4.23**	**4.08**	**4.31**	**4.59**	**4.45**
Nutrient management						
CD (0.05)	0.27			0.30		
CV%	5.39			5.37		
Varieties						
CD (0.05)	0.14			0.16		
CV%	5.64			6.02		
Interaction -M X S	NS			NS		
Interaction -S X M	NS			NS		

*Rice husk ash, M – Main plot (Nutrient management), S – Subplot (Varieties)

Table 5.4.6: Management of acid soils (*Kharif*-2023)

Nutrient (NPK) uptake at Moncompu

Treatments	Total phosphorous uptake (kg/ha)			Total potassium uptake (kg/ha)			Total zinc uptake (g/ha)		
	Vasundhara	Uma	Mean	Vasundhara	Uma	Mean	Vasundhara	Uma	Mean
RDF	23.02	26.15	24.59	64.00	69.33	66.67	163.79	176.18	169.98
RDF + Silixol	23.63	26.25	24.94	66.73	72.70	69.72	163.73	175.12	169.42
RDF + RHA*	36.10	41.94	39.02	95.09	104.21	99.65	233.42	254.10	243.76
RDF + Dolomite	40.06	40.37	40.21	105.90	109.27	107.58	262.65	279.98	271.31
RDF + Dolomite + Silixol	30.94	31.39	31.17	83.51	88.25	85.88	222.38	226.19	224.29
RDF + Dolomite + RHA	37.36	42.60	39.98	96.36	106.48	101.42	244.18	268.31	256.25
RDF + K-Silicate	27.09	28.36	27.73	73.24	79.36	76.30	179.44	185.42	182.43
RDF + Dolomite +K-Silicate	44.43	43.58	44.01	109.87	113.81	111.84	277.04	285.54	281.29
Mean	**32.83**	**35.08**	**33.95**	**86.84**	**92.93**	**89.88**	**218.33**	**231.35**	**224.84**
Nutrient management									
CD (0.05)	6.25			10.09			39.17		
CV%	14.73			8.98			13.94		
Varieties									
CD (0.05)	NS			NS			NS		
CV%	15.46			13.25			13.69		
Interaction -M X S	NS			NS			NS		
Interaction -S X M	NS			NS			NS		

*Rice husk ash, M – Main plot (Nutrient management), S – Subplot (Varieties)

Table 5.4.7: Management of acid soils (*Kharif*-2023)

Nutrient (NPK) uptake at Titabar

Treatments	**Total nitrogen uptake (kg/ha)**			**Total phosphorous uptake (kg/ha)**			**Total Potassium uptake (kg/ha)**		
	Vasundhara	**Uma**	**Mean**	**Vasundhara**	**Uma**	**Mean**	**Vasundhara**	**Uma**	**Mean**
RDF	42.95	49.34	46.15	6.95	8.08	7.51	56.00	62.59	59.30
RDF + Silixol	63.44	67.04	65.24	10.48	12.06	11.27	81.11	87.92	84.51
RDF + RHA*	49.01	54.07	51.54	8.21	9.83	9.02	66.80	84.14	75.47
RDF + Dolomite	51.83	57.25	54.54	8.72	9.92	9.32	69.17	80.52	74.84
RDF + Dolomite + Silixol	70.90	77.84	74.37	13.22	14.47	13.85	96.99	104.46	100.72
RDF + Dolomite + RHA	55.03	63.58	59.30	8.80	10.63	9.71	75.41	86.25	80.83
RDF + K-Silicate	58.14	64.90	61.52	9.99	11.72	10.85	81.30	92.64	86.97
RDF + Dolomite +K-Silicate	66.62	74.10	70.36	11.88	13.78	12.83	92.45	101.12	96.78
Mean	**57.24**	**63.51**	**60.38**	**9.78**	**11.31**	**10.54**	**77.40**	**87.46**	**82.43**
Nutrient management									
CD (0.05)	5.69			1.50			7.06		
CV%	7.61			11.48			6.92		
Varieties									
CD (0.05)	2.18			1.06			4.44		
CV%	5.89			16.43			8.81		
Interaction -M X S	NS			NS			NS		
Interaction -S X M	NS			NS			NS		

*Rice husk ash, M – Main plot (Nutrient management), S – Subplot (Varieties)

Table 5.4.8: Management of acid soils (*Kharif*-2023)

Post-harvest soil characteristics at Moncompu

Treatments	**Soil pH**			**Soil EC (dS/m)**			**Soil OC %**		
	Vasundhara	**Uma**	**Mean**	**Vasundhara**	**Uma**	**Mean**	**Vasundhara**	**Uma**	**Mean**
RDF	4.06	4.12	4.09	0.13	0.12	0.13	3.18	3.2	3.19
RDF + Silixol	4.17	4.24	4.21	0.14	0.11	0.13	3.22	3.21	3.22
RDF + RHA*	4.55	4.49	4.52	0.13	0.11	0.12	3.21	3.22	3.22
RDF + Dolomite	4.47	4.54	4.51	0.12	0.13	0.13	3.17	3.19	3.18
RDF + Dolomite + Silixol	4.26	4.37	4.31	0.14	0.12	0.13	3.17	3.15	3.16
RDF + Dolomite + RHA	4.47	4.47	4.47	0.13	0.10	0.12	3.2	3.13	3.17
RDF + K-Silicate	4.18	4.30	4.24	0.15	0.12	0.13	3.15	3.18	3.17
RDF + Dolomite +K-Silicate	4.32	4.38	4.35	0.13	0.12	0.13	3.18	3.19	3.18
Mean	4.31	4.36	4.34	0.13	0.12	0.13	3.19	3.18	3.18
Nutrient management									
CD (0.05)	NS			NS			NS		
CV%	5.81			19.02			5.05		
Varieties									
CD (0.05)	NS			0.02			NS		
CV%	5.25			18.91			10.19		
Interaction -M X S	NS			NS			NS		
Interaction -S X M	NS			NS			NS		

*Rice husk ash, M – Main plot (Nutrient management), S – Subplot (Varieties)

Table 5.4.9: Management of acid soils (Kharif-2023)

Post-harvest soil characteristics at Moncompu (Soil available nutrients)

Treatments	Available N (kg/ha)			Available P (kg/ha)			Available K (kg/ha)			Available Zn (mg/kg)		
	Vasundhara	Uma	Mean	Vasundhara	Uma	Mean	Vasundhara	Uma	Mean	Vasundhara	Uma	Mean
RDF	283.10	278.40	280.75	51.60	50.53	51.07	239.93	236.90	238.42	4.06	4.12	4.09
RDF + Silixol	284.43	282.00	283.22	52.27	53.90	53.08	239.90	241.60	240.75	4.17	4.24	4.21
RDF + RHA*	315.77	318.43	317.10	52.83	54.90	53.87	242.37	244.43	243.40	4.55	4.49	4.52
RDF + Dolomite	313.83	318.87	316.35	55.27	57.23	56.25	238.90	243.20	241.05	4.47	4.54	4.51
RDF + Dolomite + Silixol	305.33	308.87	307.10	49.47	51.63	50.55	244.43	241.10	242.77	4.26	4.37	4.31
RDF + Dolomite + RHA	297.10	315.07	306.08	54.50	55.10	54.80	242.17	241.23	241.70	4.47	4.47	4.47
RDF + K-Silicate	294.70	283.07	288.88	54.83	52.90	53.87	239.13	244.47	241.80	4.18	4.30	4.24
RDF + Dolomite +K-Silicate	309.90	311.60	310.75	51.43	50.37	50.90	244.87	245.80	245.33	4.32	4.38	4.35
Mean	300.52	302.04	301.28	52.78	53.32	53.05	241.46	242.34	241.90	4.31	4.36	4.34
Nutrient management												
CD (0.05)	20.62			3.68			NS			NS		
CV%	5.47			5.54			5.57			8.18		
Varieties												
CD (0.05)	NS			NS			NS			NS		
CV%	5.97			9.64			6.90			9.25		
Interaction -M X S	NS			NS			NS			NS		
Interaction -S X M	NS			NS			NS			NS		

*Rice husk ash, M – Main plot (Nutrient management), S – Subplot (Varieties)

Table 5.4.10: Management of acid soils (Kharif-2023)

Post-harvest soil characteristics at Titabar

Treatments	**Soil pH**			**Soil OC %**		
	Vasundhara	**Uma**	**Mean**	**Vasundhara**	**Uma**	**Mean**
RDF	5.20	5.20	5.20	0.84	0.83	0.84
RDF + Silixol	5.20	5.20	5.23	0.85	0.84	0.8
RDF + RHA*	5.23	5.10	5.17	0.87	0.90	0.89
RDF + Dolomite	6.03	6.07	6.05	0.85	0.85	0.85
RDF + Dolomite + Silixol	6.10	6.13	6.12	0.80	0.84	0.84
RDF + Dolomite + RHA	6.13	6.17	6.15	0.90	0.87	0.88
RDF + K-Silicate	5.27	5.37	5.32	0.84	0.85	0.84
RDF + Dolomite +K-Silicate	6.13	5.23	6.13	0.85	0.84	0.84
Mean	**5.66**	**5.68**	**5.67**	**0.86**	**0.86**	**0.85**
Nutrient management						
CD (0.05)	0.18			0.03		
CV%	5.67			2.69		
Varieties						
CD (0.05)	0.10			NS		
CV%	2.92			2.52		
Interaction -M X S	NS			NS		
Interaction -S X M	NS			NS		

*Rice husk ash, M – Main plot (Nutrient management), S – Subplot (Varieties), MCP- Moncompu, TTB- Titabar

Table 5.4.11: Management of acid soils (Kharif-2023)

Post-harvest soil characteristics at Titabar (Soil available nutrients)

Treatments	Available N (kg/ha)			Available P (kg/ha)			Available K (kg/ha)		
	Vasundhara	Uma	Mean	Vasundhara	Uma	Mean	Vasundhara	Uma	Mean
RDF	310.00	312.67	311.33	20.60	20.00	20.33	160.00	159.33	159.67
RDF + Silixol	310.00	311.00	310.50	20.33	20.00	20.10	161.00	160.30	160.67
RDF + RHA*	313.33	312.00	312.67	22.33	21.67	22.00	163.33	162.00	162.67
RDF + Dolomite	315.33	314.67	315.00	22.00	21.33	21.67	160.33	161.00	160.67
RDF + Dolomite + Silixol	316.67	317.33	317.00	23.00	21.67	22.33	161.33	161.67	161.50
RDF + Dolomite + RHA	321.67	318.00	319.83	23.33	22.00	22.67	165.00	164.33	164.67
RDF + K-Silicate	312.00	311.67	311.83	22.00	20.33	21.17	162.33	161.33	161.83
RDF + Dolomite +K-Silicate	313.33	316.33	314.83	24.00	22.00	23.00	162.00	162.00	162.00
Mean	**314.04**	**314.21**	**314.13**	**22.21**	**21.12**	**21.70**	**161.92**	**161.50**	**161.71**
Nutrient management									
CD (0.05)	4.04			1.53			2.71		
CV%	1.04			5.71			1.35		
Varieties									
CD (0.05)	NS			0.83			NS		
CV%	1.43			6.25			0.73		
Interaction -M X S	NS			NS			NS		
Interaction -S X M	NS			NS			NS		

*Rice husk ash, M – Main plot (Nutrient management), S – Subplot (Varieties)

5.5 Residue management in rice-based cropping systems

In India, huge quantities of crop residues (about 500 million tons) are produced annually of which paddy residues constitute around 50%. The disposal of paddy residues has become a big problem, particularly in North-Western states, mainly due to the use of combine harvesters and the narrow time gap (one to three weeks) between paddy harvesting and planting of wheat in NW India, resulting in farmers preferring to burn the residues in-situ. Burning biomass not only pollutes the environment by depleting air quality, and emitting greenhouse gases (GHGs) but also causes smog in the environment, resulting in the loss of appreciable amounts of plant essential nutrients besides being deleterious to soil microbes. The incineration of crop residues contributes to emissions of harmful air pollutants, which can cause severe impacts on human health too. Thus, proper residue management is of utmost importance as it contains plant nutrients and improves the soil-plant-atmospheric continuum. As an alternative strategy, these crop residues can be used for mulching, compost making and *in-situ* incorporation for improving soil fertility.

Keeping this in view, the present trial was initiated, in *Kharif* 2023, to study the influence of crop residues on rice productivity in rice-based cropping systems (RBCS). In the current year, the trial was conducted at eight centers *viz*., Faizabad (FZD), Khudwani (KHD), Kanpur (KPR), Karaikal (KRK), Maruteru (MTU), Moncompu (MCU), Pantnagar (PNT) and Pusa (PSA).

Last year, the treatments were simplified to six combinations consisting of application of recommended dose of fertilisers (RDF), crop residues in combination with chemical fertilizers, green manure (GM)/green leaf manure (GLM) to supply the N requirement on equal basis (50%:50%) with and without the addition of Pusa Decomposer, developed by ICAR-IARI, New Delhi (Table 5.5.1.) along with an absolute control. Pusa Decomposer is a microbial consortium, capable of producing hydrolytic enzymes responsible for the degradation of the polysaccharides in plant cell walls resulting in faster decomposition.

The test varieties were Samba Mahsuri Sub-1 at FZD, Shalimar Rice-4 at KHD, Sarjoo-52 at KNP, ADT 37 at KRK, Uma at MCU, MTU-1061 at MTU, Pant Dhan-18 at PNT and Rajendra Bhagwati at PSA. The details of crop, soil and weather parameters of the experimental sites (Table 5.5.2) show variations in soil characteristics with reference to pH, organic carbon content, soil texture and available nutrient status. The data from eight locations are presented in Tables 5.5.3 to 5.5.8.

Rice productivity

Data presented in Tables 5.5.3 & 4 shows that the rice productivity significantly varied with the source of nitrogen. Application of 100% RDF resulted in significantly highest grain yield only at two centres *viz*., FZD (4.57 t/ha) and PNT (4.28 t/ha) while at other centers it was on par with residue application combined with microbial culture (*Pusa Decomposer*). Supplementation of recommended N through residues both at 25% and 50% along with *Pusa Decomposer* gave yields on par with 100% RDF at more than half of the centres studied *viz*., KHD, KNP, MCU, MTU and PUSA. At KRK the treatment differences were not significant. The results prove that the crop residues in combination with Pusa Decomposer can be deployed to substitute up to half of the recommended nitrogen without yield penalty. A similar trend was also observed for straw yield as well.

Nutrient uptake and use efficiency

Data presented in Table 5.5.5 show a significant effect of the source of N application on nutrient uptake. Application of RDF alone or 50% RDF combined with crop residues/MC/GM resulted in nutrient uptake values (18-146 kg N/ha, 2.8-51.9 kg P/ha and 14-197 kg K/ha) which were at par with each other and significantly higher than absolute control, across the centres.

Data presented in Table 5.5.6 show lower nutrient use efficiencies in RDF as compared to crop residue treatments which were mostly at par with each other, at most of the centres.

Post-harvest soil nutrient status:

The available nutrient status (N, P and K) of soils are presented in Table 5.5.7 & 8. The data reveals that the soil nitrogen, phosphorus and potassium contents after harvest of the crop were not influenced much by various residue treatments and were at par with each other.

Summary

Supplementing half of the recommended N through residues (50% N) along with microbial consortium, Pusa Decomposer or GM, MC yielded at par with RDF (100% N) in terms of grain yield at more than half of the centres. The results show that the crop residues along with Pusa decomposer can be deployed to substitute half of the recommended nitrogen without yield penalty. Application of RDF alone or combined with crop residues/MC/GM to supply the N requirement on equal basis (50%:50%) resulted in nutrient uptake values (18-146 kg N/ha, 2.8-51.9 kg P/ha and 14-197 kg K/ha) which were at par with each other and significantly higher than absolute control, across the centres. Nutrient use efficiencies were lower in RDF as compared to crop residue treatments which were mostly at par with each other.

Table: 5.5.1 Residue Management in RBCS

Treatments Details

Sl.No	Treatments
1	100% RDF (Recommended Dose Fertilizer)
2	50% Residue + 50% RDF
3	50% Residue + 50% RDF + Pusa decomposer
4	50% Residue + 50% GM/GLM
5	75% RDF + 25% residue + Pusa Decomposer
6	Absolute control

Table: 5.5.2 Residue management in RBCS
Crop and soil characteristics

Parameter	**FZD**	**KNP**	**KRK**	**KHD**	**MTU**	**MCU**	**PNT**	**PSA**
Cropping system	Rice-Wheat	Rice-Wheat	Rice-Rice	Rice-Mustard	Rice-Rice	Rice-Rice	Rice-Wheat	Rice-Wheat
Kharif	Sambha	Sarjoo-52	ADT 37	Shalimar Rice-	MTU-1061	Uma	Pant Dhan-18	Rajendra
Rabi	-	-	BPT 5204	-	-	-	-	-
Kharif	120:60:60	120: 60: 60	150:60:60	120:60:30	90: 60: 60	90:45:45	120:60:30	120:60:40
Rabi	-	-	-	-	-	-	-	-
Kharif	Good	Good	Good	Good	Good	Good	Good	Good
Rabi	-	-	-	-	-	-	-	-
% clay	23	17.83	17.4	37	38	-	25.9	15
% silt	21	22.77	2	45	28	-	61.4	26
% sand	56	59.4	82.76	18	34	-	12.9	59
Soil Texture	Sandy loam	Sandy loam	Sandy loam	Silty clay loam	Clay loam	Sandy loam	Silty clay	Sandy loam
pH (1:1)	7.6	7.8	6.24	6.5	6.12	4.98	7.4	8.59
Org. carbon (%)	0.42	0.49	0.625	0.73	1.36	3.12	0.63	0.51
CEC [cmol(p+)/kg]	13.5	-	10.2	-	48.6	-	23.5	-
EC (ds/m)	1.04	0.56	0.26	0.08	0.69	0.06	0.34	0.19
Avail.N (kg/ha)	218	219	290	315	132	309.4	152	239.8
Avail. P_2O_5 (kg/ha)	25	23.2	38.1	18.7	50.07	46.7	10.1	19.2
Avail. K_2O (kg/ha)	235	209	216	217	440	201.8	205	208.2

Table: 5.5.3 Residue Management in RBCS
Grain and straw yields (*Kharif* 2023)

Treatment	Grain yield (t/ha)								Straw yield (t/ha)							
	FZD [1]	KNP [2]	KRK [3]	KHD [4]	MTU [5]	MCU [6]	PNT [7]	PSA [8]	FZD [1]	KNP [2]	KRK [3]	KHD [4]	MTU [5]	MCU [6]	PNT [7]	PSA [8]
100% RDF	4.57	5.02	3.27	7.63	7.63	5.19	4.28	5.49	5.02	6.96	7.42	8.55	8.69	8.45	4.68	8.94
50% Residue + 50% RDF	3.29	4.48	3.45	6.45	6.77	4.04	3.36	4.76	3.63	6.18	7.41	7.16	7.97	7.64	4.19	8.11
50% Residue + 50% RDF + Pusa decomposer	3.72	4.75	3.27	6.69	7.28	4.25	3.70	4.93	4.12	6.59	6.84	7.88	9.16	7.84	4.18	7.97
50% Residue + 50% GM/GLM	2.92	4.27	3.27	6.14	7.67	3.91	3.50	4.53	3.27	5.91	6.51	8.2	8.96	7.1	4.18	7.66
75% RDF + 25% residue + Pusa Decomposer	3.92	4.93	2.98	7.39	7.45	4.95	3.83	5.10	4.38	6.83	7.27	8.21	8.92	8.24	4.2	8.01
Absolute control	2.44	2.11	2.77	5.6	3.75	2.85	1.23	3.28	2.72	2.89	6.76	6.26	4.94	6.15	1.46	6.23
Expt. Mean	3.47	4.26	3.17	6.65	6.76	4.19	3.32	4.68	3.85	5.89	7.04	7.71	8.11	7.57	3.81	7.82
CD (0.05)	0.11	0.45	NS	0.95	0.67	0.84	0.08	0.7	0.14	0.62	NS	1.07	0.93	0.89	0.09	0.86
CV (%)	2.16	7.06	11.94	9.52	6.58	13.3	1.61	9.94	2.39	6.95	16	9.22	7.64	7.77	1.65	7.33

Table: 5.5.4 Residue Management in RBCS
Grain and straw yields (*Rabi 2022-23*)

Treatment	Grain yield (t/ha)		Straw yield (t/ha)		Total Nutrient uptake (kg/ha)						Nutrient use efficiency (Kg grain/kg uptake)					
	KRK	MTU	KRK	MTU	KRK			MTU			KRK			MTU		
					N	P	K	N	P	K	N	P	K	N	P	K
100% RDF	4.01	7.89	9.03	9.98	112	25.4	227	109	43.8	170	36.1	161	17.9	73.1	181	47.0
50% Residue + 50% RDF	4.69	7.44	10.48	7.88	137	28.1	260	91	36.2	125	34.3	168	18.0	83.5	212	60.7
50% Residue + 50% RDF + Pusa decomposer	4.79	7.73	10.63	9.50	115	37.5	267	95	39.1	156	45.5	130	18.1	82.1	201	50.0
50% Residue + 50% GM/GLM	4.88	6.70	10.78	7.50	123	40.1	287	85	27.0	118	40.6	138	17.1	81.1	259	57.3
75% RDF + 25% residue + Pusa Decomposer	-	6.82	-	7.40	-	-	-	82	34.1	117	43.4	198	18.5	83.6	203	58.7
Absolute control	3.50	3.69	7.95	5.40	81	18.1	190	53	17.7	94	40.0	159	18.0	70.6	211	39.6
Expt. Mean	4.37	6.71	9.77	7.94	114	29.8	246	86	33.0	130	12.5	57	2.9	79.0	211	52.2
CD (0.05)	0.51	0.77	1.74	0.74	NS	NS	41.9	19.8	8.6	29.3	NS	NS	NS	NS	NS	9.5
CV (%)	7.63	7.60	11.54	6.20	20.2	33.5	11.0	15.4	17.3	14.9	20.2	23	10.5	11.2	23.0	12.1

Table: 5.5.5 Residue Management in RBCS
Nutrient uptake (Kg/ha) in total dry matter (*Kharif* 2023)

Treatment	FZD [1]			KNP [2]			KRK [3]			KHD [4]			MTU [5]			MCU [6]			PNT [7]			PSA [8]		
	N	P	K	N	P	K	N	P	K	N	P	K	N	P	K	N	P	K	N	P	K	N	P	K
100% RDF	102	44.5	63	103	29.1	105	146	15.5	197	130	24.9	116	-	50.6	119	100	51.9	165	77	15.9	75	123	28.2	142
50% Residue + 50% RDF	59	24.4	37	95	27.5	96	132	10.8	174	106	20.9	97	-	39.1	98	86	41.5	141	55	9.1	35	104	23.0	119
50% Residue + 50% RDF + Pusa decomposer	74	31.5	45	105	30.9	103	125	10.2	191	110	21.4	105	-	43.8	106	100	50.5	171	60	10.5	39	108	23.7	119
50% Residue + 50% GM/GLM	50	18.8	30	93	25.8	91	122	8.6	168	105	20.9	107	-	38.2	91	97	43.8	187	61	10.4	40	96	20.7	109
75% RDF + 25% residue + Pusa Decomposer	62	22.2	36	105	29.6	104	130	10.2	180	123	24.5	112	-	49.5	116	100	43.0	197	67	12.3	52	112	24.9	125
Absolute control	34	11.5	19	37	9.4	39	116	8.6	165	86	16.1	81	-	27.3	75	49	21.1	74	18	2.8	14	72	14.9	80
Expt. Mean	63	25.5	39	89.9	25.4	89.8	128	10.7	179	110	21.5	103	-	41.4	101	89	41.9	156	56.4	10.1	42.7	102	22.5	116
CD (0.05)	4.0	2.29	2.7	9.3	3.2	10.7	NS	3.9	NS	13.2	3.34	14.4	-	9.5	14.1	17.0	8.7	30.8	3.1	1.36	2.48	11.8	3.22	15.6
CV (%)	4.2	5.96	4.7	6.9	8.5	7.9	13.4	24.5	20.1	7.95	10.3	9.32	-	15.2	9.3	12.8	13.7	13.1	3.64	8.91	3.85	7.65	9.47	8.92

Table: 5.5.6 Residue management in RBCS
Nutrient use efficiency (Kg grain/kg uptake) (*Kharif* 2023)

Treatment	FZD [1]			KNP [2]			KRK [3]			KHD [4]			MTU [5]			MCU [6]			PNT [7]			PSA [8]		
	N	P	K	N	P	K	N	P	K	N	P	K	N	P	K	N	P	K	N	P	K	N	P	K
100% RDF	44.6	103	72.7	48.6	173	47.8	22.8	231	16.8	58.8	306	67.0	-	103	43.8	76.5	147	46.2	55.4	270	56.8	44.7	194	38.8
50% Residue + 50% RDF	55.4	135	89.5	47.1	164	47.0	26.1	343	20.9	60.7	308	66.2	-	104	40.9	80.5	167	49.7	60.7	370	96.6	45.6	207	39.8
50% Residue + 50% RDF + Pusa decomposer	50.2	118	83.1	45.1	154	46.3	26.7	320	17.3	60.7	314	64.1	-	97	40.2	74.2	146	42.8	61.6	354	94.8	45.5	208	41.8
50% Residue + 50% GM/GLM	58.6	156	98.7	45.8	166	46.8	26.7	398	19.6	58.5	295	57.9	-	102	43.0	79.7	181	41.1	57.7	340	87.3	47.4	219	41.7
75% RDF + 25% residue + Pusa Decomposer	63.2	176	110	47.0	167	47.3	22.9	324	16.9	60.0	302	66.4	-	101	42.7	74.4	174	38.5	57.3	318	74.2	45.6	205	41.1
Absolute control	72.0	213	128	56.2	223	55.1	25.3	330	17.4	64.8	346	69.2	-	105	38.2	77.2	178	51.2	67.3	445	86.6	45.9	219	40.8
Expt. Mean	57.3	150	97.0	48.3	174	48.4	25.1	324	18.1	60.6	312	65.1	-	102	41.5	77.1	165	44.9	60.0	350	82.7	45.8	209	40.7
CD (0.05)	2.08	10.2	5.5	4.9	26.4	NS	NS	NS	NS	3.7	NS	NS	-	NS	NS	NS	NS	NS	3.23	39.4	6.08	NS	12.4	NS
CV (%)	2.4	4.5	3.8	6.68	10.0	15.5	15.4	28.2	19.7	4.04	7.95	7.74	-	7.38	9.62	11.6	12.9	14.0	3.57	7.48	4.88	6.94	3.94	12.3

Table: 5.5.7 Residue management in RBCS
Post-harvest nutrient status of soil (Kg/ha) (*Kharif* 2023)

Treatment	KNP			KRK			KHD			MCU			MTU			PNT			PSA		
	N	P	K	N	P	K	N	P	K	N	P	K	N	P	K	N	P	K	N	P	K
100% RDF	289	16.3	231	214	23.0	213	255	28.0	105	314	45.7	189	167	90.7	331	178	12.9	190	267	27.3	234
50% Residue + 50% RDF	292	13.9	215	208	22.9	205	229	30.7	142	307	41.5	205	156	91.2	349	165	11.2	157	260	25.0	227
50% Residue + 50% RDF + Pusa decomposer	303	14.1	220	212	22.5	209	260	28.6	171	307	42.2	213	168	93.1	364	164	11.7	166	264	23.7	224
50% Residue + 50% GM/GLM	308	13.7	210	210	21.8	165	246	32.2	193	300	40.0	208	174	91.2	333	162	11.6	160	253	22.0	217
75% RDF + 25% residue + Pusa Decomposer	292	14.8	221	213	22.9	210	264	30.6	119	309	46.3	197	157	92.6	370	171	10.6	173	263	26.0	229
Absolute control	271	12.2	181	195	20.4	203	273	32.9	125	277	36.6	173	135	88.7	293	137	8.9	159	237	19.4	208
Expt. Mean	293	14.1	213	209	22.2	201	254	30.5	143	302	42.0	198	159	91.3	340	163	11.1	167	257	23.9	223
CD (0.05)	NS	1.2	18	9.13	1.53	NS	NS	NS	55	NS	5.5	23.6	NS	NS	26.1	7.66	0.54	9.66	NS	4.8	NS
CV (%)	5.78	5.74	5.48	2.90	4.57	19.4	13.7	26.7	25.4	5.10	8.71	7.92	13.0	2.9	5.1	3.12	3.21	3.83	6.2	13.3	6.7

Table: 5.5.8 Residue management in RBCS
Post-harvest nutrient status of soils (Kg/ha) (*Rabi 2022*-23)

Treatment	KRK			MTU		
	N	P	K	N	P	K
100% RDF	171	6.43	110	195	88.3	397
50% Residue + 50% RDF	184	4.44	172	165	87.5	520
50% Residue + 50% RDF + Pusa decomposer	174	7.07	129	196	89.4	472
50% Residue + 50% GM/GLM	184	4.41	152	164	91.0	634
75% RDF + 25% residue + Pusa Decomposer	-	-	-	166	89.7	690
Absolute control	172	3.25	101	162	83.1	416
Expt. Mean	177	5.12	133	175	88.1	521
CD (0.05)	NS	NS	NS	NS	4.63	118
CV (%)	5.79	61.7	31.8	13.9	3.49	15.1

5.6. Nano-fertilizers for increasing nutrient use efficiency, yield, and economic returns in transplanted rice

The Nitrogen Use Efficiency (NUE) in agricultural systems has remained low; meaning that on a global scale, more than 50% of the N applied to agricultural soils is potentially lost into the environment. The current NUE needs to be improved substantially by increasing the efficiency of agricultural systems, adopting environmentally sound agronomic practices, and exploring disrupting technologies. Nano-fertilizers possess unique features that enhance plants' performance in ultra-high absorption, increase production, rise in photosynthesis, and significant expansion in the leaves' surface area. It would be very helpful if we use nano-fertilizers for specific crops such as rice to minimize the potential negative effects brought about by the extensive use of chemical inputs without compromising production and nutritional benefits. In this background and based on a one-year field study with objectives 1. To study the efficiency of nano-fertilizers in increasing the growth and yield of rice crops and 2. To find out the nutrient use efficiency of nano-fertilizers in rice crop. A total of seven treatments namely**,** T1: Recommended dose of nitrogen (RDN) through urea (recommended P and K) T2: T1+ Two foliar sprays Nano-Urea @ 2% at active tillering and panicle initiation stages, T3: 50 % of RDN + Two foliar sprays Nano-urea @ 2% (AT and PI) T4: 75 % RDN T5: 75% of RDN + Two foliar sprays Nano-urea @ 2% (AT and PI) and T6: Control (no application of fertilizer) in addition to this new treatment T7: Nano urea spray alone (4 sprays @ 4ml/L, 15 days' interval) which was included in this trial based on the recommendation received from the recently held 52nd ARGM**.** The trial was laid out in randomized block design (RBD) with three replications. [The trial was conducted in collaboration with Agronomy in a total of 24 locations (ARI-Rajendranagar, BNK-Bankura, CHT-Chatha, CHP-Chiplima, CBT-Coimbatore, FZB-Faizabad, JDP-Jagdalpur, JGL-Jagtial, KNP-Kanpur, KRK-Karaikal, KUL-Kaul, KHD-Khudwani, LDH-Ludhiana, MND-Mandya, MTU-Maruteru, MNC-Moncompu, NVS-Navsari, NLR-Nellore, PNR-Pantnagar, PTB-Pattambi, PDU-Puducherry, PSA-Pusa, SBR-Sabour and NRRI, Cuttack)]. The results of the second-year study were summarized and presented in Tables 5.6.2 to 5.6.7 and the salient findings are as follows.

Yield parameters like tiller number and panicle number per meter square were documented and represented in **Table 5.6.2**. Significant differences were observed in the yield parameters due to variations in treatments at all the locations. Application of 100 % RDN along with two sprays of nano urea at active tillering and panicle initiation stage registered the highest tiller and panicle numbers (per m^2) at Kanpur (338, 305), Jagdalpur (367, 355), Maruteru (322, 249), Puducherry (328, 289), Coimbatore (385, 362), Mandya (399, 370), NRRI (287, 280), Sabour (286, 284) which was on par with the recommended dose of N treated plots. At a few centres, application of 75% RDN and two sprays of nano urea recorded higher tiller and panicle numbers (per m^2) *i.e.*, Chiplima (369, 322), Gangavati (363, 323) and Pattambi (396, 383), respectively. Whereas, the application of 50% RDN combined with two sprays (T3) and 75% RDN alone also improved the tiller numbers in all centres over absolute control but not to the level of T1 treatment. The application of nano urea alone (four sprays) was found on par with the control treatment and the improvement was insignificant at Chiplima, Khudwani, and Karaikal locations. In general, the order of improvement was observed as T6<T4=T3<T5<T1=T2 across the locations.

Grain and straw yields at all the locations showed significant differences with the addition of nano urea treatments (**Table 5.6.3**). Similar to yield attributes, the application of 100% RDN and two sprays of nano urea at two critical stages of rice crop recorded the highest grain and straw yields at a majority of the locations *i.e.*, Kaul (5236 and 5616 kg/ha), Kanpur (5380 and 6940 t/ha), Jagdalpur (5722 and 7886 kg/ha), Maruteru (6638 and 7803 kg/ha), Coimbatore (6620 and 8480 kg/ha), Chatha (3133 and 7096 kg/ha), NRRI (5640 and 5720 kg/ha Moncompu (3826 and 4766 kg/ha), Ludhiana (8875 and 12505 kg/ha) and Sabour (5047 and 6150 kg/ha), respectively. At Bankura (5492 kg/ha grain yield), Pattambi (5400 kg/ha grain yield) and Puducherry (5477 kg/ha grain and 7975 kg/ha straw) exhibited the highest yields to the application of 75% RDN along with two sprays of nano urea followed by 100% RDN + two sprays of nano urea. At Navsari, Karaikal, and Mandya, RDN outperformed and registered higher grain yields *i.e.*, 5349, 3067, and 5782 kg/ha, respectively. While, application of nano urea alone at four intervals recorded on par results with control (No N) plots at Chiplima, NRRI, Khudwani, and Karaikal centres. The percent variation with the different treatments over the locations was depicted in Figures 1a and 1b. Replacement of 25 and 50% of RDN with nano urea spray at two intervals recorded a declining trend in the grain yield to the tune of -2 to 25.9% at the majority of the locations. While two sprays of nano urea in addition to 100% RDN, improved the grain yield to the tune of 0.7 5 (Ludhiana) to 33.5% (Khudwani). However, nano urea treatment alone registered, a yield decline to -10.6% (Chiplima), -20.0% (NRRI), -13.6% (Karaikal), -36.2 (Ludhiana) and -28.8% (Gangavati).

The total N uptake of rice plants was documented and represented in Table 5.6.4. Additional two sprays of nano urea with RDN registered the highest N uptake in rice plants grown at Coimbatore (133.4 kg/ha), Khudwani (146.3 kg/ha), Kanpur (108.3 kg/ha), Sabour (97.0 kg/ha) and NRRI (90.2 kg/ha) which was on par with the 75% RDN + two sprays of nano urea treatment. Surprisingly, Pusa centre (105.2 kg/ha) showed positive and highest uptake with the nano urea (four sprays) alone treatment over other treatments. At Navasari, the highest N uptake was recorded with RDN application which was higher than the rest of the treatments. The effect of nitrogen application through conventional fertilizer and nano urea significantly improved the soil available N in rice (Table 5.6.5). Either application of 100 % RDN or 100% RDN + foliar sprays of urea positively improved the soil available N over absolute N control across the locations. Treatments namely, T4 (75% RDN) and T5 (75% RDN + 2 sprays of nano urea) recorded on par value across the locations, which can be considered that additional spray of nano urea in the plant did not have a beneficial role in the improvement of soil N.

The use of nano urea in rice crops did not significantly improve the BC ratio (Economic returns) across the locations (Table 5.6.6). The highest benefit and returns were observed with T2 at Jagadalpur (1.4), Mandya (2.3), Maruteru (2.1), Sabour (2.2) and Coimbatore (2.2). Whereas, other treatments registered a lower BC ratio than T2. In general, an additional application of nano urea along with 100% RDN was on par with the 100% RDN treatments and did not fetch much monetary benefit in irrigated rice crops. The application of nano urea has increased the NUE (Agronomic efficiency) at few locations (Figure 2). The highest use efficiency was exhibited in T2 (100% RDN + two sprays of nano urea) at Jagdalpur (33.6) and Pusa (23.0) followed by other treatments. While at Mandya, application of T3 (50% RDN + nano urea spray) recorded higher NUE (103.3) followed by 75% RDN alone (74.8).

Summary:

Application of nano urea improved the tiller, panicle numbers, and grain yield of rice crops over the absolute N control. Out of all treatments, two sprays of nano urea along with RDN application performed well with the tiller, panicle numbers, yield, and N uptake at the majority of the locations. However, the replacement of nitrogen requirement through nano urea was found to be ineffective with respect to grain yield enhancement, yield attributes, N content etc., across the locations. At the end of the second-year trial, results exhibited that replacement of either 25 or 50% RDN with nano urea did not influence the yield improvement and other parameters in rice crops.

Table 5.6.1: List of centers with trial details

S. No	Centre name	Variety	Soil Type	Soil values (Initial)	Fertilizer Dose
1	ARI, Rajendranagar				
2	Bankura	Ajit	Red and Lateritic soil		70:35:35
3	Chatha	Basmati 370	Sandy Loam	245:14:146	30:20:10
4	Chiplima				
5	Coimbatore		Clay Loam	224:17.5:421	150:50:50
6	Jagdalpur		Red Soil	227:19:380	100:60:30
7	Jagtial				
8	Kanpur		Sandy Loam		120:60:60
9	Karaikal				
10	Kaul			160:12:320	
11	Khudwani			323:17: 247	120:60:30
12	Ludhiana		Sandy Loam	270:15:185	105:30:30
13	Mandya	93 R	Red Sandy Loam soil	284:60:264	100:50:50
14	Maruteru				90:60:60
15	Moncompu				
16	Navsari		Clay	282:38:0	100:30:0
17	Nellore		Sandy Clay loam	163:128:507	120:60:40
18	Pantnagar	-	-	-	-
19	Pattambi	-	--	-	-
20	Puducherry	RP Bio 226	Clay Loam	156.8:35:106	120:40:40
21	Pusa		Sandy Loam	214:15:114	120:60:40
22	Ranchi				
23	Sabour		Silty Loam	161:27:198	100:40:20
24	NRRI				

Table 5.6.2: Effect of nano urea application growth parameters of Rice (Tiller (T) and Panicle (P) Numbers per m^2)

Treatments	BNK		KUL		KNP		JDP		MNC		MTU		PUD	
	T	P	T	P	T	P	T	P	T	P	T	P	T	P
T1: Recommended dose of N (RDN)	301	235	275	262	297	276	341	334	196	186	281	245	297	249
T2: T1+ Two sprays of Nano-Urea	336	263	293	284	338	305	367	355	192	182	322	249	328	289
T3: 50% RDN+ Two sprays Nano-Urea	304	243	239	229	271	266	270	264	180	176	249	210	262	225
T4: 75% RDN	347	269	250	241	282	270	313	306	176	166	290	235	320	276
T5: 75% RDN + Two sprays Nano-Urea	343	276	264	254	317	291	326	318	188	188	274	241	335	297
T6: Nano urea Spray alone (4 sprays)	-	-	-	-	-	-	-	-	-	-	-	-		
T7: Control (no N)	282	222	229	219	265	231	126	119	172	169	248	166	240	212
Mean	**319**	**252**	**258**	**248**	**289**	**279**	**290**	**283**	**184**	**174**	**277**	**224**	**297**	**258**
CD (p=0.05)	**15**	**10**	**19**	**16**	**6**	**6.0**	**52**	**51**	**15**	**13**	**48**	**31**	**6**	**5**
CV (%)	**2.6**	**2.2**	**4**	**3.5**	**1.2**	**1.2**	**9.8**	**9.9**	**5.7**	**4.7**	**10**	**7**	**1**	**1**

T= Tiller numbers per m^2, P = Panicle number per m^2

Treatments	PTB		CBT		MND		NLR		NVS		NRRI		RNR	
	T	P	T	P	T	P	T	P	T	P	T	P	T	P
T1: Recommended dose of N (RDN)	330	322	361	342	382	348	454	405	350	340	278	269	267	258
T2: T1+ Two sprays of Nano-Urea	371	340	385	362	399	370	412	369	336	325	287	280	292	269
T3: 50% RDN+ Two sprays Nano-Urea	376	355	346	327	360	327	387	295	317	304	264	259	289	227
T4: 75% RDN	329	325	358	335	369	330	398	398	325	314	268	262	259	242
T5: 75% RDN + Two sprays Nano-Urea	396	383	370	347	393	358	394	394	323	311	270	263	272	246
T6: Nano urea Spray alone (4 sprays)	-	-	-	-	-	-	-	-	-	-	254	249	-	-
T7: Control (no N)	280	267	221	203	323	289	399	399	292	281	238	229	270	225
Mean	**347**	**332**	**340**	**319**	**371**	**337**	**407**	**360**	**324**	**312**	**265**	**258**	**275**	**244**
CD (p=0.05)	**24**	**26**	**11.6**	**8.0**	**48**	**44**	**NS**	**NS**	**33**	**33**	**5**	**6**	**19**	**29**
CV (%)	**3.9**	**4.3**	**1.9**	**1.4**	**7**	**7**	**13**	**13**	**6**	**6**	**1.1**	**1.4**	**4.0**	**7**

T= Tiller numbers per m^2, P = Panicle number per m^2

Treatments	CHP		CHT		GNV		KHD		KRK		KUL		SBR	
	T	P	T	P	T	P	T	P	T	P	T	P	T	P
T1: Recommended dose of N (RDN)	347	297	225	201	331	294	525	451	236	210	275	262	263	260
T2: T1+ Two sprays of Nano-Urea	333	278	249	228	348	312	511	437	245	224	293	284	286	284
T3: 50% RDN+ Two sprays Nano-Urea	368	324	197	175	355	308	489	434	249	237	239	229	216	214
T4: 75% RDN	286	259	199	177	320	285	483	423	244	224	250	241	224	223
T5: 75% RDN + Two sprays Nano-Urea	369	322	216	190	363	323	510	447	240	207	264	254	237	235
T6: Nano urea Spray alone (4 sprays)	251	213	-	-	277	244	465	401	232	208	-	-	-	-
T7: Control (no N)	240	194	155	136	237	203	456	388	228	210	230	219	189	188
Mean	**313**	**269**	**207**	**184**	**308**	**272**	**491**	**426**	**239**	**217**	**258**	**248**	**235**	**234**
CD (p=0.05)	**73**	**73**	**7**	**5**	**35**	**31**	**67**	**53**	**64**	**61**	**19**	**16**	**44**	**44**
CV (%)	**13**	**15**	**1.8**	**1.5**	**6.5**	**6.6**	**7.7**	**7.0**	**15**	**16**	**4**	**3.5**	**10**	**10**

Table 5.6.3: Effect of nano urea application growth parameters of Rice (Grain (kg/ha) and straw yield (kg/ha))

Treatments	BNK		KUL		KNP		JDP		MNC		MTU	
	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw
T1: Recommended dose of N (RDN)	4812	6742	4703	5400	5090	6540	5510	7022	3779	4866	6150	7506
T2: T1+ Two sprays of Nano-Urea	5119	5595	5236	5616	5380	6940	5722	7886	3826	4766	6638	7803
T3: 50% RDN+ Two sprays Nano-Urea	4988	6734	3780	4260	4630	5700	4085	5423	3142	3966	5215	6260
T4: 75% RDN	5298	7264	4276	4716	4920	5890	4745	6407	3250	3877	4841	5840
T5: 75% RDN + Two sprays Nano-Urea	5492	7722	4480	5160	5300	6580	5111	6617	3313	3777	5602	6750
T6: Nano urea Spray alone (4 sprays)	-	-	-	-	-	-	-	-	-	-	-	-
T7: Control (no N)	4527	5713	2860	3196	3240	3420	2358	3328	2737	2737	3921	4706
Mean	**5039**	**6812**	**4222**	**4725**	**4760**	**5890**	**4588**	**6114**	**3341**	**4169**	**5394**	**6477**
CD (p=0.05)	**108.5**	**671**	**265**	**374**	**110**	**150**	**422**	**837**	**337**	**312**	**745**	**884**
CV (%)	**1.2**	**5.4**	**3.5**	**4.4**	**1.3**	**1.4**	**5.1**	**7.5**	**6.7**	**9.7**	**7.6**	**7.5**

Treatments	PTB		CBT		MND		NLR		NVS		PDU (K)	
	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw
T1: Recommended dose of N (RDN)	3800	8166	6176	8170	5782	8401	4526	5233	5349	6740	4714	6760
T2: T1+ Two sprays of Nano-Urea	3866	7722	6620	8480	3126	9152	4879	5108	5091	6399	5177	7463
T3: 50% RDN+ Two sprays Nano-Urea	3033	7035	5396	7216	5172	7681	4022	4103	4449	6286	4621	6656
T4: 75% RDN	4133	8863	5620	7296	4998	7533	4665	4735	4635	5991	5093	7358
T5: 75% RDN + Two sprays Nano-Urea	5400	7151	6320	8260	5617	8348	4466	4621	4647	6036	5477	7975
T6: Nano urea Spray alone (4 sprays)	-	-	-	-	-	-	-	-	-	-	-	-
T7: Control (no N)	3500	7866	2110	3170	3801	6127	3598	4000	4113	6649	4044	5932
Mean	**3922**	**7800**	**5373**	**7098**	**5249**	**7873**	**4359**	**4633**	**4714**	**6350**	**4854**	**7024**
CD (p=0.05)	**959**	**745**	**92**	**139**	**489**	**872**	**295**	**778**	**698**	**623**	**128**	**191**
CV (%)	**13.4**	**5.3**	**0.9**	**1.1**	**5.1**	**6.1**	**3.7**	**9.2**	**8.1**	**5.4**	**1.5**	**1.5**

Continued…..

Treatments	CHP		CHT		NRRI		KHD		KRK		LDH	
	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw
T1: Recommended dose of N (RDN)	6580	7400	2890	6536	5300	5530	8466	8710	3067	6566	8815	12292
T2: T1+ Two sprays of Nano-Urea	6507	7010	3133	7096	5640	5720	8300	8560	2555	5611	8875	12505
T3: 50% RDN+ Two sprays Nano-Urea	6925	8615	2740	6070	4380	5420	7933	8360	2822	5877	7244	11067
T4: 75% RDN	6125	6963	2789	6270	4870	5450	7766	8156	2855	6700	8122	11421
T5: 75% RDN + Two sprays Nano-Urea	6824	8478	2820	6343	4180	5480	8200	8370	3022	6366	8290	11611
T6: Nano urea Spray alone (4 sprays)	5880	6613	-	-	4240	5290	7233	7756	2650	5905	5625	8205
T7: Control (no N)	5400	6037	2163	4496	3840	4960	6666	7136	2466	5866	4720	7779
Mean	**6320**	**7302**	**2755**	**6135**	**4778**	**5407**	**7795**	**8150**	**2777**	**6127**	**7384**	**10697**
CD (p=0.05)	**958**	**1528**	**45**	**98**	**344**	**151**	**686**	**799**	**636**	**1435**	**695**	**884**
CV (%)	**8.5**	**11.8**	**0.9**	**0.9**	**4.0**	**1.6**	**6.3**	**5.5**	**12.9**	**13.2**	**5.3**	**4.7**

Treatments	PSA		RNR		SBR		GNV	
	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw
T1: Recommended dose of N (RDN)	4801	6825	5253	8400	4860	5719	5175	5000
T2: T1+ Two sprays of Nano-Urea	5273	6812	5473	7333	5047	6150	5312	5833
T3: 50% RDN+ Two sprays Nano-Urea	3525	4616	3910	6866	3966	4737	4729	5000
T4: 75% RDN	4209	5656	4313	7466	4380	5235	4375	5416
T5: 75% RDN + Two sprays Nano-Urea	4552	6013	4490	6666	4590	5650	5341	5000
T6: Nano urea Spray alone (4 sprays)	5536	7248	3789	6000	-	-	3683	3750
T7: Control (no N)	2508	3462	6017	8400	3062	3819	3083	2916
Mean	**4343**	**5804**	**4749**	**7304**	**4317**	**5218**	**4405**	**4583**
CD (p=0.05)	**830**	**1163**	**793**	**1007**	**331**	**415**	**868**	**2019**
CV (%)	**10.8**	**11.3**	**9.4**	**7.8**	**4.2**	**4.4**	**11.3**	**25.2**

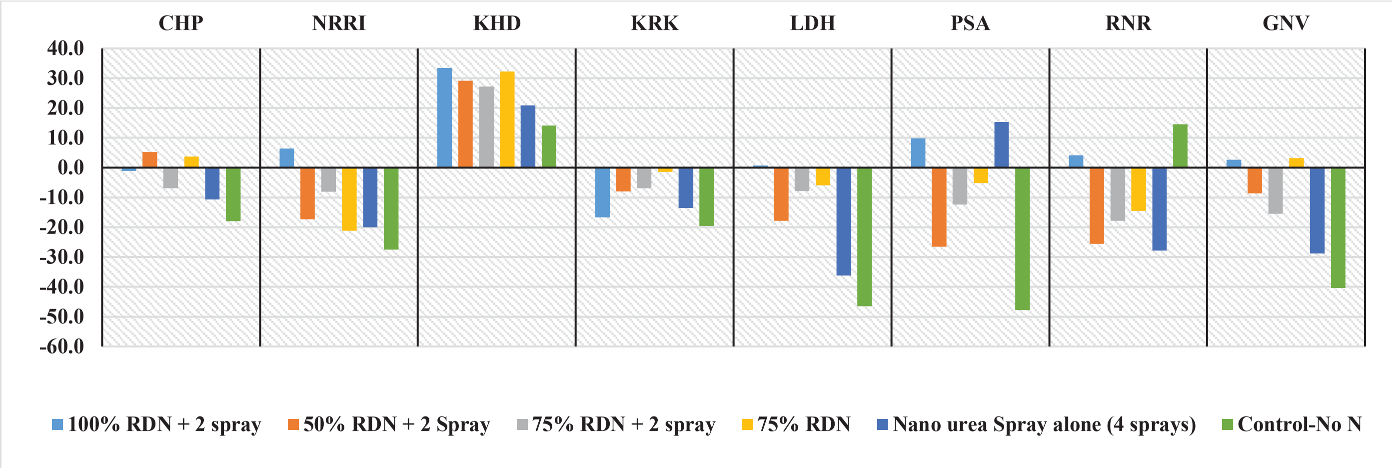

Figure 1a. Percent change over RDN treatment (Total of 7 treatments)

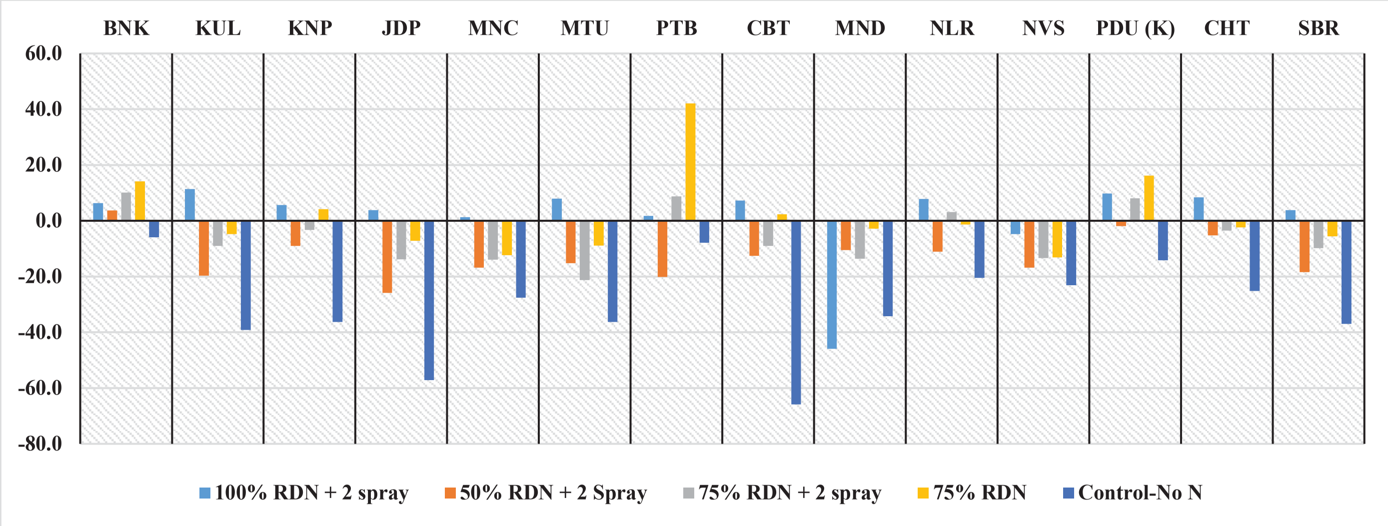

Figure 1b. Percent change over RDN treatment (Total of 6 treatments)

Table 5.6.4: Effect of nano urea application on total N uptake (kg/ha) in rice

Treatments	CBT	KHD	KNP	NVS	PSA	PDU	SBR	NRRI
T1: Recommended dose of N (RDN)	124.4	145.0	92.1	92.9	76.4	83.2	92.3	83.4
T2: T1+ Two sprays of Nano-Urea	133.4	146.3	108.3	89.6	83.0	100.6	97.0	90.2
T3: 50% RDN+ Two sprays Nano-Urea	107.8	132.3	70.3	82.6	63.5	81.2	79.8	68.4
T4: 75% RDN	114.8	131.7	80.8	80.4	74.7	98.0	85.8	75.6
T5: 75% RDN + Two sprays Nano-Urea	127.8	145.0	103.3	84.8	87.0	111.3	91.4	82.0
T6: Nano urea Spray alone (4 sprays)	-	122.3	-	-	105.2			61.9
T7: Control (no N)	80.9	106.7	42.0	69.3	33.7	63.1	56.7	52.8
Mean	**114.8**	**132.7**	**82.9**	**83.3**	**74.8**	**89.6**	**83.8**	**73.5**
CD (p=0.05)	**8.2**	**15.5**	**1.2**	**10.3**	**16.0**	**3.5**	**5.4**	**5.4**
CV (%)	**3.9**	**5.5**	**1.6**	**6.8**	**12.0**	**2.1**	**3.6**	**4.0**

Table 5.6.5: Effect of nano urea application on available N (kg/ha) in soil

Treatments	CBT	CHP	CHT	JDP	KHD	KRK	NVS	PSA	SBR	NRRI
T1: Recommended dose of N (RDN)	217.8	361.0	234.6	225.3	342.3	243.6	243.7	203.3	153.3	342.3
T2: T1+ Two sprays of Nano-Urea	224.5	352.0	238.6	234.3	335.3	264.5	246.9	199.7	153.6	360.2
T3: 50% RDN+ Two sprays Nano-Urea	20.8	420.0	265.4	226.0	336.0	256.1	242.7	196.0	148.3	327.4
T4: 75% RDN	214.0	294.3	227.3	224.3	336.7	234.2	247.6	216.7	154.3	346.7
T5: 75% RDN + Two sprays Nano-Urea	223.3	400.7	231.4	225.3	330.3	241.5	235.2	214.7	153.4	333.5
T6: Nano urea Spray alone (4 sprays)	-	229.0	-	-	316.7	178.7	-	225.0	-	306.6
T7: Control (no N)	194.3	276.7	222.8	229.3	316.7	225.8	245.5	163.0	142.5	271.3
Mean	**213.8**	**333.4**	**236.6**	**227.4**	**330.5**	**234.9**	**243.6**	**202.6**	**150.9**	**326.8**
CD (p=0.05)	**6.7**	**84.0**	**43.3**	**5.9**	**16.4**	**78.1**	**27.7**	**23.7**	**1.5**	**19.1**
CV (%)	**1.7**	**14.2**	**10.1**	**1.3**	**2.8**	**18.7**	**6.30**	**6.6**	**0.6**	**3.3**

Table 5.6.6: Effect of nano urea application on Benefit: Cost Ratio in rice

Treatments	JDP	MNC	MND	MTU	NVS	PSA	PUD	SBR	CBT
T1: Recommended dose of N (RDN)	1.4	1.7	2.2	2.1	1.8	2.1	2.1	2.1	2.1
T2: T1+ Two sprays of Nano-Urea	1.4	1.5	2.3	2.1	1.6	2.2	2.1	2.2	2.2
T3: 50% RDN+ Two sprays Nano-Urea	0.9	1.3	2.0	1.7	1.4	1.5	2.0	1.7	1.8
T4: 75% RDN	1.1	1.4	2.0	1.6	1.6	1.8	2.1	1.9	2.0
T5: 75% RDN + Two sprays Nano-Urea	1.2	1.3	2.1	1.8	1.5	1.9	2.2	2.0	2.2
T6: Nano urea Spray alone (4 sprays)	-	-	-	-	-	2.3	-	-	-
T7: Control (no N)	0.1	1.0	1.6	1.4	1.5	1.2	2.0	1.3	1.1

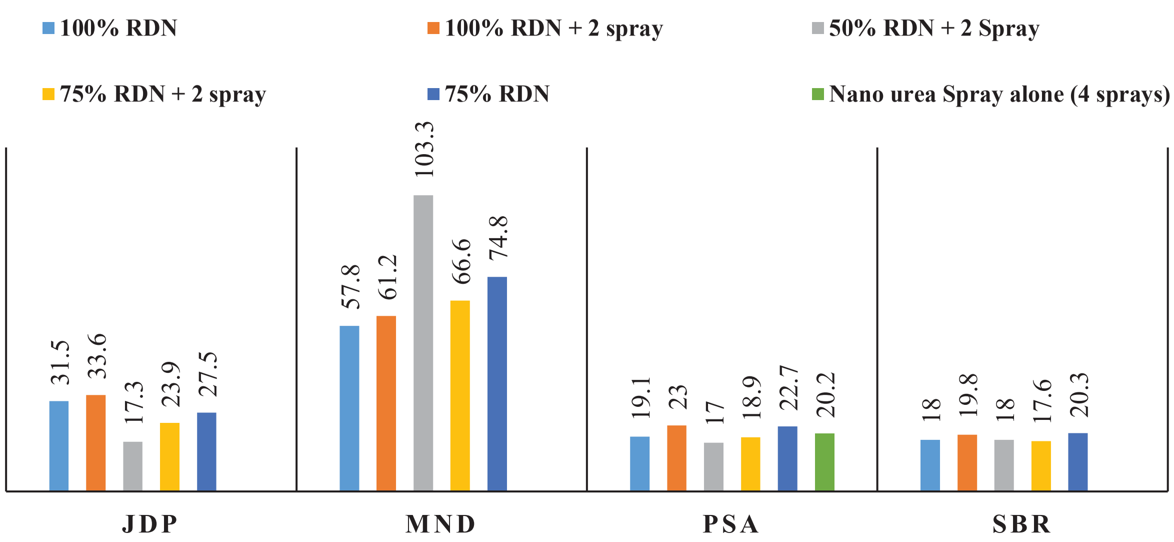

Figure 2: Effect of nano urea application on Nutrient Use Efficiency (NUE) in rice

5.8. Evaluation of Organic fertilizers and Natural farming practices for enhancing Productivity and soil health

The trial was conducted during *Rabi* 2022-23 and *kharif*-2023 in collaboration with Agronomy to "Evaluate the Organic fertilizers and Natural farming practices for enhancing the productivity and soil health" and its influence on productivity, grain quality, soil health and environmental sustainability. Currently, organic produce including organic rice is in huge demand owing to its potential to fetch premium prices in the global market. There were mainly five treatments *viz.,* 1) Control, 2) Complete Natural Farming (NF), 3) AI-NPOF package (All India Network Programme on Organic Farming), 4) Integrated Crop Management (with organic pest management practices) and 5) Integrated Crop Management (need-based pesticides). All farming practices starting from seed treatment to harvest were practiced as per the technical programme; observations were recorded on grain and straw yields and other yield parameters. Soil samples were collected before an experiment and after harvest and were analysed for important soil properties. The trial was conducted at nine locations viz., [Moncompu-MNC, Mandya-MND, Khudwani-KHD, Pantnagar-PNT, Pusa-PUSA, Puducherry-PUD and Titabar-TTB] during *Kharif*- 2023 and at Chinsurah-CHN and Karaikal-KRK during *rabi*- 2022-23. The results are presented in Tables 5.8.1 to 5.8.18.

Grain, straw yield and yield parameters

Among the seven locations, grain yield during *Kharif*-2023 (Table 5.8.2) was significantly superior in (T5) Integrated Crop Management (need based pesticides) [5.03, 3.21, 2.05, 3.53, 4.23, 4.68 t/ha] treatment as compared to other treatments recording 40%, 98%, 64%, 14.3%, 8.5% and 50%, higher yield over complete natural farming, at MNC, MND, PNT, PSA, PUD and TTB, respectively. Whereas at KHD, (6.93 t/ha) T4 Integrated Crop Management recorded higher grain yield which was 21 % higher as compared to complete natural farming. Straw yield followed an almost similar trend as that of grain yield at most of the locations (Table 5.8.3) recording 18%, 67%, 43% 18%, 14% and 23% higher yields in integrated crop management (need-based pesticides) over complete natural farming at MNC, MND, PNT, PUSA, PUD and TTB, respectively. Whereas at KHD, Integrated Crop Management recorded 25 % higher over complete natural farming. With regard to yield parameters (tillers/m^2, panicles/m^2, 1000 grain weight), and nutrient uptake the treatment integrated crop management (need based pesticides) recorded significantly higher values as compared to other treatments MNC, MND, PNT, PUSA, PUD and TTB, but at KHD the Integrated Crop Management treatment recorded significantly higher as compared to other treatments (Table 5.8.4 to 5.8.10).

At CHN, KRK location, during rabi 2022-23 (Table 5.8.11 and 5.8.12) grain yields were significantly superior in integrated crop management (need based pesticides) as compared to other treatments with 116% and 15% higher grain and straw yields over complete NF treatment and Straw yield followed almost similar trend as that of grain yield. With regard to tillers/m^2, panicles/m^2, 1000-grain wt. (g), in integrated crop management (need based pesticides) recorded significantly higher values and the highest number of tillers/m^2 (405) and panicles/m^2 (401) and but 1000-grain weight (21.75 g) integrated crop management as compared to other organic treatments respectively at CHN.

Soil properties after harvest

At CHN, MNC, MND, PNT and PUSA most of the soil properties improved with Integrated Crop Management (pest management), at KHD, PNT (P &K uptake) with Integrated Crop Management and at TTB improved with AINPOF package, as compared to other treatments. The important soil properties from nine locations (TTB, CHN, KRK, MNC, MND, KHD, PNT, PUSA and PUD) are presented in Table (5.8.10 to 5.8.18) respectively.

Summary

In the second year of study on "Evaluation of Organic fertilizers and Natural farming practices for enhancing the productivity and soil health", out of five treatments, Integrated Crop Management (pest management) was significantly superior as compared to other treatments at MNC, MND, PNT, PUSA, PUD and TTB in terms of grain yield and yield parameters. At CHN, MNC, MND, PNT and PUSA most of the soil properties improved with Integrated Crop Management ((pest management)) while at TTB, soil properties improved with AI-NPOF package compared to other treatments.

- ❖ In the second year of study on evaluation of Organic fertilizers and Natural farming practices, Integrated Crop Management (with need based pesticides) was significantly superior in terms of grain yield and yield parameters.
- ❖ Most of the soil properties improved with Integrated Crop Management ((pest management)) and AI-NPOF practices.

Table 5.8.1 Evaluation of Organic fertilizers and Natural farming practices for enhancing the productivity and soil health
Soil and crop characteristics

Parameters	CHN	MNC	MND	KHD	PNT	PUSA	PUD	TTB	KRK (Rabi)
Cropping system	**Rice**	**Rice - Rice**	**Rice**	Rice-Brown-Mustard	**Rice-Wheat**	**Rice-wheat**	**Rice – Rice**	**Rice -Fallow**	-
Variety – Kharif	Sukumar	Pournami	KMP-175	Shalimar Rice-4	Pant Dhan-24	Rajendra Nilam	ADT 54	Bokul Joha	KKLR 2
RDF (kg NPK/ha)		90:45:45	100:50:50	120:60:30	120:60:30	120:60:40	150:50:50	-	
Crop growth:	-	-	-	-		-	-	-	Good
Soil characteristic									
% Clay	-	-	-	37	25.9	15	-	35	12.6
% Silt	-	-	-	45	61.4	29	-	34	9.2
% Sand	-	-	-	18	12.9	56	-	27	75.4
Texture	Clay Loam	-	-	Silty clay loam	Silty clay loam	Sandy loam	Clay loam	Silty Clay	Sandy loam
pH (1:2)	7.51	4.96	7.47	6.5	7.5	8.3	6.80	5.3	6.6
Organic carbon (%)	1.20	3.24	0.50	0.73	0.61	0.52	0.31	0.58	0.81
CEC (cmol (p^+)/kg)		-	-		23.9	-	-	10.1	12.9
EC (dS/m)	0.4	0.08	0.12	0.08	0.32	0.29	0.27	0.13	0.061
Avail. N (kg/ha)	525	302.3	228.5	309	142	254	156	284	163
Avail. P_2O_5 (kg/ha)	120	71.7	17.7	17.6	9.85	31.5	41	22.5	34.7
Avail. K_2O (kg/ha)	386.5	248.2	171.7	208	215	143.4	158	127	151.2

Table 5.8.2 Evaluation of Organic fertilizers and Natural farming practices for enhancing the productivity and soil health Grain yield of *kharif* (Locations: MNC, MND, KHD, PNT, PUSA, PUD and TTB)

Treatment	Grain yield (t/ha)						
	MNC	**MND**	**KHD**	**PNT**	**PUSA**	**PUD**	**TTB**
Control	3.59	1.57	4.93	0.88	2.79	2.2	2.48
Complete NF	4.25	1.62	5.73	1.25	3.09	3.9	3.12
AI-NPOF package	4.31	2.62	6.29	1.42	3.14	3.81	3.33
Integrated Crop Management	4.9	3.12	6.93	2.04	3.48	4.11	3.45
Integrated Crop Management (need-based pesticides **)**	5.03	3.21	6.84	2.05	3.53	4.23	4.68
Exp. mean	**4.416**	**2.428**	**6.144**	**1.528**	**3.206**	**3.65**	**3.412**
CD (0.05)	**0.56**	**0.02**	**0.87**	**0.06**	**0.35**	**0.57**	**0.7**
CV (%)	**8.25**	**0.63**	**9.23**	**2.76**	**7.07**	**8.32**	**13.35**

Table 5.8.3 Evaluation of Organic fertilizers and Natural farming practices for enhancing the productivity and soil health Straw yield of *kharif* ((Locations: MNC, MND, KHD, PNT, PUSA, PUD and TTB)

Treatment	Straw yield (t/ha)						
	MNC	MND	KHD	PNT	PUSA	PUD	TTB
Control	5.95	2.08	5.91	1.22	4.14	3.16	6.1
Complete NF	7.16	2.38	6.56	1.58	4.53	5.53	7.45
AI-NPOF package	7.31	3.18	7.48	2.05	4.58	5.49	7.15
Integrated Crop Management	8.31	3.77	8.25	2.36	5.1	6.25	7.4
Integrated Crop Management (need-based pesticides)	8.48	3.98	8.23	2.26	5.35	6.28	9.18
Exp. mean	**7.442**	**3.078**	**7.286**	**1.894**	**4.74**	**5.342**	**7.456**
CD (0.05)	**1.11**	**0.06**	**0.96**	**0.07**	**0.58**	**0.95**	**1.39**
CV (%)	**9.72**	**1.25**	**8.53**	**2.36**	**7.93**	**9.43**	**12.14**

Table 5.8.4 Evaluation of Organic fertilizers and Natural farming practices for enhancing the productivity and soil health Yield parameters and nutrients uptake of *kharif* (Locations: MNC)

Treatments	Tiller Number/m^2	Panicle number/m^2	1000 grain wt (g)	Grain P (%)	Grain K (%)	Grain Zn (ppm)	Straw P (%)	Straw K (%)	Straw Zn (ppm)
Control	141	126.25	25.98	0.36	0.36	17.04	0.28	1.17	18.07
Complete NF	174	158	26.3	0.39	0.37	17.27	0.27	1.2	19.38
AI-NPOF package	195	180.5	26.53	0.38	0.41	19.73	0.29	1.18	24.45
Integrated Crop Management	205	190.5	27.1	0.41	0.39	19.08	0.3	1.24	21.35
Integrated Crop Management (need-based pesticides)	212	194.75	26.58	0.39	0.38	20.87	0.31	1.26	23.8
Exp. mean	**185**	**170**	**26.50**	**0.39**	**0.38**	**18.79**	**0.29**	**1.21**	**21.41**
CD (0.05)	**28.29**	**27.16**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
CV (%)	**9.91**	**10.37**	**5.21**	**15.12**	**9.49**	**10.16**	**17.74**	**7.64**	**16.32**

Table 5.8.5 Evaluation of Organic fertilizers and Natural farming practices for enhancing the productivity and soil health Yield parameters and nutrients uptake of *kharif* (Locations: MND)

Treatments	Tiller Number/m^2	Panicle number/m^2	1000 grain wt (g)	Grain N (%)	Grain P (%)	Grain K (%)	Grain Zn (mg/kg)	Straw N (%)	Straw P (%)	Straw K (%)	Straw Zn (mg/kg)
Control	178	147	17.45	0.62	0.05	0.24	5.33	0.51	0.02	0.3	8.34
Complete NF	196	159	17.97	0.92	0.06	0.27	6.77	0.6	0.03	0.41	8.69
AI-NPOF package	197	165	18.00	0.87	0.07	0.26	6.76	0.58	0.06	0.41	8.66
Integrated Crop Management	252	199	21.04	1.07	0.09	0.37	7.58	0.67	0.08	0.49	10.57
Integrated Crop Management (need-based pesticides)	260	205	21.48	1.12	0.11	0.42	8.15	0.7	0.09	0.52	11.76
Exp. mean	**216**	**175**	**19.19**	**0.92**	**0.08**	**0.31**	**6.92**	**0.61**	**0.06**	**0.43**	**9.60**
CD (0.05)	**12.56**	**10.85**	**0.51**	**0.01**	**0.01**	**0.01**	**0.15**	**0.03**	**0.02**	**0.01**	**0.38**
CV (%)	**3.77**	**4.03**	**1.73**	**0.82**	**8.58**	**1.43**	**1.38**	**3.03**	**19.9**	**1.47**	**2.59**

Table 5.8.6 Evaluation of Organic fertilizers and Natural farming practices for enhancing the productivity and soil health Yield parameters and nutrients uptake of *kharif* (Locations: KWD**)**

Treatments	Tiller Number/m^2	Panicle number/m^2	1000 grain wt (g)	Grain N (%)	Grain P (%)	Grain K (%)	Straw N (%)	Straw P (%)	Straw K (%)
Control	308	268	24.15	51.81	9.8	11.5	25.78	6.55	63.28
Complete NF	320	284	24.50	61.82	11.86	13.38	30.08	7.71	70.58
AI-NPOF package	352.	301	26.18	68.37	13.6	15.31	35.37	9.35	82.45
Integrated Crop Management	381	317	27.20	78.51	14.3	18.46	40.53	10.61	93.33
Integrated Crop Management (need-based pesticides)	377	324	27.08	76.29	14.63	18.97	41.09	10.83	92.68
Exp. mean	**348**	**298**	**25.82**	**67.36**	**12.84**	**15.52**	**34.57**	**9.01**	**80.46**
CD (0.05)	**29**	**29.74**	**2.08**	**10.72**	**2.96**	**3.26**	**4.63**	**1.68**	**10.66**
CV (%)	**5.41**	**6.47**	**5.23**	**10.33**	**14.95**	**13.63**	**8.7**	**12.12**	**8.6**

Table 5.8.7 Evaluation of Organic fertilizers and Natural farming practices for enhancing the productivity and soil health Yield parameters and nutrients uptake of *kharif* (Locations: PNT**).**

Treatments	Tiller Number/m^2	Panicle number/m^2	1000 grain wt (g)	Grain N (%)	Grain P (%)	Grain K (%)	Grain Zn	Straw N (%)	Straw P (%)	Straw K (%)	Straw Zn (mg/kg)
Control	90	83	15.88	0.89	0.08	0.74	8.1	0.35	0.11	0.35	9
Complete NF	112	97	19.1	0.98	0.1	0.83	9.4	0.41	0.13	0.52	10.45
AI-NPOF package	117	110	19.08	1.03	0.14	0.8	10.28	0.47	0.22	0.57	13.18
Integrated Crop Management	128	116	20.05	1.06	0.15	0.98	11.08	0.59	0.23	0.76	14.75
Integrated Crop Management (need-based pesticides)	133	116	20.1	1.06	0.14	0.9	11.38	0.65	0.24	0.7	16.38
Exp. mean	**116**	**104**	**18.84**	**1.00**	**0.12**	**0.85**	**10.05**	**0.49**	**0.19**	**0.58**	**12.75**
CD (0.05)	**5.51**	**4.93**	**0.72**	**0.04**	**0.02**	**0.04**	**0.41**	**0.07**	**0.03**	**0.06**	**0.93**
CV (%)	**3.08**	**3.06**	**2.49**	**2.52**	**9.01**	**2.84**	**2.65**	**9.2**	**8.88**	**7.17**	**4.75**

Table 5.8.8 Evaluation of Organic fertilizers and Natural farming practices for enhancing the productivity and soil health Yield parameters and nutrients uptake of *kharif* (Locations: PUSA**)**

Treatments	Tiller Number/m^2	Panicle number/m^2	1000 grain wt (g)	Grain N (%)	Grain P (%)	Grain K (%)	Straw N (%)	Straw P (%)	Straw K (%)
Control	209	192	26.48	1.35	0.29	1.26	0.65	0.07	1.3
Complete NF	230	205	26.8	1.39	0.3	1.26	0.71	0.07	1.33
AI-NPOF package	236	214	26.93	1.39	0.31	1.3	0.67	0.08	1.33
Integrated Crop Management	251	226	27.13	1.4	0.32	1.34	0.76	0.08	1.41
Integrated Crop Management (need-based pesticides)	260	243	27.33	1.42	0.33	1.35	0.76	0.08	1.42
Exp. mean	**237**	**216**	**26.93**	**1.39**	**0.31**	**1.30**	**0.71**	**0.08**	**1.36**
CD (0.05)	**27.1**	**15.98**	**NS**	**NS**	**NS**	**NS**	**NS**	**0.01**	**NS**
CV (%)	**7.42**	**4.81**	**6.54**	**6.15**	**10.12**	**6.96**	**7.89**	**4.8**	**4.31**

Table 5.8.9 Evaluation of Organic fertilizers and Natural farming practices for enhancing the productivity and soil health Yield parameters and nutrients uptake of *kharif* (Locations: PUD)

Treatments	Tiller Number/m^2	Panicle number/m^2	Grain N (%)	Grain P (%)	Grain K (%)	Straw N (%)	Straw P (%)	Straw K (%)	Soil OC (%)
Control	196	111	0.86	0.18	0.31	0.3	0.17	0.79	0.26
Complete NF	389	273	1.13	0.28	0.43	0.42	0.22	1.09	0.34
AI-NPOF package	406	259	1.1	0.27	0.41	0.43	0.21	1.15	0.37
Integrated Crop Management	447	309	1.29	0.29	0.44	0.42	0.23	1.2	0.32
Integrated Crop Management (need-based pesticides)	458	316	1.27	0.29	0.45	0.44	0.23	1.28	0.33
Exp. mean	**379**	**253**	**1.13**	**0.26**	**0.41**	**0.40**	**0.21**	**1.10**	**0.32**
CD (0.05)	**55.42**	**52.67**	**0.17**	**0.05**	**NS**	**0.07**	**NS**	**0.2**	**NS**
CV (%)	**7.76**	**11.04**	**8.21**	**9.4**	**13.2**	**9.5**	**14.26**	**9.65**	**14.44**

Table 5.8.10 Evaluation of Organic fertilizers and Natural farming practices for enhancing the productivity and soil health Yield parameters and nutrients uptake of *kharif* (Locations: TTB)

Treatments	Tiller Number/m^2	Panicle number/m^2	1000 grain wt (g)	Total N Uptake (kg/ha)	Total P Uptake(kg/ha)	Total K Uptake (kg/ha)	Soil pH	Soil OC (%)	Soil N (kg/ha)	Soil P (kg/ha)	Soil K (kg/ha)	Soil Zn (mg/kg)
Control	242	216	37.73	133.2	22.25	138.4	5.2	0.58	257.73	19.23	114.88	0.61
Complete NF	254	247	11.6	133.28	22.6	140.1	5.63	0.5	248.75	18.55	110.93	0.8
AI-NPOF package	305	299	12.53	134	22.6	140.48	5.48	0.5	246.63	17.93	114.33	0.72
Integrated Crop Management	259	253	11.48	134.53	22.65	141.3	5.13	0.45	235.13	16.78	112.13	0.72
Integrated Crop Management (need-based pesticides)	302	300	12.33	138.25	23.3	144.13	5.08	0.48	234.13	16.73	105.53	0.74
Exp. mean	**272**	**263**	**17.13**	**134.65**	**22.68**	**140.88**	**5.30**	**0.50**	**244.47**	**17.84**	**111.6**	**0.72**
CD (0.05)	**23.5**	**45.6**	**NS**	**2.34**	**0.4**	**2.4**	**0.18**	**0.06**	**12.82**	**1.59**	**NS**	**0.11**
CV (%)	**5.61**	**11.26**	**136.07**	**1.13**	**1.14**	**1.1**	**2.19**	**8.33**	**3.4**	**5.8**	**6.02**	**9.89**

Table 5.8.11 Evaluation of Organic fertilizers and Natural farming practices for enhancing the productivity and soil health Yield, yield parameters and soil properties after harvest of *rabi* (Locations: Chinsurah)

Treatments	Grain yield (t/ha)	Straw yield (t/ha)	Tiller Number/m^2	Panicle number/m^2	1000 grain wt (g)	Soil EC (dS/m)	Soil OC (%)	Soil N (kg/ha)	Soil P (kg/ha)	Soil K (kg/ha)	Soil Zn (mg/kg)
Control	2.33	2.75	258	219	20.18	0.21	1.19	449.75	92.25	290.43	17.28
Complete NF	2.73	3.24	249.25	215	20.3	0.21	1.16	460.75	89.5	291.58	17.35
AI-NPOF package	3.44	4.21	257.75	214	19.65	0.21	1.17	473.25	93.25	288	17.25
Integrated Crop Management	5.48	6.48	364	319	21.75	0.21	1.11	477.5	96.25	288.33	17.25
Integrated Crop Management (need-based pesticides)	5.91	6.52	405	401	20.08	0.23	1.17	474.3	96.25	291.88	17.33
Exp. mean	**3.978**	**4.64**	**306.8**	**274**	**20.39**	**0.21**	**1.16**	**467.1**	**93.5**	**290.04**	**17.29**
CD (0.05)	**0.21**	**0.26**	**34.08**	**23.51**	**0.9**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
CV (%)	**3.44**	**3.64**	**7.21**	**5.57**	**2.86**	**6.72**	**7.03**	**5.13**	**5.47**	**1.85**	**1.62**

Table 5.8.12 Evaluation of Organic fertilizers and Natural farming practices for enhancing the productivity and soil health Yield, yield parameters, nutrients uptake and soil properties of *Rabi* (Locations: KRK)

Treatments	Grain Yield (t/ha)	Straw Yield (t/ha)	Grain N (%)	Grain P (%)	Grain K (%)	Straw N (%)	Straw P (%)	Straw K (%)	Soil pH	Soil EC (dS/m)	Soil OC%	Total N uptake (kg/ha)	Total P uptake (kg/ha)	Total K uptake (kg/ha)
Control	4.99	5.47	1.15	0.09	0.84	0.49	0.11	2.02	5.76	0.59	0.48	85.08	10.36	151.31
Complete NF	5.13	6.55	1.27	0.11	0.79	0.46	0.2	2.05	5.65	0.57	0.56	95.55	18.57	175.48
AI-NPOF package	5.75	7.03	1.33	0.13	0.84	0.45	0.16	2.51	5.74	0.65	0.49	107.56	18.25	224.36
Integrated Crop Management	5.24	7.53	1.4	0.1	0.81	0.52	0.14	3.18	5.58	0.67	0.55	113.15	15.21	276.3
Integrated Crop Management (need-based pesticides)	5.91	7.96	1.44	0.1	0.81	0.57	0.23	2.23	5.59	0.79	0.61	130.13	23.19	225.56
Exp. mean	**5.404**	**6.91**	**1.32**	**0.11**	**0.82**	**0.50**	**0.17**	**2.40**	**5.66**	**0.65**	**0.54**	**106.29**	**17.12**	**210.60**
CD (0.05)	**0.44**	**NS**	**0.15**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**0.11**	**NS**	**24.44**	**NS**	**71.47**
CV (%)	**5.3**	**15.56**	**7.43**	**64.58**	**6.79**	**36.55**	**52.66**	**27.57**	**2.72**	**11.38**	**25.57**	**14.92**	**41.44**	**22.02**

Table 5.8.13 Evaluation of Organic fertilizers and Natural farming practices for enhancing the productivity and soil health Nutrients uptake and Soil properties after harvest of *kharif* (Locations: MNC)

Treatments	Soil OC (%)	Soil N (kg/ha)	Soil K (kg/ha)	Soil P (kg/ha)	Soil Zn (mg/kg)	Total P uptake (kg/ha)	Total K uptake (kg/ha)
Control	3.06	263.08	59.23	212.7	1.06	29.65	82.01
Complete NF	3.14	301.48	71.88	240.2	1.17	36.45	100.83
AI-NPOF package	3.2	311.5	75.35	249.9	1.01	37.06	103.03
Integrated Crop Management	3.09	300.7	70.25	239	0.94	43.99	122.2
Integrated Crop Management (need-based pesticides)	3.1	299.95	68.43	227	0.84	45.35	124.21
Exp. mean	**3.12**	**295.34**	**69.03**	**233.8**	**1.004**	**38.5**	**106.46**
CD (0.05)	**NS**	**28.55**	**8.18**	**11.66**	**NS**	**8.37**	**13.52**
CV (%)	**5.37**	**6.27**	**7.7**	**3.24**	**16.89**	**14.11**	**8.24**

Table 5.8.14 Evaluation of Organic fertilizers and Natural farming practices for enhancing the productivity and soil health Nutrients uptake and Soil properties after harvest of *kharif* (Locations: MND)

Treatments	Soil pH	Soil EC (dS/m)	Soil OC%	Soil N (kg/ha)	Soil P (kg/ha)	Soil K (kg/ha)	Soil Zn (mg/kg)	Total N uptake (kg/ha)	Total P uptake (kg/ha)	Total K uptake (kg/ha)
Control	7.49	0.12	0.5	228.03	17.67	164.13	0.48	20.08	1.24	10.09
Complete NF	7.49	0.13	0.55	239.75	18.91	178.58	0.6	28.93	1.78	14.1
AI-NPOF package	7.48	0.13	0.56	241.03	18.66	175.05	0.6	40.95	3.7	19.87
Integrated Crop Management	7.34	0.13	0.53	259.3	22.5	182.18	1.06	58.66	5.7	29.99
Integrated Crop Management (need-based pesticides)	7.42	0.13	0.53	256.23	22.87	185.28	1.12	63.67	6.74	33.94
Exp. mean	**7.44**	**0.13**	**0.53**	**244.86**	**20.12**	**177.04**	**0.77**	**42.49**	**3.83**	**21.60**
CD (0.05)	**NS**	**NS**	**0.02**	**0.42**	**0.15**	**9.53**	**0.01**	**0.63**	**0.65**	**0.6**
CV (%)	**0.98**	**7.58**	**2.2**	**0.11**	**0.49**	**3.49**	**0.54**	**0.96**	**10.97**	**1.79**

Table 5.8.15 Evaluation of Organic fertilizers and Natural farming practices for enhancing the productivity and soil health Nutrients uptake and Soil properties after harvest of *kharif* (Locations: KWD)

Treatments	Soil pH	Soil EC (dS/m)	Soil OC (%)	Soil N (kg/ha)	Soil P (kg/ha)	Soil K (kg/ha)	Total N uptake (kg/ha)	Total P uptake (kg/ha)	Total K uptake (kg/ha)
Control	6.33	0.26	0.66	292.75	12.63	143.95	4115.38	878.15	4340.75
Complete NF	6.28	0.26	0.72	299	13.83	158.38	5530.13	1192.46	5416.56
AI-NPOF package	6.23	0.25	0.82	337.75	14.68	171.8	7008.52	1569.02	7230.67
Integrated Crop Management	6.4	0.26	0.78	329.5	16.53	180.4	8799.68	1872.41	8991.08
Integrated Crop Management (need-based pesticides)	6.48	0.25	0.77	331.5	16.18	176.23	8657.07	1892.72	8973.03
Exp. mean	**6.34**	**0.26**	**0.75**	**318.1**	**14.77**	**166.15**	**6822.16**	**1480.95**	**6990.42**
CD (0.05)	**NS**	**NS**	**0.08**	**27.07**	**1.74**	**11.84**	**1456.12**	**290.37**	**1489.34**
CV (%)	**4.82**	**10.82**	**6.67**	**5.52**	**7.63**	**4.62**	**13.85**	**12.73**	**13.83**

Table 5.8.16 Evaluation of Organic fertilizers and Natural farming practices for enhancing the productivity and soil health Nutrients uptake and Soil properties after harvest of *kharif* (Locations: PNT)

Treatments	Soil pH	Soil EC (dS/m)	Soil OC(%)	Soil N (kg/ha)	Soil P (kg/ha)	Soil K (kg/ha)	Soil Zn (mg/kg)	Total N uptake (kg/ha)	Total P uptake (kg/ha)	Total K uptake (kg/ha)
Control	7.13	0.24	0.25	121.25	115.25	7.78	28.05	11.98	2.07	10.72
Complete NF	7.28	0.24	0.42	142.5	119.75	9.48	9.65	18.66	3.19	18.45
AI-NPOF package	7.35	0.41	0.67	158.5	140.5	11.13	9.78	24.28	6.39	23.05
Integrated Crop Management	7.25	0.42	0.7	170.5	142.75	13.58	11.65	35.53	8.44	37.83
Integrated Crop Management (need-based pesticides)	7.25	0.45	0.51	170.5	143.5	13.48	13.03	36.46	8.41	34.29
Exp. mean	**7.25**	**0.35**	**0.51**	**152.65**	**132.35**	**11.09**	**14.43**	**25.38**	**5.7**	**24.87**
CD (0.05)	**NS**	**0.05**	**0.04**	**8.79**	**7.61**	**1.06**	**NS**	**1.85**	**0.56**	**1.4**
CV (%)	**1.72**	**10.01**	**5.43**	**3.74**	**3.73**	**6.21**	**123.96**	**4.74**	**6.36**	**3.66**

Table 5.8.17 Evaluation of Organic fertilizers and Natural farming practices for enhancing the productivity and soil health Nutrients uptake and Soil properties after harvest of *kharif* (Locations: PUSA)

Treatments	Soil pH	Soil EC (dS/m)	Soil OC (%)	Soil N (kg/ha)	Soil P (kg/ha)	Soil K (kg/ha)	Total N uptake (kg/ha)	Total P uptake (kg/ha)	Total K uptake (kg/ha)
Control	8.38	0.33	0.45	218.5	26.25	121.55	64.44	10.92	88.96
Complete NF	8.31	0.28	0.47	230.5	28.13	126.9	75	12.33	99.33
AI-NPOF package	8.28	0.26	0.54	241.75	28.73	129.88	74.12	13.07	101.7
Integrated Crop Management	8.32	0.3	0.49	256.25	32.85	143.68	87.11	15.31	118.1
Integrated Crop Management (Pest management)	8.3	0.29	0.51	257.5	32.48	146.03	90.69	16.06	123.27
Exp. mean	**8.32**	**0.29**	**0.49**	**240.9**	**29.69**	**133.61**	**78.27**	**13.54**	**106.27**
CD (0.05)	**NS**	**NS**	**NS**	**NS**	**NS**	**15.22**	**9.71**	**2.53**	**13.33**
CV (%)	**0.82**	**10.72**	**8.39**	**7.83**	**10.92**	**7.39**	**8.05**	**12.13**	**8.14**

Table 5.8.18 Evaluation of Organic fertilizers and Natural farming practices for enhancing the productivity and soil health Nutrients uptake and Soil properties after harvest of *kharif* (Locations: PUD)

Treatments	Soil pH	Soil EC (dS/m)	Soil OC (%)	Soil N (kg/ha)	Soil P (kg/ha)	Soil K (kg/ha)	Total N uptake (kg/ha)	Total P uptake (kg/ha)	Total K uptake (kg/ha)
Control	6.57	0.24	0.26	115.73	39.33	131	28.53	9.26	31.79
Complete NF	6.43	0.31	0.34	138.13	46.67	157.33	67.31	22.74	77
AI-NPOF package	6.69	0.32	0.37	145.33	49.33	155.67	65.36	21.85	78.27
Integrated Crop Management	6.6	0.34	0.32	141.87	46.33	162	79.2	26.14	93.34
Integrated Crop Management (need-based pesticides)	6.54	0.3	0.33	138.13	47	159.33	81.12	26.71	99.31
Exp. mean	**6.57**	**0.30**	**0.32**	**135.83**	**45.73**	**153.07**	**64.30**	**21.34**	**75.94**
CD (0.05)	**NS**	**0.06**	**NS**	**NS**	**NS**	**NS**	**14.37**	**4.61**	**19.13**
CV (%)	**1.79**	**9.92**	**14.44**	**9.57**	**11.14**	**8.78**	**11.87**	**11.47**	**13.38**

5.9. Assessment of bio fortified rice genotypes response to Zn application and assessing agronomic bio fortification potential

Bio fortification, also known as biological fortification, involves the development and cultivation of nutritionally enriched food crops using modern biotechnology methods, traditional plant breeding, and agricultural techniques to enhance their bioavailability and address nutritional deficiencies in the human population. It is a burgeoning and cost-effective method, addressing the inadequacy of micronutrients in staple crops like rice, a consequence of agricultural systems prioritizing yield over human health, by enhancing the nutrient content to alleviate micronutrient deficiencies in populations with limited dietary diversity. Recent zinc-enriched varieties and newly developed genotypes necessitate evaluation of their reaction to applied zinc fertilizers to devise nutrient management strategies and determine their potential for agronomic biofortification.

Keeping this in view, the trial was conducted during *kharif*- 2023 with objectives

1) To evaluate the response of the fortified rice genotypes/varieties to the zinc application
2) To study the agronomic biofortification potential of the rice varieties.

The experiments were laid out in factorial RBD, consisting two factors viz., I) Rice genotypes/varieties (5); II) Zn doses (3). The treatment details are represented in table 5.9.1. From the beginning of farming until harvest, all practices were carried out in accordance with the technical programme; observations regarding grain and straw yields as well as other yield metrics were noted. Prior to starting the experiment and during harvest, soil samples were collected and significant soil characteristics were examined. Following harvesting, plant samples were also obtained, and their zinc accumulation was evaluated. The trial was conducted at five locations *viz., Cuttack, Maruteru, Pusa, Titabar, and Varanasi* during Kharif-2023. The results are presented in Table 5.9.2 to 5.9.12.

Yields

Grain and straw yields showed significant differences between the genotypes and treatments and depicted in table 5.9.3 to 5.9.5. At Cuttack, application of T3: FS of 0.5% Zn at stage, PI stage and 1 WAF treatment registered higher grain (5.01 t/ha) and straw (6.46 t/ha) yields as compared to control grain (3.78 t/ha) and straw (5.77 t/ha) yields. Between the varieties, V1: Swarna has recorded higher grain yield (5.18 t/ha) which is significantly at par with V2: CR Dhan 315 whereas V2: CR Dhan 315 registered higher straw yield (7.39 t/ha);

CG Zinc Rice-1 recorded lowest grain (3.46 t/ha) and straw (4.56 t/ha) yields. Application of T3: FS of 0.5% Zn at AT stage, PI stage and 1 WAF treatment recorded significantly higher harvest index (43.8) which is at par with application of T2: STBZ+ FS of 0.5% Zn at PI stage and 1 WAF as compared to control (39.5). In case of Varieties, V1: Swarna recorded significantly higher harvest index (47.1) as compared to all other varieties whereas V4: DR Dhan 48 registered lowest harvest index (37.7). Interaction between treatments and genotypes was found to be significant in case of straw yield and harvest index. The straw yield was higher (8.06 t/ha) in interaction between V2: CR Dhan 315 and T3: FS of 0.5% Zn at AT stage, PI stage and 1 WAF treatment. However, interaction between V1: Swarna and T3: FS of 0.5% Zn at AT stage, PI stage and 1 WAF treatment resulted in higher harvest index (48.8).

In case of Maruteru, there was no significant difference found between Zn treatments. However, there was significant variation in interaction of both Zn treatments and rice varieties. The grain and straw yields were found to be higher (7.45 t/ha and 9.42 t/ha, respectively) in interaction between V2: CR Dhan 315 and T3: FS of 0.5% Zn at AT stage, PI stage and 1 WAF treatment. In terms of varieties, V2: CR Dhan 315 recorded significantly higher grain (7.49 t/ha) and straw (8.99 t/ha) yields as compared to all other varieties. Harvest index was higher (44.7) in case of T2: STBZ+ FS of 0.5% Zn at PI stage and 1 WAF treatment whereas V1: Swarna showed higher (47.7) harvest index among the varieties.

At Pusa, the grain and straw yields was recorded higher (4.40 t/ha and 5.55 t/ha) under application of T2: STBZ+ FS of 0.5% Zn at PI stage and 1 WAF which is statistically at par with application of T3: FS of 0.5% Zn at AT stage, PI stage and 1 WAF (3.92 t/ha and 5.16 t/ha). However, there was no significant difference among the treatments in case of harvest index. Between the varieties, V1: Swarna produced substantially higher grain yield (5.08 t/ha) whereas the straw yield was found highest (5.69 t/ha) in V2: CR Dhan 315 which was on par with V1: Swarna. The harvest index was significantly influenced by the varieties. Among the varieties, V1: Swarna produced higher (47.3) harvest index which is significantly at par with V3: DR Dhan 45 (45.1) and V4: DR Dhan 48 (45.6) respectively. There was no significant difference between interaction of Zn treatments and genotypes.

In Titabar, the grain yield found to be higher (3.36 t/ha) in case of T3: FS of 0.5% Zn at AT stage, PI stage and 1 WAF treatment which is on par with T2: STBZ+ FS of 0.5% Zn at PI stage and 1 WAF treatment whereas the highest straw yield (5.30 t/ha) was recorded with application of T2: STBZ+ FS of 0.5% Zn at PI stage and 1 WAF. In case of harvest index, it was resulted highest (40.0) with the application of T3: FS of 0.5% Zn at AT stage, PI stage and

1 WAF which is significantly at par with T2: STBZ+ FS of 0.5% Zn at PI stage and 1 WAF treatment. There is no significant difference among the varieties in terms of grain yield and harvest index, however the straw yield was significantly influenced by varieties. V5: CG Zinc Rice-1 produced higher straw yield (5.47 t/ha) which is on par with V3: DR Dhan 45 (5.37 t/ha). Interaction between treatments and genotypes was found to be significant in case of straw yield and harvest index. The straw yield was found to be higher in interaction between V2: CR Dhan 315 and T2: STBZ+ FS of 0.5% Zn at PI stage and 1 WAF treatment (6.49 t/ha), conversely the harvest index was higher (52.2) with interaction of V2: CR Dhan 315 and T3: FS of 0.5% Zn at AT stage, PI stage and 1 WAF treatment.

In case of Varanasi, among Zn treatments, the application of T3: FS of 0.5% Zn at AT stage, PI stage and 1 WAF registered significantly higher grain (4.59 t/ha) and straw (11.52 t/ha) yields. Among the varieties, V3: DR Dhan 45 produced higher grain yield (5.14 t/ha) which is on par with V2: CR Dhan 315 whereas the straw yield was higher in case of V2: CR Dhan 315 which is statistically at par with V3: DR Dhan 45. Similarly, the harvest index was significantly influenced by both application of Zn treatments and varieties. The application of T3: FS of 0.5% Zn at AT stage, PI stage and 1 WAF registered higher harvest index (27.8) which is significantly at par with T2: STBZ+ FS of 0.5% Zn at PI stage and 1 WAF treatment (26.5). In case of varieties, V1: Swarna recorded higher harvest index (28.9) which is significantly at par with V2: CR Dhan 315 (27.3), V3: DR Dhan 45 (28.7) and V4: DR Dhan 48 (28.0). There was no significance difference found between interaction of treatments and genotypes.

Yield Attributes

Yield parameters like tiller number and panicle number per m^2, spikelet fertility and test weight were represented in the table 5.9.6 to 5.9.9. Tiller numbers per m^2 varied significantly across different varieties and treatments at all centres. Among the treatments, T3: FS of 0.5% Zn at AT stage, PI stage and 1 WAF, resulted in the higher tiller number per m^2 at Titabar (519.2), and Varanasi (343.1). However, at Cuttack, Maruteru and Pusa, the application of T2: STBZ+ FS of 0.5% Zn at PI stage and 1 WAF yielded the higher tiller number per m^2 (442.9, 402.6 and 391.1, respectively).

There were significant differences in the number of panicles per square meter among the various varieties and Zn treatments across all locations. Within the treatments, T3: FS of 0.5% Zn at AT stage, PI stage and 1 WAF produced higher number of panicles per m^2 at

Cuttack (336.4), Titabar (420.2) and Varanasi (291.0) except at Maruteru and Pusa, application of T2: STBZ+ FS of 0.5% Zn at PI stage and 1 WAF produced higher (307.0 and 365.1) panicle number per m^2 respectively.

Regarding varieties, V2: CR Dhan 315, exhibited a higher tiller number per square meter and panicle number per square meter at Cuttack, Maruteru, and Pusa, except for Titabar and Varanasi. At Titabar, V5: CG Zinc Rice-1 showed a higher tiller number per square meter, however V1: Swarna produced higher number of panicles per square meter. At Varanasi, higher tiller number and panicle number per m^2 were produced by V5: CG Zinc Rice-1.

Interaction between treatments and varieties was found to be significant in case of tiller number per square meter and panicle number per square meter at Maruteru and Varanasi. At Maruteru, the tiller number per m^2 and panicle number per m^2 were found to be higher (495.0 and 336.0, respectively) in interaction between of V2: CR Dhan 315 and T2: STBZ+ FS of 0.5% Zn at PI stage and 1 WAF treatment, whereas it was higher (403.7 and 374.7, respectively) in interaction between V5: CG Zinc Rice-1 and T3: FS of 0.5% Zn at AT stage, PI stage and 1 WAF treatment at Varanasi.

Spikelet fertility also varied significantly across different treatments at Cuttack, Pusa and Titabar except Maruteru and Varanasi. Conversely, varietal difference was only found at Cuttack and Varanasi. Within the treatments, application of T3: FS of 0.5% Zn at AT stage, PI stage and 1 WAF recorded higher spikelet fertility at Cuttack (83.3 %) and Titabar (91.5 %) which is significantly at par with T2: STBZ+ FS of 0.5% Zn at PI stage and 1 WAF treatment (90.9 %), however at Pusa, it was recorded higher (91.0 %) under T2: STBZ+ FS of 0.5% Zn at PI stage and 1 WAF treatment. In case of varieties, V5: CG Zinc Rice-1 registered higher (84.4 %) spikelet fertility at Cuttack, whereas it was recorded higher in V4: DR Dhan 48 (89.0 %) at Varanasi. Interaction between treatments and genotypes was found to be significant only at Varanasi, where spikelet fertility was registered higher (90.1 %) in interaction between V4: DR Dhan 48 and T2: STBZ+ FS of 0.5% Zn at PI stage and 1 WAF treatment.

There were significant differences found in test weight at all locations except Maruteru and Pusa in terms of Zn treatments, however varietal differences were found at all locations. Among the treatments, application of T3: FS of 0.5% Zn at AT stage, PI stage and 1 WAF registered higher test weight at Cuttack (23.0 g), Titabar (25.1) and Varanasi (22.9 g) and it was on par with application of T2: STBZ+ FS of 0.5% Zn at PI stage and 1 WAF treatment (24.9 g) at Titabar. In case of varieties, V2: CR Dhan 315 recorded significantly higher (25.2

g) test weight than other varieties at Cuttack, whereas in Maruteru, V2: CR Dhan 315 (24.9 g) also registered higher test weight however it was significantly at par with V3: DR Dhan 45 (24.1 g) and V5: CG Zinc Rice-1 (23.5 g). In case of Pusa, the test weight was recorded higher in V5: CG Zinc Rice-1 (38.2 g) which is on par with V1: Swarna (36.0 g), V3: DR Dhan 45 (33.9 g) and V4: DR Dhan 48 (34.3 g), whereas at Titabar, V5: CG Zinc Rice-1 exhibited significantly higher (26.4 g) test weight than other varieties and in Varanasi, higher test weight was registered under V5: CG Zinc Rice-1 (25.3 g) which is at par with V2: CR Dhan 315 (24.8 g). Interaction between treatments and genotypes was found to be non-significant at all locations.

Plant Zinc Content

Significant differences in grain Zn content were observed at all the locations with respect to Zn treatments (Table 5.9.10). Among the treatments, the application of T3: FS of 0.5% Zn at AT stage, PI stage and 1 WAF, resulted in higher grain Zn content at Cuttack (35.3 mg/kg), Maruteru (32.2 mg/kg) and Varanasi (42.9 mg/kg) which is on par with application of T2: STBZ+ FS of 0.5% Zn at PI stage and 1 WAF (33.0 mg/kg) at Cuttack and Maruteru. Conversely, at Pusa and Titabar, the higher grain Zn content (38.1 mg/kg and 38.4 mg/kg) was observed with the application of T2: STBZ+ FS of 0.5% Zn at PI stage and 1 WAF treatment which was at par with the treatment T3: FS of 0.5% Zn at AT stage, PI stage and 1 WAF (37.6 mg/kg) at Titabar. Varietal difference was observed in grain Zn content at all the locations. Between varieties, V5: CG Zinc Rice-1 exhibited higher grain Zn content at Cuttack (41.7 mg/kg), Maruteru (28.2 mg/kg), and Titabar (39.7 mg/kg) however at Maruteru it was on par with and V4: DR Dhan 48 (26.8 mg/kg). In case of Pusa, higher grain Zn content was found in V3: DR Dhan 45 (37.9 mg/kg) which was at par with both and V4: DR Dhan 48 (35.9 mg/kg) and V5: CG Zinc Rice-1 (35.9 mg/kg). At Varanasi, higher grain Zn content was observed in V4: DR Dhan 48 (39.3 mg/kg) which is on par with V1: Swarna (39.0 mg/kg) and V2: CR Dhan 315 (39.1 mg/kg). Interaction between treatments and varieties was found to be significant only at Varanasi, where higher grain Zn content (46.1 mg/kg) was found in interaction between V1: Swarna and T3: FS of 0.5% Zn at AT stage, PI stage and 1 WAF treatment.

The Zn content in the straw was affected significantly across different varieties and treatments at all centres (Table 5.9.11). Application of T3: FS of 0.5% Zn at AT stage, PI stage and 1 WAF registered higher straw Zn content at Maruteru (32.7 mg/kg), Titabar (43.0 mg/kg) and Varanasi (94.6 mg/kg), conversely at Maruteru it was significantly at par with application of T2: STBZ+ FS of 0.5% Zn at PI stage and 1 WAF (31.7 mg/kg). In case of Cuttack and Pusa the higher straw Zn content was recorded under the application of T2: STBZ+ FS of 0.5% Zn at PI stage and 1 WAF treatment (46.1 mg/kg and 41.7 mg/kg, respectively), however at Cuttack, it was on par with the application of T3: FS of 0.5% Zn at AT stage, PI stage and 1 WAF (45.4 mg/kg). Regarding varieties, V4: DR Dhan 48 displayed higher straw Zn content at Maruteru (33.6 mg/kg), Pusa (41.9 mg/kg) and Varanasi (71.7 mg/kg). At Maruteru, it was on par with V3: DR Dhan 45 (30.8 mg/kg), however at Pusa it was on par with V2: CR Dhan 315 (40.4 mg/kg) and V5: CG Zinc Rice-1 (39.9 mg/kg) and at Varanasi it was significantly at par with V1: Swarna (70.1 mg/kg). In case of Cuttack and Titabar, V3: DR Dhan 45 exhibited higher straw Zn content (56.2 mg/kg and 43.7 mg/kg, respectively) which was significantly at par with V2: CR Dhan 315 (53.5 mg/kg and 38.5 mg/kg, respectively) and V5: CG Zinc Rice-1 (46.3 mg/kg and 38.7 mg/kg respectively). Interaction between treatments and varieties was found to be significant at Pusa, Titabar and Varanasi. In Pusa, higher straw Zn content (45.7 mg/kg) was obtained in interaction between V5: CG Zinc Rice-1 and T2: STBZ+ FS of 0.5% Zn at PI stage and 1 WAF treatment whereas at Titabar, the straw Zn content was found to be higher (57.4 mg/kg) in interaction between V3: DR Dhan 45 and the straw Zn content was higher in Varanasi, the straw Zn content was higher (101.8 mg/kg) in interaction between V1: Swarna and T3: FS of 0.5% Zn at AT stage, PI stage and 1 WAF treatment.

Post-harvest soil zinc status

Following harvest, the available Zn status in soil significantly varied among the treatments at all locations (Table 5.9.12). The application of T2: STBZ+ FS of 0.5% Zn at PI stage and 1 WAF treatment exhibited higher Zn status in soil at Cuttack (1.44 mg/kg), Maruteru (1.42 mg/kg), Pusa (0.60 mg/kg), Titabar (2.03 mg/kg) and Varanasi (0.82 mg/kg), however at Pusa it was on par with application of T3: FS of 0.5% Zn at AT stage, PI stage and 1 WAF (0.58 mg/kg). At Cuttack and Titabar, significant difference in soil Zn content due to effect of varieties and at Varanasi higher content was observed under V3: DR Dhan 45 which was at par with V2: CR Dhan 315 and at Titabar higher content was observed under V2: CR Dhan 315.

Summary

At all five locations, significant variations in yield attributes and overall yields were observed based on genotype and location. Application of T3: FS of 0.5% Zn at AT stage, PI stage and 1 WAF exhibited higher grain yield at Cuttack, Titabar and Varanasi whereas application of T2: STBZ+ FS of 0.5% Zn at PI stage and 1 WAF treatment registered higher grain yield at Pusa.

The treatment effects were found to be non-significant at Maruteru. Among varieties, V1: Swarna performed better at Cuttack and Pusa, whereas V2: CR Dhan 315 found superior at Maruteru and in case of Titabar, V5: CG Zinc Rice-1 Performed more effectively whereas V3: DR Dhan 45 exhibited superior performance at Varanasi. Grain zinc content showed notable variations across all locations concerning zinc treatments. Among the treatments, the use of T3: FS of 0.5% Zn at AT stage, PI stage and 1 WAF, led to increased zinc content in grains at Cuttack, Maruteru and Varanasi. In contrast, at Pusa and Titabar, significantly higher grain zinc content was noted with the application of T2: STBZ+ FS of 0.5% Zn at PI stage and 1 WAF treatment. The variety V5: CG Zinc Rice-1 exhibited higher grain Zn content at Cuttack, Maruteru and Titabar whereas at Pusa V3: DR Dhan 45 has accumulated higher amount of Zn and the variety V4: DR Dhan 48 exhibited superior performance in terms of Zn accumulation at Varanasi. The application of T2: STBZ+ FS of 0.5% Zn at PI stage and 1 WAF treatment showed elevated zinc levels in the post- harvest soil across all locations.

Table: 5.9.1 Assessment of biofortified rice genotypes response to Zn application and assessing agronomic biofortification potential

Treatments Details

Rice Varieties Name		**Zn Doses**	
V1	Swarna	T1	Control with no Zinc
V2	CR Dhan 315	T2	Soil test-based Zinc application (STBZ)+ Foliar spray of 0.5% Zinc at PI stage and 1 week after flowering
V3	DR Dhan 45		
V4	DR Dhan 48	T3	Foliar spray of 0.5% Zinc at active tillering (AT) stage, panicle initiation (PI) stage and 1 week after flowering
V5	CG Zinc Rice-1		

.

Table: 5.9.2 Assessment of biofortified rice genotypes response to Zn application and assessing agronomic biofortification potential

Soil and crop characteristics

Parameters	NRRI	MTU	Pusa	TTB	BHU
Cropping system	Rice	Rice	Rice	Rice	Rice
Season	Kharif	Kharif	Kharif	Kharif	Kharif
RDF (kg NPK/ha)	80:40:40	90:60:60	120:60:40	60:20:40	150:60:40
Soil characteristic					
% Clay	33.2	38	14	40.5	23.66
% Silt	52.7	28	31	29.5	26.13
% Sand	14.1	34	55	30.0	50.21
Texture	Sandy clay loam	Clay loam	Sandy loam	Silty clay	Sandy clay loam
CEC (cmol (P+) / kg	16.7	48.9	-	11.5	-
pH (1:2)	5.6	6.63	8.24	5.2	7.13
EC (dS/m)	0.45	0.69	0.28	0.11	0.19
Organic carbon (%)	0.62	1.07	0.48	0.85	0.28
Avail. N (kg/ha)	288.5	184	232	237	190.0
Avail. P2O5 (kg/ha)	38.5	33.9	32.6	20.1	40.3
Avail. K2O (kg/ha)	249.8	397	140.5	157	240.0
DTPA –Zn (mg/kg)	0.81	1.10	0.54	0.76	0.65

Table: 5.9.3 Effect of biofortified rice genotypes response to Zn application on Grain yield (t/ha) of rice at different locations

Treatments/ Varieties	NRRI				MTU				Pusa				TTB				BHU			
	T1	T2	T3	Mean	T1	T2	T3	Mean	T1	T2	T3	Mean	T1	T2	T3	Mean	T1	T2	T3	Mean
V1: Swarna	4.43	5.43	5.70	5.18	5.93	6.83	5.77	6.18	4.17	5.65	5.41	5.08	2.63	2.87	3.02	2.84	4.28	4.80	5.03	4.70
V2: CR Dhan 315	4.25	5.33	5.73	5.10	7.44	7.59	7.45	7.49	3.48	3.81	3.84	3.71	2.45	2.68	3.56	2.90	4.21	5.00	5.28	4.83
V3: DR Dhan 45	4.15	4.71	5.29	4.72	5.43	5.71	5.61	5.59	3.68	5.08	4.21	4.32	2.32	2.61	2.92	2.62	4.47	5.07	5.89	5.14
V4: DR Dhan 48	3.13	3.79	4.40	3.78	4.49	5.00	5.74	5.08	3.93	5.24	3.96	4.38	1.86	2.96	3.90	2.91	4.39	4.17	4.86	4.48
V5: CG Zinc Rice-1	2.96	3.50	3.93	3.46	4.43	3.25	3.68	3.79	1.95	2.22	2.16	2.11	2.89	3.53	3.40	3.27	1.24	1.48	1.87	1.53
Mean	3.78	4.55	5.01		5.54	5.68	5.65		3.44	4.40	3.92		2.43	2.93	3.36		3.72	4.10	4.59	
CD (0.05) T	0.18				NS				0.50				0.56				0.27			
CD (0.05) V	0.23				0.33				0.64				NS				0.35			
T*V	NS				0.58				NS				NS				NS			

[T1: Control with no Zn; T2: STBZ+ FS of 0.5% Zn at PI stage and 1 WAF; T3: FS of 0.5% Zn at AT stage, PI stage and 1 WAF]

Table: 5.9.4 Effect of biofortified rice genotypes response to Zn application on Straw yield (t/ha) of rice at different locations

Treatments/ Varieties	NRRI				MTU				Pusa				TTB				BHU			
	T1	**T2**	**T3**	**Mean**	**T1**	**T2**	**T3**	**Mean**	**T1**	**T2**	**T3**	**Mean**	**T1**	**T2**	**T3**	**Mean**	**T1**	**T2**	**T3**	**Mean**
V1: Swarna	5.63	5.75	5.98	**5.79**	8.02	6.97	5.55	**6.85**	5.06	6.15	5.66	**5.62**	4.92	5.27	5.55	**5.25**	10.99	11.41	12.20	**11.53**
V2: CR Dhan 315	6.69	7.43	8.06	**7.39**	8.40	9.15	9.42	**8.99**	5.03	6.26	5.78	**5.69**	4.62	6.49	3.26	**4.79**	11.88	12.89	13.73	**12.83**
V3: DR Dhan 45	6.41	6.75	6.90	**6.69**	7.35	8.55	8.20	**8.03**	4.88	5.51	5.06	**5.15**	5.47	5.11	5.53	**5.37**	12.20	12.78	13.11	**12.69**
V4: DR Dhan 48	5.85	6.18	6.55	**6.19**	6.58	6.37	7.25	**6.73**	4.72	5.44	5.41	**5.19**	4.81	5.25	4.85	**4.97**	11.51	11.01	11.94	**11.49**
V5: CG Zinc Rice-1	4.28	4.59	4.82	**4.56**	6.16	4.02	4.94	**5.04**	3.28	4.38	3.88	**3.85**	6.07	4.40	5.93	**5.47**	6.02	6.26	6.63	**6.30**
Mean	**5.77**	**6.14**	**6.46**		**7.30**	**7.01**	**7.07**		**4.59**	**5.55**	**5.16**		**5.18**	**5.30**	**5.02**		**10.52**	**10.87**	**11.52**	
CD (0.05) T	0.16				NS				0.51				0.16				0.33			
CD (0.05) V	0.21				0.46				0.65				0.21				0.42			
T*V	0.37				0.79				NS				0.36				NS			

[T1: Control with no Zn; T2: STBZ+ FS of 0.5% Zn at PI stage and 1 WAF; T3: FS of 0.5% Zn at AT stage, PI stage and 1 WAF]

Table: 5.9.5 Effect of biofortified rice genotypes response to Zn application on Harvest index of rice at different locations

Treatments/ Varieties	NRRI				MTU				Pusa				TTB				BHU			
	T1	T2	T3	Mean	T1	T2	T3	Mean	T1	T2	T3	Mean	T1	T2	T3	Mean	T1	T2	T3	Mean
V1: Swarna	44.0	48.5	48.8	**47.1**	42.5	49.6	51.1	**47.7**	45.1	48.0	48.8	**47.3**	34.9	35.6	31.8	**34.1**	27.9	29.6	29.2	**28.9**
V2: CR Dhan 315	38.8	41.8	41.5	**40.7**	47.0	45.3	44.2	**45.5**	41.0	37.9	39.9	**39.6**	34.7	29.2	52.2	**38.7**	26.1	28.0	27.8	**27.3**
V3: DR Dhan 45	39.3	41.1	43.4	**41.3**	42.6	40.1	40.6	**41.1**	42.7	47.6	44.8	**45.1**	29.8	34.0	34.8	**32.8**	26.8	28.4	31.0	**28.7**
V4: DR Dhan 48	34.9	38.0	40.2	**37.7**	40.5	44.0	44.3	**42.9**	45.4	49.1	42.1	**45.6**	28.0	36.2	44.7	**36.3**	27.6	27.4	29.0	**28.0**
V5: CG Zinc Rice-1	40.7	43.3	44.9	**43.0**	41.8	44.7	42.7	**43.1**	37.6	35.1	35.7	**36.2**	32.5	44.6	36.6	**37.9**	17.1	18.9	21.9	**19.3**
Mean	**39.5**	**42.5**	**43.8**		**42.9**	**44.7**	**44.6**		**42.4**	**43.6**	**42.3**		**32.0**	**35.9**	**40.0**		**25.1**	**26.5**	**27.8**	
CD (0.05) T	1.3				NS				NS				4.1				1.7			
CD (0.05) V	1.7				2.4				4.8				NS				2.2			
T*V	2.9				4.2				NS				9.3				NS			

[T1: Control with no Zn; T2: STBZ+ FS of 0.5% Zn at PI stage and 1 WAF; T3: FS of 0.5% Zn at AT stage, PI stage and 1 WAF]

Table: 5.9.6 Effect of biofortified rice genotypes response to Zn application on Tiller Number/m^2 of rice at different locations

Treatments/ Varieties	NRRI				MTU				Pusa				TTB				BHU			
	T1	T2	T3	Mean	T1	T2	T3	Mean	T1	T2	T3	Mean	T1	T2	T3	Mean	T1	T2	T3	Mean
V1: Swarna	421.7	440.0	421.7	**427.8**	336.0	462.0	363.0	**387.0**	383.3	395.3	396.0	**391.6**	451.0	457.6	554.4	**487.7**	281.3	326.0	326.0	**311.1**
V2: CR Dhan 315	436.3	480.3	432.7	**449.8**	462.0	495.0	363.0	**440.0**	364.7	396.7	416.7	**392.7**	443.3	502.7	474.1	**473.4**	245.3	253.7	276.3	**258.4**
V3: DR Dhan 45	421.7	432.7	436.3	**430.2**	396.0	396.0	297.0	**363.0**	374.3	372.7	393.7	**380.2**	413.6	443.3	541.2	**466.0**	284.7	332.3	347.7	**321.6**
V4: DR Dhan 48	392.3	407.0	425.3	**408.2**	320.0	363.0	462.0	**381.7**	343.0	405.0	394.0	**380.7**	349.8	411.4	446.6	**402.6**	282.7	320.3	361.7	**321.6**
V5: CG Zinc Rice-1	396.0	454.7	480.3	**443.7**	297.0	297.0	264.0	**286.0**	282.3	386.0	319.0	**329.1**	443.3	514.8	579.7	**512.6**	346.7	378.7	403.7	**376.3**
Mean	**413.6**	**442.9**	**439.3**		**362.2**	**402.6**	**349.8**		**349.5**	**391.1**	**383.9**		**420.2**	**466.0**	**519.2**		**288.1**	**322.2**	**343.1**	
CD (0.05) T	25.3				11.3				29.6				27.2				7.7			
CD (0.05) V	32.7				14.6				38.2				35.1				10.0			
T*V	NS				25.3				NS				NS				17.3			

[T1: Control with no Zn; T2: STBZ+ FS of 0.5% Zn at PI stage and 1 WAF; T3: FS of 0.5% Zn at AT stage, PI stage and 1 WAF]

Table: 5.9.7. Effect of biofortified rice genotypes response to Zn application on Panicle number/m^2 of rice at different locations

Treatments/ Varieties	NRRI				MTU				Pusa				TTB				BHU			
	T1	T2	T3	Mean	T1	T2	T3	Mean	T1	T2	T3	Mean	T1	T2	T3	Mean	T1	T2	T3	Mean
V1: Swarna	302.3	336.7	345.7	**328.2**	325.0	330.0	328.0	**327.7**	360.3	370.7	371.3	**367.4**	396.0	407.0	429.0	**410.7**	234.7	250.3	270.0	**251.7**
V2: CR Dhan 315	324.3	343.3	353.7	**340.4**	321.0	336.0	333.0	**330.0**	341.7	372.7	391.0	**368.4**	363.0	396.0	407.0	**388.7**	227.3	247.0	262.3	**245.6**
V3: DR Dhan 45	299.0	314.3	336.7	**316.7**	310.0	322.0	286.0	**306.0**	344.7	343.7	366.3	**351.6**	363.0	374.0	451.0	**396.0**	212.7	243.7	257.0	**237.8**
V4: DR Dhan 48	265.7	286.3	304.0	**285.3**	198.0	299.0	304.0	**267.0**	317.0	375.7	368.3	**353.7**	319.0	352.0	363.0	**344.7**	213.3	265.3	291.0	**256.6**
V5: CG Zinc Rice-1	282.3	325.0	342.0	**316.4**	274.0	248.0	241.0	**254.3**	253.0	363.0	292.0	**302.7**	341.0	429.0	451.0	**407.0**	304.0	336.7	374.7	**338.4**
Mean	**294.7**	**321.1**	**336.4**		**285.6**	**307.0**	**298.4**		**323.3**	**365.1**	**357.8**		**356.4**	**391.6**	**420.2**		**238.4**	**268.6**	**291.0**	
CD (0.05) T	10.7				14.2				28.9				25.7				8.1			
CD (0.05) V	13.8				18.4				37.3				33.2				10.4			
T*V	NS				31.8				NS				NS				18.1			

[T1: Control with no Zn; T2: STBZ+ FS of 0.5% Zn at PI stage and 1 WAF; T3: FS of 0.5% Zn at AT stage, PI stage and 1 WAF]

Table: 5.9.8. Effect of biofortified rice genotypes response to Zn application on Spikelet Fertility (%) of rice at different locations

Treatments/ Varieties	NRRI				MTU				Pusa				TTB				BHU			
	T1	T2	T3	Mean	T1	T2	T3	Mean	T1	T2	T3	Mean	T1	T2	T3	Mean	T1	T2	T3	Mean
V1: Swarna	75.6	77.4	77.9	**76.9**	91.6	89.9	88.7	**90.1**	86.0	91.1	85.1	**87.4**	90.6	91.3	91.8	**91.2**	80.0	86.9	86.1	**84.4**
V2: CR Dhan 315	79.9	84.2	85.5	**83.2**	93.8	95.8	91.8	**93.8**	85.0	90.6	86.4	**87.3**	86.6	91.2	92.1	**90.0**	88.3	86.0	80.7	**85.0**
V3: DR Dhan 45	82.8	83.2	81.5	**82.5**	91.8	88.3	95.3	**91.8**	84.9	91.4	89.0	**88.4**	89.7	90.9	91.6	**90.7**	81.7	76.3	82.2	**80.0**
V4: DR Dhan 48	79.3	84.7	85.3	**83.1**	95.4	94.7	95.9	**95.3**	84.8	90.5	88.8	**88.0**	89.7	90.4	91.0	**90.4**	88.5	90.1	88.4	**89.0**
V5: CG Zinc Rice-1	83.3	83.6	86.4	**84.4**	90.9	92.2	86.7	**89.9**	86.0	91.6	89.2	**88.9**	90.1	90.6	90.8	**90.5**	80.0	80.0	75.3	**78.4**
Mean	**80.2**	**82.6**	**83.3**		**92.7**	**92.2**	**91.7**		**85.3**	**91.0**	**87.7**		**89.3**	**90.9**	**91.5**		**83.7**	**83.9**	**82.5**	
CD (0.05) T	1.6				NS				1.1				1.2				NS			
CD (0.05) V	2.1				NS				NS				NS				3.6			
T*V	NS				NS				NS				NS				6.3			

[T1: Control with no Zn; T2: STBZ+ FS of 0.5% Zn at PI stage and 1 WAF; T3: FS of 0.5% Zn at stage, PI stage and 1 WAF]

Table: 5.9.9. Effect of biofortified rice genotypes response to Zn application on test weight (g) of rice at different locations

Treatments/ Varieties	Cuttack				Maruteru				Pusa				Titabar				Varanasi			
	T1	**T2**	**T3**	**Mean**	**T1**	**T2**	**T3**	**Mean**	**T1**	**T2**	**T3**	**Mean**	**T1**	**T2**	**T3**	**Mean**	**T1**	**T2**	**T3**	**Mean**
V1: Swarna	19.3	20.3	20.9	**20.2**	20.0	19.5	19.3	**19.6**	36.3	37.1	34.7	**36.0**	23.1	23.3	23.3	**23.3**	20.9	21.6	22.7	**21.8**
V2: CR Dhan 315	24.0	24.6	27.0	**25.2**	23.2	27.6	23.9	**24.9**	25.8	28.6	26.7	**27.1**	23.9	24.1	24.2	**24.1**	23.3	25.3	25.9	**24.8**
V3: DR Dhan 45	22.5	23.5	23.1	**23.0**	23.4	28.2	20.9	**24.1**	33.7	34.5	33.3	**33.9**	25.7	26.0	26.5	**26.0**	22.5	23.5	24.6	**23.5**
V4: DR Dhan 48	18.8	18.9	20.4	**19.4**	12.6	14.4	16.3	**14.4**	34.5	35.0	33.3	**34.3**	24.4	24.6	24.8	**24.6**	12.9	13.9	14.4	**13.7**
V5: CG Zinc Rice-1	22.2	22.9	23.8	**23.0**	25.1	23.6	21.7	**23.5**	42.2	39.2	33.1	**38.2**	26.1	26.4	26.7	**26.4**	23.8	25.2	27.0	**25.3**
Mean	**21.4**	**22.0**	**23.0**		**20.9**	**22.7**	**20.4**		**34.5**	**34.9**	**32.3**		**24.6**	**24.9**	**25.1**		**20.7**	**21.9**	**22.9**	
CD (0.05) T	0.6				NS				NS				0.2				0.5			
CD (0.05) V	0.7				3.4				4.8				0.3				0.7			
T*V	NS				NS				NS				NS				NS			

[T1: Control with no Zn; T2: STBZ+ FS of 0.5% Zn at PI stage and 1 WAF; T3: FS of 0.5% Zn at AT stage, PI stage and 1 WAF]

Table: 5.9.10. Effect of biofortified rice genotypes response to Zn application on Grain Zn Content (mg/kg) of rice at different locations

Treatments/ Varieties	Cuttack				Maruteru				Pusa				Titabar				Varanasi			
	T1	T2	T3	Mean	T1	T2	T3	Mean	T1	T2	T3	Mean	T1	T2	T3	Mean	T1	T2	T3	Mean
V1: Swarna	23.1	29.0	37.0	**29.7**	18.3	27.4	28.2	**24.7**	28.6	34.2	29.5	**30.8**	22.2	38.1	34.3	**31.5**	29.8	41.1	46.1	**39.0**
V2: CR Dhan 315	17.7	33.1	33.6	**28.1**	24.6	29.7	32.2	**28.9**	33.0	38.5	35.4	**35.6**	31.5	36.0	36.2	**34.6**	32.7	40.4	44.2	**39.1**
V3: DR Dhan 45	20.1	28.0	30.4	**26.2**	25.6	26.4	33.1	**28.4**	37.7	38.8	37.2	**37.9**	36.4	36.5	42.6	**38.5**	29.0	37.0	40.9	**35.6**
V4: DR Dhan 48	25.6	30.7	31.2	**29.2**	28.2	33.4	33.7	**31.8**	32.9	40.4	34.3	**35.9**	40.9	37.9	34.5	**37.8**	32.1	40.0	45.7	**39.3**
V5: CG Zinc Rice-1	36.5	44.1	44.4	**41.7**	28.9	36.7	33.9	**33.2**	33.1	38.6	36.1	**35.9**	35.4	43.4	40.2	**39.7**	33.4	36.2	37.6	**35.8**
Mean	**24.6**	**33.0**	**35.3**		**25.1**	**30.7**	**32.2**		**33.1**	**38.1**	**34.5**		**33.3**	**38.4**	**37.6**		**31.4**	**38.9**	**42.9**	
CD (0.05) T	3.9				2.8				2.4				4.0				1.6			
CD (0.05) V	5.1				3.6				3.0				5.2				2.1			
T*V	NS				NS				NS				NS				3.7			

[T1: Control with no Zn; T2: STBZ+ FS of 0.5% Zn at PI stage and 1 WAF; T3: FS of 0.5% Zn at AT stage, PI stage and 1 WAF]

Table: 5.9.11. Effect of biofortified rice genotypes response to Zn application on Straw Zn Content (mg/kg) of rice at different locations

Treatments/ Varieties	Cuttack				Maruteru				Pusa				Titabar				Varanasi			
	T1	T2	T3	Mean	T1	T2	T3	Mean	T1	T2	T3	Mean	T1	T2	T3	Mean	T1	T2	T3	Mean
V1: Swarna	24.0	23.9	24.0	**24.0**	22.9	29.4	26.9	**26.4**	33.6	37.9	38.5	**36.7**	23.7	36.6	30.9	**30.4**	50.3	58.0	101.8	**70.1**
V2: CR Dhan 315	44.6	58.0	57.8	**53.5**	27.3	29.1	28.5	**28.3**	39.0	43.5	40.4	**40.9**	35.2	32.2	48.2	**38.5**	44.4	60.9	94.1	**66.5**
V3: DR Dhan 45	54.6	57.1	56.9	**56.2**	27.0	33.0	32.5	**30.8**	38.5	37.3	36.3	**37.4**	33.7	40.1	57.4	**43.7**	41.4	45.9	95.8	**61.0**
V4: DR Dhan 48	19.8	33.7	31.5	**28.3**	24.5	36.3	40.1	**33.6**	38.6	44.2	42.9	**41.9**	35.0	38.0	36.6	**36.5**	42.4	72.9	99.9	**71.7**
V5: CG Zinc Rice-1	24.8	57.8	56.5	**46.3**	20.2	30.6	35.6	**28.8**	38.4	45.7	35.7	**39.9**	29.1	44.9	42.0	**38.7**	44.9	67.3	81.4	**64.6**
Mean	**33.6**	**46.1**	**45.4**		**24.4**	**31.7**	**32.7**		**37.6**	**41.7**	**38.8**		**31.3**	**38.4**	**43.0**		**44.7**	**61.0**	**94.6**	
CD (0.05) T	10.8				3.41				2.2				4.8				3.0			
CD (0.05) V	13.9				4.40				2.8				6.2				3.9			
T*V	NS				NS				4.9				10.7				6.8			

[T1: Control with no Zn; T2: STBZ+ FS of 0.5% Zn at PI stage and 1 WAF; T3: FS of 0.5% Zn at AT stage, PI stage and 1 WAF]

Table: 5.9.12. Effect of biofortified rice genotypes response to Zn application on post-harvest soil zinc status (mg/kg) of rice at different locations

Treatments/ Varieties	Cuttack				Maruteru				Pusa				Titabar				Varanasi			
	T1	**T2**	**T3**	**Mean**	**T1**	**T2**	**T3**	**Mean**	**T1**	**T2**	**T3**	**Mean**	**T1**	**T2**	**T3**	**Mean**	**T1**	**T2**	**T3**	**Mean**
V1: Swarna	0.65	1.20	2.03	**1.29**	1.01	1.44	1.32	**1.26**	0.53	0.60	0.57	**0.57**	1.06	1.98	1.18	**1.40**	0.67	0.81	0.69	**0.72**
V2: CR Dhan 315	2.06	1.23	1.09	**1.46**	1.17	1.33	1.42	**1.31**	0.53	0.60	0.58	**0.57**	1.25	3.10	1.01	**1.78**	0.56	0.87	0.70	**0.71**
V3: DR Dhan 45	0.74	2.13	1.73	**1.54**	1.30	1.41	1.14	**1.29**	0.54	0.61	0.58	**0.57**	1.16	1.93	1.13	**1.41**	0.63	0.79	0.69	**0.70**
V4: DR Dhan 48	0.94	1.34	0.87	**1.05**	1.00	1.54	1.13	**1.22**	0.53	0.61	0.59	**0.58**	0.89	1.04	1.09	**1.01**	0.74	0.82	0.69	**0.75**
V5: CG Zinc Rice-1	1.36	1.32	1.06	**1.25**	1.01	1.36	1.30	**1.22**	0.54	0.61	0.59	**0.58**	0.99	2.08	1.02	**1.36**	0.58	0.82	0.76	**0.72**
Mean	**1.15**	**1.44**	**1.36**		**1.10**	**1.42**	**1.26**		**0.53**	**0.60**	**0.58**		**1.07**	**2.03**	**1.08**		**0.64**	**0.82**	**0.71**	
CD (0.05) T	0.08				0.10				0.03				0.29				0.04			
CD (0.05) V	0.10				NS				NS				0.37				NS			
T*V	0.17				0.22				NS				0.65				0.10			

[T1: Control with no Zn; T2: STBZ+ FS of 0.5% Zn at PI stage and 1 WAF; T3: FS of 0.5% Zn at AT stage, PI stage and 1 WAF

List of cooperating centers of Soil Science and allotment of trials: 2023 -24

Appendix-I

Sl. No	Locations	Trial 1		Trial 2		Trial 3		Trial 4	Trial 5		Trial 6		Trial 7		Trial 8		Trail 9		Allotted	Conducted	Conducted %
		K	R	K		K	R	K	K	R	K	R	K	R	K	R	K	R			
1	Kanpur (F)			x		x	x		x	x	x	x	x	x					09	09	100
2	Karaikal (F)								x	x	x		x			x			05	05	100
3	Kaul (F)			x							x		x						03	03	100
4	Mandya (F)	x	x			x							x		x				05	05	100
5	Maruteru (F)	x	x						x	x	x	x	x	x			x	x	10	10	100
6	Moncompu (F)							x	x		x		x		x				08	05	63
7	Pantnagar (F)			x					x				x		x				07	04	57
8	Pusa (F)					x			x				x		x		x		05	05	100
9	Titabar (F)	x	x					x					x		x		x		06	06	100
10	Ludhiana (F)																		-	-	-
11	Bankura												x	x					02	02	100
12	Chinsurah (V)			x									x			x			05	03	60
13	Chiplima (V)										x		x						03	02	67
14	Faizabad (V)					x			x		x		x						04	04	100
15	Khudwani (V)								x		x		x		x				04	04	100
16	NRRI,Cuttack(V)										x						x		04	02	50
17	Puducherry (V)												**x**		x				02	02	100
18	Varanasi (V)																x		01	01	100
Total trials conducted		**03**	**03**	**04**		**04**	**01**	**02**	**08**	**03**	**09**	**02**	**15**	**03**	**07**	**02**	**05**	**01**	**83**	**72**	**87**

K – *Kharif;* R- *Rabi*; X - Conducted by Soil Scientists

Trial No.1: **Long-term soil fertility management in rice-based cropping systems** (RBCS): 03 (Mandya, Maruteru, Titabar)

Trial No.2: **Soil quality and productivity assessment for bridging the yield gaps in farmers' fields:** 04 (Kanpur, Kaul, Pantnagar, Chinsurah)

Trial No.3: **Management of sodic soils using nano Zn formulation:** 04 (Kanpur, Mandya, Pusa, Faizabad)

Trial No.4: **Management of acid soils:** 02 (Moncompu, Titabar)

Trial No.5**: Residue management in rice-based cropping systems**: 08 (Kanpur, Karaikal, Maruteru, Moncompu, Pantnagar, Pusa, Faizabad, Khudwani)

Trial No.6: **Nano-fertilizers for increasing nutrient use efficiency, yield and economic returns in transplanted rice**: 09 (Kanpur, Karaikal, Kaul, Maruteru, Moncompu, Chiplima, Faizabad, Khudwani, NRRI cuttack)

Trial No.7: **Yield maximization of rice in different zones:** 15 (Kanpur, Karaikal, Kaul, Mandya, Maruteru, Moncompu, Pantnagar, Pusa, Titabar, Bankura, Chinsurah, Chiplima, Faizabad, Khudwani,Puducherry)

Trial No.8: **Enhancing productivity of Organic Rice cultivation**: 09 (Karaikal, Mandya, Moncompu, Pantnagar, Pusa, Titabar, Chinsurah, Khudwani, Puducherry).

Trial No.9: **Assessment of bio fortified rice genotypes response to Zn application and assessing agronomic bio fortification potential; 05** (Maruteru, Pusa, Titabar, NRRI cuttack, Varanasi)

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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 Kharif 2023 are given as below.

Star Chart of Plant Physiology Coordinated Studies for the Year Kharif 2023

Locations	Trials						Allotted	Conducted	Conducted (%)
	Silicon	Heat Tolerance	RFU	MAS	SUB	LLS			
CHN	-	-	√	-	√	√	3	3	100
CBT	√	-	-	√	√	-	3	3	100
NRRI	-	-	√	√	√	√	4	4	100
IIRR	√	√	-	-	-	√	3	3	100
FZB	-	-	-	√	-	-	1	1	100
KJT	√	-	-	√	-	√	3	3	100
KRK	√	-	-	√	√	-	3	3	100
MTU	√	√	-	√	-	√	4	4	100
PNR	√	√	-	√	-	√	4	4	100
PTB	√	√	√	√	√	-	5	5	100
REWA	√	√	√	-	-	-	3	3	100
TTB	√	√	√	√	√	√	6	6	100
RPUR	-	-	√	-	-	√	2	2	100
RANCHI	√	-	√	-	-	-	2	2	100
KAUL	-	√		√	-	-	2	2	100
Total	**10**	**7**	**7**	**10**	**6**	**8**	**48**	**48**	

The salient findings of the experimental research are presented below:

6.1 Role of Silicon in inducing abiotic stress tolerance in rice

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, 0.08% ortho silicic acid, 0.08% ortho silicic acid + water stress and water stress only. The results revealed that 27P63, 28P67 and US-312 was found to be most promising for grain yield. Application of 0.08% ortho silicic acid has enhanced the grain yield by 2.99% over the control. Water stress resulted in decreased grain yield by 21.88% over control while the application of 0.08% ortho silicic acid under water stress has ameliorated the adverse effects of drought on plants and resulted in reduced grain yield only by 7.51% over the control.

6.2 Phenotyping of elite rice genotypes for Drought Tolerance

Mean grain yield (mean of all locations) was reduced by show 27.8% under rainfed condition in comparison with irrigated control. IL 19027 (1.73%), DRT-11 (8.91%), DRT-15 (9.07%) and DRT-6 (9.60%) exhibited least 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 DRT-5, IL 19026, IL 19023, DRT-3 and DRT-12 may be considered as relatively drought tolerant. Parametric model for simultaneous selection in yield and stability across locations and YSi values identified DRT-5, IL 19026, DRT-11, DRT-3, IL 19023, DRT-6, DRT-15, DRT-12, DRT-4, IL 19241, IL 19177, DRT-8, DRT-1 and IL 19246 as stable genotypes under rainfed condition. At Titabar centre the trial was conducted during Rabi (dry) season with 26 entries. IET 30241, IET 29859, IL-19100 and IL-19103 exhibited minimum reduction in grain yield (< 20%) in comparison with irrigated control and can be considered as donors for breeding under rainfed conditions. Based on drought tolerance indices IET 29834, IET 29859, IL-19083, IL-19079 and IL-19194 could be identified as drought tolerant and are suitable for cultivation under 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. Screening for high temperature tolerance in rice genotypes

Changing climate scenario lead to global warming that resulted in elevated 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 26 entries. ϕPSII, ETR and qP of JBC 159-11, JB 683-1, IET 29859, JB 687-3, IL 19198 and JB 689-1 were enhanced with heat stress over control which can be a promising germplasm to breed varieties with enhanced efficiency of photosystem functioning under high temperature. IL 19022 followed by JB 680-2 and MTU 1293 recorded the least reduction in grain yield under heat stress over control which can be utilized as promising donors in breeding programmes.

Significant variation was observed amongst the genotypes for most of the heat indices. Based on the overall rank IL19026, IL 19485, IL 19246, IL 19241 and IL 19451 were identified as relatively heat tolerant genotypes. Multiple correlation and regression analysis indicate highly significant positive association between grain yield under heat stress 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 MTU 1293, N-22, MTU 1153, MTU 1156, IL 19020, IL 19022, IL 19024, JB 680-2, MTU 1290, NLR 3778, IL 19211 and MTU 1273 were selected as promising entries 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 28 rice accessions for multiple abiotic stress tolerance was conducted at nine AICRP-R 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. Out of 28 accessions, two accessions CRAC-4423-102 and CRAC-4423-5 did not germinate in majority of the locations. Hence, they were excluded from the study. 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, one entry IET-18716 was found to be most promising with highest anaerobic germination potential (AGI). Six other entries *viz.*, NICRA-16, Binnaful, IC-516149, AUS-301, CR-3439-4-E-17-2-1-B-1-S-1 and Morishal performed better or at par with tolerant check Vandana, hence they can be considered as highly tolerant to anaerobic germination. Similarly under salinity stress, one entry CR-4215-2-5-2-M-4-SUB-2-5-1 was tolerant with an 'SES score of 3', which was at par with tolerant check FL478. A few other entries *viz.*, CR-3439-4-E-17-2-1-B-1-S-1, IET-18727; NICRA 17, AUS 301, Binnaful, NICRA 16, IC-516149, Ravana and Morishal were moderately tolerant to salinity stress with an 'SES score of 5'. Under severe osmotic stress (2% mannitol) a few entries *viz.*, Binnaful, AC-35678, Ravana, IC-516149, Suga Pankha, NICRA-16, Kangri; Ravana, CRAC-4423-14 and CRAC-4423-5 were found to be tolerant. Considering the performance of these 26 tested entries under different abiotic stresses, we found four entries *viz.* Binnaful, NICRA-16, IC-516149, CR-3439-4-E-17-2-1-B-1-S-1 were tolerant to all the three abiotic stresses (AG, salinity and osmotic), while four other entries (CR-4215-2-5-2-M-

4-SUB-2-5-1, NICRA-17, Morishal, AUS-301) were found tolerant to salinity and AG stresses and one entry (Ravana) was tolerant to salinity and osmotic stresses.

6.5. Screening of Rice Genotypes for Submergence Tolerance

The trial was conducted at six different locations (CBT, CHN, KRK, PTB, TTB, and CTC) using 34 rice genotypes. After 14 days of complete submergence, highest survival rate (88.09%) was found in the tolerant check FR13A. In contrast, a lower survival rate of 5.10% and 12.87% was observed in Swarna and Naveen (susceptible checks) respectively. The mean survival rate among all the genotypes and across all the locations was 49.6% with CTC reporting highest average survival rate of 67.7% and TTB reporting lowest average survival rate of 32.4%. As per the data of multilocation trial, out of all the tested entries, IC-516366 was recorded survival rate (78%) which was at par with the tolerant check Swarna-Sub1. Thus, it can be considered as highly tolerant to submergence stress. Six other entries i.e., IC-516149, Kangri, AC-35678, Barh-Avarodhi, CR4430-13-19-1-1 and OROI-5-IR 86256-6 were considered tolerant to complete submergence with a survival rate ranging from 60-70%. We found eleven other entries i.e., RCPR90-IR09L342, CR4430-1-3-2-1, IET-27670, BRR O289-IR18A1711, BRR 0290-IR19X1001, IET30695 (KR19015), CRAC-4423-45, OROI-8-IR 88228-33, Binnaful, RCPR91-IR11F195 and IET-18716 with moderate tolerance to submergence stress as they showed survival rate in the range of 50-60%. From the multilocation trial we observed that, the most of the tolerant genotypes showed lower internode elongation in submerged condition and possessed higher post-submergence leaf starch content. However, we observed one genotype, IC-516366 with both higher elongation ability (58%) and higher survival rate (78%). These genotypes may be used as potential donors for improving submergence tolerance trait in high yielding rice cultivars.

6.6 Screening of rice varieties for tolerance to low light stress

Reduced rice yield was observed during the kharif (wet) season in eastern and north eastern regions of India due to cloudy days with low or sub-optimal light. Hence, in the 51st ARGM, this trial was constituted to screen AVT-2 material to identify donors having low light stress tolerance. Low light was imposed immediately after transplantation by enclosing the plants in shade net having 50% transmittance supported by metal rods/bamboo poles. Among the recorded traits, total dry matter (TDM), shoot weight, panicle weight, panicle number, spikelet number per panicle, grain number per panicle, grain yield, total dry matter (TDM), thousand grain weight and Harvest Index (HI%) were significant ($p<0.01$) for both treatment and varieties.Variation in days to 50% flowering (DFF) and plant height (PH) were not significant for treatment. Total chlorophyll content at panicle initiation as well as flowering stages, days to maturity, were non-significant for lowlight treatment as well as varieties.

Compared with control conditions, 25 to 47% reduction in grain yield (g/m^2) was observed under low light stress. Of the 18 varieties tested, nine varieties that noted lesser reduction in grain yield over control than low light stress tolerant check (Swarna Prabha) were considered promising. Further, of the 8 locations, least reduction in grain yield was observed at Maruteru and highest reduction in grain yield was observed at Pantnagar.

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 silica. 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: silisilic acid (0.08% Ortho silicic acid) @ 40ppm silicon at 15 DAP, 30DAP, 45DAP and 60DAP, total 4 sprays (see the detailed protocol below), T3: silisilic 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 of Si application had no statistical significant effect on days to 50% flowering (Tables 6.1.1). Consequently, interaction of between Silicon x Variety and Location x Silicon x Variety are also non-significant. However, varieties differed significantly for days to 50% flowering and also they differed significantly at various locations and with Si application as well. In case of days to maturity, Si application had no statistical significant effect, however, it too varied significantly in terms of interaction between Variety, Location x Silicon, Variety x Location and Location x Silicon x Variety (Tables 6.1.2). In all, it can be inferred that Silicon has no significant influence on the growth phenology of rice varieties. The significant interaction effects can be due to the location effects such as variation in the environmental factors such as light, day length and temperature etc. Leaf area index (LAI) is one of the most important determinants of crop productivity. Table 6.1.3-5 shows the data regarding to LAI at tillering stage, at panicle initiation stage and at flowering stage. Table 6.1.3-5 shows Silicon did not significantly affect the LAI at all these stages, even interaction effect of Silicon x Variety is also non-significant at all these stages. However, LAI varied significantly at various location indicating that this variation is due to the location factors and therefore the interaction effects of Location x Silicon, Variety x Location and Location x Silicon x Variety are statistically significant.

Plant height determines the access of the plants to environmental inputs such as light, CO_2 and temperature etc. Silicon has significantly affected the plant height (cm) (Table 6.1.6). Moreover, it can be observed form the Table 6.1.6 that this is purely the treatment effect and there is very less influence of the factors such as location etc. Though interaction effect between Location x Variety is statistically significant interactions between other factors are non-significant. Si treatment did not significantly affect the tiller number/m^2 at flowering stage (Table 6.1.7). However, entries differed significantly as the interaction effects between Location x Silicon, Location x Variety and Location x Silicon x Variety are statistically significant. This significant effect between various factors suggests that this effect is due to the environmental factors with Silicon treatment and not exclusively due to Silicon application. Table 6.1.8 shows data for influence of Silicon on shoot weight (g/m^2). Shoot weight includes all the above ground biomass. Si treatment did not significantly affect the shoot weight and the interaction effect between Silicon x Variety is also non-significant. Nevertheless, interaction effects between Location x Silicon, Location x Variety and Location x Silicon x Variety are statistically significant. Panicle number/m^2 was significantly affected by Silicon treatment (Table 6.1.9). It varied from 156 at Titabar to 565 at Coimbatore with an overall mean of 312. The interaction effects between Variety, Silicon x Variety and Location x Silicon x Variety are non-significant. Panicle weight (g/m^2) varied from 411 g/m^2 at Pattambi to 2022 g/m^2 at Coimbatore with an overall mean of 868 g/m^2 (Table 6.1.10). Though silicon treatment did not influence panicle weight (g/m^2), interaction between the Location x Silicon, Variety, Location x Variety and Location x Silicon x Variety are statistically significant. Treatment mean show that silicon treatment i.e. treatment 2 (T2) increased panicle weight (g/m^2). Location wise mean grain number/panicle varied from 65 at Pattambi to 205 at Coimbatore with an overall mean of 145 (Table 6.1.11). Silicon treatment significantly influenced the grain number/panicle, the treatment T3 performed at par with the overall treatment mean. The interactions between the Location x Silicon, Variety, Location x Variety and Location x Silicon x Variety were also statistically significant except Silicon x Variety. Among centers Pantnagar has shown the maximum number of grains per panicle (205) followed by Coimbatore (195). Among entries 27P63 has shown greater mean grains per panicle than all the treatments mean except in T3. Among entries 27P63 has shown highest mean grains per panicle in all the treatments except treatment T3. In T3 as well entry 27P63 (152 mean grains per panicle) has shown mean grains per panicle almost on par with that of US-312 (153 mean grains per panicle).

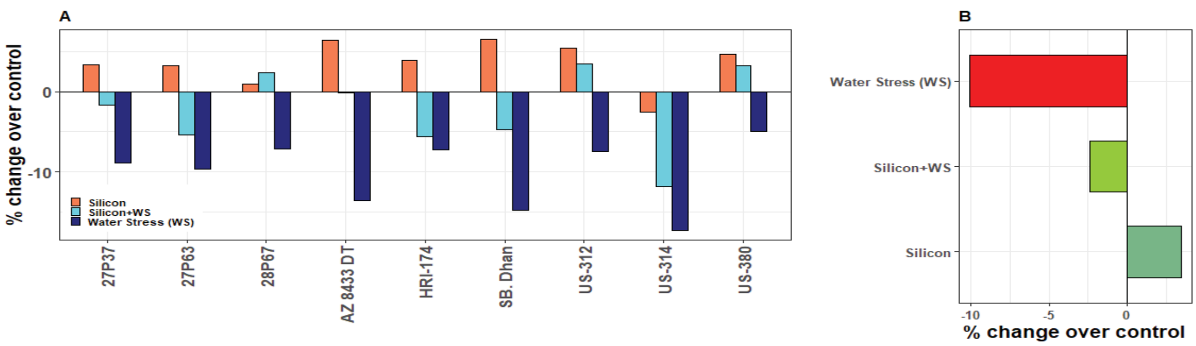


Fig 6.1.1: Percentage change in grain number per panicle with respect to control. (A) Mean of all locations (B) Mean of all varieties and locations.

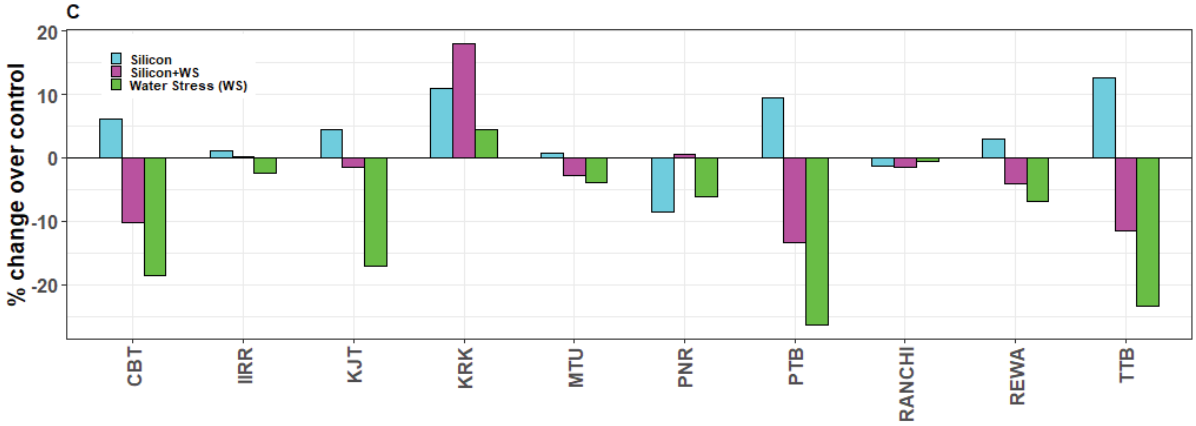


Fig 6.1.2: Percentage change in grain number per panicle with respect to control. Each value represents mean of all varieties.

In terms of % change in grain number per panicle with respect to control (Fig 6.1.1 A) entry US-312 has shown the highest positive performance in the T3 followed by US-380 and 28P67, whereas entry US-314 has shown the highest negative performance followed by HRI-174 and 27P63. Fig 6.1.1 B shows that in terms of % change over control, silicon treatment increased mean grain number per panicle (T2), Water stress (T4) reduced it and silicon treatment along with water stress (T3) could reduce the negative impact of water stress to an extent. In terms of % change in grain number per panicle with respect to control (Fig 6.1.2), centre Karaikal shows the highest positive performance in theT1, T2 and T3. Among centres, Karaikal has also shown the highest positive performance in treatment T3. Centre Pantnagar has also shown the positive performance, but it is just slightly above the zero mark. All other centres except Karaikal & Pantnagar have shown the negative performance in terms of % change in grain number per panicle with respect to control. Mean spikelet number/panicle varied from 96 at Pattambi to 241 at Pantnagar with an overall mean of 175 across locations (Table 6.1.12). Silicon treatment significantly influenced the spikelet number per panicle. The interactions between the Variety, Location x Variety and Location x Silicon x Variety were also statistically significant except Location x Silicon and Silicon x Variety. Mean spikelet number/panicle of T1 (177) and T3 (175) was at par with overall treatment mean across entries (175). Among entries, entry 27P63 (188) has shown highest mean spikelet number per panicle in T1 followed by US-312 (185) & lowest by SB Dhan (148), in T2 by US-312 (194) followed by 27P63 (192) & lowest by SB Dhan (154), in T3 by US-312 (188) followed by 27P63 (186) & lowest by SB Dhan (144) and in T4 by 27P63 (176) followed by HRI-174 (173) and US-312 (173) and lowest by SB Dhan (133). Among entries 27P63 has shown highest mean grains per panicle in all the treatments except treatment T3. In T3 as well entry 27P63 (152 mean grains per panicle) has shown mean grains per panicle almost on par with that of US-312 (153 mean grains per panicle). Table 6.1.13 show the data for grain number/m^2. Silicon application significantly influenced the grain number/m^2. Mean grain number/m^2 varied form 19381 grains/m^2 at Ranchi to 113808 grains/m^2 at Coimbatore with an overall mean of 46957 grains/m^2 across locations. Various interaction effects except Silicon x Variety are also statistically significant. Among the entries, entry 27P63 performed best in treatment T3 which is also greater than mean of T3 and overall treatment mean. Silicon application influenced spikelet number/m^2 significantly and other interactions various factors except interaction between Silicon x Variety were also found to be statistically significant. Mean spikelet number/m^2 ranged from 22140 spikelet number/m^2 at Ranchi to 119639 spikelet number/m^2 at Coimbatore with an overall mean across all the centers was 56372 spikelet number/m^2 (Table 6.1.14). In terms of mean spikelet number/m^2 also entry 27P63 (63947 spikelet/m^2) performed better than all the treatment means as well as over all mean of all the entries in T3 and T4 treatments and overall treatment mean across entries. Mean 1000 grain weight varied from 19 gm at Pantnagar to 22.2 gm at IIRR with an overall mean 1000 grain weight across all the locations 21 gm (Table 6.1.15). Silicon application significantly influenced the 1000 grain weight of all the entries. The interactions between the Location x Silicon, Variety, Location x Variety and Location x Silicon x Variety were also statistically significant. In treatment 3 i.e. Silicon treatment plus water stress among entries, entry 28P67 has shown the highest 1000 grain weight (23.4 g) whereas the lowest (18.7 g) was shown by 27P63.

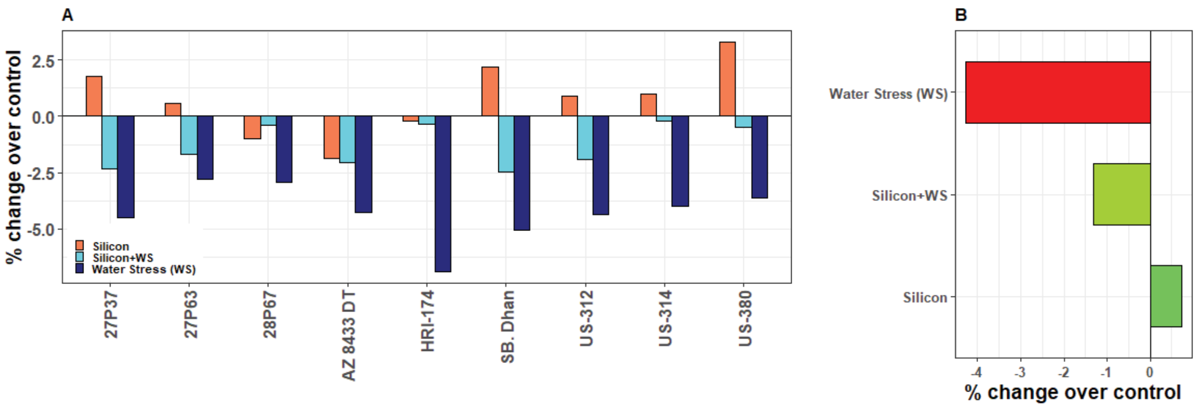


Fig 6.1.3: *Percentage change in 1000 grain weight with respect to control. (A) Mean of all locations (B) Mean of all varieties and locations.*

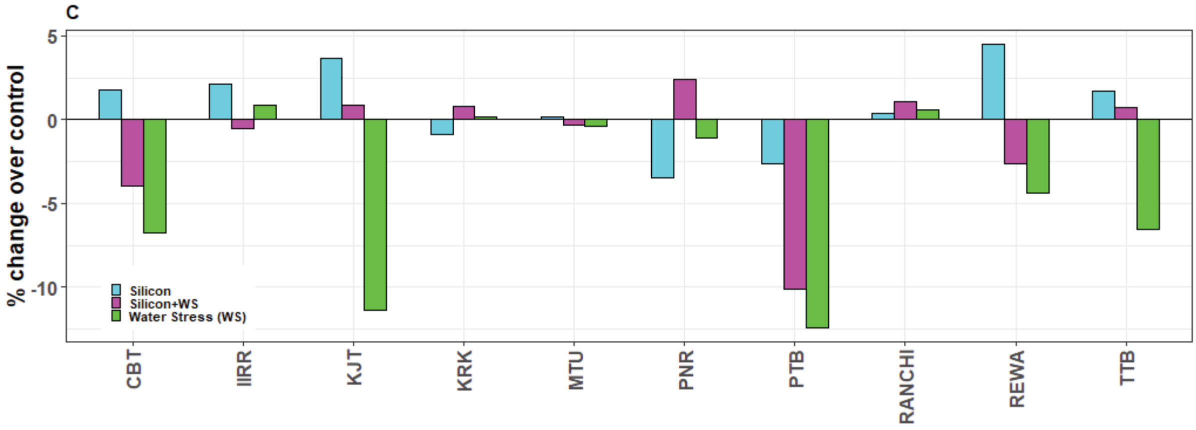


Fig 6.1.4: *Percentage change in 1000 grain weight with respect to control. Each value represents mean of all varieties.*

In terms of percentage change in 1000 grain weight with respect to control in T3, among entries entry US-314 has shown the least negative performance followed closely by HRI-174, 28P67 and US-380 whereas the greatest negative performance was shown by SB Dhan (Fig 6.1.3A). Fig 6.1.3 B shows that in terms of % change over control, silicon treatment increased mean 1000 grain weight (T2), Water stress (T4) reduced it and silicon treatment along with water stress (T3) could reduce the negative impact of water stress to an extent. In terms of % change in 1000 grain weight with respect to control (Fig 6.1.3), Pantnagar centre shows the highest positive performance in T3 followed by Ranchi and Karjat and the highest negative performance was shown by Pattambi followed by Coimbatore and Rewa. Mean total dry matter (g/m^2) varied from 650 g/m^2 at Maruteru to 1927 g/m^2 at Pantnagar with an overall mean across all the location was 1376 g/m^2 (Table 6.1.16). Silicon treatment did not significantly affect the total dry matter of the entries however, interactions between the Location x Silicon, Variety, Location x Variety and Location x Silicon x Variety were also statistically significant.

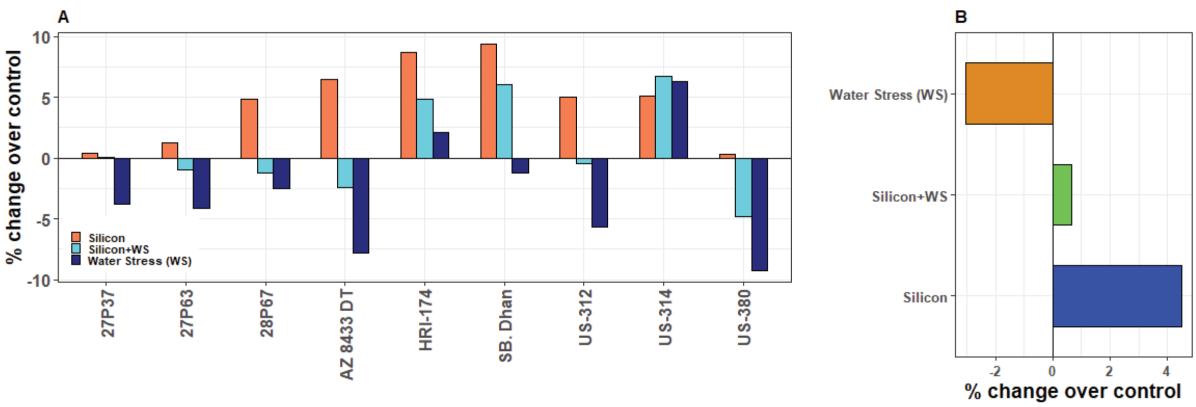


Fig 6.1.5: Percentage change in total dry matter (g/m^2) at maturity with respect to control. (A) Mean of all locations (B) Mean of all varieties and locations.

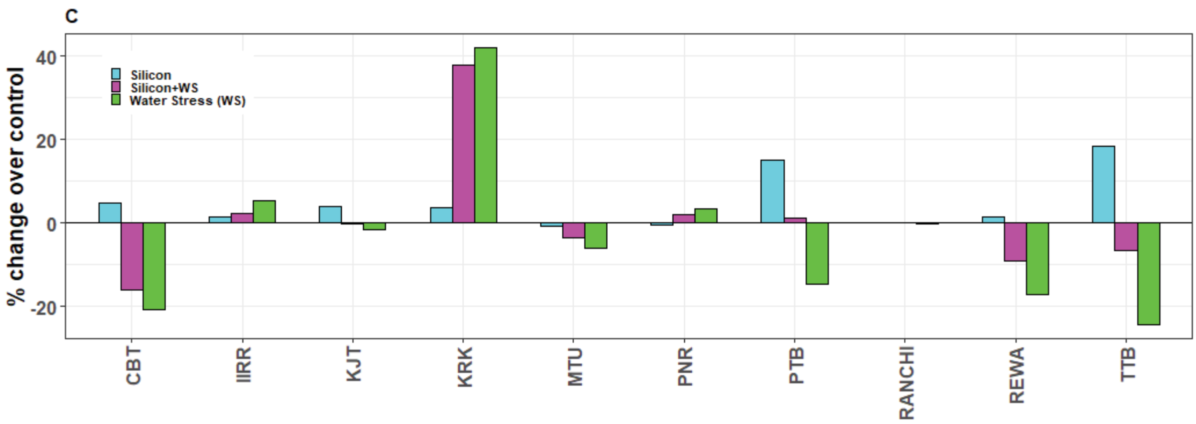


Fig 6.1.6: Percentage change in total dry matter (g/m^2) at maturity with respect to control. Each value represents mean of all varieties.

In terms of percentage change in total dry matter (g/m^2) with respect to control in T3, among entries entry US-314 has shown the highest positive performance followed closely by SB Dhan and HRI-174, whereas the greatest negative performance was shown by US-380 followed by AZ8433DT (Fig 6.1.5A). Fig 6.1.5B shows that in terms of % change over control, silicon treatment increased mean total dry matter (T2), Water stress (T4) reduced it and silicon treatment along with water stress (T3) reduced the negative impact of water stress and also helped entries to recover from stress and to reproduce. In terms of % change in total dry matter with respect to control (Fig 6.1.6), Karaikal centre shows the highest positive performance in T3 followed by IIRR and Pantnagar and the highest negative performance was shown by Coimbatore followed by Rewa and Titabar. Table 6.1.17 shows the data for Grain yield (g/m^2). The mean grain yield ranged from 231 g/m^2 at Ranchi to 862 g/m^2 at Coimbatore with an overall mean of 542 g/m^2 across all the locations. The silicon treatment has significantly affected the mean grain yield of all the entries. The interactions between the Location x Silicon, Variety, Location x Variety and Location x Silicon x Variety were also statistically significant. The entry 28P67 has shown mean total dry matter 607 g/m^2 in treatment 3 (T3) which is higher than the mean of all the entries in T2 (598 g/m^2).

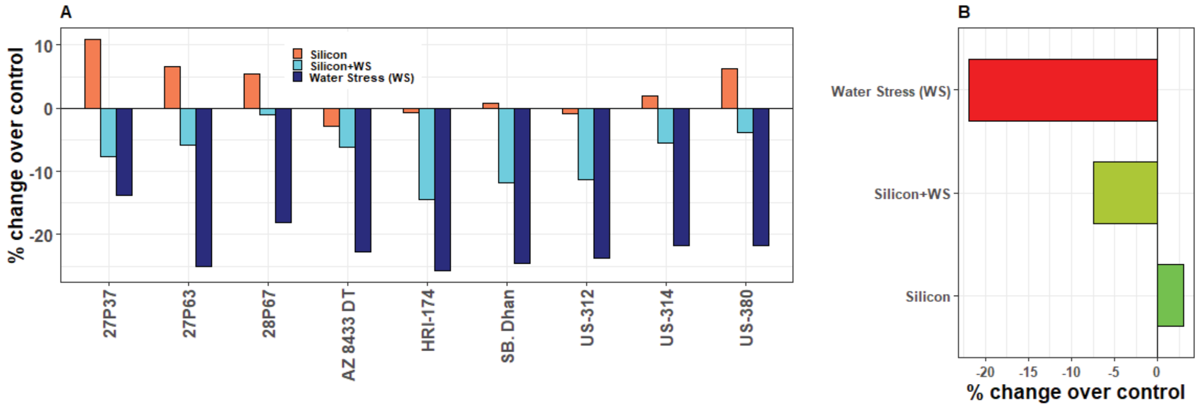


Fig 6.1.7: Percentage change in grain yield with respect to control. (A) Mean of all locations (B) Mean of all varieties and locations.

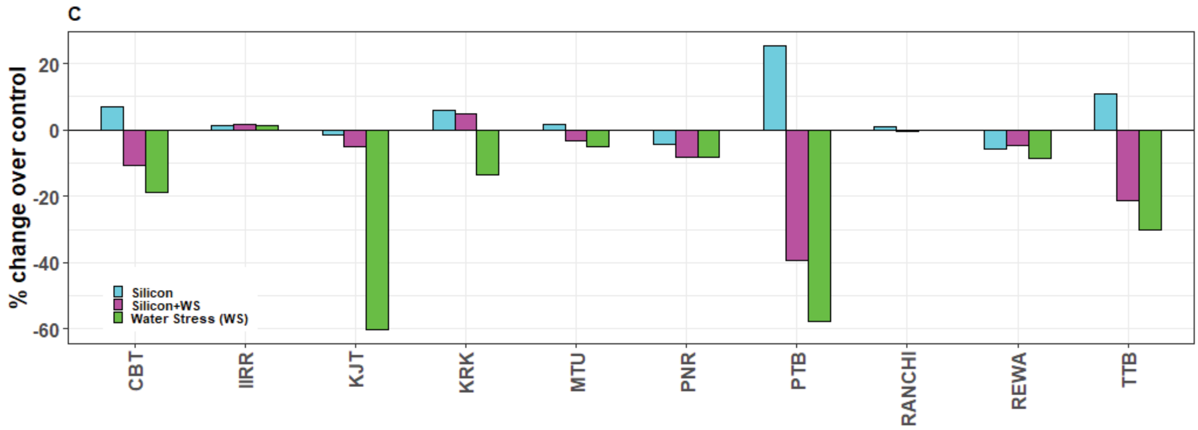


Fig 6.1.8: Percentage change in grain yield with respect to control. Each value represents mean of all varieties.

In terms of percentage change in grain yield (g/m^2) with respect to control in T3, among entries entry 28P67 has shown the least negative performance followed closely by US-380, US-314, and AZ8433DT whereas the greatest negative performance was shown by HRI-174 followed by SB Dhan and US-312 (Fig 6.1.7A). Fig 6.1.7 B shows that in terms of % change over control, silicon treatment increased mean grain yield (g/m^2) (T2), Water stress (T4) reduced it and silicon treatment along with water stress (T3) could reduce the negative impact of water stress to an extent. In terms of % change in grain yield (g/m^2) with respect to control (Fig 6.1.8), Karaikal centre shows the highest positive performance in T3 followed by IIRR whereas the highest negative performance was shown by Pattambi followed by Titabar and Coimbatore. Harvest index was not significantly influenced by silicon treatment (Table 6.1.18), however the interactions between Location x Silicon, Location x Variety and Location x Silicon x Variety were also statistically significant. Mean HI varied from 19.1 % at Pattambi to 45.2 %

at IIRR with an overall mean of 34.1 % across all the centers. Among all the entries the entry 27P63 has shown the highest HI of 35% which is on par with the mean treatment T1 (35%) and T2 (35%) and significantly higher than mean of treatment T3 (33.4%) and T4 (32.8%).

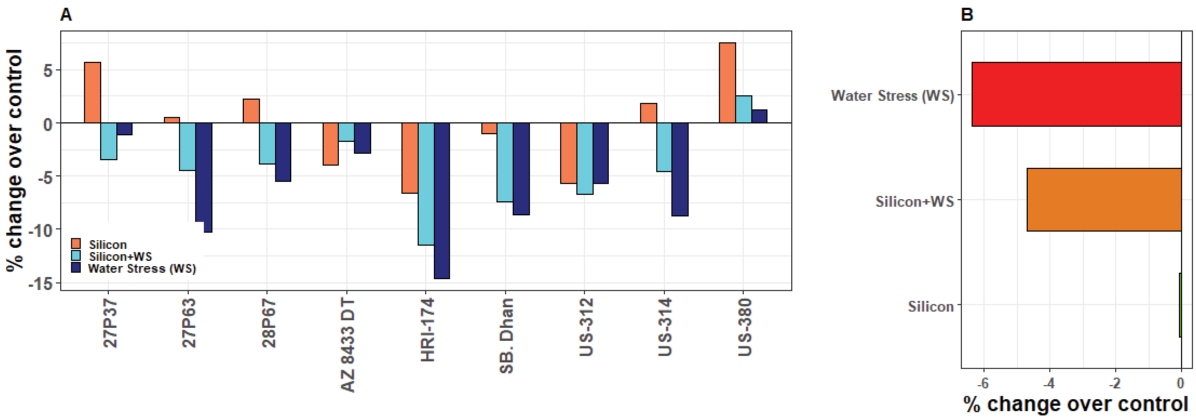


Fig 6.1.9: Percentage change in harvest index with respect to control. (A) Mean of all locations (B) Mean of all varieties and locations.

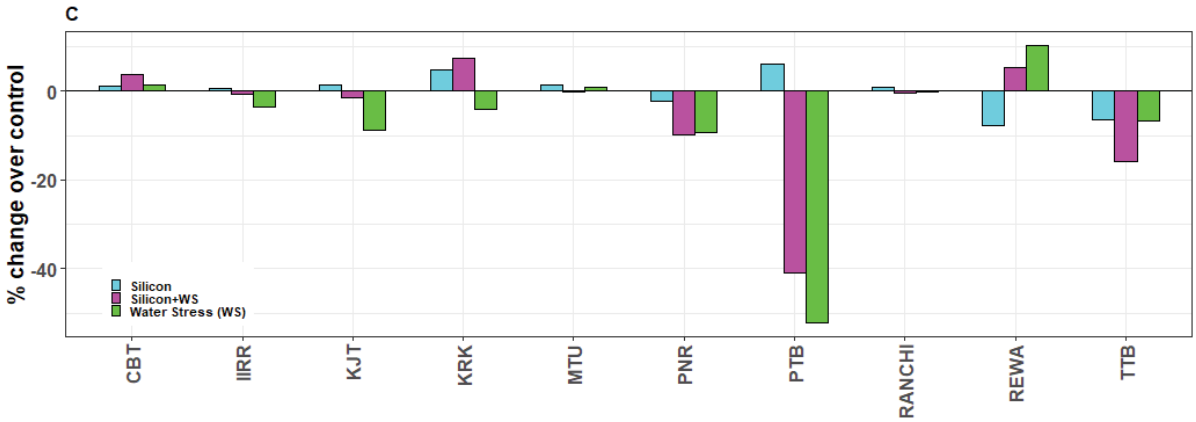


Fig 6.1.10: Percentage change in harvest index with respect to control. Each value represents mean of all varieties.

In terms of percentage change in harvest index with respect to control in T3, among entries entry US-380 has shown the greatest positive performance whereas the greatest negative performance was shown by HRI-174 followed by SB Dhan and US-312 (Fig 6.1.9A). Fig 6.1.9 B shows that in terms of % change over control, silicon treatment did not have any positive impact on mean HI (T2), water stress (T4) reduced it and silicon treatment along with water stress (T3) could reduce the negative impact of water stress to a very lesser extent. In terms of % change in grain yield (g/m^2) with respect to control (Fig 6.1.10), Karaikal centre shows the highest positive performance in T3 followed by Rewa and Coimbatore whereas the highest negative performance was shown by Pattambi followed by Titabar and Pantnagar.

Summary and conclusions:

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, 0.08% ortho silicic acid, 0.08% ortho silicic acid + water stress and water stress only. The results revealed that 27P63, 28P67 and US-312 was found to be most promising for grain yield. Application of 0.08% ortho silicic acid has enhanced the grain yield by 2.99% over the control. Water stress resulted in decreased grain yield by 21.88% over control while the application of 0.08% ortho silicic acid under water stress has ameliorated the adverse effects of drought on plants and resulted in reduced grain yield only by 7.51% over the control.

Table: 6.1.1 Influence of Silica Application days to flowering at different locations *Kharif* 2023

Treat	S.No.	Genotypes	CBT	IIRR	KJT	KRK	MTU	PNR	PTB	RANCHI	REWA	TTB	Grand Mean
T1 (Control)	1	27P37	98	101	92	85	86	94	99	116	93	95	96
	2	27P63	99	100	96	89	92	105	103	107	92	111	99
	3	28P67	103	100	97	91	93	102	107	112	92	108	101
	4	AZ 8433 DT	96	95	94	91	91	109	102	117	90	99	98
	5	HRI-174	98	104	96	91	91	100	101	106	88	103	98
	6	SB. Dhan	84	94	92	73	81	85	86	110	88	88	88
	7	US-312	88	103	94	85	86	87	98	115	85	91	93
	8	US-314	79	103	85	79	86	77	85	112	91	88	88
	9	US-380	89	95	88	85	84	89	96	121	91	95	93
		T1 Mean	**93**	**99**	**93**	**85**	**88**	**94**	**97**	**113**	**90**	**98**	**95**
T2 (0.08% Ortho silicic acid)	1	27P37	98	101	93	85	87	95	101	116	91	95	96
	2	27P63	99	101	95	87	95	104	104	112	89	111	100
	3	28P67	103	100	100	89	94	101	103	109	90	108	100
	4	AZ 8433 DT	96	95	95	93	90	108	100	112	94	103	99
	5	HRI-174	98	104	98	91	91	100	101	112	92	103	99
	6	SB. Dhan	84	94	92	75	82	84	86	111	90	88	89
	7	US-312	88	103	93	85	85	86	97	116	93	94	94
	8	US-314	79	103	83	79	85	76	86	114	94	88	89
	9	US-380	89	95	90	87	86	88	97	112	95	95	93
		T2 Mean	**93**	**99**	**93**	**86**	**88**	**94**	**97**	**113**	**92**	**98**	**95**
T3 (Silicon + Water Stress)	1	27P37	98	101	94	85	88	94	97	116	92	89	95
	2	27P63	99	101	93	87	94	104	102	103	88	107	98
	3	28P67	103	100	98	89	94	102	99	112	89	104	99
	4	AZ 8433 DT	96	95	98	91	92	108	104	119	90	93	99
	5	HRI-174	98	104	99	91	90	101	97	106	91	100	98
	6	SB. Dhan	84	93	93	75	82	85	77	112	87	84	87
	7	US-312	88	103	92	85	85	87	91	116	93	86	93
	8	US-314	79	103	84	79	85	76	75	117	93	83	87
	9	US-380	89	95	84	85	85	89	97	118	92	92	93
		T3 Mean	**93**	**99**	**93**	**85**	**88**	**94**	**93**	**113**	**91**	**93**	**94**
T4 (Water Stress)	1	27P37	98	101	94	85	87	95	103	117	95	89	96
	2	27P63	99	100	94	88	93	105	106	108	93	109	100
	3	28P67	103	99	98	91	95	102	104	109	94	104	100
	4	AZ 8433 DT	96	94	99	92	90	109	105	116	91	89	98
	5	HRI-174	98	104	99	91	92	101	99	112	91	100	99
	6	SB. Dhan	84	93	94	77	81	85	84	118	92	80	89
	7	US-312	88	102	93	85	84	87	91	112	91	86	92
	8	US-314	79	104	85	79	84	77	82	112	94	83	88
	9	US-380	89	95	86	85	85	89	95	117	92	88	92
		T4 Mean	**93**	**99**	**93**	**86**	**88**	**94**	**97**	**113**	**93**	**92**	**95**
		Grand Mean	**93**	**99**	**93**	**86**	**88**	**94**	**96**	**113**	**91**	**95**	**95**
		LSD (Silicon)				ns		*LSD (Silicon x Variety)*					ns
		LSD (Location x Silicon)				2.97**		*LSD (Location x Silicon x Variety)*					ns
		LSD (Variety)				0.91**		*CV(Silicon) %*					4.33
		LSD (Location x Variety)				2.88**		*CV (Residual) %*					2.88

Table: 6.1.2 Influence of Silica Application days to maturity at different locations *Kharif* 2023

Treat	S.No.	Genotypes	CBT	IIRR	KJT	KRK	MTU	PNR	PTB	RANCHI	REWA	TTB	Grand Mean
T1 (Control)	1	27P37	123	132	122	107	116	122	146	154	113	124	126
	2	27P63	123	131	126	107	123	123	138	146	117	140	127
	3	28P67	134	132	129	107	122	119	145	148	116	136	129
	4	AZ 8433 DT	123	125	126	107	122	128	140	152	114	128	126
	5	HRI-174	123	131	126	107	121	119	137	146	114	132	126
	6	SB. Dhan	112	125	122	107	113	114	115	148	115	116	119
	7	US-312	123	134	124	107	116	111	132	151	116	119	123
	8	US-314	112	135	113	107	116	113	110	150	115	117	119
	9	US-380	134	130	118	107	114	116	126	155	118	125	124
		T1 Mean	**123**	**131**	**123**	**107**	**118**	**118**	**132**	**150**	**115**	**126**	**124**
T2 (0.08% Ortho silicic acid)	1	27P37	123	132	123	107	117	121	140	152	121	124	126
	2	27P63	123	133	125	107	124	122	140	151	119	139	128
	3	28P67	134	131	132	107	124	118	140	148	119	137	129
	4	AZ 8433 DT	123	126	127	107	119	128	139	147	117	135	127
	5	HRI-174	123	131	128	107	122	118	133	149	118	132	126
	6	SB. Dhan	112	126	122	107	112	113	116	148	117	116	119
	7	US-312	123	135	123	107	115	111	136	153	118	122	124
	8	US-314	112	135	111	107	115	112	109	150	117	117	119
	9	US-380	134	130	120	107	115	116	127	150	117	125	124
		T2 Mean	**123**	**131**	**124**	**107**	**118**	**118**	**131**	**150**	**118**	**127**	**125**
T3 (Silicon + Water Stress)	1	27P37	123	132	124	107	117	121	129	152	121	121	125
	2	27P63	123	133	123	107	123	122	134	145	119	136	127
	3	28P67	134	131	130	107	123	119	133	149	119	133	128
	4	AZ 8433 DT	123	126	130	107	121	128	134	154	117	124	127
	5	HRI-174	123	131	129	107	122	118	129	146	117	129	125
	6	SB. Dhan	112	126	123	107	112	113	109	149	117	115	118
	7	US-312	123	134	122	107	115	111	124	154	117	116	122
	8	US-314	112	134	112	107	114	112	100	154	117	112	117
	9	US-380	134	130	114	107	115	116	125	154	118	122	124
		T3 Mean	**123**	**131**	**123**	**107**	**118**	**118**	**124**	**151**	**118**	**123**	**124**
T4 (Water Stress)	1	27P37	123	132	124	107	118	122	134	153	121	118	125
	2	27P63	123	131	124	107	123	122	136	146	118	136	127
	3	28P67	134	130	130	107	124	119	132	146	117	135	127
	4	AZ 8433 DT	123	129	131	107	121	129	134	152	118	118	126
	5	HRI-174	123	131	128	107	121	119	131	150	119	132	126
	6	SB. Dhan	112	129	123	107	112	114	114	154	117	112	119
	7	US-312	123	134	124	107	115	111	123	151	116	114	122
	8	US-314	112	135	113	107	114	113	104	150	118	114	118
	9	US-380	134	130	116	107	116	117	124	153	119	116	123
		T4 Mean	**123**	**131**	**124**	**107**	**118**	**118**	**126**	**151**	**118**	**122**	**124**
		Grand Mean	**123**	**131**	**123**	**107**	**118**	**118**	**128**	**150**	**117**	**125**	**124**
		LSD (Silicon)				ns		*LSD (Silicon x Variety)*					ns
		LSD (Location x Silicon)				2.03**		*LSD (Location x Silicon x Variety)*					4.74**
		LSD (Variety)				0.75**		*CV(Silicon) %*					2.26
		LSD (Location x Variety)				2.37**		*CV (Residual) %*					1.81

Table: 6.1.3 Influence of Silica Application Leaf area index at tillering at different locations *Kharif* 2023

Treat	S.No.	Genotypes	CBT	IIRR	KJT	KRK	PNR	PTB	REWA	Grand Mean
T1 (Control)	1	27P37	4.49	1.53	3.87	1.82	1.73	1.16	4.39	2.71
	2	27P63	3.87	1.73	4.30	1.27	1.83	1.21	3.87	2.58
	3	28P67	3.97	1.51	4.00	1.60	2.05	1.44	4.48	2.72
	4	AZ 8433 DT	5.03	1.34	3.67	1.11	1.72	1.56	4.28	2.67
	5	HRI-174	4.58	1.70	4.03	1.30	2.57	1.13	3.37	2.67
	6	SB. Dhan	2.73	1.47	3.87	1.18	1.22	1.44	3.77	2.24
	7	US-312	4.06	1.43	3.97	1.59	1.78	1.60	3.73	2.59
	8	US-314	3.44	1.26	3.70	1.69	1.68	1.31	4.58	2.52
	9	US-380	4.07	1.65	4.10	1.45	2.21	1.75	3.48	2.67
		T1 Mean	**4.03**	**1.51**	**3.94**	**1.44**	**1.86**	**1.40**	**4.00**	**2.60**
T2 (0.08% Ortho silicic acid)	1	27P37	4.72	1.97	4.03	0.92	1.64	1.34	3.57	2.60
	2	27P63	4.20	1.34	4.00	1.38	1.90	1.16	3.74	2.53
	3	28P67	4.16	1.55	3.80	1.19	2.49	1.67	4.56	2.77
	4	AZ 8433 DT	5.18	1.39	3.40	0.98	1.90	1.44	3.93	2.60
	5	HRI-174	4.69	2.09	3.63	1.32	2.33	1.29	4.69	2.86
	6	SB. Dhan	2.94	1.60	3.50	1.63	2.39	1.45	3.58	2.44
	7	US-312	4.28	1.41	3.83	1.61	1.76	1.91	4.33	2.73
	8	US-314	3.63	1.69	3.53	1.46	2.07	1.42	4.56	2.62
	9	US-380	4.23	1.52	3.80	1.11	2.34	1.55	3.70	2.61
		T2 Mean	**4.22**	**1.62**	**3.73**	**1.29**	**2.09**	**1.47**	**4.07**	**2.64**
T3 (Silicon + Water Stress)	1	27P37	3.32	1.70	3.77	1.44	2.10	0.81	3.56	2.39
	2	27P63	3.15	1.55	4.00	1.03	2.21	0.68	3.55	2.31
	3	28P67	2.89	1.96	3.63	2.05	1.71	0.89	3.96	2.44
	4	AZ 8433 DT	3.92	1.95	3.77	1.17	2.49	1.02	4.32	2.66
	5	HRI-174	3.70	1.96	3.67	1.40	2.73	1.03	4.15	2.66
	6	SB. Dhan	2.32	1.53	3.70	2.00	1.50	0.99	3.35	2.20
	7	US-312	3.21	1.95	4.37	1.30	2.34	0.88	3.86	2.56
	8	US-314	3.03	1.71	4.23	2.01	2.76	1.03	4.39	2.74
	9	US-380	3.47	1.73	3.83	2.43	2.20	0.95	3.69	2.61
		T3 Mean	**3.22**	**1.78**	**3.89**	**1.65**	**2.23**	**0.92**	**3.87**	**2.51**
T4 (Water Stress)	1	27P37	3.07	1.51	3.43	2.36	2.28	0.70	4.20	2.51
	2	27P63	2.88	1.78	3.73	1.32	2.26	0.57	2.88	2.20
	3	28P67	2.73	1.34	3.73	1.46	1.71	0.79	3.39	2.16
	4	AZ 8433 DT	3.67	1.87	3.90	1.66	1.63	0.87	3.51	2.44
	5	HRI-174	3.40	1.65	3.60	1.05	2.37	0.76	3.45	2.33
	6	SB. Dhan	2.03	1.80	3.67	1.44	1.91	0.77	3.19	2.11
	7	US-312	2.98	1.63	3.77	1.94	2.56	0.82	3.25	2.42
	8	US-314	2.86	1.56	3.67	2.30	2.30	0.90	3.50	2.44
	9	US-380	3.12	1.50	3.60	1.34	2.39	0.71	3.22	2.27
		T4 Mean	**2.97**	**1.63**	**3.68**	**1.65**	**2.16**	**0.77**	**3.40**	**2.32**
		Grand Mean	**3.61**	**1.64**	**3.81**	**1.51**	**2.08**	**1.14**	**3.83**	**2.52**
		LSD (Silicon)		ns		*LSD (Silicon x Variety)*				ns
		LSD (Location x Silicon)		0.47**		*LSD (Location x Silicon x Variety)*				0.73**
		LSD (Variety)		ns		*CV(Silicon) %*				25.26
		LSD (Location x Variety)		0.36**		*CV (Residual) %*				13.73

Table: 6.1.4 Influence of Silica Application Leaf area index at panicle initiation at different locations *Kharif* 2023

Treat	S.No.	Genotypes	CBT	IIRR	KJT	KRK	PNR	PTB	REWA	Grand Mean
T1 (Control)	1	27P37	5.53	4.93	4.40	2.33	2.49	1.87	7.92	4.21
	2	27P63	4.87	5.64	5.00	3.24	4.84	1.69	7.06	4.62
	3	28P67	5.10	4.89	4.40	2.18	5.29	1.55	8.18	4.51
	4	AZ 8433 DT	5.70	4.51	4.87	1.34	4.46	1.11	7.77	4.25
	5	HRI-174	5.94	4.30	4.47	1.22	4.87	1.52	7.10	4.20
	6	SB. Dhan	3.88	3.42	5.13	2.65	3.43	1.10	7.47	3.87
	7	US-312	5.27	4.57	5.03	2.30	3.53	1.45	7.48	4.23
	8	US-314	4.95	5.31	4.80	3.12	3.88	1.01	8.17	4.46
	9	US-380	5.42	3.96	5.63	2.71	4.23	2.15	6.41	4.36
		T1 Mean	**5.18**	**4.61**	**4.86**	**2.34**	**4.11**	**1.49**	**7.51**	**4.30**
T2 (0.08% Ortho silicic acid)	1	27P37	5.78	4.18	4.97	3.51	3.27	2.03	8.09	4.54
	2	27P63	4.96	3.82	5.30	1.18	4.59	1.17	7.56	4.08
	3	28P67	5.23	3.27	5.33	2.00	3.80	1.82	8.39	4.26
	4	AZ 8433 DT	6.12	3.73	3.93	2.55	4.08	1.52	7.75	4.24
	5	HRI-174	6.15	4.57	4.53	1.83	5.28	1.84	6.80	4.43
	6	SB. Dhan	4.17	3.49	4.43	1.60	3.89	1.11	7.33	3.72
	7	US-312	5.65	3.97	4.30	2.95	4.12	1.76	7.70	4.35
	8	US-314	5.42	4.57	4.17	2.20	3.17	1.25	8.20	4.14
	9	US-380	5.73	3.48	4.10	1.25	4.70	1.83	6.52	3.94
		T2 Mean	**5.47**	**3.90**	**4.56**	**2.12**	**4.10**	**1.59**	**7.59**	**4.19**
T3 (Silicon + Water Stress)	1	27P37	3.75	3.23	4.73	3.65	3.26	1.35	6.70	3.81
	2	27P63	4.35	3.08	4.40	3.33	4.12	1.96	6.56	3.97
	3	28P67	4.24	3.61	4.60	3.93	5.11	2.22	7.58	4.47
	4	AZ 8433 DT	3.59	3.97	4.43	2.12	3.98	1.59	7.91	3.94
	5	HRI-174	4.09	4.66	4.83	1.90	4.47	1.27	7.52	4.11
	6	SB. Dhan	3.40	3.23	4.47	4.92	3.47	1.78	6.22	3.93
	7	US-312	4.23	4.63	5.10	3.25	4.51	1.80	7.00	4.36
	8	US-314	4.44	3.93	4.63	5.12	2.48	1.89	8.15	4.38
	9	US-380	4.61	4.01	4.77	1.49	3.95	1.67	6.52	3.86
		T3 Mean	**4.08**	**3.82**	**4.66**	**3.30**	**3.93**	**1.73**	**7.13**	**4.09**
T4 (Water Stress)	1	27P37	3.50	4.22	4.40	2.89	2.98	1.01	6.78	3.68
	2	27P63	4.02	3.53	5.07	2.54	4.12	1.30	5.81	3.77
	3	28P67	3.97	3.98	4.67	3.22	4.15	1.19	6.19	3.91
	4	AZ 8433 DT	3.35	3.87	4.67	1.92	5.02	1.11	7.01	3.85
	5	HRI-174	3.87	4.08	4.67	1.93	5.26	1.06	6.52	3.91
	6	SB. Dhan	3.13	4.28	4.40	2.97	3.20	1.46	6.19	3.66
	7	US-312	3.74	4.47	4.50	3.02	4.10	0.75	6.07	3.81
	8	US-314	4.15	4.23	4.63	3.48	2.15	1.58	6.58	3.83
	9	US-380	4.34	3.87	3.93	2.79	3.86	0.79	5.92	3.64
		T4 Mean	**3.79**	**4.06**	**4.55**	**2.75**	**3.87**	**1.14**	**6.34**	**3.79**
		Grand Mean	**4.63**	**4.10**	**4.66**	**2.63**	**4.00**	**1.49**	**7.14**	**4.09**
		LSD (Silicon)		ns		*LSD (Silicon x Variety)*				ns
		LSD (Location x Silicon)		0.61**		*LSD (Location x Silicon x Variety)*				1.19**
		LSD (Variety)		ns		*CV(Silicon) %*				20.42
		LSD (Location x Variety)		0.59**		*CV (Residual) %*				13.77

Table: 6.1.5 Influence of Silica Application Leaf area index at flowering at different locations *Kharif* 2023

Treat	S.No.	Genotypes	CBT	IIRR	KJT	KRK	PNR	PTB	REWA	TTB	Grand Mean
T1 (Control)	1	27P37	5.95	7.51	5.73	4.06	3.32	2.18	8.47	3.51	5.09
	2	27P63	5.17	6.84	5.70	3.77	5.45	1.79	7.80	3.95	5.06
	3	28P67	5.56	6.33	5.47	3.72	5.60	1.27	8.73	3.88	5.07
	4	AZ 8433 DT	5.81	6.98	6.07	2.69	4.92	1.62	8.66	4.64	5.17
	5	HRI-174	6.25	5.63	5.00	2.54	5.31	1.31	7.44	5.31	4.85
	6	SB. Dhan	4.06	6.44	5.67	5.35	4.13	1.34	8.26	4.67	4.99
	7	US-312	5.75	5.78	5.63	6.16	4.53	1.28	7.70	5.66	5.31
	8	US-314	5.37	5.21	5.90	4.23	3.98	1.44	8.78	3.85	4.84
	9	US-380	5.76	5.89	6.50	2.97	4.97	1.44	6.64	4.53	4.84
		T1 Mean	**5.52**	**6.29**	**5.74**	**3.94**	**4.69**	**1.52**	**8.05**	**4.44**	**5.02**
T2 (0.08% Ortho silicic acid)	1	27P37	6.07	6.18	6.77	3.84	4.09	1.62	8.50	3.45	5.06
	2	27P63	5.26	7.10	6.43	4.13	5.39	1.74	8.07	3.97	5.26
	3	28P67	5.71	6.89	6.83	4.36	6.18	1.42	8.94	4.05	5.55
	4	AZ 8433 DT	6.15	5.41	5.63	3.29	4.67	1.71	7.91	5.47	5.03
	5	HRI-174	6.43	6.63	5.50	3.06	5.33	1.80	7.13	5.36	5.16
	6	SB. Dhan	4.38	5.38	5.20	4.76	4.70	3.04	7.72	4.82	5.00
	7	US-312	5.91	6.91	5.23	3.67	4.75	2.05	8.33	5.61	5.31
	8	US-314	5.55	7.86	6.30	6.12	3.11	3.17	8.30	3.31	5.47
	9	US-380	5.87	5.43	5.30	3.18	4.83	1.93	7.62	5.33	4.94
		T2 Mean	**5.70**	**6.42**	**5.91**	**4.04**	**4.78**	**2.05**	**8.06**	**4.60**	**5.20**
T3 (Silicon + Water Stress)	1	27P37	3.86	6.90	5.83	5.69	4.17	1.62	6.97	2.93	4.75
	2	27P63	4.38	7.16	4.93	4.22	6.59	1.53	7.45	3.60	4.98
	3	28P67	4.54	7.53	5.17	5.13	5.28	1.45	7.90	2.91	4.99
	4	AZ 8433 DT	3.77	5.83	5.67	4.36	4.90	1.77	8.39	3.95	4.83
	5	HRI-174	4.38	6.45	5.47	1.81	4.93	2.02	8.13	4.40	4.70
	6	SB. Dhan	3.53	6.26	4.87	4.81	4.19	1.18	6.42	3.88	4.39
	7	US-312	4.59	6.28	5.60	3.97	4.23	1.30	7.46	3.97	4.68
	8	US-314	4.66	6.34	5.67	6.00	5.11	1.14	8.48	3.00	5.05
	9	US-380	4.84	6.34	5.33	4.62	4.40	1.21	6.79	3.80	4.67
		T3 Mean	**4.28**	**6.56**	**5.39**	**4.51**	**4.87**	**1.47**	**7.55**	**3.60**	**4.78**
T4 (Water Stress)	1	27P37	3.58	7.06	5.20	4.53	4.45	0.99	7.60	2.65	4.51
	2	27P63	4.21	6.91	19.57	4.21	4.58	1.24	6.93	3.87	6.44
	3	28P67	4.18	6.81	5.40	4.86	4.49	1.27	7.49	2.45	4.62
	4	AZ 8433 DT	3.45	5.02	5.43	4.96	5.43	1.35	7.52	3.44	4.57
	5	HRI-174	4.05	6.96	4.97	6.14	5.73	1.36	6.90	3.95	5.01
	6	SB. Dhan	3.22	5.93	4.77	4.62	4.39	1.97	6.61	3.52	4.38
	7	US-312	3.92	6.17	4.90	5.27	4.88	0.99	6.30	3.35	4.47
	8	US-314	4.26	6.17	5.43	6.89	4.43	2.83	6.69	3.06	4.97
	9	US-380	4.52	6.01	4.37	4.18	5.23	0.98	6.23	3.38	4.36
		T4 Mean	**3.93**	**6.34**	**6.67**	**5.07**	**4.85**	**1.44**	**6.92**	**3.30**	**4.81**
		Grand Mean	**4.86**	**6.40**	**5.93**	**4.39**	**4.80**	**1.62**	**7.65**	**3.99**	**4.95**
		LSD (Silicon)			ns		*LSD (Silicon x Variety)*				ns
		LSD (Location x Silicon)			1.01*		*LSD (Location x Silicon x Variety)*				2.57*
		LSD (Variety)			ns		*CV (Silicon) %*				37.34
		LSD (Location x Variety)			1.69**		*CV (Residual) %*				32.36

Table: 6.1.6 Influence of Silica Application Plant height (cm) flowering at different locations *Kharif* 2023

Treat	S.No.	Genotypes	CBT	IIRR	KJT	KRK	MTU	PNR	PTB	RANCHI	REWA	TTB	Grand Mean
T1 (Control)	1	27P37	100	113	106	114	131	127	97	71	108	122	109
	2	27P63	106	110	103	113	130	129	100	70	86	117	107
	3	28P67	108	115	103	131	142	131	103	67	83	129	111
	4	AZ 8433 DT	108	106	109	109	132	115	101	69	89	118	106
	5	HRI-174	101	117	103	120	132	128	95	67	92	123	108
	6	SB. Dhan	104	105	107	108	133	115	97	67	99	124	106
	7	US-312	102	113	104	114	124	112	99	67	89	120	104
	8	US-314	88	116	110	106	125	120	87	66	102	112	103
	9	US-380	99	86	111	107	127	119	98	63	92	119	102
		T1 Mean	**102**	**109**	**106**	**113**	**131**	**122**	**98**	**67**	**93**	**120**	**106**
T2 (0.08% Ortho silicic acid)	1	27P37	101	108	114	112	133	128	107	66	107	131	110
	2	27P63	108	118	117	105	132	118	109	68	91	119	108
	3	28P67	109	115	112	124	143	133	101	67	89	131	112
	4	AZ 8433 DT	109	109	108	115	132	113	105	69	99	122	108
	5	HRI-174	103	115	110	115	133	123	95	68	97	125	108
	6	SB. Dhan	105	105	105	112	127	118	97	69	100	129	107
	7	US-312	103	106	105	109	122	114	97	70	100	122	105
	8	US-314	90	309	109	105	126	116	91	67	108	110	123
	9	US-380	101	103	108	119	124	115	100	65	98	132	106
		T2 Mean	**103**	**132**	**110**	**113**	**130**	**120**	**100**	**68**	**99**	**124**	**110**
T3 (Silicon + Water Stress)	1	27P37	98	115	106	111	132	125	103	65	103	119	108
	2	27P63	95	110	112	115	129	121	87	64	78	112	102
	3	28P67	107	113	110	122	141	130	99	64	74	125	109
	4	AZ 8433 DT	103	101	107	120	133	116	97	66	84	117	104
	5	HRI-174	101	113	111	124	134	120	98	69	80	118	107
	6	SB. Dhan	103	97	112	110	127	116	90	63	94	117	103
	7	US-312	100	111	115	114	124	120	91	68	83	114	104
	8	US-314	87	111	109	113	128	114	80	67	96	111	102
	9	US-380	95	103	107	109	125	114	101	69	89	117	103
		T3 Mean	**99**	**108**	**110**	**115**	**130**	**119**	**94**	**66**	**87**	**117**	**105**
T4 (Water Stress)	1	27P37	97	109	106	115	134	126	91	63	100	114	106
	2	27P63	93	106	112	116	133	118	78	65	71	113	101
	3	28P67	104	103	110	129	145	130	96	69	74	124	108
	4	AZ 8433 DT	101	104	105	117	134	116	86	65	73	113	101
	5	HRI-174	100	114	104	120	135	121	94	64	80	117	105
	6	SB. Dhan	102	103	108	115	132	113	87	67	87	112	103
	7	US-312	98	113	113	115	125	117	85	63	77	112	102
	8	US-314	86	112	117	105	126	118	76	66	81	98	98
	9	US-380	93	102	114	110	121	116	90	70	78	113	101
		T4 Mean	**97**	**107**	**110**	**116**	**132**	**119**	**87**	**66**	**80**	**113**	**103**
		Grand Mean	**100**	**114**	**109**	**114**	**131**	**120**	**95**	**67**	**90**	**119**	**106**
		LSD (Silicon)				3.17*		*LSD (Silicon x Variety)*					ns
		LSD (Location x Silicon)				ns		*LSD (Location x Silicon x Variety)*					ns
		LSD (Variety)				ns		*CV (Silicon) %*					17.41
		LSD (Location x Variety)				19.93		*CV (Residual) %*					17.85

Table: 6.1.7 Influence of Silica Application Tiller number/m² flowering at different locations *Kharif* 2023

Treat	S.No.	Genotypes	CBT	IIRR	KJT	KRK	MTU	PNR	PTB	RANCHI	REWA	TTB	Grand Mean
T1 (Control)	1	27P37	912	400	367	638	385	250	407	149	329	189	403
	2	27P63	864	392	433	752	418	350	396	148	342	171	427
	3	28P67	840	350	400	556	429	367	283	147	362	175	391
	4	AZ 8433 DT	852	433	417	751	418	400	307	147	343	133	420
	5	HRI-174	732	367	467	610	429	350	357	148	343	205	401
	6	SB. Dhan	816	400	400	732	418	300	347	146	336	146	404
	7	US-312	708	350	417	762	418	383	400	148	348	160	409
	8	US-314	684	300	317	494	418	350	323	153	328	139	351
	9	US-380	768	442	350	556	429	333	297	149	326	142	379
		T1 Mean	**797**	**381**	**396**	**650**	**418**	**343**	**346**	**148**	**340**	**162**	**398**
T2 (0.08% Ortho silicic acid)	1	27P37	936	400	433	486	407	317	437	147	336	194	409
	2	27P63	912	425	383	614	407	383	490	149	344	189	430
	3	28P67	852	383	417	750	418	333	290	149	358	198	415
	4	AZ 8433 DT	888	408	417	784	407	383	525	148	326	200	449
	5	HRI-174	780	367	467	630	429	400	367	151	349	221	416
	6	SB. Dhan	840	375	567	545	418	300	570	153	326	169	426
	7	US-312	732	425	417	696	407	417	339	152	362	212	416
	8	US-314	714	350	483	837	429	383	397	153	358	154	426
	9	US-380	828	408	450	538	440	400	400	149	337	160	411
		T2 Mean	**831**	**394**	**448**	**653**	**418**	**369**	**424**	**150**	**344**	**188**	**422**
T3 (Silicon + Water Stress)	1	27P37	672	417	417	688	396	300	427	149	276	198	394
	2	27P63	720	358	450	838	418	317	433	150	313	181	418
	3	28P67	732	417	450	602	407	367	360	146	326	182	399
	4	AZ 8433 DT	744	450	483	805	407	400	457	147	293	136	432
	5	HRI-174	660	367	467	582	407	450	497	150	324	198	410
	6	SB. Dhan	732	483	517	850	407	350	407	149	267	141	430
	7	US-312	612	400	483	745	385	333	470	154	343	201	413
	8	US-314	636	350	383	771	407	400	517	152	325	157	410
	9	US-380	684	450	450	588	418	350	493	150	309	137	403
		T3 Mean	**688**	**410**	**456**	**719**	**406**	**363**	**451**	**150**	**309**	**170**	**412**
T4 (Water Stress)	1	27P37	600	392	417	486	396	283	373	147	254	143	349
	2	27P63	660	433	400	643	429	350	453	148	300	140	396
	3	28P67	660	383	367	572	418	350	393	149	264	146	370
	4	AZ 8433 DT	684	400	383	623	418	450	453	146	259	118	393
	5	HRI-174	624	392	417	833	418	467	421	152	284	165	417
	6	SB. Dhan	648	375	433	857	407	350	310	148	259	131	392
	7	US-312	564	367	417	778	407	333	459	151	293	153	392
	8	US-314	600	325	350	1028	407	367	427	152	309	142	411
	9	US-380	636	408	433	639	418	400	418	150	250	140	389
		T4 Mean	**631**	**386**	**402**	**718**	**413**	**372**	**412**	**149**	**275**	**142**	**390**
		Grand Mean	**737**	**393**	**425**	**685**	**414**	**362**	**408**	**149**	**317**	**166**	**406**
		LSD (Silicon)				ns		*LSD (Silicon x Variety)*					ns
		LSD (Location x Silicon)				55.70**		*LSD (Location x Silicon x Variety)*					149.17**
		LSD (Variety)				ns		*CV (Silicon) %*					18.97
		LSD (Location x Variety)				74.58**		*CV (Residual) %*					17.44

Table: 6.1.8 Influence of Silica Application Shoot weight (g/m²) at different locations *Kharif* 2023

Treat	S.No.	Genotypes	CBT	IIRR	KJT	KRK	MTU	PNR	PTB	RANCHI	REWA	TTB	Grand Mean
T1 (Control)	1	27P37	1368	903	833	602	648	543	883	494	660	591	752
	2	27P63	1224	950	817	680	641	805	717	509	437	566	735
	3	28P67	2116	888	1317	642	607	1146	967	511	547	505	925
	4	AZ 8433 DT	1216	838	900	933	667	846	1050	523	547	572	809
	5	HRI-174	1308	938	933	708	626	716	773	523	496	567	759
	6	SB. Dhan	1072	687	683	383	696	595	613	531	2300	459	802
	7	US-312	1212	872	1217	903	660	683	920	527	491	572	806
	8	US-314	796	845	883	444	721	638	747	521	493	669	676
	9	US-380	1060	838	900	433	738	933	967	508	470	602	745
		T1 Mean	**1264**	**862**	**943**	**636**	**667**	**767**	**849**	**516**	**716**	**567**	**779**
T2 (0.08% Ortho silicic acid)	1	27P37	1462	1005	650	717	644	451	1100	527	693	656	790
	2	27P63	1332	917	750	684	636	680	937	512	521	634	760
	3	28P67	2440	888	1450	1055	596	1357	940	508	558	627	1042
	4	AZ 8433 DT	1514	968	683	915	651	602	1000	525	596	777	823
	5	HRI-174	1524	819	833	789	659	771	853	511	562	727	805
	6	SB. Dhan	1228	751	817	777	686	532	737	519	658	520	722
	7	US-312	1364	876	850	772	671	905	947	512	552	625	807
	8	US-314	958	847	850	827	699	750	853	518	533	743	758
	9	US-380	1148	752	767	1242	720	609	767	528	681	728	794
		T2 Mean	**1441**	**869**	**850**	**864**	**662**	**739**	**904**	**518**	**595**	**671**	**811**
T3 (Silicon + Water Stress)	1	27P37	1098	919	600	483	616	570	957	523	647	522	693
	2	27P63	1018	877	717	730	626	805	850	528	439	513	710
	3	28P67	1804	944	883	707	591	1175	977	515	443	516	855
	4	AZ 8433 DT	1056	835	900	566	646	704	1043	517	587	585	744
	5	HRI-174	1024	929	1117	1153	622	753	1050	512	577	527	826
	6	SB. Dhan	852	791	817	379	670	850	627	515	539	483	652
	7	US-312	1040	885	733	909	644	571	947	512	516	470	723
	8	US-314	772	942	1083	774	682	816	807	513	526	563	748
	9	US-380	884	857	783	1312	697	590	847	513	458	593	753
		T3 Mean	**1061**	**886**	**848**	**779**	**644**	**760**	**900**	**517**	**526**	**530**	**745**
T4 (Water Stress)	1	27P37	948	1074	883	961	559	769	823	505	533	434	749
	2	27P63	952	1017	867	861	618	787	607	516	416	434	707
	3	28P67	1656	1090	1117	1176	570	1215	870	517	475	407	909
	4	AZ 8433 DT	948	833	1133	829	626	779	853	517	551	446	751
	5	HRI-174	908	957	867	656	615	750	1047	520	459	448	723
	6	SB. Dhan	740	774	1017	572	663	782	687	515	534	355	664
	7	US-312	936	957	467	943	629	544	767	523	471	394	663
	8	US-314	698	1022	650	1078	677	858	693	514	424	460	707
	9	US-380	756	746	800	1488	680	513	670	510	416	453	703
		T4 Mean	**949**	**941**	**867**	**952**	**626**	**777**	**780**	**515**	**475**	**425**	**731**
		Grand Mean	**1179**	**890**	**877**	**808**	**650**	**761**	**858**	**516**	**578**	**548**	**766**
		LSD (Silicon)				ns		*LSD (Silicon x Variety)*					ns
		LSD (Location x Silicon)				151.18**		*LSD (Location x Silicon x Variety)*					400.93**
		LSD (Variety)				ns		*CV (Silicon) %*					27.24
		LSD (Location x Variety)				200.46**		*CV (Residual) %*					24.79

Table: 6.1.9 Influence of Silica Application Panicle number/m² at different locations *Kharif* 2023

Treat	S.No.	Genotypes	CBT	IIRR	KJT	KRK	MTU	PNR	PTB	RANCHI	REWA	TTB	Grand Mean
T1 (Control)	1	27P37	587	330	257	250	385	250	293	197	321	179	305
	2	27P63	639	313	249	342	407	317	348	201	334	161	331
	3	28P67	638	337	294	258	418	317	190	199	377	165	319
	4	AZ 8433 DT	695	353	243	258	407	283	253	200	337	126	316
	5	HRI-174	527	393	286	233	429	317	273	199	318	194	317
	6	SB. Dhan	508	377	315	133	407	300	253	200	333	138	296
	7	US-312	561	347	239	183	418	350	310	203	326	151	309
	8	US-314	526	327	290	250	407	317	269	206	325	131	305
	9	US-380	518	387	334	208	418	317	278	207	321	134	312
		T1 Mean	**578**	**351**	**278**	**235**	**411**	**307**	**274**	**201**	**333**	**153**	**312**
T2 (0.08% Ortho silicic acid)	1	27P37	619	360	281	217	396	250	286	196	356	183	314
	2	27P63	720	313	318	358	407	350	473	198	339	178	366
	3	28P67	697	340	305	175	418	317	208	199	353	186	320
	4	AZ 8433 DT	761	457	264	358	396	283	400	196	324	188	363
	5	HRI-174	629	347	338	258	418	317	287	202	341	209	335
	6	SB. Dhan	525	347	298	133	407	283	443	196	321	159	311
	7	US-312	580	330	260	242	396	400	280	206	358	200	325
	8	US-314	548	320	247	200	407	383	337	201	357	145	314
	9	US-380	592	357	266	275	429	333	324	199	335	151	326
		T2 Mean	**630**	**352**	**286**	**246**	**408**	**324**	**338**	**199**	**343**	**178**	**330**
T3 (Silicon + Water Stress)	1	27P37	476	340	293	217	385	217	322	197	296	187	293
	2	27P63	529	350	333	342	396	267	388	197	335	170	331
	3	28P67	562	380	300	208	396	350	253	202	311	172	313
	4	AZ 8433 DT	774	393	248	292	396	300	327	206	295	129	336
	5	HRI-174	561	333	300	233	407	300	410	210	290	187	323
	6	SB. Dhan	475	373	278	258	396	317	250	203	250	133	293
	7	US-312	639	347	261	258	385	283	335	206	334	189	324
	8	US-314	728	323	261	283	396	383	342	199	294	148	336
	9	US-380	525	383	305	283	407	283	265	201	295	129	308
		T3 Mean	**585**	**358**	**287**	**264**	**396**	**300**	**321**	**202**	**300**	**160**	**317**
T4 (Water Stress)	1	27P37	450	330	174	250	374	267	245	201	271	135	270
	2	27P63	505	350	187	317	374	317	345	204	291	132	302
	3	28P67	510	373	156	358	407	317	260	203	285	138	301
	4	AZ 8433 DT	482	387	144	325	407	317	377	201	225	111	298
	5	HRI-174	505	360	173	292	396	300	259	197	261	156	290
	6	SB. Dhan	428	380	148	233	396	317	220	199	251	124	270
	7	US-312	395	333	120	225	374	317	305	199	280	145	269
	8	US-314	439	363	129	242	374	367	319	202	301	134	287
	9	US-380	476	357	129	425	407	350	291	200	227	132	299
		T4 Mean	**466**	**359**	**151**	**296**	**390**	**319**	**291**	**201**	**266**	**134**	**287**
		Grand Mean	**565**	**355**	**251**	**260**	**401**	**313**	**306**	**201**	**310**	**156**	**312**
		LSD (Silicon)				15.11*		*LSD (Silicon x Variety)*					ns
		LSD (Location x Silicon)				63.53**		*LSD (Location x Silicon x Variety)*					ns
		LSD (Variety)				ns		*CV (Silicon) %*					28.14
		LSD (Location x Variety)				58.42**		*CV (Residual) %*					17.76

Table: 6.1.10 Influence of Silica Application Panicle weight (g/m²) maturity at different locations *Kharif* 2023

Treat	S.No.	Genotypes	CBT	IIRR	KJT	KRK	MTU	PNR	PTB	RANCHI	REWA	TTB	Grand Mean
T1 (Control)	1	27P37	2367	1022	1067	809	462	1369	333	523	799	498	925
	2	27P63	2407	1078	950	1403	468	749	497	519	828	495	939
	3	28P67	2888	988	1050	868	504	1796	390	517	836	443	1028
	4	AZ 8433 DT	2854	807	1233	975	545	1131	560	525	915	494	1004
	5	HRI-174	2028	1073	1033	837	508	1055	410	519	839	495	880
	6	SB. Dhan	1392	918	933	847	490	847	367	516	824	403	754
	7	US-312	2149	975	1017	821	500	1071	430	530	901	503	890
	8	US-314	2156	924	800	763	529	1012	300	530	828	545	839
	9	US-380	1981	900	1250	886	552	1193	443	526	819	527	908
		T1 Mean	**2247**	**965**	**1037**	**912**	**507**	**1136**	**414**	**523**	**843**	**489**	**907**
T2 (0.08% Ortho silicic acid)	1	27P37	2703	1033	833	940	467	1373	523	518	866	576	983
	2	27P63	2808	952	900	1095	460	754	680	525	876	558	961
	3	28P67	3371	1024	1267	714	510	1868	467	523	872	548	1116
	4	AZ 8433 DT	3239	998	833	1348	555	1313	653	522	899	674	1103
	5	HRI-174	2597	1016	800	940	527	1102	620	517	905	635	966
	6	SB. Dhan	1538	903	817	604	514	944	383	527	854	455	754
	7	US-312	2319	966	917	732	493	1110	703	520	937	547	924
	8	US-314	2494	991	1167	459	537	935	397	522	893	651	904
	9	US-380	2378	961	1050	1158	555	1002	517	527	917	638	970
		T2 Mean	**2605**	**983**	**954**	**888**	**513**	**1156**	**549**	**522**	**891**	**587**	**965**
T3 (Silicon + Water Stress)	1	27P37	2000	1015	900	1058	452	1157	583	517	809	456	895
	2	27P63	1659	1016	1133	1123	462	1016	377	512	715	450	846
	3	28P67	2164	1078	1050	1209	498	1851	387	524	672	451	988
	4	AZ 8433 DT	1687	911	1350	1565	540	1137	533	527	672	513	944
	5	HRI-174	1969	1000	1183	788	484	1187	377	525	726	459	870
	6	SB. Dhan	1066	884	967	354	480	1148	253	525	658	423	676
	7	US-312	1587	1051	983	1002	484	1099	363	523	791	411	830
	8	US-314	1754	967	1050	560	504	959	230	522	732	494	777
	9	US-380	1866	926	1167	1216	541	1081	303	522	735	522	888
		T3 Mean	**1750**	**983**	**1087**	**986**	**494**	**1182**	**379**	**522**	**723**	**464**	**857**
T4 (Water Stress)	1	27P37	1766	1067	383	873	447	1415	470	522	490	380	781
	2	27P63	1561	1038	283	1222	459	1060	300	520	633	378	746
	3	28P67	1910	1056	350	1749	493	1788	287	520	675	355	918
	4	AZ 8433 DT	1401	915	583	1293	533	888	460	523	666	389	765
	5	HRI-174	1682	992	250	1219	477	1284	273	528	680	395	778
	6	SB. Dhan	931	887	367	563	472	953	157	528	681	310	585
	7	US-312	1266	1003	300	717	477	986	297	526	696	344	661
	8	US-314	1391	1017	450	498	494	1063	180	517	678	402	669
	9	US-380	1466	888	333	1555	540	1276	277	519	683	397	793
		T4 Mean	**1486**	**985**	**367**	**1077**	**488**	**1190**	**300**	**523**	**654**	**372**	**744**
		Grand Mean	**2022**	**979**	**861**	**966**	**500**	**1166**	**411**	**522**	**778**	**478**	**868**
		LSD (Silicon)				ns		*LSD (Silicon x Variety)*					ns
		LSD (Location x Silicon)				147.04**		*LSD (Location x Silicon x Variety)*					307.90**
		LSD (Variety)				48.68**		*CV (Silicon) %*					23.39
		LSD (Location x Variety)				153.95**		*CV (Residual) %*					16.81

Table: 6.1.11 Influence of Silica Application Grain number/panicle at different locations *Kharif* 2023

Treat	S.No.	Genotypes	CBT	IIRR	KJT	KRK	MTU	PNR	PTB	RANCHI	REWA	TTB	Grand Mean
T1 (Control)	1	27P37	213	122	159	153	153	286	55	96	164	122	152
	2	27P63	255	127	211	131	153	254	70	98	156	155	161
	3	28P67	196	106	178	166	128	179	87	101	165	120	143
	4	AZ 8433 DT	219	86	172	202	133	164	89	99	187	132	148
	5	HRI-174	214	119	162	137	138	230	87	92	173	201	155
	6	SB. Dhan	201	92	154	122	152	138	43	97	153	98	125
	7	US-312	225	124	145	139	149	176	72	98	169	179	148
	8	US-314	228	129	162	167	144	211	59	97	165	219	158
	9	US-380	205	92	203	151	134	193	69	98	174	121	144
		T1 Mean	**217**	**111**	**172**	**152**	**143**	**203**	**70**	**97**	**167**	**150**	**148**
T2 (0.08% Ortho silicic acid)	1	27P37	225	104	157	152	147	306	66	94	188	136	157
	2	27P63	263	109	218	188	156	200	93	94	168	173	166
	3	28P67	209	104	164	166	130	179	76	98	183	129	144
	4	AZ 8433 DT	233	91	172	223	135	197	102	98	176	152	158
	5	HRI-174	225	134	171	166	142	183	93	99	167	235	161
	6	SB. Dhan	211	97	162	165	156	137	47	94	157	108	133
	7	US-312	240	128	156	148	146	188	87	98	164	202	156
	8	US-314	243	144	194	110	146	130	58	98	170	247	154
	9	US-380	226	96	221	199	138	157	69	92	176	136	151
		T2 Mean	**231**	**112**	**179**	**169**	**144**	**186**	**77**	**96**	**172**	**169**	**153**
T3 (Silicon + Water Stress)	1	27P37	171	106	188	193	142	280	67	94	159	96	150
	2	27P63	223	111	181	170	149	215	86	94	156	137	152
	3	28P67	194	103	182	227	125	205	75	94	150	106	146
	4	AZ 8433 DT	204	89	186	223	130	156	93	95	179	126	148
	5	HRI-174	202	136	154	148	137	210	57	98	155	169	147
	6	SB. Dhan	188	91	116	148	150	149	18	90	145	98	119
	7	US-312	179	132	177	166	142	265	48	102	162	157	153
	8	US-314	204	133	169	117	142	129	40	97	169	191	139
	9	US-380	190	98	170	221	134	233	62	98	171	111	149
		T3 Mean	**195**	**111**	**169**	**179**	**139**	**205**	**61**	**96**	**161**	**132**	**145**
T4 (Water Stress)	1	27P37	161	114	172	147	139	248	73	98	155	81	139
	2	27P63	203	103	181	167	148	229	62	102	148	111	145
	3	28P67	185	97	132	185	123	197	61	95	154	96	132
	4	AZ 8433 DT	185	94	127	137	128	156	71	98	173	112	128
	5	HRI-174	184	122	129	144	135	240	84	102	154	148	144
	6	SB. Dhan	154	93	120	101	147	117	8	91	146	89	107
	7	US-312	151	130	142	168	143	201	48	97	154	135	137
	8	US-314	192	121	156	129	141	141	18	90	154	164	131
	9	US-380	180	98	124	250	132	189	41	97	164	95	137
		T4 Mean	**177**	**108**	**142**	**158**	**137**	**191**	**52**	**97**	**156**	**115**	**133**
		Grand Mean	**205**	**110**	**166**	**165**	**141**	**196**	**65**	**96**	**164**	**141**	**145**
		LSD (Silicon)				6.68**		*LSD (Silicon x Variety)*					ns
		LSD (Location x Silicon)				21.14**		*LSD (Location x Silicon x Variety)*					37.78**
		LSD (Variety)				4.54*		*CV (Silicon) %*					20.14
		LSD (Location x Variety)				18.89**		*CV (Residual) %*					12.36

Table: 6.1.12 Influence of Silica Application Spikelet number/panicle at different locations *Kharif* 2023

Treat	S.No.	Genotypes	CBT	IIRR	KJT	KRK	MTU	PNR	PTB	RANCHI	REWA	TTB	Grand Mean
T1 (Control)	1	27P37	212	244	181	170	165	300	85	110	175	139	178
	2	27P63	251	253	230	147	169	280	99	114	165	174	188
	3	28P67	233	211	200	204	142	239	107	114	182	137	177
	4	AZ 8433 DT	229	172	193	241	145	261	111	114	200	151	182
	5	HRI-174	215	238	178	147	150	254	100	107	189	210	179
	6	SB. Dhan	200	185	172	135	165	172	58	111	174	110	148
	7	US-312	225	249	165	151	161	223	90	114	182	205	176
	8	US-314	231	257	184	183	156	214	79	111	189	249	185
	9	US-380	216	185	221	164	146	282	106	111	195	139	176
		T1 Mean	**224**	**222**	**192**	**171**	**155**	**247**	**93**	**112**	**184**	**168**	**177**
T2 (0.08% Ortho silicic acid)	1	27P37	220	209	171	161	160	335	100	107	202	151	182
	2	27P63	260	218	242	205	171	228	109	108	185	192	192
	3	28P67	243	208	179	197	143	272	100	107	194	145	179
	4	AZ 8433 DT	235	182	187	235	147	256	131	111	204	170	186
	5	HRI-174	223	268	187	181	154	199	111	113	183	265	188
	6	SB. Dhan	207	195	177	172	167	160	58	109	178	121	154
	7	US-312	234	256	169	161	158	206	122	112	186	226	183
	8	US-314	239	289	207	119	157	267	79	112	198	275	194
	9	US-380	225	192	237	213	151	213	98	106	197	151	178
		T2 Mean	**232**	**224**	**195**	**183**	**156**	**237**	**101**	**109**	**192**	**188**	**182**
T3 (Silicon + Water Stress)	1	27P37	187	211	198	205	157	285	103	107	178	115	175
	2	27P63	233	223	199	182	162	283	137	109	169	160	186
	3	28P67	222	205	197	287	138	209	128	109	162	124	178
	4	AZ 8433 DT	214	178	200	236	143	184	123	109	187	151	172
	5	HRI-174	206	272	168	155	149	227	93	111	170	202	175
	6	SB. Dhan	188	182	141	161	163	175	43	105	170	115	144
	7	US-312	198	264	191	178	153	309	102	117	179	185	188
	8	US-314	220	267	185	138	153	253	62	112	185	224	180
	9	US-380	208	196	192	231	145	271	102	112	181	131	177
		T3 Mean	**208**	**222**	**186**	**197**	**152**	**244**	**99**	**110**	**176**	**156**	**175**
T4 (Water Stress)	1	27P37	181	228	191	165	154	299	113	108	173	101	171
	2	27P63	223	206	199	188	162	268	96	113	166	137	176
	3	28P67	209	194	157	221	135	232	113	109	175	117	166
	4	AZ 8433 DT	204	188	141	149	142	185	114	111	188	143	157
	5	HRI-174	195	245	153	150	148	273	102	116	168	184	173
	6	SB. Dhan	174	187	134	107	161	149	34	105	161	115	133
	7	US-312	175	260	156	192	154	226	91	111	172	165	170
	8	US-314	210	243	175	150	153	252	64	105	181	203	173
	9	US-380	197	196	149	276	145	242	82	106	178	121	169
		T4 Mean	**196**	**216**	**162**	**178**	**150**	**236**	**90**	**109**	**173**	**143**	**165**
		Grand Mean	**215**	**221**	**183**	**182**	**153**	**241**	**96**	**110**	**181**	**164**	**175**
		LSD (Silicon)				8.15**		*LSD (Silicon x Variety)*					ns
		LSD (Location x Silicon)				ns		*LSD (Location x Silicon x Variety)*					44.34**
		LSD (Variety)				5.33*		*CV (Silicon) %*					20.36
		LSD (Location x Variety)				22.17**		*CV (Residual) %*					12.03

Table: 6.1.13 Influence of Silica Application Grain number/m^2 at different locations *Kharif* 2023

Treat	S.No.	Genotypes	CBT	IIRR	KJT	KRK	MTU	PNR	PTB	RANCHI	REWA	TTB	Grand Mean
T1 (Control)	1	27P37	122064	39878	40920	42292	59092	71375	16176	18838	52403	21841	48488
	2	27P63	161760	39563	52675	46242	62370	80167	24272	19830	52157	24903	56394
	3	28P67	124164	35829	52567	44075	53680	56783	16479	20032	62525	19783	48592
	4	AZ 8433 DT	144276	30146	41873	54850	54098	46292	22677	19791	63054	16506	49356
	5	HRI-174	118140	47047	46293	30708	59367	72500	23777	18195	55073	38862	50996
	6	SB. Dhan	101232	34468	48663	20383	61952	41167	10463	19453	51169	13504	40246
	7	US-312	126288	43089	34642	25600	62392	61667	22721	19975	55037	27208	47862
	8	US-314	122880	41553	47012	41583	58696	66658	15859	20081	53348	28634	49630
	9	US-380	108420	34514	68089	31658	56177	61000	19378	20224	55871	16212	47154
		T1 Mean	**125469**	**38454**	**48082**	**37488**	**58647**	**61956**	**19089**	**19602**	**55626**	**23050**	**48746**
T2 (0.08% Ortho silicic acid)	1	27P37	137292	37770	44008	36700	58322	76375	18994	18425	66904	24988	51978
	2	27P63	188640	34256	69932	75667	63393	69800	44020	18551	57146	30891	65230
	3	28P67	147660	35255	49667	31392	54461	56683	15875	19536	64708	24060	49930
	4	AZ 8433 DT	169848	37554	44516	83283	53592	55500	40563	19141	57001	28882	58988
	5	HRI-174	142464	45461	57583	43475	59510	57750	26724	19947	56734	49155	55880
	6	SB. Dhan	115824	33312	48508	22692	63349	38633	19893	18367	50823	17278	42868
	7	US-312	141024	41412	40790	40400	57893	75083	24293	20217	58702	40372	54019
	8	US-314	137028	45586	47803	22933	59257	49642	19611	19745	60977	35863	49845
	9	US-380	132624	33384	58009	53592	59224	51992	22269	18336	58953	20404	50879
		T2 Mean	**145823**	**38221**	**51202**	**45570**	**58778**	**59051**	**25805**	**19141**	**59105**	**30210**	**53291**
T3 (Silicon + Water Stress)	1	27P37	81672	35944	54923	41808	54780	60550	21806	18579	47485	17872	43542
	2	27P63	123000	39146	60465	62550	59004	57433	33484	18553	52746	23295	52968
	3	28P67	111336	38858	54434	47875	49368	71750	19256	19001	46599	18279	47676
	4	AZ 8433 DT	111336	34804	45264	66250	51348	46567	30251	19587	53061	16211	47468
	5	HRI-174	109308	44527	46062	35133	55880	63000	23517	20510	44891	31624	47445
	6	SB. Dhan	88597	33579	32457	42333	59213	47133	4521	18274	36071	13014	37519
	7	US-312	85932	45449	46485	44600	54560	74942	16037	20977	54352	29597	47293
	8	US-314	98088	42584	44088	32333	56364	49533	13836	19285	49785	28122	43402
	9	US-380	91152	36263	51912	62608	54428	65567	16402	19734	50350	14379	46279
		T3 Mean	**100047**	**39017**	**48454**	**48388**	**54994**	**59608**	**19901**	**19389**	**48371**	**21377**	**45955**
T4 (Water Stress)	1	27P37	75168	37489	30067	40142	52096	65792	18541	19667	41873	10875	39171
	2	27P63	104544	36100	33822	52875	55363	72450	21498	20775	42903	14612	45494
	3	28P67	93156	36246	20754	65925	50083	62383	15771	19233	43493	13279	42032
	4	AZ 8433 DT	88608	36117	18257	43292	52074	49333	26781	19783	38977	12406	38563
	5	HRI-174	88452	42023	22092	46575	53328	71675	21303	20064	40191	23187	42889
	6	SB. Dhan	68496	34978	17523	23150	58025	36850	1492	18174	36757	11026	30647
	7	US-312	65352	43276	17063	35000	53394	63500	14483	19308	43271	19413	37406
	8	US-314	85080	43632	20584	34000	52866	51400	5302	18150	46438	21870	37932
	9	US-380	86184	34798	16046	106175	53702	66383	11561	19391	37154	12500	44389
		T4 Mean	**83893**	**38295**	**21801**	**49681**	**53437**	**59974**	**15192**	**19394**	**41228**	**15463**	**39836**
		Grand Mean	**113808**	**38497**	**42385**	**45282**	**56464**	**60147**	**19997**	**19381**	**51083**	**22525**	**46957**
		LSD (Silicon)				2801*		*LSD (Silicon x Variety)*					ns
		LSD (Location x Silicon)				8857**		*LSD (Location x Silicon x Variety)*					18408**
		LSD (Variety)				2910**		*CV (Silicon) %*					26.05
		LSD (Location x Variety)				9204**		*CV (Residual) %*					18.58

Table: 6.1.14 Influence of Silica Application Spikelet number/m² at different locations *Kharif* 2023

Treat	S.No.	Genotypes	CBT	IIRR	KJT	KRK	MTU	PNR	PTB	RANCHI	REWA	TTB	Grand Mean
T1 (Control)	1	27P37	122712	79756	46758	46000	63580	74917	24995	21728	56360	24824	56163
	2	27P63	160584	79125	57751	51717	68717	88400	34487	22913	55076	28018	64679
	3	28P67	148824	71659	58874	54667	59246	75950	20381	22751	68824	22611	60378
	4	AZ 8433 DT	151800	60291	46824	63992	58982	73717	28197	22932	67450	18926	59311
	5	HRI-174	119472	94094	50762	33050	64515	80167	27322	21173	60079	40020	59065
	6	SB. Dhan	101004	68937	54157	22300	67122	51367	14564	22258	58125	15219	47505
	7	US-312	127404	86178	39515	27850	67430	78050	28452	23154	59478	31079	56859
	8	US-314	125292	83105	53357	46208	63437	67767	21134	22965	61437	32618	57732
	9	US-380	114000	69027	74148	34508	60918	89200	29161	22911	62918	18522	57531
		T1 Mean	**130121**	**76908**	**53572**	**42255**	**63772**	**75504**	**25410**	**22532**	**61083**	**25760**	**57692**
T2 (0.08% Ortho silicic acid)	1	27P37	135276	75540	47989	38975	63338	83750	28619	21040	71661	27620	59381
	2	27P63	187704	68513	77534	82442	69509	79617	52065	21323	62731	34277	73571
	3	28P67	172704	70509	54186	36942	59906	85700	20775	21322	68537	27143	61772
	4	AZ 8433 DT	173136	75108	48648	88383	58344	72383	52187	21689	65904	32368	68815
	5	HRI-174	142656	90922	63200	47100	64526	62867	32016	22773	62163	55359	64358
	6	SB. Dhan	114816	66624	53007	23650	67958	45267	24709	21309	56986	19366	49369
	7	US-312	138432	82823	44107	44117	62524	82333	34210	23106	66748	45118	62352
	8	US-314	134952	91172	51027	24642	63734	102300	25915	22562	70830	39849	62698
	9	US-380	132504	66768	62250	58058	64636	71383	31579	21126	66065	22777	59715
		T2 Mean	**148020**	**76442**	**55772**	**49368**	**63831**	**76178**	**33564**	**21806**	**65736**	**33764**	**62448**
T3 (Silicon + Water Stress)	1	27P37	89904	71888	57890	44383	60577	62233	33305	21012	53063	21287	51554
	2	27P63	129528	78293	66407	66458	64284	75383	53197	21510	57215	27194	63947
	3	28P67	128448	77717	59119	60775	54516	73033	32443	21963	50259	21357	57963
	4	AZ 8433 DT	115776	69608	48890	70258	56496	54650	40155	22327	55237	19307	55270
	5	HRI-174	111444	89053	49985	36633	60764	68200	38267	23380	49256	37717	56470
	6	SB. Dhan	88440	67158	39677	46333	64493	55167	10715	21320	42559	15296	45116
	7	US-312	95796	90898	50229	48183	59059	87467	34321	24209	59772	34722	58466
	8	US-314	105912	85167	48413	40350	60720	96733	21347	22281	54580	32917	56842
	9	US-380	99768	72526	58485	65500	59180	76600	26953	22543	53235	16960	55175
		T3 Mean	**107224**	**78034**	**53233**	**53208**	**60010**	**72163**	**32300**	**22283**	**52797**	**25195**	**55645**
T4 (Water Stress)	1	27P37	84816	74978	33481	46167	57706	79417	28156	21734	46760	13612	48683
	2	27P63	115140	72200	37230	59717	60467	84467	33019	22936	48065	18129	55137
	3	28P67	105540	72492	24742	79758	54989	73167	29367	22130	49467	16251	52790
	4	AZ 8433 DT	98112	72234	20212	47567	57618	58250	42727	22321	42349	15842	47723
	5	HRI-174	93648	84047	26445	48592	58608	81300	25940	22818	43804	28867	51407
	6	SB. Dhan	77532	69957	19602	24500	63657	47083	6948	20960	40393	14211	38484
	7	US-312	75912	86551	18712	39550	57519	71450	27760	22094	48036	23772	47136
	8	US-314	93264	87263	23080	38425	57112	92283	20548	21183	54201	27100	51446
	9	US-380	94752	69595	19249	117375	59158	84333	23499	21277	40280	15777	54530
		T4 Mean	**93191**	**76591**	**24750**	**55739**	**58537**	**74639**	**26440**	**21939**	**45928**	**19285**	**49704**
		Grand Mean	**119639**	**76994**	**46832**	**50142**	**61537**	**74621**	**29429**	**22140**	**56386**	**26001**	**56372**
		LSD (Silicon)				2492*		*LSD (Silicon x Variety)*					ns
		LSD (Location x Silicon)				10482**		*LSD (Location x Silicon x Variety)*					21265**
		LSD (Variety)				3362**		*CV (Silicon) %*					25.68
		LSD (Location x Variety)				10632**		*CV (Residual) %*					17.88

Table: 6.1.15 Influence of Silica Application 1000 grain weight (g) at different locations *Kharif* 2023

Treat	S.No.	Genotypes	CBT	IIRR	KJT	KRK	MTU	PNR	PTB	RANCHI	REWA	TTB	Grand Mean
T1 (Control)	1	27P37	26.7	23.7	25.6	21.0	25.2	23.8	30.1	19.7	17.8	20.9	23.4
	2	27P63	16.5	23.9	15.5	19.8	16.2	14.9	19.2	19.8	21.8	22.4	19.0
	3	28P67	26.4	24.0	26.9	22.4	24.4	23.4	29.7	19.7	19.7	18.5	23.5
	4	AZ 8433 DT	21.8	23.6	20.1	25.3	17.4	18.8	21.7	19.8	21.0	22.9	21.3
	5	HRI-174	24.5	19.4	22.4	25.4	20.4	21.2	22.9	19.7	22.4	17.8	21.6
	6	SB. Dhan	22.0	22.9	23.5	16.1	22.6	21.9	20.9	19.9	21.9	16.0	20.8
	7	US-312	19.8	19.1	18.8	25.0	20.4	17.9	19.8	20.3	19.7	21.2	20.2
	8	US-314	21.1	18.9	22.7	20.3	22.1	14.6	23.2	20.0	18.6	22.3	20.4
	9	US-380	21.6	22.8	20.7	23.4	20.3	15.8	22.4	19.9	20.1	21.1	20.8
		T1 Mean	**22.3**	**22.0**	**21.8**	**22.1**	**21.0**	**19.1**	**23.3**	**19.9**	**20.3**	**20.3**	**21.2**
T2 (0.08% Ortho silicic acid)	1	27P37	27.1	23.8	27.4	23.9	25.4	20.7	28.4	19.9	20.9	21.0	23.9
	2	27P63	16.8	24.6	16.4	19.7	16.0	14.9	17.1	20.0	22.6	23.2	19.1
	3	28P67	26.9	24.7	26.9	23.9	24.5	19.0	27.3	20.0	20.7	18.8	23.3
	4	AZ 8433 DT	22.1	22.8	21.3	20.8	17.5	16.9	21.4	20.3	22.7	22.9	20.9
	5	HRI-174	25.0	19.3	23.5	23.4	20.5	20.8	22.4	20.0	22.3	18.3	21.6
	6	SB. Dhan	22.3	24.0	23.9	19.3	22.7	21.5	21.1	20.2	21.1	16.1	21.2
	7	US-312	20.4	19.5	20.0	22.7	20.2	18.7	21.4	19.6	19.3	21.9	20.4
	8	US-314	21.5	19.3	22.7	19.8	22.3	18.1	20.8	19.3	19.7	22.2	20.6
	9	US-380	21.8	24.5	21.3	23.2	20.2	15.7	24.5	20.1	21.8	21.9	21.5
		T2 Mean	**22.7**	**22.5**	**22.6**	**21.9**	**21.0**	**18.5**	**22.7**	**19.9**	**21.2**	**20.7**	**21.4**
T3 (Silicon + Water Stress)	1	27P37	25.4	23.6	25.7	24.6	25.0	22.3	24.7	19.7	17.0	21.0	22.9
	2	27P63	16.0	23.0	16.0	19.7	16.1	15.1	15.7	20.1	22.5	22.6	18.7
	3	28P67	25.9	23.7	25.7	24.2	24.4	26.0	26.1	20.2	19.3	18.6	23.4
	4	AZ 8433 DT	21.3	22.9	21.3	22.9	17.3	16.7	20.4	20.1	22.7	22.8	20.8
	5	HRI-174	23.6	19.8	24.2	21.9	20.2	22.2	22.8	20.2	22.1	18.3	21.5
	6	SB. Dhan	20.0	22.6	23.1	22.1	22.5	17.8	20.5	20.0	18.6	15.3	20.3
	7	US-312	19.2	19.5	20.0	22.2	20.2	18.9	18.6	20.0	17.7	21.8	19.8
	8	US-314	20.2	19.7	21.5	19.7	22.2	18.1	21.0	20.3	18.2	22.4	20.3
	9	US-380	20.9	22.3	20.5	22.9	20.3	19.4	19.0	20.0	20.1	21.8	20.7
		T3 Mean	**21.4**	**21.9**	**22.0**	**22.2**	**20.9**	**19.6**	**21.0**	**20.1**	**19.8**	**20.5**	**20.9**
T4 (Water Stress)	1	27P37	24.2	24.7	22.8	23.7	24.9	21.5	22.6	20.1	19.5	19.8	22.4
	2	27P63	15.0	24.5	16.1	21.1	15.9	13.7	16.6	20.0	21.7	20.0	18.5
	3	28P67	25.6	24.3	26.2	25.7	24.2	23.3	21.9	19.9	19.9	17.2	22.8
	4	AZ 8433 DT	20.8	22.3	18.3	23.3	17.6	21.1	20.6	19.4	20.3	19.9	20.4
	5	HRI-174	23.2	19.8	15.8	19.6	20.3	21.1	22.5	19.9	21.9	17.0	20.1
	6	SB. Dhan	19.5	22.3	21.8	22.5	22.2	18.0	18.0	20.1	17.3	15.5	19.7
	7	US-312	18.9	19.9	18.2	20.8	20.3	16.7	19.5	20.5	18.3	20.0	19.3
	8	US-314	19.8	19.7	19.4	19.5	22.4	16.3	20.2	20.2	16.6	21.7	19.6
	9	US-380	19.9	22.4	15.4	22.7	20.4	18.8	22.1	19.5	19.4	20.0	20.1
		T4 Mean	**20.8**	**22.2**	**19.3**	**22.1**	**20.9**	**18.9**	**20.4**	**20.0**	**19.4**	**19.0**	**20.3**
		Grand Mean	**21.8**	**22.2**	**21.4**	**22.1**	**21.0**	**19.0**	**21.9**	**20.0**	**20.2**	**20.1**	**21.0**
		LSD (Silicon)				0.38**		*LSD (Silicon x Variety)*					ns
		LSD (Location x Silicon)				1.20**		*LSD (Location x Silicon x Variety)*					3.42**
		LSD (Variety)				0.54**		*CV (Silicon) %*					7.89
		LSD (Location x Variety)				1.71**		*CV (Residual) %*					7.75

Table: 6.1.16 Influence of Silica Application Total dry matter (g/m^2) maturity at different locations *Kharif* 2023

Treat	S.No.	Genotypes	CBT	IIRR	KJT	KRK	MTU	PNR	PTB	RANCHI	REWA	TTB	Grand Mean
T1 (Control)	1	27P37	1350	1924	1600	1556	648	1912	1217	1017	1974	1201	1440
	2	27P63	1298	2029	1678	967	641	1554	1213	1028	1632	1151	1319
	3	28P67	1455	1876	1578	1556	607	2942	1357	1028	1765	1027	1519
	4	AZ 8433 DT	1353	1645	1622	1078	667	1977	1610	1048	1915	1169	1408
	5	HRI-174	1278	2011	1311	1178	626	1771	1183	1041	1778	1152	1333
	6	SB. Dhan	1263	1605	1411	722	696	1442	980	1047	1740	935	1184
	7	US-312	1158	1847	1733	1278	660	1754	1350	1057	1808	1170	1381
	8	US-314	1202	1768	1122	1422	721	1651	1047	1051	1669	1355	1301
	9	US-380	1217	1738	1533	1444	738	2127	1410	1035	1818	1225	1429
		T1 Mean	**1286**	**1827**	**1510**	**1244**	**667**	**1903**	**1263**	**1039**	**1789**	**1154**	**1368**
T2 (0.08% Ortho silicic acid)	1	27P37	1438	2038	1655	822	644	1824	1623	1045	2025	1339	1445
	2	27P63	1377	1869	1300	1011	636	1433	1617	1037	1776	1295	1335
	3	28P67	1507	1912	1989	1189	596	3225	1407	1031	1801	1273	1593
	4	AZ 8433 DT	1403	1966	1611	1289	651	1915	1653	1046	1857	1607	1500
	5	HRI-174	1328	1836	1642	1233	659	1873	1473	1028	1932	1476	1448
	6	SB. Dhan	1320	1654	1511	1489	686	1475	1120	1046	1592	1057	1295
	7	US-312	1238	1842	1689	1189	671	2014	1650	1032	1913	1273	1451
	8	US-314	1277	1838	1278	1633	699	1684	1250	1040	1455	1511	1367
	9	US-380	1248	1713	1448	1767	720	1611	1283	1055	2005	1481	1433
		T2 Mean	**1349**	**1852**	**1569**	**1291**	**662**	**1895**	**1453**	**1040**	**1817**	**1368**	**1430**
T3 (Silicon + Water Stress)	1	27P37	1202	1934	1763	1733	616	1727	1540	1040	1793	1059	1441
	2	27P63	1043	1893	1233	1533	626	1821	1227	1040	1599	1045	1306
	3	28P67	1205	2022	1400	1867	591	3027	1363	1039	1446	1048	1501
	4	AZ 8433 DT	1088	1746	1500	1478	646	1841	1577	1045	1632	1192	1374
	5	HRI-174	1112	1929	1533	1611	622	1941	1427	1038	1690	1067	1397
	6	SB. Dhan	1035	1675	1478	1200	670	1998	880	1041	1592	984	1255
	7	US-312	973	1936	1522	2078	644	1670	1310	1035	1631	953	1375
	8	US-314	1045	1909	1511	2089	682	1775	1037	1035	1656	1146	1388
	9	US-380	1005	1783	1611	1844	697	1671	1150	1035	1583	1213	1359
		T3 Mean	**1079**	**1870**	**1506**	**1715**	**644**	**1941**	**1279**	**1039**	**1625**	**1079**	**1377**
T4 (Water Stress)	1	27P37	1110	2140	1311	1767	559	2184	1293	1028	1580	883	1386
	2	27P63	1017	2056	1360	1533	618	1847	907	1036	1398	878	1265
	3	28P67	1147	2146	1489	2022	570	3003	1157	1036	1411	825	1481
	4	AZ 8433 DT	1012	1748	1366	1722	626	1666	1313	1040	1583	904	1298
	5	HRI-174	1050	1949	1678	1500	615	2033	1320	1048	1499	917	1361
	6	SB. Dhan	970	1660	1422	1089	663	1735	843	1043	1475	791	1169
	7	US-312	922	1960	1511	2111	629	1529	1063	1049	1462	798	1303
	8	US-314	1000	2039	1500	2378	677	1921	873	1031	1471	934	1382
	9	US-380	950	1634	1756	1789	680	1789	947	1029	1464	922	1296
		T4 Mean	**1020**	**1926**	**1488**	**1768**	**626**	**1967**	**1080**	**1038**	**1483**	**872**	**1327**
		Grand Mean	**1183**	**1869**	**1518**	**1505**	**650**	**1927**	**1269**	**1039**	**1678**	**1118**	**1376**
		LSD (Silicon)				ns		*LSD (Silicon x Variety)*					ns
		LSD (Location x Silicon)				200.07**		*LSD (Location x Silicon x Variety)*					369.42**
		LSD (Variety)				44.40*		*CV (Silicon) %*					20.09
		LSD (Location x Variety)				184.71**		*CV (Residual) %*					12.73

Table: 6.1.17 Influence of Silica Application Grain yield (g/m²) at different locations *Kharif* 2023

Treat	S.No.	Genotypes	CBT	IIRR	KJT	KRK	MTU	PNR	PTB	RANCHI	REWA	TTB	Grand Mean
T1 (Control)	1	27P37	972	922	956	433	474	740	281	224	442	458	590
	2	27P63	880	935	997	522	487	616	465	230	374	465	597
	3	28P67	957	843	863	411	440	908	362	227	685	441	614
	4	AZ 8433 DT	892	706	1113	507	490	774	364	225	468	516	606
	5	HRI-174	973	903	1019	544	474	670	333	236	537	519	621
	6	SB. Dhan	940	790	939	294	503	538	243	231	225	384	509
	7	US-312	887	822	1105	411	504	737	350	231	428	515	599
	8	US-314	847	785	1095	367	516	505	118	236	287	572	533
	9	US-380	870	788	1017	422	500	623	263	237	291	545	556
		T1 Mean	**913**	**833**	**1012**	**435**	**488**	**679**	**309**	**231**	**415**	**491**	**580**
T2 (0.08% Ortho silicic acid)	1	27P37	1033	883	983	500	463	667	619	229	659	507	654
	2	27P63	977	833	1102	500	477	642	643	234	445	509	636
	3	28P67	1020	859	1008	478	450	819	434	235	668	499	647
	4	AZ 8433 DT	953	847	932	506	507	690	381	233	255	576	588
	5	HRI-174	1020	870	1067	500	508	617	377	234	394	573	616
	6	SB. Dhan	977	802	874	333	522	526	184	238	245	423	512
	7	US-312	970	807	1110	400	491	716	357	231	287	566	593
	8	US-314	920	880	908	443	535	472	170	231	237	631	543
	9	US-380	933	817	980	478	517	693	316	233	326	608	590
		T2 Mean	**978**	**844**	**996**	**460**	**497**	**649**	**387**	**233**	**391**	**543**	**598**
T3 (Silicon + Water Stress)	1	27P37	843	839	929	478	445	586	203	236	477	411	545
	2	27P63	783	887	1002	488	473	624	250	228	526	362	562
	3	28P67	875	913	1169	467	432	848	290	227	475	381	607
	4	AZ 8433 DT	823	801	1012	504	482	740	258	230	447	384	568
	5	HRI-174	883	879	921	467	460	506	200	233	393	372	531
	6	SB. Dhan	823	762	620	333	493	475	120	226	233	403	449
	7	US-312	783	881	992	431	481	650	166	230	383	309	531
	8	US-314	753	841	1055	433	485	490	68	226	278	405	503
	9	US-380	780	808	937	500	488	682	131	234	346	440	535
		T3 Mean	**816**	**846**	**960**	**456**	**471**	**622**	**187**	**230**	**395**	**385**	**537**
T4 (Water Stress)	1	27P37	765	919	381	463	440	845	160	233	522	365	509
	2	27P63	732	875	382	400	470	487	130	230	445	325	448
	3	28P67	747	876	452	533	424	671	154	230	612	331	503
	4	AZ 8433 DT	742	808	408	367	478	660	280	231	359	346	468
	5	HRI-174	787	828	452	444	450	573	147	234	366	332	461
	6	SB. Dhan	750	783	200	222	482	531	50	228	241	350	384
	7	US-312	722	860	372	367	466	784	112	230	373	282	457
	8	US-314	703	848	551	322	481	448	38	229	187	360	417
	9	US-380	730	784	429	267	482	618	106	230	309	391	434
		T4 Mean	**742**	**842**	**403**	**376**	**464**	**624**	**131**	**231**	**379**	**342**	**453**
		Grand Mean	**862**	**841**	**843**	**432**	**480**	**643**	**253**	**231**	**395**	**440**	**542**
		LSD (Silicon)				54.36**		*LSD (Silicon x Variety)*					ns
		LSD (Location x Silicon)				171.89**		*LSD (Location x Silicon x Variety)*					152.04**
		LSD (Variety)				24.04**		*CV (Silicon) %*					43.79
		LSD (Location x Variety)				76.02**		*CV (Residual) %*					13.29

Table: 6.1.18 Influence of Silica Application Harvest index (%) at different locations *Kharif* 2023

Treat	S.No.	Genotypes	CBT	IIRR	KJT	KRK	MTU	PNR	PTB	RANCHI	REWA	TTB	Grand Mean
T1 (Control)	1	27P37	41.9	47.9	43.3	26.0	42.2	38.7	23.5	22.1	22.4	38.2	34.6
	2	27P63	40.5	46.3	42.7	30.6	43.2	39.6	38.0	22.3	22.9	40.6	36.7
	3	28P67	39.7	45.0	42.9	25.7	42.0	30.9	26.6	22.1	38.8	43.1	35.7
	4	AZ 8433 DT	39.7	42.4	43.3	27.5	42.4	39.2	22.8	21.4	24.5	44.4	34.7
	5	HRI-174	43.3	44.9	45.1	31.6	43.1	37.8	28.2	22.6	30.2	45.2	37.2
	6	SB. Dhan	42.7	49.3	45.2	30.1	42.0	37.3	24.8	22.1	12.9	41.2	34.8
	7	US-312	43.4	44.6	48.2	26.2	43.2	42.1	26.1	21.9	23.7	44.1	36.3
	8	US-314	41.4	44.5	44.0	27.4	41.7	30.6	11.3	22.5	17.9	42.3	32.4
	9	US-380	41.7	45.2	43.4	27.0	40.4	29.3	18.7	22.9	16.0	44.7	32.9
		T1 Mean	**41.6**	**45.6**	**44.2**	**28.0**	**42.2**	**36.2**	**24.4**	**22.2**	**23.3**	**42.6**	**35.0**
T2 (0.08% Ortho silicic acid)	1	27P37	41.8	43.4	42.8	28.6	41.8	36.6	38.3	21.9	32.6	38.0	36.6
	2	27P63	41.5	44.5	42.4	25.7	42.9	44.9	39.6	22.6	25.0	39.4	36.9
	3	28P67	40.4	45.0	48.5	32.0	43.0	25.4	30.8	22.8	37.1	39.7	36.5
	4	AZ 8433 DT	40.4	43.5	46.9	28.1	43.7	36.0	23.0	22.3	13.8	35.8	33.4
	5	HRI-174	43.4	47.4	44.9	28.0	43.5	33.0	25.6	22.8	20.4	38.8	34.8
	6	SB. Dhan	42.6	49.0	46.9	31.4	43.0	35.6	16.4	22.7	16.6	40.0	34.4
	7	US-312	44.0	44.0	42.1	30.9	42.3	35.6	21.6	22.4	15.0	44.7	34.3
	8	US-314	41.9	47.9	45.0	29.1	43.4	28.0	13.6	22.2	16.7	41.8	33.0
	9	US-380	42.8	48.2	44.0	30.6	41.7	43.0	24.4	22.1	16.3	41.1	35.4
		T2 Mean	**42.1**	**45.9**	**44.8**	**29.4**	**42.8**	**35.3**	**25.9**	**22.4**	**21.5**	**39.9**	**35.0**
T3 (Silicon + Water Stress)	1	27P37	41.2	43.5	42.1	30.2	41.9	33.8	13.3	22.7	26.6	38.9	33.4
	2	27P63	42.9	46.9	43.2	28.4	43.2	34.2	20.8	21.9	33.7	34.9	35.0
	3	28P67	42.1	45.2	44.9	28.3	42.2	28.0	21.4	21.8	32.8	36.4	34.3
	4	AZ 8433 DT	42.9	45.6	44.7	27.2	42.7	40.2	16.2	22.0	27.4	32.3	34.1
	5	HRI-174	44.3	45.5	43.1	33.6	42.5	26.1	13.8	22.5	23.2	34.8	32.9
	6	SB. Dhan	44.3	45.6	44.0	30.7	42.2	23.7	14.0	21.7	14.6	40.9	32.2
	7	US-312	44.6	45.5	43.9	32.3	42.8	38.9	12.6	22.2	23.5	32.7	33.9
	8	US-314	41.9	44.1	44.4	28.7	41.5	27.6	6.5	21.8	16.8	35.4	30.9
	9	US-380	43.7	45.5	42.3	31.7	41.0	40.8	11.6	22.6	21.9	36.4	33.8
		T3 Mean	**43.1**	**45.3**	**43.6**	**30.1**	**42.2**	**32.6**	**14.5**	**22.2**	**24.5**	**35.9**	**33.4**
T4 (Water Stress)	1	27P37	40.7	43.2	41.4	24.6	44.0	38.7	12.3	22.7	33.0	41.5	34.2
	2	27P63	41.9	42.6	41.6	27.3	43.2	26.4	14.6	22.2	31.8	37.6	32.9
	3	28P67	39.4	40.9	40.7	30.7	42.6	22.4	13.5	22.2	43.5	41.3	33.7
	4	AZ 8433 DT	42.2	46.1	39.3	22.5	43.2	39.6	21.5	22.3	22.7	38.4	33.8
	5	HRI-174	42.9	42.7	40.5	26.8	42.3	28.2	11.2	22.4	24.4	36.4	31.8
	6	SB. Dhan	43.6	47.0	39.9	24.5	42.1	30.6	6.0	21.8	16.2	45.6	31.7
	7	US-312	43.9	43.7	37.9	29.4	42.5	51.2	10.4	21.9	25.6	36.3	34.3
	8	US-314	41.3	41.7	41.9	27.4	41.6	23.3	4.6	22.2	12.7	38.6	29.5
	9	US-380	43.5	47.7	40.3	28.7	41.5	34.6	11.2	22.3	21.1	42.6	33.3
		T4 Mean	**42.2**	**44.0**	**40.4**	**26.9**	**42.6**	**32.8**	**11.7**	**22.2**	**25.7**	**39.8**	**32.8**
		Grand Mean	**42.2**	**45.2**	**43.3**	**28.6**	**42.5**	**34.2**	**19.1**	**22.3**	**23.7**	**39.6**	**34.1**
		LSD (Silicon)				ns		*LSD (Silicon x Variety)*					ns
		LSD (Location x Silicon)				2.58**		*LSD (Location x Silicon x Variety)*					6.58**
		LSD (Variety)				ns		*CV (Silicon) %*					10.45
		LSD (Location x Variety)				3.29**		*CV (Residual) %*					9.16

6.2 Phenotyping of elite rice genotypes for Drought Tolerance

Locations: CHN, NRRI, PTB, REWA, TTB, RPUR & RANCHI

Drought stress is the major one among the abiotic constraints in rain-fed ecologies. For numerous soils, at least two weeks without rainfall induces noticeable negative differences in drought sensitivity during the vegetative stage, and at least seven days without rainfall causes severe drought damage during the reproductive stage. Drought can cause yield losses of up to 21% under mild drought, up to 51% under moderate drought, and up to 90.6% in severe cases, depending on the grown variety, growth stage, degree, and duration of the stress. Reduced grain yield is a result of morphological responses such as increases in leaf rolling, stomata closure, and leaf tip drying; molecular responses that include changes in gene expression (up/down regulation of transcripts) and the activation of relevant transcription factors and signalling pathways; and physiological and biochemical responses such as reductions in transpiration, photosynthesis, chlorophyll content, membrane stability, stomatal conductance, and increases in osmoprotectants. Drought stress reduces the performance of rice varieties that are grown worldwide.

With this objective, a trial to study the drought tolerance traits of rice cultures with respect to yield and physiological traits under dry spells was conducted with 30 genotypes. 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 26 RUFs. Fig 6.2.1A shows PTB centre has received about 2042 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 54 rainy days with an overall rainfall of 1566 mm from sowing to physiological maturity and the rainfall was also well distributed throughout the growing period. At Ranchi centre, 1336 mm rainfall was recorded with 55 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, 724 mm rainfall was recorded with about 31 rainy days from sowing to physiological maturity after which there was a long dry spell. The rainfall was not well distributed and in 1st week of August 2023, it rained about 250 mm that is about 35% of all the rainfall of the season and on the other-hand it rained average about 25 mm per day among the rainy days. At TTB centre, trial was conducted during *Rabi* season (Fig 6.2.1B). There were about 35 rainy days with an overall rainfall of 305 mm during the Jan to May 2023. The rainfall was quite well distributed throughout the growing season. Mean tiller number hill^{-1} was significantly influenced by drought stress treatment (Table 6.2.1). However, the interactions between Location x Variety and Location x Treatment x Variety were statistically significant except Location x Treatment, Variety and Treatment x Variety. Mean tiller number hill^{-1} ranged from 7.1 tiller hill^{-1} at NRRI to 10.6 tiller hill^{-1} at Raipur with a mean 9.2 tiller hill^{-1} across all the locations in irrigated conditions whereas it ranged from 6.5 tiller hill^{-1} at NRRI to 8.9 tiller hill^{-1} at Raipur and Ranchi with a mean 8.3 tiller hill^{-1} across all the locations in drought conditions. Among entries, entry IL19210 has recorded the least tiller number hill^{-1} of 8.5 tiller hill^{-1} followed by DRT-5 (8.6 tiller hill^{-1}) and DRT-15 & IL19180 (8.7 tiller hill^{-1}) whereas entry JB 680-4 has recorded the highest tiller number hill^{-1} of 10.1 tiller hill^{-1} followed by IL 19026 (10.0 tiller hill^{-1}) and DRT-4, IL 19023, IL 19027 & JB 687-2 (9.6 tiller hill^{-1}) in control. In treatment, entry IL 19026 has recorded the lowest tiller number hill^{-1} of 7.7 tiller hill^{-1} followed by IL19177, IL 19180, IL 19246 (7.8 tiller hill^{-1} each) whereas entries DRT-11, IL19027 & IL 19408 has recorded the highest tiller number hill^{-1} of 8.8 tiller hill^{-1} followed by DRT-15, DRT-9 & JB 687-2 (8.7 tiller hill^{-1}) and SB Dhan (8.6 tiller hill^{-1}).

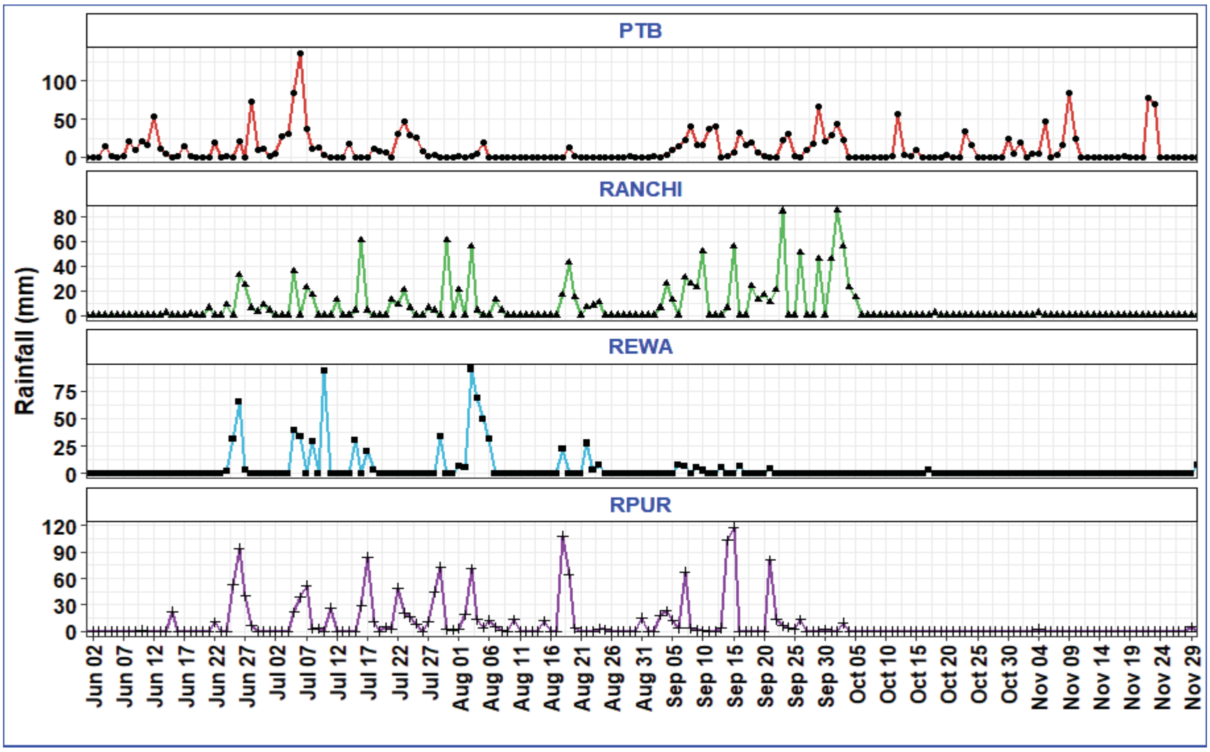


Fig 6.2.1A: Rainfall pattern under rainfed upland situation (drought) at different locations during Kharif 2023.

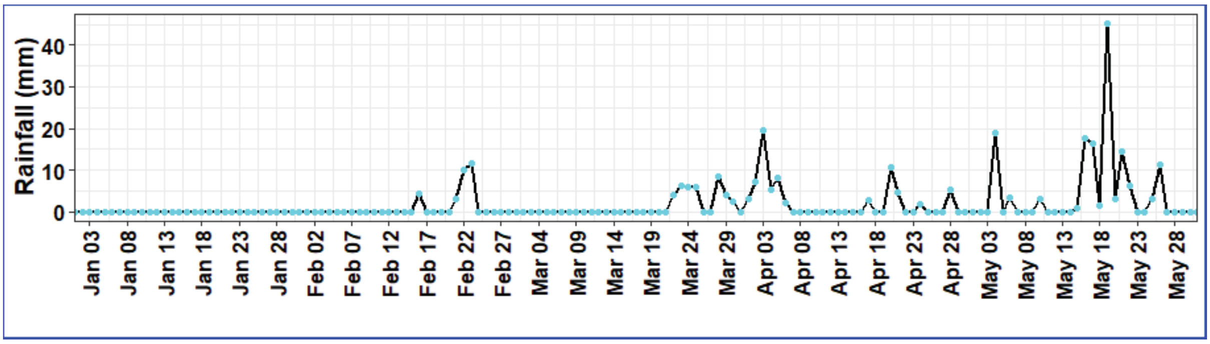


Fig 6.2.1B: Rainfall pattern under rainfed upland situation (drought) at Titabar during Rabi 2022-23.

Mean shoot weight (g/m^2) was not significantly influenced by drought stress treatment (Table 6.2.2). However, the interaction between Location x Treatment, Variety, Location x Variety and Location x Treatment x Variety were statistically significant except Treatment x Variety. Mean shoot weight ranged from 481 g/m^2 at NRRI to 1004 g/m^2 at Pattambi with a mean 635 g/m^2 across all the locations in irrigated conditions whereas it ranged from 399 g/m^2 at Raipur to 661 g/m^2 at Pattambi with a mean 529 g/m^2 across all the locations in drought conditions. Among entries, entry IL19027 has recorded the least shoot weight of 477 g/m^2 followed by Krishna Hamsa (493 g/m^2) and JB 680-4 (556 g/m^2) whereas entry JB 631-1 has recorded the highest shoot weight of 764 g/m^2 followed by IL 19180 (755 g/m^2) and IL 19177 (730 g/m^2) in control. In treatment, entry Krishna Hamsa has recorded the lowest shoot weight of 405 g/m^2 followed by IL19027 (446 g/m^2 each) whereas entries JB 631-1 has recorded the highest shoot weight of 627 g/m^2 followed by IL 19177 (605 g/m^2) and SM-D-S-3 (599 g/m^2).

Mean panicle weight (g/m^2) was not significantly influenced by drought stress treatment (Table 6.2.3). However, the interaction between Location x Treatment, Location x Variety and Location x Treatment x Variety were statistically significant except Variety and Treatment x Variety. Mean panicle weight ranged from 390 g/m^2 at NRRI to 682 g/m^2 at Rewa with a mean 537 g/m^2 across all the locations in irrigated conditions whereas it ranged from 323 g/m^2 at NRRI to 684 g/m^2 at Rewa with a mean 446 g/m^2 across all the locations in drought conditions. Among entries, entry SM-D-S-19 & IL 19027 has recorded the least panicle weight of 443 g/m^2 each followed by SM-D-S-5 (455 g/m^2) and IL 19241 (463 g/m^2) whereas entry IL 19180 has recorded the highest panicle weight of 753 g/m^2 followed by IL 19023 (642 g/m^2) and IL 19026 (633 g/m^2) in control. In drought treatment, entry SB Dhan has recorded the lowest panicle weight of 371 g/m^2 followed by JB 631-1 (389 g/m^2 each) whereas entries IL 19451 has recorded the highest panicle weight of 547 g/m^2 followed by IL 19408 (524 g/m^2) and IL

19180 (496 g/m^2). Mean panicle number m^{-2} was not significantly influenced by drought stress treatment (Table 6.2.4). However, the interaction between Location x Treatment, Location x Variety and Location x Treatment x Variety were statistically significant except Variety and Treatment x Variety. Mean panicle number m^{-2} ranged from 134 m^{-2} at Rewa to 484 m^{-2} at Pattambi with a mean 253 m^{-2} across all the locations in irrigated conditions whereas it ranged from 104 m^{-2} at Rewa to 421 m^{-2} at Pattambi with a mean 220 m^{-2} across all the locations in drought conditions. Among entries, entry IL 19177 has recorded the least panicle number m^{-2} of 191 m^{-2} followed by IL 19408 (194 m^{-2}) and SM-D-S-6 (210 m^{-2}) whereas entry SM-D-S-14 has recorded the highest panicle number m^{-2} of 305 m^{-2} followed by JB 680-4 (299 m^{-2}) and IL 19026 (297 m^{-2}) in control. In drought treatment, entry SB Dhan has recorded the lowest panicle number m^{-2} of 176 m^{-2} followed by IL 19027 (195 m^{-2} each) whereas entries SM-D-S-5 & IL 19451 has recorded the highest panicle number m^{-2} of 250 m^{-2} followed by IL 19408 (243 m^{-2}) and SM-D-S-14 (235 m^{-2}). Mean grain number panicle^{-1} was significantly influenced by drought stress treatment (Table 6.2.5). However, the interactions between Location x Treatment, Variety, Location x Variety and Location x Treatment x Variety were statistically significant except Treatment x Variety. Mean grain number panicle^{-1} ranged from 66 grain panicle^{-1} at Pattambi to 145 grain panicle^{-1} at Raipur with a mean 105 grain panicle^{-1} across all the locations in irrigated conditions whereas it ranged from 36 grain panicle^{-1} at Pattambi to 121 grain panicle^{-1} at Raipur with a mean 84 grain panicle^{-1} across all the locations in drought conditions. Among entries, entry IL19027 has recorded the least grain number panicle^{-1}of 78 grain panicle^{-1} followed by Krishna Hamsa (85 grain panicle^{-1}) and IL19023 (87 grain panicle^{-1}) whereas entry IL 19177 has recorded the highest grain number panicle^{-1} of 129 grain panicle^{-1} followed by SM-D-S-15 & IL 19182 (126 grain panicle^{-1} each) and WGL-14 (125 grain panicle^{-1}) in control. In treatment, entry IL 19027 has recorded the lowest grain number panicle^{-1} of 70 grain panicle^{-1} followed by Krishna Hamsa (74 grain panicle^{-1} each) and IL19206, JB 631-1 & JB 680-4 (75 grain panicle^{-1} each) whereas entries SM-D-S-15 has recorded the highest grain number panicle^{-1} of 113 grain panicle^{-1} followed by IL 19177 (99 grain panicle^{-1}) and WGL-14 (96 grain panicle^{-1}).

Mean spikelet number panicle^{-1} was significantly influenced by drought stress treatment (Table 6.2.6). However, the interactions between Location x Treatment, Variety, Location x Variety and Location x Treatment x Variety were statistically significant except Treatment x Variety. Mean spikelet number panicle^{-1} ranged from 105 spikelet panicle^{-1} at Pattambi to 159 spikelet panicle^{-1} at Raipur with a mean 133 spikelet panicle^{-1} across all the locations in irrigated conditions whereas it ranged from 73 spikelet panicle^{-1} at Pattambi to 137 spikelet panicle^{-1} at Raipur with a mean 115 spikelet panicle^{-1} across all the locations in drought treatment conditions. Among entries, entry IL19027 has recorded the least spikelet number panicle^{-1}of 100 spikelet panicle^{-1} followed by Krishna Hamsa (108 spikelet panicle^{-1}) and JB 687-2 (109 spikelet panicle^{-1}) whereas entry IL 19177 has recorded the highest spikelet number panicle^{-1} of 168 spikelet panicle^{-1} followed by WGL-14 (161 spikelet panicle^{-1} each) and IL 19246 (155 spikelet panicle^{-1}) in control. In treatment, entry IL 19027 has recorded the lowest spikelet number panicle^{-1} of 94 spikelet panicle^{-1} followed by IL 19206 (101 spikelet panicle^{-1}) and Krishna Hamsa & SB Dhan (102 spikelet panicle^{-1} each) whereas entries SM-D-S-15 has recorded the highest spikelet number panicle^{-1} of 142 spikelet panicle^{-1} followed by SM-D-S-3, SM-D-S-6 & IL 19182 (125 spikelet panicle^{-1}) and JB 631-1 & WGL-14 (124 spikelet panicle^{-1}). Mean grain number/m^2 was not significantly influenced by drought stress treatment (Table 6.2.7). However, the interactions between Location x Treatment, Location x Variety and Location x Treatment x Variety were statistically significant except Variety, Treatment x Variety. Mean grain number/m^2 ranged from 14080 grain /m^2 at Rewa to 49809 grain /m^2 at Raipur with a mean 28574 grain /m^2 across all the locations in irrigated conditions whereas it ranged from 7690 grain /m^2 at Rewa to 25984 grain /m^2 at Raipur with a mean 18208 spikelet panicle^{-1} across all the locations in drought treatment conditions. Mean spikelet number/m^2 was not significantly influenced by drought stress treatment (Table 6.2.7). However, the interactions between Location x Treatment, Location x Variety and Location x Treatment x Variety were statistically significant except Variety and Treatment x Variety. Mean spikelet number/m^2 ranged from 19218 spikelet /m^2 at Rewa to 54543 spikelet /m^2 at Raipur with a mean 36629 spikelet /m^2 across all the locations in irrigated conditions whereas it ranged from 12312 spikelet /m^2 at Rewa to 32705 spikelet /m^2 at NRRI with a mean 25604 spikelet panicle^{-1} across all the locations in drought treatment conditions. Mean grain yield (g/m^2) was not significantly influenced by drought stress treatment (Table 6.2.2). However, the interaction between Location x Treatment, Location x Variety and Location x Treatment x Variety were statistically significant except Variety and Treatment x Variety. Mean grain yield ranged from 230 g/m^2 at Ranchi to 476 g/m^2 at Rewa with a mean 359 g/m^2 across all the locations in irrigated conditions whereas it ranged from 184 g/m^2 at Pattambi to 382 g/m^2 at Rewa with a mean 259 g/m^2 across all the locations in drought conditions. Among entries, entry IL19027 has recorded the least grain yield of 254 g/m^2 followed by IL19485 (294 g/m^2) and SM-D-S-5

(312 g/m^2) whereas entry IL 19180 has recorded the highest grain yield of 445 g/m^2 followed by IL 19023 (430 g/m^2) and IL 19177 & JB 631-1 (414 g/m^2) in control. In treatment, entry IL19206 has recorded the lowest grain yield of 200 g/m^2 followed by JB 631-1 (212 g/m^2 each) whereas entries SM-D-S-11 has recorded the highest grain yield of 315 g/m^2 followed by IL19026 (302 g/m^2) and SM-D-S-3 (297 g/m^2). Mean 1000 grain weight (g) was significantly influenced by drought stress treatment (Table 6.2.10). However, the interactions between Location x Treatment, Variety, Location x Variety and Location x Treatment x Variety were statistically significant except Treatment x Variety. Mean 1000 grain weight ranged from 19.1 g at NRRI to 26.9 g at Rewa with a mean 22.3 g across all the locations in irrigated conditions whereas it ranged from 17.9 g at NRRI to 24.4 g at Rewa with a mean 20.8 g across all the locations in drought treatment conditions. Among entries, entry IL19177 has recorded the 1000 grain weight of 18.6 g followed by IL 19485 (18.9 g) and SM-D-8 (19.4 g) whereas entry IL 19408 has recorded the highest 1000 grain weight of 26.3 g followed by JB 687-2 (25.5 g) and IL 19180 (25.1 g) in control. In treatment, entry IL 19485 has recorded the lowest 1000 grain weight of 17.1 g followed by IL 19177 (17.9 g) and SM-D-S-14 (18.2 g) whereas entries IL 19408 has recorded the highest 1000 grain weight of 24.8 g followed by IL 19182 (24.3 g) and JB 687-2 (23.7 g).

Mean total dry matter (g/m^2) (TDM) was not significantly influenced by drought stress treatment (Table 6.2.11). However, the interactions between Location x Treatment, Location x Variety and Location x Treatment x Variety were statistically significant except Variety and Treatment x Variety. Mean TDM ranged from 871 g/m^2 at NRRI to 1557 g/m^2 at Pattambi with a mean 1181 g/m^2 across all the locations in irrigated conditions whereas it ranged from 763 g/m^2 at NRRI to 1121 g/m^2 at Rewa with a mean 963 g/m^2 across all the locations in drought treatment conditions. Mean harvest index (%) (HI) was not significantly influenced by drought stress treatment (Table 6.2.12). However, the interaction between Location x Treatment, Location x Variety and Location x Treatment x Variety were statistically significant except Variety and Treatment x Variety. Mean HI ranged from 22.2 % at Ranchi to 42.9 % at Rewa with a mean 30.8 % across all the locations in irrigated conditions whereas it ranged from 18.5 % at Pattambi to 34.5 % at Rewa with a mean 27.1 % across all the locations in drought conditions. Among entries, entry IL19027 has recorded the least HI of 25.7 % followed by DRT-15 (27.7 %) and DRT-9 (27.8 %) whereas entry IL 19023 has recorded the highest HI of 35.0 % followed by DRT-1 (33.3 %) and IL 19026 (33.1 %) in control. In treatment, entry JB

631-1 has recorded the lowest HI of 22 % followed by WGL-14 (24.1 %) whereas entries IL 19027 has recorded the highest HI of 29.4 % followed by IL19026 (29.3 %) and IL19023 (29.0 %).

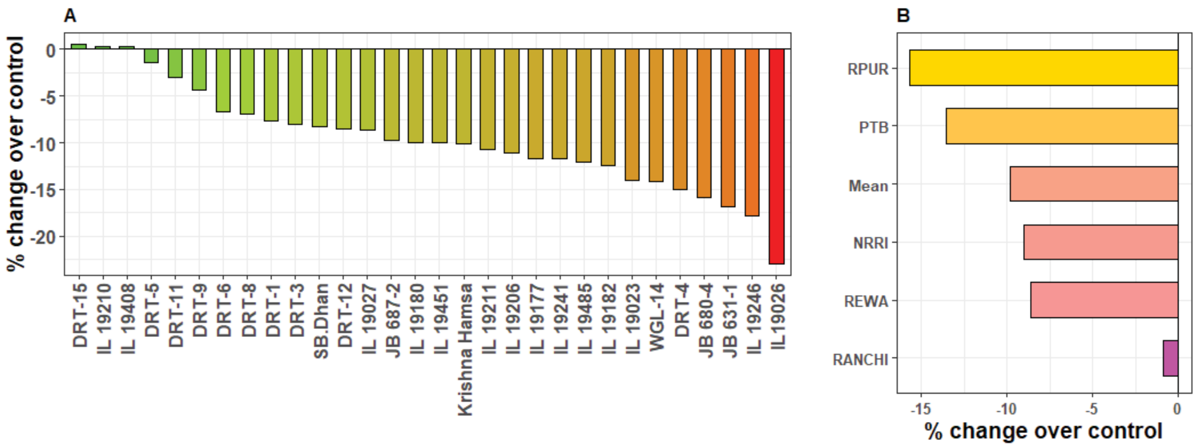


Fig 6.2.2: Influence of irrigation regimes on Tiller Number/Plant recorded at maturity in different rice genotypes at different AICRIP centres during kharif-2023. [A] Mean of all locations [B] Mean of all genotypes. Each value represents % change under rainfed treatment in comparison with irrigated control.

In terms of percentage change under rainfed treatment in comparison with irrigated control (Fig 6.2.2A), tiller number plant^{-1} DRT-15 followed by IL19408 followed by IL 19210 in that order has shown the enhancement whereas IL 19026 followed by IL 19246 followed by JB 631-1 in that order has shown the highest reduction in tiller number plant^{-1}. Among centres, All the centres have recorded the reduction in tiller number plant^{-1}. Ranchi has shown the highest reduction tiller number plant^{-1} followed by Rewa and NRRI (Fig 6. 2.2B).

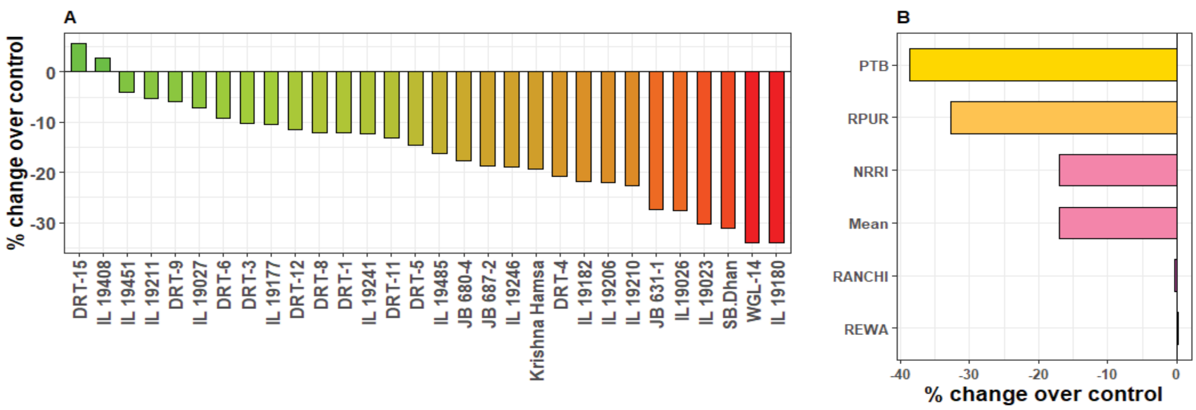


Fig. 6.2.3: Influence of irrigation regimes on panicle weight/m^2 recorded at maturity in different rice genotypes at different AICRIP centres during kharif-2023. [A] Mean of all locations [B] Mean of all genotypes. Each value represents % change under rainfed treatment in comparison with irrigated control.

Entry DRT-15 followed by IL 19048 has shown the positive enhancement of about 5 % and 2 % respectively over control in panicle weight/m^2 (Fig. 6.2.3A). Rest all other entries have recorded the reduction. Entry IL 19180 has shown the highest negative reduction in panicle weight/m^2 under rainfed treatment in comparison with irrigated control followed by WGL-14 and SB Dhan. Among centers, Rewa has recorded the positive near zero under increase in % change under rainfed treatment in comparison with irrigated control whereas Ranchi has recorded the least reduction in % change under rainfed treatment in comparison with irrigated control followed by NRRI panicle weight/m^2. Pattambi has recorded the highest reduction in % change under rainfed treatment in comparison with irrigated control panicle weight/m^2 (Fig. 6.2.3B).

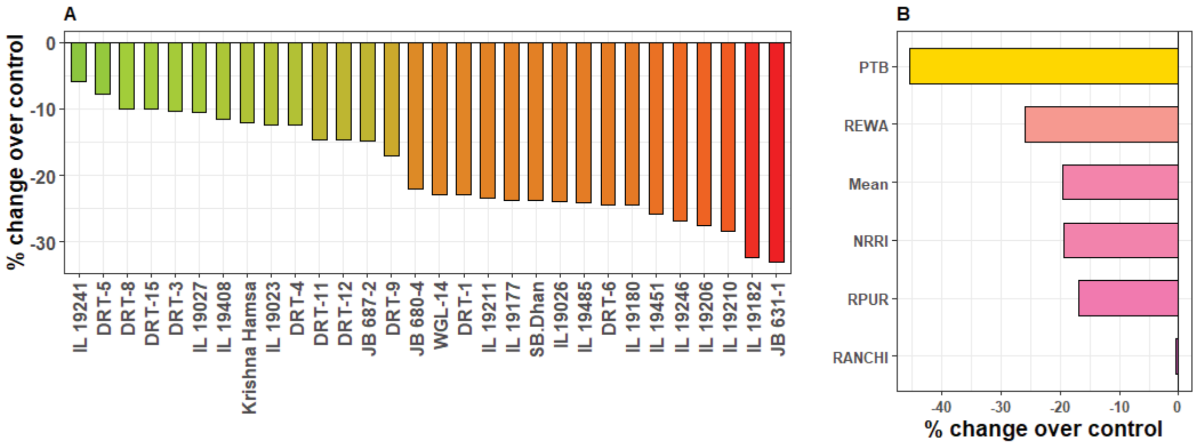


Fig. 6.2.4: Influence of irrigation regimes on Grain number/Panicle in different rice genotypes at different AICRIP centres during kharif-2023. [A] Mean of all locations [B] Mean of all genotypes. Each value represents % change under rainfed treatment in comparison with irrigated control.

All the entries have recorded the reduction in Grain number/Panicle with respect to % change under rainfed treatment in comparison with irrigated control (Fig. 6.2.4A). Entry JB 631-1 has recorded the highest reduction in the % change under rainfed treatment in comparison with irrigated control followed by IL 19182 and IL 19210 whereas IL 19241 has recorded the least reduction. All the centres have recorded the reduction in % change under rainfed treatment in comparison with irrigated control, however, Ranchi has recorded the least and near zero reduction and Pattambi has recorded the highest reduction more than 40% (Fig. 6.2.4B).

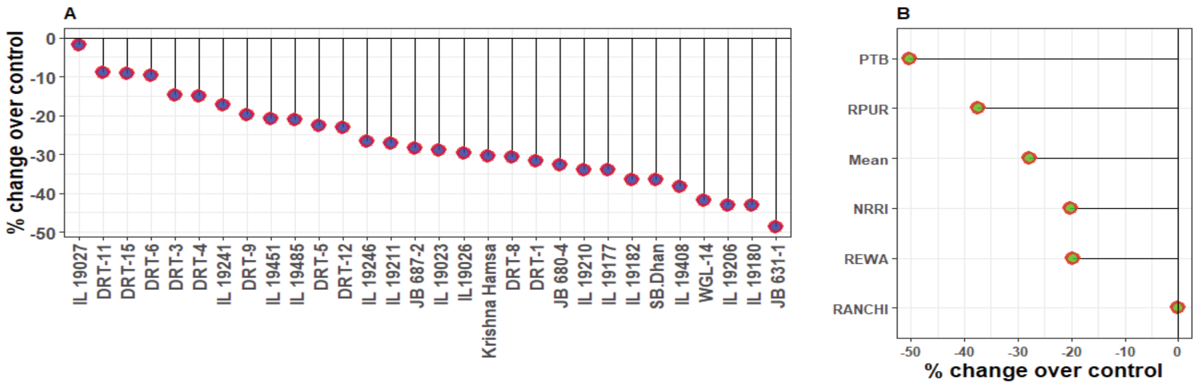


Fig. 6.2.5: Influence of irrigation regimes on Grain Yield (g/m^2) in different rice genotypes at different AICRIP centres during kharif-2023. [A] Mean of all locations [B] Mean of all genotypes. Each value represents % change under rainfed treatment in comparison with irrigated control.

The % change grain yield (g/m^2) under rainfed treatment in comparison with irrigated control shows that all the entries has recorded the reduction ranging from -2% to abpot-48%. Entry IL 19027 has shown the least reduction of -2% followed by DRT-11 & DRT-15 (-9% each) whereas JB631-1 has recorded the highest reduction of about -48% followed by IL19180 (Fig. 6.2.5A). Among centres, Ranchi has recorded the zero % change grain yield (g/m^2) under rainfed treatment in comparison with irrigated control whereas Pattambi has recorded the highest reduction of about -50% (Fig. 6.2.5B).

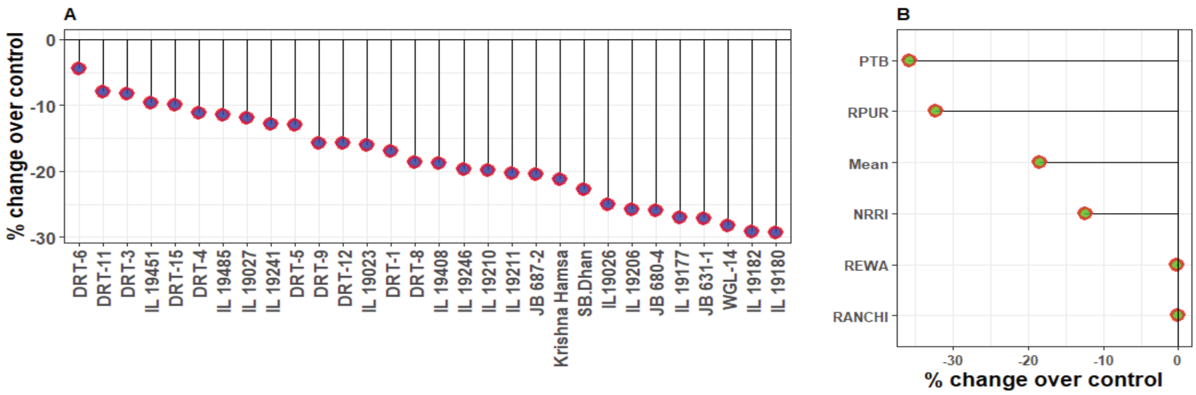


Fig. 6.2.6: Influence of irrigation regimes on TDM (g/m^2) at maturity in different rice genotypes at different AICRIP centres during kharif-2023. [A] Mean of all locations [B] Mean of all genotypes. Each value represents % change under rainfed treatment in comparison with irrigated control.

The % change TDM (g/m^2) under rainfed treatment in comparison with irrigated control shows that all the entries have recorded the reduction ranging from -5% to -29%. Entry DRT-6 has shown the least reduction of -5% followed by DRT-11 & DRT-3 (-8% each) whereas IL 19180 has recorded the highest reduction of about -29% followed by IL19182 (-27%) (Fig. 6.2.6A). Among centres, Ranchi and Rewa has recorded the zero % change grain yield (g/m^2) under rainfed treatment in comparison with irrigated control whereas Pattambi has recorded the highest reduction of about -50% followed by Raipur (33%) (Fig. 6.2.5B).

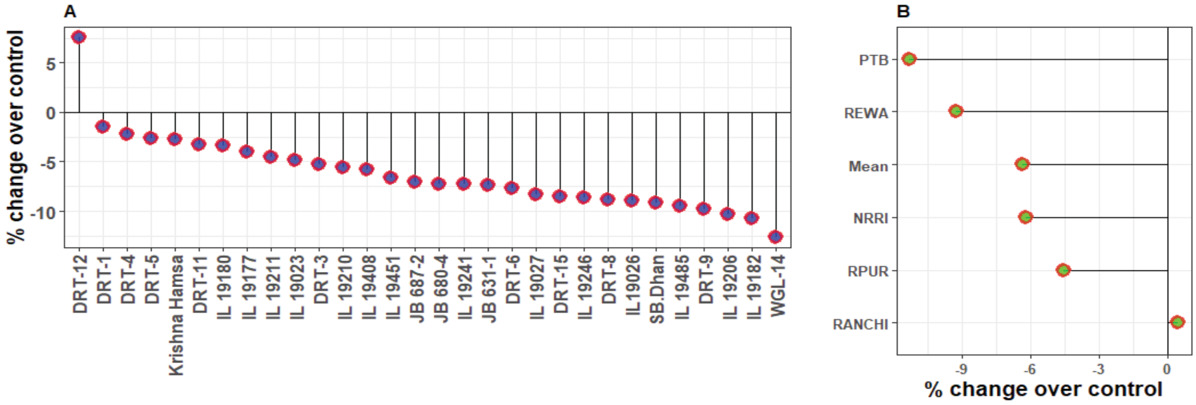


Fig. 6.2.7: Influence of irrigation regimes on 1000 grain weight (g) in different rice genotypes at different AICRIP centres during kharif-2023. [A] Mean of all locations [B] Mean of all genotypes. Each value represents % change under rainfed treatment in comparison with irrigated control.

Fig. 6.2.7A shows that except DRT-12 all the entries has shown reduction in % change 1000 grain weight (g) under rainfed treatment in comparison with irrigated control. DRT-12 has recorded the increase in the % change 1000 grain weight (g) under rainfed treatment in comparison with irrigated control to the tune of 10%. WGL-14 has recorded the highest reduction (15%) in the % change 1000 grain weight (g) under rainfed treatment in comparison with irrigated control followed by IL 19182 (12%) and IL 19206 (11%) whereas entry DRT-1 has recorded 3% followed by DRT-4 4% which is the least. Among centres Ranchi has recorded positive increase in the % change 1000 grain weight (g) under rainfed treatment in comparison with irrigated control rest all other centres have recorded reduction in the range from 4.5% (Raipur) to 10% (Pattambi) (Fig. 6.2.7B).

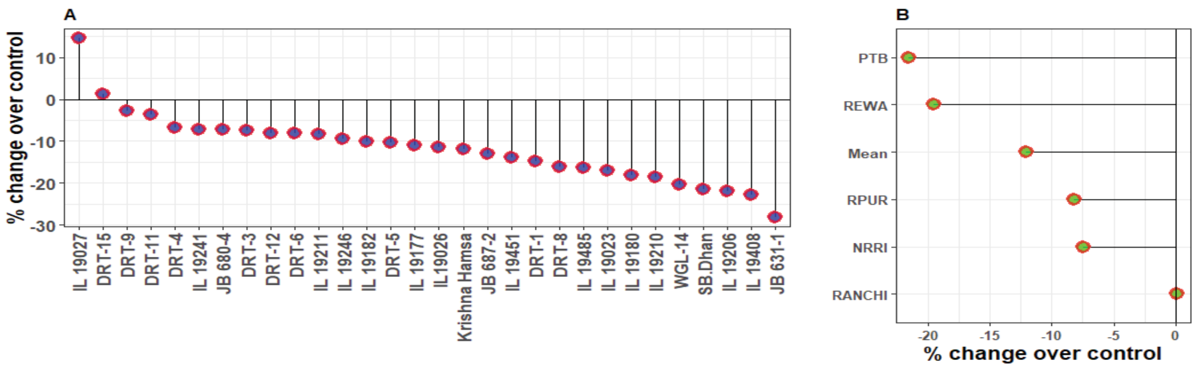


Fig. 6.2.8: Influence of irrigation regimes Harvest Index (%) in different rice genotypes at different AICRIP centres during kharif-2023. [A] Mean of all locations [B] Mean of all genotypes. Each value represents % change under rainfed treatment in comparison with irrigated control.

Fig. 6.2.8 A shows that except IL 19027 and DRT-15 all the entries have shown reduction in % change harvest index under rainfed treatment in comparison with irrigated control. IL 19027 has recorded the increase in the % change harvest index under rainfed treatment in comparison with irrigated control to the tune of 15% followed by DRT-15 (1.2%). JB 631-1 has recorded the highest reduction (27%) in the % change harvest index under rainfed treatment in comparison with irrigated control followed by IL 19408 (25%) and IL 19206 (23%) whereas entry DRT-9 has recorded 2.5% followed by DRT-11 3.5%. Among centres Ranchi has recorded zero % change in harvest index under rainfed treatment in comparison with irrigated control rest all other centres have recorded reduction in the range from 7.5% (NRRI) to 23% (Pattambi) (Fig. 6.2.8B).

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 DRT-5, IL 19026, IL 19023, DRT-3 and DRT-12 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.

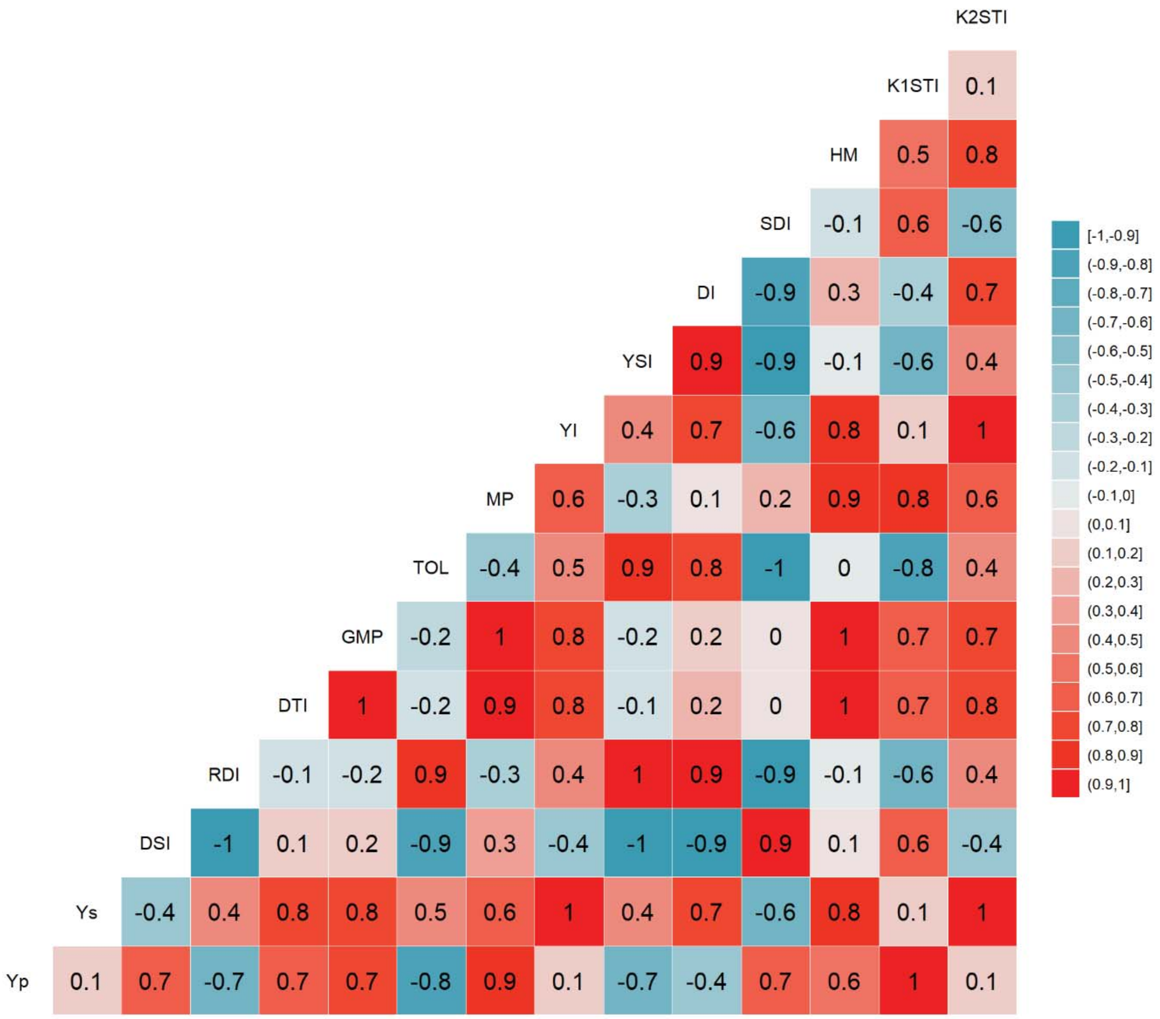


Fig. 6.2.10: Relationship between grain yield recorded under irrigated and rain fed condition and drought tolerant indices. For computing indices mean yield values for all the locations were used.

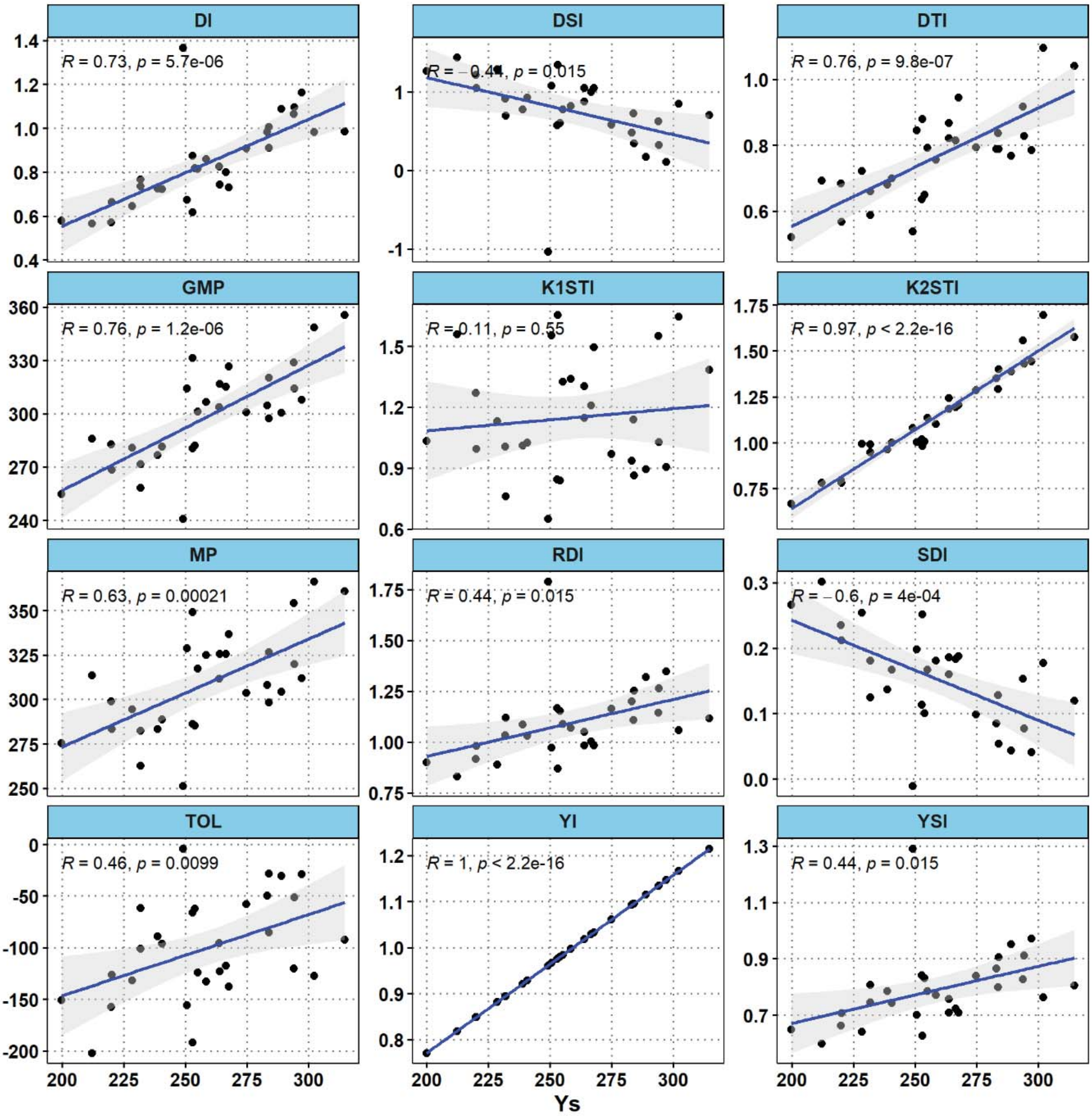


Fig 6.2.11: Relationship between grain yield recorded under rainfed condition (drought) and different drought tolerance indices computed from grain yield recorded under both rainfed and irrigated conditions. For computing indices mean yield values for all the locations were used.

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 rainfed 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, DRT-5, IL 19026, DRT-11, DRT-3, IL 19023, DRT-6, DRT-15, DRT-12, DRT-4, IL 19241, IL 19177, DRT-8, DRT-1 and IL 19246 could be identified as stable genotypes under rainfed condition.

Screening of elite rice genotypes for drought tolerance during *Rabi* 2022-23 season at Titabar

The data for tiller number per plant at maturity, Shoot weight at maturity (g/m^2), Panicle weight (g/m^2) and Panicle number/m^2 at TTB center during Rabi (dry) season 2022-23 was presented in Table 6.2.13 and Fig 6.2.9. Tiller number per plant at maturity was significantly influenced by drought stress treatment. Mean tiller number per plant at maturity was 9.6 and 8.4 per plant in irrigated and rainfed conditions respectively. Entry DRR Dhan-44 & IL-19079 has recorded the lowest tiller number per plant (6.7 per plant) whereas IL-19100 has recorded the highest 11.3 per plant. Shoot weight (g) at maturity was significantly influenced by drought stress treatment. Mean shoot weight at maturity was 722 g and 571 g per plant in irrigated and rainfed conditions respectively. Entry IL-19088 has recorded the lowest tiller number per plant (597 g) whereas IL-19194 has recorded the highest 690 g. Panicle weight (g/m^2) was significantly influenced by drought stress treatment. Mean panicle weight was 432 g/m^2 and 284 g/m^2 per plant in irrigated and rainfed conditions respectively. Entry IL-19088 has recorded the lowest tiller number per plant (319 g/m^2) whereas IL-19194 has recorded the highest 418 g/m^2. Panicle number m^{-2} was significantly influenced by drought stress treatment. Mean panicle number/m^2 was 270 m^{-2} and 214 m^{-2} per plant in irrigated and rainfed conditions respectively. Entry IL-19353 has recorded the lowest tiller number per plant (200 m^{-2}) whereas IL-19196 has recorded the highest 314 m^{-2}. The data for grain number/panicle, spikelet number/panicle, grain number m^{-2} and spikelet number m^{-2} at TTB center during Rabi (dry) season 2022-23 was presented in Table 6.2.14. Grain number/panicle was significantly influenced by drought stress treatment. Mean grain number/panicle was 115 and 78 in irrigated and rainfed conditions respectively. Entry IET 30241 has recorded the lowest grain number/panicle (78) whereas IL-19186 has recorded the highest 116. Spikelet number/panicle was significantly influenced by drought stress treatment. Mean shoot weight at maturity was 140 and 125 in irrigated and rainfed conditions respectively. Grain number m^{-2} was significantly influenced by drought stress treatment. Mean grain number m^{-2} was 31136 m^{-2} and 16639 m^{-2} in irrigated and rainfed conditions respectively. Spikelet number m^{-2} was significantly influenced by drought stress treatment. Mean spikelet number m^{-2} was 37735 m^{-2} and 24522 m^{-2} in irrigated and rainfed conditions respectively. The data for Total dry matter (g/m^2), Grain yield (g/m^2), 1000 grain weight (g) and Harvest index (%) at TTB center during Rabi (dry) season 2022-23 was presented in Table 6.2.15. TDM was significantly influenced by drought stress treatment. Mean TDM was 1203 g/m^2 and 999 g/m^2 in irrigated and rainfed conditions respectively. Grain yield

(g/m^2) was significantly influenced by drought stress treatment. Mean grain yield was 375 g/m^2 and 271 g/m^2 in irrigated and rainfed conditions respectively. 1000 grain weight (g) was significantly influenced by drought stress treatment. Mean 1000 grain weight was 22.5 g and 21.1 g in irrigated and rainfed conditions respectively. Harvest index (%) was significantly influenced by drought stress treatment. Mean HI was 31.2 % and 27.1 % in irrigated and rainfed conditions respectively. Fig. 6.2.9 shows that all the entries have shown reduction in % change 1000 grain weight (g) under rainfed treatment in comparison with irrigated control least reduction was shown by IET 29859, IL19353 and IL 19451 about 7% each. Fig. 6.2.9 shows % change under rainfed condition in relation to irrigated control treatment in various parameters such as 1000 grain weight (g), grain number/panicle, Grain yield Harvest index (%), panicle weight, tiller number per plant and Total dry matter. At Titabar centre, all the above parameters have shown reduction in % change under rainfed condition in relation to irrigated control treatment except in HI, entry IL 19083 has recorded the zero % change.

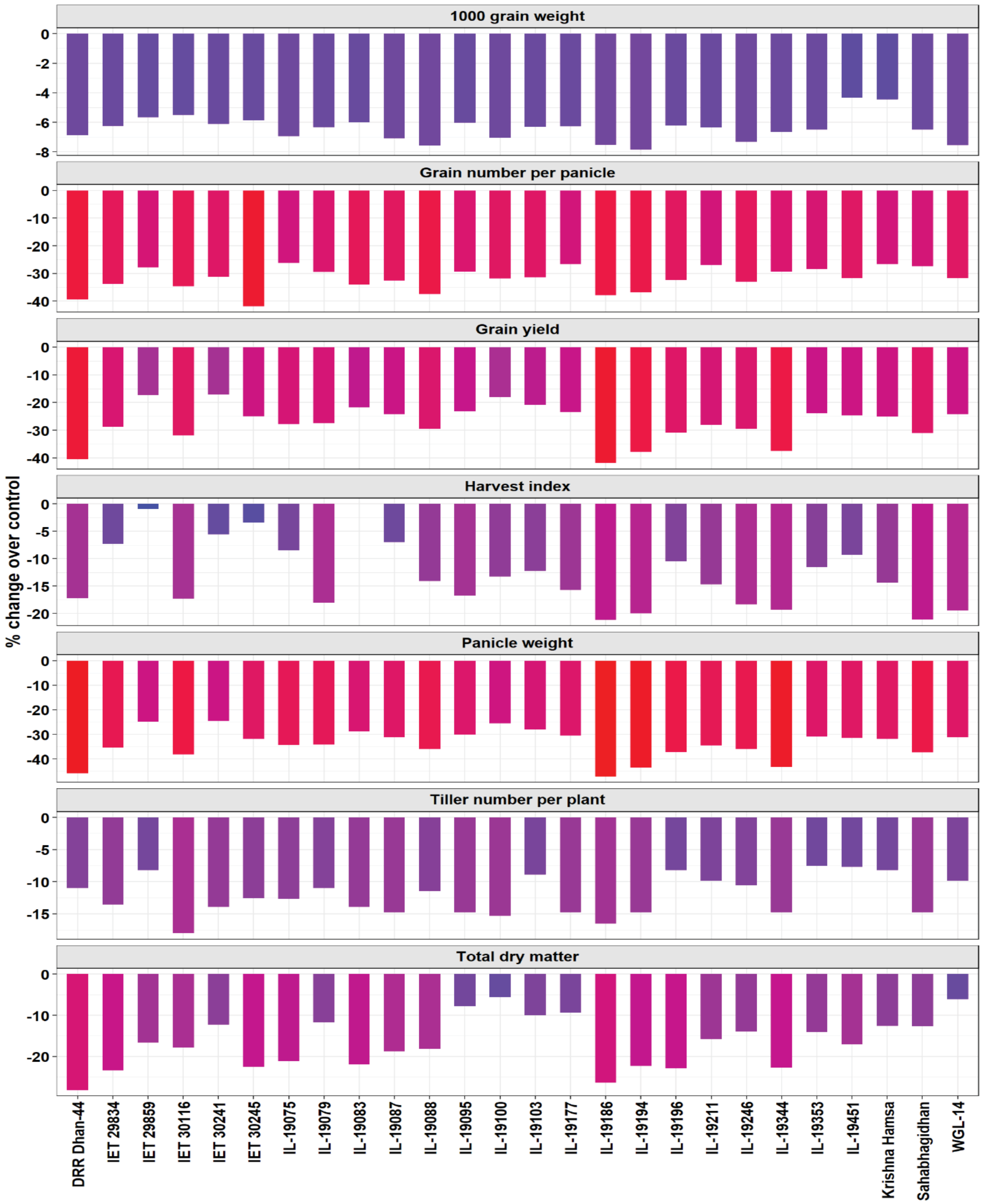


Fig 6.2.9: Influence of irrigation regimes on important physiological traits in selected rice genotypes at TTB centre during Rabi season. Each bar represents % change under rainfed condition in relation to irrigated control treatment.

Different drought tolerance indices including Drought Resistance Index (DI), Drought susceptibility index (DSI), Relative Drought index (RDI), Drought tolerance index (DTI), Geometric mean productivity (GMP), Tolerance (TOL), Mean production (MP), Yield index

(YI), 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 IET 29834, IET 29859, IL-19083, IL-19079 and IL-19194 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.

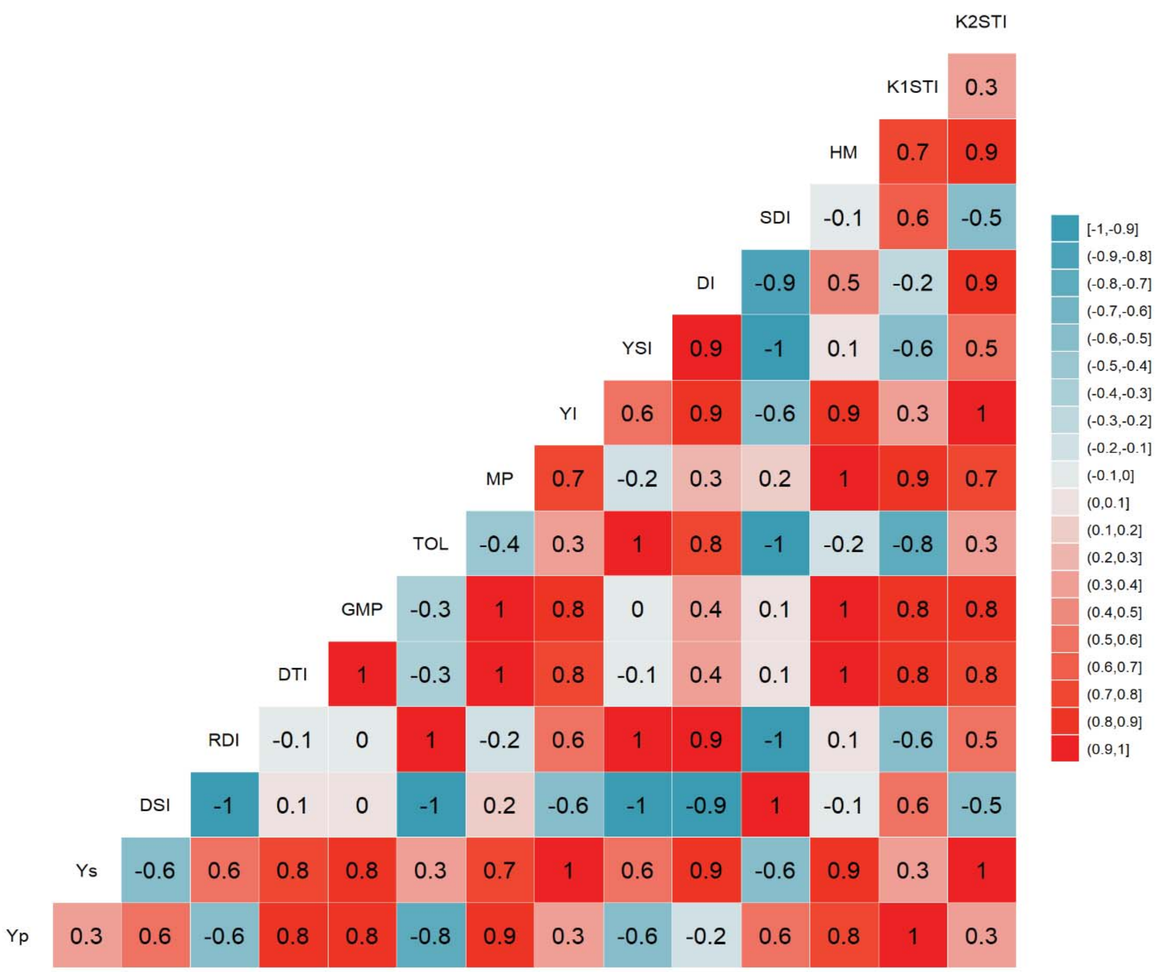


Fig. 6.2.12: Relationship between different drought tolerance indices and grain yield recorded under Rainfed (Ys) and Irrigated control (Yp) at TTB centre during Rabi season

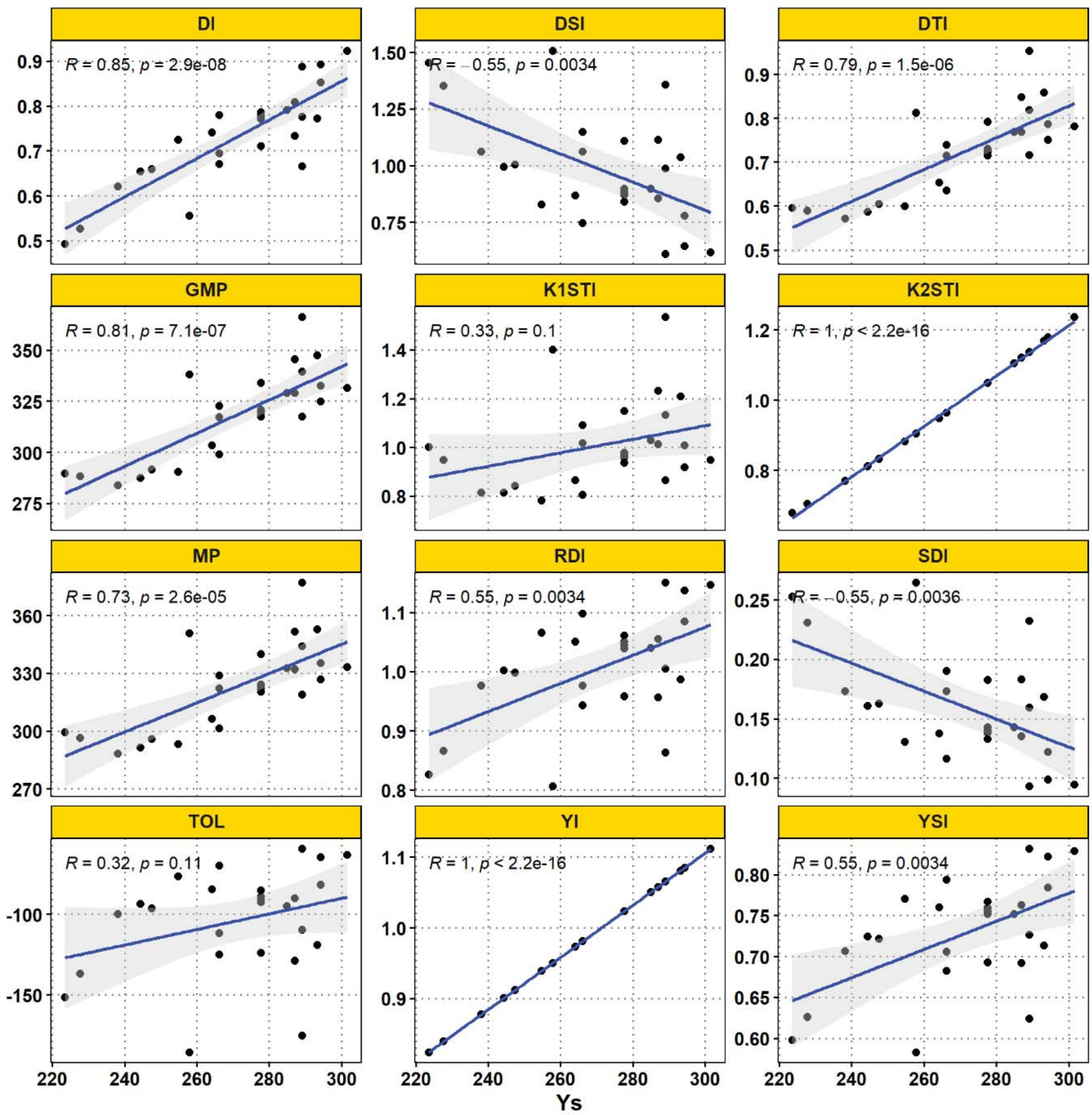


Fig 6.2.13: Relationship between grain yield recorded under rainfed condition (drought) and different drought tolerance indices computed from grain yield recorded under both rainfed and irrigated conditions at TTB centre during Rabi season

Summary & Conclusions

- Mean grain yield (mean of all locations) was reduced by show 27.8% under rainfed condition in comparison with irrigated control. IL 19027 (1.73%), DRT-11 (8.91%), DRT-15 (9.07%) and DRT-6 (9.60%) exhibited least 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 DRT-5, IL 19026, IL 19023, DRT-3 and DRT-12 may be considered as relatively drought tolerant.

- Parametric model for simultaneous selection in yield and stability across locations and YSi values identified DRT-5, IL 19026, DRT-11, DRT-3, IL 19023, DRT-6, DRT-15, DRT-12, DRT-4, IL 19241, IL 19177, DRT-8, DRT-1 and IL 19246 as stable genotypes under rainfed condition.
- At Titabar centre the trial was conducted during Rabi (dry) season with 26 entries. IET 30241, IET 29859, IL-19100 and IL-19103 exhibited minimum reduction in grain yield (< 20%) in comparison with irrigated control and can be considered as donors for breeding under rainfed conditions. Based on drought tolerance indices IET 29834, IET 29859, IL-19083, IL-19079 and IL-19194 could be identified as drought tolerant and are suitable for cultivation under 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/hill at different centers *Kharif* 2023

S.No.	Genotypes	IRRIGATED					Grand Mean	DROUGHT					Grand Mean
		NRRI	PTB	RANCHI	REWA	RPUR		NRRI	PTB	RANCHI	REWA	RPUR	
1	DRT-1	7.7	9.9	8.0	8.7	10.2	**8.9**	5.7	9.0	8.0	9.1	9.2	**8.2**
2	DRT-11	5.6	10.5	8.7	9.8	10.9	**9.1**	5.9	9.7	10.0	9.0	9.5	**8.8**
3	DRT-12	6.5	10.7	8.3	8.2	11.1	**9.0**	5.5	9.9	9.3	7.5	8.8	**8.2**
4	DRT-15	7.5	9.4	8.0	9.3	9.3	**8.7**	7.1	9.7	9.3	9.8	7.7	**8.7**
5	DRT-3	6.7	9.9	10.3	9.0	10.4	**9.3**	6.3	7.8	10.0	8.4	10.2	**8.5**
6	DRT-4	7.7	9.3	9.7	10.4	11.1	**9.6**	6.0	7.9	9.3	9.9	7.8	**8.2**
7	DRT-5	5.4	10.3	9.0	9.5	8.7	**8.6**	5.4	9.5	9.7	9.4	8.3	**8.4**
8	DRT-6	6.5	9.7	9.3	9.1	9.6	**8.9**	6.0	9.3	8.0	9.6	8.4	**8.3**
9	DRT-8	4.9	11.4	8.7	9.2	9.9	**8.8**	5.1	8.7	8.0	9.7	9.6	**8.2**
10	DRT-9	7.4	10.1	8.3	9.2	10.5	**9.1**	7.2	10.1	8.7	7.7	9.9	**8.7**
11	IL 19023	8.3	8.8	9.7	9.0	12.2	**9.6**	6.9	7.2	9.7	8.7	8.8	**8.2**
12	IL 19027	8.7	7.9	9.3	10.3	11.9	**9.6**	7.7	8.0	9.0	9.1	10.3	**8.8**
13	IL 19177	5.8	10.9	7.7	9.4	10.3	**8.8**	5.9	8.6	8.7	7.0	8.8	**7.8**
14	IL 19180	6.5	10.4	8.3	9.0	9.2	**8.7**	5.6	9.3	9.7	7.3	7.2	**7.8**
15	IL 19182	6.1	9.3	10.7	7.3	11.5	**9.0**	6.5	7.8	9.0	8.8	7.2	**7.9**
16	IL 19206	8.2	8.4	9.3	9.6	10.9	**9.3**	7.7	8.6	8.7	8.0	8.2	**8.3**
17	IL 19210	6.4	9.3	8.3	8.2	10.4	**8.5**	6.7	8.2	9.0	9.8	9.1	**8.5**
18	IL 19211	7.5	7.8	7.7	10.5	11.1	**8.9**	7.1	6.5	9.0	8.3	8.8	**8.0**
19	IL 19241	9.8	8.6	8.0	11.0	9.6	**9.4**	7.6	6.8	9.0	10.0	8.2	**8.3**
20	IL 19246	7.0	10.1	10.7	9.8	9.9	**9.5**	6.5	7.1	8.0	9.6	7.8	**7.8**
21	IL 19408	6.0	9.1	9.3	9.5	9.7	**8.7**	6.0	8.4	10.7	8.8	9.9	**8.8**
22	IL 19451	7.5	8.3	9.3	7.2	11.8	**8.8**	6.5	6.9	7.7	8.8	9.9	**7.9**
23	IL 19485	7.3	10.3	8.0	8.5	11.4	**9.1**	6.3	8.9	8.0	8.5	8.4	**8.0**
24	IL19026	7.1	8.7	10.3	9.6	14.1	**10.0**	6.7	7.5	7.3	7.7	9.1	**7.7**
25	JB 631-1	6.9	10.6	9.7	8.8	11.5	**9.5**	6.1	8.2	8.7	8.0	8.5	**7.9**
26	JB 680-4	7.5	10.1	10.3	11.8	10.9	**10.1**	7.3	8.1	10.7	7.8	8.7	**8.5**
27	JB 687-2	9.3	10.4	8.7	10.7	8.9	**9.6**	7.8	7.4	8.3	9.7	10.2	**8.7**
28	Krishna Hamsa	8.1	7.8	8.3	12.0	9.9	**9.2**	7.2	6.6	9.3	8.6	9.7	**8.3**
29	SB.Dhan	7.1	10.5	8.7	11.1	9.6	**9.4**	6.6	9.5	9.0	8.3	9.8	**8.6**
30	WGL-14	6.5	10.7	9.3	10.7	10.2	**9.5**	5.5	8.9	8.0	9.1	9.2	**8.2**
	Mean	**7.1**	**9.6**	**9.0**	**9.6**	**10.6**	**9.2**	**6.5**	**8.3**	**8.9**	**8.7**	**8.9**	**8.3**
	LSD (Treat)				0.33*			*LSD (Treat x Variety)*				ns	
	LSD (Location x Treat)				ns			*LSD (Location x Treat x Variety)*				1.89*	
	LSD (Variety)				ns			*CV(%) Treat*				25.59	
	LSD (Location x Variety)				1.76**								

Table 6.2.2 Screening for elite rice culture for drought tolerance on Shoot weight (g/m²) at different centers *Kharif* 2023

S.No.	Genotypes	IRRIGATED					Grand Mean	DROUGHT					Grand Mean
		NRRI	PTB	RANCHI	REWA	RPUR		NRRI	PTB	RANCHI	REWA	RPUR	
1	SM-D-S-1	430	1057	513	513	513	**605**	361	770	517	597	319	**513**
2	SM-D-S-3	397	1137	509	500	754	**659**	378	827	517	553	436	**542**
3	SM-D-S-4	691	1229	504	557	662	**729**	375	1003	526	626	465	**599**
4	SM-D-S-5	495	1063	527	502	565	**630**	382	750	519	694	265	**522**
5	SM-D-S-6	439	1113	513	525	602	**638**	440	903	517	585	334	**556**
6	SM-D-8	494	1002	514	550	563	**624**	345	707	503	619	344	**504**
7	SM-D-S-11	558	1200	505	508	553	**665**	444	930	526	550	391	**568**
8	SM-D-S-14	550	982	525	506	535	**619**	457	940	520	584	424	**585**
9	SM-D-S-15	468	1115	517	401	465	**593**	346	820	528	604	333	**526**
10	SM-D-S-19	556	900	516	571	664	**641**	419	730	519	611	494	**555**
11	IL 19023	450	703	517	527	773	**594**	425	347	515	677	630	**519**
12	IL 19027	322	580	526	556	403	**477**	313	403	523	726	264	**446**
13	IL 19177	646	1130	528	447	897	**730**	569	657	512	687	598	**605**
14	IL 19180	709	1082	517	633	834	**755**	615	627	496	687	442	**573**
15	IL 19182	495	1111	511	582	855	**711**	425	699	507	639	407	**535**
16	IL 19206	365	796	515	636	511	**565**	378	663	520	706	294	**512**
17	IL 19210	482	1164	522	497	763	**685**	507	693	524	636	383	**549**
18	IL 19211	373	843	526	580	466	**558**	342	550	522	686	294	**479**
19	IL 19241	427	861	519	585	473	**573**	460	467	520	662	354	**493**
20	IL 19246	555	1143	525	466	743	**686**	563	687	528	586	475	**568**
21	IL 19408	535	1196	509	571	763	**715**	507	593	517	555	344	**503**
22	IL 19451	460	850	516	568	483	**575**	473	670	510	594	255	**500**
23	IL 19485	404	833	519	492	624	**575**	479	603	507	672	675	**587**
24	IL19026	463	1298	515	509	800	**717**	490	447	518	532	427	**483**
25	JB 631-1	562	1247	515	485	1011	**764**	646	715	512	602	662	**627**
26	JB 680-4	402	746	501	535	599	**556**	346	573	507	656	389	**494**
27	JB 687-2	431	1203	517	539	681	**674**	443	710	514	623	333	**525**
28	Krishna Hamsa	358	588	518	480	524	**493**	411	257	513	590	252	**405**
29	SB.Dhan	339	893	529	464	623	**570**	296	547	520	704	249	**463**
30	WGL-14	567	1064	512	543	695	**676**	582	550	527	615	435	**542**
	Mean	**481**	**1004**	**517**	**528**	**647**	635	**441**	**661**	**517**	**629**	**399**	529
	LSD (Treat)				ns			*LSD (Treat x Variety)*				ns	
	LSD (Location x Treat)				55.38**			*LSD (Location x Treat x Variety)*				160.9**	
	LSD (Variety)				38.68*			*CV (%) Treat*				20.13	
	LSD (Location x Variety)				113.8**								

Table 6.2.3 Screening for elite rice culture for drought tolerance on Panicle weight (g/m^2) at different centers *Kharif* 2023

S.No.	Genotypes	IRRIGATED					Grand Mean	DROUGHT					Grand Mean
		NRRI	PTB	RANCHI	REWA	RPUR		NRRI	PTB	RANCHI	REWA	RPUR	
1	SM-D-S-1	402	517	522	632	508	**516**	316	487	530	683	251	**453**
2	SM-D-S-3	321	485	518	654	708	**537**	284	527	520	630	374	**467**
3	SM-D-S-4	494	420	528	644	592	**536**	261	530	525	676	380	**474**
4	SM-D-S-5	384	330	517	599	445	**455**	342	447	529	741	347	**481**
5	SM-D-S-6	338	387	526	732	460	**489**	355	497	528	619	193	**438**
6	SM-D-8	396	372	520	656	550	**499**	281	413	523	698	58	**395**
7	SM-D-S-11	431	750	530	663	389	**553**	336	550	518	635	323	**472**
8	SM-D-S-14	445	460	528	630	460	**504**	301	407	519	668	395	**458**
9	SM-D-S-15	438	667	518	538	541	**540**	381	327	514	695	457	**475**
10	SM-D-S-19	466	330	513	655	250	**443**	326	363	517	656	219	**416**
11	IL 19023	397	710	525	641	938	**642**	380	233	517	785	324	**448**
12	IL 19027	186	640	523	647	218	**443**	359	173	526	738	258	**411**
13	IL 19177	368	623	516	709	258	**495**	313	270	511	751	369	**443**
14	IL 19180	584	767	520	755	1141	**753**	416	370	516	667	513	**496**
15	IL 19182	491	748	524	753	407	**584**	357	287	526	692	423	**457**
16	IL 19206	373	567	521	700	531	**538**	371	262	527	659	280	**420**
17	IL 19210	394	632	529	758	652	**593**	374	377	526	641	373	**458**
18	IL 19211	419	393	525	669	318	**465**	329	203	520	690	458	**440**
19	IL 19241	368	409	520	657	361	**463**	331	283	524	731	159	**406**
20	IL 19246	321	722	520	716	449	**546**	247	347	517	673	427	**442**
21	IL 19408	381	367	526	685	589	**510**	345	490	513	565	705	**524**
22	IL 19451	385	533	515	813	602	**570**	315	407	520	683	808	**547**
23	IL 19485	333	440	527	631	473	**481**	224	293	518	698	282	**403**
24	IL19026	407	705	520	613	919	**633**	373	197	524	613	584	**458**
25	JB 631-1	364	663	521	757	375	**536**	222	317	522	608	276	**389**
26	JB 680-4	295	857	533	740	559	**597**	275	350	525	760	547	**492**
27	JB 687-2	382	460	530	642	515	**506**	326	220	522	694	296	**412**
28	Krishna Hamsa	337	303	528	688	707	**513**	323	153	518	700	373	**414**
29	SB.Dhan	488	513	525	698	472	**539**	374	123	524	762	73	**371**
30	WGL-14	299	808	526	786	681	**620**	258	283	528	698	278	**409**
	Mean	**390**	**553**	**523**	**682**	**536**	**537**	**323**	**340**	**522**	**684**	**360**	**446**
	LSD (Treat)				ns			*LSD (Treat x Variety)*				ns	
	LSD (Location x Treat)				38.93**			*LSD (Location x Treat x Variety)*				133.6**	
	LSD (Variety)				ns			*CV (%) Treat*				16.78	
	LSD (Location x Variety)				94.47**								

Table 6.2.4 Screening for elite rice culture for drought tolerance on Panicle number/m^2 at different centers *Kharif* 2023

S.No.	Genotypes	IRRIGATED					Grand Mean	DROUGHT					Grand Mean
		NRRI	PTB	RANCHI	REWA	RPUR		NRRI	PTB	RANCHI	REWA	RPUR	
1	SM-D-S-1	252	467	198	95	207	**244**	236	477	201	111	93	**224**
2	SM-D-S-3	206	450	203	116	264	**248**	216	513	204	78	153	**233**
3	SM-D-S-4	274	443	207	153	187	**253**	208	457	203	82	133	**217**
4	SM-D-S-5	289	523	201	125	188	**265**	280	520	195	114	142	**250**
5	SM-D-S-6	244	323	199	111	175	**210**	280	457	199	64	109	**222**
6	SM-D-8	295	567	203	145	244	**291**	238	397	198	114	33	**196**
7	SM-D-S-11	285	453	201	119	146	**241**	241	520	201	78	113	**230**
8	SM-D-S-14	278	687	197	131	235	**305**	283	513	197	43	138	**235**
9	SM-D-S-15	220	377	196	109	169	**214**	204	410	201	87	102	**201**
10	SM-D-S-19	286	720	204	149	75	**287**	238	513	209	90	96	**229**
11	IL 19023	263	517	201	114	269	**273**	259	373	199	132	124	**217**
12	IL 19027	252	546	205	167	139	**262**	274	287	198	111	107	**195**
13	IL 19177	220	327	205	124	82	**191**	248	323	201	119	92	**197**
14	IL 19180	240	380	201	127	257	**241**	231	463	199	133	114	**228**
15	IL 19182	265	617	196	146	174	**280**	201	383	209	104	126	**205**
16	IL 19206	256	667	200	153	175	**290**	266	380	201	159	115	**224**
17	IL 19210	218	503	201	160	208	**258**	245	440	204	128	109	**225**
18	IL 19211	270	507	200	148	187	**262**	250	337	201	123	111	**204**
19	IL 19241	291	373	201	168	167	**240**	272	450	195	68	117	**220**
20	IL 19246	216	514	198	162	163	**251**	231	407	196	117	131	**216**
21	IL 19408	202	260	206	125	178	**194**	204	463	202	131	211	**243**
22	IL 19451	262	413	203	138	234	**250**	242	433	198	102	274	**250**
23	IL 19485	235	361	199	122	185	**220**	253	460	199	92	132	**227**
24	IL19026	252	570	204	110	347	**297**	265	367	199	102	206	**228**
25	JB 631-1	205	353	198	158	204	**224**	225	427	206	113	109	**216**
26	JB 680-4	230	740	203	145	178	**299**	226	403	201	100	227	**232**
27	JB 687-2	256	460	203	105	229	**251**	270	363	204	131	125	**219**
28	Krishna Hamsa	265	347	200	142	221	**235**	281	367	198	75	167	**217**
29	SB.Dhan	228	457	206	133	179	**240**	222	370	198	65	27	**176**
30	WGL-14	229	593	197	125	211	**271**	232	367	202	146	98	**209**
	Mean	**249**	**484**	**201**	**134**	**196**	**253**	**244**	**421**	**201**	**104**	**128**	**220**
	LSD (Treat)				ns			*LSD (Treat x Variety)*				ns	
	LSD (Location x Treat)				15.83**			*LSD (Location x Treat x Variety)*				79.39**	
	LSD (Variety)				ns			*CV (%) Treat*				14.19	
	LSD (Location x Variety)				56.14**								

Table 6.2.5 Screening for elite rice culture for drought tolerance on Grain number/panicle at different centers *Kharif* 2023

S.No.	Genotypes	IRRIGATED					Grand Mean	DROUGHT					Grand Mean
		NRRI	PTB	RANCHI	REWA	RPUR		NRRI	PTB	RANCHI	REWA	RPUR	
1	SM-D-S-1	93	51	96	100	157	**99**	76	54	101	46	105	**77**
2	SM-D-S-3	121	77	100	98	138	**107**	96	58	96	75	131	**91**
3	SM-D-S-4	130	49	102	107	164	**111**	102	57	100	77	135	**94**
4	SM-D-S-5	106	17	98	108	174	**100**	103	53	99	99	99	**90**
5	SM-D-S-6	86	55	95	103	190	**106**	86	60	104	61	163	**95**
6	SM-D-8	93	44	108	106	122	**95**	82	33	101	86	112	**83**
7	SM-D-S-11	108	46	104	99	118	**95**	91	71	98	64	114	**88**
8	SM-D-S-14	135	44	99	104	170	**110**	100	43	93	49	132	**83**
9	SM-D-S-15	141	89	102	102	196	**126**	93	30	97	72	275	**113**
10	SM-D-S-19	100	25	103	104	152	**97**	91	40	93	75	102	**80**
11	IL 19023	91	40	103	87	113	**87**	85	18	104	68	106	**76**
12	IL 19027	57	47	97	100	91	**78**	60	16	96	76	103	**70**
13	IL 19177	170	126	98	97	155	**129**	136	54	103	75	125	**99**
14	IL 19180	141	85	99	103	131	**112**	124	36	103	62	97	**85**
15	IL 19182	118	92	100	121	200	**126**	97	26	99	98	108	**86**
16	IL 19206	102	87	98	96	131	**103**	82	24	98	76	93	**75**
17	IL 19210	109	108	91	118	171	**119**	89	28	96	89	126	**85**
18	IL 19211	92	67	100	107	155	**104**	75	13	98	60	152	**80**
19	IL 19241	81	58	99	92	101	**86**	81	23	99	91	111	**81**
20	IL 19246	99	102	102	105	172	**116**	69	27	96	84	148	**85**
21	IL 19408	86	55	110	113	136	**100**	85	47	91	92	126	**88**
22	IL 19451	125	48	104	107	176	**112**	90	37	100	76	114	**83**
23	IL 19485	145	42	99	112	136	**107**	85	28	100	81	111	**81**
24	IL19026	113	98	96	102	101	**102**	87	16	102	91	91	**78**
25	JB 631-1	136	46	100	105	175	**113**	25	57	106	85	103	**75**
26	JB 680-4	74	99	97	101	110	**96**	74	38	96	68	99	**75**
27	JB 687-2	77	72	94	100	101	**89**	63	29	107	76	104	**76**
28	Krishna Hamsa	73	30	94	89	137	**85**	77	12	93	87	103	**74**
29	SB.Dhan	104	91	99	117	110	**104**	75	21	97	80	125	**80**
30	WGL-14	156	99	95	110	165	**125**	154	38	102	82	105	**96**
	Mean	**109**	**66**	**99**	**104**	**145**	**105**	**88**	**36**	**99**	**77**	**121**	**84**
	LSD (Treat)				3.12*			*LSD (Treat x Variety)*				ns	
	LSD (Location x Treat)				9.93**			*LSD (Location x Treat x Variety)*				40.93**	
	LSD (Variety)				12.94**			*CV (%) Treat*				22.27	
	LSD (Location x Variety)				28.94**								

Table 6.2.6 Screening for elite rice culture for drought tolerance on Spikelet number/panicle at different centers *Kharif* 2023

S.No.	Genotypes	IRRIGATED					Grand Mean	DROUGHT					Grand Mean
		NRRI	PTB	RANCHI	REWA	RPUR		NRRI	PTB	RANCHI	REWA	RPUR	
1	SM-D-S-1	124	94	108	110	170	**121**	111	91	110	85	125	**104**
2	SM-D-S-3	148	115	112	148	152	**135**	126	90	109	157	146	**125**
3	SM-D-S-4	171	97	113	133	176	**138**	134	95	112	127	149	**123**
4	SM-D-S-5	129	59	109	141	187	**125**	131	94	112	141	115	**118**
5	SM-D-S-6	112	130	108	139	205	**139**	129	110	116	97	174	**125**
6	SM-D-8	122	88	116	125	137	**118**	111	73	109	119	131	**109**
7	SM-D-S-11	140	90	116	120	132	**120**	132	95	111	117	131	**117**
8	SM-D-S-14	168	76	110	131	184	**134**	126	71	105	99	148	**110**
9	SM-D-S-15	176	128	115	124	210	**151**	124	62	107	125	290	**142**
10	SM-D-S-19	129	63	116	133	169	**122**	131	81	106	122	121	**112**
11	IL 19023	144	102	114	121	126	**121**	131	61	116	104	122	**107**
12	IL 19027	76	62	110	146	105	**100**	86	28	108	130	120	**94**
13	IL 19177	250	167	109	146	168	**168**	199	100	115	129	141	**137**
14	IL 19180	181	108	111	140	144	**137**	182	72	117	97	114	**116**
15	IL 19182	147	126	109	159	214	**151**	156	77	111	154	125	**125**
16	IL 19206	125	111	109	141	142	**126**	110	57	110	118	111	**101**
17	IL 19210	150	132	103	161	184	**146**	152	75	109	112	142	**118**
18	IL 19211	125	108	111	167	167	**135**	131	67	110	92	167	**113**
19	IL 19241	129	76	111	147	113	**115**	129	63	112	139	126	**114**
20	IL 19246	193	123	115	159	185	**155**	136	81	108	127	160	**122**
21	IL 19408	130	108	118	138	149	**129**	146	87	102	120	142	**120**
22	IL 19451	174	101	117	138	189	**143**	144	67	112	112	130	**113**
23	IL 19485	193	95	111	145	151	**139**	139	73	113	117	126	**113**
24	IL19026	148	126	107	147	114	**128**	135	43	114	143	107	**108**
25	JB 631-1	192	107	113	153	190	**151**	176	82	120	122	121	**124**
26	JB 680-4	114	132	110	122	124	**120**	122	68	108	102	117	**103**
27	JB 687-2	108	85	105	134	115	**109**	91	58	116	110	122	**99**
28	Krishna Hamsa	100	66	105	118	150	**108**	125	37	106	118	121	**102**
29	SB.Dhan	131	113	112	166	126	**129**	106	46	110	108	140	**102**
30	WGL-14	208	177	107	135	181	**161**	180	81	116	118	123	**124**
	Mean	**148**	**105**	**111**	**140**	**159**	**133**	**134**	**73**	**111**	**119**	**137**	**115**
	LSD (Treat)				2.81*			*LSD (Treat x Variety)*				ns	
	LSD (Location x Treat)				8.93**			*LSD (Location x Treat x Variety)*				46.06**	
	LSD (Variety)				14.56**			*CV (%) Treat*				15.29	
	LSD (Location x Variety)				32.57**								

Table 6.2.7 Screening for elite rice culture for drought tolerance on Grain number/m² at different centers *Kharif* 2023

S.No.	Genotypes	IRRIGATED					Grand	DROUGHT					Grand
		NRRI	PTB	RANCHI	REWA	RPUR	Mean	NRRI	PTB	RANCHI	REWA	RPUR	Mean
1	SM-D-S-1	23554	23160	18973	8828	56265	**26156**	18415	25760	20361	5694	19250	**17896**
2	SM-D-S-3	23976	34957	20237	12320	56995	**29697**	20730	29349	19617	5000	31978	**21335**
3	SM-D-S-4	35568	21653	21114	16458	55062	**29971**	21095	26468	20354	5959	30171	**20809**
4	SM-D-S-5	30731	8688	19797	14250	58597	**26413**	28594	27029	19261	11181	22826	**21778**
5	SM-D-S-6	21076	17330	19002	11607	61885	**26180**	24712	27415	20713	3708	32436	**21797**
6	SM-D-8	27264	24659	21933	15942	48108	**27581**	19221	13127	19987	9844	13812	**15198**
7	SM-D-S-11	30384	20572	21030	12151	34854	**23798**	22010	36955	19716	5592	23228	**21500**
8	SM-D-S-14	37530	29792	19444	13632	65414	**33162**	28447	21923	18391	2024	30119	**20181**
9	SM-D-S-15	31070	33540	20026	11576	62426	**31728**	18993	12271	19455	6911	51813	**21889**
10	SM-D-S-19	28287	18303	20981	15880	34248	**23540**	21600	20123	19533	6252	19000	**17302**
11	IL 19023	24113	20550	20637	10135	47516	**24590**	22183	6542	20744	8905	22610	**16197**
12	IL 19027	14682	25452	19940	16728	26165	**20593**	16670	4487	19132	8759	20240	**13858**
13	IL 19177	37530	40800	19997	11998	36006	**29266**	33581	17381	20659	8624	22787	**20607**
14	IL 19180	33433	32377	19894	13640	53452	**30559**	28959	16675	20594	8202	19776	**18841**
15	IL 19182	31932	55983	19628	17760	64870	**38035**	19547	9950	20632	10020	23248	**16679**
16	IL 19206	25838	58127	19575	14710	42425	**32135**	22045	8808	19676	11690	19116	**16267**
17	IL 19210	23684	54331	18364	18727	61133	**35248**	21739	12020	19580	11333	25026	**17940**
18	IL 19211	24432	33655	19955	15448	52307	**29159**	18655	4303	19667	7466	30647	**16148**
19	IL 19241	23699	21711	19795	15428	32098	**22546**	22267	10581	19357	6630	22843	**16336**
20	IL 19246	21204	52058	20190	16988	53789	**32846**	15802	11030	18862	9462	32636	**17558**
21	IL 19408	17382	13771	22620	13695	44547	**22403**	17638	22057	18416	12085	38103	**21660**
22	IL 19451	32495	19431	21140	14530	67550	**31029**	21785	15429	19736	7822	41448	**21244**
23	IL 19485	34043	15248	19796	13631	45715	**25686**	21505	12590	20018	6877	24722	**17142**
24	IL19026	28335	55719	19559	12061	50148	**33164**	23149	6090	20271	9994	26847	**17270**
25	JB 631-1	28672	16533	19726	16850	62001	**28756**	5685	24340	21793	9035	20604	**16292**
26	JB 680-4	16852	72733	19721	14067	35873	**31849**	16809	14991	19394	6143	31246	**17717**
27	JB 687-2	20093	32882	19003	10505	38345	**24165**	17055	10080	21897	10255	22270	**16311**
28	Krishna Hamsa	19045	10178	18782	13009	50843	**22371**	21350	4273	18435	6474	26471	**15401**
29	SB.Dhan	23776	41483	20422	15942	36093	**27543**	16464	7840	19223	4763	14590	**12576**
30	WGL-14	34741	58511	18623	13893	59532	**37060**	36074	14020	20672	12103	19653	**20504**
	Mean	**26847**	**32140**	**19997**	**14080**	**49809**	**28574**	**21426**	**15797**	**19872**	**7960**	**25984**	**18208**
	LSD (Treat)				ns			*LSD (Treat x Variety)*				ns	
	LSD (Location x Treat)				1818**			*LSD (Location x Treat x Variety)*				10300**	
	LSD (Variety)				ns			*CV (%) Treat*				16.46	
	LSD (Location x Variety)				7283**								

Table 6.2.8 Screening for elite rice culture for drought tolerance on Spikelet number/m² at different centers *Kharif* 2023

S.No.	Genotypes	IRRIGATED					Grand	DROUGHT					Grand
		NRRI	PTB	RANCHI	REWA	RPUR	Mean	NRRI	PTB	RANCHI	REWA	RPUR	Mean
1	SM-D-S-1	31236	43912	21352	10259	60627	**33477**	26581	43135	22172	9690	22785	**24873**
2	SM-D-S-3	29382	51713	22672	18597	62937	**37060**	27312	46144	22203	14084	35470	**29043**
3	SM-D-S-4	46828	42537	23463	20635	59406	**38574**	27829	43527	22726	9877	33290	**27450**
4	SM-D-S-5	37338	30361	22011	18058	63255	**34205**	36465	47765	21728	15680	26532	**29634**
5	SM-D-S-6	27300	41027	21585	16917	66506	**34667**	37007	50043	23104	5665	34694	**30103**
6	SM-D-8	35932	49443	23647	17856	54041	**36184**	26072	29053	21640	13947	16188	**21380**
7	SM-D-S-11	39686	40418	23449	14475	38997	**31405**	31921	49253	22186	9295	26541	**27839**
8	SM-D-S-14	46510	51765	21608	17847	70823	**41711**	35998	36157	20701	4043	33700	**26120**
9	SM-D-S-15	38780	48183	22641	14565	66927	**38219**	25301	25205	21603	11469	54829	**27682**
10	SM-D-S-19	36422	45539	23621	19822	38004	**32682**	31029	41259	22116	10647	22530	**25516**
11	IL 19023	37927	52943	22840	13916	52876	**36100**	34107	22863	23134	13629	26190	**23985**
12	IL 19027	19448	33982	22531	24605	30365	**26186**	23851	7950	21514	14476	23612	**18281**
13	IL 19177	55292	54253	22314	19356	39018	**38047**	49259	31853	23208	14978	25644	**28988**
14	IL 19180	43009	40826	22239	18330	58410	**36563**	42448	33188	23252	12701	23243	**26967**
15	IL 19182	39423	77010	21399	23521	69217	**46114**	31316	29829	23281	17154	26917	**25699**
16	IL 19206	31439	73857	21840	21735	45989	**38972**	29376	21299	22226	18530	22866	**22859**
17	IL 19210	32568	66503	20710	25228	66021	**42206**	37284	32501	22307	14216	28262	**26914**
18	IL 19211	33379	54418	22148	23847	56418	**38042**	32726	22607	22216	11387	33519	**24491**
19	IL 19241	37559	28597	22344	24432	35726	**29732**	35022	28585	21758	9726	26024	**24223**
20	IL 19246	41858	63225	22630	25808	57974	**42299**	31515	32423	21139	14531	35364	**26994**
21	IL 19408	26337	28103	24399	16955	48992	**28957**	30056	40315	20707	15698	42831	**29922**
22	IL 19451	45284	41283	23636	19602	72508	**40463**	34576	28910	22115	11237	47404	**28848**
23	IL 19485	45377	34572	22057	18589	50601	**34239**	35223	32983	22472	10639	27890	**25841**
24	IL19026	37143	71757	21873	17542	56712	**41005**	35760	15986	22734	15019	31672	**24234**
25	JB 631-1	40552	37927	22357	24607	67145	**38517**	39647	35128	24600	13799	24130	**27461**
26	JB 680-4	26053	97113	22218	17145	40612	**40628**	27784	27391	21740	9822	37059	**24759**
27	JB 687-2	27798	39082	21232	13715	43691	**29104**	24984	20403	23678	14682	26286	**22007**
28	Krishna Hamsa	26332	22467	20986	17332	55844	**28592**	35008	13268	20948	9011	31177	**21882**
29	SB.Dhan	29761	52033	22958	23768	41283	**33961**	23517	16775	21738	6391	16420	**16968**
30	WGL-14	46752	104160	21048	17478	65364	**50961**	42161	29860	23367	17321	23096	**27161**
	Mean	**36423**	**50634**	**22327**	**19218**	**54543**	36629	**32705**	**31189**	**22277**	**12312**	**29539**	**25604**
	LSD (Treat)				ns			*LSD (Treat x Variety)*				ns	
	LSD (Location x Treat)				2434**			*LSD (Location x Treat x Variety)*				13025**	
	LSD (Variety)				3130*			*CV (%) Treat*				16.56	
	LSD (Location x Variety)				9210**								

Table 6.2.9 Screening for elite rice culture for drought tolerance on Grain yield (g/m^2) at different centers *Kharif* 2023

S.No.	Genotypes	IRRIGATED					Grand	DROUGHT					Grand
		NRRI	PTB	RANCHI	REWA	RPUR	Mean	NRRI	PTB	RANCHI	REWA	RPUR	Mean
1	SM-D-S-1	317	490	232	588	308	**387**	233	230	228	450	178	**264**
2	SM-D-S-3	253	363	224	431	361	**326**	221	340	236	446	242	**297**
3	SM-D-S-4	389	347	237	461	412	**369**	177	327	221	382	313	**284**
4	SM-D-S-5	297	200	232	524	308	**312**	267	160	230	497	266	**284**
5	SM-D-S-6	233	320	228	487	460	**346**	266	297	229	450	229	**294**
6	SM-D-8	301	263	237	491	372	**333**	206	253	227	480	250	**283**
7	SM-D-S-11	336	533	229	479	457	**407**	243	310	239	453	330	**315**
8	SM-D-S-14	350	193	231	506	318	**320**	227	220	233	439	327	**289**
9	SM-D-S-15	349	467	232	454	419	**384**	255	218	224	440	196	**267**
10	SM-D-S-19	352	233	231	437	329	**316**	248	210	233	354	225	**254**
11	IL 19023	251	680	221	447	472	**414**	252	111	239	380	488	**294**
12	IL 19027	119	277	231	490	152	**254**	242	101	234	393	275	**249**
13	IL 19177	269	323	238	550	648	**406**	210	173	226	296	433	**268**
14	IL 19180	416	564	225	510	509	**445**	281	213	222	285	264	**253**
15	IL 19182	318	480	226	321	389	**347**	242	153	231	310	164	**220**
16	IL 19206	263	343	230	463	456	**351**	281	123	228	250	117	**200**
17	IL 19210	270	493	232	362	599	**391**	274	220	230	380	189	**258**
18	IL 19211	296	150	232	516	446	**328**	229	120	233	352	261	**239**
19	IL 19241	253	260	229	540	382	**333**	234	147	240	452	302	**275**
20	IL 19246	202	437	234	358	566	**359**	131	180	225	348	437	**264**
21	IL 19408	256	310	227	521	719	**407**	222	193	223	339	276	**251**
22	IL 19451	291	317	241	293	454	**319**	233	177	228	338	288	**253**
23	IL 19485	252	170	229	355	462	**294**	124	137	223	354	323	**232**
24	IL19026	273	550	235	437	655	**430**	243	119	230	369	551	**302**
25	JB 631-1	253	610	228	393	588	**414**	97	167	231	334	233	**212**
26	JB 680-4	166	500	222	591	418	**379**	166	132	234	325	419	**255**
27	JB 687-2	282	263	233	587	319	**337**	243	123	240	389	209	**241**
28	Krishna Hamsa	231	227	224	540	443	**333**	227	110	235	415	172	**232**
29	SB.Dhan	389	327	228	584	275	**361**	286	83	238	408	127	**229**
30	WGL-14	197	398	231	570	491	**378**	177	180	222	355	166	**220**
	Mean	**281**	**370**	**230**	**476**	**440**	**359**	**225**	**184**	**230**	**382**	**275**	**259**
	LSD (Treat)				9.23*			*LSD (Treat x Variety)*				ns	
	LSD (Location x Treat)				29.36**			*LSD (Location x Treat x Variety)*				95.99**	
	LSD (Variety)				ns			*CV (%) Treat*				20.09	
	LSD (Location x Variety)				67.88**								

Table 6.2.10 Screening for elite rice culture for drought tolerance on 1000 weight (g) at different centers *Kharif* 2023

S.No.	Genotypes	IRRIGATED					Grand Mean	DROUGHT					Grand Mean
		NRRI	PTB	RANCHI	REWA	RPUR		NRRI	PTB	RANCHI	REWA	RPUR	
1	SM-D-S-1	17.3	16.6	19.9	24.5	21.3	**19.9**	16.0	17.1	19.8	23.8	21.4	**19.6**
2	SM-D-S-3	15.8	16.5	20.2	26.2	21.8	**20.1**	16.0	16.6	20.0	22.9	21.7	**19.4**
3	SM-D-S-4	16.5	17.9	19.4	25.6	21.5	**20.2**	15.4	17.6	19.9	34.5	21.3	**21.7**
4	SM-D-S-5	17.1	19.8	20.0	27.4	21.4	**21.2**	16.5	16.8	20.1	22.3	21.1	**19.4**
5	SM-D-S-6	16.1	17.5	19.6	29.3	21.1	**20.7**	15.9	16.7	20.4	24.1	21.0	**19.6**
6	SM-D-8	16.4	17.2	19.8	26.3	17.1	**19.4**	15.5	16.7	20.1	25.2	17.1	**18.9**
7	SM-D-S-11	15.7	18.2	19.7	25.3	22.6	**20.3**	15.0	17.8	19.7	23.7	22.5	**19.8**
8	SM-D-S-14	16.9	15.8	19.6	27.8	18.2	**19.7**	15.6	15.8	19.9	22.0	17.5	**18.2**
9	SM-D-S-15	18.7	24.3	20.5	25.5	21.0	**22.0**	17.7	18.2	20.2	26.5	17.5	**20.0**
10	SM-D-S-19	17.6	21.6	20.0	25.1	21.9	**21.2**	15.8	17.3	20.0	23.9	18.8	**19.2**
11	IL 19023	22.8	23.3	20.3	25.3	22.2	**22.8**	20.6	21.5	20.1	24.4	21.9	**21.7**
12	IL 19027	23.7	23.9	19.4	29.3	30.2	**25.3**	23.8	21.6	20.4	23.5	26.6	**23.2**
13	IL 19177	14.1	14.8	20.1	27.1	17.1	**18.6**	12.4	15.2	20.4	24.3	17.2	**17.9**
14	IL 19180	23.9	25.9	19.9	24.9	31.2	**25.1**	23.0	23.4	19.9	24.1	31.1	**24.3**
15	IL 19182	22.8	23.0	19.8	28.8	27.0	**24.3**	21.0	18.9	19.5	22.7	26.2	**21.7**
16	IL 19206	22.8	22.6	19.8	29.4	30.0	**24.9**	21.5	20.1	19.9	24.1	26.2	**22.3**
17	IL 19210	23.5	24.0	19.9	29.6	26.4	**24.7**	20.3	21.6	20.0	27.9	26.8	**23.3**
18	IL 19211	19.5	24.9	19.8	26.5	25.3	**23.2**	19.1	19.3	19.6	30.3	22.4	**22.2**
19	IL 19241	18.3	19.0	20.4	26.7	22.1	**21.3**	17.8	18.8	20.1	23.5	18.5	**19.7**
20	IL 19246	19.3	26.3	20.1	25.5	26.6	**23.6**	18.2	19.7	19.8	23.6	26.3	**21.5**
21	IL 19408	25.4	24.4	19.9	29.9	31.9	**26.3**	24.6	24.4	20.1	24.4	30.3	**24.8**
22	IL 19451	18.0	22.7	19.5	26.0	23.0	**21.8**	16.6	16.1	20.2	26.7	22.4	**20.4**
23	IL 19485	12.7	15.1	20.1	28.9	17.5	**18.9**	12.5	15.0	20.4	20.3	17.1	**17.1**
24	IL19026	22.2	24.3	19.7	27.2	25.1	**23.7**	20.0	21.2	19.8	21.4	25.4	**21.6**
25	JB 631-1	17.5	19.8	20.3	24.7	22.4	**20.9**	12.7	17.1	19.8	24.9	22.4	**19.4**
26	JB 680-4	21.5	25.4	19.7	28.5	26.8	**24.4**	19.4	24.0	20.3	23.1	26.3	**22.6**
27	JB 687-2	24.9	26.3	20.1	25.3	31.1	**25.5**	22.3	23.4	19.7	21.5	31.8	**23.7**
28	Krishna Hamsa	17.8	22.5	20.2	25.3	22.1	**21.6**	18.3	18.4	19.9	26.3	22.0	**21.0**
29	SB.Dhan	22.1	23.5	19.7	30.3	26.4	**24.4**	20.3	20.6	20.0	23.7	26.1	**22.2**
30	WGL-14	12.9	24.3	20.2	25.8	25.5	**21.7**	14.1	18.1	20.5	23.8	18.3	**19.0**
	Mean	**19.1**	**21.4**	**19.9**	**26.9**	**23.9**	**22.3**	**17.9**	**19.0**	**20.0**	**24.4**	**22.8**	**20.8**
	LSD (Treat)				0.33*			*LSD (Treat x Variety)*				ns	
	LSD (Location x Treat)				1.06**			*LSD (Location x Treat x Variety)*				4.41**	
	LSD (Variety)				1.39**			*CV (%) Treat*				10.39	
	LSD (Location x Variety)				3.11**								

Table 6.2.11 Influence of irrigation regimes on total dry matter (g/m^2) at maturity in different rice genotypes

S.No.	Genotypes	IRRIGATED					Grand Mean	DROUGHT					Grand Mean
		NRRI	PTB	RANCHI	REWA	RPUR		NRRI	PTB	RANCHI	REWA	RPUR	
1	DRT-1	833	1573	1035	1443	924	**1162**	677	1257	1047	1213	626	**964**
2	DRT-11	719	1622	1027	982	1350	**1140**	662	1353	1036	1390	807	**1050**
3	DRT-12	1185	1649	1031	1084	1391	**1268**	635	1533	1051	1207	914	**1068**
4	DRT-15	879	1393	1044	1388	1057	**1152**	724	1197	1048	1406	818	**1038**
5	DRT-3	778	1500	1039	1083	1273	**1135**	794	1400	1044	1209	758	**1041**
6	DRT-4	890	1373	1034	1074	1224	**1119**	626	1120	1026	1305	890	**994**
7	DRT-5	989	1950	1035	1188	1290	**1291**	780	1480	1044	1415	899	**1123**
8	DRT-6	994	1442	1053	1068	1196	**1151**	757	1347	1039	1317	1040	**1100**
9	DRT-8	906	1781	1035	1007	1319	**1210**	727	1147	1042	1254	746	**983**
10	DRT-9	1022	1230	1029	1186	1248	**1143**	745	1093	1036	990	952	**963**
11	IL 19023	847	1413	1042	1031	1448	**1156**	805	580	1032	1168	1270	**971**
12	IL 19027	508	1220	1049	1099	925	**960**	672	577	1048	1243	689	**846**
13	IL 19177	1013	1753	1045	1302	1693	**1361**	882	927	1024	974	1161	**994**
14	IL 19180	1293	1849	1037	1109	1633	**1384**	1030	997	1012	866	982	**977**
15	IL 19182	985	1859	1035	887	1416	**1237**	782	985	1033	892	685	**875**
16	IL 19206	738	1363	1036	1097	1246	**1096**	749	924	1047	714	630	**813**
17	IL 19210	876	1796	1051	930	1489	**1228**	881	1070	1050	1144	775	**984**
18	IL 19211	792	1237	1051	1149	1299	**1106**	671	753	1042	1144	799	**882**
19	IL 19241	795	1270	1038	1325	1018	**1089**	791	750	1043	1302	862	**950**
20	IL 19246	876	1866	1045	903	1474	**1233**	810	1033	1045	1082	981	**990**
21	IL 19408	916	1562	1035	1291	1522	**1265**	851	1083	1029	1080	1098	**1028**
22	IL 19451	856	1383	1031	703	1230	**1041**	787	1077	1030	916	889	**940**
23	IL 19485	738	1273	1046	776	1371	**1041**	703	897	1025	965	1013	**921**
24	IL19026	871	2002	1035	1010	1631	**1310**	862	643	1043	1099	1259	**981**
25	JB 631-1	926	1910	1036	1054	1743	**1334**	867	1031	1035	910	1010	**971**
26	JB 680-4	696	1602	1034	1365	1313	**1202**	621	923	1032	904	968	**890**
27	JB 687-2	814	1663	1047	1311	1267	**1220**	769	930	1036	1080	1036	**970**
28	Krishna Hamsa	695	891	1046	1305	1207	**1029**	734	410	1031	1215	663	**811**
29	SB.Dhan	827	1406	1054	1333	957	**1116**	670	670	1043	1237	688	**862**
30	WGL-14	866	1872	1038	1219	1300	**1259**	840	833	1056	994	790	**903**
	Mean	**871**	**1557**	**1040**	**1123**	**1315**	1181	**763**	**1001**	**1038**	**1121**	**890**	**963**
	LSD (Treat)				ns			*LSD (Treat x Variety)*				ns	
	LSD (Location x Treat)				93.1**			*LSD (Location x Treat x Variety)*				300.3**	
	LSD (Variety)				ns			*CV(%) Treat*				18.39	
	LSD (Location x Variety)				212.3**								

Table 6.2.12 Influence of irrigation regimes on harvest index (%) in different rice genotypes

S.No.	Genotypes	IRRIGATED					Grand Mean	DROUGHT					Grand Mean
		NRRI	PTB	RANCHI	REWA	RPUR		NRRI	PTB	RANCHI	REWA	RPUR	
1	DRT-1	38.1	31.1	22.5	41.4	33.3	**33.3**	35.1	18.4	21.8	37.8	28.4	**28.3**
2	DRT-11	34.8	22.4	21.8	43.4	26.8	**29.8**	33.5	25.0	22.8	32.0	30.5	**28.8**
3	DRT-12	33.4	21.0	23.0	42.7	29.7	**30.0**	28.5	21.3	21.0	32.7	34.3	**27.5**
4	DRT-15	33.9	14.5	22.3	38.8	29.2	**27.7**	36.6	13.6	22.0	35.6	32.6	**28.1**
5	DRT-3	30.0	21.5	22.0	44.8	36.2	**30.9**	32.3	21.2	21.9	37.3	30.3	**28.6**
6	DRT-4	34.4	19.3	23.0	45.8	30.5	**30.6**	32.6	22.9	22.1	36.8	28.1	**28.5**
7	DRT-5	34.1	27.4	22.2	42.3	35.4	**32.3**	31.7	21.3	22.9	32.2	36.7	**28.9**
8	DRT-6	35.3	13.4	21.9	47.5	26.6	**29.0**	29.8	16.3	22.4	33.2	31.5	**26.6**
9	DRT-8	38.6	26.3	22.5	45.2	31.8	**32.9**	35.6	19.5	21.5	35.0	26.3	**27.6**
10	DRT-9	34.5	19.1	22.4	36.9	26.4	**27.8**	33.3	19.4	22.5	36.4	23.7	**27.1**
11	IL 19023	29.6	48.1	21.2	43.4	32.6	**35.0**	30.8	19.1	23.2	33.1	38.9	**29.0**
12	IL 19027	22.8	22.4	22.0	44.8	16.5	**25.7**	35.6	17.6	22.3	31.5	40.3	**29.4**
13	IL 19177	26.6	18.2	22.8	43.6	38.9	**30.0**	23.5	18.6	22.1	31.8	37.4	**26.7**
14	IL 19180	32.2	30.5	21.7	45.8	31.2	**32.3**	27.1	22.5	22.0	33.7	26.9	**26.4**
15	IL 19182	31.9	25.9	21.8	36.3	27.8	**28.7**	31.0	16.2	22.4	35.4	24.4	**25.9**
16	IL 19206	35.6	25.3	22.2	42.6	36.6	**32.5**	38.0	13.3	21.8	35.1	18.7	**25.4**
17	IL 19210	30.6	27.4	22.1	39.5	41.2	**32.2**	30.5	20.5	21.9	33.6	24.4	**26.2**
18	IL 19211	37.6	12.2	22.0	44.9	34.2	**30.2**	34.3	15.9	22.3	33.2	32.8	**27.7**
19	IL 19241	31.9	20.6	22.0	40.9	37.6	**30.6**	29.6	19.6	23.0	34.7	35.1	**28.4**
20	IL 19246	23.1	23.4	22.4	39.7	38.6	**29.4**	16.3	17.9	21.5	32.8	44.8	**26.7**
21	IL 19408	28.2	20.0	21.9	41.6	47.4	**31.8**	25.9	17.9	21.7	32.1	25.3	**24.6**
22	IL 19451	34.2	22.9	23.3	42.8	37.1	**32.1**	29.8	16.5	22.1	37.1	32.4	**27.6**
23	IL 19485	33.6	13.4	21.9	45.7	33.9	**29.7**	17.6	15.4	21.8	36.7	32.6	**24.8**
24	IL19026	31.3	27.4	22.7	43.9	40.2	**33.1**	28.0	18.8	22.0	33.7	43.9	**29.3**
25	JB 631-1	26.4	31.9	22.0	38.9	33.8	**30.6**	11.1	16.5	22.4	36.5	23.4	**22.0**
26	JB 680-4	24.3	33.9	21.4	43.4	31.8	**31.0**	27.3	14.3	22.7	35.9	43.4	**28.7**
27	JB 687-2	34.5	15.8	22.3	45.2	25.1	**28.6**	31.6	13.3	23.1	35.9	20.3	**24.8**
28	Krishna Hamsa	33.3	25.7	21.4	42.6	36.9	**32.0**	31.3	26.8	22.8	33.8	26.0	**28.1**
29	SB.Dhan	46.9	23.2	21.6	44.1	28.9	**32.9**	42.6	12.6	22.8	32.9	18.6	**25.9**
30	WGL-14	22.7	21.5	22.3	47.0	38.1	**30.3**	21.1	21.8	21.0	35.7	21.0	**24.1**
	Mean	**32.1**	**23.5**	**22.2**	**42.9**	**33.1**	**30.8**	**29.7**	**18.5**	**22.2**	**34.5**	**30.4**	**27.1**
	LSD (Treat)				ns			*LSD (Treat x Variety)*				ns	
	LSD (Location x Treat)				1.40**			*LSD (Location x Treat x Variety)*				7.28**	
	LSD (Variety)				ns			*CV(%) Treat*				10.27	
	LSD (Location x Variety)				5.14**								

Table 6.2.13 Influence of irrigation regimes on important physiological traits of rice genotypes at TTB centre during *Rabi* (dry) season 2022-23

S.No	Genotypes	Tiller number/plant at mat		Mean	Shoot weight at mat (g/m²)		Mean	Panicle weight (g/m²)		Mean	Panicle number/m²		Mean
		Irrigated	Rainfed		Irrigated	Rainfed		Irrigated	Rainfed		Irrigated	Rainfed	
1	DRR Dhan-44	7.1	6.3	**6.7**	777	535	**656**	432	234	**333**	285	206	**245**
2	IET 29834	11.2	9.7	**10.4**	756	552	**654**	474	307	**391**	258	201	**229**
3	IET 29859	10.2	9.3	**9.8**	751	594	**673**	420	315	**367**	273	233	**253**
4	IET 30116	10.2	8.3	**9.3**	754	582	**668**	450	278	**364**	280	229	**254**
5	IET 30241	8.1	7.0	**7.6**	701	582	**641**	401	302	**352**	260	215	**237**
6	IET 30245	9.2	8.0	**8.6**	776	573	**675**	437	298	**368**	306	240	**273**
7	IL-19075	8.0	7.0	**7.5**	698	524	**611**	389	256	**322**	261	209	**235**
8	IL-19079	7.1	6.3	**6.7**	701	590	**646**	459	302	**381**	242	199	**220**
9	IL-19083	8.1	7.0	**7.6**	769	575	**672**	433	308	**370**	284	225	**255**
10	IL-19087	10.2	8.7	**9.4**	728	564	**646**	422	290	**356**	290	227	**259**
11	IL-19088	10.2	9.0	**9.6**	669	525	**597**	389	249	**319**	245	194	**220**
12	IL-19095	10.2	8.7	**9.4**	639	564	**601**	381	267	**324**	261	213	**237**
13	IL-19100	12.2	10.3	**11.3**	682	613	**648**	413	308	**360**	242	218	**230**
14	IL-19103	9.2	8.3	**8.7**	646	555	**600**	387	278	**333**	263	216	**239**
15	IL-19177	10.2	8.7	**9.4**	679	586	**632**	417	290	**354**	256	217	**236**
16	IL-19186	11.2	9.3	**10.3**	802	563	**683**	510	270	**390**	263	193	**228**
17	IL-19194	10.2	8.7	**9.4**	797	582	**690**	534	302	**418**	311	215	**263**
18	IL-19196	10.2	9.3	**9.8**	739	543	**641**	462	290	**376**	355	272	**314**
19	IL-19211	8.1	7.3	**7.7**	719	577	**648**	395	259	**327**	244	176	**210**
20	IL-19246	11.2	10.0	**10.6**	708	582	**645**	435	278	**357**	299	265	**282**
21	IL-19344	10.2	8.7	**9.4**	740	543	**641**	420	238	**329**	271	212	**241**
22	IL-19353	11.2	10.3	**10.8**	703	577	**640**	434	300	**367**	244	157	**200**
23	IL-19451	7.6	7.0	**7.3**	741	586	**663**	424	290	**357**	228	182	**205**
24	Krishna Hamsa	10.2	9.3	**9.8**	691	577	**634**	426	290	**358**	258	214	**236**
25	Sahabhagidhan	10.2	8.7	**9.4**	740	614	**677**	479	300	**389**	306	248	**277**
26	WGL-14	8.1	7.3	**7.7**	659	593	**626**	401	276	**339**	239	185	**212**
	Mean	**9.6**	**8.4**	**9.0**	**722**	**571**	**646**	**432**	**284**	**358**	**270**	**214**	**242**
	LSD (Treat)			1.03**			54.18**			73.87*			53.08*
	LSD (Variety)			1.09**			5.01**			2.33**			2.21**
	LSD (Treat x Variety)			ns			7.08**			3.29**			3.12**
	CV(%) Treat			7.2			5.27			29.97			31.83

Table 6.2.14 Influence of irrigation regimes on important physiological traits of rice genotypes at TTB centre during *Rabi* (dry) season 2022-23

S.No	Genotypes	Grain number/panicle		Mean	Spikelet number/panicle		Mean	Grain number/m²		Mean	Spikelet number/m²		Mean
		Irrigated	Rainfed		Irrigated	Rainfed		Irrigated	Rainfed		Irrigated	Rainfed	
1	DRR Dhan-44	130	79	**105**	157	130	**143**	37240	16254	**26747**	44725	26822	**35774**
2	IET 29834	130	87	**108**	166	130	**148**	33727	17373	**25550**	42986	26183	**34585**
3	IET 29859	104	75	**89**	121	104	**113**	28439	17498	**22968**	33245	24220	**28732**
4	IET 30116	102	67	**84**	117	102	**109**	28517	15254	**21885**	32836	23327	**28081**
5	IET 30241	92	64	**78**	113	92	**103**	24054	13633	**18844**	29452	19785	**24618**
6	IET 30245	123	72	**97**	143	123	**133**	37771	17165	**27468**	43847	29511	**36679**
7	IL-19075	117	86	**101**	141	117	**129**	30539	17946	**24242**	36827	24330	**30578**
8	IL-19079	111	79	**95**	146	111	**129**	26992	15612	**21302**	35391	22133	**28762**
9	IL-19083	127	84	**106**	153	127	**140**	36194	18927	**27561**	43647	28660	**36153**
10	IL-19087	104	70	**87**	127	104	**115**	30231	15911	**23071**	36889	23609	**30249**
11	IL-19088	123	77	**100**	148	123	**135**	30217	14937	**22577**	36386	23850	**30118**
12	IL-19095	112	80	**96**	136	112	**124**	29429	16900	**23164**	35711	23885	**29798**
13	IL-19100	114	78	**96**	143	114	**129**	27763	16964	**22363**	34616	24897	**29756**
14	IL-19103	105	72	**88**	136	105	**121**	27711	15517	**21614**	36005	22616	**29311**
15	IL-19177	107	79	**93**	126	107	**116**	27463	16996	**22230**	32244	23178	**27711**
16	IL-19186	143	89	**116**	168	143	**156**	37788	17178	**27483**	44444	27616	**36030**
17	IL-19194	119	75	**97**	143	119	**131**	36980	16089	**26535**	44462	25470	**34966**
18	IL-19196	105	71	**88**	131	105	**118**	37325	19336	**28331**	46602	28579	**37591**
19	IL-19211	106	78	**92**	130	106	**118**	25935	13666	**19800**	31796	18691	**25244**
20	IL-19246	119	80	**99**	143	119	**131**	35573	21028	**28300**	42770	31401	**37086**
21	IL-19344	114	81	**98**	141	114	**128**	31094	17142	**24118**	38191	24224	**31208**
22	IL-19353	112	81	**96**	145	112	**129**	27491	12621	**20056**	35445	17611	**26528**
23	IL-19451	127	87	**107**	151	127	**139**	29065	15857	**22461**	34563	23177	**28870**
24	Krishna Hamsa	117	86	**101**	137	117	**127**	30162	18263	**24212**	35546	24901	**30223**
25	Sahabhagidhan	104	76	**90**	121	104	**113**	31910	18714	**25312**	37303	25746	**31524**
26	WGL-14	125	86	**105**	147	125	**136**	29929	15832	**22880**	35174	23158	**29166**
	Mean	**115**	**78**	**97**	**140**	**115**	**127**	**31136**	**16639**	**23888**	**37735**	**24522**	**31129**
	LSD (Treat)			22.25**			11.48**			8775*			9399*
	LSD (Variety)			2.55**			1.14**			780**			691**
	LSD (Treat x Variety)			3.60**			1.61**			1103**			977**
	CV (%) Treat			14.48			5.67			53.32			43.83

Table 6.2.15 Influence of irrigation regimes on important physiological traits of rice genotypes at TTB centre during *Rabi* (dry) season 2022-23

S.No	Genotypes	Total dry matter (g/m2)		Mean	Grain yield (g/m2)		Mean	1000 grain weight (g)		Mean	Harvest index (%)		Mean
		Irrigated	Rainfed		Irrigated	Rainfed		Irrigated	Rainfed		Irrigated	Rainfed	
1	DRR Dhan-44	1295	930	**1112**	375	224	**299**	21.0	19.6	**20.3**	29.0	24.0	**26.5**
2	IET 29834	1260	965	**1112**	412	293	**353**	24.3	22.8	**23.5**	32.8	30.4	**31.6**
3	IET 29859	1252	1043	**1148**	365	302	**333**	24.5	23.1	**23.8**	29.2	28.9	**29.0**
4	IET 30116	1257	1032	**1144**	391	266	**329**	25.0	23.6	**24.3**	31.2	25.8	**28.5**
5	IET 30241	1168	1024	**1096**	349	289	**319**	24.1	22.6	**23.3**	29.9	28.2	**29.1**
6	IET 30245	1294	1003	**1148**	380	285	**332**	20.2	19.0	**19.6**	29.4	28.4	**28.9**
7	IL-19075	1164	918	**1041**	338	244	**291**	21.8	20.3	**21.1**	29.1	26.6	**27.9**
8	IL-19079	1169	1032	**1101**	399	289	**344**	21.7	20.3	**21.0**	34.2	28.0	**31.1**
9	IL-19083	1282	1002	**1142**	376	294	**335**	22.2	20.9	**21.6**	29.4	29.4	**29.4**
10	IL-19087	1213	986	**1100**	367	278	**322**	25.2	23.4	**24.3**	30.3	28.2	**29.2**
11	IL-19088	1114	912	**1013**	338	238	**288**	22.6	20.9	**21.8**	30.4	26.1	**28.3**
12	IL-19095	1065	982	**1024**	332	255	**293**	20.2	19.0	**19.6**	31.2	25.9	**28.6**
13	IL-19100	1137	1073	**1105**	359	294	**327**	20.0	18.6	**19.3**	31.6	27.4	**29.5**
14	IL-19103	1076	969	**1023**	336	266	**301**	19.2	18.0	**18.6**	31.3	27.5	**29.4**
15	IL-19177	1131	1025	**1078**	363	278	**320**	25.3	23.7	**24.5**	32.1	27.1	**29.6**
16	IL-19186	1337	984	**1161**	444	258	**351**	20.1	18.6	**19.3**	33.2	26.2	**29.7**
17	IL-19194	1329	1032	**1180**	465	289	**377**	23.7	21.8	**22.7**	35.0	28.0	**31.5**
18	IL-19196	1231	949	**1090**	402	278	**340**	26.1	24.5	**25.3**	32.7	29.3	**31.0**
19	IL-19211	1198	1009	**1103**	344	248	**296**	26.0	24.4	**25.2**	28.8	24.5	**26.6**
20	IL-19246	1180	1016	**1098**	378	266	**322**	21.3	19.8	**20.5**	32.1	26.2	**29.1**
21	IL-19344	1233	953	**1093**	365	228	**296**	24.3	22.7	**23.5**	29.6	23.9	**26.8**
22	IL-19353	1172	1007	**1089**	377	287	**332**	19.0	17.7	**18.4**	32.2	28.5	**30.4**
23	IL-19451	1235	1024	**1130**	369	278	**323**	21.9	21.0	**21.5**	29.9	27.1	**28.5**
24	Krishna Hamsa	1152	1007	**1079**	371	278	**324**	24.0	22.9	**23.4**	32.2	27.6	**29.9**
25	Sahabhagidhan	1234	1077	**1156**	416	287	**352**	21.6	20.2	**20.9**	33.8	26.6	**30.2**
26	WGL-14	1099	1032	**1066**	349	264	**306**	19.9	18.4	**19.1**	31.8	25.6	**28.7**
	Mean	**1203**	**999**	1101	**375**	**271**	323	**22.5**	**21.1**	**21.8**	**31.2**	**27.1**	**29.2**
	LSD (Treat)			88.47**			65.97*			0.78**			ns
	LSD (Variety)			2.51**			2.04**			0.36**			0.16**
	LSD (Treat x Variety)			3.55**			2.89**			ns			0.23**
	CV (%) Treat			5.06			29.61			2.27			33.62

Table 6.2.11 Influence of irrigation regimes on important physiological traits of rice genotypes at TTB centre during *Rabi* (dry) season 2022-23

S.No	Genotypes	Tiller number/plant at mat		Mean	Shoot weight at mat (g/m^2)		Mean	Panicle weight (g/m^2)		Mean	Panicle number/m^2		Mean
		Irrigated	Rainfed		Irrigated	Rainfed		Irrigated	Rainfed		Irrigated	Rainfed	
1	DRR Dhan-44	7.1	6.3	**6.7**	777	535	**656**	432	234	**333**	285	206	**245**
2	IET 29834	11.2	9.7	**10.4**	756	552	**654**	474	307	**391**	258	201	**229**
3	IET 29859	10.2	9.3	**9.8**	751	594	**673**	420	315	**367**	273	233	**253**
4	IET 30116	10.2	8.3	**9.3**	754	582	**668**	450	278	**364**	280	229	**254**
5	IET 30241	8.1	7.0	**7.6**	701	582	**641**	401	302	**352**	260	215	**237**
6	IET 30245	9.2	8.0	**8.6**	776	573	**675**	437	298	**368**	306	240	**273**
7	IL-19075	8.0	7.0	**7.5**	698	524	**611**	389	256	**322**	261	209	**235**
8	IL-19079	7.1	6.3	**6.7**	701	590	**646**	459	302	**381**	242	199	**220**
9	IL-19083	8.1	7.0	**7.6**	769	575	**672**	433	308	**370**	284	225	**255**
10	IL-19087	10.2	8.7	**9.4**	728	564	**646**	422	290	**356**	290	227	**259**
11	IL-19088	10.2	9.0	**9.6**	669	525	**597**	389	249	**319**	245	194	**220**
12	IL-19095	10.2	8.7	**9.4**	639	564	**601**	381	267	**324**	261	213	**237**
13	IL-19100	12.2	10.3	**11.3**	682	613	**648**	413	308	**360**	242	218	**230**
14	IL-19103	9.2	8.3	**8.7**	646	555	**600**	387	278	**333**	263	216	**239**
15	IL-19177	10.2	8.7	**9.4**	679	586	**632**	417	290	**354**	256	217	**236**
16	IL-19186	11.2	9.3	**10.3**	802	563	**683**	510	270	**390**	263	193	**228**
17	IL-19194	10.2	8.7	**9.4**	797	582	**690**	534	302	**418**	311	215	**263**
18	IL-19196	10.2	9.3	**9.8**	739	543	**641**	462	290	**376**	355	272	**314**
19	IL-19211	8.1	7.3	**7.7**	719	577	**648**	395	259	**327**	244	176	**210**
20	IL-19246	11.2	10.0	**10.6**	708	582	**645**	435	278	**357**	299	265	**282**
21	IL-19344	10.2	8.7	**9.4**	740	543	**641**	420	238	**329**	271	212	**241**
22	IL-19353	11.2	10.3	**10.8**	703	577	**640**	434	300	**367**	244	157	**200**
23	IL-19451	7.6	7.0	**7.3**	741	586	**663**	424	290	**357**	228	182	**205**
24	Krishna Hamsa	10.2	9.3	**9.8**	691	577	**634**	426	290	**358**	258	214	**236**
25	Sahabhagidhan	10.2	8.7	**9.4**	740	614	**677**	479	300	**389**	306	248	**277**
26	WGL-14	8.1	7.3	**7.7**	659	593	**626**	401	276	**339**	239	185	**212**
	Mean	**9.6**	**8.4**	**9.0**	**722**	**571**	**646**	**432**	**284**	**358**	**270**	**214**	**242**
	LSD (Treat)			1.03**			54.18**			73.87*			53.08*
	LSD (Variety)			1.09**			5.01**			2.33**			2.21**
	LSD (Treat x Variety)			ns			7.08**			3.29**			3.12**
	CV(%) Treat			7.2			5.27			29.97			31.83

Table 6.2.12 Influence of irrigation regimes on important physiological traits of rice genotypes at TTB centre during *Rabi* (dry) season 2022-23

S.No	Genotypes	Grain number/panicle		Mean	Spikelet number/panicle		Mean	Grain number/m^2		Mean	Spikelet number/m^2		Mean
		Irrigated	Rainfed		Irrigated	Rainfed		Irrigated	Rainfed		Irrigated	Rainfed	
1	DRR Dhan-44	130	79	**105**	157	130	**143**	37240	16254	**26747**	44725	26822	**35774**
2	IET 29834	130	87	**108**	166	130	**148**	33727	17373	**25550**	42986	26183	**34585**
3	IET 29859	104	75	**89**	121	104	**113**	28439	17498	**22968**	33245	24220	**28732**
4	IET 30116	102	67	**84**	117	102	**109**	28517	15254	**21885**	32836	23327	**28081**
5	IET 30241	92	64	**78**	113	92	**103**	24054	13633	**18844**	29452	19785	**24618**
6	IET 30245	123	72	**97**	143	123	**133**	37771	17165	**27468**	43847	29511	**36679**
7	IL-19075	117	86	**101**	141	117	**129**	30539	17946	**24242**	36827	24330	**30578**
8	IL-19079	111	79	**95**	146	111	**129**	26992	15612	**21302**	35391	22133	**28762**
9	IL-19083	127	84	**106**	153	127	**140**	36194	18927	**27561**	43647	28660	**36153**
10	IL-19087	104	70	**87**	127	104	**115**	30231	15911	**23071**	36889	23609	**30249**
11	IL-19088	123	77	**100**	148	123	**135**	30217	14937	**22577**	36386	23850	**30118**
12	IL-19095	112	80	**96**	136	112	**124**	29429	16900	**23164**	35711	23885	**29798**
13	IL-19100	114	78	**96**	143	114	**129**	27763	16964	**22363**	34616	24897	**29756**
14	IL-19103	105	72	**88**	136	105	**121**	27711	15517	**21614**	36005	22616	**29311**
15	IL-19177	107	79	**93**	126	107	**116**	27463	16996	**22230**	32244	23178	**27711**
16	IL-19186	143	89	**116**	168	143	**156**	37788	17178	**27483**	44444	27616	**36030**
17	IL-19194	119	75	**97**	143	119	**131**	36980	16089	**26535**	44462	25470	**34966**
18	IL-19196	105	71	**88**	131	105	**118**	37325	19336	**28331**	46602	28579	**37591**
19	IL-19211	106	78	**92**	130	106	**118**	25935	13666	**19800**	31796	18691	**25244**
20	IL-19246	119	80	**99**	143	119	**131**	35573	21028	**28300**	42770	31401	**37086**
21	IL-19344	114	81	**98**	141	114	**128**	31094	17142	**24118**	38191	24224	**31208**
22	IL-19353	112	81	**96**	145	112	**129**	27491	12621	**20056**	35445	17611	**26528**
23	IL-19451	127	87	**107**	151	127	**139**	29065	15857	**22461**	34563	23177	**28870**
24	Krishna Hamsa	117	86	**101**	137	117	**127**	30162	18263	**24212**	35546	24901	**30223**
25	Sahabhagidhan	104	76	**90**	121	104	**113**	31910	18714	**25312**	37303	25746	**31524**
26	WGL-14	125	86	**105**	147	125	**136**	29929	15832	**22880**	35174	23158	**29166**
	Mean	**115**	**78**	**97**	**140**	**115**	**127**	**31136**	**16639**	**23888**	**37735**	**24522**	**31129**
	LSD (Treat)			22.25**			11.48**			8775*			9399*
	LSD (Variety)			2.55**			1.14**			780**			691**
	LSD (Treat x Variety)			3.60**			1.61**			1103**			977**
	CV (%) Treat			14.48			5.67			53.32			43.83

Table 6.2.13 Influence of irrigation regimes on important physiological traits of rice genotypes at TTB centre during *Rabi* (dry) season 2022-23

S.No	Genotypes	Total dry matter (g/m²)		Mean	Grain yield (g/m²)		Mean	1000 grain weight (g)		Mean	Harvest index (%)		Mean
		Irrigated	Rainfed		Irrigated	Rainfed		Irrigated	Rainfed		Irrigated	Rainfed	
1	DRR Dhan-44	1295	930	**1112**	375	224	**299**	21.0	19.6	**20.3**	29.0	24.0	**26.5**
2	IET 29834	1260	965	**1112**	412	293	**353**	24.3	22.8	**23.5**	32.8	30.4	**31.6**
3	IET 29859	1252	1043	**1148**	365	302	**333**	24.5	23.1	**23.8**	29.2	28.9	**29.0**
4	IET 30116	1257	1032	**1144**	391	266	**329**	25.0	23.6	**24.3**	31.2	25.8	**28.5**
5	IET 30241	1168	1024	**1096**	349	289	**319**	24.1	22.6	**23.3**	29.9	28.2	**29.1**
6	IET 30245	1294	1003	**1148**	380	285	**332**	20.2	19.0	**19.6**	29.4	28.4	**28.9**
7	IL-19075	1164	918	**1041**	338	244	**291**	21.8	20.3	**21.1**	29.1	26.6	**27.9**
8	IL-19079	1169	1032	**1101**	399	289	**344**	21.7	20.3	**21.0**	34.2	28.0	**31.1**
9	IL-19083	1282	1002	**1142**	376	294	**335**	22.2	20.9	**21.6**	29.4	29.4	**29.4**
10	IL-19087	1213	986	**1100**	367	278	**322**	25.2	23.4	**24.3**	30.3	28.2	**29.2**
11	IL-19088	1114	912	**1013**	338	238	**288**	22.6	20.9	**21.8**	30.4	26.1	**28.3**
12	IL-19095	1065	982	**1024**	332	255	**293**	20.2	19.0	**19.6**	31.2	25.9	**28.6**
13	IL-19100	1137	1073	**1105**	359	294	**327**	20.0	18.6	**19.3**	31.6	27.4	**29.5**
14	IL-19103	1076	969	**1023**	336	266	**301**	19.2	18.0	**18.6**	31.3	27.5	**29.4**
15	IL-19177	1131	1025	**1078**	363	278	**320**	25.3	23.7	**24.5**	32.1	27.1	**29.6**
16	IL-19186	1337	984	**1161**	444	258	**351**	20.1	18.6	**19.3**	33.2	26.2	**29.7**
17	IL-19194	1329	1032	**1180**	465	289	**377**	23.7	21.8	**22.7**	35.0	28.0	**31.5**
18	IL-19196	1231	949	**1090**	402	278	**340**	26.1	24.5	**25.3**	32.7	29.3	**31.0**
19	IL-19211	1198	1009	**1103**	344	248	**296**	26.0	24.4	**25.2**	28.8	24.5	**26.6**
20	IL-19246	1180	1016	**1098**	378	266	**322**	21.3	19.8	**20.5**	32.1	26.2	**29.1**
21	IL-19344	1233	953	**1093**	365	228	**296**	24.3	22.7	**23.5**	29.6	23.9	**26.8**
22	IL-19353	1172	1007	**1089**	377	287	**332**	19.0	17.7	**18.4**	32.2	28.5	**30.4**
23	IL-19451	1235	1024	**1130**	369	278	**323**	21.9	21.0	**21.5**	29.9	27.1	**28.5**
24	Krishna Hamsa	1152	1007	**1079**	371	278	**324**	24.0	22.9	**23.4**	32.2	27.6	**29.9**
25	Sahabhagidhan	1234	1077	**1156**	416	287	**352**	21.6	20.2	**20.9**	33.8	26.6	**30.2**
26	WGL-14	1099	1032	**1066**	349	264	**306**	19.9	18.4	**19.1**	31.8	25.6	**28.7**
	Mean	**1203**	**999**	**1101**	**375**	**271**	**323**	**22.5**	**21.1**	**21.8**	**31.2**	**27.1**	**29.2**
	LSD (Treat)			88.47**			65.97*			0.78**			ns
	LSD (Variety)			2.51**			2.04**			0.36**			0.16**
	LSD (Treat x Variety)			3.55**			2.89**			ns			0.23**
	CV (%) Treat			5.06			29.61			2.27			33.62

Table 6.2.14 Selection for high yield and stability of performance under rainfed conditions during *Kharif* 2023

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	DRT-1	263.9	18	+1	19	12498.3	-8	13	+
2	DRT-11	297.2	28	+2	30	17435.4	-8	23	+
3	DRT-12	283.9	23	+1	24	16387.6	-8	18	+
4	DRT-15	283.9	24	+1	25	9679.7	-8	19	+
5	DRT-3	294.2	27	+2	28	11540.9	-8	22	+
6	DRT-4	283.2	22	+1	23	9543.8	-8	17	+
7	DRT-5	314.7	30	+2	32	6581.6	-8	25	+
8	DRT-6	289.0	25	+2	27	1754.8	-8	20	+
9	DRT-8	266.6	19	+1	20	8741.8	-8	14	+
10	DRT-9	253.9	14	-1	13	3033.9	-8	3	
11	IL 19023	293.9	26	+2	28	36126.3	-8	21	+
12	IL 19027	249.1	10	-1	9	5003.9	-8	-1	
13	IL 19177	267.8	20	+1	21	25570.1	-8	15	+
14	IL 19180	253.0	13	-1	12	10398.9	-8	2	
15	IL 19182	220.1	4	-2	2	8417.6	-8	-7	
16	IL 19206	199.8	1	-2	-1	24941.3	-8	-10	
17	IL 19210	258.4	16	-1	15	8449.2	-8	7	
18	IL 19211	238.8	8	-1	7	2080.7	-8	-3	
19	IL 19241	274.9	21	+1	22	4304.9	-8	16	+
20	IL 19246	263.9	17	+1	18	28506.4	-8	12	+
21	IL 19408	250.6	11	-1	10	823.1	-8	0	
22	IL 19451	252.9	12	-1	11	1143.2	-8	1	
23	IL 19485	231.9	7	-1	6	8984.9	-8	-4	
24	IL19026	302.2	29	+2	31	56988.3	-8	24	+
25	JB 631-1	212.2	2	-2	0	7364.0	-8	-9	
26	JB 680-4	255.1	15	-1	14	23770.9	-8	4	
27	JB 687-2	240.7	9	-1	8	5021.4	-8	-2	
28	Krishna Hamsa	231.9	6	-1	5	10364.6	-8	-5	
29	SB.Dhan	228.5	5	-2	3	25079.6	-8	-6	
30	WGL-14	219.9	3	-2	1	5416.2	-8	-8	
	Yield Mean	259.2			**Selected genotypes**				
	YS Mean	7.37	LSD (0.05): 29.7		**Kang, M.S. 1993. Agronomy Journal. 85:754-757**				

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 26 entries. 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.

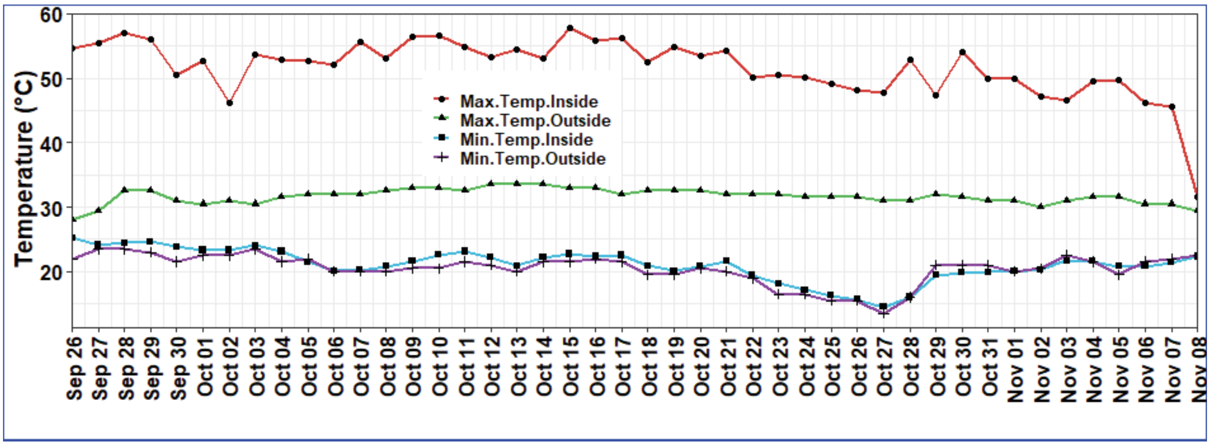


Fig 6.3.1: Maximum and minimum temperatures recorded between PI and maturity stages of rice crop inside and outside of the polythene tunnel at IIRR, Hyderabad during Kharif 2023.

The mean maximum temperature recorded at IIRR center during reproductive stage is in the range of 15-25 °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 stages at IIRR center.

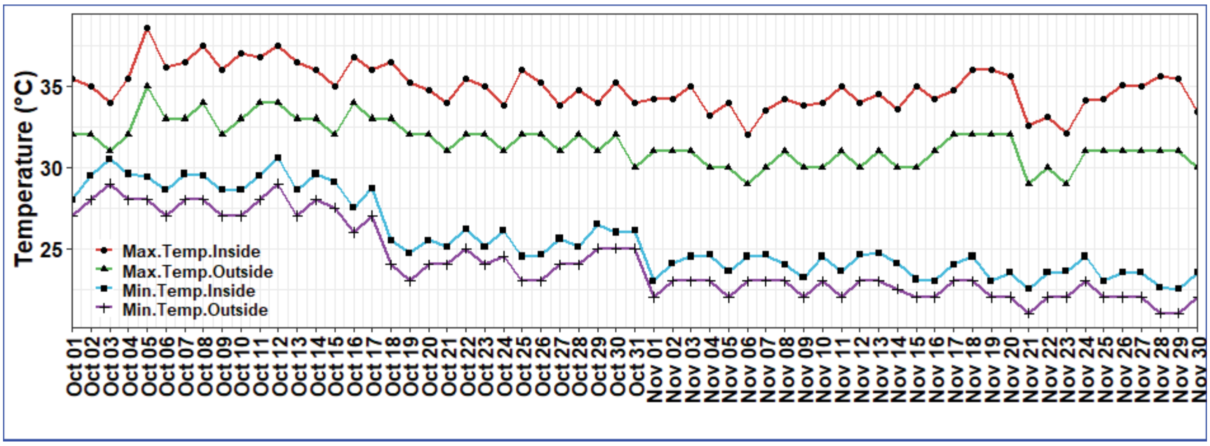


Fig 6.3.2: Maximum and minimum temperatures recorded between PI and maturity stages of rice crop inside and outside of the polythene tunnel at Maruteru during Kharif 2023.

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 lower than mean maximum temperature outside the polytunnel almost by 2-3 °C (Fig 6.3.2). The maximum temperature during day time has reached 30-37.5°C during PI and maturity stages at MTU center barring for few days.

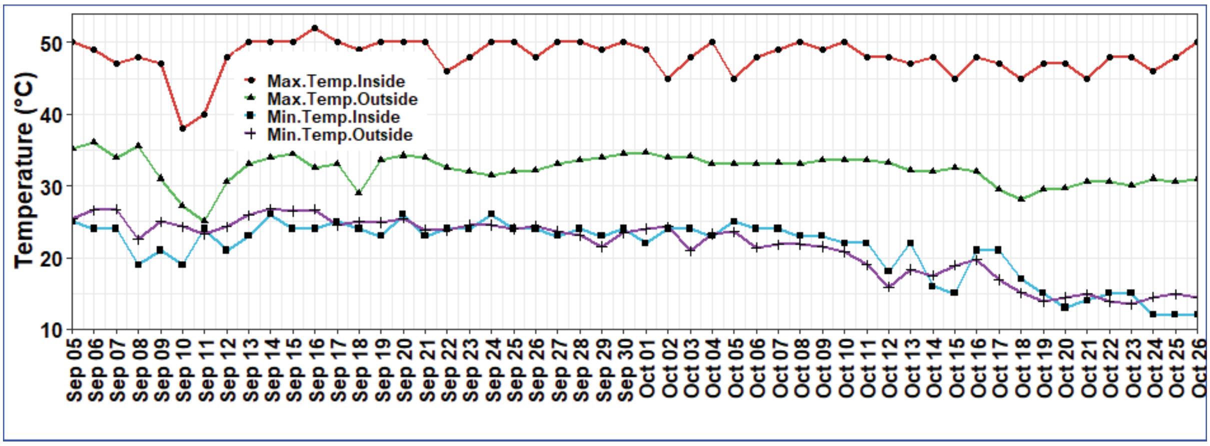


Fig 6.3.3: Maximum and minimum temperatures recorded between PI and maturity stages of rice crop inside and outside of the polythene tunnel at Pantnagar during Kharif 2023.

At PNR center the mean maximum temperature inside the polytunnel was higher than mean maximum ambient temperature by about 5-10°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 stages at PNR center.

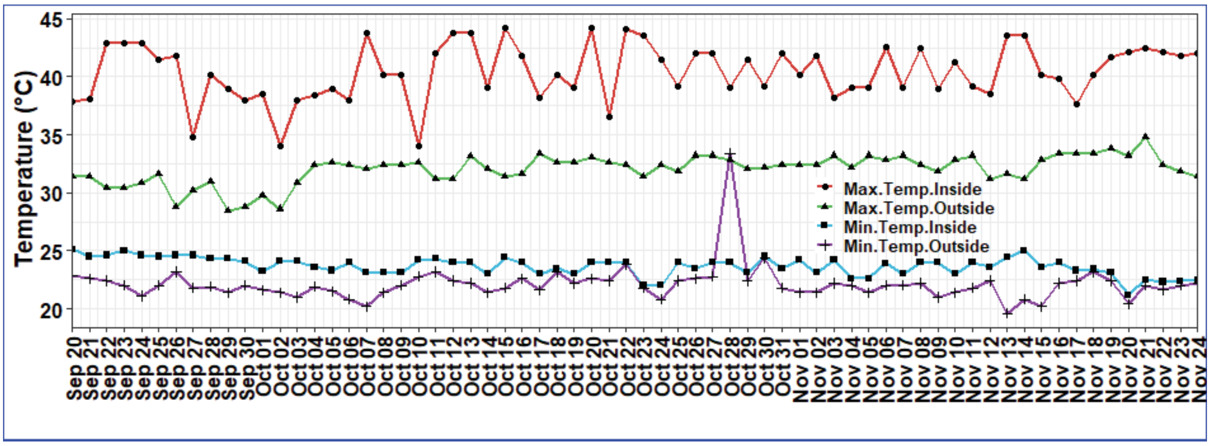


Fig 6.3.4: Maximum and minimum temperatures recorded between PI and maturity stages of rice crop inside and outside of the polythene tunnel at Pattambi, Kerala during Kharif 2023.

At PTB center the mean maximum temperature inside the polytunnel was higher than the ambient mean maximum temperature by 5-10°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). The maximum temperature during day time has reached 35.5-42.5°C during PI and maturity stages at PTB center.

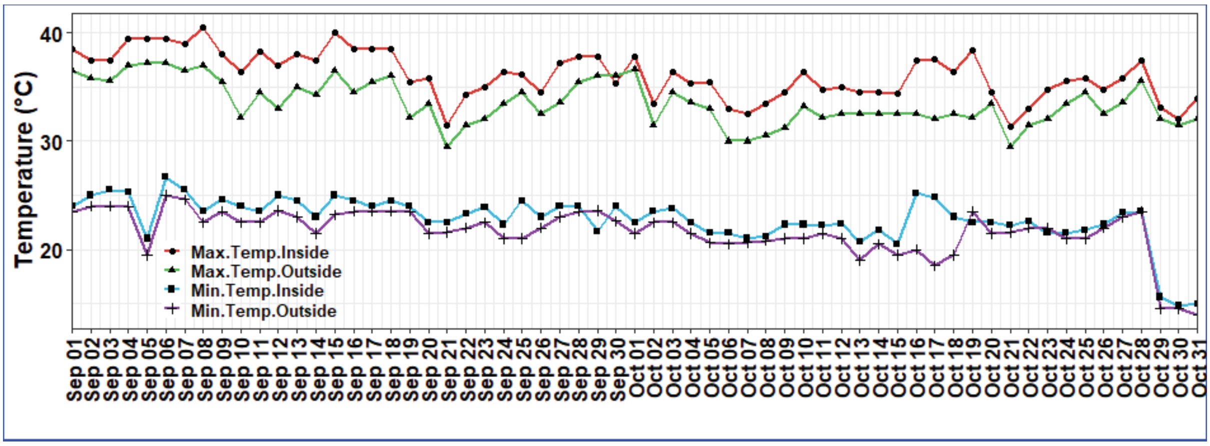


Fig 6.3.5: Maximum and minimum temperatures recorded between PI and maturity stages of rice crop inside and outside of the polythene tunnel at Titabar, Assam during Kharif 2023.

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 6.3.5). At TTB center the maximum temperature during day time has reached 32-37.5°C during PI and maturity stages at except few days.

High temperature stress did not significantly affect the days to flowering stage (Table 6.3.1). It ranged from 78 days at Pattambi to 105 at Rewa with an overall mean of 95 days across all the locations in control whereas it ranged from 73 days at Pattambi to 106 at Rewa with an overall mean of 94 days across all the locations in heat stress treatment. In control among entries, entry IL19202 (89 days) and N22 (89 days) required the least number of days to flowering whereas entries IET29859 (101 days) and IL19247 (101 days) required the greatest number of days to flowering in control. In heat stress treatment, entry IL19202 (89 days) and N22 (89 days) required the least number of days to flowering whereas entries IET29859 (100 days) and IL19247 (100 days). In case of days to maturity as well heat stress treatment did not significantly affect the rice entries (Table 6.3.2). However, the interactions between Location x Treat, Variety, Location x Variety and Location x Treat x Variety were statistically significant except Treat x Variety. In control, it ranged from 116 days at Pattambi to 136 days at Pantnagar with an overall mean of 127 days across all the centers whereas in treatment it ranged from 112 days at Pattambi to 136 days at Titabar with an overall mean of 127 days across all the centers. Same trend was observed in the case of plant height also (Table 6.3.3).

Heat stress treatment did not significantly influence the plant height if the entries. However, the interactions between Location x Treat, Variety, Location x Variety and Location x Treat x Variety were statistically significant except Treat x Variety. Mean plant height ranged from 97 cm at IIRR and Pattambi to 116 cm at Rewa with an overall mean of 106 cm across all the locations in control whereas it ranged from 104 cm at Pantnagar to 108 cm at Kaul with an overall mean of 106 cm across all the locations in treatment. Among entries, entry IL19202 has recorded the least plant height of 97 cm followed by IL19211 (98 cm) and IL19020 (102 cm) whereas entry JB 680-2 has recorded the highest plant height of 113 cm followed by N22 (111 cm) and JB 680-1 (110 cm), MTU-1290 (110 cm) and NLR3778 (110 cm) in control. In treatment, entry IL 19202 has recorded the lowest plant height of 96 cm followed by IL19211 (99 cm) and Krishna Hansa (100 cm) whereas entries JB 680-2, N22 and NLR3778 has recorded the highest plant height of 112 cm followed by MTU1273 (111 cm) and JB-689-1 (110 cm).

Heat stress treatment has statistically significantly influenced the leaf weight (g/m^2) of the rice entries (Table 6.3.4). The interactions between Location x Treat, Variety, Location x Variety and Location x Treat x Variety were statistically significant except Treat x Variety. Mean leaf weight ranged from 85 g/m^2 at Pattambi to 289 g/m^2 at Pantnagar with an overall mean of 194 g/m^2 across all the locations in control whereas it ranged from 71 g/m^2 at Pattambi to 249 g/m^2 at IIRR with an overall mean of 163 g/m^2 across all the locations in treatment. Among entries, entry IL19202 has recorded the least leaf weight of 167 g/m^2 followed by IL19211 (171 g/m^2) and MTU-1290 (171 g/m^2) whereas entry IL19185 has recorded the highest leaf weight of 256 g/m^2 followed by IL19198 (220 g/m^2) and NLR3778 (216 g/m^2) in control. In treatment, entry IL 19202 has recorded the lowest leaf weight of 126 g/m^2 followed by IL19211 (131 g/m^2) and IL19022 (145 g/m^2) whereas entries IL-19185 has recorded the highest leaf weight of 186 g/m^2 followed by IL-19021 (184 g/m^2) and JBC-159-11 (183 g/m^2).

Data for influence of heat stress on stem weight (g/m^2) on rice entries was shown in Table 6.3.5. Stem weight (g/m^2) was significantly influenced by heat stress treatment. The interactions between Location x Treat, Variety, Location x Variety and Location x Treat x Variety were statistically significant except Treat x Variety. Mean stem weight (g/m^2) ranged from 101 g/m^2 at Pattambi to 646 g/m^2 at IIRR with an overall mean of 408 g/m^2 across all the locations in control whereas it ranged from 113 g/m^2 at Pattambi to 490 g/m^2 at Pantnagar with an overall mean of 312 g/m^2 across all the locations in treatment. Among entries, entry IL19202 has recorded the least stem weight of 306 g/m^2 followed by IL19211 (312 g/m^2) and NLR3778 (343 g/m^2) whereas entry IL19185 has recorded the highest stem weight of 518 g/m^2 followed by IL19247 (484 g/m^2) and IET29859 (469 g/m^2) in control. In treatment, entry IL 19202 has recorded the lowest stem weight of 240 g/m^2 followed by IL19211 (245 g/m^2) and IL19396 (256 g/m^2) whereas entries IL-19198 has recorded the highest stem weight of 432 g/m^2 followed by MTU-1153 (363 g/m^2) and JBC-159-11 (353 g/m^2).

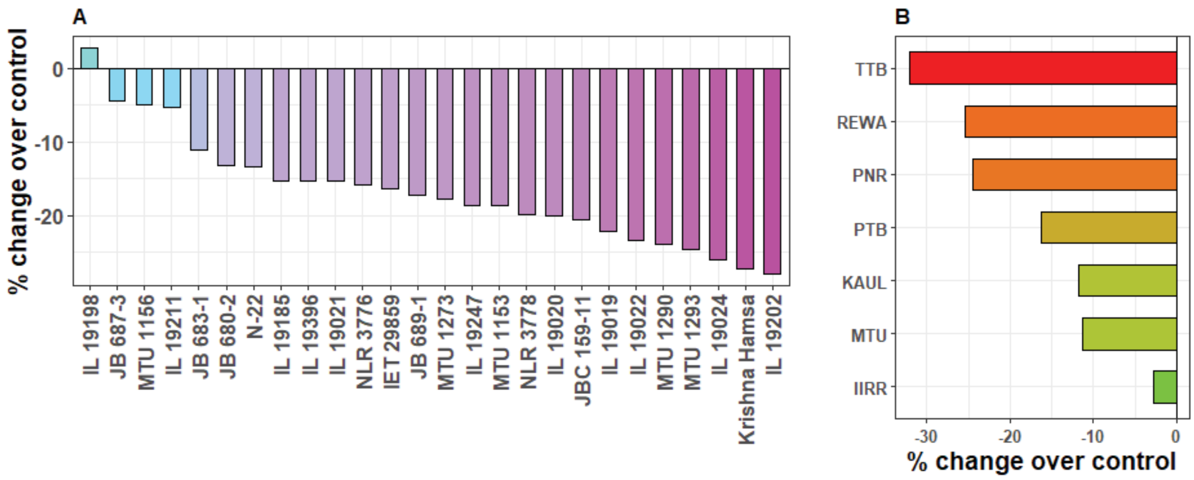


Fig 6.3.8. *Influence of elevated temperature on shoot weight (g/m^2) recorded at maturity. Each bar represents percent change in shoot weight under elevated temperature in comparison with control (A) mean of all locations, (B) mean of all varieties.*

In terms of percentage change over control (Fig 6.3.8A), shoot weight (g/m^2) IL19198 has shown the least reduction followed by JB 687-3 and MTU 1156 whereas IL 19202, Krishna Hansa, and IL 19024 respectively has shown the highest reduction. Among centres, Titabar has shown the highest reduction followed by Rewa and IIRR has shown the least reduction followed by Maruteru (Fig 6.3.8B).

Panicle weight (g/m^2) was significantly influenced by heat stress treatment (Table 6.3.6). The interactions between Location x Treat, Location x Variety and Location x Treat x Variety were statistically significant except Variety and Treat x Variety. Mean panicle weight (g/m^2) ranged from 57 g/m^2 at Pattambi and Maruteru to 191 g/m^2 at Rewa with an overall mean of 131 g/m^2 across all the locations in control whereas it ranged from 49 g/m^2 at Pattambi to 130 g/m^2 at Rewa with an overall mean of 87 g/m^2 across all the locations in treatment. Among entries, entry IL19202 has recorded the least panicle weight of 103 g/m^2 followed by NLR3778 (113 g/m^2) and IL-19396 & N22 114 g/m^2 each whereas entry MTU-1293 has recorded the highest panicle weight of 150 g/m^2 followed by IL19022 (148 g/m^2) and IET29859 (147 g/m^2) in control. In treatment, entry IL 19202 has recorded the lowest panicle weight of 71 g/m^2 followed by JB 687-3 & NLR3778 72 g/m^2 each and IL19211 (73 g/m^2) whereas entries IL-19185 & IL-19198 has recorded the highest panicle weight of 103 g/m^2 each followed by IL-19019 & IL-19021 (102 g/m^2) each and MTU-1153 & MTU-1156 98 g/m^2 each.

Total dry matter (TDM) (g/m^2) was significantly influenced by heat stress treatment (Table 6.3.7). The interactions between Location x Treat, Variety, Location x Variety and Location x Treat x Variety were statistically significant except Treat x Variety. Mean TDM (g/m^2) ranged from 243 g/m^2 at Pattambi to 1099 g/m^2 at Pantnagar with an overall mean of 726 g/m^2 across all the locations in control whereas it ranged from 232 g/m^2 at Pattambi to 803 g/m^2 at IIRR with an overall mean of 558 g/m^2 across all the locations in treatment. Among entries, entry IL19202 has recorded the least TDM of 576 g/m^2 followed by IL19211 (598 g/m^2) and NLR 3776 (617 g/m^2) whereas entry IL19185 has recorded the highest TDM of 911 g/m^2 followed by IL19247 (834 g/m^2) and IL19198 (813 g/m^2) in control. In treatment, entry IL 19202 has recorded the lowest TDM of 437 g/m^2 followed by IL19211 (449 g/m^2) and JB 680-2 (488 g/m^2) whereas entries IL-19198 has recorded the highest TDM of 714 g/m^2 followed by IL-19185 (628 g/m^2) and MTU-1153 (621 g/m^2).

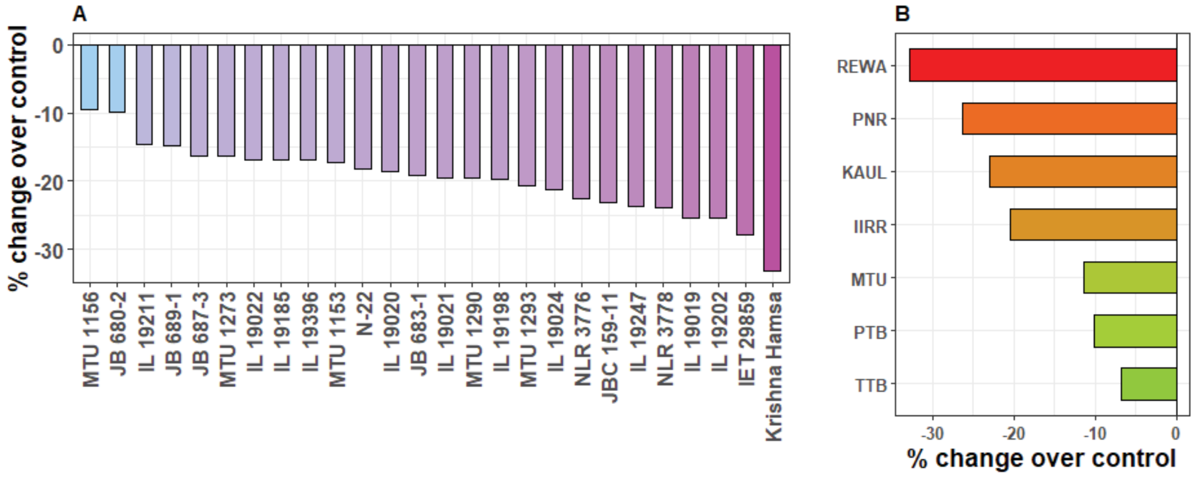


Fig 6.3.6. *Influence of elevated temperature on total dry matter (g/m^2) recorded at maturity. Each bar represents percent change in total dry matter under elevated temperature in comparison with control (A) mean of all locations, (B) mean of all varieties.*

In terms of percentage change over control (Fig 6.3.6A) for TDM, MTU 1156 has shown the least reduction followed by JB 680-2 and IL 19211 whereas Krishna Hansa, IET 29859 and IL 19202 respectively has shown the highest reduction. Among centers, Rewa has shown the highest reduction followed by Pantnagar and Titabar has shown the least reduction followed by Pattambi (Fig 6.3.6B).

SPAD values was not significantly influenced by heat stress treatment (Table 6.3.8). However, the interactions between Location x Treat, Location x Variety were statistically significant except Variety, Treat x Variety and Location x Treat x Variety. Mean SPAD value ranged from 30.4 at Rewa to 40.6 at IIRR with an overall mean of 36.9 across all the locations in control whereas it ranged from 29 at Rewa to 44.2 at IIRR with an overall mean of 37.6 across all the locations in treatment.

Total chlorophyll content (mg/g fr.wt) was significantly influenced by heat stress treatment (Table 6.3.8). The interactions between Location x Treat, Location x Variety and Location x Treat x Variety were statistically significant except Variety and Treat x Variety. Mean Total chlorophyll content ranged from 1.70 mg/g fr.wt at Pantnagar to 2.84 mg/g fr.wt at titabar with an overall mean of 2.41 mg/g fr.wt across all the locations in control whereas it ranged from 1.50 mg/g fr.wt at Pantnagar to 2.34 mg/g fr.wt at Titabar with an overall mean of 2.11 mg/g fr.wt across all the locations in treatment. Among entries, entry IL19198 and JBC 159-11 has recorded the least total chlorophyll content of 2.08 mg/g fr.wt each followed by N22 (2.15 mg/g fr.wt) whereas entry JB 689-1 has recorded the highest Total chlorophyll content of 2.78

mg/g fr.wt followed by NLR 3776 (2.72 mg/g fr.wt) and IL19247 (2.68 mg/g fr.wt) in control. In treatment, entry JBC 159-11 has recorded the lowest Total chlorophyll content of 1.60 mg/g fr.wt followed by N22 (1.66 mg/g fr.wt) and IL 19019 (1.70 mg/g fr.wt) whereas entries Krishna Hansa has recorded the highest Total chlorophyll content of 2.60 mg/g fr.wt followed by IL-19247 (2.51 mg/g fr.wt) and IL 19022 (2.45 mg/g fr.wt).

Panicle weight (g/m^2) was significantly influenced by heat stress treatment (Table 6.3.11). The interactions between Location x Treat, Variety, Location x Variety and Location x Treat x Variety were statistically significant except Treat x Variety. Mean panicle weight ranged from 471 g/m^2 at Kaul to 833 g/m^2 at IIRR with an overall mean of 649 g/m^2 across all the locations in control whereas it ranged from 305 g/m^2 at Kaul to 589 g/m^2 at Pattambi with an overall mean of 435 g/m^2 across all the locations in treatment. Among entries, entry JBC 159-11 has recorded the least panicle weight of 488 g/m^2 followed by Krishna Hansa (574 g/m^2) and IL 19396 (575 g/m^2) whereas entry IL19198 has recorded the highest panicle weight of 773 g/m^2 followed by IL 19021 (742 g/m^2) and MTU 1156 (734 g/m^2) in control. In treatment, entry IET 29859 has recorded the lowest panicle weight of 311 g/m^2 followed by Krishna Hansa (339 g/m^2) and IL 19247 (368 g/m^2) whereas entries MTU 1156 has recorded the highest panicle weight of 567 g/m^2 followed by MTU 1153 (500 g/m^2) and MTU-1290 (498 g/m^2).

Panicle number m^{-2} was not significantly influenced by heat stress treatment (Table 6.3.12). However, the interactions between Location x Treat, Variety, Location x Variety and Location x Treat x Variety were statistically significant except Treat x Variety. Mean panicle number/m^2 ranged from 155 m^{-2} at Kaul to 496 m^{-2} at Maruteru with an overall mean of 348 m^{-2} across all the locations in control whereas it ranged from 1545 m^{-2} at Kaul to 517 m^{-2} at Pattambi with an overall mean of 314 m^{-2} across all the locations in treatment. Among entries, entry MTU 1290 recorded the least panicle number/m^2 of 317 m^{-2} followed by IL 19019 (320 m^{-2}) and N22 (324 m^{-2}) whereas entry Krishna Hansa has recorded the highest panicle number of 395 m^{-2} followed by IL 19185 (376 m^{-2}) and IL 19202 (372 m^{-2}) in control. In treatment, entry MTU 1273 has recorded the lowest panicle number of 255 m^{-2} followed by N22 (258 m^{-2}) and IL 19019 (280 m^{-2}) whereas entries IL19185 has recorded the highest panicle number of 359 m^{-2} followed by IL 19024 (342 m^{-2}) and IL 19198 & IL 19202 (335 m^{-2} each).

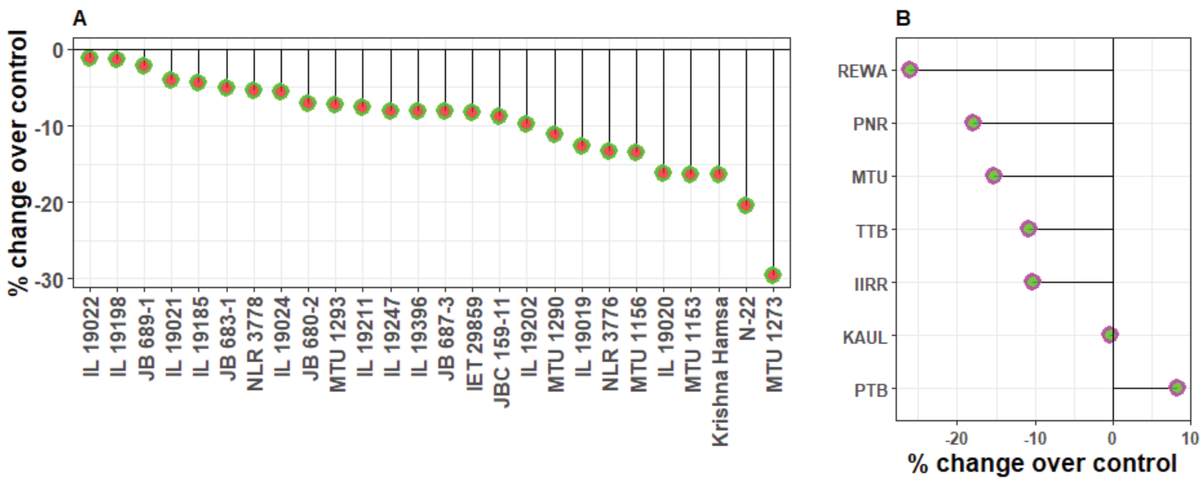


Fig 6.3.9. *Influence of elevated temperature on panicle number/m^2 recorded at maturity. Each bar represents percent change in panicle number under elevated temperature in comparison with control (A) mean of all locations, (B) mean of all varieties.*

In terms of percentage change over control (Fig 6.3.9A), panicle number/m^2 IL19022 has shown the least reduction followed by IL 19198 and JB 689-1 whereas MTU 1273, N22 and Krishna Hansa respectively has shown the highest reduction. Among centres, Rewa has shown the highest reduction followed by Pantnagar and Pattambi has enhancement of about 8% over control and Kaul has recorded almost near zero reduction (Fig 6.3.9B).

Grain number panicle^{-1} was significantly influenced by heat stress treatment (Table 6.3.13). However, the interactions between Location x Treat, Variety, Location x Variety and Location x Treat x Variety were statistically significant except Treat x Variety. Mean grain number panicle^{-1} ranged from 56 panicle^{-1} at Pattambi to 183 panicle^{-1} at Titabar with an overall mean of 129 panicle^{-1} across all the locations in control whereas it ranged from 47 panicle^{-1} at Pattambi to 162 panicle^{-1} at Rewa with an overall mean of 97 panicle^{-1} across all the locations in treatment. Among entries, entry JBC 159-11 recorded the least grain number of 96 panicle^{-1} followed by JB 687-3L (109 panicle^{-1}) and IL 19211 & Krishna Hansa (111 panicle^{-1}) each whereas entry IL 19247 & NLR 3776 has recorded the highest grain number of 157 panicle^{-1} each followed by MTU 1156 & NLR 3778 (156 panicle^{-1} each) and MTU 1153 (142 panicle^{-1}) in control. In treatment, entry IL 19198 has recorded the lowest grain number of 77 panicle^{-1} followed by IET 29859 (78 panicle^{-1}) and JB 687-3 (81 panicle^{-1}) whereas entries MTU 1156 has recorded the highest grain number of 124 panicle^{-1} followed by NLR 3778 (121 panicle^{-1}) and MTU 1153 & NLR 3776 (114 panicle^{-1} each).

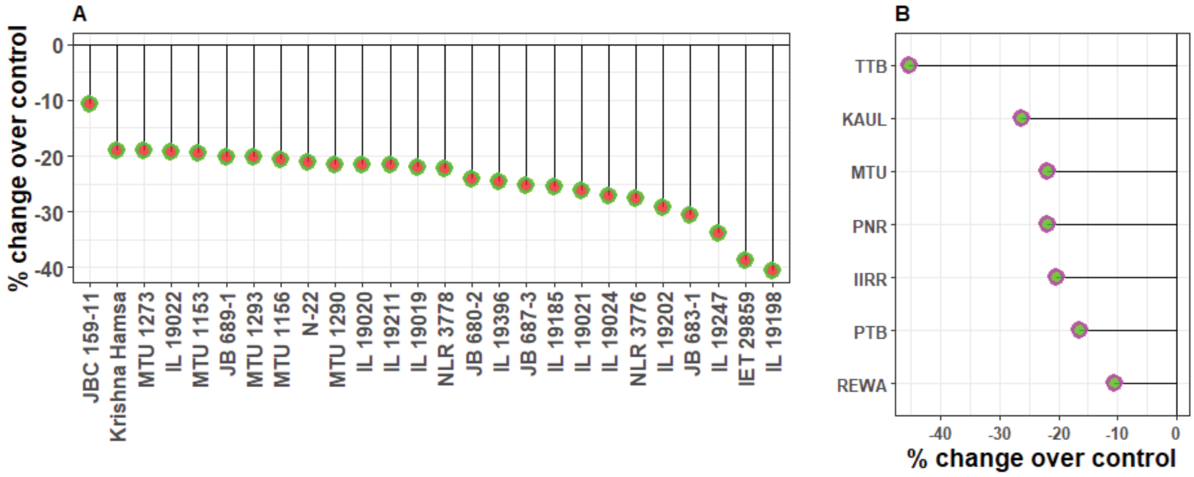


Fig 6.3.7. *Influence of elevated temperature on number filled grains per/panicle recorded at maturity. Each bar represents percent change in grain number under elevated temperature in comparison with control (A) mean of all locations, (B) mean of all varieties.*

Entry IL 19198 has recorded the highest reduction in number of filled grains per panicle in terms of percent change over control followed by IET29859 and IL 19247 whereas entry JBC 159-11 recorded the least reduction followed by Krishna Hansa and MTU 1273 (Fig 6.37A). Fig 6.3.7B shows the centerwise performance of the all the entries. The centre Rewa has recorded the lowest reduction in the number of filled grains per panicle in terms of percent change over control followed by Pattambi and IIRR whereas Titabar centre show the highest reduction followed by Kaul.

Spikelet number panicle^{-1} was not significantly influenced by heat stress treatment (Table 6.3.14). However, the interactions between Location x Treat, Variety, Location x Variety and Location x Treat x Variety were statistically significant except Treat x Variety. Mean spikelet number panicle^{-1} ranged from 78 panicle^{-1} at Pattambi to 236 panicle^{-1} at Rewa with an overall mean of 157 panicle^{-1} across all the locations in control whereas it ranged from 81 panicle^{-1} at Pattambi to 204 panicle^{-1} at Rewa with an overall mean of 137 panicle^{-1} across all the locations in treatment. Among entries, entry JBC 159-11 recorded the least spikelet number of 125 panicle^{-1} followed by Krishna Hansa (139 panicle^{-1}) and JB 687-3 (141 panicle^{-1}) whereas entry IL 19247 has recorded the highest spikelet number of 185 panicle^{-1} each followed by MTU 1156 (183 panicle^{-1} each) and NLR 3778 (182 panicle^{-1}) in control. In treatment, entry IL 19202 has recorded the lowest spikelet number of 114 panicle^{-1} followed by IL 19211 & Krishna Hansa (118 panicle^{-1}) and IET 29859 (120 panicle^{-1}) whereas entries NLR 3776 has recorded the highest spikelet number of 164 panicle^{-1} followed by MTU 1156 (161 panicle^{-1}) and IL 19247 & NLR 3778 (160 panicle^{-1}) each.

Grain yield (g/m^2) was significantly influenced by heat stress treatment (Table 6.3.17). The interactions between Location x Treat, Variety, Location x Variety and Location x Treat x Variety were statistically significant except Treat x Variety. Mean grain yield ranged from 3861 g/m^2 at Pattambi to 731 g/m^2 at IIRR with an overall mean of 540 g/m^2 across all the locations in control whereas it ranged from 177 g/m^2 at Rewa to 489 g/m^2 at Pantnagar with an overall mean of 339 g/m^2 across all the locations in treatment. Among entries, entry JBC 159-11 has recorded the least grain yield of 411 g/m^2 followed by IL 19019 (485 g/m^2) and IL 19202 (495 g/m^2) whereas entry N22 has recorded the highest grain yield of 623 g/m^2 followed by MTU 1156 (598 g/m^2) and MTU 1293 (597 g/m^2) in control. In treatment, entry IET 29859 has recorded the lowest grain yield of 259 g/m^2 followed by JB 683-1 (269 g/m^2) and JBC 159-11 (275 g/m^2) whereas entries N22 has recorded the highest grain yield of 425 g/m^2 followed by MTU 1293 (413 g/m^2) and MTU-1156 (409 g/m^2).

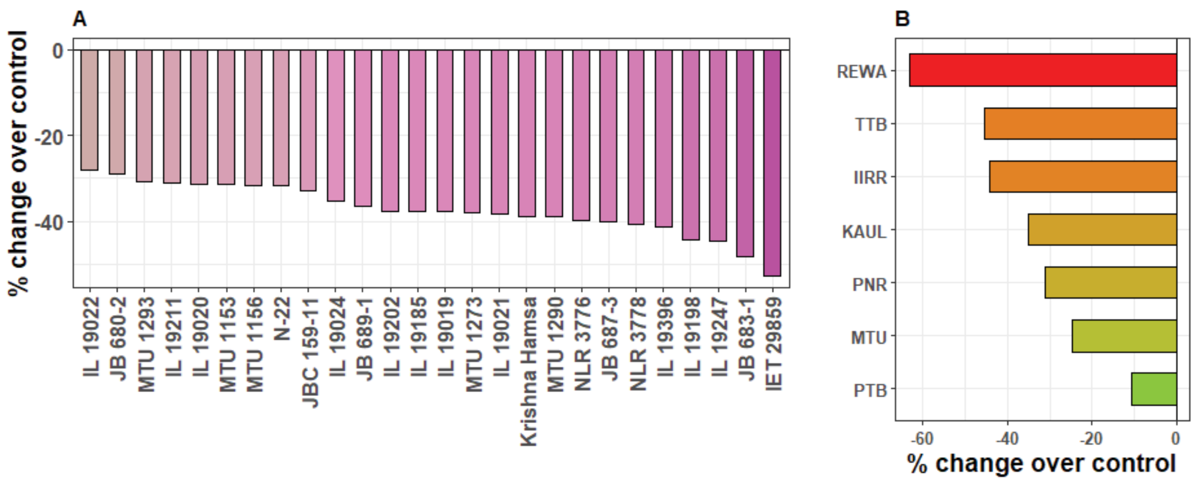


Fig 6.3.10. *Influence of elevated temperature on grain yield (g/m^2) recorded at maturity. Each bar represents percent change in grain yield under elevated temperature in comparison with control (A) mean of all locations, (B) mean of all varieties.*

Entry IET29859 has recorded the highest reduction in grain yield in terms of percent change over control followed by JB 683-1 and IL 19247 whereas entry IL 19022 recorded the least reduction followed by JB 680-2 and MTU 1293 (Fig 6.310A). Fig 6.3.10B shows the center wise performance in terms of percent change over control of grain yield. The centre Pattambi has recorded the lowest reduction in the grain yield in terms of percent change over control followed by Maruteru and Pantnagar whereas Rewa centre show the highest reduction followed by Titabar.

1000 grain weight (g) was significantly influenced by heat stress treatment (Table 6.3.19). The interactions between Location x Treat, Variety, Location x Variety and Location x Treat x Variety were statistically significant except Treat x Variety. Mean 1000 grain weight ranged from 21.2 g at Pattambi to 28 g at Rewa with an overall mean of 23.4 g across all the locations in control whereas it ranged from 18.1 g at Pantnagar to 25.2 g at Rewa with an overall mean of 20.6 g across all the locations in treatment. Among entries, entry JBC 159-11 has recorded the least 1000 grain weight of 19.5 g followed by Krishna Hansa (20.3 g) and N22 (21.9 g) whereas entry JB 680-2 has recorded the highest 1000 grain weight of 25.9 g followed by IL 19185 (25.7 g) and MTU 1273 (25.4 g) in control. In treatment, entry JBC 159-11 has recorded the lowest 1000 grain weight of 18.1 g followed by Krishna Hansa (18.3 g) and IL 19211 & NLR 3776 (18.8 g each) whereas entries MTU 1273 has recorded the highest 1000 grain weight of 23.4 g followed by JB 689-1 (22.8 g) and JB 680-2 (22.6 g).

Heat stress has significantly affected harvest index (%) (Table 6.3.20). No significant variation was noticed among the varieties but the interactions between Location x Treatment, Location x Variety and Location x Treatment x Variety were statistically significant except for Treatment x Variety. In control, mean harvest index ranged from 26.6% to 48.0% with overall mean of 39.9% while in treatment it ranged from 18.9% to 39.0% with overall mean of 30.9%. Among the genotypes under heat stress, Krishna Hamsa (36.4%) followed by MTU 1293 (36.0%) has exhibited highest harvest index while least was recorded in IET 29859 (24.0%) followed by IL 19198 (24.6%).

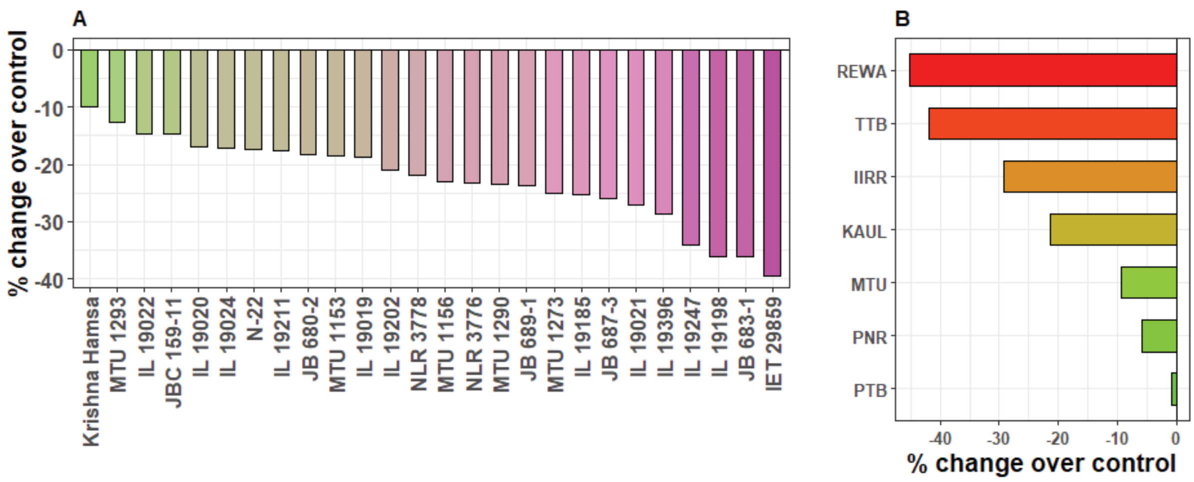


Fig 6.3.11. *Influence of elevated temperature on harvest index (%) recorded at maturity. Each bar represents percent change in harvest index under elevated temperature in comparison with control (A) mean of all locations, (B) mean of all varieties.*

Entry IET29859 has recorded the highest reduction in harvest index (%) in terms of percent change over control followed by JB 683-1 and IL 19198 whereas entry Krishna Hansa recorded the least reduction followed by MTU 1293 and IL 19022 (Fig 6.3. 11A). Fig 6.3.11B shows the centerwise performance of the all the entries. The centre Pattambi has recorded the lowest reduction in the harvest index (%) in terms of percent change over control followed by Pantnagar and Maruteru whereas Rewa centre show the highest reduction followed by Titabar.

Starch (%) was significantly affected by heat stress, significant variation was noticed among the genotypes and interaction between treatment and genotypes also found to be significant (Table 6.3.21). In control, mean starch (%) ranged from 50.1% (IL19396) to 86.1% (MTU 1156) with overall mean of 61.0% while in treatment it ranged from 10.3% (IET 29859) to 74.1% (IL 19019) with overall mean of 53.9%. Among the genotypes, IET 29859 (84.9%) exhibited maximum reduction in starch (%) under heat stress over the control while IL 19019 (30.6%) followed by IL 19396 (29.3%) showed enhancement in starch (%).

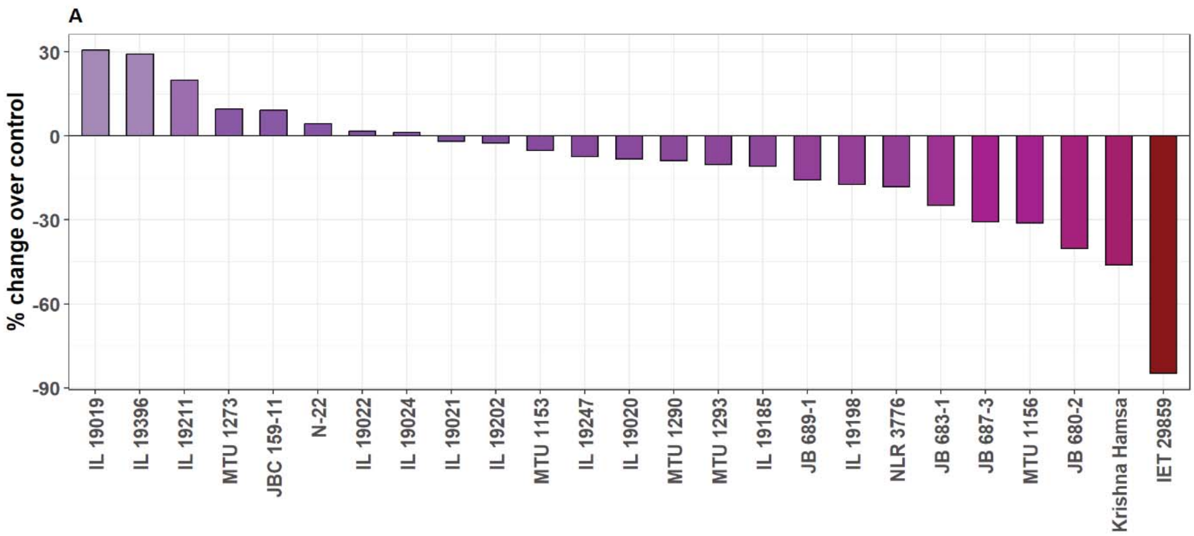


Fig 6.3.12 Percentage change in starch (%) under heat stress with respect to control at IIRR during Kharif 2023.

Chlorophyll fluorescence is extensively used to understand photosynthetic energy flow and function under changing climate conditions such as high temperature. Hence, chlorophyll fluorescence traits were also recorded under heat stress trial at IIRR. Heat stress significantly affected maximum quantum yield of PSII (Table 6.3.22.A). Significant variation noticed among the genotypes and treatment x genotype interaction found significant for all the chlorophyll fluorescence traits (actual quantum yield of PSII (ΦPSII), electron transport rate

(ETR), maximum quantum yield of PSII (Fv/Fm), coefficient of photochemical quenching (qP) and coefficient of non-photochemical quenching (qN) (Table 6.3.22.B). ΦPSII and ETR of JBC 159-11, JB 683-1, IET 29859, JB 687-3, IL 19198, JB 689-1 enhanced under heat stress over control along with tolerant check N-22 and similar result was noticed for qP also except for N22. N-22, MTU 1156, NLR 3778, MTU 1153, IL 19202 and JB 680-2 recorded maximum reduction in qN under heat stress over control. NLR 3776 IL 19021, IL 19020, MTU 1153, IL 19202, NLR 3778, IL 19211 and MTU 1273 exhibited higher Fv/Fm under heat stress over control and also over the tolerant check N22. Therefore, the above genotypes can be a good source of donors to breed for varieties with efficiently functioning photosystems under high temperature conditions.

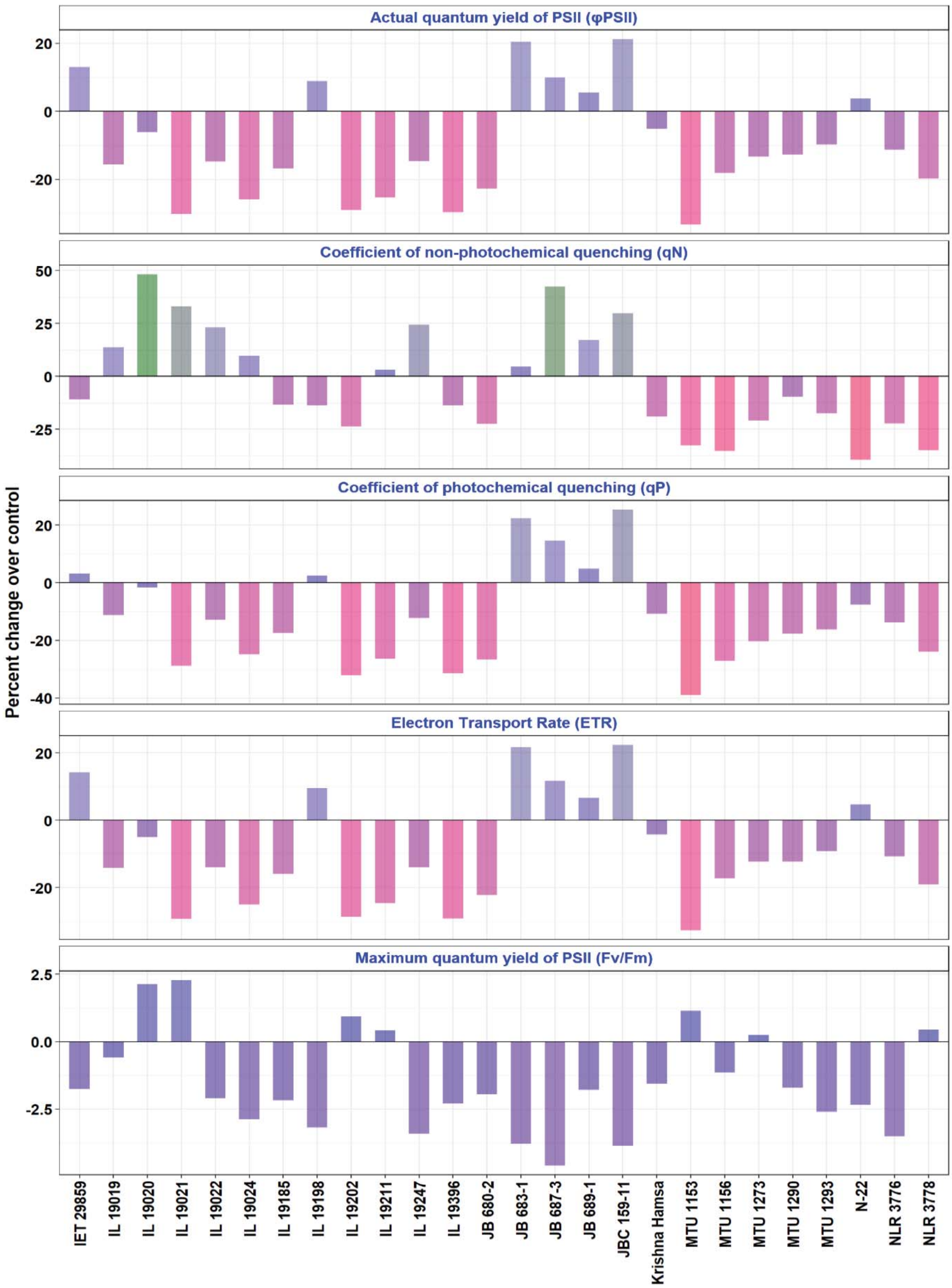


Fig 6.3.13 Percentage change in chlorophyll fluorescence traits under heat stress with respect to control at IIRR during Kharif 2023.

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 (6.3.23). 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 IL19026, IL 19485, IL 19246, IL 19241 and IL 19451 can be identified as relatively heat tolerant genotype (Table 6.3.24).

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. 6.3.15 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), K1STI, K2STI (Modified Stress Tolerance Index), Yield index (YI) and Yield stability index (YSI) 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 6.3.25). Based on their performance across locations and YSi values under elevated temperature conditions genotypes MTU 1293, N-22, MTU

1153, MTU 1156, IL 19020, IL 19022, IL 19024, JB 680-2, MTU 1290, NLR 3778, IL 19211 and MTU 1273 can be selected as they produced relatively higher yield under heat stress condition and showed a lower variation.

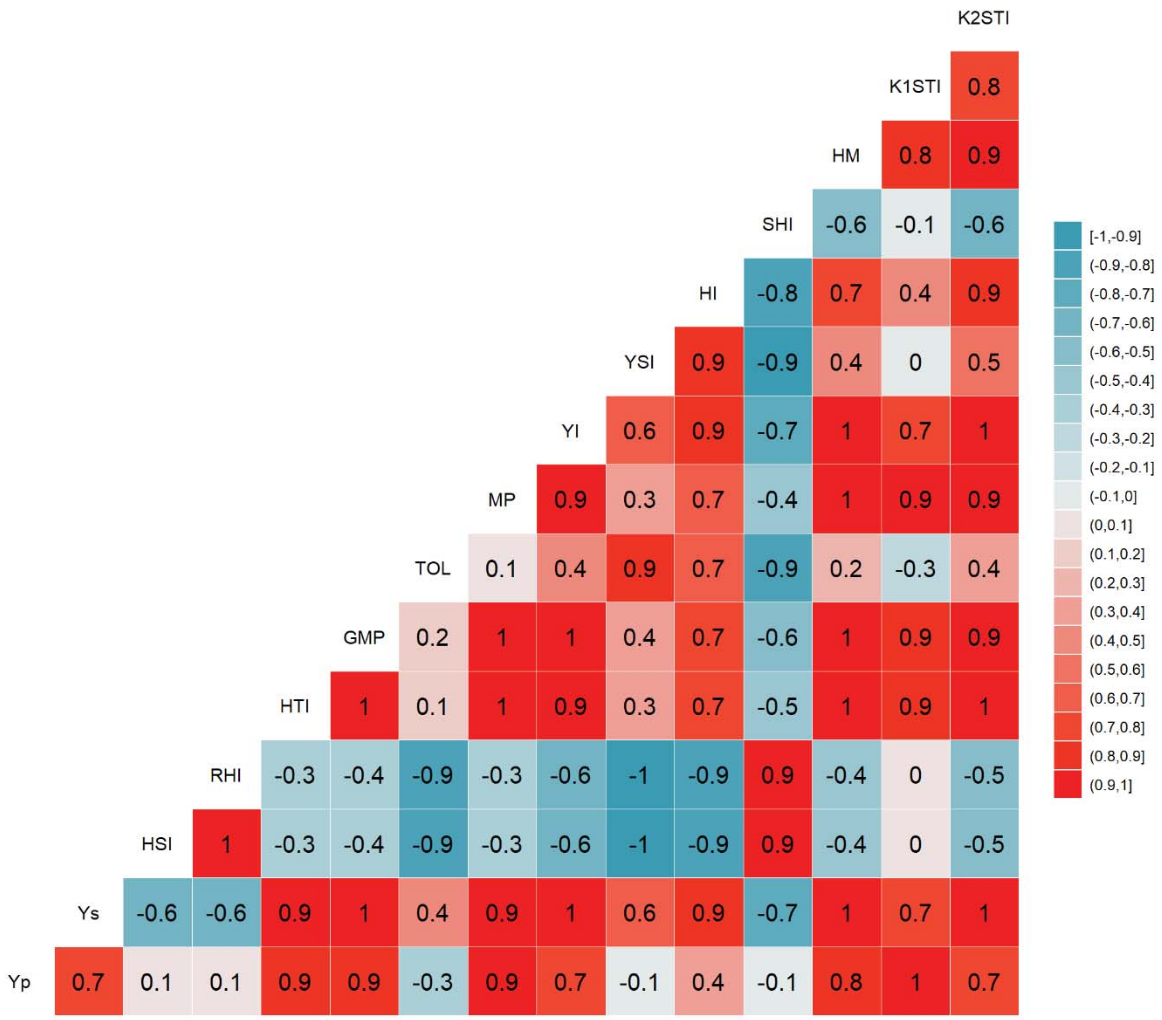


Fig 6.3.14. Correlation between yield recorded under elevated temperature condition and heat indices computed from yield recorded under both control and elevated temperature condition. Mean yield data from all locations was used for computing the correlation coefficients.

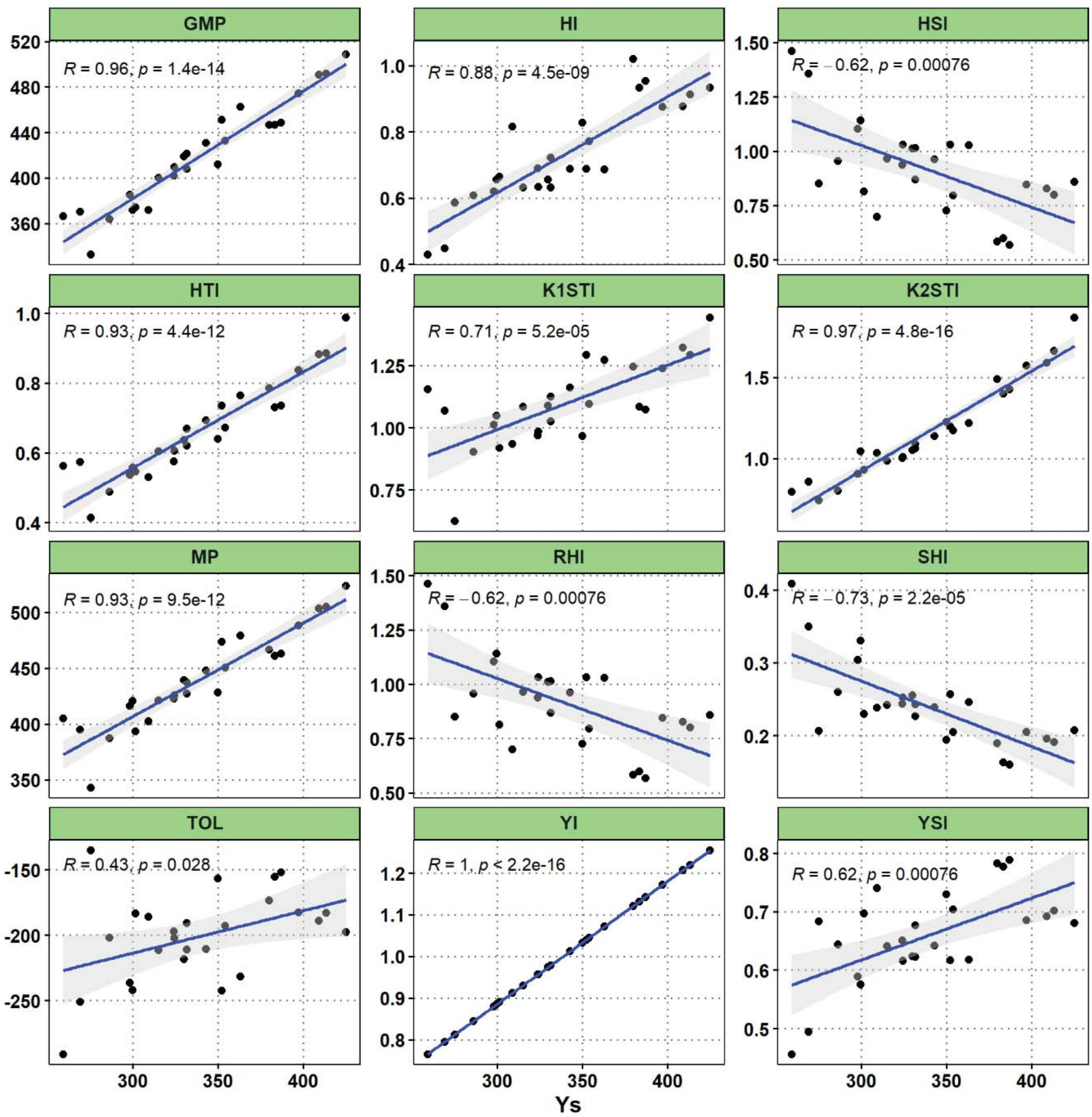


Fig 6.3.15. Relationship between heat stress indices and grain yield recorded under elevated temperature (Ys). Mean of grain yield recorded at different locations was used for regression analysis.

Summary and Conclusions:

- Changing climate scenario lead to global warming that resulted in elevated 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 26 entries.
- ϕPSII, ETR and qP of JBC 159-11, JB 683-1, IET 29859, JB 687-3, IL 19198 and JB 689-1 were enhanced with heat stress over control which can be a promising germplasm to breed varieties with enhanced efficiency of photosystem functioning under high temperature.

- IL 19022 followed by JB 680-2 and MTU 1293 recorded the least reduction in grain yield under heat stress over control which can be utilized as promising donors in breeding programmes.
- Significant variation was observed amongst the genotypes for most of the heat indices. Based on the overall rank IL19026, IL 19485, IL 19246, IL 19241 and IL 19451 were identified as relatively heat tolerant genotypes.
- Multiple correlation and regression analysis indicate highly significant positive association between grain yield under heat stress 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 MTU 1293, N-22, MTU 1153, MTU 1156, IL 19020, IL 19022, IL 19024, JB 680-2, MTU 1290, NLR 3778, IL 19211 and MTU 1273 were selected as 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* 2023

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	IET 29859	112	115	96	95	79	103	109	**101**	104	115	94	90	73	109	115	**100**
2	IL 19019	92	110	90	93	82	102	97	**95**	95	110	88	88	78	105	100	**95**
3	IL 19020	93	95	93	88	80	101	96	**92**	96	95	91	89	76	107	98	**93**
4	IL 19021	92	98	94	88	79	100	92	**92**	96	98	93	88	74	110	99	**94**
5	IL 19022	93	96	96	85	81	104	96	**93**	95	96	94	87	76	110	100	**94**
6	IL 19024	93	96	91	95	79	107	96	**94**	95	96	90	87	72	112	100	**93**
7	IL 19185	102	117	93	91	79	110	110	**100**	105	117	91	85	74	110	112	**99**
8	IL 19198	93	110	93	89	81	111	109	**98**	95	110	92	81	76	107	112	**96**
9	IL 19202	91	88	88	91	71	113	81	**89**	93	88	86	92	71	106	87	**89**
10	IL 19211	91	97	91	90	74	110	90	**92**	94	97	90	89	70	107	94	**92**
11	IL 19247	103	110	97	96	83	109	109	**101**	109	110	96	93	70	105	114	**100**
12	IL 19396	92	94	92	90	78	107	97	**93**	95	94	91	93	71	104	100	**93**
13	JB 680-2	92	92	91	93	76	107	96	**92**	92	92	90	88	70	103	99	**91**
14	JB 683-1	101	97	90	95	80	106	96	**95**	109	97	89	92	76	105	98	**95**
15	JB 687-3	110	94	91	96	80	103	97	**96**	106	94	90	86	76	107	102	**95**
16	JB 689-1	110	102	91	99	76	100	97	**96**	95	102	90	92	76	110	100	**95**
17	JBC 159-11	110	105	91	97	77	106	104	**98**	95	105	90	92	71	109	109	**96**
18	Krishna Hamsa	89	95	91	93	72	109	88	**91**	89	95	90	94	67	106	94	**91**
19	MTU 1153	93	95	94	89	75	108	97	**93**	96	95	93	85	66	104	101	**91**
20	MTU 1156	93	94	92	99	76	108	97	**94**	95	94	91	96	72	101	102	**93**
21	MTU 1273	91	93	94	94	78	106	97	**93**	95	93	91	90	70	105	103	**93**
22	MTU 1290	91	93	92	95	78	104	97	**93**	93	93	91	92	71	104	100	**92**
23	MTU 1293	91	94	92	87	78	99	96	**91**	93	94	91	87	78	103	101	**93**
24	N-22	90	93	95	86	72	101	88	**89**	92	93	94	84	64	101	94	**89**
25	NLR 3776	111	108	97	87	82	106	104	**99**	102	108	96	87	77	106	107	**98**
26	NLR 3778	111	111	97	93	79	100	109	**100**	104	111	95	93	81	106	114	**100**
	Mean	**97**	**100**	**93**	**92**	**78**	**105**	**98**	**95**	**97**	**100**	**91**	**89**	**73**	**106**	**102**	**94**
	LSD (Treat)				ns					*LSD (Treat x Variety)*				ns			
	LSD (Location x Treat)				0.68**					*LSD (Location x Treat x Variety)*				4.01**			
	LSD (Variety)				1.07**					*CV (%) Treat*				1.51			
	LSD (Location x Variety)				2.83**												

Table 6.3.2 Influence of Heat Stress on Days to maturity at different AICRIP centres *Kharif* 2023

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	IET 29859	143	144	124	136	116	124	139	**132**	135	144	121	134	112	127	147	**132**
2	IL 19019	125	139	122	137	119	122	128	**127**	129	139	115	128	116	126	136	**127**
3	IL 19020	125	124	124	135	117	121	125	**125**	130	124	119	131	116	127	132	**126**
4	IL 19021	123	128	122	135	116	121	120	**124**	130	128	119	132	115	130	135	**127**
5	IL 19022	124	125	126	140	118	123	125	**126**	129	125	123	128	115	131	130	**126**
6	IL 19024	125	125	121	133	116	123	127	**124**	130	125	118	130	111	133	132	**125**
7	IL 19185	132	144	123	144	116	125	138	**132**	136	144	119	143	112	131	147	**133**
8	IL 19198	125	140	123	136	118	127	140	**130**	130	140	120	134	115	129	141	**130**
9	IL 19202	123	118	117	130	115	130	111	**121**	129	118	114	127	110	128	123	**121**
10	IL 19211	124	127	120	133	118	127	120	**124**	131	127	118	129	109	130	128	**125**
11	IL 19247	128	140	127	134	118	127	137	**130**	135	140	123	131	110	129	147	**131**
12	IL 19396	124	123	121	137	115	127	132	**126**	132	123	119	135	110	126	134	**126**
13	JB 680-2	124	120	122	138	113	126	129	**125**	132	120	118	136	109	127	134	**125**
14	JB 683-1	133	128	121	140	119	128	130	**128**	139	128	119	129	116	129	131	**127**
15	JB 687-3	142	124	121	142	117	125	129	**128**	136	124	118	130	115	130	135	**127**
16	JB 689-1	143	131	121	143	116	121	129	**129**	132	131	119	132	115	130	133	**127**
17	JBC 159-11	142	135	121	135	114	125	135	**130**	133	135	119	131	109	129	142	**128**
18	Krishna Hamsa	121	125	121	135	109	127	116	**122**	126	125	118	133	106	127	130	**124**
19	MTU 1153	125	126	124	129	112	125	127	**124**	131	126	122	125	106	124	131	**124**
20	MTU 1156	125	124	121	132	113	125	128	**124**	132	124	119	135	111	124	134	**125**
21	MTU 1273	123	122	123	132	118	126	129	**125**	133	122	121	133	109	125	135	**125**
22	MTU 1290	122	123	122	134	115	124	129	**124**	133	123	119	129	110	127	137	**125**
23	MTU 1293	122	122	122	138	115	121	127	**124**	133	122	119	135	117	127	138	**127**
24	N-22	124	122	126	136	117	123	117	**123**	123	122	123	133	112	127	133	**125**
25	NLR 3776	143	138	126	142	119	121	133	**132**	140	138	123	134	117	126	140	**131**
26	NLR 3778	143	141	127	138	116	121	138	**132**	140	141	123	131	118	128	148	**133**
	Mean	**129**	**129**	**123**	**136**	**116**	**125**	**128**	**127**	**132**	**129**	**120**	**132**	**112**	**128**	**136**	**127**
	LSD (Treat)				ns					*LSD (Treat x Variety)*				ns			
	LSD (Location x Treat)				1.27**					*LSD (Location x Treat x Variety)*				3.46**			
	LSD (Variety)				0.92**					*CV (%) Treat*				2.11			
	LSD (Location x Variety)				2.45**												

Table 6.3.3 Influence of Heat Stress on Plant height (cm) flowering at different AICRIP centres *Kharif* 2023

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	IET 29859	108	92	112	115	100	116	115	**108**	109	91	111	101	105	109	114	**106**
2	IL 19019	90	105	105	111	85	123	100	**103**	92	106	104	101	102	112	105	**103**
3	IL 19020	89	110	100	104	95	117	98	**102**	97	112	99	116	101	114	102	**106**
4	IL 19021	86	109	106	112	93	111	103	**103**	96	110	102	99	100	121	104	**104**
5	IL 19022	92	109	107	107	93	121	96	**103**	99	108	105	110	98	123	103	**107**
6	IL 19024	95	106	103	105	91	125	97	**103**	95	105	102	106	98	118	100	**103**
7	IL 19185	93	105	112	108	92	123	104	**105**	100	104	106	98	99	115	111	**105**
8	IL 19198	95	108	106	109	95	122	104	**106**	98	109	105	101	101	111	111	**105**
9	IL 19202	85	104	88	98	94	117	91	**97**	85	105	84	92	98	112	95	**96**
10	IL 19211	83	108	88	103	96	110	98	**98**	87	108	87	103	99	111	100	**99**
11	IL 19247	97	105	109	112	101	117	104	**106**	101	106	109	107	117	111	111	**109**
12	IL 19396	98	105	107	106	94	111	100	**103**	99	106	102	99	101	109	104	**103**
13	JB 680-2	106	115	117	114	110	111	116	**113**	106	115	114	111	107	110	118	**112**
14	JB 683-1	105	103	112	109	98	110	98	**105**	106	103	107	103	107	113	104	**106**
15	JB 687-3	106	100	107	114	101	111	100	**106**	104	101	105	109	104	111	99	**105**
16	JB 689-1	113	105	115	113	100	112	110	**110**	113	105	113	103	106	114	113	**110**
17	JBC 159-11	100	101	110	105	92	114	102	**103**	99	102	108	99	95	106	106	**102**
18	Krishna Hamsa	82	104	104	111	90	111	96	**100**	94	103	101	107	96	105	97	**100**
19	MTU 1153	108	114	110	108	101	110	108	**108**	107	115	106	111	107	109	107	**109**
20	MTU 1156	103	113	104	116	108	104	116	**109**	102	112	102	107	115	118	103	**109**
21	MTU 1273	99	119	113	100	102	114	106	**108**	99	119	109	105	119	121	105	**111**
22	MTU 1290	93	116	112	110	101	123	115	**110**	94	115	110	107	114	125	101	**109**
23	MTU 1293	90	116	106	110	103	124	110	**108**	92	115	103	105	109	118	109	**107**
24	N-22	94	114	122	109	97	128	117	**111**	105	115	118	103	120	112	111	**112**
25	NLR 3776	93	110	115	102	92	118	106	**105**	102	109	111	96	103	120	115	**108**
26	NLR 3778	112	106	110	108	102	123	113	**110**	110	107	105	114	107	118	120	**112**
	Mean	**97**	**108**	**108**	**108**	**97**	**116**	**105**	**106**	**100**	**108**	**105**	**104**	**105**	**114**	**106**	**106**
	LSD (Treat)				ns					*LSD (Treat x Variety)*				ns			
	LSD (Location x Treat)				2.31**					*LSD (Location x Treat x Variety)*				9.83**			
	LSD (Variety)				2.63**					*CV (%) Treat*				4.59			
	LSD (Location x Variety)				6.95**												

Table 6.3.4 Influence of Heat Stress on Leaf weight (g/m²) flowering at different AICRIP centres *Kharif* 2023

S.No.	Genotypes	Control						Grand	Heat Stress						Grand
		IIRR	MTU	PNR	PTB	REWA	TTB	Mean	IIRR	MTU	PNR	PTB	REWA	TTB	Mean
1	IET 29859	241	117	322	67	303	87	**190**	323	113	243	64	189	136	**178**
2	IL 19019	211	117	348	78	321	189	**211**	268	102	150	158	282	112	**179**
3	IL 19020	251	101	262	106	355	87	**194**	239	98	333	100	220	49	**173**
4	IL 19021	261	116	304	89	311	140	**203**	242	104	349	59	212	136	**184**
5	IL 19022	287	117	369	94	291	112	**212**	262	98	156	59	245	52	**145**
6	IL 19024	308	122	268	89	306	143	**206**	240	115	199	97	210	52	**152**
7	IL 19185	358	115	482	78	278	227	**256**	184	97	379	61	261	136	**186**
8	IL 19198	300	121	414	94	236	157	**220**	266	110	214	58	205	223	**180**
9	IL 19202	239	116	251	67	264	66	**167**	167	103	171	69	213	35	**126**
10	IL 19211	238	108	242	78	251	108	**171**	192	103	188	53	193	56	**131**
11	IL 19247	364	110	306	100	212	164	**209**	187	107	344	92	242	63	**172**
12	IL 19396	303	118	288	89	252	143	**199**	239	98	190	97	242	38	**151**
13	JB 680-2	254	124	316	83	224	119	**187**	259	93	180	81	217	56	**148**
14	JB 683-1	316	131	238	94	239	115	**189**	210	104	214	47	269	87	**155**
15	JB 687-3	204	100	256	89	290	105	**174**	264	87	140	86	274	77	**155**
16	JB 689-1	209	128	287	83	269	150	**188**	340	110	169	47	217	77	**160**
17	JBC 159-11	168	109	194	78	288	234	**178**	280	97	229	53	240	203	**183**
18	Krishna Hamsa	296	125	272	67	281	98	**190**	199	114	243	58	248	84	**158**
19	MTU 1153	313	119	307	72	228	143	**197**	275	109	210	53	226	84	**159**
20	MTU 1156	273	108	305	72	245	126	**188**	348	103	166	47	265	84	**169**
21	MTU 1273	223	103	271	94	251	150	**182**	260	101	212	86	226	98	**164**
22	MTU 1290	271	120	172	83	244	136	**171**	171	98	197	86	299	84	**156**
23	MTU 1293	256	122	257	89	291	112	**188**	212	93	210	42	287	94	**156**
24	N-22	285	130	310	100	266	91	**197**	247	111	262	58	237	87	**167**
25	NLR 3776	131	128	204	83	357	129	**172**	296	104	206	64	241	56	**161**
26	NLR 3778	260	101	279	89	405	161	**216**	300	88	239	58	292	112	**181**
	Mean	**262**	**116**	**289**	**85**	**279**	**134**	**194**	**249**	**102**	**223**	**71**	**241**	**91**	**163**
	LSD (Treat)				3.79*				*LSD (Treat x Variety)*				ns		
	LSD (Location x Treat)				13.01**				*LSD (Location x Treat x Variety)*				80.96**		
	LSD (Variety)				17.76*				*CV (%) Treat*				14.89		
	LSD (Location x Variety)				57.25**										

Table 6.3.5 Influence of Heat Stress on Stem weight (g/m^2) flowering at different AICRIP centres *Kharif* 2023

S.No.	Genotypes	Control						Grand Mean	Heat Stress						Grand Mean
		IIRR	MTU	PNR	PTB	REWA	TTB		IIRR	MTU	PNR	PTB	REWA	TTB	
1	IET 29859	589	396	1049	100	538	140	**469**	479	393	456	128	386	218	**343**
2	IL 19019	576	406	818	111	392	302	**434**	489	346	400	178	313	179	**317**
3	IL 19020	558	342	549	194	455	140	**373**	374	329	638	183	338	78	**323**
4	IL 19021	568	392	641	122	516	223	**410**	429	356	566	66	275	218	**318**
5	IL 19022	607	401	797	94	572	179	**442**	509	334	314	94	317	84	**275**
6	IL 19024	686	415	542	89	524	229	**414**	424	399	368	100	232	84	**268**
7	IL 19185	733	380	1063	94	472	363	**518**	363	341	672	150	254	218	**333**
8	IL 19198	641	436	910	111	378	251	**455**	443	398	1006	89	298	358	**432**
9	IL 19202	655	394	242	72	370	106	**306**	252	373	341	133	282	56	**240**
10	IL 19211	453	370	434	83	357	173	**312**	373	354	272	78	304	89	**245**
11	IL 19247	954	360	812	106	408	263	**484**	396	359	871	89	292	101	**351**
12	IL 19396	766	418	712	67	428	229	**437**	391	332	342	122	287	61	**256**
13	JB 680-2	615	420	680	94	370	190	**395**	421	310	413	94	309	89	**273**
14	JB 683-1	857	453	596	67	403	184	**427**	451	348	593	94	336	140	**327**
15	JB 687-3	505	345	644	133	444	168	**373**	465	301	342	106	351	123	**281**
16	JB 689-1	540	447	572	94	502	240	**399**	602	376	350	94	331	123	**313**
17	JBC 159-11	534	380	392	83	479	374	**374**	619	338	424	72	342	324	**353**
18	Krishna Hamsa	553	432	646	33	478	156	**383**	336	398	531	139	376	134	**319**
19	MTU 1153	858	394	464	111	454	229	**418**	648	373	548	106	372	134	**363**
20	MTU 1156	701	368	591	128	474	201	**411**	693	352	334	144	427	134	**347**
21	MTU 1273	583	356	645	111	455	240	**399**	545	341	473	172	362	156	**342**
22	MTU 1290	764	409	417	139	445	218	**399**	335	334	376	156	267	134	**267**
23	MTU 1293	756	420	516	133	469	179	**412**	374	305	496	50	270	151	**274**
24	N-22	703	447	690	67	408	145	**410**	478	380	673	100	317	140	**348**
25	NLR 3776	373	446	479	83	472	207	**343**	441	354	389	95	316	89	**281**
26	NLR 3778	683	350	649	106	443	257	**415**	458	309	541	100	279	179	**311**
	Mean	**646**	**399**	**637**	**101**	**450**	**215**	**408**	**453**	**351**	**490**	**113**	**317**	**146**	**312**
	LSD (Treat)				6.89*				*LSD (Treat x Variety)*				ns		
	LSD (Location x Treat)				23.68**				*LSD (Location x Treat x Variety)*				148.25**		
	LSD (Variety)				32.53*				*CV (%) Treat*				13.45		
	LSD (Location x Variety)				104.83**										

Table 6.3.6 Influence of Heat Stress on Panicle weight (g/m²) flowering at different AICRIP centres *Kharif* 2023

S.No.	Genotypes	Control						Grand Mean	Heat Stress						Grand Mean
		IIRR	MTU	PNR	PTB	REWA	TTB		IIRR	MTU	PNR	PTB	REWA	TTB	
1	IET 29859	168	58	224	63	210	159	**147**	78	55	173	48	155	44	**92**
2	IL 19019	121	58	244	64	212	129	**138**	148	52	74	82	156	100	**102**
3	IL 19020	130	49	105	69	198	141	**115**	82	45	64	82	184	96	**92**
4	IL 19021	108	55	234	64	220	172	**142**	98	52	190	43	146	86	**102**
5	IL 19022	110	54	310	69	209	133	**148**	114	49	124	32	146	80	**91**
6	IL 19024	158	57	161	64	177	164	**130**	89	54	110	48	105	62	**78**
7	IL 19185	150	53	215	47	177	183	**137**	123	49	189	43	129	84	**103**
8	IL 19198	140	59	197	58	208	170	**139**	115	55	202	37	121	89	**103**
9	IL 19202	143	56	78	47	167	127	**103**	86	52	81	59	99	47	**71**
10	IL 19211	131	52	182	58	165	106	**116**	98	50	123	37	94	38	**73**
11	IL 19247	197	52	150	47	172	168	**131**	63	49	118	54	125	96	**84**
12	IL 19396	167	59	133	53	138	133	**114**	111	49	137	76	148	52	**96**
13	JB 680-2	106	58	151	42	200	159	**119**	86	43	85	37	109	80	**73**
14	JB 683-1	258	64	104	47	166	111	**125**	86	51	139	32	100	59	**78**
15	JB 687-3	284	51	94	81	213	98	**137**	90	44	54	54	113	77	**72**
16	JB 689-1	278	64	202	47	133	134	**143**	122	56	68	32	148	72	**83**
17	JBC 159-11	214	55	142	53	188	111	**127**	115	49	101	37	142	96	**90**
18	Krishna Hamsa	153	60	268	42	187	96	**134**	98	55	132	59	180	50	**96**
19	MTU 1153	189	55	163	64	204	135	**135**	146	52	130	37	143	82	**98**
20	MTU 1156	158	53	196	47	220	156	**138**	160	49	111	32	132	103	**98**
21	MTU 1273	136	52	210	64	241	163	**144**	141	49	124	54	105	88	**94**
22	MTU 1290	167	59	134	53	219	174	**134**	78	46	138	76	92	96	**88**
23	MTU 1293	158	63	282	58	185	155	**150**	74	46	116	37	106	84	**77**
24	N-22	113	65	139	59	200	112	**114**	67	54	78	43	153	78	**79**
25	NLR 3776	159	62	78	47	182	187	**119**	102	52	76	54	137	122	**90**
26	NLR 3778	120	50	121	69	168	150	**113**	65	44	80	43	118	84	**72**
	Mean	**162**	**57**	**174**	**57**	**191**	**143**	**131**	**101**	**50**	**116**	**49**	**130**	**79**	**87**
	LSD (Treat)				3.52*				*LSD (Treat x Variety)*				ns		
	LSD (Location x Treat)				12.09**				*LSD (Location x Treat x Variety)*				56.03**		
	LSD (Variety)				ns				*CV (%) Treat*				22.69		
	LSD (Location x Variety)				39.62**										

Table 6.3.7 Influence of Heat Stress on Total dry matter (g/m²) flowering at different AICRIP centres *Kharif* 2023

S.No.	Genotypes	Control						Grand Mean	Heat Stress						Grand Mean
		IIRR	MTU	PNR	PTB	REWA	TTB		IIRR	MTU	PNR	PTB	REWA	TTB	
1	IET 29859	999	571	1594	229	915	386	**782**	879	562	871	240	730	399	**613**
2	IL 19019	908	581	1410	253	924	619	**782**	906	500	624	418	750	391	**598**
3	IL 19020	939	492	915	369	917	368	**667**	695	472	1035	365	742	223	**588**
4	IL 19021	937	563	1178	275	927	535	**736**	770	512	1105	168	632	440	**604**
5	IL 19022	1004	572	1476	258	1053	424	**798**	885	481	594	185	708	216	**512**
6	IL 19024	1152	594	971	242	968	536	**744**	753	568	677	246	547	198	**498**
7	IL 19185	1240	548	1760	219	927	773	**911**	670	487	1240	254	679	438	**628**
8	IL 19198	1081	615	1521	264	822	579	**813**	824	564	1421	184	624	670	**714**
9	IL 19202	1036	565	570	186	800	300	**576**	504	529	593	262	594	137	**437**
10	IL 19211	822	531	858	219	773	388	**598**	663	507	583	168	590	184	**449**
11	IL 19247	1515	522	1267	253	851	595	**834**	646	516	1333	235	633	259	**604**
12	IL 19396	1236	595	1132	208	770	505	**741**	741	479	669	296	677	152	**502**
13	JB 680-2	975	602	1147	219	794	468	**701**	766	446	678	212	600	225	**488**
14	JB 683-1	1430	647	938	208	808	411	**740**	746	503	945	173	704	286	**560**
15	JB 687-3	993	496	994	303	832	370	**665**	819	432	536	246	663	277	**495**
16	JB 689-1	1027	639	1061	225	904	525	**730**	1063	542	587	173	644	272	**547**
17	JBC 159-11	916	544	728	214	893	719	**669**	1014	484	754	162	657	622	**616**
18	Krishna Hamsa	1002	617	1185	142	872	351	**695**	632	567	905	257	734	268	**561**
19	MTU 1153	1361	568	934	247	886	507	**750**	1068	534	888	196	740	300	**621**
20	MTU 1156	1131	528	1092	247	918	483	**733**	1200	505	610	223	686	321	**591**
21	MTU 1273	942	511	1126	269	856	554	**710**	946	492	809	312	611	343	**586**
22	MTU 1290	1202	587	722	275	771	528	**681**	583	478	710	318	658	314	**510**
23	MTU 1293	1170	604	1055	281	946	446	**750**	660	444	821	129	663	329	**508**
24	N-22	1101	642	1139	226	873	348	**721**	792	545	1013	201	608	305	**577**
25	NLR 3776	663	636	760	214	907	523	**617**	839	510	671	212	694	268	**532**
26	NLR 3778	1063	501	1049	264	926	568	**729**	823	441	860	201	689	375	**565**
	Mean	**1071**	**572**	**1099**	**243**	**878**	**493**	**726**	**803**	**504**	**828**	**232**	**664**	**316**	**558**
	LSD (Treat)				10.81*				*LSD (Treat x Variety)*				ns		
	LSD (Location x Treat)				37.11**				*LSD (Location x Treat x Variety)*				199.72**		
	LSD (Variety)				43.82*				*CV (%) Treat*				11.82		
	LSD (Location x Variety)				141.22**										

Table 6.3.8 Influence of Heat Stress on SPAD values/Total chlorophyll content (mg/g fr.wt) in different AICRIP centres *Kharif* 2023

S.No.	Genotypes	Control			Grand	Heat Stress			Grand	Control				Grand	Heat Stress				Grand
		IIRR	KAUL	REWA	Mean	IIRR	KAUL	REWA	Mean	MTU	PNR	PTB	TTB	Mean	MTU	PNR	PTB	TTB	Mean
1	IET 29859	36.4	38.8	31.5	**35.5**	44.3	39.0	31.1	**38.1**	2.39	1.46	2.33	2.82	**2.25**	2.00	1.04	1.48	2.35	**1.72**
2	IL 19019	40.7	34.9	28.0	**34.5**	46.9	35.1	26.4	**36.1**	2.26	1.82	2.44	2.72	**2.31**	1.92	1.35	1.82	1.71	**1.70**
3	IL 19020	42.7	38.8	27.1	**36.2**	46.5	38.6	26.2	**37.1**	2.43	1.59	2.67	2.98	**2.42**	2.13	1.89	2.57	2.91	**2.37**
4	IL 19021	41.9	37.8	27.8	**35.8**	47.0	37.3	30.9	**38.4**	2.38	1.59	2.35	2.70	**2.25**	1.80	1.47	2.66	2.62	**2.14**
5	IL 19022	42.5	40.2	28.0	**36.9**	44.4	40.1	31.5	**38.7**	3.24	1.70	2.54	2.73	**2.55**	2.52	1.13	3.10	3.05	**2.45**
6	IL 19024	41.8	38.2	31.9	**37.3**	43.0	38.0	32.4	**37.8**	2.52	1.72	1.78	2.97	**2.25**	2.07	1.11	1.99	2.98	**2.04**
7	IL 19185	40.4	34.3	33.0	**35.9**	40.9	34.6	29.4	**34.9**	3.08	1.54	2.68	2.96	**2.56**	2.72	0.61	1.61	2.56	**1.88**
8	IL 19198	42.8	41.9	33.9	**39.5**	45.6	41.8	28.4	**38.6**	2.45	1.33	1.82	2.71	**2.08**	2.04	1.16	3.06	2.11	**2.09**
9	IL 19202	37.0	41.4	30.9	**36.4**	45.0	41.7	28.5	**38.4**	3.26	1.76	2.69	2.91	**2.65**	2.83	1.64	2.82	2.35	**2.41**
10	IL 19211	46.4	40.3	31.5	**39.4**	47.1	40.4	28.1	**38.6**	2.31	2.27	1.59	2.94	**2.28**	1.97	2.30	2.19	2.17	**2.16**
11	IL 19247	39.8	43.1	30.2	**37.7**	43.7	43.3	28.2	**38.4**	3.34	1.77	2.55	3.06	**2.68**	3.13	1.92	2.70	2.30	**2.51**
12	IL 19396	38.6	38.8	28.8	**35.4**	42.3	38.9	28.7	**36.6**	2.45	1.86	2.17	2.91	**2.35**	2.08	2.17	2.25	2.65	**2.29**
13	JB 680-2	43.7	41.8	30.2	**38.6**	44.2	41.8	29.8	**38.6**	3.04	1.50	2.03	2.61	**2.29**	2.60	1.42	2.22	1.65	**1.97**
14	JB 683-1	39.3	36.3	29.4	**35.0**	43.9	36.2	29.0	**36.3**	2.41	1.40	3.05	2.67	**2.38**	2.00	1.36	2.91	2.50	**2.19**
15	JB 687-3	39.3	45.6	31.2	**38.7**	44.2	45.8	29.9	**40.0**	2.65	1.68	2.77	2.80	**2.47**	2.42	1.46	2.84	1.98	**2.18**
16	JB 689-1	41.1	41.9	30.2	**37.7**	43.0	41.9	30.3	**38.4**	3.07	2.23	2.78	3.06	**2.78**	2.63	1.39	1.62	2.43	**2.02**
17	JBC 159-11	39.1	33.9	30.9	**34.6**	47.3	33.6	28.6	**36.5**	2.35	1.66	1.75	2.55	**2.08**	1.97	0.26	1.93	2.25	**1.60**
18	Krishna Hamsa	41.7	39.7	32.5	**38.0**	45.2	39.8	29.4	**38.1**	3.26	1.56	2.16	2.32	**2.32**	2.85	1.45	3.82	2.28	**2.60**
19	MTU 1153	38.4	40.3	31.0	**36.6**	45.0	40.5	28.8	**38.1**	3.08	1.75	1.42	2.66	**2.23**	2.50	2.15	1.62	1.97	**2.06**
20	MTU 1156	40.6	39.0	30.4	**36.7**	43.0	39.1	30.2	**37.4**	3.20	1.78	1.88	3.19	**2.51**	2.73	1.85	1.14	2.15	**1.97**
21	MTU 1273	39.4	41.4	30.3	**37.0**	43.5	41.2	29.3	**38.0**	3.26	2.02	2.54	2.65	**2.62**	2.50	1.58	1.61	2.55	**2.06**
22	MTU 1290	40.7	43.6	31.4	**38.6**	47.8	43.3	29.0	**40.0**	2.79	1.36	2.66	3.24	**2.51**	2.10	1.49	3.26	2.23	**2.27**
23	MTU 1293	39.3	40.6	31.0	**37.0**	42.2	41.0	26.5	**36.6**	3.01	1.32	2.81	3.06	**2.55**	2.46	1.79	2.92	2.21	**2.35**
24	N-22	40.5	43.0	28.9	**37.5**	41.4	43.7	28.1	**37.7**	2.59	1.80	1.94	2.28	**2.15**	2.16	1.41	1.26	1.82	**1.66**
25	NLR 3776	40.4	39.1	32.2	**37.2**	44.5	39.7	27.0	**37.1**	2.81	2.02	3.04	3.00	**2.72**	2.37	1.71	2.79	2.49	**2.34**
26	NLR 3778	40.5	35.1	27.7	**34.4**	38.6	34.9	27.4	**33.6**	2.62	1.70	2.19	3.22	**2.43**	2.13	1.85	1.14	2.52	**1.91**
	Mean	**40.6**	**39.6**	**30.4**	**36.9**	**44.2**	**39.7**	**29.0**	**37.6**	**2.78**	**1.70**	**2.33**	**2.84**	**2.41**	**2.33**	**1.50**	**2.28**	**2.34**	**2.11**
	LSD (Treat)			ns		*LSD (Treat x Variety)*			ns	*LSD (Treat)*				ns	*LSD (Treat x Variety)*				ns
	LSD (Location x Treat)			0.90**		*LSD (Location x Treat x Variety)*			ns	*LSD (Location x Treat)*				0.23**	*LSD (Location x Treat x Variety)*				0.66**
	LSD (Variety)			ns		*CV(%) Treat*			4.07	*LSD (Variety)*				ns	*CV (%) Treat*				18.79
	LSD (Location x Variety)			3.52**						*LSD (Location x Variety)*				0.47**					

Table 6.3.10 Influence of Heat Stress on Shoot weight (g/m²) maturity at different AICRIP centres *Kharif* 2023

S.No.	Genotypes	Control							Grand	Heat Stress							Grand
		IIRR	KAUL	MTU	PNR	PTB	REWA	TTB	Mean	IIRR	KAUL	MTU	PNR	PTB	REWA	TTB	Mean
1	IET 29859	1034	385	677	1044	1122	606	307	**739**	968	338	680	655	758	452	479	**619**
2	IL 19019	692	391	743	1080	943	478	664	**713**	644	359	583	824	743	338	393	**555**
3	IL 19020	645	389	590	1104	988	564	307	**655**	630	356	522	947	681	362	172	**524**
4	IL 19021	646	449	691	783	1167	566	492	**685**	809	412	597	759	675	329	479	**580**
5	IL 19022	736	552	633	791	1293	622	393	**717**	624	475	596	656	1013	299	184	**550**
6	IL 19024	697	540	626	1029	1027	566	504	**713**	821	427	588	607	738	322	184	**527**
7	IL 19185	791	654	592	879	870	552	799	**734**	938	531	537	823	699	346	479	**622**
8	IL 19198	816	547	688	750	1081	389	553	**689**	879	521	644	630	1127	374	787	**709**
9	IL 19202	636	530	622	867	1144	434	234	**638**	569	463	577	652	507	324	123	**459**
10	IL 19211	597	375	681	804	963	403	381	**601**	526	341	614	815	1110	382	197	**569**
11	IL 19247	915	717	621	1058	877	474	578	**749**	695	622	582	1028	739	378	221	**609**
12	IL 19396	772	423	640	1083	623	468	504	**645**	824	380	566	838	694	386	135	**546**
13	JB 680-2	789	437	689	1017	538	466	418	**622**	929	383	585	790	474	418	197	**539**
14	JB 683-1	935	320	577	867	773	465	406	**620**	982	269	566	721	607	409	307	**552**
15	JB 687-3	924	276	679	850	585	480	369	**595**	994	246	596	747	703	427	270	**569**
16	JB 689-1	911	522	670	1040	690	569	529	**704**	890	472	544	668	858	377	270	**583**
17	JBC 159-11	872	314	640	661	877	556	824	**678**	566	230	574	559	641	483	713	**538**
18	Krishna Hamsa	691	467	737	1335	672	548	344	**685**	686	417	667	609	364	452	295	**498**
19	MTU 1153	1049	736	664	841	858	490	504	**735**	925	655	629	643	662	371	295	**597**
20	MTU 1156	946	542	622	1022	879	512	443	**709**	913	522	596	837	1204	351	295	**674**
21	MTU 1273	854	531	607	976	658	509	529	**666**	654	471	630	635	749	354	344	**548**
22	MTU 1290	885	686	697	1132	758	432	479	**724**	684	559	563	639	782	336	295	**551**
23	MTU 1293	925	610	711	1051	1030	530	393	**750**	735	541	490	837	667	355	332	**565**
24	N-22	856	679	751	1060	824	455	320	**706**	944	650	627	774	570	414	307	**612**
25	NLR 3776	775	598	767	883	663	527	455	**667**	862	523	598	650	686	413	197	**561**
26	NLR 3778	918	576	583	1109	1218	489	565	**780**	1044	520	498	649	917	350	393	**624**
	Mean	**820**	**509**	**661**	**966**	**889**	**506**	**473**	**689**	**797**	**449**	**587**	**730**	**745**	**377**	**321**	**572**
	LSD (Treat)				14.75**					*LSD (Treat x Variety)*				ns			
	LSD (Location x Treat)				39.03**					*LSD (Location x Treat x Variety)*				134.12**			
	LSD (Variety)				ns					*CV(%) Treat*				12.98			
	LSD (Location x Variety)				94.84**												

Table 6.3.11 Influence of Heat Stress on Panicle weight (g/m²) at different AICRIP centres *Kharif* 2023

S.No.	Genotypes	Control						Grand Mean	Heat Stress						Grand Mean
		IIRR	KAUL	PNR	PTB	REWA	TTB		IIRR	KAUL	PNR	PTB	REWA	TTB	
1	IET 29859	741	365	796	530	614	572	**603**	381	31	489	457	347	160	**311**
2	IL 19019	720	356	895	453	714	464	**600**	605	106	489	517	413	361	**415**
3	IL 19020	816	368	1166	523	740	559	**695**	555	223	601	750	371	344	**474**
4	IL 19021	751	421	905	997	761	617	**742**	518	186	627	823	329	308	**465**
5	IL 19022	781	516	694	503	677	479	**608**	668	339	494	700	376	287	**477**
6	IL 19024	798	551	795	583	666	591	**664**	613	355	458	757	334	222	**457**
7	IL 19185	594	557	750	677	759	660	**666**	469	361	496	667	399	303	**449**
8	IL 19198	746	522	771	1220	767	613	**773**	463	85	562	880	357	319	**444**
9	IL 19202	577	506	783	377	754	459	**576**	663	288	456	417	333	168	**387**
10	IL 19211	828	349	838	517	642	383	**593**	611	315	716	693	284	138	**459**
11	IL 19247	738	669	584	517	598	606	**619**	657	14	320	583	286	346	**368**
12	IL 19396	891	390	602	531	558	477	**575**	490	320	431	531	325	188	**381**
13	JB 680-2	856	413	721	422	613	574	**600**	535	367	673	679	250	287	**465**
14	JB 683-1	974	272	747	560	611	400	**594**	503	106	653	567	229	212	**378**
15	JB 687-3	1036	249	784	978	595	352	**666**	406	182	670	693	235	279	**411**
16	JB 689-1	792	495	931	530	591	484	**637**	397	448	791	554	269	259	**453**
17	JBC 159-11	671	289	598	393	579	400	**488**	473	119	537	440	384	344	**383**
18	Krishna Hamsa	804	431	854	450	555	347	**574**	510	367	356	265	355	180	**339**
19	MTU 1153	968	676	718	597	633	485	**679**	509	641	642	500	412	294	**500**
20	MTU 1156	1066	511	752	860	655	561	**734**	530	494	843	783	378	371	**567**
21	MTU 1273	966	482	879	418	736	588	**678**	496	422	673	627	381	318	**486**
22	MTU 1290	942	571	785	557	750	626	**705**	546	469	657	653	320	345	**498**
23	MTU 1293	873	576	880	603	802	558	**715**	484	537	626	517	320	302	**464**
24	N-22	933	627	882	520	668	402	**672**	499	618	696	320	365	281	**463**
25	NLR 3776	828	555	781	587	655	675	**680**	427	173	467	380	404	441	**382**
26	NLR 3778	959	534	1127	583	609	542	**726**	415	374	605	567	400	302	**444**
	Mean	**833**	**471**	**808**	**596**	**665**	**518**	**649**	**516**	**305**	**578**	**589**	**341**	**283**	**435**
	LSD (Treat)				16.71**				*LSD (Treat x Variety)*				ns		
	LSD (Location x Treat)				40.93**				*LSD (Location x Treat x Variety)*				145.12**		
	LSD (Variety)				31.84*				*CV (%) Treat*				15.44		
	LSD (Location x Variety)				102.61**										

Table 6.3.12 Influence of Heat Stress on Panicle number/m² maturity at different AICRIP centres *Kharif* 2023

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	IET 29859	363	129	495	250	624	267	208	**334**	337	128	462	283	548	175	208	**306**
2	IL 19019	350	121	429	433	467	201	242	**320**	390	121	341	367	408	133	200	**280**
3	IL 19020	380	117	495	433	550	211	250	**348**	337	118	418	283	467	150	267	**291**
4	IL 19021	393	147	473	417	386	202	267	**326**	367	147	396	333	463	184	300	**313**
5	IL 19022	407	169	495	333	430	194	308	**334**	350	169	407	317	583	200	283	**330**
6	IL 19024	403	198	517	333	523	152	408	**362**	393	198	462	283	581	193	283	**342**
7	IL 19185	373	194	539	517	478	219	308	**376**	480	194	462	383	484	177	333	**359**
8	IL 19198	353	165	506	367	418	251	317	**340**	387	161	473	283	623	168	250	**335**
9	IL 19202	363	161	473	417	555	284	350	**372**	407	165	407	367	516	153	333	**335**
10	IL 19211	380	143	517	433	430	233	300	**348**	347	147	440	383	524	135	275	**322**
11	IL 19247	367	169	517	267	530	233	325	**344**	340	165	484	217	605	143	258	**316**
12	IL 19396	450	158	528	317	513	209	325	**357**	433	154	440	267	550	168	283	**328**
13	JB 680-2	363	147	517	417	428	224	358	**351**	333	150	429	333	533	177	325	**326**
14	JB 683-1	400	139	495	433	445	191	300	**343**	327	139	429	367	542	185	292	**326**
15	JB 687-3	417	147	517	367	507	210	358	**360**	340	143	495	333	562	176	267	**331**
16	JB 689-1	373	147	462	433	400	217	300	**333**	323	147	374	417	542	176	300	**326**
17	JBC 159-11	397	125	495	483	505	210	333	**364**	313	124	374	467	587	226	233	**332**
18	Krishna Hamsa	387	151	528	583	529	243	342	**395**	360	150	396	317	559	234	292	**330**
19	MTU 1153	367	161	528	433	539	236	192	**351**	320	165	440	417	348	137	225	**293**
20	MTU 1156	343	117	484	567	437	260	200	**344**	267	121	396	417	539	111	233	**298**
21	MTU 1273	353	165	517	417	578	235	275	**363**	277	161	418	283	273	125	250	**255**
22	MTU 1290	353	187	462	333	323	243	317	**317**	240	191	363	333	452	133	258	**282**
23	MTU 1293	387	158	440	433	452	226	292	**341**	277	154	385	417	595	151	233	**316**
24	N-22	337	169	473	483	383	159	267	**324**	253	165	407	283	385	127	183	**258**
25	NLR 3776	453	173	495	483	513	174	283	**368**	347	172	418	333	603	134	225	**319**
26	NLR 3778	390	165	495	417	459	175	208	**330**	340	165	407	383	563	109	217	**312**
	Mean	**381**	**155**	**496**	**415**	**477**	**218**	**294**	**348**	**342**	**154**	**420**	**341**	**517**	**161**	**262**	**314**
	LSD (Treat)				ns					*LSD (Treat x Variety)*				ns			
	LSD (Location x Treat)				17.30**					*LSD (Location x Treat x Variety)*				92.21**			
	LSD (Variety)				18.73*					*CV (%) Treat*				10.97			
	LSD (Location x Variety)				65.20**												

Table 6.3.13 Influence of Heat Stress on Grain number per panicle at different AICRIP centres *Kharif* 2023

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	IET 29859	75	118	132	168	49	146	202	**127**	42	22	109	90	61	164	57	**78**
2	IL 19019	78	119	146	125	49	174	164	**122**	60	51	114	108	40	165	127	**95**
3	IL 19020	78	129	118	148	72	193	197	**134**	67	109	88	105	71	171	121	**105**
4	IL 19021	69	129	85	136	54	194	218	**127**	51	83	62	120	45	184	109	**93**
5	IL 19022	71	123	86	130	55	245	169	**125**	82	122	65	104	45	189	101	**101**
6	IL 19024	71	114	81	127	49	193	209	**120**	62	103	60	94	36	179	78	**88**
7	IL 19185	55	118	111	123	50	192	233	**126**	41	91	88	129	51	150	107	**94**
8	IL 19198	75	134	106	132	54	189	216	**130**	48	26	82	83	44	143	113	**77**
9	IL 19202	60	128	97	156	55	190	162	**121**	73	80	74	100	62	151	59	**86**
10	IL 19211	86	107	124	112	32	177	135	**111**	81	108	107	62	34	167	49	**87**
11	IL 19247	74	184	210	200	44	172	214	**157**	88	4	177	139	36	161	122	**104**
12	IL 19396	71	115	92	160	46	174	169	**118**	48	101	59	167	18	163	67	**89**
13	JB 680-2	77	105	116	151	56	183	203	**127**	61	101	89	128	50	144	101	**96**
14	JB 683-1	86	94	139	142	63	179	141	**120**	67	41	92	96	84	130	75	**84**
15	JB 687-3	86	80	125	98	84	163	124	**109**	43	66	109	80	27	144	98	**81**
16	JB 689-1	77	127	166	158	40	157	171	**128**	50	124	131	124	34	159	91	**102**
17	JBC 159-11	67	110	123	58	36	136	141	**96**	59	61	100	48	49	162	121	**86**
18	Krishna Hamsa	86	138	104	136	39	149	123	**111**	66	136	88	74	22	177	64	**90**
19	MTU 1153	98	185	155	130	83	169	171	**142**	67	174	118	125	46	164	104	**114**
20	MTU 1156	113	183	140	193	67	197	198	**156**	98	182	112	119	67	157	131	**124**
21	MTU 1273	90	121	150	134	64	184	208	**136**	73	120	115	129	50	168	112	**110**
22	MTU 1290	92	127	140	92	71	177	221	**132**	101	111	113	78	54	143	122	**103**
23	MTU 1293	84	154	135	100	73	191	197	**133**	74	150	102	86	52	174	107	**106**
24	N-22	110	163	138	155	44	208	142	**137**	95	161	111	102	44	146	99	**108**
25	NLR 3776	91	145	241	158	47	179	238	**157**	56	57	177	147	43	159	156	**114**
26	NLR 3778	118	147	166	200	87	186	191	**156**	54	120	132	191	60	187	107	**121**
	Mean	**82**	**131**	**132**	**139**	**56**	**181**	**183**	**129**	**66**	**96**	**103**	**109**	**47**	**162**	**100**	**97**
	LSD (Treat)				2.16*					*LSD (Treat x Variety)*				ns			
	LSD (Location x Treat)				7.94**					*LSD (Location x Treat x Variety)*				29.50**			
	LSD (Variety)				7.88**					*CV (%) Treat*				14.7			
	LSD (Location x Variety)				20.86**												

Table 6.3.14 Influence of Heat Stress on Spikelet number per panicle at different AICRIP centres *Kharif* 2023

S.No.	Genotypes	Control						Grand Mean	Heat Stress						Grand Mean
		IIRR	MTU	PNR	PTB	REWA	TTB		IIRR	MTU	PNR	PTB	REWA	TTB	
1	IET 29859	99	144	194	65	271	222	**166**	72	141	130	85	215	78	**120**
2	IL 19019	96	157	150	73	205	180	**143**	107	150	141	62	202	175	**139**
3	IL 19020	102	128	180	83	213	217	**154**	115	120	150	126	194	168	**145**
4	IL 19021	91	96	181	75	238	240	**154**	112	91	162	69	221	150	**134**
5	IL 19022	89	97	167	80	276	186	**149**	144	91	138	85	221	140	**137**
6	IL 19024	96	94	150	70	255	229	**149**	121	91	140	85	196	108	**123**
7	IL 19185	94	123	185	68	221	256	**158**	80	116	155	103	207	148	**135**
8	IL 19198	100	116	143	73	255	238	**154**	90	112	116	87	191	156	**125**
9	IL 19202	69	108	217	68	288	178	**155**	89	102	130	98	182	82	**114**
10	IL 19211	116	135	155	71	238	149	**144**	130	131	112	77	193	67	**118**
11	IL 19247	119	222	232	61	238	235	**185**	124	203	207	60	195	168	**160**
12	IL 19396	95	101	206	77	213	185	**146**	110	91	196	79	205	92	**129**
13	JB 680-2	90	126	197	78	243	223	**159**	106	119	167	71	180	140	**131**
14	JB 683-1	125	150	188	81	212	155	**152**	127	145	178	105	203	103	**143**
15	JB 687-3	130	135	120	111	213	137	**141**	98	133	117	68	180	136	**122**
16	JB 689-1	102	177	197	57	221	188	**157**	92	166	165	47	207	126	**134**
17	JBC 159-11	88	134	104	58	213	155	**125**	112	127	98	84	205	168	**132**
18	Krishna Hamsa	109	113	180	53	246	135	**139**	116	112	118	55	218	88	**118**
19	MTU 1153	127	164	180	101	238	188	**166**	144	156	146	69	196	143	**142**
20	MTU 1156	157	150	221	97	256	218	**183**	142	145	196	97	204	181	**161**
21	MTU 1273	117	162	159	85	258	228	**168**	130	152	150	99	244	155	**155**
22	MTU 1290	111	148	182	105	247	243	**173**	154	144	146	92	199	168	**151**
23	MTU 1293	103	146	155	93	229	217	**157**	126	139	109	86	209	147	**136**
24	N-22	130	149	170	68	241	156	**152**	158	140	158	65	216	137	**146**
25	NLR 3776	105	252	186	67	190	262	**177**	107	225	182	72	182	215	**164**
26	NLR 3778	148	178	241	109	204	210	**182**	130	167	209	76	228	147	**160**
	Mean	**108**	**143**	**178**	**78**	**236**	**201**	**157**	**117**	**135**	**151**	**81**	**204**	**138**	**137**
	LSD (Treat)				ns				*LSD (Treat x Variety)*				ns		
	LSD (Location x Treat)				11.25**				*LSD (Location x Treat x Variety)*				35.23**		
	LSD (Variety)				10.17**				*CV (%) Treat*				15.61		
	LSD (Location x Variety)				24.91**										

Table 6.3.15 Influence of Heat Stress on Grain number/m² at different AICRIP centres *Kharif* 2023

S.No.	Genotypes	Control							Grand	Heat Stress							Grand
		IIRR	KAUL	MTU	PNR	PTB	REWA	TTB	Mean	IIRR	KAUL	MTU	PNR	PTB	REWA	TTB	Mean
1	IET 29859	27234	15142	65109	41917	31071	38947	42235	**37379**	14124	2838	50358	25517	33441	29280	11780	**23905**
2	IL 19019	27193	14409	62700	54150	22919	35592	39627	**36656**	23078	6166	38907	39633	16612	22316	25491	**24600**
3	IL 19020	29827	15067	58421	64133	39587	40653	48727	**42345**	22491	12869	36905	29700	33291	25294	32388	**27563**
4	IL 19021	27255	18923	40051	56700	20738	38843	58165	**37239**	18831	12126	24728	40000	21133	34247	32673	**26248**
5	IL 19022	28886	20805	42339	43217	23386	47013	51836	**36783**	28614	20274	26411	32983	26083	37739	28683	**28684**
6	IL 19024	28375	22632	41811	42300	25261	29354	85183	**39274**	24010	20456	27808	26600	21437	34541	22030	**25269**
7	IL 19185	20455	23017	60269	63367	24026	42389	72026	**43650**	19811	17384	40623	49583	24820	26266	35630	**30588**
8	IL 19198	25830	21803	53636	48467	22700	47925	68406	**41252**	18323	4103	38951	23483	27049	24102	28170	**23454**
9	IL 19202	21807	20547	45870	64933	30786	53916	56723	**42083**	29235	13386	30052	36717	32126	23158	19836	**26358**
10	IL 19211	32301	15229	63844	48633	13675	41321	40567	**36510**	27817	15654	46937	23583	17867	22295	13433	**23941**
11	IL 19247	27331	31099	108350	53400	23307	40079	69515	**50440**	29916	687	85470	30050	21449	22754	31580	**31701**
12	IL 19396	31019	18038	48510	50767	23596	36391	55164	**37641**	20806	15467	26169	44617	9900	26985	18818	**23252**
13	JB 680-2	27460	15226	59818	63133	23929	40369	72548	**43212**	20167	15191	38313	42850	26155	25340	32973	**28713**
14	JB 683-1	34266	12954	68706	61433	27392	34250	42382	**40198**	21583	5783	40029	35333	45294	24715	21794	**27790**
15	JB 687-3	36031	11528	64405	36167	42709	34545	44733	**38588**	14520	9485	54131	26667	15357	25919	26359	**24634**
16	JB 689-1	28892	18633	76890	68383	15857	33401	51218	**41896**	16030	18081	49258	51817	18292	29298	27327	**30015**
17	JBC 159-11	26622	13625	61270	28033	17945	28733	47079	**31901**	18465	7480	36938	22433	28841	37437	28248	**25692**
18	Krishna Hamsa	33063	20633	54890	79200	21199	36645	41988	**41088**	23427	20340	34716	23583	12414	41155	18582	**24888**
19	MTU 1153	35881	29927	81510	56350	44098	39082	32761	**45659**	20921	28566	51964	52000	15873	22063	23300	**30670**
20	MTU 1156	38807	21483	67870	109600	29140	50866	39455	**51031**	25336	21867	44264	49550	36382	17582	30588	**32224**
21	MTU 1273	31596	20077	77418	55767	36933	42856	57100	**45964**	20232	19433	48026	36683	13760	20580	28345	**26723**
22	MTU 1290	32223	23918	64636	30667	23016	42972	70114	**41078**	23936	21388	41118	25833	24375	19024	31582	**26751**
23	MTU 1293	32504	24400	59763	43233	32779	43282	57400	**41909**	20365	23122	39171	35900	30691	26442	24776	**28638**
24	N-22	37114	27499	65505	74867	16813	33605	37970	**41910**	24139	26689	45177	28917	16857	18798	18144	**25532**
25	NLR 3776	40940	24871	119130	76417	24208	31648	67485	**54957**	19396	9799	73293	48917	26184	21156	35073	**33403**
26	NLR 3778	46042	24068	82016	83167	39964	32404	39891	**49650**	18185	19923	53548	73367	33658	19835	23108	**34518**
	Mean	**31114**	**20214**	**65182**	**57631**	**26809**	**39118**	**53473**	**41934**	**21683**	**14944**	**43203**	**36781**	**24205**	**26089**	**25797**	**27529**
	LSD (Treat)				908**					*LSD (Treat x Variety)*				ns			
	LSD (Location x Treat)				2402**					*LSD (Location x Treat x Variety)*				14124**			
	LSD (Variety)				ns					*CV (%) Treat*				14.51			
	LSD (Location x Variety)				9987**												

Table 6.3.16 Influence of Heat Stress on Spikelet number/m² at different AICRIP centres *Kharif* 2023

S.No.	Genotypes	Control						Grand	Heat Stress						Grand
		IIRR	MTU	PNR	PTB	REWA	TTB	Mean	IIRR	MTU	PNR	PTB	REWA	TTB	Mean
1	IET 29859	35908	71005	48583	40397	73446	46458	**52633**	23947	65043	36800	46506	37185	16255	**37623**
2	IL 19019	33622	67221	65183	33753	41784	43590	**47526**	41555	51062	51683	25325	27064	34992	**38614**
3	IL 19020	39011	63360	78050	45927	44873	53600	**54137**	38703	50490	42467	58683	28821	44690	**43976**
4	IL 19021	35883	45243	75533	28897	47652	63982	**49532**	40968	36157	54000	32400	40776	45083	**41564**
5	IL 19022	36363	47960	55733	34537	53100	57020	**47452**	50334	37125	43533	49585	44134	39578	**44048**
6	IL 19024	38305	48675	50017	36721	38868	93702	**51048**	46935	41877	39633	49415	37972	30398	**41038**
7	IL 19185	34540	66770	95467	32608	49022	79228	**59606**	38437	53812	59600	49886	36715	49164	**47936**
8	IL 19198	34813	58850	52100	30556	65043	75247	**52768**	34800	52888	32883	53669	32410	38870	**40920**
9	IL 19202	25110	51062	90233	37701	82088	62395	**58098**	35505	41668	47700	50621	27661	27371	**38421**
10	IL 19211	44276	69531	67083	29979	55800	44623	**51882**	44543	57816	42850	40087	25977	18536	**38301**
11	IL 19247	43648	114389	61950	32535	55854	76467	**64140**	42171	98296	44667	36297	27756	43576	**48794**
12	IL 19396	41690	53284	65133	39569	44518	60680	**50812**	47369	39952	52083	43450	34281	25966	**40517**
13	JB 680-2	32153	64988	82150	33221	54873	79803	**57865**	35435	51117	55783	37710	31960	45497	**42917**
14	JB 683-1	50174	74162	81517	35308	40545	46620	**54721**	41749	62612	65100	56466	40111	30072	**49352**
15	JB 687-3	54188	69520	44000	56530	45951	49207	**53233**	33344	66022	39033	38090	32601	36371	**40910**
16	JB 689-1	38061	81983	85417	23033	48835	56340	**55612**	29236	62282	68617	25648	37739	37707	**43538**
17	JBC 159-11	34794	66550	50333	29465	45076	51787	**46334**	35012	47212	45617	49337	46658	38978	**43802**
18	Krishna Hamsa	42019	59686	105000	28582	60339	46187	**56969**	41081	44220	37217	30690	51208	25640	**38342**
19	MTU 1153	46862	86482	78167	53821	56569	36037	**59656**	45180	68684	60900	24148	26578	32150	**42940**
20	MTU 1156	53849	72567	125283	42277	66724	43400	**67350**	36404	57310	81700	52269	22797	42206	**48781**
21	MTU 1273	41280	83941	66183	49009	61438	62810	**60777**	35992	63316	42500	27192	29438	39112	**39592**
22	MTU 1290	38839	68442	60767	34040	60500	77125	**56619**	36753	52272	48783	41744	26462	43578	**41599**
23	MTU 1293	39403	64614	66983	42235	52747	63140	**54854**	34574	53262	45417	50913	31282	34187	**41606**
24	N-22	43981	70543	81900	26023	38650	41767	**50477**	40057	56991	44767	24969	27405	25036	**36537**
25	NLR 3776	47493	124575	90000	34349	33446	74233	**67349**	36860	93555	60700	43595	24299	48395	**51234**
26	NLR 3778	57947	88000	100367	49915	35536	43880	**62607**	44300	67804	80233	42559	23872	31885	**48442**
	Mean	**40931**	**70516**	**73967**	**36961**	**52049**	**58820**	**55541**	**38894**	**56648**	**50933**	**41587**	**32814**	**35588**	**42744**
	LSD (Treat)				962*				*LSD (Treat x Variety)*				ns		
	LSD (Location x Treat)				3304**				*LSD (Location x Treat x Variety)*				18461**		
	LSD (Variety)				ns				*CV (%) Treat*				13.75		
	LSD (Location x Variety)				13053**										

Table 6.3.17 Influence of Heat Stress on Grain yield (g/m²) at different AICRIP centres *Kharif* 2023

S.No.	Genotypes	Control							Grand	Heat Stress							Grand
		IIRR	KAUL	MTU	PNR	PTB	REWA	TTB	Mean	IIRR	KAUL	MTU	PNR	PTB	REWA	TTB	Mean
1	IET 29859	653	365	507	905	380	487	556	**550**	305	31	388	527	217	192	156	**259**
2	IL 19019	634	356	535	758	177	488	450	**485**	496	106	345	375	250	188	351	**302**
3	IL 19020	726	368	501	1027	287	424	543	**554**	434	223	351	613	560	145	334	**380**
4	IL 19021	667	421	523	579	447	451	600	**527**	387	186	387	440	393	179	300	**324**
5	IL 19022	707	516	493	700	277	617	465	**539**	533	339	408	534	416	201	279	**387**
6	IL 19024	696	551	511	641	277	582	574	**547**	461	355	396	470	333	248	216	**354**
7	IL 19185	492	557	429	616	423	492	641	**521**	354	361	348	358	447	106	295	**324**
8	IL 19198	647	522	529	469	407	574	595	**535**	360	85	388	326	453	165	310	**298**
9	IL 19202	525	506	469	759	196	568	446	**495**	580	288	386	353	310	84	163	**309**
10	IL 19211	728	349	514	670	317	599	372	**507**	499	315	403	490	406	204	134	**350**
11	IL 19247	615	669	468	609	360	484	589	**542**	553	14	416	396	264	121	336	**300**
12	IL 19396	782	390	462	609	271	443	464	**489**	342	320	364	368	320	107	183	**286**
13	JB 680-2	772	413	516	723	287	506	557	**539**	410	367	407	598	405	219	279	**383**
14	JB 683-1	852	272	422	791	471	446	389	**520**	374	106	228	609	215	147	206	**269**
15	JB 687-3	881	249	515	642	587	472	342	**527**	315	182	443	485	357	154	271	**315**
16	JB 689-1	700	495	511	735	293	454	470	**523**	313	448	366	516	297	132	251	**332**
17	JBC 159-11	561	289	483	485	235	435	388	**411**	353	119	364	353	219	185	334	**275**
18	Krishna Hamsa	715	431	552	880	400	484	337	**543**	413	367	434	450	226	257	175	**332**
19	MTU 1153	849	676	501	697	473	392	471	**580**	388	641	420	553	323	171	286	**397**
20	MTU 1156	905	511	486	648	713	379	545	**598**	443	494	378	497	530	161	361	**409**
21	MTU 1273	848	482	472	764	383	355	571	**553**	386	422	345	509	303	126	309	**343**
22	MTU 1290	849	571	518	648	570	400	608	**595**	431	469	381	406	329	191	335	**363**
23	MTU 1293	775	576	551	825	467	440	542	**597**	388	537	345	673	414	244	293	**413**
24	N-22	829	627	571	923	438	582	390	**623**	414	618	434	738	267	232	273	**425**
25	NLR 3776	742	555	577	557	363	390	655	**548**	328	173	392	474	313	202	428	**330**
26	NLR 3778	844	534	416	753	527	564	526	**595**	305	374	290	591	381	232	294	**352**
	Mean	**731**	**471**	**501**	**708**	**386**	**481**	**503**	**540**	**406**	**305**	**377**	**489**	**344**	**177**	**275**	**339**
	LSD (Treat)				12.04**					*LSD (Treat x Variety)*				ns			
	LSD (Location x Treat)				31.85**					*LSD (Location x Treat x Variety)*				111.81**			
	LSD (Variety)				29.88**					*CV (%) Treat*				15.2			
	LSD (Location x Variety)				79.06**												

Table 6.3.18 Influence of Heat Stress on Total dry matter (g/m²) at different AICRIP centres *Kharif* 2023

S.No.	Genotypes	Control							Grand	Heat Stress							Grand
		IIRR	KAUL	MTU	PNR	PTB	REWA	TTB	Mean	IIRR	KAUL	MTU	PNR	PTB	REWA	TTB	Mean
1	IET 29859	1774	750	677	1840	1652	1243	1460	**1342**	1349	369	680	1144	1215	880	1138	**968**
2	IL 19019	1412	747	743	1974	1396	1531	1299	**1300**	1248	466	583	1313	1260	948	977	**971**
3	IL 19020	1461	757	590	2270	1512	1395	1184	**1310**	1186	579	522	1548	1431	996	1198	**1066**
4	IL 19021	1398	870	691	1688	2163	1344	1305	**1351**	1327	598	597	1386	1498	936	1276	**1088**
5	IL 19022	1517	1068	633	1484	1797	1422	1283	**1315**	1292	814	596	1150	1713	887	1205	**1094**
6	IL 19024	1495	1091	626	1824	1610	1521	1200	**1338**	1434	782	588	1064	1495	928	1089	**1054**
7	IL 19185	1385	1212	592	1629	1547	1571	1289	**1318**	1407	892	537	1318	1366	974	1172	**1095**
8	IL 19198	1562	1069	688	1521	2301	1551	1212	**1415**	1342	606	644	1192	2007	1021	1142	**1136**
9	IL 19202	1213	1035	622	1650	1521	1498	944	**1212**	1232	751	577	1107	924	969	760	**903**
10	IL 19211	1425	724	681	1641	1480	1482	1160	**1228**	1137	656	614	1530	1803	981	623	**1049**
11	IL 19247	1653	1386	621	1642	1393	1420	1183	**1328**	1353	636	582	1349	1323	843	1013	**1014**
12	IL 19396	1663	812	640	1686	1154	1345	936	**1177**	1314	700	566	1269	1225	910	854	**977**
13	JB 680-2	1644	850	689	1738	961	1255	1181	**1188**	1464	751	585	1463	1153	876	1200	**1070**
14	JB 683-1	1909	593	577	1614	1333	1230	1387	**1235**	1485	374	566	1374	1174	997	1013	**998**
15	JB 687-3	1960	525	679	1635	1563	1240	990	**1227**	1400	428	596	1417	1396	927	1028	**1027**
16	JB 689-1	1703	1017	670	1970	1220	1199	1194	**1282**	1287	920	544	1459	1412	871	1158	**1093**
17	JBC 159-11	1544	603	640	1259	1270	1326	1174	**1117**	1039	349	574	1095	1081	887	988	**859**
18	Krishna Hamsa	1495	898	737	2189	1122	1355	1027	**1261**	1196	784	667	965	629	919	733	**842**
19	MTU 1153	2018	1413	664	1559	1455	1418	1068	**1371**	1434	1295	629	1285	1162	916	1211	**1133**
20	MTU 1156	2013	1052	622	1773	1739	1352	1128	**1383**	1443	1016	596	1680	1988	827	1212	**1252**
21	MTU 1273	1820	1013	607	1854	1077	1346	1171	**1270**	1149	893	630	1308	1376	824	1259	**1063**
22	MTU 1290	1826	1257	697	1917	1315	1344	1206	**1366**	1230	1028	563	1296	1436	892	1243	**1098**
23	MTU 1293	1798	1186	711	1931	1634	1373	1098	**1390**	1219	1078	490	1463	1183	1015	1273	**1103**
24	N-22	1788	1306	751	1942	1344	1677	934	**1392**	1442	1268	627	1470	890	1129	1143	**1139**
25	NLR 3776	1603	1153	767	1664	1249	1425	1275	**1305**	1289	696	598	1116	1066	1063	1254	**1012**
26	NLR 3778	1878	1110	583	2236	1802	1545	1217	**1481**	1459	894	498	1253	1483	1028	1275	**1127**
	Mean	**1652**	**981**	**661**	**1774**	**1485**	**1400**	**1173**	**1304**	**1314**	**755**	**587**	**1308**	**1334**	**940**	**1094**	**1047**
	LSD (Treat)				26.27**					*LSD (Treat x Variety)*				ns			
	LSD (Location x Treat)				69.50**					*LSD (Location x Treat x Variety)*				205.16**			
	LSD (Variety)				41.68*					*CV (%) Treat*				12.4			
	LSD (Location x Variety)				145.07**												

Table 6.3.19 Influence of Heat Stress on 1000 grain weight (g) at different AICRIP centres *Kharif* 2023

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	IET 29859	24.0	24.1	21.2	21.0	23.0	27.7	24.7	**23.7**	21.6	11.1	19.3	19.7	20.9	21.7	22.8	**19.6**
2	IL 19019	23.3	24.8	20.5	28.5	20.8	29.7	20.0	**23.9**	21.5	17.2	18.2	14.9	21.5	24.7	19.1	**19.6**
3	IL 19020	24.2	24.5	22.2	26.0	20.6	29.7	24.1	**24.5**	19.3	17.3	20.7	25.5	22.9	25.7	23.0	**22.0**
4	IL 19021	24.5	22.3	22.4	21.9	23.2	29.0	26.6	**24.3**	20.7	15.4	21.2	11.2	23.0	25.0	24.9	**20.2**
5	IL 19022	24.5	24.8	21.5	22.6	23.2	28.0	20.7	**23.6**	18.9	16.8	20.2	12.9	22.9	26.0	19.0	**19.5**
6	IL 19024	24.5	24.5	20.3	21.0	20.5	27.7	25.5	**23.4**	19.2	17.3	18.7	23.3	21.3	26.7	22.5	**21.3**
7	IL 19185	24.0	24.2	23.3	25.8	22.6	31.3	28.5	**25.7**	17.9	20.8	22.1	17.1	23.3	24.7	26.0	**21.7**
8	IL 19198	25.0	23.9	24.1	19.0	22.4	30.0	26.4	**24.4**	19.9	20.8	23.2	19.7	22.4	23.7	23.9	**21.9**
9	IL 19202	24.2	24.6	21.0	18.9	18.7	29.0	19.8	**22.3**	19.9	21.8	19.9	15.3	20.6	23.3	17.9	**19.8**
10	IL 19211	22.5	23.0	20.9	24.4	19.5	27.3	16.5	**22.0**	17.9	20.1	19.5	13.5	21.2	24.7	14.8	**18.8**
11	IL 19247	22.5	21.5	18.4	24.5	19.7	27.3	26.2	**22.9**	18.6	19.8	17.5	18.6	21.1	25.0	24.9	**20.8**
12	IL 19396	25.2	21.6	23.1	24.5	22.1	23.7	20.6	**23.0**	16.4	20.7	21.2	21.3	21.9	27.0	19.0	**21.1**
13	JB 680-2	28.1	27.2	24.0	26.0	22.7	28.7	24.8	**25.9**	20.4	24.1	22.5	17.3	24.1	26.3	23.2	**22.6**
14	JB 683-1	24.9	21.0	22.2	18.3	22.8	28.7	17.3	**22.2**	17.4	18.2	20.6	15.8	20.4	26.0	16.1	**19.2**
15	JB 687-3	24.5	21.6	22.1	21.3	20.7	28.7	15.2	**22.0**	21.8	19.2	21.3	12.3	20.7	24.7	14.5	**19.2**
16	JB 689-1	24.2	26.4	24.2	25.0	23.4	27.0	20.9	**24.4**	19.5	24.8	22.7	24.2	23.2	26.3	19.0	**22.8**
17	JBC 159-11	21.1	21.2	17.2	16.0	17.5	26.0	17.2	**19.5**	19.3	15.9	15.7	18.4	18.3	22.3	16.6	**18.1**
18	Krishna Hamsa	21.6	20.9	19.2	19.0	19.2	27.0	15.0	**20.3**	17.6	18.0	17.9	20.0	17.2	23.3	14.2	**18.3**
19	MTU 1153	23.7	22.8	22.1	25.7	22.0	26.3	20.9	**23.4**	18.5	22.4	20.6	18.0	21.3	25.3	19.0	**20.7**
20	MTU 1156	23.3	23.8	22.2	33.0	23.6	26.0	24.2	**25.2**	17.5	22.6	20.6	19.2	19.8	28.7	22.2	**21.5**
21	MTU 1273	26.8	24.2	24.4	26.5	23.6	26.7	25.4	**25.4**	19.2	21.8	22.8	26.1	24.3	26.0	23.8	**23.4**
22	MTU 1290	26.4	24.0	24.7	23.9	22.9	26.7	27.0	**25.1**	18.0	22.0	23.3	18.4	22.0	26.0	25.8	**22.2**
23	MTU 1293	23.8	23.6	21.2	27.8	20.2	29.0	24.1	**24.2**	19.1	23.3	20.0	18.8	19.8	25.3	24.0	**21.5**
24	N-22	22.4	22.9	21.3	20.5	20.4	28.3	17.3	**21.9**	17.2	23.1	19.4	18.5	19.9	24.3	16.1	**19.8**
25	NLR 3776	18.2	22.3	17.2	21.9	16.3	29.3	29.1	**22.1**	16.9	17.8	15.1	11.8	15.7	26.7	27.5	**18.8**
26	NLR 3778	18.3	22.2	22.0	26.1	18.7	28.7	23.4	**22.8**	16.8	19.2	20.1	18.4	18.6	25.7	21.9	**20.1**
	Mean	**23.7**	**23.4**	**21.6**	**23.4**	**21.2**	**28.0**	**22.4**	**23.4**	**18.9**	**19.7**	**20.2**	**18.1**	**21.1**	**25.2**	**20.8**	**20.6**
	LSD (Treat)				0.24**					*LSD (Treat x Variety)*				ns			
	LSD (Location x Treat)				0.63**					*LSD (Location x Treat x Variety)*				1.17**			
	LSD (Variety)				0.83**					*CV (%) Treat*				5.98			
	LSD (Location x Variety)				2.19**												

Table 6.3.20 Influence of Heat Stress on Harvest index (%) at different AICRIP centres *Kharif* 2023

S.No.	Genotypes	Control							Grand	Heat Stress							Grand
		IIRR	KAUL	MTU	PNR	PTB	REWA	TTB	Mean	IIRR	KAUL	MTU	PNR	PTB	REWA	TTB	Mean
1	IET 29859	36.6	48.7	42.8	49.2	23.0	39.0	38.1	**39.6**	22.7	8.5	36.0	46.1	18.0	22.7	13.7	**24.0**
2	IL 19019	44.9	47.7	41.9	38.4	12.7	31.6	34.7	**36.0**	39.7	22.9	37.1	28.5	20.3	20.0	35.9	**29.2**
3	IL 19020	49.5	48.6	46.0	45.2	19.0	31.4	45.8	**40.8**	36.6	38.5	40.1	39.9	39.5	14.5	27.9	**33.8**
4	IL 19021	47.8	48.4	43.1	34.4	20.6	33.4	45.9	**39.1**	29.1	31.0	39.1	31.8	26.2	19.3	23.5	**28.6**
5	IL 19022	46.6	48.3	43.7	47.3	15.2	44.0	36.2	**40.2**	41.4	41.7	40.5	46.5	24.4	22.8	23.1	**34.3**
6	IL 19024	46.4	50.4	44.8	35.1	17.2	38.3	47.8	**40.0**	32.2	45.4	40.3	44.5	22.4	27.3	19.8	**33.1**
7	IL 19185	35.5	46.0	41.9	37.9	27.2	31.0	49.7	**38.5**	25.2	40.5	39.2	27.2	32.9	11.0	25.1	**28.7**
8	IL 19198	41.3	48.8	43.4	30.8	17.7	37.5	49.2	**38.4**	26.9	14.1	37.5	27.6	22.5	16.3	27.1	**24.6**
9	IL 19202	43.2	48.9	43.0	46.0	12.8	38.2	47.2	**39.9**	47.1	38.2	40.0	31.9	33.5	8.7	21.5	**31.5**
10	IL 19211	51.0	48.3	42.9	40.8	21.4	40.4	32.4	**39.6**	43.8	48.1	39.6	32.0	22.5	20.9	21.5	**32.6**
11	IL 19247	37.0	48.2	42.9	37.1	25.9	34.0	49.7	**39.3**	40.8	2.1	41.6	29.4	20.0	14.5	33.1	**25.9**
12	IL 19396	46.9	48.0	41.9	36.1	23.7	33.2	49.5	**39.9**	26.0	46.1	38.8	29.2	26.1	11.9	21.4	**28.5**
13	JB 680-2	47.0	48.6	42.8	41.6	29.8	40.4	47.2	**42.5**	28.3	49.0	41.0	40.9	35.1	25.2	23.2	**34.7**
14	JB 683-1	44.7	46.0	42.2	49.1	35.4	36.3	28.0	**40.2**	25.2	28.1	28.6	44.4	18.5	14.7	20.3	**25.7**
15	JB 687-3	44.9	47.3	43.1	39.3	37.6	37.8	34.6	**40.7**	22.6	42.5	42.8	34.2	25.7	16.5	26.3	**30.1**
16	JB 689-1	40.8	48.4	42.9	37.3	24.0	37.8	39.3	**38.7**	24.3	48.9	40.1	35.3	21.0	15.0	21.7	**29.5**
17	JBC 159-11	36.3	48.0	42.9	38.6	18.4	33.1	33.1	**35.8**	34.0	34.1	38.7	32.3	20.3	20.7	33.8	**30.5**
18	Krishna Hamsa	47.7	48.0	42.9	40.2	35.9	35.5	32.9	**40.4**	34.6	46.7	39.4	46.7	35.7	28.0	23.9	**36.4**
19	MTU 1153	42.1	47.9	42.8	45.1	32.5	27.5	44.1	**40.3**	27.1	49.8	40.0	43.2	27.9	18.5	23.6	**32.9**
20	MTU 1156	45.0	48.5	43.8	36.6	41.0	28.4	48.3	**41.7**	30.7	48.7	38.6	29.6	27.2	19.8	29.8	**32.1**
21	MTU 1273	46.6	47.5	43.3	41.2	36.1	26.7	48.8	**41.5**	33.6	47.1	35.4	39.0	22.1	15.7	24.6	**31.1**
22	MTU 1290	46.7	45.3	42.8	33.8	43.5	30.0	50.4	**41.8**	35.2	45.6	40.3	31.4	22.9	21.6	26.9	**32.0**
23	MTU 1293	43.2	48.5	43.6	42.8	28.6	31.8	49.7	**41.2**	31.8	49.8	41.5	46.4	35.0	24.3	23.0	**36.0**
24	N-22	46.3	48.0	43.2	47.5	32.7	34.8	41.9	**42.1**	28.6	48.7	40.9	50.2	30.1	20.6	23.8	**34.7**
25	NLR 3776	46.3	48.1	42.9	33.5	30.1	27.7	51.4	**40.0**	25.5	25.0	39.7	42.5	29.3	19.0	34.1	**30.7**
26	NLR 3778	44.9	48.1	41.6	33.8	29.2	38.3	43.2	**39.9**	21.1	41.9	36.5	47.4	25.7	22.5	23.0	**31.2**
	Mean	**44.2**	**48.0**	**43.0**	**40.0**	**26.6**	**34.5**	**43.1**	**39.9**	**31.3**	**37.8**	**39.0**	**37.6**	**26.3**	**18.9**	**25.1**	**30.9**
	LSD (Treat)				0.42*					*LSD (Treat x Variety)*				ns			
	LSD (Location x Treat)				1.53**					*LSD (Location x Treat x Variety)*				2.81**			
	LSD (Variety)				ns					*CV (%) Treat*				9.06			
	LSD (Location x Variety)				5.25**												

Table 6.3.21 Influence of Heat Stress on starch (%) of rice genotypes at IIRR during *Kharif* 2023

S.No	Genotype	Control	Heat Stress	Mean
1	IET 29859	68.1	10.3	39.2
2	IL 19019	56.7	74.1	65.4
3	IL 19020	62.4	57.3	59.8
4	IL 19021	60.6	59.4	60.0
5	IL 19022	64.8	65.9	65.4
6	IL 19024	62.8	63.7	63.3
7	IL 19185	56.9	50.8	53.8
8	IL 19198	59.7	49.4	54.5
9	IL 19202	51.5	50.1	50.8
10	IL 19211	56.3	67.5	61.9
11	IL 19247	69.2	64.0	66.6
12	IL 19396	50.1	64.7	57.4
13	JB 680-2	55.3	33.1	44.2
14	JB 683-1	52.9	39.7	46.3
15	JB 687-3	67.5	46.8	57.1
16	JB 689-1	73.2	61.7	67.5
17	JBC 159-11	61.0	66.6	63.8
18	Krishna Hamsa	66.4	35.7	51.0
19	MTU 1153	57.1	54.1	55.6
20	MTU 1156	86.1	59.3	72.7
21	MTU 1273	59.7	65.4	62.5
22	MTU 1290	56.4	51.4	53.9
23	MTU 1293	56.6	50.8	53.7
24	N-22	54.1	56.4	55.3
25	NLR 3776	61.0	49.9	55.5
	Mean	61.0	53.9	57.5
	LSD (Treat)			3.56*
	LSD (Variety)			5.16**
	LSD (Treat x Variety)			7.29**
	CV(%) Treat			2.44

Table 6.3.22.A Influence of Heat Stress on chlorophyll fluorescence traits at IIRR during *Kharif* 2023

S.No	Genotypes	Actual quantum yield of PSII (φPSII)			Electron Transport Rate (ETR)			Maximum quantum yield of PSII (Fv/Fm)		
		Control	Heat Stress	Mean	Control	Heat Stress	Mean	Control	Heat Stress	Mean
1	IET 29859	0.321	0.363	**0.342**	21.9	25.0	**23.5**	0.798	0.784	**0.791**
2	IL 19019	0.406	0.342	**0.374**	27.3	23.4	**25.4**	0.796	0.791	**0.793**
3	IL 19020	0.477	0.447	**0.462**	32.1	30.5	**31.3**	0.765	0.781	**0.773**
4	IL 19021	0.469	0.327	**0.398**	31.7	22.4	**27.1**	0.775	0.792	**0.784**
5	IL 19022	0.471	0.401	**0.436**	31.8	27.4	**29.6**	0.796	0.779	**0.787**
6	IL 19024	0.478	0.354	**0.416**	32.3	24.2	**28.3**	0.798	0.775	**0.786**
7	IL 19185	0.442	0.367	**0.405**	29.9	25.1	**27.5**	0.797	0.779	**0.788**
8	IL 19198	0.402	0.437	**0.420**	27.3	29.9	**28.6**	0.796	0.771	**0.784**
9	IL 19202	0.457	0.324	**0.391**	31.1	22.2	**26.7**	0.783	0.790	**0.787**
10	IL 19211	0.435	0.325	**0.380**	29.6	22.3	**26.0**	0.793	0.796	**0.794**
11	IL 19247	0.349	0.298	**0.324**	23.8	20.4	**22.1**	0.820	0.792	**0.806**
12	IL 19396	0.411	0.289	**0.350**	28.0	19.8	**23.9**	0.797	0.779	**0.788**
13	JB 680-2	0.407	0.314	**0.360**	27.8	21.6	**24.7**	0.788	0.773	**0.780**
14	JB 683-1	0.340	0.410	**0.375**	23.2	28.2	**25.7**	0.818	0.787	**0.803**
15	JB 687-3	0.394	0.433	**0.414**	26.9	30.0	**28.4**	0.806	0.769	**0.788**
16	JB 689-1	0.390	0.412	**0.401**	26.6	28.4	**27.5**	0.799	0.785	**0.792**
17	JBC 159-11	0.308	0.374	**0.341**	21.0	25.7	**23.4**	0.818	0.787	**0.803**
18	Krishna Hamsa	0.390	0.370	**0.380**	26.7	25.6	**26.1**	0.791	0.778	**0.785**
19	MTU 1153	0.424	0.283	**0.353**	29.0	19.5	**24.3**	0.787	0.796	**0.792**
20	MTU 1156	0.400	0.327	**0.364**	27.4	22.7	**25.0**	0.790	0.781	**0.786**
21	MTU 1273	0.401	0.347	**0.374**	27.4	24.1	**25.8**	0.787	0.789	**0.788**
22	MTU 1290	0.386	0.337	**0.362**	26.6	23.3	**25.0**	0.779	0.766	**0.772**
23	MTU 1293	0.368	0.332	**0.350**	25.3	23.0	**24.1**	0.810	0.789	**0.800**
24	N-22	0.345	0.358	**0.352**	23.7	24.8	**24.3**	0.809	0.790	**0.800**
25	NLR 3776	0.396	0.352	**0.374**	27.3	24.4	**25.8**	0.806	0.778	**0.792**
26	NLR 3778	0.378	0.303	**0.341**	26.0	21.0	**23.5**	0.813	0.817	**0.815**
	Mean	**0.402**	**0.355**	**0.378**	**27.4**	**24.4**	**25.9**	**0.797**	**0.784**	**0.791**
	LSD (Treat)			ns			ns			0.007**
	LSD (Variety)			0.053**			3.67**			0.021**
	LSD (Treat x Variety)			0.076**			5.20**			0.030*
	CV(%) Treat			21.14			21.09			0.535

Table 6.3.22.B Influence of Heat Stress on chlorophyll fluorescence traits at IIRR during *Kharif* 2023

S.No	Genotypes	Coefficient of photochemical quenching (qP)			Coefficient of non-photochemical quenching (qN)		
		Control	Heat Stress	Mean	Control	Heat Stress	Mean
1	IET 29859	0.549	0.567	**0.558**	0.328	0.292	**0.310**
2	IL 19019	0.695	0.617	**0.656**	0.380	0.432	**0.406**
3	IL 19020	0.789	0.776	**0.783**	0.300	0.444	**0.372**
4	IL 19021	0.795	0.566	**0.681**	0.304	0.404	**0.354**
5	IL 19022	0.763	0.665	**0.714**	0.275	0.339	**0.307**
6	IL 19024	0.769	0.578	**0.673**	0.270	0.296	**0.283**
7	IL 19185	0.769	0.635	**0.702**	0.405	0.351	**0.378**
8	IL 19198	0.690	0.707	**0.699**	0.361	0.311	**0.336**
9	IL 19202	0.789	0.536	**0.662**	0.362	0.276	**0.319**
10	IL 19211	0.707	0.520	**0.614**	0.294	0.303	**0.299**
11	IL 19247	0.563	0.494	**0.529**	0.299	0.372	**0.335**
12	IL 19396	0.712	0.488	**0.600**	0.388	0.334	**0.361**
13	JB 680-2	0.723	0.530	**0.626**	0.425	0.330	**0.378**
14	JB 683-1	0.552	0.675	**0.613**	0.347	0.363	**0.355**
15	JB 687-3	0.647	0.741	**0.694**	0.303	0.431	**0.367**
16	JB 689-1	0.661	0.693	**0.677**	0.358	0.419	**0.389**
17	JBC 159-11	0.499	0.626	**0.563**	0.280	0.363	**0.322**
18	Krishna Hamsa	0.666	0.594	**0.630**	0.350	0.284	**0.317**
19	MTU 1153	0.747	0.456	**0.601**	0.377	0.254	**0.316**
20	MTU 1156	0.732	0.533	**0.633**	0.411	0.266	**0.338**
21	MTU 1273	0.685	0.546	**0.615**	0.344	0.272	**0.308**
22	MTU 1290	0.675	0.556	**0.616**	0.355	0.320	**0.337**
23	MTU 1293	0.624	0.523	**0.574**	0.354	0.292	**0.323**
24	N-22	0.580	0.536	**0.558**	0.363	0.220	**0.292**
25	NLR 3776	0.663	0.571	**0.617**	0.338	0.263	**0.301**
26	NLR 3778	0.588	0.447	**0.518**	0.316	0.206	**0.261**
	Mean	**0.678**	**0.584**	**0.631**	**0.342**	**0.325**	**0.333**
	LSD (Treat)			ns			ns
	LSD (Variety)			0.099**			0.079**
	LSD (Treat x Variety)			0.140**			0.112**
	CV(%) Treat			23.17			25.25

Table 6.3.23 Screening for elite rice culture for heat tolerance INDICES of different genotypes across locations in *Kharif* 2023

S.No.	Genotypes	HSI	RHI	HTI	GMP	TOL	MP	YI	YSI	HI	SHI	HM	K1STI	K2STI
1	IET 29859	1.46	1.46	0.56	366.4	-290.9	404.8	0.77	0.46	0.43	0.41	337.0	1.15	0.80
2	IL 19019	0.81	0.81	0.55	374.4	-183.7	393.5	0.89	0.70	0.66	0.23	357.3	0.92	0.93
3	IL 19020	0.58	0.58	0.79	446.6	-173.6	466.7	1.12	0.78	1.02	0.19	427.9	1.25	1.49
4	IL 19021	1.03	1.03	0.61	409.5	-202.4	425.5	0.96	0.62	0.63	0.25	394.5	0.98	1.01
5	IL 19022	0.57	0.57	0.73	448.4	-152.1	463.1	1.14	0.79	0.95	0.16	435.0	1.07	1.43
6	IL 19024	0.80	0.80	0.67	432.5	-193.2	450.7	1.04	0.70	0.77	0.20	416.1	1.10	1.17
7	IL 19185	0.94	0.94	0.58	402.0	-197.3	422.8	0.96	0.65	0.69	0.24	384.4	0.97	1.00
8	IL 19198	1.10	1.10	0.54	385.1	-236.5	416.4	0.88	0.59	0.62	0.30	360.2	1.01	0.90
9	IL 19202	0.70	0.70	0.53	371.7	-186.2	402.3	0.91	0.74	0.82	0.24	347.4	0.94	1.03
10	IL 19211	0.73	0.73	0.64	411.8	-156.9	428.5	1.03	0.73	0.83	0.19	397.5	0.97	1.22
11	IL 19247	1.14	1.14	0.56	371.7	-242.0	420.8	0.88	0.57	0.66	0.33	349.8	1.05	1.04
12	IL 19396	0.96	0.96	0.49	363.9	-202.2	387.4	0.84	0.64	0.61	0.26	343.5	0.90	0.80
13	JB 680-2	0.60	0.60	0.73	446.7	-155.7	461.3	1.13	0.78	0.93	0.16	433.0	1.09	1.40
14	JB 683-1	1.36	1.36	0.57	370.3	-251.2	394.8	0.79	0.49	0.45	0.35	348.0	1.07	0.86
15	JB 687-3	0.96	0.96	0.60	399.8	-211.6	421.1	0.93	0.64	0.63	0.24	381.2	1.09	0.99
16	JB 689-1	0.87	0.87	0.62	407.7	-191.0	427.2	0.98	0.68	0.72	0.23	390.6	1.03	1.09
17	JBC 159-11	0.85	0.85	0.41	332.5	-135.4	343.0	0.81	0.68	0.59	0.21	323.0	0.62	0.74
18	Krishna Hamsa	1.01	1.01	0.67	421.4	-210.9	437.1	0.98	0.62	0.63	0.24	406.5	1.13	1.06
19	MTU 1153	0.84	0.84	0.84	474.4	-182.9	488.5	1.17	0.69	0.88	0.20	461.2	1.24	1.57
20	MTU 1156	0.83	0.83	0.88	490.5	-189.1	503.6	1.21	0.69	0.88	0.20	478.2	1.32	1.59
21	MTU 1273	0.96	0.96	0.69	430.4	-210.5	448.1	1.01	0.64	0.69	0.24	414.1	1.16	1.14
22	MTU 1290	1.03	1.03	0.76	462.3	-231.8	479.1	1.07	0.62	0.69	0.25	446.3	1.27	1.22
23	MTU 1293	0.80	0.80	0.89	491.7	-183.1	504.9	1.22	0.70	0.91	0.19	479.2	1.29	1.66
24	N-22	0.86	0.86	0.99	508.4	-197.7	523.9	1.25	0.68	0.93	0.21	494.1	1.44	1.87
25	NLR 3776	1.01	1.01	0.64	418.7	-218.3	439.2	0.97	0.62	0.66	0.25	400.3	1.09	1.05
26	NLR 3778	1.03	1.03	0.74	451.1	-242.6	473.6	1.04	0.62	0.69	0.26	430.6	1.29	1.20
	Mean	**0.92**	**0.92**	**0.66**	**418.8**	**-201.1**	**439.5**	**1.00**	**0.66**	**0.73**	**0.24**	**401.4**	**1.09**	**1.16**

Table 6.3.24 Ranking for elite rice culture for heat tolerance on INDICES RANKING of different genotypes across locations in *Kharif* 2023

S.No.	Genotypes	HSI	RHI	HTI	GMP	TOL	MP	YI	YSI	HI	SHI	HM	K1STI	K2STI	Overall Rank
1	DRT-1	1	1	20	24	26	21	26	26	26	1	25	9	25	21
2	DRT-11	19	19	22	20	8	24	20	8	16	15	20	24	21	24
3	DRT-12	25	25	5	9	5	7	7	2	1	24	9	6	5	7
4	DRT-15	5	5	16	15	16	16	16	22	19	8	15	20	18	16
5	DRT-3	26	26	8	7	2	8	5	1	2	26	6	15	6	8
6	DRT-4	21	21	11	10	12	10	9	6	10	19	10	11	11	11
7	DRT-5	13	13	18	17	13	17	17	14	12	10	17	21	19	17
8	DRT-6	4	4	23	19	22	20	22	23	22	4	19	19	22	20
9	DRT-8	23	23	24	21	9	22	19	4	9	14	23	23	17	21
10	DRT-9	22	22	13	14	4	14	11	5	8	22	14	22	8	14
11	IL 19023	3	3	21	22	23	19	21	24	17	3	21	17	16	18
12	IL 19027	12	12	25	25	15	25	23	15	23	5	24	25	24	25
13	IL 19177	24	24	9	8	3	9	6	3	3	25	7	14	7	9
14	IL 19180	2	2	19	23	25	23	25	25	25	2	22	16	23	23
15	IL 19182	10	10	17	18	19	18	18	17	20	12	18	13	20	18
16	IL 19206	14	14	15	16	11	15	13	13	11	16	16	18	13	15
17	IL 19210	16	16	26	26	1	26	24	11	24	18	26	26	26	26
18	IL 19211	8	8	12	12	18	13	14	19	21	11	12	10	14	12
19	IL 19241	17	17	4	4	6	4	4	10	7	20	4	7	4	4
20	IL 19246	18	18	3	3	10	3	3	9	6	21	3	2	3	3
21	IL 19408	11	11	10	11	17	11	12	16	14	13	11	8	12	10
22	IL 19451	7	7	6	5	21	5	8	20	15	9	5	5	9	5
23	IL 19485	20	20	2	2	7	2	2	7	5	23	2	3	2	2
24	IL19026	15	15	1	1	14	1	1	12	4	17	1	1	1	1
25	JB 631-1	9	9	14	13	20	12	15	18	18	7	13	12	15	13
26	JB 680-4	6	6	7	6	24	6	10	21	13	6	8	4	10	6

Table 6.3.25 Selection for high yield and stability of performance under heat stress during *Kharif* 2023

S.No.	Genotypes	Mean Yield (g/m2)	Yield Rank (Yn)	Adj-rank	Adjustment to Yield Rank (Yn)	Stability Variance (σi2)	Stability Rating	YSi = (Y+S)	
1	IET 29859	259.4	1	-3	-2	38677.2	-8	-10	
2	IL 19019	301.6	7	-2	5	34984.5	-8	-3	
3	IL 19020	379.9	20	+2	22	33186.0	-8	14	+
4	IL 19021	324.4	11	-1	10	9012.1	-8	2	
5	IL 19022	387.1	22	+2	24	4205.0	-8	16	+
6	IL 19024	354.1	18	+1	19	6140.0	-8	11	+
7	IL 19185	324.1	10	-1	9	19514.1	-8	1	
8	IL 19198	298.1	5	-2	3	41478.2	-8	-5	
9	IL 19202	309.1	8	-2	6	34120.0	-8	-2	
10	IL 19211	350.0	16	+1	17	16730.4	-8	9	+
11	IL 19247	299.8	6	-2	4	63533.5	-8	-3	
12	IL 19396	286.3	4	-3	1	6298.0	-8	-7	
13	JB 680-2	383.5	21	+2	23	3490.9	-8	15	+
14	JB 683-1	269.2	2	-3	-1	34690.3	-8	-9	
15	JB 687-3	315.3	9	-1	8	12221.0	-8	0	
16	JB 689-1	331.7	14	-1	13	17441.6	-8	5	
17	JBC 159-11	275.3	3	-3	0	24381.7	-8	-8	
18	Krishna Hamsa	331.7	13	-1	12	19825.1	-8	4	
19	MTU 1153	397.1	23	+3	26	50801.7	-8	18	+
20	MTU 1156	409.1	24	+3	27	23196.2	-8	19	+
21	MTU 1273	342.9	15	+1	16	10097.9	-8	8	+
22	MTU 1290	363.2	19	+1	20	17414.7	-8	12	+
23	MTU 1293	413.4	25	+3	28	31506.0	-8	20	+
24	N-22	425.1	26	+3	29	64308.6	-8	21	+
25	NLR 3776	330.0	12	-1	11	25230.1	-8	3	
26	NLR 3778	352.3	17	+1	18	18729.0	-8	10	+
	Yield Mean	339.0			**Selected genotypes**				
	YS Mean	5.27	LSD (0.05): 25.6		**Kang, M.S. 1993. Agronomy Journal. 85:754-757**				

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

Locations: *CTC, CBT, MTU, PTB, TTB, KAUL, KRK and KJT*

Rice, one of the most vital cereal crops worldwide, faces numerous challenges due to abiotic stresses, which include but are not limited to drought, salinity, heat, and flooding. These stresses often occur simultaneously, creating a complex scenario that significantly impacts rice production and poses a threat to global food security. Under recent climate change scenarios drought, flood, and other extreme weather conditions becoming more common. The combined effect of these abiotic stresses often exacerbates the challenges faced by rice cultivation. Plants exposed to multiple stresses may exhibit complex responses, involving interconnected signaling pathways and physiological adjustments to cope with the adverse conditions. 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 28 rice accessions for anaerobic germination potential (AGP) was conducted at nine AICRP-R locations *viz*., CTC, KJT, CBT, FZB, TTB, PTB, KAUL, MTU and KRK centers. Out of 28 accessions, two accessions CRAC-4423-102 and CRAC-4423-5 did not germinate in majority of the locations. Hence, they were excluded from the study. Out of nine locations, the data received from MTU location were not included in the report due to very poor germination data of tolerant checks. The AGP of each genotypes were 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 35.9% (PTB) to 62.6% (FZB) with an overall experimental CV of 7.1% **(Table 6.4.2)**. The tolerant checks Rahaspunjar and Vandana recorded an overall mean (across all locations) AGI of 70.5% and 58.9%, respectively; while the susceptible checks IR29 and Naveen recorded 20.6 and 14.7% AGI, respectively. One entry IET-18716 was found to be most promising with highest anaerobic germination potential (AGI) of 82.4% based on mean data of all six locations. It was closely followed by six other entries viz., NICRA 16 (66.7%), BINNAFUL (65.5%), IC-516149 (65.3%), AUS 301 (63.4%), CR-3439-4-E-17-2-1-B-1-S-1 (58.9%) and Morishal (58.7%), all of which performed better or at par with tolerant check Vandana (58.9%). All these entries can be considered as highly tolerant to anaerobic germination **(Fig. 6.4.1)**. Besides, there were four other accessions CR-4215-2-5-2-M-4-SUB-2-5-1 (53.2%), NICRA 17 (53.0%), AC-85 (52.8%), KATAKCHIKON (50.0%) which also performed well under multi-location testing and can be considered as tolerant to anaerobic germination stress. Rest of the genotypes showed less than 50% germination under anaerobic conditions.

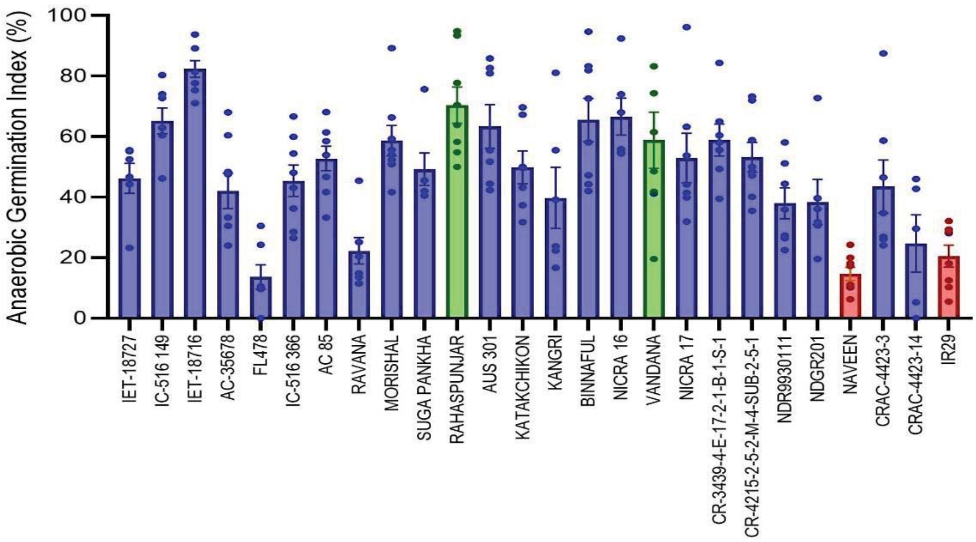


Fig. 6.4.1 *Mean AGI (%) of 26 rice accesions recorded after under 21 days of germination stage submergence stress tested at eight different locations. Error bars representing SE (mean) of all locations and scattered dots are representing mean of individual location. The green, red and blue histograms represent tolerant check, susceptible check and tested genotypes, respectively.*

Besides AGI, 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 locations) varied from 16.8 cm for Naveen to 38.0 cm for IET-18716 with an overall experimental mean of 31.2 cm and CV of 5.33% across all locations **(Table 6.5.3)**. The mean epicotyl length was highest in IET-18716 (38.0 cm), followed by AC-35687 (36.6 cm), Rahaspunjar (36.0 cm), AUS-301 (35.9 cm) and CRAC-4423-3 (35.7 cm) after 21 days of AG treatment **(Fig. 6.4.2)**. But the epicotyl length was found significantly low in some genotypes like Naveen (16.8 cm), IR29 (18.6 cm), NDR9930111 (20.1 cm), CRAC-4423-14 (21.8 cm). We found a significant correlation (R^2 = 0.6671) 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)**.

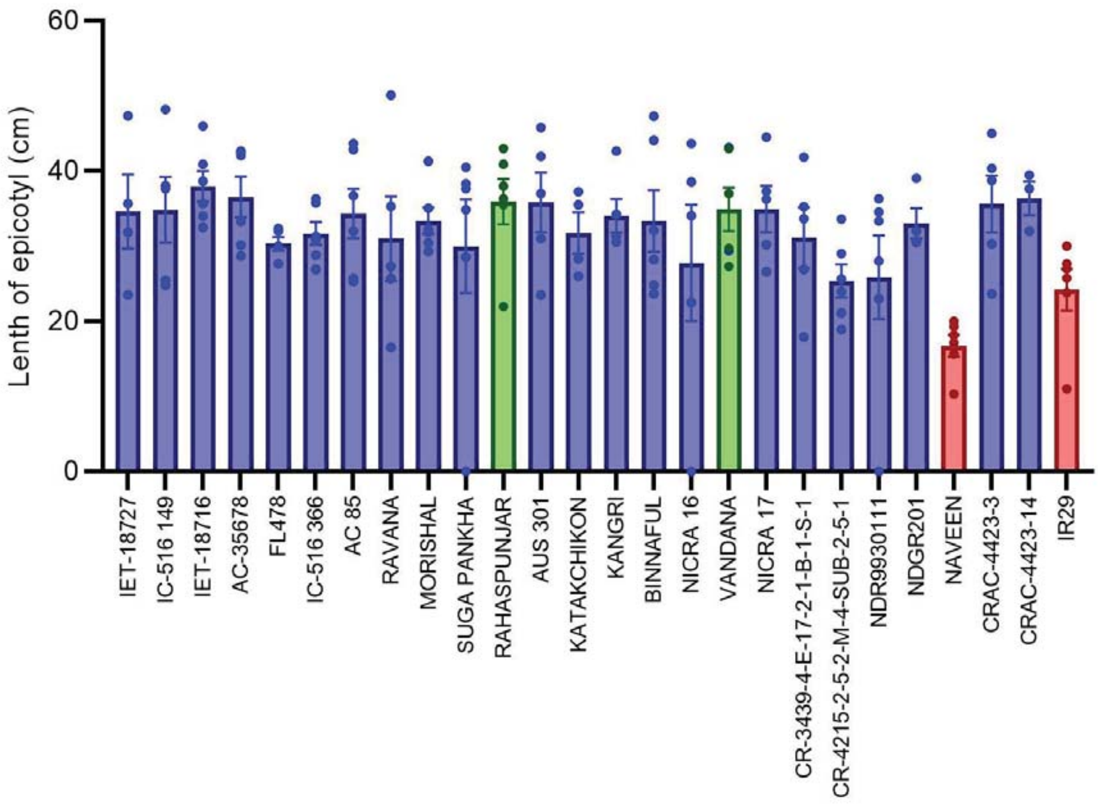


Fig. 6.4.2 *Mean length of epicotyl (cm) of rice genotypes recorded after under 21 days of germination stage submergence stress tested at three different locations. Error bars representing SE (mean) of all locations and scattered dots are representing mean of individual location.*

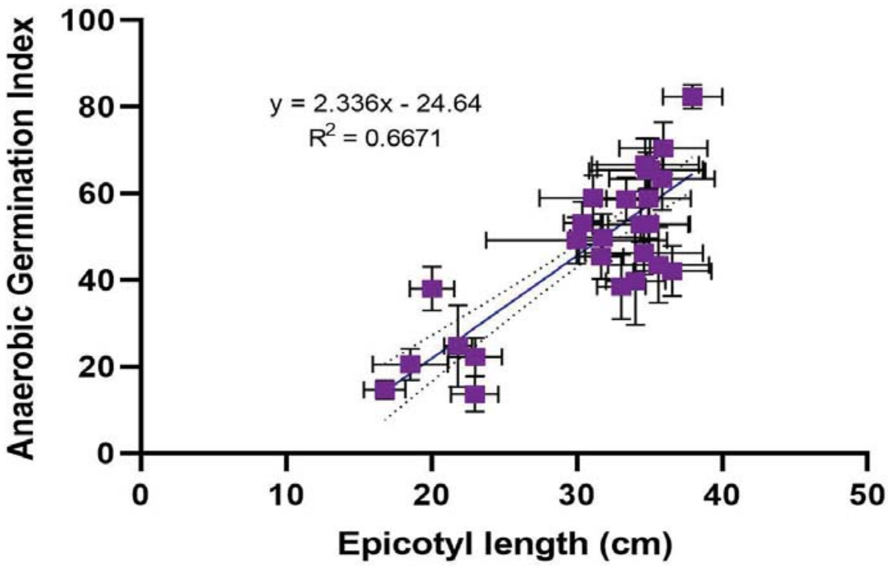


Fig. 6.4.3 *An XY-scatter plot showing simple linear regression between anaerobic germination potential and epicotyl length of rice genotypes under 14 days of complete submergence tested at three different locations. Error bars representing SE (mean) of all locations.*

Salinity Stress:

Evaluation for salinity tolerance was carried out at seven different location i.e., CBT, KJT, MTU, KRK, PNR, PTB, and CTC. Chlorophyll content, root length, shoot length, root dry weight, shoot dry weight, visual salt injury score, shoot Na^+/K^+ ratio are some of the important traits that can be used for screening genotypes for salt tolerance during seedling stage. The genotypes differed substantially for root and shoot length during salinity stress at all the locations. The root length reduced from 8.10 cm in control condition to 6.19 cm in saline condition with 23.5% decline over control **(Fig. 6.4.4)**. Root length reduced the most in the tested line NDGR201 (65.78%) followed by the susceptible checks Naveen (54.40%) and IR29 (51.25%). Whereas, least reduction in root length was observed in the tested entries CR-4215-2-5-2-M-4-SUB-2-5-1 (7.63%). This was followed by the tolerant checks FL478 (9.16%) and Rashpanjor (12.31%). Tested line CR-3439-4-E-17-2-1-B-1-S-1 performed even better than Rashpanjor with 10.82% decline over control. Shoot length in the genotypes were also studied across different locations. Which showed a 24.5% decline in saline condion (18.85 cm) over control (24.98 cm). Highest decline in shoot length was observed in the tested genotypes CRAC-4423-14 (50.30%), followed by IR29 (47.75%) and CRAC-4423-3 (36.31%). Whereas, least reduction in shoot length was noted in tolerant checks FL478 (8.46%) and Rashpanjor (9.92%). This was followed by the tested entries AUS 301 (13.32%) and CR-4215-2-5-2-M-4-SUB-2-5-1 (14.14%).

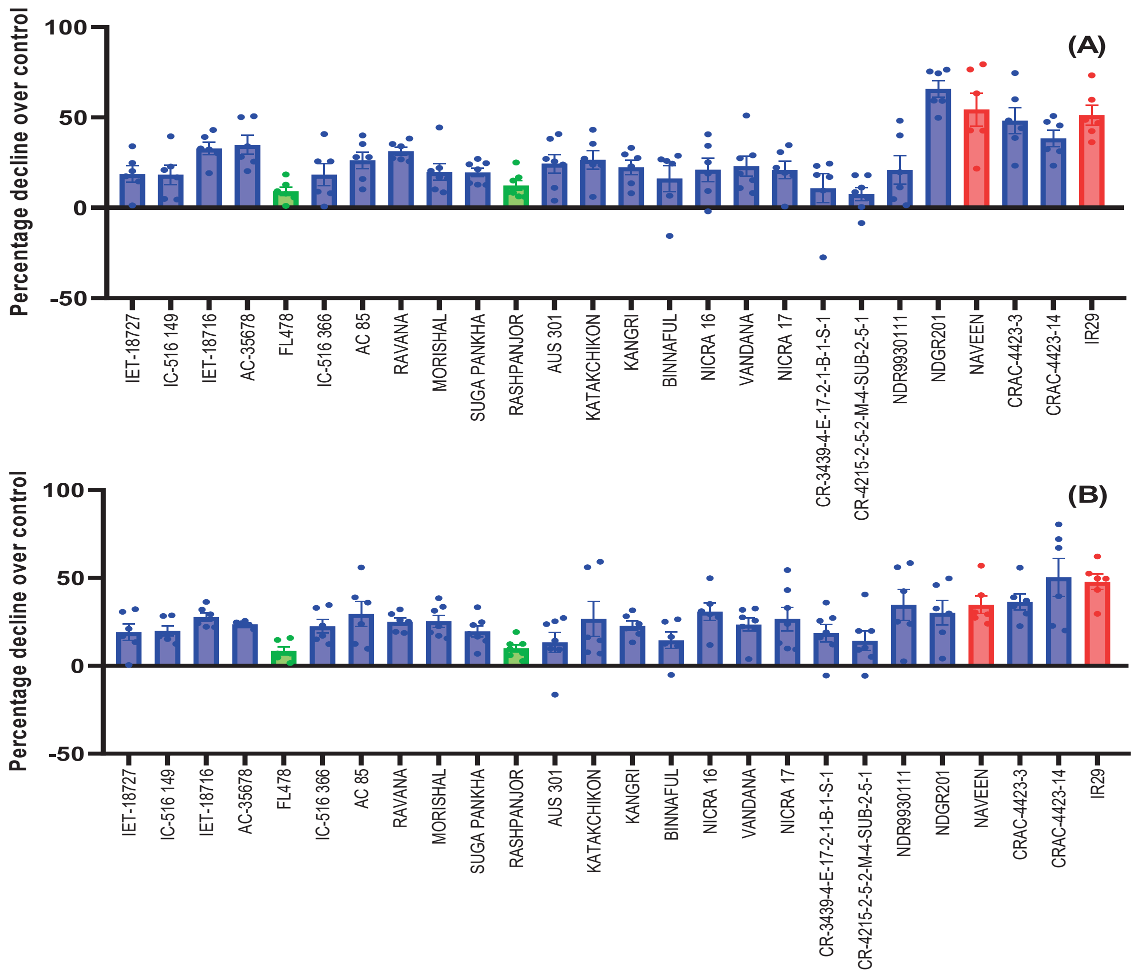


Fig. 6.4.4 *Changes in root length (A) and shoot length (B) of 26 rice genotypes (mean of all locations) in response to 12 dS m^{-1} salinity stress imposed at seedling stage tested across seven distinct locations. Error bars representing SE (mean) of all locations and scattered dots are representing mean of individual location. The green, red and blue histograms represent tolerant check, susceptible check and tested genotypes, respectively.*

A significant decline in mean (mean of all locations) root and shoot dry weight was observed in all the entries under salinity stress **(Fig. 6.4.5)**. Approximately 40% reduction in root dry weight was noted in all the genotypes across different locations under salinity stress with a mean root dry weight of 6.73 mg in control to 4.09 mg in saline condition. Highest decline in root dry weight over control was observed in CRAC-4423-14 (58.87%) followed by IR 29 (53.81%), Naveen (52.25%), and AC-35678 (51.36%). On the other hand lowest decline in root dry weight was noted in FL478 (8.42%), Binnaful (10.49%) and IET-18727 (17.82%). Due to salinity stress 34% reduction in shoot dry weight was observed in all the genotypes at different locations. Mean shoot dry weight of 26.47 mg was observed in control contion, while in salinity condition it was 17.31 mg. IR29 (55.33%) reported highest decline in shoot dry weight followed by CRAC-4423-14 (49.72%) and NDGR201 (42.18%). On the contrary lowest decline in shoot dry weight was observed in FL478 (12.06%), followed by Binnaful (12.49%), Rashpanjor (13.91%), and CR-4215-2-5-2-M-4-SUB-2-5-1 (16.30%).

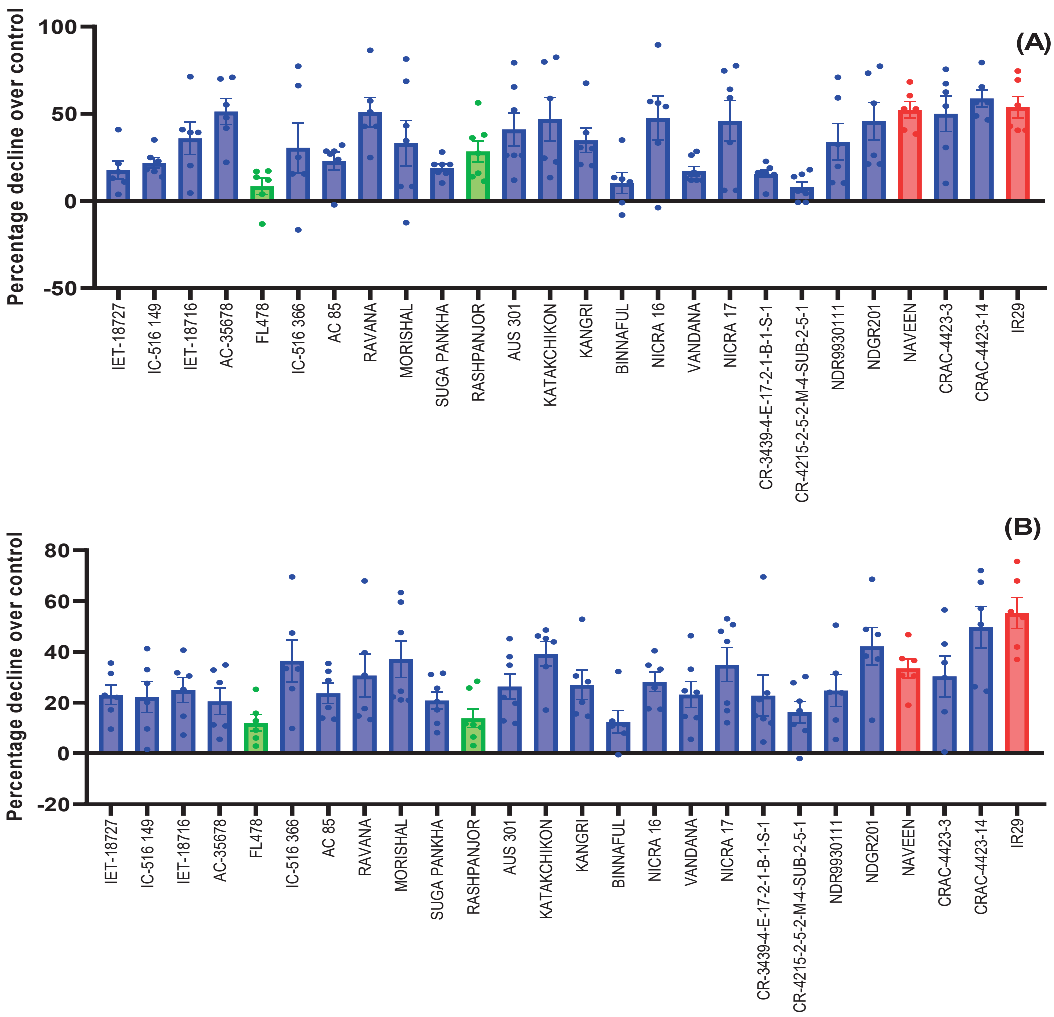


Fig. 6.4.5 *Changes in root dry weight (A) and shoot dry weight (B) of 26 rice genotypes (mean of all locations) in response to 12 dS m^{-1} salinity stress imposed at seedling stage tested across seven distinct locations. Error bars representing SE (mean) of all locations and scattered dots are representing mean of individual location. The green, red and blue histograms represent tolerant check, susceptible check and tested genotypes, respectively.*

Similarly, a significant decline in leaf total chlorophyll content was also observed in salinity condition at different locations for all the entries **(Fig. 6.4.6)**. The mean leaf chlorophyll content reduced from 1.54 mg g^{-1} leaf dry weight in control to 0.89 mg g^{-1} leaf dry weight in salinity stress. Highest decline in leaf total chlorophyll content of 55.98% was observed in IR29 followed by CRAC-4423-14 (51.70%) and KATAKCHIKON (50.19%). While least reduction in total chlorophyll content was recorded in FL478 (21.35%) followed by Ravana (25.74%), Rashpanjor (26.61%), and AUS 301 (26.89%).

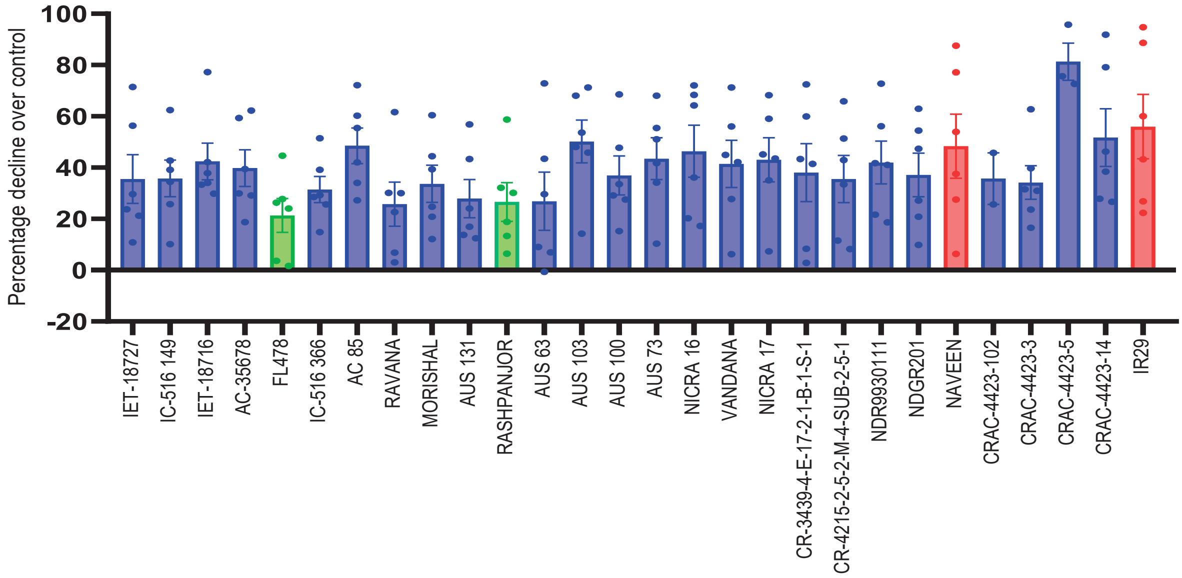


Fig. 6.4.6 *Changes in total chlorophyll content of the leaf of 26 rice genotypes (mean of all locations) in response to 12 dS m^{-1} salinity stress imposed at seedling stage tested at all locations. Error bars representing SE (mean) of all locations and scattered dots are representing mean of individual location. The green, red and blue histograms represent tolerant check, susceptible check and tested genotypes, respectively.*

The visual salt injury score (SES score) was recorded at four different locations i.e., CBT, KRK, PNR, and CTC. The genotypes varied significantly for SES score at all the locatons. IR29, a susceptible check recorded the highest SES score of '9' followed by the tested lines CRAC-4423-14 and CRAC-4423-3, with a SES score of '7' and the susceptible check Naveen (7). On the other hand, lowest SES score of '3' was noted in the tolerant check, FL478 and Rashpanjor, followed by the tested entries CR-4215-2-5-2-M-4-SUB-2-5-1 (3) and IET-18727 (5) **Fig. 6.4.7)**. These entries may be regarded as toleant to salinity stress during sedling stage, as per the standard evaluation system.

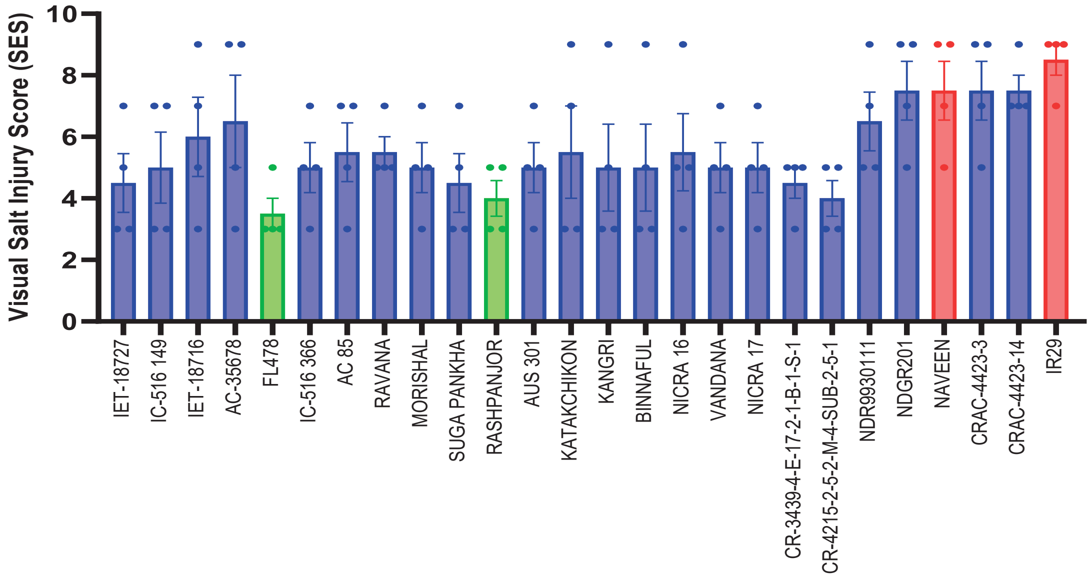


Fig. 6.4.7 *Visual salt injury (VSI) score (mean of all locations) in response to 12 dS m^{-1} salinity stress imposed at seedling stage tested at four different locations. Error bars representing SE (mean) of all biological replicates. Error bars representing SE (mean) of all locations and scattered dots are representing mean of individual location. The green, red and blue histograms represent tolerant check, susceptible check and tested genotypes, respectively.*

The shoot Na^+/K^+ ratio under salt stress and visual salt injury (VSI) scores are two associated traits for salt tolerance in rice, if the genotypes primarily follow Na^+-exclusion strategy for survival. Here in the present experiment, the Na^+/K^+ ratio was found to be correlated (0.3754*) with VSI for all genotypes across three locations **(Fig. 6.4.8)**. The Na^+/K^+ ratio in shoot tissue ranged from 0.89 to 2.34 across different locations. The tolerant check FL478 showed the lowest shoot Na^+/K^+ ratio of 0.89. Three tested lines i.e., NDR9930111 (0.97), AUS 301 (1.11), and CR-4215-2-5-2-M-4-SUB-2-5-1 (1.11) recorded even lower shoot Na^+/K^+ ratio than the tolerant check Rashpanjor. This showed the tolerance nature of these genotypes to salt stress. Whereas, the highest shoot Na^+/K^+ ratio was noted in the susceptible checks, Naveen (2.34) and IR29 (1.99). This was followed by the tesed genotypes CR-3439-4-E-17-2-1-B-1-S-1 and CRAC-4423-14 with a shoot Na^+/K^+ ratio of 1.97 and 1.89 respectively.

After dissecting different adaptive traits, it was found that apart from the salinity tolerant checks (FL478 and Rashpanjor) one entrey CR-4215-2-5-2-M-4-SUB-2-5-1 was tolerant with an 'SES score of 3', which was at par with tolerant check FL478 and better than Rashpanjor. Based on other traits like shoot Na^+/K^+ ratio under stress, reduction total biomass and chlorophyll pigmentation this genotype found best among the tested entries. Among rest of the genotypes, few other entries *viz*., CR-3439-4-E-17-2-1-B-1-S-1, IET-18727; NICRA 17, AUS 301, Binnaful, NICRA 16, IC-516149, Ravana and Morishal were moderately tolerant to salinity stress with an 'SES score of 5'. Interestingly, some of the genotypes CR-3439-4-E-17-2-1-B-1-S-1 showed high level of tolerance despite having relatively higher shoot Na+-load. On the contrary, another genotype despite having a very low shoot Na^+/K^+ ratio, phenotypically found to be moderately tolerant to salt stress with an SES score of '7'.

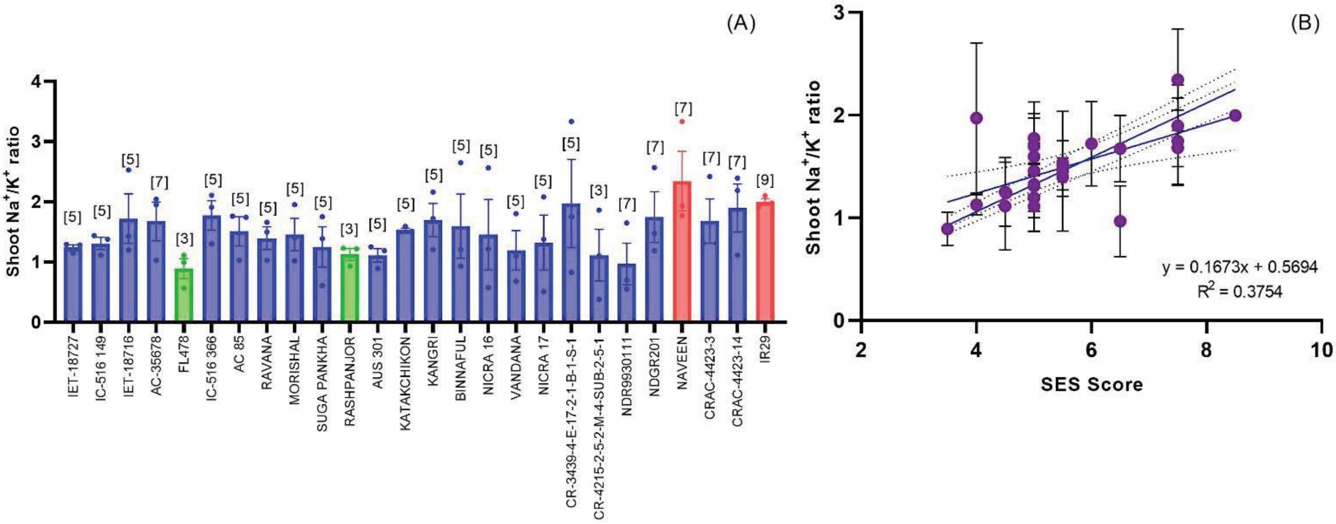


Fig. 6.4.8 *Changes in shoot Na^+/K^+ ratio and visual salt injury (VSI) score (A) and XY-scatter plot showing simple linear regression between shoot Na^+/K^+ ratio and visual salt injury (VSI) score (B) of 26 rice entries (mean of all locations) in response to 12 dS m^{-1} salinity stress imposed at seedling stage tested at three different locations. Error bars representing SE (mean) of all biological replicates.*

Osmotic/dehydration Stress:

A comprehensive screening for osmotic/dehydration stress was conducted at eight different AICRP-R centers, including CTC, KARJAT, MTU, TTB, PTB, PNR, CBT, and KRK. To impose osmotic stress, mannitol solutions of 1% and 2% concentrations (w/v) were applied to the hydroponic growth medium to induce stress when the rice plants attained 3-4 leaf stage growth. Both concentrations of mannitol led to significant reductions in root and shoot dry weights across various genotypes and research centres. There were also significant differences in various traits between the 1% and 2% mannitol treatments in various research locations. The mean root length under control, 1% and 2 % mannitol stress was reported to be 8.2, 6.0 and 5.2 cm, respectively (**Fig. 6.4.9**). Most rice varieties generally show a decrease in root length under osmotic stress, indicating they are sensitive to water deficits. The least reduction of the root length was observed in RAVANA (18.8 %), IC-516149 (19.20 %), SUGA PANKHA (22.52 %) and AC-35678 (25.8), which shows that these rice entries shows tolerance under osmotic stress. These aforementioned cultivars showed to have higher root lengths as compared to the tolerant check *viz*., Vandana and FL478.

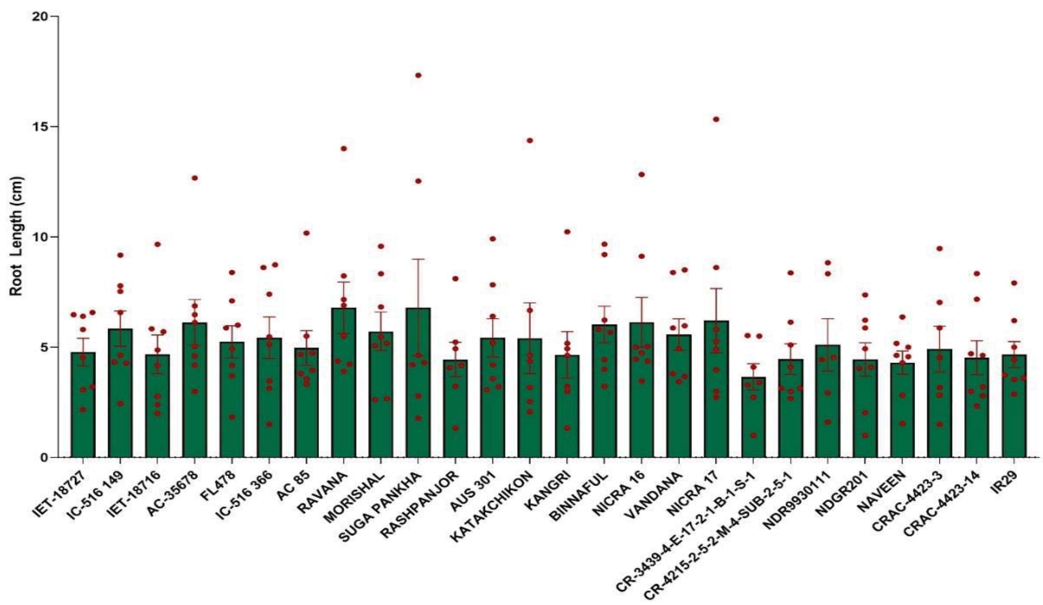


Fig. 6.4.9. *Root length of the 28 rice entries grown under 2 % mannitol osmotic stress imposed at the seedling stage at eight different locations. The error bars represent the standard error mean (SEM) of all locations and scattered dots represent the means of the individual location.*

Shoot length:The shoot lengths varied among the different germplasms, indicating diverse responses to mannitol-induced stress. The shoot lengths of the different germplasms varied significantly, ranging from as low as 9.61 cm to as high as 14.12 cm (**Fig. 6.4.10)**. Some germplasms exhibit higher shoot lengths than others under mannitol stress, indicating potential tolerance or resistance to drought conditions. Germplasms such as AC-35678 and RAVANA exhibit relatively longer shoot lengths, suggesting they may be more tolerant as compared to Vandana and FL478 under mannitol-induced stress, having mean shoot lengths of 14.12 and 13.97 cm, respectively. Conversely, germplasms like NDR9930111 (9.61 cm) and KATAKCHIKON (10.13 cm) have shorter shoot lengths, indicating potential sensitivity to 2 % mannitol stress as compared to susceptible variety viz., IR9 and NAVEEN. Shoot length is an important indicator of plant growth and vigour. Germplasms like AC-35678, RAVANA, and SUGA PANKHA show comparatively longer shoot lengths, indicating they might possess mechanisms to withstand mannitol-induced osmotic stress. The data provides valuable insights into the shoot length responses of different germplasms under mannitol-induced osmotic stress, offering potential avenues for further research and breeding efforts to enhance crop drought tolerance.

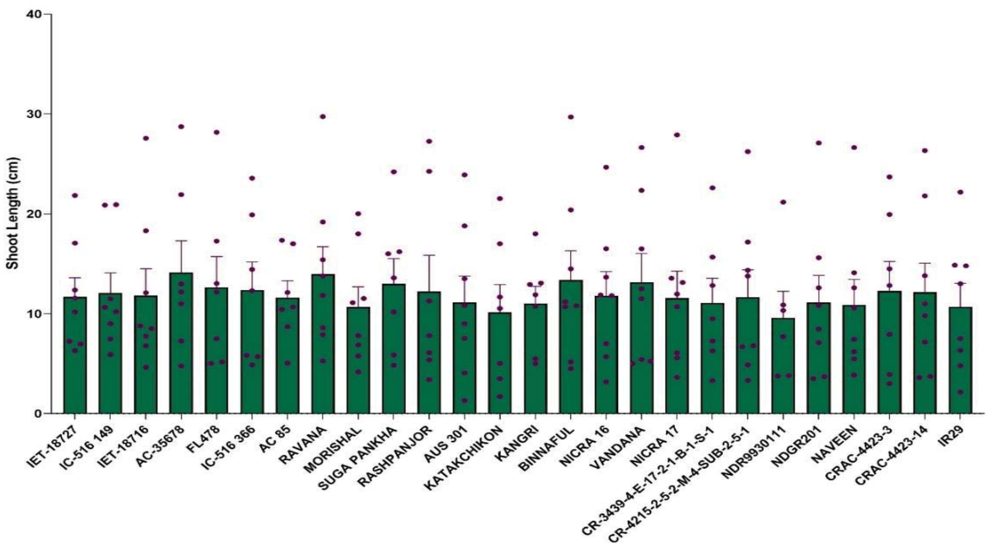


Fig. 6.4.10. *Root length of the 28 rice entries grown under 2 % mannitol osmotic stress imposed at seedling stage at eight different locations. The error bars represent the standard error mean (SEM) of all locations and scattered dots represent the means of the individual location..*

Root dry weight: The root weights under 2% mannitol stress vary across different germplasms, ranging from as low as 0.0071 g to as high as 0.0389 g in CRAC-4423-5 and RAHASPUNJOR, respectively (**Fig. 6.4.11)**. This indicates significant variability in the response of different varieties to the stress condition. Germplasms with higher root weights might possess genetic traits that confer tolerance to mannitol-induced osmotic stress. Germplasms like AC-35678, RAHASPUNJAR, and SUGA PANKHA exhibit relatively higher root weights, suggesting they might be more tolerant or adapted to mannitol-induced stress of 0.0380, 0.0374 and 0.0371 g, respectively which is higher as compared to tolerant check of Vandana and FL 478 under 2 % mannitol stress. On the other hand, germplasms like CRAC-4423-5 and CRAC-4423-102 have considerably lower root weights, indicating susceptibility or poor adaptation to the stress condition.

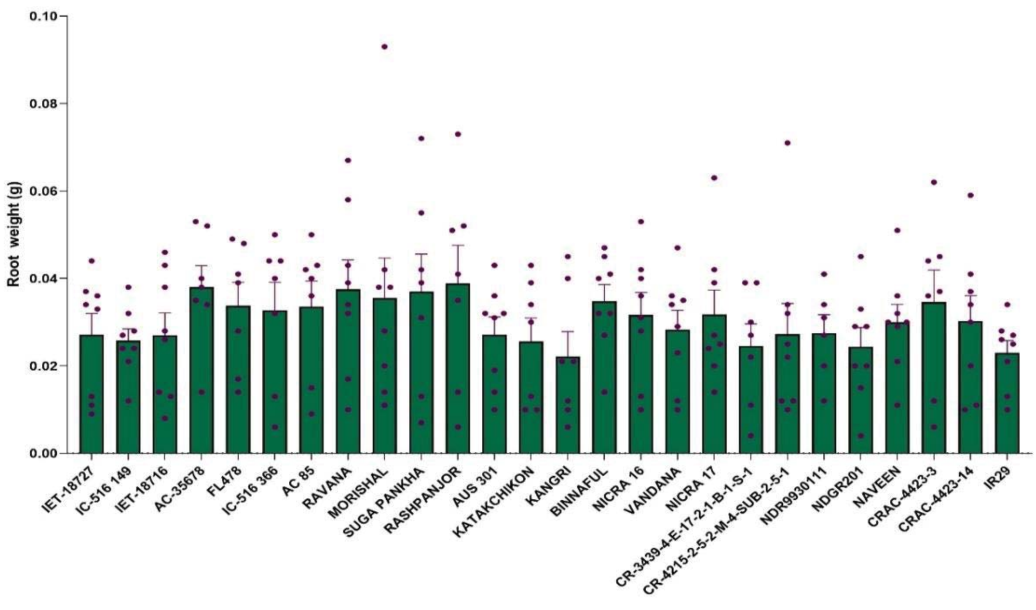


Fig. 6.4.11. *Root weight of the 28 rice entries grown under 2 % mannitol osmotic stress imposed at seedling stage at eight different locations. The error bars represent the standard error mean (SEM) of all locations and scattered dots represent the means of the individual location.*

Shoot dry weight: Germplasms such as BINNAFUL, RAVANA, and CRAC-4423-14 exhibit relatively higher shoot weights (0.055 g, 0.051875 g, and 0.051625 g, respectively), suggesting potential resilience or adaptation to the osmotic stress induced by mannitol. On the other hand, germplasms like CRAC-4423-5 and CRAC-4423-102 display notably lower shoot weights (0.0168 g and 0.0195 g, respectively), indicating higher susceptibility to the stress condition (**Fig. 6.4.12)**. The results also reveal interesting patterns among certain groups of germplasms. Similarly, germplasms CRAC-4423-14, RAVANA and BINNAFUL show higher shoot weight as compared to tolerance genotypes Vandana and FL478, indicating potential susceptibility to mannitol-induced stress. These findings underscore the genetic variability in response to osmotic stress within the germplasm collection studied. The germplasms with higher shoot weights could serve as valuable genetic resources for breeding programs to enhance crop drought tolerance.

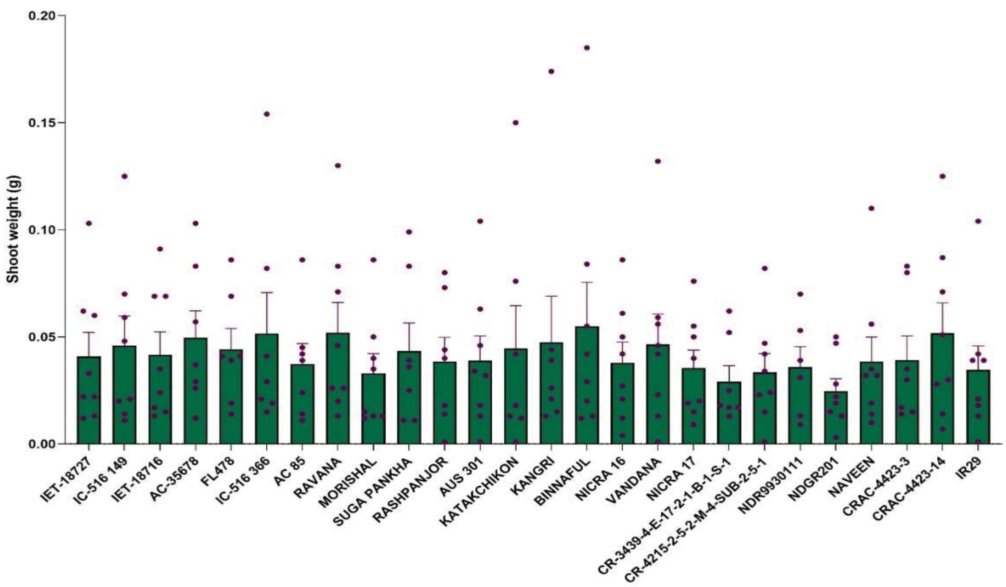


Fig. 6.4.12. *Shoot weight of the 28 rice entries grown under 2 % mannitol osmotic stress imposed at seedling stage at eight different locations. The error bars represent the standard error mean (SEM) of all locations and scattered dots represent the means of the individual location..*

Total chlorophyll content: The total chlorophyll content varies significantly across different germplasms under 2% mannitol stress, ranging from 0.675 mg/100g to 2.243 mg/100g FW (**Fig. 6.4.13)**. This indicates diverse responses of different varieties to mannitol-induced stress. Germplasms such as NICRA 16, BINNAFUL, and KANGRI exhibit relatively higher total chlorophyll content of around 2.2 mg/ 100 g FW, indicating potential tolerance or adaptation to mannitol stress as compared to the tolerant check Vandana and FL478. Conversely, germplasms like CRAC-4423-3 and CRAC-4423-5 have considerably lower chlorophyll content as compared to N29 and Naveen, suggesting susceptibility or poor adaptation to stress conditions. The chlorophyll content varies significantly among the different germplasms, reflecting their diverse responses to environmental conditions, including stress. This suggests these germplasms possess robust photosynthetic systems and potentially higher stress tolerance, as chlorophyll is crucial in capturing light energy for photosynthesis. Germplasms with higher total chlorophyll content might have genetic traits that confer tolerance to mannitol-induced osmotic stress.

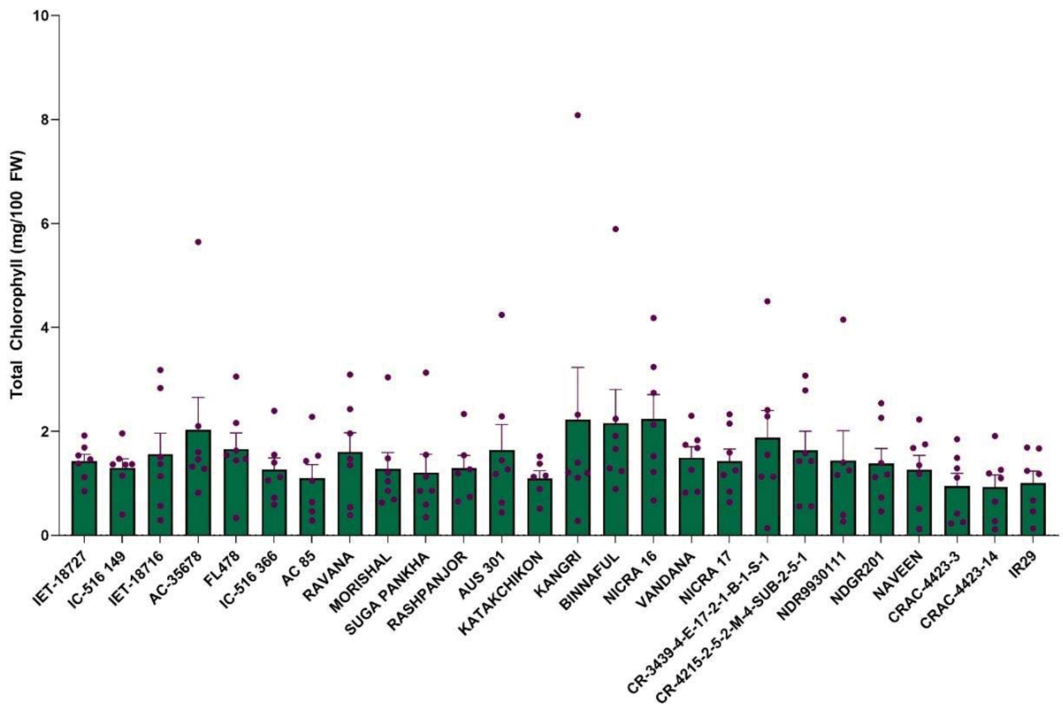


Fig. 6.4.13. *Chlorophyll content of the 26 rice entries grown under 2% mannitol osmotic stress imposed at seedling stage at eight different locations. The error bars represent the standard error mean (SEM) of all locations and scattered dots represent the means of the individual location.*

Taken together, analysing the responses of all 26 enetries based on the adaptive traits under mild (1% mannitol) and severe (2% mannitol) osmotic we found a few genotypes like BINNAFUL, AC-35678, RAVANA, IC-516149, SUGA PANKHA; NICRA 16, KANGRI; RAVANA, and CRAC-4423-14; CRAC-4423-5 are tolerant to mannitol induced osmotic stress even up to 2% concentration (w/v) owing to about -3.0 to -4.0 bar osmotic potential.

Summary and Conclusion:

Screening of 28 rice accessions for multiple abiotic stress tolerance was conducted at nine AICRP-R 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. Out of 28 accessions, two accessions CRAC-4423-102 and CRAC-4423-5 did not germinate in majority of the locations. Hence, they were excluded from the study. 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, one entry IET-18716 was found to be most promising with highest anaerobic germination potential (AGI). Six other entries *viz*., NICRA-16, Binnaful, IC-516149, AUS-301, CR-3439-4-E-17-2-1-B-1-

S-1 and Morishal performed better or at par with tolerant check Vandana, hence they can be considered as highly tolerant to anaerobic germination. Similarly under salinity stress, one entrey CR-4215-2-5-2-M-4-SUB-2-5-1 was tolerant with an 'SES score of 3', which was at par with tolerant check FL478. A few other entries *viz*., CR-3439-4-E-17-2-1-B-1-S-1, IET-18727; NICRA 17, AUS 301, Binnaful, NICRA 16, IC-516149, Ravana and Morishal were moderately tolerant to salinity stress with an 'SES score of 5'. Under severe osmotic stress (2% mannitol) a few entries *viz*., Binnaful, AC-35678, Ravana, IC-516149, Suga Pankha, NICRA-16, Kangri; Ravana, CRAC-4423-14 and CRAC-4423-5 were found to be tolerant. Considering the performance of these 26 tested entries under different abiotic stresses, we found four entries *viz*. Binnaful, NICRA-16, IC-516149, CR-3439-4-E-17-2-1-B-1-S-1 were tolerant to all the three abiotic stresses (AG, salinity and osmotic), while four other entries (CR-4215-2-5-2-M-4-SUB-2-5-1, NICRA-17, Morishal, AUS-301) were found tolerant to salinity and AG stresses and one entry (Ravana) was tolerant to salinity and osmotic stresses **(Table 6.4.1)**.

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

Sl. No.	Nature of Stress	Tolerant genotypes identified
1	Anaerobic germination (AG)	IET-18716, NICRA-16, Binnaful, IC-516149, AUS-301, CR-3439-4-E-17-2-1-B-1-S-1, Morishal, CR-4215-2-5-2-M-4-SUB-2-5-1, NICRA-17, AC-85, Katak Chikon
2	Salinity stress (SS)	CR-4215-2-5-2-M-4-SUB-2-5-1, CR-3439-4-E-17-2-1-B-1-S-1, IET-18727; NICRA-17, AUS-301, Binnaful, NICRA-16, IC-516149, Ravana, Morishal
3	Osmotic stress (OS)	Binnaful, AC-35678, Ravana, Suga Pankha; NICRA-16, Kangri, CRAC-4423-14, CRAC-4423-5, IC-516149
4	AG + SS	CR-3439-4-E-17-2-1-B-1-S-1, Binnaful, CR-4215-2-5-2-M-4-SUB-2-5-1, NICRA-17, NICRA-16, Morishal, AUS-301, IC-516149
5	AG + OS	Binnaful, NICRA-16, IC-516149, CR-3439-4-E-17-2-1-B-1-S-1
6	SS + OS	Binnaful, Ravana, NICRA-16, IC-516149, CR-3439-4-E-17-2-1-B-1-S-1
7	AG + SS+ OS	Binnaful, NICRA-16, IC-516149, CR-3439-4-E-17-2-1-B-1-S-1

Table 6.4.2 Effect of 21 days of submergence stress on anaerobic germination index (%) of rice genotypes during *Kharif* 2023 at different locations.

S.No	GENOTYPES	CBT	FZB	KJT	KAUL	PNR	PTB	TTB	CTC	Grand Mean
1	IET-18727	44.3	55.6	23.3	.	46.7	.	52.5	55.2	**46.3**
2	IC-516 149	60.5	46.2	72.8	.	63.0	74.1	80.4	60.0	**65.3**
3	IET-18716	89.2	93.8	77.7	81.4	75.4	81.3	89.3	71.1	**82.4**
4	AC-35678	63.8	68.1	24.1	24.4	33.3	30.6	47.6	48.4	**42.5**
5	FL478	.	10.5	24.3	30.6	24.1	10.2	0.0	9.7	**15.6**
6	IC-516 366	43.2	59.9	36.3	66.7	28.5	26.6	48.1	54.5	**45.5**
7	AC 85	54.0	68.1	61.5	41.7	46.7	33.3	58.6	58.6	**52.8**
8	RAVANA	45.5	13.6	14.9	.	25.2	11.6	25.1	20.5	**22.3**
9	MORISHAL	52.3	89.3	59.3	41.7	51.0	54.0	55.6	66.4	**58.7**
10	AUS 131	45.6	75.7	45.7	40.6	45.8	.	.	42.0	**49.2**
11	RAHASPUNJAR	58.2	94.9	70.4	50.0	54.9	63.9	77.8	93.5	**70.5**
12	AUS 63	51.8	80.9	.	55.6	82.7	44.5	85.9	42.4	**63.4**
13	AUS 103	31.8	43.2	.	50.0	67.3	37.4	69.7	49.7	**49.9**
14	AUS 100	39.2	81.2	.	55.6	23.8	16.7	.	22.4	**39.8**
15	AUS 73	44.3	94.7	58.1	83.3	72.6	42.0	82.0	47.3	**65.5**
16	NICRA 16	54.9	92.5	.	.	74.1	55.9	68.1	54.4	**66.6**
17	VANDANA	41.2	84.5	35.6	83.3	48.5	41.9	74.4	61.5	**58.9**
18	NICRA 17	31.9	96.2	41.5	.	63.3	39.9	44.2	53.8	**53.0**
19	CR-3439-4-E-17-2-1-B-1-S-1	58.1	84.4	39.5	.	65.1	49.4	60.4	55.6	**58.9**
20	CR-4215-2-5-2-M-4-SUB-2-5-1	72.0	47.2	35.5	50.0	48.5	40.1	73.3	58.9	**53.2**
21	NDR9930111	51.2	22.5	.	44.4	35.9	26.5	58.1	27.4	**38.0**
22	NDGR201	19.6	39.7	.	.	36.1	31.7	72.8	30.7	**38.4**
23	NAVEEN	24.3	10.2	17.3	20.0	18.1	10.4	6.3	11.1	**14.7**
24	CRAC-4423-3	46.5	87.5	.	26.1	27.0	24.1	58.7	34.8	**43.5**
25	CRAC-4423-14	29.7	42.8	.	.	0.0	5.3	46.0	.	**24.8**
26	IR29	12.5	28.1	28.6	5.6	32.1	10.3	29.4	18.1	**20.6**
	Mean	**46.6**	**62.0**	**42.6**	**47.3**	**45.8**	**35.9**	**56.8**	**45.9**	**48.2**
	LSD (Genotype)							**1.924**		
	LSD (Location × Genotype)							**5.440**		
	CV (Residual) %							**7.035**		

Table 6.4.3 Effect of 21 days of submergence stress on epicotyl growth (cm) of rice genotypes during *Kharif* 2023 at different locations.

S.No	GENOTYPES	CBT	FZB	KJT	KAUL	PTB	CTC	Grand Mean
1	IET-18727	47.4	35.7	23.5	.	.	31.9	**34.6**
2	IC-516 149	38.1	37.7	24.8	.	48.2	25.5	**34.8**
3	IET-18716	46.0	34.0	40.9	38.7	32.5	35.7	**38.0**
4	AC-35678	42.1	42.7	30.2	33.3	42.5	28.7	**36.6**
5	FL478	22.4	27.7	27.8	22.0	20.0	18.0	**23.0**
6	IC-516 366	35.8	31.3	28.8	36.3	26.9	30.9	**31.7**
7	AC 85	42.9	43.7	25.7	25.3	36.7	32.0	**34.4**
8	RAVANA	20.1	27.3	25.3	.	25.7	16.5	**23.0**
9	MORISHAL	32.3	41.3	30.5	29.3	31.8	35.1	**33.4**
10	AUS 131	40.5	37.7	28.6	38.3	.	34.9	**36.0**
11	RAHASPUNJAR	40.9	43.0	38.0	36.3	22.0	35.5	**36.0**
12	AUS 63	45.8	37.0	.	31.0	42.0	23.5	**35.9**
13	AUS 103	37.3	26.0	.	28.3	35.5	.	**31.8**
14	AUS 100	34.3	42.7	.	31.3	31.4	30.6	**34.0**
15	AUS 73	44.1	47.3	28.2	33.7	32.1	24.8	**35.0**
16	NICRA 16	38.6	43.7	.	.	22.5	34.1	**34.7**
17	VANDANA	43.2	43.0	29.4	27.3	29.7	37.0	**34.9**
18	NICRA 17	44.5	37.3	26.6	.	36.3	30.2	**35.0**
19	CR-3439-4-E-17-2-1-B-1-S-1	35.3	33.7	26.9	.	41.8	17.9	**31.1**
20	CR-4215-2-5-2-M-4-SUB-2-5-1	33.6	29.0	31.1	25.7	29.0	33.9	**30.4**
21	NDR9930111	23.4	18.0	.	23.0	21.3	14.6	**20.0**
22	NDGR201	39.1	30.7	.	.	30.5	32.0	**33.1**
23	NAVEEN	18.2	20.0	10.3	19.3	15.7	17.2	**16.8**
24	CRAC-4423-3	38.8	45.0	.	30.3	40.4	23.7	**35.6**
25	CRAC-4423-14	23.7	22.6	.	.	19.2	.	**21.8**
26	IR29	23.8	27.0	11.0	20.7	13.0	15.8	**18.5**
	Mean	**35.8**	**34.8**	**27.1**	**29.5**	**30.3**	**27.5**	**31.2**
	LSD (Genotype)					**1.091**		
	LSD (Location × Genotype)					**2.674**		
	CV (Residual) %					**5.332**		

Table 6.4.4 Root length (cm) of 26 rice entries subjected to NaCl induced salinity stress (12 dS m^{-1}) at vegetative stage tested at different locations during *Kharif* 2023

S.No	GENOTYPES	CBT	KJT	MTU	KRK	PNR	PTB	CTC	Mean
1	IET-18727		6.70	5.37	6.80	4.07	10.85	7.83	**6.94**
2	IC-516 149		5.10	4.03	7.67	6.33	8.15	7.33	**6.43**
3	IET-18716		4.09	5.10	5.03	5.00	9.17	6.33	**5.79**
4	AC-35678		6.77	4.20	7.53	5.24	8.90	6.33	**6.50**
5	FL478		11.93	11.07	13.53	11.50	16.14	12.23	**12.73**
6	IC-516 366		5.63	4.53	4.53	6.83	9.48	7.23	**6.37**
7	AC 85		5.87	4.10	3.70	4.10	8.01	9.17	**5.82**
8	RAVANA		4.57	5.10	6.97	6.00	7.31	5.83	**5.96**
9	MORISHAL	9.6	7.23	4.80	7.17	4.17	14.19	6.50	**7.66**
10	SUGA PANKHA	4.3	6.87	4.30	4.67	5.17	10.44	6.83	**6.08**
11	RASHPANJOR	7.3	11.77	11.97	12.67	10.33	16.23	11.83	**11.73**
12	AUS 301	8.3	4.40	4.73	6.03	3.67	10.71	5.50	**6.20**
13	KATAKCHIKON		6.95	4.03	4.07	5.30	11.09	6.33	**6.30**
14	KANGRI		4.83	4.37	4.53	4.60	9.80	6.40	**5.76**
15	BINNAFUL		7.77	4.97	6.50	6.17	10.00	7.90	**7.22**
16	NICRA 16		5.84	4.77	5.50	5.17	10.56	7.07	**6.48**
17	VANDANA	7.0	6.75	4.40	5.13	4.27	10.54	7.57	**6.53**
18	NICRA 17	5.1		4.63	6.33	6.00	8.33	7.13	**6.26**
19	CR-3439-4-E-17-2-1-B-1-S-1	5.7		3.43	5.13	3.10	9.10	6.50	**5.50**
20	CR-4215-2-5-2-M-4-SUB-2-5-1	7.0	9.97	9.53	11.17	10.20	15.75	11.33	**10.71**
21	NDR9930111		5.83	5.87	6.77	4.47	8.35	8.83	**6.69**
22	NDGR201		2.53	1.03	4.10	1.17	3.33	2.12	**2.38**
23	NAVEEN		1.07	0.98	1.40	1.57	2.68	1.33	**1.50**
24	CRAC-4423-3		2.00	2.90	1.27	1.13	3.57	3.17	**2.34**
25	CRAC-4423-14		1.23	1.10	2.27	1.67	4.01	3.67	**2.32**
26	IR29		2.61	1.77	1.77	3.20	2.91	4.67	**2.82**
	Mean	**6.80**	**5.76**	**4.73**	**5.86**	**5.02**	**9.22**	**6.81**	**6.27**
	LSD (Genotype)						**0.275**		
	LSD (Location × Genotype)						**0.727**		
	CV (Residual) %						**9.129**		

Table 6.4.5 Shoot length (cm) of 26 rice entries subjected to NaCl induced salinity stress (12 dS m^{-1}) at vegetative stage tested at different locations during *Kharif* 2023

S.No	GENOTYPES	CBT	KJT	MTU	KRK	PNR	PTB	CTC	Mean
1	IET-18727	.	12.91	10.37	18.40	17.17	19.86	22.50	**16.87**
2	IC-516 149	.	21.36	19.27	24.27	19.80	19.56	30.00	**22.38**
3	IET-18716	.	26.50	18.40	22.27	17.60	20.18	29.17	**22.35**
4	AC-35678	.	25.40	18.47	31.00	16.33	20.24	27.17	**23.10**
5	FL478	.	32.97	25.07	34.40	31.47	29.08	38.17	**31.86**
6	IC-516 366	.	13.09	15.97	23.77	18.00	17.72	33.67	**20.37**
7	AC 85	.	12.77	11.00	11.28	18.23	19.05	25.83	**16.36**
8	RAVANA	.	22.23	18.57	32.83	18.70	23.01	27.17	**23.75**
9	MORISHAL	23.80	20.27	10.43	18.13	12.00	17.81	21.83	**17.75**
10	SUGA PANKHA	11.57	21.81	19.93	20.83	15.30	19.72	26.00	**19.31**
11	RASHPANJOR	33.10	30.43	22.40	34.37	26.07	33.49	29.90	**29.96**
12	AUS 301	20.33	17.39	10.00	14.60	11.33	19.51	21.00	**16.31**
13	KATAKCHIKON	.	22.60	19.67	11.10	10.00	25.50	20.57	**18.24**
14	KANGRI	.	16.04	18.53	22.70	17.10	21.51	24.17	**20.01**
15	BINNAFUL	.	26.65	24.67	40.15	25.13	21.55	32.17	**28.39**
16	NICRA 16	.	12.09	10.00	15.63	15.33	16.13	20.83	**15.00**
17	VANDANA	27.03	25.73	21.87	30.77	18.00	21.33	30.17	**24.99**
18	NICRA 17	11.83	13.12	11.63	13.07	10.33	15.10	24.03	**14.16**
19	CR-3439-4-E-17-2-1-B-1-S-1	26.97	14.29	10.47	13.97	19.50	12.81	26.10	**17.73**
20	CR-4215-2-5-2-M-4-SUB-2-5-1	10.30	20.51	12.70	16.90	11.23	12.71	25.27	**15.66**
21	NDR9930111	.	12.51	10.33	13.57	10.00	10.79	19.00	**12.70**
22	NDGR201	.	12.24	10.17	17.53	11.63	11.66	20.00	**13.87**
23	NAVEEN	.	13.88	11.32	17.16	10.80	13.52	22.40	**14.85**
24	CRAC-4423-3	.	11.50	8.56	10.84	12.40	11.39	20.40	**12.51**
25	CRAC-4423-14	.	6.58	6.13	6.03	11.33	9.49	16.00	**9.26**
26	IR29	.	9.56	7.97	14.17	8.67	10.63	19.93	**11.82**
	Mean	**20.62**	**18.25**	**14.77**	**20.37**	**15.90**	**18.21**	**25.13**	**18.86**
	LSD (Genotype)						**0.766**		
	LSD (Location × Genotype)						**2.028**		
	CV (Residual) %						**8.102**		

Table 6.4.6 Root dry weight (mg) of 26 rice entries subjected to NaCl induced salinity stress (12 dS m^{-1}) at vegetative stage tested at different locations during *Kharif* 2023

S.No	GENOTYPES	CBT	KJT	MTU	KRK	PNR	PTB	CTC	Mean
1	IET-18727	.	5.53	4.97	3.43	6.61	7.82	7.09	**5.91**
2	IC-516 149	.	5.67	5.50	4.60	5.45	6.28	6.16	**5.61**
3	IET-18716	.	2.73	3.60	1.40	4.34	7.17	6.96	**4.37**
4	AC-35678	.	3.73	2.43	1.60	5.08	3.47	4.12	**3.41**
5	FL478	.	7.38	9.10	6.63	9.34	11.46	10.03	**8.99**
6	IC-516 366	.	3.07	4.00	1.13	2.61	4.10	3.91	**3.14**
7	AC 85	.	2.67	3.47	1.10	5.74	4.43	3.81	**3.54**
8	RAVANA	.	2.67	2.60	1.73	4.07	5.03	4.08	**3.36**
9	MORISHAL	5.33	5.40	4.37	2.30	2.57	8.08	6.29	**4.91**
10	SUGA PANKHA	7.20	3.27	2.73	1.07	2.83	3.45	2.72	**3.32**
11	RASHPANJOR	13.23	6.48	6.47	5.57	10.39	7.46	8.38	**8.28**
12	AUS 301	2.98	3.20	2.53	1.33	3.62	5.00	4.12	**3.25**
13	KATAKCHIKON	.	3.87	2.63	1.22	4.53	4.04	3.82	**3.35**
14	KANGRI	.	4.53	3.47	1.60	5.75	1.93	2.08	**3.23**
15	BINNAFUL	.	5.73	4.47	3.37	5.37	4.98	4.13	**4.67**
16	NICRA 16	.	3.67	2.53	1.33	3.51	1.41	2.80	**2.54**
17	VANDANA	4.53	4.00	3.60	1.33	4.79	3.49	3.17	**3.56**
18	NICRA 17	4.30	3.60	3.57	1.60	1.58	4.06	2.86	**3.08**
19	CR-3439-4-E-17-2-1-B-1-S-1	2.65	4.13	2.53	1.30	2.39	5.22	4.31	**3.22**
20	CR-4215-2-5-2-M-4-SUB-2-5-1	7.43	9.30	7.60	6.57	9.08	7.83	7.69	**7.93**
21	NDR9930111	.	4.33	2.63	1.30	2.44	3.99	4.13	**3.14**
22	NDGR201	.	2.73	2.73	1.43	1.65	2.35	2.18	**2.18**
23	NAVEEN	.	3.07	2.53	1.27	4.46	3.86	2.72	**2.99**
24	CRAC-4423-3	.	4.20	3.70	1.40	2.49	2.71	2.38	**2.81**
25	CRAC-4423-14	.	3.27	2.80	1.63	5.61	2.34	2.06	**2.95**
26	IR29	.	3.20	2.53	1.17	3.22	3.56	2.73	**2.74**
	Mean	**5.96**	**4.29**	**3.81**	**2.25**	**4.60**	**4.83**	**4.41**	**4.12**
	LSD (Genotype)						**0.424**		
	LSD (Location × Genotype)						**1.121**		
	CV (Residual) %						**17.97**		

Table 6.4.7 Shoot dry weight (mg) of 26 rice entries subjected to NaCl induced salinity stress (12 dS m^{-1}) at vegetative stage tested at different locations during *Kharif* 2023

S.No.	GENOTYPES	CBT	KJT	MTU	KRK	PNR	PTB	CTC	Mean
1	IET-18727	.	33.70	12.67	16.67	15.80	6.15	20.60	**17.60**
2	IC-516 149	.	33.90	12.37	16.67	10.15	7.65	15.90	**16.11**
3	IET-18716	.	28.80	12.00	11.67	18.80	9.09	20.13	**16.75**
4	AC-35678	.	32.20	10.33	15.00	17.61	11.51	21.40	**18.01**
5	FL478	.	33.10	18.53	20.67	35.70	24.98	33.38	**27.73**
6	IC-516 366	.	30.60	13.97	15.33	8.06	7.89	20.42	**16.05**
7	AC 85	.	28.80	12.73	16.00	8.77	9.27	21.60	**16.20**
8	RAVANA	.	23.40	12.07	17.33	12.79	11.87	15.60	**15.51**
9	MORISHAL	25.03	19.50	10.43	13.33	15.45	14.18	20.13	**16.87**
10	SUGA PANKHA	38.15	28.10	10.17	14.00	7.85	10.93	15.70	**17.84**
11	RASHPANJOR	45.73	32.00	19.50	22.00	18.23	19.74	26.60	**26.26**
12	AUS 301	18.37	30.30	17.00	17.33	15.36	13.03	21.70	**19.01**
13	KATAKCHIKON	.	28.10	12.23	12.00	13.38	12.01	16.81	**15.76**
14	KANGRI	.	37.60	19.07	19.57	21.47	13.95	27.37	**23.17**
15	BINNAFUL	.	28.00	12.13	16.33	16.08	12.43	20.72	**17.62**
16	NICRA 16	.	18.50	11.33	15.00	8.71	8.03	11.30	**12.15**
17	VANDANA	40.17	25.60	12.37	20.33	12.01	7.39	25.70	**20.51**
18	NICRA 17	42.77	31.30	13.97	15.33	6.38	9.58	21.61	**20.13**
19	CR-3439-4-E-17-2-1-B-1-S-1	30.67	31.90	12.17	14.33	11.73	7.04	15.27	**17.59**
20	CR-4215-2-5-2-M-4-SUB-2-5-1	45.50	29.00	20.37	26.00	18.21	14.39	23.32	**25.26**
21	NDR9930111	.	24.70	12.47	14.33	8.80	4.54	15.27	**13.35**
22	NDGR201	.	23.55	12.13	15.00	6.61	3.49	12.75	**12.26**
23	NAVEEN	.	22.40	10.40	15.00	11.12	5.06	8.82	**12.13**
24	CRAC-4423-3	.	21.60	11.10	12.14	6.25	7.83	13.37	**12.05**
25	CRAC-4423-14	.	23.50	11.03	14.33	10.53	3.14	17.82	**13.39**
26	IR29	.	22.20	9.93	11.33	4.37	4.03	13.30	**10.86**
	Mean	**.**	**27.78**	**13.17**	**16.04**	**13.09**	**9.97**	**19.10**	**17.47**
	LSD (Genotype)						**0.555**		
	LSD (Location × Genotype)						**1.469**		
	CV (Residual) %						**5.838**		

Table 6.4.8 Total chlorophyll content (mg g^{-1} FW) of the leaf of 26 rice entries subjected to NaCl induced salinity stress (12 dS m^{-1}) at vegetative stage tested at different locations during *Kharif* 2023

S.No.	GENOTYPES	KJT	MTU	KRK	PNR	PTB	CTC	Mean
1	IET-18727	0.97	1.28	1.46	0.49	1.09	1.12	**1.07**
2	IC-516 149	0.93	1.23	0.61	0.58	0.97	1.01	**0.89**
3	IET-18716	0.73	1.24	0.64	0.38	0.76	0.67	**0.74**
4	AC-35678	0.90	1.15	0.95	0.92	0.71	1.22	**0.97**
5	FL478	1.43	1.52	1.18	1.04	1.65	1.77	**1.43**
6	IC-516 366	1.17	1.30	0.94	1.05	1.20	1.22	**1.15**
7	AC 85	0.73	0.94	0.75	0.62	0.99	0.72	**0.79**
8	RAVANA	0.97	1.33	0.93	0.84	1.08	1.06	**1.03**
9	MORISHAL	0.93	1.28	0.94	0.81	1.19	1.09	**1.04**
10	SUGA PANKHA	1.03	0.90	0.94	0.95	0.90	1.24	**0.99**
11	RASHPANJOR	1.03	1.12	1.15	0.91	1.02	1.24	**1.08**
12	AUS 301	1.10	1.05	0.94	0.96	1.07	0.80	**0.99**
13	KATAKCHIKON	0.63	0.83	0.31	0.69	0.90	0.92	**0.71**
14	KANGRI	0.93	1.12	0.82	0.88	0.94	0.86	**0.93**
15	BINNAFUL	0.87	1.06	0.92	0.86	0.87	1.40	**1.00**
16	NICRA 16	0.53	0.97	0.75	0.68	0.67	1.09	**0.78**
17	VANDANA	0.90	1.17	0.93	0.91	1.05	1.34	**1.05**
18	NICRA 17	0.63	1.20	0.57	0.65	0.54	1.40	**0.83**
19	CR-3439-4-E-17-2-1-B-1-S-1	0.87	0.90	0.88	0.83	0.99	1.10	**0.93**
20	CR-4215-2-5-2-M-4-SUB-2-5-1	0.90	1.14	0.97	0.92	1.00	1.19	**1.02**
21	NDR9930111	0.93	0.87	0.78	0.61	0.76	1.12	**0.84**
22	NDGR201	0.93	0.88	0.56	0.51	0.67	0.73	**0.71**
23	NAVEEN	0.83	1.12	0.30	0.09	0.22	1.10	**0.61**
24	CRAC-4423-3	0.97	1.18	0.66	0.71	0.91	1.21	**0.94**
25	CRAC-4423-14	1.07	1.15	0.12	0.14	0.18	1.45	**0.69**
26	IR29	1.03	0.89	0.18	0.09	0.23	1.35	**0.63**
	Mean	**0.88**	**1.11**	**0.76**	**0.66**	**0.81**	**1.10**	**0.88**
	LSD (Genotype)						**0.209**	
	LSD (Location × Genotype)						**0.512**	
	CV (Residual) %						**16.99**	

6.5 Screening of Rice Genotypes for Submergence Tolerance

Locations: CBT, CHN, KRK, PTB, TTB and CTC

Flooding or excess water stress poses serious threat to rice production, especially in low and semi-deep rice growing ecologies. In India, about 40 m ha rice growing area is vulnerable to flooding stress. Depending on the level of water flooding event can be categorised into complete submergence, stagnant flooding and waterlogging. 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* 2023, a trial was formulated to evaluate promising rice genotypes for their tolerance to two weeks of complete submergence.

The submergence trial was conducted a six AICRP-R centres i.e., Coimbatore (CBT); Chinsurah (CHN), Karaikal (KRK); Patambi (PTB), Titabar (TTB), and NRRI, Cuttack (CTC). The experiment included thirty-four promising rice lines with two tolerant (FR13A and Swarna-Sub1) and two susceptible checks (Naveen and Swarna). These genotypes were subjected to 14 days of complete submergence and evaluated for some key tolerance traits i.e., survival rate (%), elongation ability (%), plant height (cm) after stress and leaf starch content after de-submergence across different locations. Substantial variation was observed between the genotypes for all four traits at all the six locations **(Table 6.5.1)**. Highest survival rate was noted in the tolerant check FR13A (88.1%). Swarna-Sub1 also reported a high survival rate (%) of 77.26%. On the contrary, the susceptible checks Swarna and Naveen reported a lower survival rate of 5.1% and 12.9%, respectively. From the multilocation trial, we found that, among 34 tested accessions, 7 accessions reported a high survival rate of >60%. Among the tested entries, highest survival rate was observed in IC-516 366 (78.04%), followed by IC-516 149 (70.39%), Kangri (70.31%), AC-35678 (68.11%), Barh-Avarodhi (65.61%), CR4430-13-19-1-1 (63.15%), OROI-5-IR 86256-6 (62.82%) **(Fig. 6.5.1; Table 6.5.1)**. While, four lines (CR 3918-119-1, Madhukar, Suga Pankha, and NDGR201) reported a moderated level of tolerance with survival rate 42-46%. Out of six different locations, CTC reported highest average survival rate of 67.7%, followed by KRK (60.9%), PTB (52.5%), TTB (45.6%), CHN (38.7%), and CBT (32.4%).

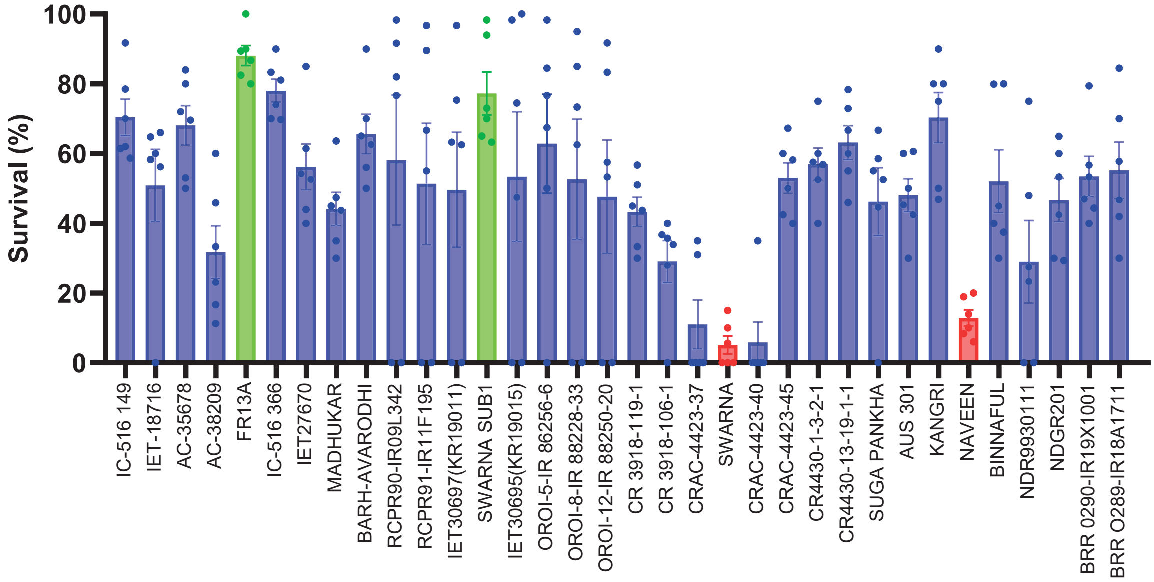


Fig. 6.5.1 *Mean survival rate (%) of rice genotypes under 14 days of complete submergence tested at three different locations. Error bars representing SE (mean) of all locations and scattered dots are representing mean of individual location. The green, red and blue histograms represent tolerant check, susceptible check and tested genotypes, respectively.*

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. Significant difference was observed among the tested lines for plant height after de-submergence at all the locations **(Fig. 6.5.2; Table 6.5.2)**. The mean plant height of tested lines after stress varied from 33.84 – 71.37 cm. CR4430-1-3-2-1 reported the lowest plant height, whereas, the highest plant height after de-submergence was noted in RCPR91-IR11F195. Swarna SUB1 and FR13A (tolerant checks) reported 37.55 and 53.03 cm plant height after stress respectively. On the contrary, the susceptible checks Naveen and Swarna reported plant height of 61.1 and 56.77 cm respectively. Among the locations highest mean plant height was noted at KRK center (71.99 cm), followed by CTC (64.78 cm), CHN (55.18 cm), PTB (53.55cm), CBT (52 cm) and TTB (45.43 cm). The multi-location results suggest that the majority of tolerant and moderately tolerant entries followed quiescence strategy and remained under water for the complete period of submergence stress, which might be due to *SUB1A* gene action.

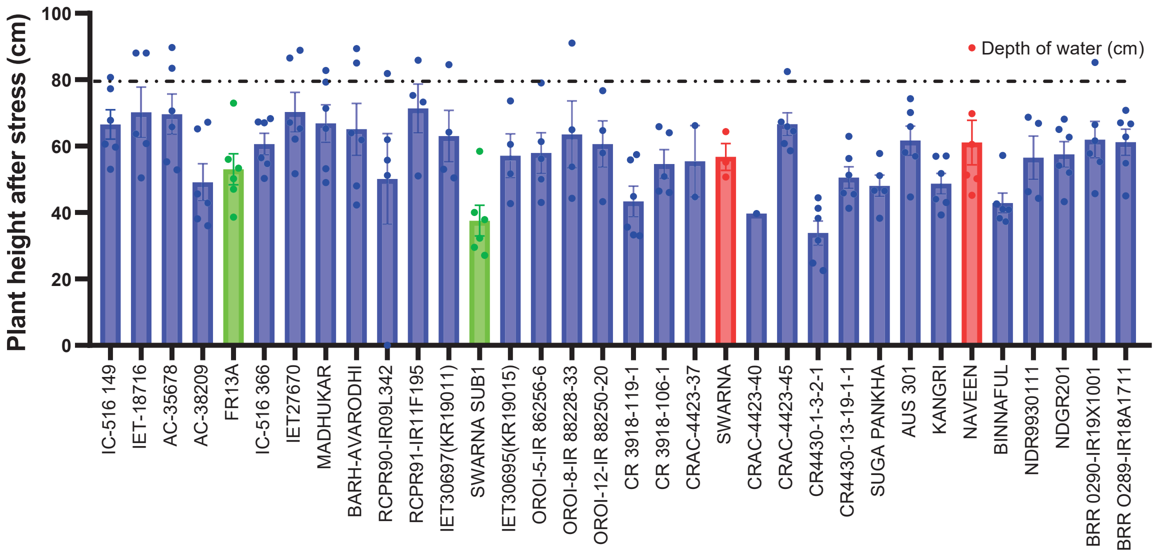


Fig. 6.5.2 *Mean plant height (cm) of rice genotypes under 14 days of complete submergence tested at three different locations. Error bars representing SE (mean) of all locations and scattered dots are representing mean of individual location. The green, red and blue histograms represent tolerant check, susceptible check and tested genotypes, respectively.*

We also found a significant variation among the genotypes for elongation ability (EA) across all the locations with a mean of 40.3%. Swarna-Sub1 and FR13A (tolerant checks) reported a lower EA of 27.8% and 32.3%, respectively. Whereas, Naveen and Swarna (susceptible checks) recorded 40.6% and 42% EA, respectively (**Fig. 6.5.3; Table 6.5.3)**. Surprisingly, from the multi-location trial, we observed one accession OROI-8-IR 88228-33 with very low elongation ability of 18.61% (lower than Swarna-Sub1), but with a moderate survival rate (52.63%). The EA of promising lines (>60% survival rate) varied from 22.83-68.51%. Interestingly, it was observed that three genotypes i.e., AC-35678, IC-516149, and IC-516366 showed both high elongation ability (56.43, 68.51 and 58.08%, respectively) and high survival rate (68.11, 70.39 and 78.04%, respectively) under complete submergence. As these genotypes reported higher internode elongation under submergence condition, we assume the presence of both *SUB1* and *SNORKEL* QTLs. Still these genotypes can be regarded as submergence tolerant genotypes, as the plant height was lower than the water surface.

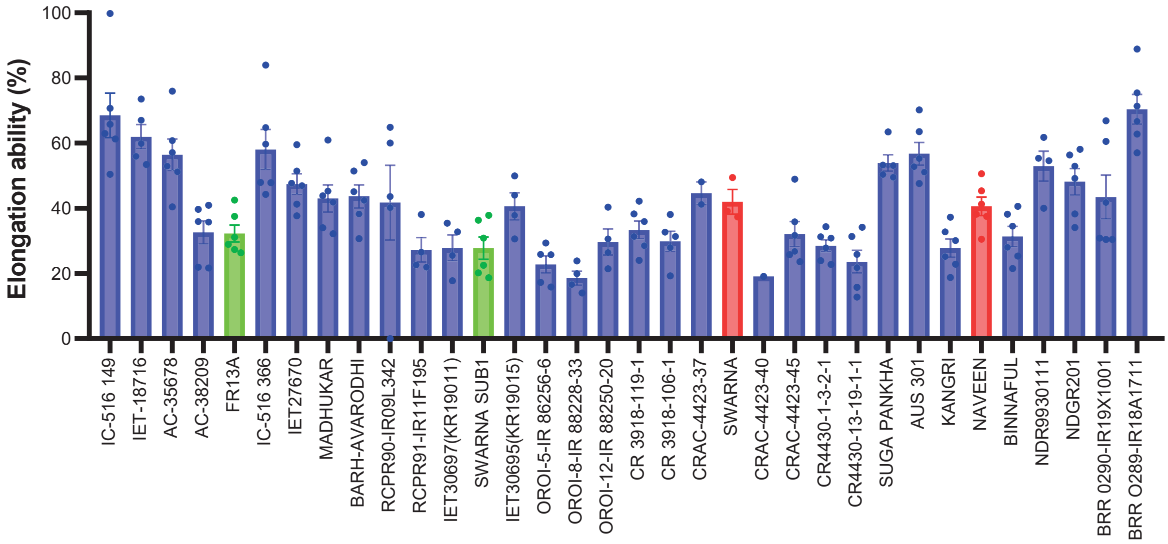


Fig. 6.5.3 *Mean elongation ability (%) of rice genotypes under 14 days of complete submergence tested at three different locations. Error bars representing SE (mean) of all locations and scattered dots are representing mean of individual location. The green, red and blue histograms represent tolerant check, susceptible check and tested genotypes, respectively.*

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 submergence tolerant genotypes possess a greater leaf starch content and prevents its fast depletion for rapid regeneration at the time of revival after stress recedes. Leaf starch content of all the 34 accessions were measured after de-submergence at four locations CBT, CHN, PTB and CTC. Highest leaf starch content post submergence was noted in FR13A (58.53 mg g^{-1} leaf DW) followed by OROI-5-IR 86256-6 (49.28 mg g^{-1} leaf DW). (**Fig. 6.5.4; Table 6.5.4**). On the contrary CRAC-4423-40 recorded the lowest leaf starch content (21.53 mg g^{-1} leaf DW), followed by Suga Pankha. Taken together, the data of four locations (CBT, CHN, PTB and CTC), a significant and positive association (R^2 = 0.601) was observed among the genotypes for survival rate and leaf starch content **(Fig. 6.5.5)**.

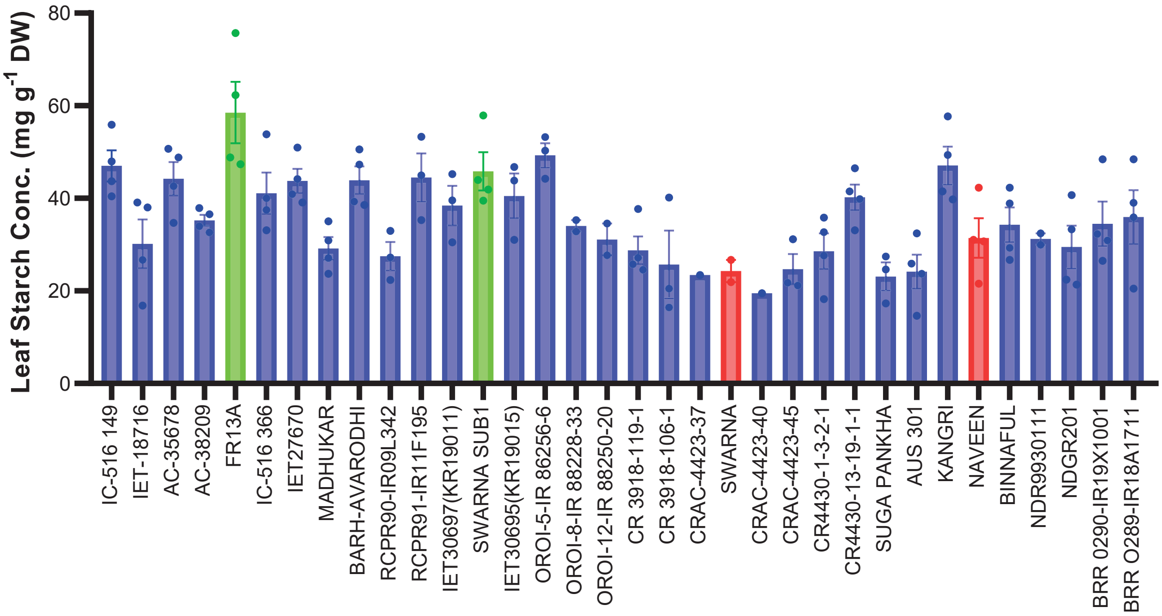


Fig. 6.5.4 *Mean starch content (mg g^{-1} DW) of rice genotypes under 14 days of complete submergence tested at three different locations. Error bars representing SE (mean) of all locations and scattered dots are representing mean of individual location. The green, red and blue histograms represent tolerant check, susceptible check and tested genotypes, respectively.*

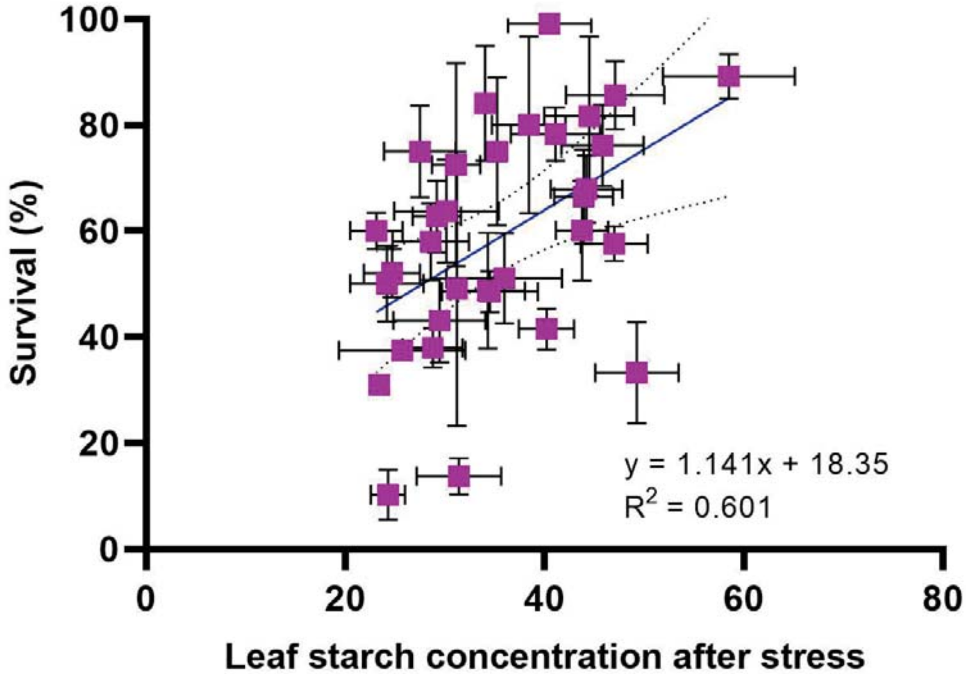


Fig. 6.5.5 *An XY-scatter plot showing simple linear regression between survival rate and elongation ability of rice genotypes under 14 days of complete submergence tested at three different locations. Error bars representing SE (mean) of all locations.*

Summary & Conclusion:

The trial was conducted at six different locations (CBT, CHN, KRK, PTB, TTB, and CTC) using 34 rice genotypes. After 14 days of complete submergence, highest survival rate (88.09%) was found in the tolerant check FR13A. In contrast, a lower survival rate of 5.10% and 12.87% was observed in Swarna and Naveen (susceptible checks) respectively. The mean survival rate among all the genotypes and across all the locations was 49.6% with CTC reporting highest average survival rate of 67.7% and TTB reporting lowest average survival rate of 32.4%. As per the data of multilocation trial, out of all the tested entries, IC-516366 was recorded survival rate (78%) which was at par with the tolerant check Swarna-Sub1. Thus, it can be considered as highly tolerant to submergence stress. Six other entries i.e., IC-516149, Kangri, AC-35678, Barh-Avarodhi, CR4430-13-19-1-1 and OROI-5-IR 86256-6 were considered tolerant to complete submergence with a survival rate ranging from 60-70%. We found eleven other entries i.e., RCPR90-IR09L342, CR4430-1-3-2-1, IET-27670, BRR O289-IR18A1711, BRR 0290-IR19X1001, IET30695 (KR19015), CRAC-4423-45, OROI-8-IR 88228-33, Binnaful, RCPR91-IR11F195 and IET-18716 with moderate tolerance to submergence stress as they showed survival rate in the range of 50-60%. From the multilocation trial we observed that, the most of the tolerant genotypes showed lower internode elongation in submerged condition and possessed higher post-submergence leaf starch content. However, we observed one genotype, IC-516366 with both higher elongation ability (58%) and higher survival rate (78%). These genotypes may be used as potential donors for improving submergence tolerance trait in high yielding rice cultivars.

Table 6.5.1 Effect of 14 days of submergence stress on survival rate (%) on rice genotypes during *Kharif* 2023 at different locations. NG: Not Germinated

SN	GENOTYPES	CBT	CHN	KRK	PTB	TTB	CTC	Grand mean
1	IC-516 149	70.0	61.4	58.7	62.0	78.5	91.7	**70.4**
2	IET-18716	60.0	56.2	64.8	58.3	--	66.0	**50.9**
3	AC-35678	80.0	69.6	84.0	50.0	53.0	72.0	**68.1**
4	AC-38209	60.0	23.1	45.9	16.7	11.3	33.3	**31.7**
5	FR13A	90.0	80.0	89.4	86.7	82.5	100.0	**88.1**
6	IC-516 366	70.0	69.8	81.1	83.3	74.0	90.0	**78.0**
7	IET27670	40.0	61.4	52.6	54.2	44.0	85.0	**56.2**
8	MADHUKAR	30.0	47.4	63.6	43.7	35.0	45.0	**44.1**
9	BARH-AVARODHI	50.0	56.0	62.6	70.0	65.0	90.0	**65.6**
10	RCPR90-IR09L342	--	82.0	91.6	76.7	0.0	98.3	**58.1**
11	RCPR91-IR11F195	--	--	89.6	66.7	55.0	96.7	**51.3**
12	IET30697(KR19011)	--	--	75.3	63.3	62.5	96.7	**49.6**
13	SWARNA SUB1	70.0	73.0	94.0	63.3	65.0	98.3	**77.3**
14	IET30695(KR19015)	--	0.0	74.5	100.0	47.5	98.3	**53.4**
15	OROI-5-IR 86256-6	50.0	0.0	84.5	76.7	67.4	98.3	**62.8**
16	OROI-8-IR 88228-33	--	--	85.0	73.3	62.5	95.0	**52.6**
17	OROI-12-IR 88250-20	--	--	83.3	53.3	57.5	91.7	**47.6**
18	CR 3918-119-1	30.0	43.7	56.7	33.3	51.0	45.0	**43.3**
19	CR 3918-106-1	--	35.7	33.9	36.7	28.0	40.0	**29.0**
20	CRAC-4423-37	0.0	31.0	--	0.0	35.0	0.0	**11.0**
21	SWARNA	0.0	0.0	0.0	5.6	10.0	15.0	**5.1**
22	CRAC-4423-40	--	--	--	--	35.0	0.0	**5.8**
23	CRAC-4423-45	40.0	58.2	67.3	50.0	42.5	60.0	**53.0**
24	CR4430-1-3-2-1	40.0	56.9	52.5	60.0	57.5	75.0	**57.0**
25	CR4430-13-19-1-1	60.0	46.0	72.9	66.7	55.0	78.3	**63.1**
26	SUGA PANKHA	--	58.5	44.6	66.7	52.5	55.0	**46.2**
27	AUS 301	30.0	60.6	45.3	50.0	42.5	60.0	**48.1**
28	KANGRI	90.0	50.0	46.9	80.0	75.0	80.0	**70.3**
29	NAVEEN	10.0	18.9	13.9	20.0	8.4	6.0	**12.9**
30	BINNAFUL	30.0	45.0	79.9	40.0	37.5	80.0	**52.1**
31	NDR9930111	--	--	48.0	23.3	27.5	75.0	**29.0**
32	NDGR201	30.0	29.3	64.9	53.3	42.5	60.0	**46.7**
33	BRR 0290-IR19X1001	40.0	44.4	79.4	53.3	47.0	56.7	**53.5**
34	BRR O289-IR18A1711	30.0	57.8	84.5	46.7	42.0	70.0	**55.2**
	Mean	**32.4**	**38.7**	**60.9**	**52.5**	**45.6**	**67.7**	**49.6**
	LSD (Genotype)					**2.16**		
	LSD (Location × Genotype)					**5.31**		
	CV (Residual) %					**6.64**		

Table 6.5.2 Effect of 14 days of submergence stress on plant height (in cm after stress) on rice genotypes during *Kharif* 2023 at different locations. NG: Not germinated

SN	GENOTYPES	CBT	CHN	KRK	PTB	TTB	CTC	Grand mean
1	IC-516 149	60.60	59.67	80.73	67.76	53.00	77.33	**66.52**
2	IET-18716	63.70	60.80	88.07	50.47		88.01	**70.21**
3	AC-35678	52.87	70.66	89.70	65.82	55.33	83.44	**69.64**
4	AC-38209	38.10	67.17	45.60	42.87	36.00	65.22	**49.16**
5	FR13A	56.06	47.03	72.93	50.20	38.59	53.37	**53.03**
6	IC-516 366	54.67	67.30	68.27	56.42	50.33	67.00	**60.66**
7	IET27670	65.30	62.10	86.50	67.11	51.67	88.87	**70.26**
8	MADHUKAR	65.30	71.38	82.83	53.21	49.00	79.33	**66.84**
9	BARH-AVARODHI	42.30	61.90	89.40	63.96	48.00	85.00	**65.09**
10	RCPR90-IR09L342		51.20	81.90	61.95		55.78	**62.71**
11	RCPR91-IR11F195			85.87	73.28	51.00	75.32	**71.37**
12	IET30697(KR19011)			84.50	64.20	53.00	50.44	**63.04**
13	SWARNA SUB1	27.13	32.33	37.87	29.52	40.00	58.44	**37.55**
14	IET30695(KR19015)			73.63	60.50	42.67	51.67	**57.12**
15	OROI-5-IR 86256-6	56.23		79.00	61.38	43.00	50.00	**57.92**
16	OROI-8-IR 88228-33			91.03	64.96	44.33	53.78	**63.53**
17	OROI-12-IR 88250-20			76.73	57.93	43.33	64.67	**60.67**
18	CR 3918-119-1	33.00	44.90	57.47	35.59	33.33	55.89	**43.36**
19	CR 3918-106-1		46.42	64.07	50.86	46.00	65.89	**54.65**
20	CRAC-4423-37		66.17			44.67		**55.42**
21	SWARNA				55.17	50.74	64.41	**56.77**
22	CRAC-4423-40					39.67		**39.67**
23	CRAC-4423-45	65.90	64.54	82.47	58.64	67.33	60.78	**66.61**
24	CR4430-1-3-2-1	24.83	31.60	41.27	22.58	38.33	44.44	**33.84**
25	CR4430-13-19-1-1	51.30	45.90	62.93	45.53	41.33	56.33	**50.56**
26	SUGA PANKHA		46.60	57.77	46.52	38.33	51.11	**48.07**
27	AUS 301	65.91	58.12	70.10	56.93	44.67	74.33	**61.68**
28	KANGRI	39.33	51.80	56.93	44.04	43.00	57.00	**48.68**
29	NAVEEN	60.50	50.20	89.63	45.17	51.33	69.78	**61.10**
30	BINNAFUL	40.90	42.60	41.00	38.29	37.33	57.22	**42.89**
31	NDR9930111			68.73	46.25	44.33	66.89	**56.55**
32	NDGR201	52.03	62.71	65.00	54.14	43.33	68.11	**57.55**
33	BRR 0290-IR19X1001	61.60	57.77	85.17	55.28	45.67	66.44	**61.99**
34	BRR O289-IR18A1711	62.80	54.90	70.83	67.01	45.00	66.67	**61.20**
	Mean	**52.00**	**55.18**	**71.99**	**53.55**	**45.43**	**64.78**	**57.23**
	LSD (Genotype)					**2.11**		
	LSD (Location × Genotype)					**5.16**		
	CV (Residual) %					**5.60**		

Table 6.5.3 Effect of 14 days of submergence stress on elongation ability (%) on rice genotypes during *Kharif* 2023 at different locations. NG: Not germinated

SN	GENOTYPES	CBT	CHN	KRK	PTB	TTB	CTC	Grand mean
1	IC-516 149	99.81	50.45	61.32	62.97	70.71	65.79	**68.5**
2	IET-18716	67.08	53.49	55.96	59.90		73.54	**62.0**
3	AC-35678	57.16	40.42	52.97	51.23	60.83	75.98	**56.4**
4	AC-38209	21.67	40.96	35.75	35.94	21.95	39.71	**32.7**
5	FR13A	37.5	26.39	42.51	31.14	27.34	28.94	**32.3**
6	IC-516 366	83.96	44.26	64.75	47.84	59.71	47.94	**58.1**
7	IET27670	41.30	51.48	37.74	47.71	46.92	59.56	**47.5**
8	MADHUKAR	43.90	41.84	45.33	32.18	34.01	60.96	**43.0**
9	BARH-AVARODHI	38.25	45.12	30.67	51.48	42.48	54.01	**43.7**
10	RCPR90-IR09L342		60.04	40.23	43.64		64.85	**52.2**
11	RCPR91-IR11F195			22.65	26.57	21.94	38.13	**27.3**
12	IET30697(KR19011)			25.52	35.49	17.83	32.78	**27.9**
13	SWARNA SUB1	20.23	36.35	22.56	18.73	37.88	30.85	**27.8**
14	IET30695(KR19015)			30.65	44.04	37.90	49.98	**40.6**
15	OROI-5-IR 86256-6	15.85		25.75	25.89	17.30	29.35	**22.8**
16	OROI-8-IR 88228-33			19.94	14.00	16.65	23.86	**18.6**
17	OROI-12-IR 88250-20			26.46	40.35	21.48	30.64	**29.7**
18	CR 3918-119-1	35.96	42.23	31.35	28.51	24.07	38.31	**33.4**
19	CR 3918-106-1		32.67	31.34	19.31	27.94	38.15	**29.9**
20	CRAC-4423-37		48.16			41.17		**44.7**
21	SWARNA				49.45	39.15	37.4	**42.0**
22	CRAC-4423-40					19.12		**19.1**
23	CRAC-4423-45	35.90	48.97	26.77	23.66	25.82	31.69	**32.1**
24	CR4430-1-3-2-1	27.90	30.90	23.95	31.28	22.75	34.36	**28.5**
25	CR4430-13-19-1-1	25.90	21.80	31.36	15.83	12.77	34.17	**23.6**
26	SUGA PANKHA		53.33	50.38	53.15	49.56	63.45	**54.0**
27	AUS 301	55.30	52.80	47.63	63.55	51.14	70.20	**56.8**
28	KANGRI	18.83	30.15	32.81	25.23	22.87	37.27	**27.9**
29	NAVEEN	45.40	41.30	50.59	30.50	37.55	38.23	**40.6**
30	BINNAFUL	34.50	25.40	28.06	21.56	38.21	40.64	**31.4**
31	NDR9930111			54.62	61.81	40.01	55.35	**52.9**
32	NDGR201	56.40	52.94	38.32	49.23	34.09	58.12	**48.2**
33	BRR 0290-IR19X1001	41.80	60.54	30.84	30.45	30.49	66.87	**43.5**
34	BRR O289-IR18A1711	71.40	57.02	66.69	75.47	62.81	88.91	**70.4**
	Mean	**44.8**	**44.6**	**37.9**	**39.1**	**34.8**	**48.3**	**40.3**
	LSD (Genotype)						**1.99**	
	LSD (Location × Genotype)						**4.88**	
	CV (Residual) %						**7.39**	

Table 6.5.4 Effect of 14 days of submergence stress on leaf starch concentration (mg g^{-1} leaf dry weight) after stress on rice genotypes during *Kharif* 2023 at different locations.

SN	Genotype Details	Starch content (mg g^{-1} leaf dry weight)				
		CBT	CHN	PTB	CTC	Grand mean
1	IC-516 149	55.93	40.41	43.73	47.95	**47.00**
2	IET-18716	38.00	16.82	39.09	26.73	**30.16**
3	AC-35678	50.67	42.61	34.73	48.82	**44.21**
4	AC-38209	37.88	32.60	33.97	36.55	**35.25**
5	FR13A	75.67	47.36	62.27	48.82	**58.53**
6	IC-516 366	40.00	37.48	33.09	53.84	**41.10**
7	IET27670	40.90	44.19	39.09	50.95	**43.78**
8	MADHUKAR	30.90	27.10	35.00	23.73	**29.18**
9	BARH-AVARODHI	39.33	47.27	38.55	50.56	**43.93**
10	RCPR90-IR09L342		22.34	27.24	32.96	**27.51**
11	RCPR91-IR11F195		35.27	53.27	44.95	**44.50**
12	IET30697(KR19011)		30.51	39.55	45.22	**38.43**
13	SWARNA SUB1	41.90	39.53	57.91	43.96	**45.83**
14	IET30695(KR19015)		31.00	43.82	46.75	**40.52**
15	OROI-5-IR 86256-6	53.26		44.26	50.31	**49.28**
16	OROI-8-IR 88228-33			32.82	35.29	**34.06**
17	OROI-12-IR 88250-20			34.55	27.71	**31.13**
18	CR 3918-119-1	37.67	27.16	24.55	25.75	**28.78**
19	CR 3918-106-1		16.43	40.18	20.51	**25.71**
20	CRAC-4423-37		23.42			**23.42**
21	SWARNA			26.73	21.87	**24.30**
22	CRAC-4423-40				19.53	**19.53**
23	CRAC-4423-45		21.76	31.18	21.16	**24.70**
24	CR4430-1-3-2-1	32.67	18.25	35.82	27.60	**28.59**
25	CR4430-13-19-1-1	39.80	41.49	33.09	46.47	**40.21**
26	SUGA PANKHA		17.29	24.64	27.44	**23.12**
27	AUS 301	25.90	14.63	23.73	32.40	**24.17**
28	KANGRI	49.37	41.52	57.69	39.77	**47.09**
29	NAVEEN	42.33	21.57	30.73	31.04	**31.42**
30	BINNAFUL	42.33	26.72	38.91	29.29	**34.31**
31	NDR9930111			32.45	29.95	**31.20**
32	NDGR201	33.33	22.43	40.73	21.38	**29.47**
33	BRR 0290-IR19X1001	30.90	26.48	48.45	32.29	**34.53**
34	BRR O289-IR18A1711	35.90	20.47	48.45	39.00	**35.96**
	Mean	**41.65**	**29.79**	**38.45**	**35.83**	**35.03**
	LSD (Genotype)					**2.40**
	LSD (Location X Genotype)					**4.79**
	CV (Residual) %					**8.25**

6.6. Screening of rice varieties for tolerance to low light stress

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

Light is one of the essential environmental inputs that can influence plant growth, development and yield processes. More specifically, it's duration, intensity and the range of wavelength that represents visible radiation are important for the generation of reducing power as well as energy required for photosynthesis which consecutively also contributes for the crop sustenance and yield. Hence, rice yield is comparatively low during the kharif (wet) season in eastern and north eastern regions of India, primarily due to cloudy days with sub-optimal light intensity. Literature indicates that low light can reduce tillering, panicle and spikelet numbers; and weight, yield and quality of the grain. Further, it was estimated that the solar radiation of 200 hrs and bright sunshine during 30 days before harvest could be optimum for grain yield. However, in kharif (wet) season, bright sun shine with a light intensity (200-300 cal $cm^{-2}day^{-1}$) that prevails for only a few hours (~4 hrs day^{-1}) is a major limitation for rice production.

Consequently, in the 51st ARGM, this trial was constituted in AICRPR to screen elite germplasm for low light stress tolerance with an objective to identify donors to improve the breeding program in low light stress tolerance environment. The trail was conducted at 8 locations with material from AVT-2 obtained from eastern and north eastern India. The entries were screened for tolerance to low light stress with Swarnaprabha as tolerant check and IR8 as susceptible check. The trial was conducted in 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 transplantation by enclosing the plants in shade net having 50% transmittance. The shade net was supported by metal rods/bamboo poles.

The effect of low light stress on days to 50% flowering (DFF) was non-significant (Table No. 6.6.1) for treatment with similar mean values under controlled and low light conditions. However, DFF varied significantly ($p<0.01$) in the varieties. The mean DFF varied from 84 (Swarna Prabha) to 112 (Pooja) under control conditions and 92 (Swarna Prabha) to 117 (IET 30423) under low light stress conditions. Among the locations, mean DFF varied from 81 (TTB) to 117 (CHN) under control conditions and 86 (RPUR) to 121 (CHN) under low light stress conditions. The interaction was significant ($p<0.01$) for location into treatment and location into varieties which indicates that the impact of low light stress varied among the locations and the DFF of the varieties varied among the locations.

The effect of low light stress on days to maturity was non-significant (Table No. 6.6.2) for both treatment and varieties. The mean days to maturity varied from 115 (Swarna Prabha) to 144 (IET 30423) under control conditions and 123 (Swarna Prabha) to 149 (IET 30423) under low light stress conditions. Among the locations, mean days to maturity varied from 117 (RPUR) to 148 (NRRI) under control conditions and 123 (RPUR) to 149 (NRRI) under low light stress conditions. The interaction was significant for location into treatment and location into varieties which indicates that the influence of low light stress varied among the locations and the days to maturity of the varieties varied among the locations.

The effect of low light stress on plant height (PH) was non-significant (Table No. 6.6.3) for treatment. However, PH varied significantly ($p<0.01$) in the varieties. The mean PH varied from 98 (Swarna Sub-1) to 132 (Swarna Prabha) under control conditions and 102 (Swarna Sub-1 and IR 8) to 139 (Swarna Prabha) under low light stress conditions. Among the locations, mean PH varied from 91 (CHN) to 133 (MTU) under control conditions and 100 (CHN) to 136 (RPUR) under low light stress conditions. The interaction was significant ($p<0.01$) for location into treatment and location into varieties which indicates that the effect of low light stress varied among the locations and the PH of the varieties varied among the locations.

The effect of low light stress on total chlorophyll content was non-significant at panicle initiation stage (Table No. 6.6.4) and flowering stage (Table No. 6.6.5) for both treatment and varieties. At panicle initiation stage, the mean chlorophyll content varied from 1.86 (IET 31220) to 2.43 (Swarna Sub-1) under control conditions and 2.15 (IR8) to 3.14 (IET 31246) under low light stress conditions. Among the locations, mean chlorophyll content varied from 1.3 (NRRI) to 2.59 (CHN) under control conditions and 1.42 (KJT) to 4.11 (PNR) under low light stress conditions. At flowering stage, the mean chlorophyll content varied from 2.03 (CR Dhan 801) to 2.8 (IET 31204) under control conditions and 1.95 (IET 30409) to 3.18 (IET 31246) under low light stress conditions. Among the locations, mean chlorophyll content varied from 1.32 (KJT) to 4.01 (MTU) under control conditions and 1.25 (KJT) to 4.19 (MTU) under low light stress conditions. The interaction was significant for location into treatment and location into varieties which indicates that the influence of low light stress varied among the locations and the chlorophyll content of the varieties varied among the locations at both panicle initiation as well as flowering stages.

The effect of low light stress on total dry matter (TDM) (g/m^2) at flowering was significant ($p<0.01$) for both treatment and varieties (Table No. 6.6.6). The TDM (g/m^2) at flowering values decreased from control conditions to low light stress conditions. The mean TDM (g/m^2) at flowering varied from 1041 (IR 8) to 1534 (IET 30423) under control conditions and 810 (IR 8) to 1114 (IET 30423) under low light stress conditions. Among the locations, mean TDM (g/m^2) at flowering varied from 554 (MTU) to 2901 (RPUR) under control conditions and 450 (MTU) to 1853 (RPUR) under low light stress conditions. The interaction was significant ($p<0.01$) for location into treatment and location into varieties which indicates that the effect of low light stress varied among the locations and the TDM (g/m^2) at flowering of the varieties varied among the locations.

The effect of low light stress on shoot weight was significant ($p<0.01$) for treatment and non-significant ($p<0.01$) for varieties (Table No. 6.6.7). The mean shoot weight varied from 706 (CR Dhan 801) to 913 (Pooja) under control conditions and 596 (Swarna Prabha) to 798 (IET 31253) under low light stress conditions. Among the locations, mean shoot weight varied from 196 (NRRI) to 1360 (RPUR) under control conditions and 165 (NRRI) to 1241 (RPUR) under low light stress conditions. The interaction was significant ($p<0.01$) for location into treatment and location into varieties which indicates that the impact of low light stress varied among the locations and the shoot weight of the varieties varied among the locations.

The effect of low light stress on panicle weight/m^2 was significant ($p<0.01$) for both treatment and varieties (Table No. 6.6.8). The panicle weight/m^2 decreased from control conditions to low light stress conditions. The mean panicle weight/m^2 varied from 570 (IR 8) to 1013 (IET 31250) under control conditions and 399 (Swarna Prabha) to 668 (IET 30367) under low light stress conditions. Among the locations, mean panicle weight/m^2 varied from 554 (NRRI) to 1252 (IIRR) under control conditions and 358 (MTU and TTB) to 1018 (IIRR) under low light stress conditions. The interaction was significant ($p<0.01$) for location into treatment and location into varieties which implies that the effect of low light stress varied among the locations and the panicle weight/m^2 of the varieties varied among the locations.

The effect of low light stress on panicle number/m^2 was significant ($p<0.01$) for treatment and non-significant ($p<0.01$) for varieties (Table No. 6.6.9). The mean panicle number/m^2 varied from 317 (IET 31245) to 442 (IET 30409) under control conditions and 266 (IET 30367) to 361 (Swarna Prabha) under low light stress conditions. Among the locations, mean panicle number/m^2 varied from 221 (NRRI) to 919 (IIRR) under control conditions and 200 (TTB) to 527 (IIRR) under low light stress conditions. The interaction was significant ($p<0.01$) for location into treatment and location into varieties which indicates that the impact of low light stress varied among the locations and the panicle number/m^2 of the varieties varied among the locations.

The effect of low light stress on grain number per panicle was significant ($p<0.01$) for both treatment and varieties (Table No. 6.6.10). The grain number per panicle decreased from control conditions to low light stress conditions. The grain number per panicle varied from 119 (IET 31245) to 163 (IET 31244) under control conditions and 85 (IET 31237) to 134 (IET 30367) under low light stress conditions. Among the locations, grain number per panicle varied from 93 (PNR) to 192 (KJT) under control conditions and 60 (IIRR) to 161 (KJT) under low light stress conditions. The interaction was significant ($p<0.01$) for location into treatment and location into varieties which indicates that the effect of low light stress varied among the locations and the grain number per panicle of the varieties varied among the locations. The percent change in grain number per panicle over control indicates that, all the varieties noted 16 to 42% reduction in grain number per panicle under low light stress over control (Fig 6.6.1a). Only three varieties (IET 30367, Swarna Sub-1 and IET 31204) noted less than 20% reduction. Of the 18 varieties, only two varieties (IET 31244 and IET 31237) noted more reduction in grain number per panicle over control than low light stress tolerant check (Swarna Prabha) which noted around 30% reduction. Of the 8 locations, least and highest reduction in grain number per panicle over control was observed at NRRI and Titabar locations respectively (Fig 6.6.1b).

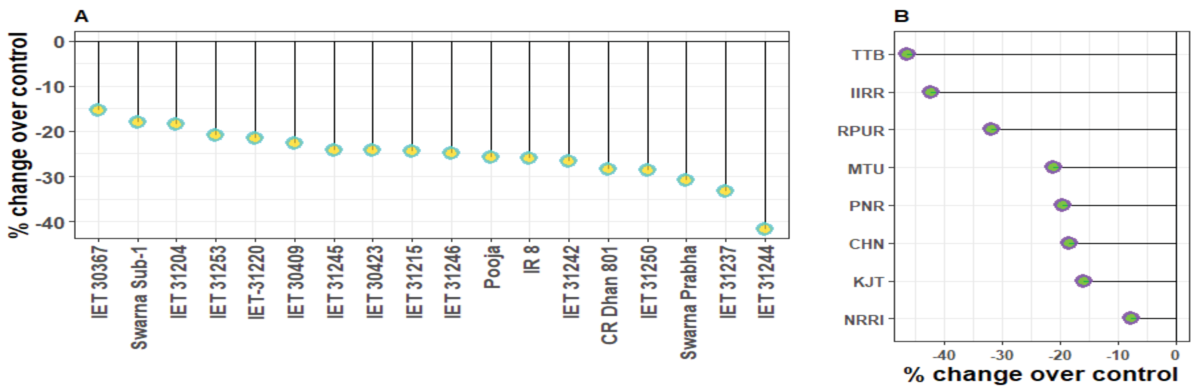


Figure 6.6.1 Influence of Low-Light Stress on grain number per panicle: a) mean of all locations b) mean of all genotypes.

The effect of low light stress on spikelet number per panicle was significant ($p<0.01$) for both treatment and varieties (Table No. 6.6.11). The spikelet number per panicle decreased from control conditions to low light stress conditions. The spikelet number per panicle varied from 139 (Swarna Prabha) to 216 (IET 31244) under control conditions and 106 (IET 31237) to 160

(IET 31204) under low light stress conditions. Among the locations, grain number per panicle varied from 127 (CHN) to 211 (KJT) under control conditions and 87 (IIRR) to 186 (NRRI) under low light stress conditions. The interaction was significant ($p<0.01$) for location into treatment and location into varieties which indicates that the effect of low light stress varied among the locations and the spikelet number per panicle of the varieties varied among the locations.

The effect of low light stress on grain number/m^2 was significant ($p<0.01$) for treatment and non-significant ($p<0.01$) for varieties (Table No. 6.6.12). The mean grain number/m^2 varied from 37451 (IET 31245) to 48279 (IET 31244) under control conditions and 23561 (Swarna Prabha) to 36724 (IET 30367) under low light stress conditions. Among the locations, mean panicle number/m^2 varied from 31094 (PNR) to 52953 (RPUR) under control conditions and 17297 (PNR) to 45553 (RPUR) under low light stress conditions. The interaction was significant ($p<0.01$) for location into treatment and location into varieties which indicates that the impact of low light stress varied among the locations and the grain number/m^2 of the varieties varied among the locations.

The effect of low light stress on spikelet number/m^2 was significant ($p<0.01$) for treatment and non-significant ($p<0.01$) for varieties (Table No. 6.6.13). The mean spikelet number/m^2 varied from 42811 (Swarna Prabha) to 60004 (IET 31244) under control conditions and 31973 (IET 31245) to 43240 (IET 30409) under low light stress conditions. Among the locations spikelet number/m^2 varied from 38789 (CHN) to 66322 (MTU) under control conditions and 24249 (TTB) to 56355 (MTU) under low light stress conditions. The interaction was significant ($p<0.01$) for location into treatment and location into varieties which indicates that the impact of low light stress varied among the locations and the spikelet number/m^2 of the varieties varied among the locations.

The effect of low light stress on grain yield (g/m^2) was significant ($p<0.01$) for treatment and non-significant ($p<0.01$) for varieties (Table No. 6.6.14). The mean grain yield (g/m^2) decreased from control conditions to low light stress conditions. The grain yield (g/m^2) varied from 536 (IR 8) to 772 (IET 31250) under control conditions and 265 (IR 8) to 412 (IET 31253) under low light stress conditions. Among the locations grain yield (g/m^2) varied from 409 (PNR) to 989 (RPUR) under control conditions and 140 (PNR) to 534 (CHN) under low light stress conditions. The interaction was significant ($p<0.01$) for location into treatment and location into varieties which indicates that the impact of low light stress varied among the locations and the grain yield (g/m^2) of the varieties varied among the locations. The percent change in grain yield (g/m^2) over control indicates that, all the varieties noted 25 to 47% reduction in grain yield (g/m^2) under low light stress over control (Fig 6.6.2a). Of the 18 varieties, nine varieties noted lesser reduction in grain yield (g/m^2) over control than low light stress tolerant check (Swarna Prabha) which noted around 42% reduction in grain yield (g/m^2). Of the 8 locations, least and highest reduction in grain yield (g/m^2) was observed at Maruteru and Pantnagar locations respectively (Fig 6.6.2b).

The effect of low light stress on total dry matter (TDM) (g/m^2) at maturity was significant ($p<0.01$) for both treatment and varieties (Table No. 6.6.15). The TDM (g/m^2) at maturity decreased from control conditions to low light stress conditions. The mean TDM (g/m^2) at maturity varied from 1394 (IR 8) to 2017 (IET 31244) under control conditions and 1011 (IR 8) to 1518 (IET 31253) under low light stress conditions. Among the locations, mean TDM (g/m^2) at maturity varied from 710 (MTU) to 3744 (RPUR) under control conditions and 571 (MTU) to 2896 (RPUR) under low light stress conditions. The interaction was significant ($p<0.01$) for location into treatment and location into varieties which indicates that the effect of low light stress varied among the locations and the TDM (g/m^2) at maturity of the varieties varied among the locations. The percent change in TDM (g/m^2) at maturity over control indicates that, all the varieties noted 14 to 33% reduction in TDM (g/m^2) at maturity under low light stress over control (Fig 6.6.3a). Only two varieties (IET 30409 and IET 31253) noted lesser reduction. Of the 18 varieties, IET 31204 alone noted more reduction in TDM (g/m^2) at maturity over control than low light stress tolerant check (Swarna Prabha) which noted around 33% reduction in TDM (g/m^2) at maturity over control. Of the 8 locations, three locations (Maruteru, Karjat and Titabar) noted least reduction TDM (g/m^2) at maturity while Pantnagar location noted highest reduction TDM (g/m^2) at maturity over control (Fig 6.6.3b).

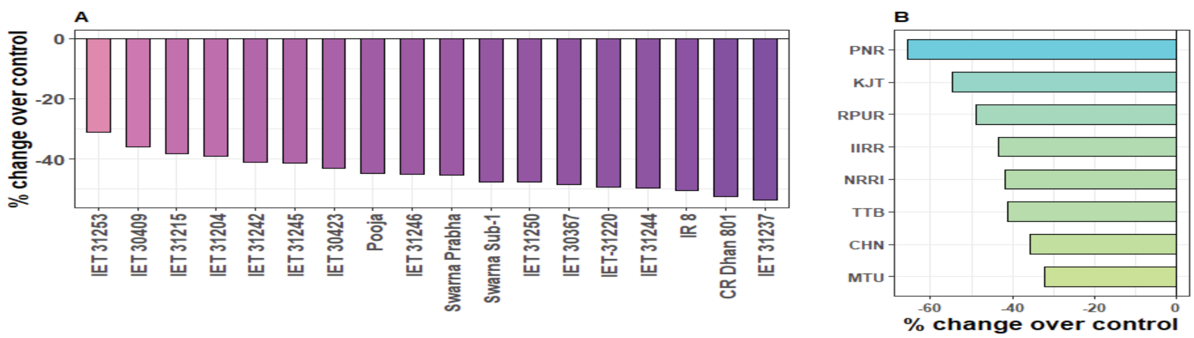


Figure 6.6.2 Influence of Low-Light Stress on grain yield (g/m2): a) mean of all locations b) mean of all genotypes.

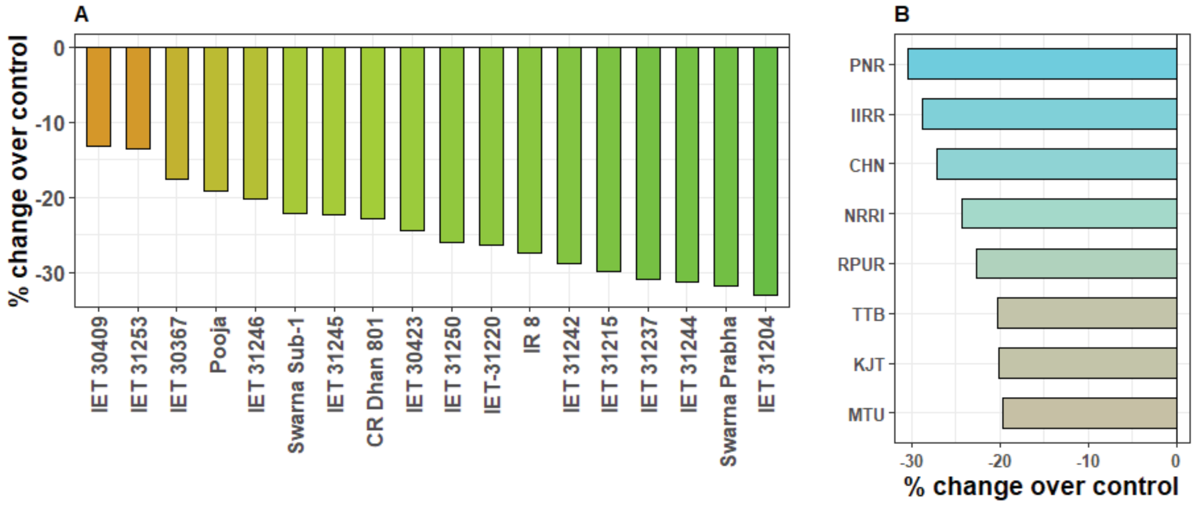


Figure 6.6.3 Influence of Low-Light Stress on total dry matter (g/m2) at maturity: a) mean of all locations b) mean of all genotypes.

The effect of low light stress on thousand grain weight was significant ($p<0.01$) for both treatment and varieties (Table No. 6.6.16). The thousand grain weight decreased from control conditions to low light stress conditions. The mean thousand grain weight varied from 16.8 (Pooja) to 28.7 (IET 31237) under control conditions and 16.4 (IR 8) to 25 (IET 31237) under low light stress conditions. Among the locations, mean thousand grain weight varied from 20.4 (IIRR) to 22.9 (TTB) under control conditions and 15.3 (PNR) to 23.1 (TTB) under low light stress conditions. The interaction was significant ($p<0.01$) for location into treatment and location into varieties which indicates that the effect of low light stress varied among the locations and the thousand grain weight of the varieties varied among the locations. The percent change in thousand grain weight over control indicates that, all the varieties noted 2 to 17% reduction in thousand grain weight under low light stress over control (Fig 6.6.4a). Of the 18 varieties, seventeen varieties noted lesser reduction in thousand grain weight over control than low light stress tolerant check (Swarna Prabha) which noted around 17% reduction in thousand grain weight over control. Of the 8 locations, Titabar location noted marginal increment in thousand grain weight over control. In the remaining 7 locations, least and highest reduction in thousand grain weight over control were noted at Karjat and Pantnagar respectively (Fig 6.6.4b).

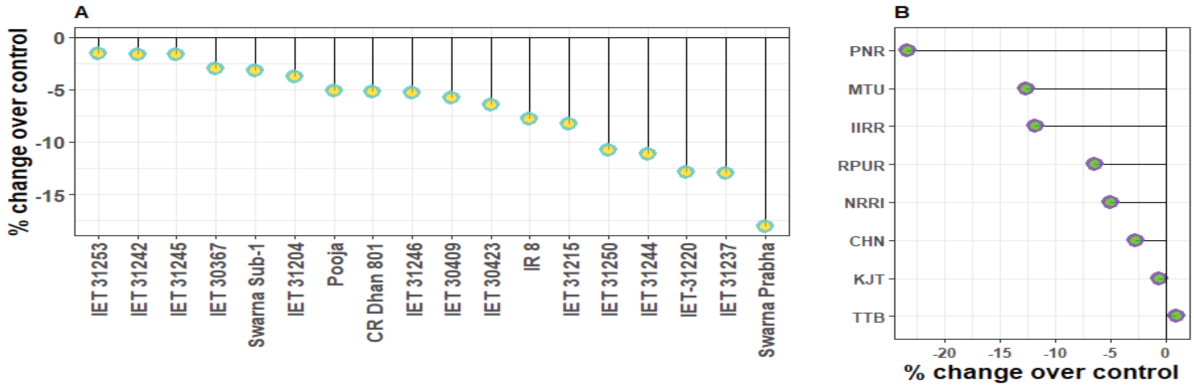


Figure 6.6.4 Influence of Low-Light Stress on 1000 grain weight (g): a) mean of all locations b) mean of all genotypes.

The effect of low light stress on Harvest Index (HI%) was significant ($p<0.01$) for both treatment and varieties (Table No. 6.6.17). The HI% decreased from control conditions to low light stress conditions. The mean HI% varied from 29 (IET 31245) to 41.4 (IET 30367) under control conditions and 24.3 (Pooja) to 34.6 (IET 31242) under low light stress conditions. Among the locations, HI% varied from 20.9 (PNR) to 53 (CHN) under control conditions and 10.6 (PNR) to 46.6 (CHN) under low light stress conditions. The interaction was significant ($p<0.01$) for location into treatment and location into varieties which indicates that the effect of low light stress varied among the locations and the HI% of the varieties varied among the locations. The percent change in HI% over control indicates that, all the varieties noted 10 to 31% reduction in HI% under low light stress over control (Fig 6.6.5a). Of the 18 varieties, six varieties noted either similar or lesser reduction in HI% over control than low light stress tolerant check (Swarna Prabha) which noted around 17% reduction in HI% over control. Of the 8 locations, two locations (Maruteru and Karjat) noted least reduction in HI% while Pantnagar location noted highest reduction in HI% over control (Fig 6.6.5b).

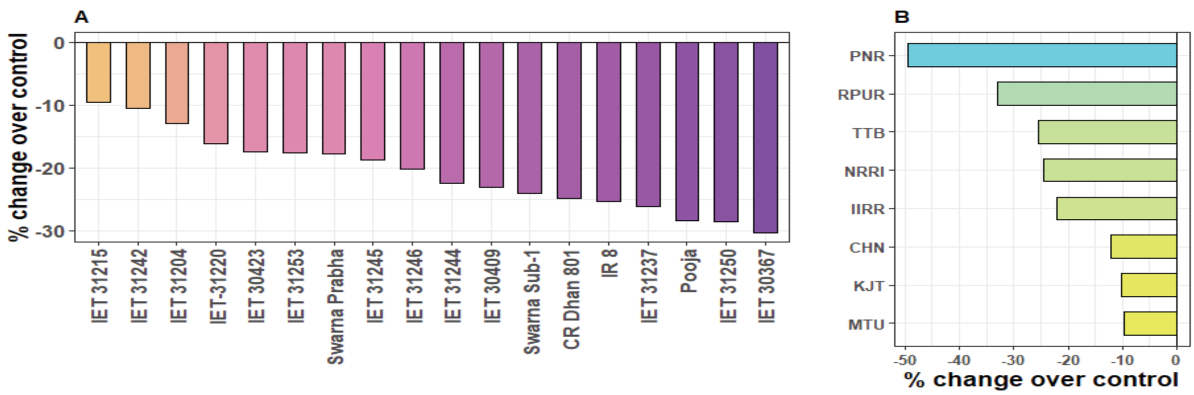


Figure 6.6.5 Influence of Low-Light Stress on harvest index (%): a) mean of all locations b) mean of all genotypes.

Low light stress has no significant effect on starch (%), however, significant variation was noticed among the genotypes and interaction between treatment and genotypes also found to be significant (Table 6.6.18). In control, mean starch (%) ranged from 53.3% (LL-617) to 62.3% (LL-616) with overall mean of 58.6% while in treatment it ranged from 41.8% (LL-605) to 76.4% (LL-610) with overall mean of 61.0%. Among the genotypes, LL-605 (22.7%) exhibited maximum reduction in starch (%) under low light stress over the control while LL-610 (24.3%) followed by LL-613 (18.3%) showed enhancement in starch (%).

Chlorophyll Fluorescence

Efficient functioning of the photosystems under changing climate conditions such as low light stress can be monitored by measuring chlorophyll fluorescence. Hence, chlorophyll fluorescence traits were also recorded under low light stress trial at IIRR. Low light stress significantly affected maximum quantum yield of PSII (Table 6.6.19A). Significant variation noticed among the genotypes and treatment x genotype interaction found significant for all the chlorophyll fluorescence traits (actual quantum yield of PSII (ΦPSII), electron transport rate (ETR), maximum quantum yield of PSII (Fv/Fm), coefficient of photochemical quenching (qP) and coefficient of non-photochemical quenching (qN) (Table 6.6.19B). LL-617, LL-603, LL-604, LL-615 and LL-601 exhibited enhancement in ΦPSII, ETR, Fv/Fm and qP while LL-603, LL-614, LL-608, LL-610, LL-607, LL-616 and LL-613 exhibited maximum reduction in qN under heat stress over control. Therefore, the above genotypes can be a good source of donors to breed for varieties with efficiently functioning photosystems under high temperature conditions.

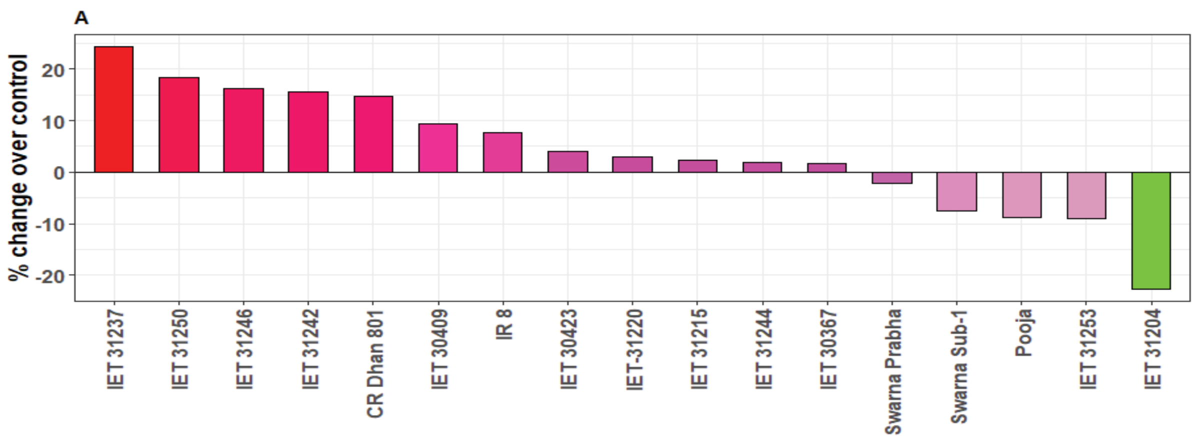


Fig 6.3…. Percentage change in starch (%) under low light stress with respect to control at IIRR during Kharif 2023.

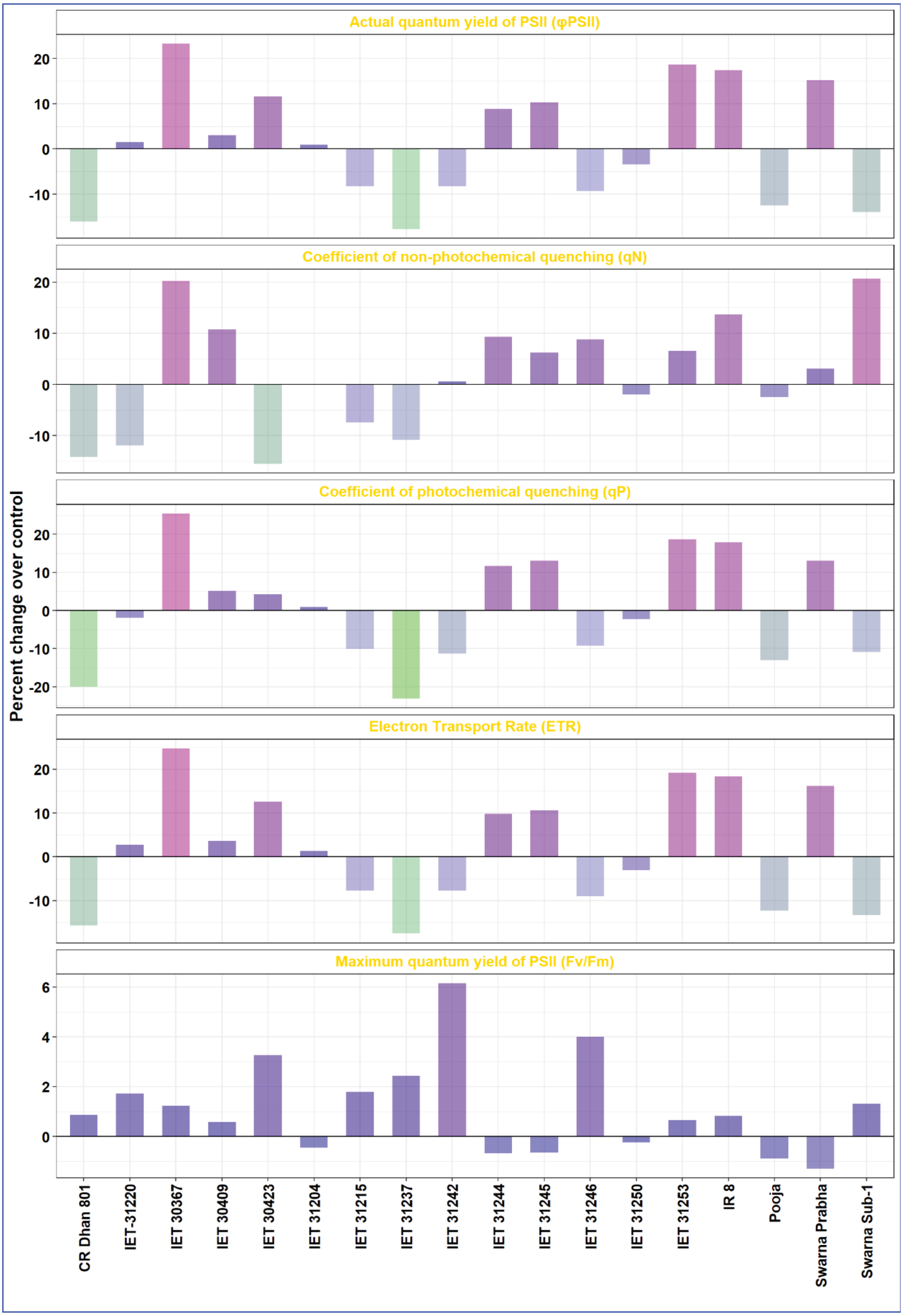


Fig 6.6…. Percentage change in chlorophyll fluorescence traits under low light stress with respect to control at IIRR during Kharif 2023.

Summary and conclusions

Reduced rice yield was observed during the kharif (wet) season in eastern and north eastern regions of India due to cloudy days with low or sub-optimal light. Hence, in the 51st ARGM, this trial was constituted to screen AVT-2 material to identify donors having low light stress tolerance. Low light was imposed immediately after transplantation by enclosing the plants in shade net having 50% transmittance supported by metal rods/bamboo poles. Among the recorded traits, total dry matter (TDM), shoot weight, panicle weight, panicle number, spikelet number per panicle, grain number per panicle, grain yield, total dry matter (TDM), thousand grain weight and Harvest Index (HI%) were significant ($p<0.01$) for both treatment and varieties.Variation in days to 50% flowering (DFF) and plant height (PH) were not significant for treatment. Total chlorophyll content at panicle initiation as well as flowering stages, days to maturity, were non-significant for lowlight treatment as well as varieties.

Compared with control conditions, 25 to 47% reduction in grain yield (g/m^2) was observed under low light stress. Of the 18 varieties tested, nine varieties that noted lesser reduction in grain yield over control than low light stress tolerant check (Swarna Prabha) were considered promising. Further, of the 8 locations, least reduction in grain yield was observed at Maruteru and highest reduction in grain yield was observed at Pantnagar.

Table 6.6.1 Influence of Low-Light Stress on Days to flowering in different rice varieties during Kharif 2023 at different centers

S.No.	Genotypes	Control								Grand Mean	Low light stress								Grand Mean
		CHN	IIRR	KJT	MTU	NRRI	PNR	RPUR	TTB		CHN	IIRR	KJT	MTU	NRRI	PNR	RPUR	TTB	
1	IET 30367	124	117	112	110	112	125	87	91	**110**	129	116	113	112	112	127	92	92	**112**
2	IET 31244	115	119	111	103	104	117	88	89	**106**	121	116	112	105	106	111	93	96	**108**
3	IET 30423	129	126	106	105	121	137	88	90	**113**	133	126	113	109	121	140	94	98	**117**
4	IR 8	106	103	84	86	94	96	69	86	**91**	110	102	84	89	96	101	73	95	**94**
5	IET 31204	108	104	87	93	96	105	75	70	**92**	113	102	86	95	94	109	80	82	**95**
6	IET 31245	135	126	107	109	121	0	99	87	**98**	139	126	108	111	126	0	106	89	**101**
7	IET 31215	112	116	104	109	106	122	87	88	**105**	118	116	104	109	108	124	93	94	**108**
8	IET-31220	122	116	102	103	108	121	79	88	**105**	126	116	102	108	108	121	84	94	**108**
9	Swarna Prabha	94	96	84	83	82	80	63	86	**84**	99	126	84	86	82	93	67	95	**92**
10	IET 31237	98	105	86	91	96	109	76	103	**96**	101	104	86	95	99	100	81	104	**96**
11	IET 31242	106	103	109	101	104	121	77	102	**103**	107	112	112	103	104	111	83	108	**105**
12	IET 31246	117	103	90	104	104	113	84	103	**102**	122	112	95	105	104	115	84	109	**106**
13	IET 31250	124	103	108	110	108	118	75	76	**103**	128	112	112	110	112	125	80	93	**109**
14	CR Dhan 801	118	103	95	93	101	109	77	77	**97**	122	112	94	95	101	108	81	85	**100**
15	IET 31253	122	126	113	109	112	132	86	91	**111**	126	126	113	110	112	132	92	94	**113**
16	Pooja	122	120	113	100	116	135	89	103	**112**	128	126	113	102	116	0	95	105	**98**
17	IET 30409	128	116	108	106	112	127	78	75	**106**	133	114	109	111	112	137	84	91	**111**
18	Swarna Sub-1	119	102	107	104	104	111	79	102	**103**	123	112	107	104	104	113	84	100	**106**
	Mean	**117**	**111**	**102**	**101**	**106**	**110**	**81**	**89**	**102**	**121**	**115**	**103**	**103**	**107**	**104**	**86**	**96**	**104**
		LSD (Treat)				ns					*LSD (Treat x Variety)*					ns			
		LSD (Location x Treat)				0.89**					*LSD (Location x Treat x Variety)*					4.56**			
		LSD (Variety)				1.14**					*CV (%) Treat*					1.52			
		LSD (Location x Variety)				3.23**					*CV (%) Residual*					2.09			

Table 6.6.2 Influence of Low-Light Stress on Days to maturity in different rice varieties during *Kharif* 2023 at different centers

S.No.	Genotypes	Control								Grand Mean	Low light stress								Grand Mean
		CHN	IIRR	KJT	MTU	NRRI	PNR	RPUR	TTB		CHN	IIRR	KJT	MTU	NRRI	PNR	RPUR	TTB	
1	IET 30367	150	149	140	141	150	159	123	119	**141**	154	147	143	144	150	160	129	126	**144**
2	IET 31244	140	151	138	132	150	147	132	117	**138**	145	147	140	137	150	145	138	132	**142**
3	IET 30423	155	157	136	136	150	165	133	118	**144**	158	156	142	145	152	162	139	134	**149**
4	IR 8	130	135	116	118	150	130	101	115	**124**	133	136	113	123	150	131	105	150	**130**
5	IET 31204	130	134	114	124	150	135	104	99	**124**	138	136	114	126	150	139	109	126	**130**
6	IET 31245	160	154	137	141	158	0	138	115	**125**	154	156	135	143	165	0	145	124	**128**
7	IET 31215	138	150	136	139	150	155	129	116	**139**	142	145	134	143	150	160	135	129	**142**
8	IET-31220	147	147	132	135	150	155	115	118	**137**	151	147	134	141	150	157	120	129	**141**
9	Swarna Prabha	119	130	112	114	112	117	99	115	**115**	121	157	114	118	112	127	105	130	**123**
10	IET 31237	121	136	116	121	150	145	102	132	**128**	125	127	114	125	150	135	108	138	**128**
11	IET 31242	131	135	139	131	150	155	117	131	**136**	132	142	142	134	150	145	123	141	**139**
12	IET 31246	141	135	118	135	150	148	119	131	**135**	150	142	124	137	150	150	125	144	**140**
13	IET 31250	151	137	135	142	150	154	103	105	**135**	120	144	140	143	150	160	109	128	**137**
14	CR Dhan 801	142	135	125	125	150	139	120	106	**130**	145	142	121	126	150	141	125	119	**134**
15	IET 31253	149	153	145	140	150	160	128	120	**143**	152	156	143	142	150	161	135	129	**146**
16	Pooja	147	150	143	131	150	160	130	132	**143**	152	156	145	134	152	0	136	139	**127**
17	IET 30409	151	147	136	134	150	160	113	106	**137**	158	146	136	141	152	164	118	129	**143**
18	Swarna Sub-1	142	135	137	133	150	148	107	130	**135**	146	144	137	134	150	150	113	138	**139**
	Mean	**141**	**143**	**131**	**132**	**148**	**141**	**117**	**118**	**134**	**143**	**146**	**132**	**135**	**149**	**133**	**123**	**133**	**137**
		LSD (Treat)				ns					*LSD (Treat x Variety)*					ns			
		LSD (Location x Treat)				2.36**					*LSD (Location x Treat x Variety)*					10.04**			
		LSD (Variety)				ns					*CV (%) Treat*					3.11			
		LSD (Location x Variety)				7.10**					*CV (%) Residual*					3.52			

Table 6.6.3 Influence of Low-Light Stress on Plant height (cm) in different rice varieties during *Kharif* 2023 at different centers

S.No.	Genotypes	Control								Grand Mean	Low light stress								Grand Mean
		CHN	IIRR	KJT	MTU	NRRI	PNR	RPUR	TTB		CHN	IIRR	KJT	MTU	NRRI	PNR	RPUR	TTB	
1	IET 30367	113	110	103	115	106	103	112	109	**109**	124	100	109	112	113	112	119	108	**112**
2	IET 31244	112	121	118	133	110	112	130	114	**119**	119	111	122	129	118	117	144	116	**122**
3	IET 30423	115	129	120	151	132	111	146	124	**128**	124	120	124	147	132	138	162	133	**135**
4	IR 8	74	88	105	128	101	115	96	99	**101**	84	89	96	125	99	128	101	99	**102**
5	IET 31204	97	115	136	150	127	117	128	121	**124**	101	119	133	147	132	137	134	122	**128**
6	IET 31245	92	104	99	126	100	111	112	91	**104**	101	100	105	122	113	114	121	100	**110**
7	IET 31215	92	105	102	128	111	102	110	96	**106**	102	102	108	123	108	95	114	99	**106**
8	IET-31220	88	103	109	123	119	104	117	104	**108**	102	102	115	121	111	112	135	114	**114**
9	Swarna Prabha	72	133	124	186	124	125	157	134	**132**	78	143	139	183	145	131	162	135	**139**
10	IET 31237	82	110	129	135	126	114	131	123	**119**	86	102	119	131	131	132	146	112	**120**
11	IET 31242	82	100	116	123	109	95	109	120	**107**	88	100	121	120	116	104	135	113	**112**
12	IET 31246	79	90	98	122	108	93	109	116	**102**	89	93	101	118	104	107	152	111	**109**
13	IET 31250	94	105	134	149	111	113	134	121	**120**	99	118	113	145	129	114	149	127	**124**
14	CR Dhan 801	82	99	107	122	100	95	121	102	**103**	94	86	98	120	103	121	136	104	**108**
15	IET 31253	96	97	117	125	110	100	125	104	**109**	103	112	115	123	122	117	137	117	**118**
16	Pooja	94	110	102	134	107	103	118	97	**108**	102	94	98	132	106	110	147	117	**113**
17	IET 30409	94	113	109	132	108	111	136	99	**113**	103	121	119	130	110	120	142	113	**120**
18	Swarna Sub-1	80	87	98	115	99	95	113	95	**98**	98	81	108	112	100	105	115	99	**102**
	Mean	**91**	**107**	**113**	**133**	**112**	**107**	**122**	**109**	**112**	**100**	**105**	**113**	**130**	**116**	**117**	**136**	**113**	**116**
		LSD (Treat)				ns					*LSD (Treat x Variety)*					ns			
		LSD (Location x Treat)				2.35**					*LSD (Location x Treat x Variety)*					9.81**			
		LSD (Variety)				2.45**					*CV (%) Treat*					3.67			
		LSD (Location x Variety)				6.93**					*CV (%) Residual*					4.07			

Table 6.6.4 Influence of Low-Light Stress on Total chlorophyll content (mg/g f.w.) at panicle initiation in different rice varieties during *Kharif* 2023 at different centers

S.No.	Genotypes	Control					Grand Mean	Low light stress					Grand Mean
		CHN	KJT	NRRI	PNR	TTB		CHN	KJT	NRRI	PNR	TTB	
1	IET 30367	3.43	1.35	1.12	3.36	2.53	**2.36**	3.91	1.16	1.74	5.55	2.82	**3.04**
2	IET 31244	3.17	1.34	1.00	2.15	2.79	**2.09**	3.53	1.15	2.29	3.18	2.49	**2.53**
3	IET 30423	3.10	1.28	0.98	2.63	1.61	**1.92**	3.42	1.34	3.48	2.86	1.34	**2.49**
4	IR 8	1.92	1.42	3.51	2.49	1.77	**2.22**	2.13	1.27	2.68	3.82	0.86	**2.15**
5	IET 31204	2.25	1.39	0.96	3.15	2.51	**2.05**	2.97	1.27	2.81	4.60	1.53	**2.64**
6	IET 31245	2.80	1.39	1.26	2.50	2.39	**2.07**	3.38	1.26	2.31	2.73	1.65	**2.27**
7	IET 31215	2.56	1.30	0.93	3.79	2.64	**2.24**	2.84	1.59	1.89	4.33	2.11	**2.55**
8	IET-31220	3.10	1.29	1.08	2.55	1.29	**1.86**	3.53	1.35	1.95	4.78	0.97	**2.52**
9	Swarna Prabha	1.91	1.21	2.30	4.54	2.08	**2.41**	2.17	1.44	2.28	4.59	1.64	**2.42**
10	IET 31237	2.50	1.40	0.83	2.95	2.86	**2.11**	2.88	1.41	2.86	3.29	2.87	**2.66**
11	IET 31242	2.00	1.37	1.52	4.49	2.40	**2.35**	2.52	1.54	2.22	4.82	1.79	**2.58**
12	IET 31246	3.17	1.46	0.81	4.99	3.52	**2.79**	3.01	1.60	3.02	5.04	3.03	**3.14**
13	IET 31250	2.16	1.67	1.12	2.56	2.91	**2.08**	2.72	1.50	2.24	3.16	3.22	**2.57**
14	CR Dhan 801	2.15	1.27	1.27	5.15	1.55	**2.28**	2.37	1.58	2.31	5.49	1.90	**2.73**
15	IET 31253	2.57	1.48	0.95	2.94	2.63	**2.12**	3.08	1.44	2.24	3.42	2.52	**2.54**
16	Pooja	2.51	1.41	1.02	2.85	2.44	**2.05**	2.58	1.87	2.96	3.47	2.06	**2.59**
17	IET 30409	2.15	1.49	1.48	2.87	1.65	**1.93**	2.42	1.32	2.41	4.08	1.59	**2.36**
18	Swarna Sub-1	3.12	1.37	1.28	3.88	2.49	**2.43**	3.46	1.40	2.51	4.80	2.19	**2.87**
	Mean	**2.59**	**1.38**	**1.30**	**3.32**	**2.34**	**2.19**	**2.94**	**1.42**	**2.45**	**4.11**	**2.03**	**2.59**
		LSD (Treat)				ns		*LSD (Treat x Variety)*					ns
		LSD (Location x Treat)				0.07**		*LSD (Location x Treat x Variety)*					0.46**
		LSD (Variety)				ns		*CV (%) Treat*					4.93
		LSD (Location x Variety)				0.32**		*CV (%) Residual*					9.04

Table 6.6.5 Influence of Low-Light Stress on Total chlorophyll content (mg/g f.w.) at flowering in different rice varieties during *Kharif* 2023 at different centers

S.No.	Genotypes	Control						Grand Mean	Low light stress						Grand Mean
		CHN	KJT	MTU	NRRI	PNR	TTB		CHN	KJT	MTU	NRRI	PNR	TTB	
1	IET 30367	3.37	1.18	4.08	2.16	1.44	4.08	**2.72**	3.84	1.28	4.26	0.97	1.55	3.98	**2.65**
2	IET 31244	3.12	1.26	4.17	1.43	1.05	4.37	**2.56**	3.46	1.13	4.42	0.68	1.08	3.24	**2.33**
3	IET 30423	3.13	1.26	4.09	3.17	1.26	3.01	**2.65**	3.46	1.16	4.26	1.01	1.28	1.62	**2.13**
4	IR 8	1.82	1.33	4.85	2.42	1.38	3.18	**2.50**	2.20	1.13	4.92	1.21	1.45	1.27	**2.03**
5	IET 31204	2.15	1.25	4.56	2.06	2.94	3.87	**2.80**	2.97	1.14	4.82	0.73	3.29	2.33	**2.55**
6	IET 31245	2.83	1.31	3.67	2.29	2.74	3.54	**2.73**	3.38	1.15	3.97	0.90	2.82	2.32	**2.42**
7	IET 31215	2.51	1.29	3.85	2.02	1.99	4.19	**2.64**	2.84	1.18	3.97	0.63	2.04	3.21	**2.31**
8	IET-31220	3.13	1.34	4.22	2.78	1.34	2.43	**2.54**	3.53	1.37	4.37	3.74	2.52	1.75	**2.88**
9	Swarna Prabha	1.84	1.09	3.37	3.06	2.36	2.85	**2.43**	2.17	1.25	3.80	1.25	3.89	2.13	**2.41**
10	IET 31237	2.41	1.32	4.29	2.18	1.23	5.01	**2.74**	2.88	1.30	4.41	1.33	1.89	3.81	**2.60**
11	IET 31242	2.00	1.38	3.65	2.09	2.03	3.72	**2.48**	2.52	1.49	3.96	0.76	2.53	2.83	**2.35**
12	IET 31246	3.17	1.40	4.05	1.80	1.84	5.40	**2.94**	3.01	1.11	4.21	3.90	2.01	4.86	**3.18**
13	IET 31250	2.16	1.58	4.13	1.95	1.20	4.95	**2.66**	2.72	1.28	4.25	0.50	1.50	4.49	**2.46**
14	CR Dhan 801	2.15	1.18	3.10	2.40	1.33	1.99	**2.03**	2.37	1.43	3.43	1.07	3.22	2.32	**2.30**
15	IET 31253	2.57	1.31	4.31	2.90	2.11	3.37	**2.76**	3.08	1.27	4.73	0.92	2.56	2.93	**2.58**
16	Pooja	2.51	1.42	4.30	2.39	1.22	3.75	**2.60**	2.58	1.24	4.69	0.96	1.18	2.88	**2.25**
17	IET 30409	2.15	1.41	4.28	1.82	1.14	2.63	**2.24**	2.42	1.16	3.63	1.03	1.17	2.30	**1.95**
18	Swarna Sub-1	3.12	1.38	3.14	2.94	2.34	3.48	**2.73**	3.46	1.44	3.39	1.56	2.68	3.28	**2.63**
	Mean	**2.56**	**1.32**	**4.01**	**2.32**	**1.72**	**3.66**	**2.60**	**2.94**	**1.25**	**4.19**	**1.28**	**2.15**	**2.86**	**2.45**
		LSD (Treat)				ns			*LSD (Treat x Variety)*					ns	
		LSD (Location x Treat)				0.09**			*LSD (Location x Treat x Variety)*					0.59**	
		LSD (Variety)				ns			*CV (%) Treat*					14.72	
		LSD (Location x Variety)				0.41**			*CV (%) Residual*					11.03	

Table 6.6.6 Influence of Low-Light Stress on Total dry matter (g/m²) flowering in different rice varieties during *Kharif* 2023 at different centers

S.No.	Genotypes	Control								Grand Mean	Low light stress								Grand Mean
		CHN	IIRR	KJT	MTU	NRRI	PNR	RPUR	TTB		CHN	IIRR	KJT	MTU	NRRI	PNR	RPUR	TTB	
1	IET 30367	1775	1544	1239	458	821	1183	4004	1105	**1516**	1254	1311	1000	299	600	1201	1324	678	**958**
2	IET 31244	1728	1417	1253	426	834	507	2290	1552	**1251**	1272	986	822	327	571	468	1161	1262	**859**
3	IET 30423	1819	1951	1182	553	1291	1274	3340	859	**1534**	1036	1203	956	449	1048	1028	2448	749	**1114**
4	IR 8	977	1067	1133	550	634	829	2322	820	**1041**	741	638	1031	481	600	470	1803	717	**810**
5	IET 31204	1870	1395	1228	575	1044	1104	3347	1346	**1489**	1343	718	886	520	827	810	2790	722	**1077**
6	IET 31245	1791	1621	1099	586	882	791	2763	1054	**1323**	1171	839	1027	403	700	493	1733	819	**898**
7	IET 31215	1522	1420	1138	539	783	975	1839	1453	**1209**	1217	899	824	484	560	704	2196	595	**935**
8	IET-31220	1553	1312	1032	547	936	1277	2722	1048	**1303**	1116	1008	995	358	715	930	2065	837	**1003**
9	Swarna Prabha	865	1516	980	570	473	683	3643	981	**1214**	672	1133	875	448	461	625	2354	897	**933**
10	IET 31237	1924	1561	995	524	790	938	3351	1022	**1388**	1330	709	940	380	642	653	1832	825	**914**
11	IET 31242	1864	941	1016	570	857	1202	2802	1519	**1347**	1216	627	958	506	605	727	2036	1155	**979**
12	IET 31246	1659	950	1116	585	823	851	3056	1165	**1276**	1148	812	770	513	499	604	2384	534	**908**
13	IET 31250	1475	1029	1009	592	849	1757	2897	1239	**1356**	1215	700	968	476	1024	1471	2047	779	**1085**
14	CR Dhan 801	1531	724	985	601	655	778	3325	724	**1165**	1118	682	954	374	581	616	1710	655	**836**
15	IET 31253	1610	1167	1161	518	694	1008	2166	1300	**1203**	1062	1303	937	492	793	887	1077	1015	**946**
16	Pooja	1734	1298	1294	577	690	1444	2807	956	**1350**	1311	945	1034	566	714	889	2115	829	**1050**
17	IET 30409	1661	1519	1204	597	860	1287	3283	1125	**1442**	1255	1251	930	556	626	1289	1086	891	**985**
18	Swarna Sub-1	1859	874	1076	596	551	917	2270	1265	**1176**	1322	798	883	464	559	679	1200	698	**825**
	Mean	**1623**	**1295**	**1119**	**554**	**804**	**1045**	**2901**	**1141**	**1310**	**1155**	**920**	**933**	**450**	**674**	**808**	**1853**	**814**	**951**
		LSD (Treat)				15.45*					*LSD (Treat x Variety)*					ns			
		LSD (Location x Treat)				60.19**					*LSD (Location x Treat x Variety)*					198.01**			
		LSD (Variety)				37.62*					*CV (%) Treat*					9.47			
		LSD (Location x Variety)				140.01**					*CV (%) Residual*					8.29			

Table 6.6.7 Influence of Low-Light Stress on Shoot weight (g/m^2) maturity in different rice varieties during *Kharif* 2023 at different centers

S.No.	Genotypes	Control								Grand Mean	Low light stress								Grand Mean
		CHN	IIRR	KJT	MTU	NRRI	PNR	RPUR	TTB		CHN	IIRR	KJT	MTU	NRRI	PNR	RPUR	TTB	
1	IET 30367	915	450	1143	587	127	830	1051	806	**739**	671	390	875	382	178	896	1250	496	**642**
2	IET 31244	927	283	1121	547	139	1541	1690	800	**881**	645	460	991	415	152	1708	1107	522	**750**
3	IET 30423	923	303	1280	700	361	1115	1617	864	**895**	666	323	909	579	247	608	1444	636	**677**
4	IR 8	781	427	1172	707	121	874	810	772	**708**	532	457	1065	618	98	1045	567	428	**601**
5	IET 31204	984	317	1125	722	201	1857	1221	813	**905**	684	413	956	663	183	1003	893	652	**681**
6	IET 31245	918	407	1175	743	220	1264	1065	623	**802**	684	443	1124	506	175	748	1622	481	**723**
7	IET 31215	974	320	1236	692	206	1394	790	728	**793**	643	400	964	614	140	1042	1467	552	**728**
8	IET-31220	960	443	936	720	219	1072	1840	649	**855**	745	423	1055	466	176	427	1346	526	**646**
9	Swarna Prabha	731	403	1048	733	190	1664	1182	564	**814**	413	500	876	572	128	786	1025	470	**596**
10	IET 31237	713	360	972	671	215	1210	1017	771	**741**	477	420	834	478	155	703	1085	686	**605**
11	IET 31242	664	323	1179	729	200	884	1517	708	**776**	429	410	909	632	177	761	1019	499	**604**
12	IET 31246	638	380	956	745	193	1002	1435	753	**763**	411	377	780	655	139	1186	1050	463	**632**
13	IET 31250	592	437	952	765	230	1359	1914	657	**863**	416	497	811	599	221	844	1456	551	**674**
14	CR Dhan 801	925	443	1001	779	145	747	992	614	**706**	672	347	1101	470	103	721	1418	627	**682**
15	IET 31253	876	380	1024	662	219	1083	1350	591	**773**	615	377	918	633	193	1254	1589	808	**798**
16	Pooja	894	430	1062	748	171	991	2226	783	**913**	607	403	996	730	174	724	1018	630	**660**
17	IET 30409	881	433	1144	767	201	697	1281	590	**749**	596	293	915	672	218	925	1708	706	**754**
18	Swarna Sub-1	872	383	1001	768	170	1009	1489	725	**802**	582	450	946	597	114	1211	1276	639	**727**
	Mean	**843**	**385**	**1085**	**710**	**196**	**1144**	**1360**	**712**	**804**	**583**	**410**	**946**	**571**	**165**	**922**	**1241**	**576**	**677**
		LSD (Treat)				31.73**					*LSD (Treat x Variety)*					ns			
		LSD (Location x Treat)				89.75**					*LSD (Location x Treat x Variety)*					207.88**			
		LSD (Variety)				ns					*CV (%) Treat*					21.56			
		LSD (Location x Variety)				146.99**					*CV (%) Residual*					13.31			

Table 6.6.8 Influence of Low-Light Stress on Panicle weight (g/m^2) in different rice varieties during *Kharif* 2023 at different centers

S.No.	Genotypes	Control								Grand Mean	Low light stress								Grand Mean
		CHN	IIRR	KJT	MTU	NRRI	PNR	RPUR	TTB		CHN	IIRR	KJT	MTU	NRRI	PNR	RPUR	TTB	
1	IET 30367	927	1320	776	558	644	732	1139	711	**851**	594	1304	867	297	336	642	877	428	**668**
2	IET 31244	1039	1503	839	701	751	1053	1027	644	**945**	727	1361	714	337	253	545	560	442	**617**
3	IET 30423	1082	1675	740	796	802	175	1260	631	**895**	792	1498	571	487	441	192	733	390	**638**
4	IR 8	314	810	509	590	406	509	757	662	**570**	164	636	589	459	201	611	578	239	**435**
5	IET 31204	890	1214	776	585	599	1225	893	688	**859**	548	916	700	485	434	726	615	355	**597**
6	IET 31245	734	1598	652	488	450	0	709	476	**638**	505	1281	735	321	392	0	368	317	**490**
7	IET 31215	786	1500	708	456	565	1075	1035	714	**855**	493	907	619	233	346	424	607	517	**518**
8	IET-31220	1040	1485	703	606	568	774	928	576	**835**	697	1090	509	333	338	464	816	322	**571**
9	Swarna Prabha	364	1126	530	268	433	1143	806	469	**642**	179	1166	417	162	301	264	480	225	**399**
10	IET 31237	1297	1235	552	605	424	761	1003	613	**811**	844	776	483	389	312	207	584	360	**494**
11	IET 31242	904	1027	659	417	494	782	1245	673	**775**	564	831	883	241	375	188	677	350	**514**
12	IET 31246	1171	1043	522	339	552	870	1500	685	**835**	760	658	592	236	331	537	569	377	**507**
13	IET 31250	1170	1318	547	797	596	1467	1529	677	**1013**	782	1294	784	445	554	324	655	299	**642**
14	CR Dhan 801	767	970	659	725	421	571	1103	517	**716**	488	694	654	405	258	449	740	377	**508**
15	IET 31253	757	1546	710	452	564	586	1173	524	**789**	570	1137	546	405	501	247	821	402	**579**
16	Pooja	648	996	701	551	457	206	1640	599	**725**	439	912	487	429	392	0	877	306	**480**
17	IET 30409	932	1347	479	985	601	576	1534	551	**876**	579	1102	621	667	574	518	744	344	**644**
18	Swarna Sub-1	826	818	783	277	646	820	1006	536	**714**	551	757	541	114	378	676	612	391	**502**
	Mean	**869**	**1252**	**658**	**567**	**554**	**740**	**1127**	**608**	**797**	**571**	**1018**	**628**	**358**	**373**	**390**	**662**	**358**	**545**
		LSD (Treat)				25.02**					*LSD (Treat x Variety)*					ns			
		LSD (Location x Treat)				71.28**					*LSD (Location x Treat x Variety)*					201.82**			
		LSD (Variety)				50.46**					*CV (%) Treat*					18.91			
		LSD (Location x Variety)				142.71**					*CV (%) Residual*					14.26			

Table 6.6.9 Influence of Low-Light Stress on Panicle number/m² in different rice varieties during *Kharif* 2023 at different centers

S.No.	Genotypes	Control								Grand Mean	Low light stress								Grand Mean
		CHN	IIRR	KJT	MTU	NRRI	PNR	RPUR	TTB		CHN	IIRR	KJT	MTU	NRRI	PNR	RPUR	TTB	
1	IET 30367	314	963	270	407	196	400	456	233	**405**	250	307	210	330	183	283	374	192	**266**
2	IET 31244	322	1141	278	418	180	383	386	192	**413**	261	529	208	341	140	217	292	192	**272**
3	IET 30423	309	1128	254	429	210	167	335	208	**380**	263	612	206	396	128	133	351	200	**286**
4	IR 8	241	864	273	451	200	350	385	292	**382**	200	448	202	429	180	367	401	175	**300**
5	IET 31204	308	912	247	440	195	450	411	208	**396**	247	669	210	429	148	267	357	200	**316**
6	IET 31245	305	646	230	407	218	0	443	283	**317**	246	388	173	374	145	0	426	208	**245**
7	IET 31215	308	967	255	440	200	383	490	275	**415**	243	577	182	374	173	267	385	192	**299**
8	IET-31220	334	1042	231	451	183	283	478	208	**401**	273	676	209	396	167	167	443	158	**311**
9	Swarna Prabha	275	1025	274	429	223	650	346	208	**429**	195	1144	185	396	173	267	331	200	**361**
10	IET 31237	312	979	263	407	190	333	493	275	**407**	242	476	213	385	226	117	407	258	**291**
11	IET 31242	307	713	242	429	208	250	411	250	**351**	218	593	182	385	183	133	382	192	**284**
12	IET 31246	372	830	258	396	211	300	514	283	**396**	304	494	238	385	191	367	382	192	**319**
13	IET 31250	290	1078	282	429	241	300	399	225	**406**	237	664	209	385	185	183	393	175	**304**
14	CR Dhan 801	272	891	240	440	251	250	583	292	**402**	217	271	184	396	201	200	499	192	**270**
15	IET 31253	300	867	252	429	243	200	482	308	**385**	265	563	231	418	206	183	392	225	**310**
16	Pooja	278	706	284	451	258	300	608	308	**399**	252	245	253	418	256	0	463	208	**262**
17	IET 30409	302	983	254	440	265	300	726	267	**442**	229	435	257	396	240	183	490	208	**305**
18	Swarna Sub-1	306	799	256	418	301	433	525	275	**414**	241	398	194	341	226	325	451	233	**301**
	Mean	**303**	**919**	**258**	**428**	**221**	**319**	**471**	**255**	**397**	**244**	**527**	**208**	**387**	**186**	**203**	**401**	**200**	**295**
		LSD (Treat)				7.90*					*LSD (Treat x Variety)*					ns			
		LSD (Location x Treat)				30.78**					*LSD (Location x Treat x Variety)*					102.84**			
		LSD (Variety)				ns					*CV (%) Treat*					15.85			
		LSD (Location x Variety)				72.72**					*CV (%) Residual*					14.09			

Table 6.6.10 Influence of Low-Light Stress on Grain number/panicle in different rice varieties during Kharif 2023 at different centers

S.No.	Genotypes	Control								Grand Mean	Low light stress								Grand Mean
		CHN	IIRR	KJT	MTU	NRRI	PNR	RPUR	TTB		CHN	IIRR	KJT	MTU	NRRI	PNR	RPUR	TTB	
1	IET 30367	132	97	213	152	162	112	176	221	**158**	109	50	175	112	184	179	173	87	**134**
2	IET 31244	141	155	168	141	184	111	199	207	**163**	121	56	149	109	111	87	72	58	**95**
3	IET 30423	130	128	191	159	168	38	186	187	**148**	110	72	156	118	228	0	108	106	**112**
4	IR 8	68	98	197	170	166	77	165	150	**136**	47	53	147	148	181	6	148	79	**101**
5	IET 31204	121	119	182	140	215	104	158	178	**152**	93	73	139	129	208	110	121	119	**124**
6	IET 31245	116	73	179	127	153	0	135	170	**119**	94	39	164	105	115	0	108	97	**90**
7	IET 31215	128	127	191	115	184	121	154	170	**149**	104	60	172	81	119	106	137	120	**112**
8	IET-31220	138	107	198	137	198	112	141	176	**151**	120	74	164	98	156	113	125	95	**118**
9	Swarna Prabha	60	97	212	80	95	90	204	151	**124**	42	89	181	67	109	81	88	27	**86**
10	IET 31237	132	81	177	151	121	67	118	176	**128**	108	36	152	117	84	44	79	62	**85**
11	IET 31242	138	90	177	118	175	74	203	181	**145**	120	63	164	85	142	40	142	91	**106**
12	IET 31246	139	91	196	129	181	100	171	118	**141**	113	59	167	110	131	63	90	109	**105**
13	IET 31250	130	89	187	167	136	120	238	201	**158**	110	56	174	118	181	113	87	66	**113**
14	CR Dhan 801	118	90	177	204	137	171	170	172	**155**	92	39	146	146	110	92	153	108	**111**
15	IET 31253	121	138	184	141	171	170	197	166	**161**	97	88	163	133	202	65	113	157	**127**
16	Pooja	113	81	205	151	127	0	181	188	**131**	81	40	158	133	121	0	131	111	**97**
17	IET 30409	125	109	209	220	154	104	160	176	**157**	104	81	151	180	117	148	117	71	**121**
18	Swarna Sub-1	127	97	203	86	145	95	128	163	**131**	109	47	172	52	152	91	109	124	**107**
	Mean	**121**	**104**	**192**	**144**	**159**	**93**	**171**	**175**	**145**	**99**	**60**	**161**	**114**	**147**	**74**	**117**	**94**	**108**
		LSD (Treat)				5.86**					*LSD (Treat x Variety)*					ns			
		LSD (Location x Treat)				16.59**					*LSD (Location x Treat x Variety)*					40.18**			
		LSD (Variety)				10.04**					*CV (%) Treat*					23.35			
		LSD (Location x Variety)				28.41**					*CV (%) Residual*					15.06			

Table 6.6.11 Influence of Low-Light Stress on Spikelet number/panicle in different rice varieties during Kharif 2023 at different centers

S.No.	Genotypes	Control								Grand Mean	Low light stress								Grand Mean
		CHN	IIRR	KJT	MTU	NRRI	PNR	RPUR	TTB		CHN	IIRR	KJT	MTU	NRRI	PNR	RPUR	TTB	
1	IET 30367	140	151	232	164	192	128	190	254	**181**	119	68	196	156	233	202	165	109	**156**
2	IET 31244	147	276	187	153	249	242	235	237	**216**	126	107	174	141	219	255	149	96	**158**
3	IET 30423	135	181	210	165	204	211	202	215	**190**	116	93	171	155	271	148	129	145	**154**
4	IR 8	72	145	221	183	199	122	175	174	**161**	51	75	165	173	222	170	161	107	**140**
5	IET 31204	126	180	201	152	236	237	172	205	**189**	101	97	152	147	242	260	141	139	**160**
6	IET 31245	120	107	203	140	194	0	152	195	**139**	103	79	173	130	193	0	137	142	**120**
7	IET 31215	134	187	205	128	210	146	172	197	**172**	113	76	192	125	138	199	151	136	**141**
8	IET-31220	148	128	217	148	214	143	154	205	**170**	128	95	177	129	168	142	149	131	**140**
9	Swarna Prabha	63	118	214	87	116	116	222	173	**139**	46	125	191	82	148	130	106	118	**118**
10	IET 31237	139	110	194	161	146	81	131	202	**145**	116	47	168	148	117	88	92	67	**106**
11	IET 31242	147	157	199	127	205	122	217	208	**173**	129	98	190	119	175	123	159	102	**137**
12	IET 31246	143	142	208	140	204	145	187	136	**163**	119	101	193	133	159	109	114	119	**131**
13	IET 31250	135	113	206	179	155	160	257	231	**179**	114	78	196	164	206	204	103	78	**143**
14	CR Dhan 801	123	123	200	214	152	226	179	200	**177**	102	68	165	209	149	253	152	126	**153**
15	IET 31253	126	176	203	152	186	198	212	193	**181**	107	108	188	149	219	146	136	180	**154**
16	Pooja	116	123	234	162	149	94	194	216	**161**	87	57	178	152	155	0	136	147	**114**
17	IET 30409	129	148	246	231	211	139	175	203	**185**	110	106	163	224	158	204	130	94	**149**
18	Swarna Sub-1	135	149	226	94	162	109	136	188	**150**	114	85	189	70	175	136	111	152	**129**
	Mean	**127**	**151**	**211**	**154**	**188**	**145**	**187**	**202**	**171**	**106**	**87**	**179**	**145**	**186**	**154**	**134**	**121**	**139**
		LSD (Treat)				4.24*					*LSD (Treat x Variety)*					ns			
		LSD (Location x Treat)				16.51**					*LSD (Location x Treat x Variety)*					44.07**			
		LSD (Variety)				11.02**					*CV (%) Treat*					18.98			
		LSD (Location x Variety)				31.16**					*CV (%) Residual*					13.49			

Table 6.6.12 Influence of Low-Light Stress on Grain number/m² in different rice varieties during Kharif 2023 at different centers

S.No.	Genotypes	Control								Grand Mean	Low light stress								Grand Mean
		CHN	IIRR	KJT	MTU	NRRI	PNR	RPUR	TTB		CHN	IIRR	KJT	MTU	NRRI	PNR	RPUR	TTB	
1	IET 30367	41598	43726	57320	61787	31638	44517	49308	51877	**47721**	27237	19395	36266	36960	40356	50883	65922	16775	**36724**
2	IET 31244	45304	43682	46780	58795	33108	42350	76491	39725	**48279**	31625	25395	31012	37059	15270	18733	22588	11833	**24189**
3	IET 30423	40275	38364	48971	68343	35414	6317	62627	39071	**42423**	29062	23105	32205	46794	29327	0	38061	21842	**27549**
4	IR 8	16307	42086	53968	76868	32490	26800	63680	43627	**44478**	9330	23805	29993	63701	32252	2333	58778	13325	**29190**
5	IET 31204	37150	37589	44760	61490	41760	46900	66098	37009	**46594**	23085	30180	29176	55484	31067	29333	42767	23892	**33123**
6	IET 31245	35281	29840	41262	51821	33199	0	60042	48167	**37451**	23155	17944	28465	39369	16948	0	46066	20350	**24037**
7	IET 31215	39417	40548	49229	50754	36659	46533	46550	46614	**44538**	25344	24276	31452	30283	20715	28117	52058	22783	**29378**
8	IET-31220	46146	46940	45745	61622	36257	31517	68858	36525	**46701**	32761	31540	34260	38940	26277	19100	55471	14908	**31657**
9	Swarna Prabha	16490	38995	58483	34463	21135	58917	39906	31401	**37474**	8139	44674	33491	26796	19050	21683	29024	5633	**23561**
10	IET 31237	41035	28405	46532	61501	23165	22350	56389	48127	**40938**	26102	15309	33069	44935	18123	5067	32177	16100	**23860**
11	IET 31242	42302	29157	43022	50743	36005	18517	45314	44852	**38739**	26218	25845	29859	33088	26089	5217	54214	17300	**27229**
12	IET 31246	51864	34370	50590	51018	38103	30000	55799	33179	**43115**	34408	22200	39782	42361	25158	22833	34548	21092	**30298**
13	IET 31250	37561	38548	52729	71643	32761	35750	27227	45312	**42691**	25964	28201	36965	45540	33568	19900	34380	10933	**29431**
14	CR Dhan 801	32141	40081	42586	89595	34331	42483	51113	49420	**47719**	19984	13455	26825	57266	22390	18750	40530	20517	**27465**
15	IET 31253	36237	52170	46479	60489	41708	33717	55871	51293	**47245**	25651	33393	37526	55737	41459	12050	44427	35417	**35707**
16	Pooja	31474	35058	58351	67804	32565	0	27310	57452	**38752**	20411	14869	40126	55495	31065	0	61020	22900	**30736**
17	IET 30409	37625	47050	52950	96800	40811	31300	32579	46738	**48232**	23922	23753	39046	71247	27884	27717	58164	15133	**35858**
18	Swarna Sub-1	39004	37053	52035	36025	43677	41733	67986	44815	**45291**	26160	20939	33435	17820	34730	29633	49751	29017	**30185**
	Mean	**37067**	**39092**	**49544**	**61753**	**34710**	**31094**	**52953**	**44178**	43799	**24364**	**24349**	**33497**	**44382**	**27318**	**17297**	**45553**	**18875**	**29454**
		LSD (Treat)				2020**					*LSD (Treat x Variety)*					ns			
		LSD (Location x Treat)				5715**					*LSD (Location x Treat x Variety)*					19226**			
		LSD (Variety)				ns					*CV (%) Treat*					27.76			
		LSD (Location x Variety)				13595**					*CV (%) Residual*					24.87			

Table 6.6.13 Influence of Low-Light Stress on Spikelet number/m² in different rice varieties during Kharif 2023 at different centers

S.No.	Genotypes	Control								Grand Mean	Low light stress								Grand Mean
		CHN	IIRR	KJT	MTU	NRRI	PNR	RPUR	TTB		CHN	IIRR	KJT	MTU	NRRI	PNR	RPUR	TTB	
1	IET 30367	44118	67986	62332	66781	37350	50950	52488	59667	**55209**	29665	26262	40631	51590	43470	57017	62730	20300	**41458**
2	IET 31244	47219	78055	52028	63954	44689	92467	56171	45450	**60004**	33014	48749	36253	47982	30499	55167	44085	19083	**39354**
3	IET 30423	41613	54456	53676	70961	42852	35117	68243	44792	**51464**	30456	30228	35230	61402	34787	19333	45523	28992	**35744**
4	IR 8	17429	61629	60755	82742	39504	42950	67720	50650	**52922**	10265	34183	33879	74294	39606	61367	64043	18400	**42005**
5	IET 31204	38696	57040	49587	66726	45759	105833	71761	42725	**59766**	24896	39878	31808	63074	36029	68500	49814	27975	**42747**
6	IET 31245	36700	43613	47058	57123	42062	0	67631	55350	**43692**	25226	35244	30116	48554	28676	0	58298	29667	**31973**
7	IET 31215	41378	59906	52509	56210	41713	56050	50611	54175	**51569**	27379	30690	35031	46508	23904	53433	57439	25875	**37532**
8	IET-31220	49498	56349	50083	66275	39306	40483	74814	42400	**52401**	34860	40317	36990	51216	28245	24083	65797	20250	**37720**
9	Swarna Prabha	17318	47506	58916	37180	25902	75483	44007	36175	**42811**	8920	62563	35306	32439	25609	34750	35193	22867	**32206**
10	IET 31237	43222	38830	51163	65571	28008	27067	62927	55458	**46531**	28110	19857	36623	56815	26051	10217	37757	17492	**29115**
11	IET 31242	45169	50608	48373	54714	42033	30733	48532	51567	**46466**	28193	40230	34595	45694	32083	16067	60566	19275	**34588**
12	IET 31246	53231	54064	53681	55242	43088	43500	64629	38317	**50719**	36188	38023	45841	50930	30431	40767	43490	22942	**38577**
13	IET 31250	39005	49080	58136	76934	37461	48083	30030	52058	**48849**	26946	38910	41547	63426	37941	36400	40747	13133	**37381**
14	CR Dhan 801	33320	54588	48018	94292	38221	56200	53583	57325	**54443**	22168	23268	30480	82335	30125	50600	39280	24067	**37790**
15	IET 31253	37835	66671	51199	65065	45273	39100	62114	59533	**53349**	28475	40889	43271	62139	44982	26950	53307	40367	**42547**
16	Pooja	32379	53130	66520	73051	38249	28200	29298	66175	**48375**	21918	20874	44955	63283	39615	0	63108	30950	**35588**
17	IET 30409	38811	64068	62498	101486	55871	41600	35861	54125	**56790**	25155	31185	42392	88638	38188	36967	63921	19475	**43240**
18	Swarna Sub-1	41263	57111	57759	39490	49014	47467	71836	51608	**51944**	27518	37894	36698	24068	40030	44242	49498	35367	**36914**
	Mean	**38789**	**56372**	**54683**	**66322**	**40909**	**47849**	**56237**	**50975**	**51517**	**26075**	**35514**	**37314**	**56355**	**33904**	**35325**	**51922**	**24249**	**37582**
		LSD (Treat)				2663**					*LSD (Treat x Variety)*					ns			
		LSD (Location x Treat)				7531**					*LSD (Location x Treat x Variety)*					22100**			
		LSD (Variety)				ns					*CV (%) Treat*					30.07			
		LSD (Location x Variety)				15627**					*CV (%) Residual*					23.51			

Table 6.6.14 Influence of Low-Light Stress on Grain yield (g/m²) in different rice varieties during Kharif 2023 at different centers

S.No.	Genotypes	Control								Grand Mean	Low light stress								Grand Mean
		CHN	IIRR	KJT	MTU	NRRI	PNR	RPUR	TTB		CHN	IIRR	KJT	MTU	NRRI	PNR	RPUR	TTB	
1	IET 30367	874	810	560	441	579	542	874	618	**662**	545	264	264	255	253	184	596	373	**342**
2	IET 31244	997	898	752	424	621	493	753	560	**687**	696	394	269	281	162	227	357	385	**346**
3	IET 30423	1047	957	612	526	641	111	872	548	**664**	756	517	329	322	288	0	478	339	**379**
4	IR 8	294	737	645	533	313	462	726	576	**536**	149	375	298	438	136	80	438	208	**265**
5	IET 31204	854	778	821	522	528	721	810	598	**704**	508	578	408	463	334	445	386	309	**429**
6	IET 31245	706	527	586	527	350	0	794	414	**488**	463	290	253	330	145	0	526	276	**286**
7	IET 31215	749	832	744	544	498	398	922	620	**663**	456	516	362	372	295	98	732	450	**410**
8	IET-31220	969	927	729	564	507	523	1319	500	**755**	655	608	393	292	279	243	315	280	**383**
9	Swarna Prabha	346	923	1065	570	326	633	432	408	**588**	163	979	234	356	220	162	263	196	**322**
10	IET 31237	1231	871	589	523	320	637	1378	533	**760**	783	415	263	297	197	136	424	313	**353**
11	IET 31242	846	583	732	534	417	489	1143	585	**666**	524	484	378	393	281	259	508	305	**391**
12	IET 31246	1141	708	682	571	480	365	1188	595	**716**	723	403	382	383	248	150	526	328	**393**
13	IET 31250	1127	938	687	564	501	636	1133	589	**772**	753	573	307	341	464	88	446	260	**404**
14	CR Dhan 801	739	784	719	548	335	367	1040	450	**623**	440	212	295	308	189	98	496	328	**296**
15	IET 31253	725	766	506	538	500	280	1025	455	**599**	513	502	278	458	388	59	753	350	**412**
16	Pooja	629	585	618	585	413	0	1354	521	**588**	408	202	325	488	268	0	638	266	**324**
17	IET 30409	903	850	518	559	487	128	758	479	**585**	550	383	243	408	412	61	647	299	**375**
18	Swarna Sub-1	780	679	732	580	522	572	1286	466	**702**	523	307	295	356	290	238	597	340	**368**
	Mean	**831**	**786**	**683**	**536**	**463**	**409**	**989**	**529**	**653**	**534**	**445**	**310**	**363**	**270**	**140**	**507**	**311**	**360**
		LSD (Treat)				31.95**					*LSD (Treat x Variety)*					ns			
		LSD (Location x Treat)				90.36**					*LSD (Location x Treat x Variety)*					146.55**			
		LSD (Variety)				ns					*CV (%) Treat*					31.73			
		LSD (Location x Variety)				103.62**					*CV (%) Residual*					13.71			

Table 6.6.15 Influence of Low-Light Stress on Total dry matter (g/m²) maturity in different rice varieties during Kharif 2023 at different centers

S.No.	Genotypes	Control								Grand Mean	Low light stress								Grand Mean
		CHN	IIRR	KJT	MTU	NRRI	PNR	RPUR	TTB		CHN	IIRR	KJT	MTU	NRRI	PNR	RPUR	TTB	
1	IET 30367	1673	2283	1593	587	1066	1562	3511	1240	**1689**	1152	1611	1184	382	928	1537	3465	882	**1393**
2	IET 31244	1657	2644	1528	547	1213	2594	4688	1267	**2017**	1218	1890	991	415	758	2253	2690	883	**1387**
3	IET 30423	1761	2803	1424	700	2003	1289	2613	1329	**1740**	1210	2110	1164	579	1263	800	2415	979	**1315**
4	IR 8	914	1674	1250	707	1018	1383	2986	1221	**1394**	673	1084	972	618	527	1656	1896	658	**1011**
5	IET 31204	1796	2126	1466	722	1269	3082	3804	1248	**1939**	1246	1584	1019	663	1042	1729	2111	1004	**1300**
6	IET 31245	1721	2243	1410	743	1183	1264	4031	958	**1694**	1076	1669	1233	506	974	748	3571	740	**1315**
7	IET 31215	1451	2466	1161	692	1251	2469	4749	1299	**1942**	1128	1484	1121	614	813	1466	3265	990	**1360**
8	IET-31220	1448	2527	1007	720	1295	1846	4203	1062	**1764**	1049	1766	1032	466	925	891	3440	810	**1297**
9	Swarna Prabha	824	2151	1300	733	1064	2807	3542	868	**1661**	613	2311	949	572	726	1050	2108	723	**1132**
10	IET 31237	1827	2214	1218	671	1140	1971	3606	1186	**1729**	1235	1252	899	478	828	909	2885	1055	**1193**
11	IET 31242	1746	1739	1358	729	1160	1666	3754	1199	**1669**	1131	1424	1135	632	964	949	2494	768	**1187**
12	IET 31246	1617	1873	1153	745	1194	1872	2956	1210	**1577**	1438	1152	915	655	794	1723	2597	794	**1258**
13	IET 31250	1420	2396	1198	765	1362	2826	4585	1197	**1969**	1535	1957	1123	599	1291	1168	3128	847	**1456**
14	CR Dhan 801	1477	1860	1269	779	903	1318	3372	945	**1491**	1009	964	1042	470	602	1170	2975	964	**1149**
15	IET 31253	1543	2413	1436	662	1294	1669	4050	968	**1754**	956	1700	1122	633	1145	1501	3840	1243	**1518**
16	Pooja	1686	1702	1566	748	1026	1197	3550	1205	**1585**	1221	1157	1203	730	972	724	3261	969	**1280**
17	IET 30409	1609	2330	1399	767	1268	1273	3715	1008	**1671**	1195	1537	1000	672	1300	1443	3378	1086	**1451**
18	Swarna Sub-1	1759	1617	1266	768	1213	1829	3686	1115	**1657**	1256	1155	1064	597	759	1887	2603	983	**1288**
	Mean	**1552**	**2170**	**1334**	**710**	**1218**	**1884**	**3744**	**1140**	**1719**	**1130**	**1545**	**1065**	**571**	**923**	**1311**	**2896**	**910**	**1294**
		LSD (Treat)				76.41**					*LSD (Treat x Variety)*					ns			
		LSD (Location x Treat)				216.11**					*LSD (Location x Treat x Variety)*					597.41**			
		LSD (Variety)				113.49*					*CV (%) Treat*					25.52			
		LSD (Location x Variety)				422.43**					*CV (%) Residual*					18.79			

Table 6.6.16 Influence of Low-Light Stress on 1000 grain weight (g) in different rice varieties during Kharif 2023 at different centers

S.No.	Genotypes	Control								Grand Mean	Low light stress								Grand Mean
		CHN	IIRR	KJT	MTU	NRRI	PNR	RPUR	TTB		CHN	IIRR	KJT	MTU	NRRI	PNR	RPUR	TTB	
1	IET 30367	21.0	18.5	20.0	21.3	20.9	16.7	19.1	21.2	**19.8**	20.0	13.6	19.8	18.9	19.8	21.6	18.8	21.5	**19.2**
2	IET 31244	22.0	20.6	21.6	28.1	22.3	25.2	20.4	25.2	**23.2**	22.0	15.4	21.1	21.4	20.3	19.7	18.7	26.1	**20.6**
3	IET 30423	26.0	24.9	21.3	27.4	27.5	10.5	26.2	29.2	**24.1**	26.0	22.2	26.4	24.5	26.4	0.0	23.6	31.4	**22.6**
4	IR 8	18.0	17.5	19.2	18.1	19.4	15.0	17.3	17.5	**17.8**	16.0	15.7	19.4	16.9	17.0	17.3	11.5	17.1	**16.4**
5	IET 31204	23.0	20.7	20.9	22.4	21.3	22.9	20.7	22.7	**21.8**	22.0	19.1	21.3	20.6	19.7	21.3	20.4	23.5	**21.0**
6	IET 31245	20.0	17.7	21.3	22.2	16.3	0.0	18.3	22.4	**17.3**	20.0	16.1	19.7	19.2	19.3	0.0	17.8	23.9	**17.0**
7	IET 31215	19.0	20.5	23.1	21.2	23.8	26.3	20.4	26.2	**22.6**	18.0	21.3	23.2	18.1	21.3	16.4	19.7	27.6	**20.7**
8	IET-31220	21.0	19.8	21.8	23.2	21.6	28.9	20.7	23.4	**22.6**	20.0	19.3	18.1	20.1	20.0	19.0	18.5	22.0	**19.6**
9	Swarna Prabha	21.0	23.7	26.5	18.3	24.8	27.4	25.3	25.6	**24.1**	20.0	21.9	26.6	14.2	22.9	7.4	23.6	21.1	**19.7**
10	IET 31237	30.0	30.7	29.3	23.1	29.5	34.7	28.7	23.7	**28.7**	30.0	27.1	30.4	20.4	27.9	10.4	29.0	24.9	**25.0**
11	IET 31242	20.0	20.0	21.8	19.3	22.4	21.1	20.7	22.2	**20.9**	20.0	18.8	21.2	17.1	21.7	22.4	19.4	24.0	**20.6**
12	IET 31246	22.0	20.6	20.8	15.6	20.2	20.2	19.5	22.8	**20.2**	21.0	18.2	20.4	13.1	18.7	21.7	19.5	20.5	**19.1**
13	IET 31250	30.0	24.4	25.9	26.2	26.5	31.7	24.5	29.0	**27.3**	29.0	20.1	21.6	23.0	24.4	27.8	21.4	27.5	**24.3**
14	CR Dhan 801	23.0	19.6	18.9	19.0	20.1	19.4	18.2	20.2	**19.8**	22.0	15.7	22.4	16.6	19.4	16.3	17.6	20.0	**18.8**
15	IET 31253	20.0	14.7	15.9	17.6	18.7	20.9	17.4	17.9	**17.9**	20.0	15.1	16.8	17.1	16.9	20.2	15.6	19.2	**17.6**
16	Pooja	20.0	16.7	19.8	19.1	18.5	0.0	19.5	21.1	**16.8**	20.0	13.6	16.3	18.2	19.3	0.0	18.7	21.8	**16.0**
17	IET 30409	24.0	18.1	20.2	21.6	20.5	22.0	19.7	22.3	**21.0**	23.0	16.1	20.7	19.2	19.8	16.6	19.1	24.1	**19.8**
18	Swarna Sub-1	20.0	18.3	18.7	18.1	18.9	17.4	17.3	19.8	**18.6**	20.0	14.5	19.4	15.1	18.8	18.1	17.4	20.5	**18.0**
	Mean	**22.2**	**20.4**	**21.5**	**21.2**	**21.8**	**20.0**	**20.8**	**22.9**	**21.4**	**21.6**	**18.0**	**21.4**	**18.5**	**20.8**	**15.3**	**19.5**	**23.1**	**19.8**
		LSD (Treat)				0.33*					*LSD (Treat x Variety)*					ns			
		LSD (Location x Treat)				1.28**					*LSD (Location x Treat x Variety)*					2.09**			
		LSD (Variety)				0.52**					*CV (%) Treat*					11.09			
		LSD (Location x Variety)				1.48**					*CV (%) Residual*					4.81			

Table 6.6.17 Influence of Low-Light Stress on Harvest Index (%) in different rice varieties during Kharif 2023 at different centers

S.No.	Genotypes	Control								Grand Mean	Low light stress								Grand Mean
		CHN	IIRR	KJT	MTU	NRRI	PNR	RPUR	TTB		CHN	IIRR	KJT	MTU	NRRI	PNR	RPUR	TTB	
1	IET 30367	52.2	35.5	34.1	42.8	54.5	34.7	27.3	50.0	**41.4**	47.3	16.4	26.8	39.8	27.5	11.9	18.8	42.4	**28.9**
2	IET 31244	60.1	34.0	36.3	43.6	52.0	19.0	17.9	44.2	**38.4**	57.1	20.5	31.0	40.5	21.5	10.1	13.7	43.7	**29.8**
3	IET 30423	59.5	34.3	25.5	42.9	32.0	8.6	35.5	41.4	**34.9**	66.3	24.3	25.8	35.8	23.0	0.0	20.8	34.8	**28.9**
4	IR 8	32.1	43.9	35.4	43.0	38.0	33.4	25.6	47.1	**37.3**	22.2	35.3	37.4	41.4	26.5	4.8	23.7	31.7	**27.9**
5	IET 31204	47.6	36.6	39.0	42.0	41.5	23.4	22.9	48.1	**37.6**	40.8	36.5	35.2	41.1	32.5	25.8	19.4	30.9	**32.8**
6	IET 31245	41.0	23.6	32.4	41.6	29.5	0.0	20.3	43.3	**29.0**	43.1	16.8	21.5	39.6	15.0	0.0	15.0	37.4	**23.6**
7	IET 31215	51.7	33.8	37.4	44.0	40.0	16.1	20.1	47.8	**36.3**	40.5	34.1	38.8	37.7	36.0	6.7	22.8	46.3	**32.9**
8	IET-31220	66.9	36.7	35.5	43.9	39.0	28.4	31.6	47.1	**41.1**	62.5	34.3	38.1	38.2	31.5	27.3	9.5	34.7	**34.5**
9	Swarna Prabha	42.0	42.6	46.6	43.8	30.0	22.6	12.3	47.1	**35.9**	26.5	42.4	41.5	38.3	30.5	15.5	14.3	27.2	**29.5**
10	IET 31237	67.4	39.4	32.7	43.7	27.5	32.4	38.9	45.0	**40.9**	63.4	32.8	22.6	38.7	23.5	14.9	15.9	29.8	**30.2**
11	IET 31242	48.5	33.5	40.6	42.3	36.0	29.3	30.8	49.0	**38.7**	46.4	34.1	39.7	38.4	29.5	27.4	22.0	39.8	**34.6**
12	IET 31246	70.6	37.9	36.4	43.4	40.5	19.5	40.3	49.1	**42.2**	52.9	35.2	41.1	36.9	31.0	8.7	22.1	41.6	**33.7**
13	IET 31250	79.4	39.2	31.1	42.4	37.0	22.5	24.9	49.2	**40.7**	50.9	29.5	25.2	36.7	36.5	7.6	15.1	30.9	**29.0**
14	CR Dhan 801	50.1	42.1	28.7	41.3	37.0	27.8	31.1	47.6	**38.2**	43.6	21.9	34.2	39.5	31.0	8.4	17.1	34.1	**28.7**
15	IET 31253	47.3	31.7	33.5	44.9	38.5	16.8	25.2	47.0	**35.6**	53.6	29.6	23.3	41.9	34.0	3.9	19.8	28.2	**29.3**
16	Pooja	37.3	34.3	33.7	43.9	40.0	0.0	39.1	43.3	**33.9**	33.4	17.8	27.5	40.1	27.5	0.0	20.8	27.6	**24.3**
17	IET 30409	56.1	36.5	28.2	42.1	38.5	10.1	20.2	47.6	**34.9**	46.1	24.9	21.8	37.8	31.5	4.3	20.9	27.7	**26.9**
18	Swarna Sub-1	44.4	42.7	39.8	43.0	43.0	31.3	35.2	41.9	**40.2**	41.6	26.3	32.1	37.3	36.0	12.6	23.1	34.8	**30.5**
	Mean	**53.0**	**36.6**	**34.8**	**43.0**	**38.6**	**20.9**	**27.7**	**46.4**	**37.6**	**46.6**	**28.5**	**31.3**	**38.9**	**29.1**	**10.6**	**18.6**	**34.6**	**29.8**
		LSD (Treat)				1.53**					*LSD (Treat x Variety)*					ns			
		LSD (Location x Treat)				3.14*					*LSD (Location x Treat x Variety)*					7.77**			
		LSD (Variety)				1.48*					*CV (%) Treat*					22.82			
		LSD (Location x Variety)				5.49**					*C V(%) Residual*					10.92			

Table 6.6.18 Influence of Low Light Stress on starch (%) of rice genotypes at IIRR during *Kharif* 2023

S.No	Genotypes	LLSC	LLST	Mean
1	IET 30367	58.9	59.9	59.4
2	IET 31244	55.4	56.5	55.9
3	IET 30423	58.6	61.0	59.8
4	IR 8	56.4	60.7	58.5
5	IET 31204	54.1	41.8	47.9
6	IET 31215	60.5	62.0	61.2
7	IET-31220	59.0	60.7	59.9
8	Swarna Prabha	57.9	56.7	57.3
9	IET 31237	61.4	76.4	68.9
10	IET 31242	60.2	69.6	64.9
11	IET 31246	58.5	67.9	63.2
12	IET 31250	61.9	73.3	67.6
13	CR Dhan 801	56.7	65.0	60.8
14	IET 31253	59.1	53.7	56.4
15	Pooja	62.3	56.8	59.5
16	IET 30409	53.3	58.3	55.8
17	Swarna Sub-1	62.2	57.5	59.8
	Mean	58.6	61.0	59.8
	LSD (Treat)			ns
	LSD (Variety)			2.62**
	LSD (Treat x Variety)			3.70**
	CV(%) Treat			2.54

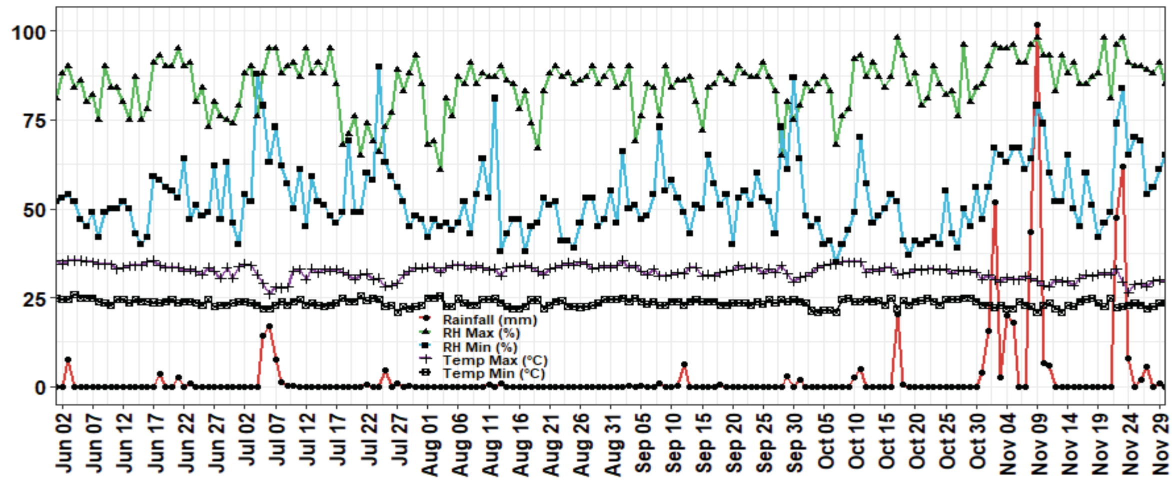
Table 6.6.19A Influence of Low Light Stress on chlorophyll fluorescence traits at IIRR during *Kharif* 2023

S.No	Genotypes	Actual quantum yield of PSII (φPSII)			Electron Transport Rate (ETR)			Maximum quantum yield of PSII (Fv/Fm)		
		Control	Low light stress	Mean	Control	Low light stress	Mean	Control	Low light stress	Mean
1	IET 30367	0.276	0.341	**0.309**	18.7	23.4	**21.1**	0.809	0.819	**0.814**
2	IET 31244	0.299	0.325	**0.312**	20.3	22.3	**21.3**	0.820	0.814	**0.817**
3	IET 30423	0.331	0.369	**0.350**	22.5	25.3	**23.9**	0.787	0.813	**0.800**
4	IR 8	0.315	0.370	**0.343**	21.4	25.4	**23.4**	0.803	0.810	**0.806**
5	IET 31204	0.394	0.397	**0.396**	26.8	27.2	**27.0**	0.819	0.815	**0.817**
6	IET 31245	0.262	0.289	**0.275**	17.9	19.8	**18.9**	0.824	0.818	**0.821**
7	IET 31215	0.328	0.301	**0.315**	22.4	20.7	**21.5**	0.805	0.819	**0.812**
8	IET-31220	0.311	0.316	**0.314**	21.2	21.7	**21.5**	0.813	0.827	**0.820**
9	Swarna Prabha	0.354	0.408	**0.381**	24.1	28.0	**26.1**	0.800	0.790	**0.795**
10	IET 31237	0.422	0.348	**0.385**	28.9	23.8	**26.3**	0.795	0.814	**0.805**
11	IET 31242	0.383	0.351	**0.367**	26.2	24.2	**25.2**	0.765	0.812	**0.788**
12	IET 31246	0.431	0.391	**0.411**	29.5	26.9	**28.2**	0.777	0.808	**0.793**
13	IET 31250	0.334	0.323	**0.329**	22.9	22.2	**22.6**	0.822	0.820	**0.821**
14	CR Dhan 801	0.341	0.286	**0.314**	23.4	19.7	**21.5**	0.807	0.814	**0.811**
15	IET 31253	0.287	0.341	**0.314**	19.7	23.5	**21.6**	0.819	0.824	**0.821**
16	Pooja	0.295	0.258	**0.277**	20.2	17.7	**19.0**	0.818	0.811	**0.814**
17	IET 30409	0.317	0.327	**0.322**	21.8	22.6	**22.2**	0.811	0.816	**0.814**
18	Swarna Sub-1	0.406	0.349	**0.378**	27.8	24.1	**26.0**	0.806	0.817	**0.811**
	Mean	**0.338**	**0.338**	**0.338**	**23.1**	**23.3**	**23.2**	**0.806**	**0.815**	**0.810**
	LSD (Treat)			ns			ns			0.012*
	LSD (Variety)			0.054**			3.73**			0.016**
	LSD (Treat x Variety)			0.077**			5.27**			0.022**
	CV(%) Treat			8.87			9.03			0.772

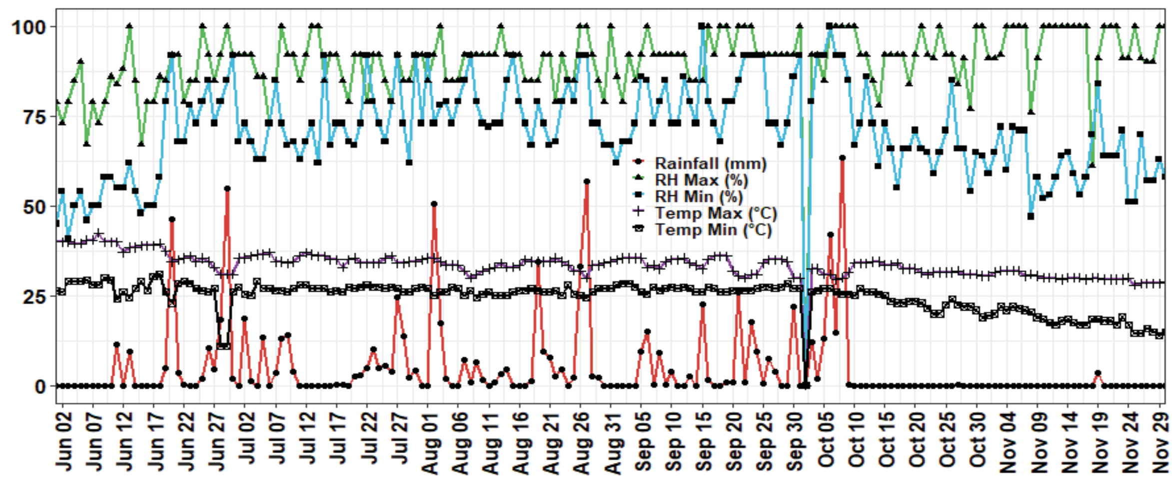
Table 6.6.19B Influence of Low Light Stress on chlorophyll fluorescence traits at IIRR during *Kharif* 2023

S.No	Genotypes	Coefficient of photochemical quenching (qP)			Coefficient of non-photochemical quenching (qN)		
		Control	Low light stress	Mean	Control	Low light stress	Mean
1	IET 30367	0.439	0.551	**0.495**	0.270	0.325	**0.298**
2	IET 31244	0.467	0.522	**0.495**	0.259	0.283	**0.271**
3	IET 30423	0.559	0.583	**0.571**	0.318	0.269	**0.294**
4	IR 8	0.528	0.622	**0.575**	0.351	0.399	**0.375**
5	IET 31204	0.620	0.626	**0.623**	0.335	0.335	**0.335**
6	IET 31245	0.403	0.456	**0.430**	0.255	0.271	**0.263**
7	IET 31215	0.543	0.488	**0.515**	0.305	0.283	**0.294**
8	IET-31220	0.513	0.503	**0.508**	0.373	0.328	**0.351**
9	Swarna Prabha	0.595	0.672	**0.634**	0.376	0.388	**0.382**
10	IET 31237	0.709	0.545	**0.627**	0.361	0.322	**0.342**
11	IET 31242	0.649	0.575	**0.612**	0.341	0.343	**0.342**
12	IET 31246	0.706	0.641	**0.674**	0.296	0.322	**0.309**
13	IET 31250	0.513	0.501	**0.507**	0.290	0.284	**0.287**
14	CR Dhan 801	0.563	0.450	**0.506**	0.350	0.300	**0.325**
15	IET 31253	0.466	0.553	**0.510**	0.326	0.347	**0.337**
16	Pooja	0.468	0.407	**0.437**	0.329	0.321	**0.325**
17	IET 30409	0.500	0.526	**0.513**	0.307	0.340	**0.324**
18	Swarna Sub-1	0.617	0.550	**0.584**	0.253	0.305	**0.279**
	Mean	**0.548**	**0.543**	**0.545**	**0.316**	**0.320**	**0.318**
	LSD (Treat)			ns			ns
	LSD (Variety)			0.093**			0.062**
	LSD (Treat x Variety)			0.132**			ns
	CV(%) Treat			9.57			14.96

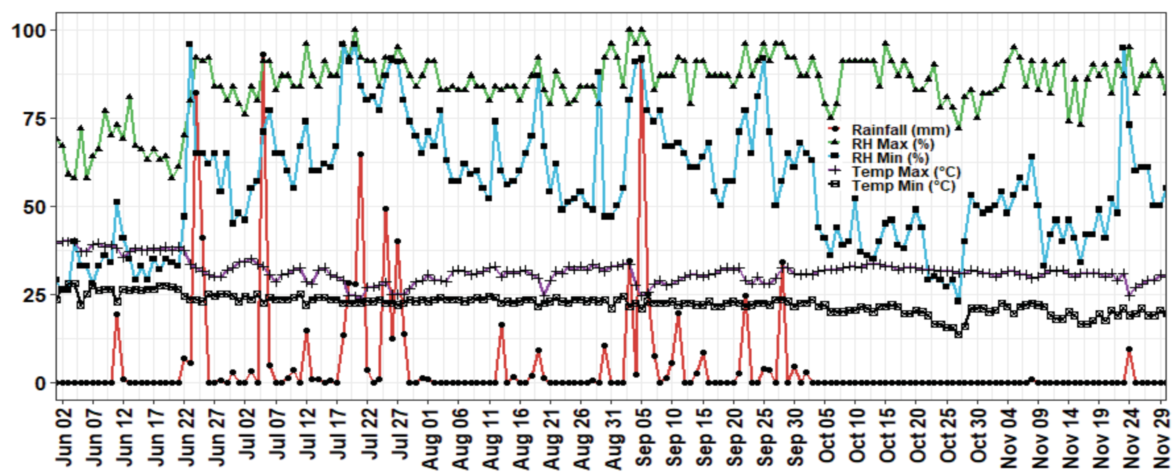
Weather graphs



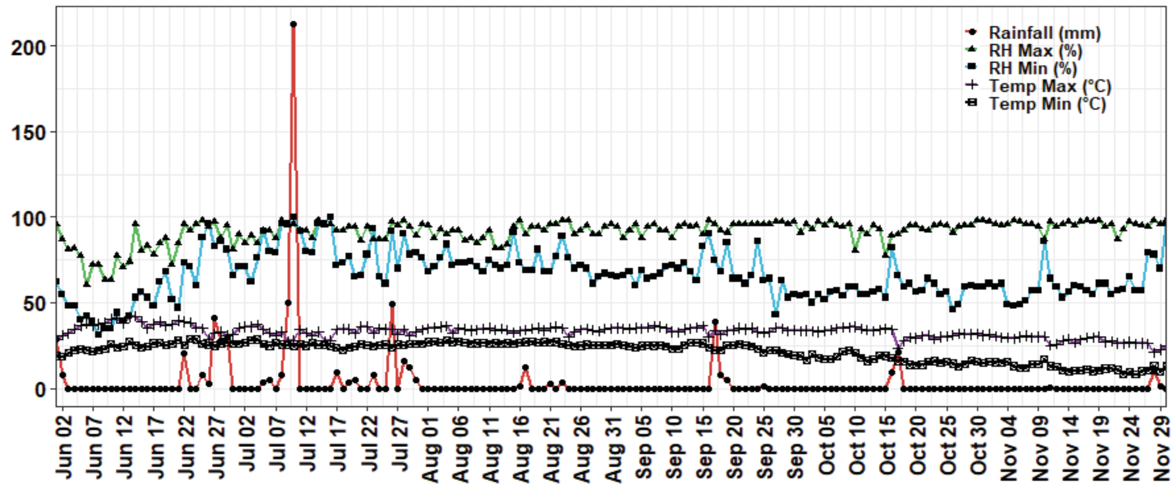
Temperature, Humidity and Rainfall recorded at Coimbatore (CBT) centre during 2023



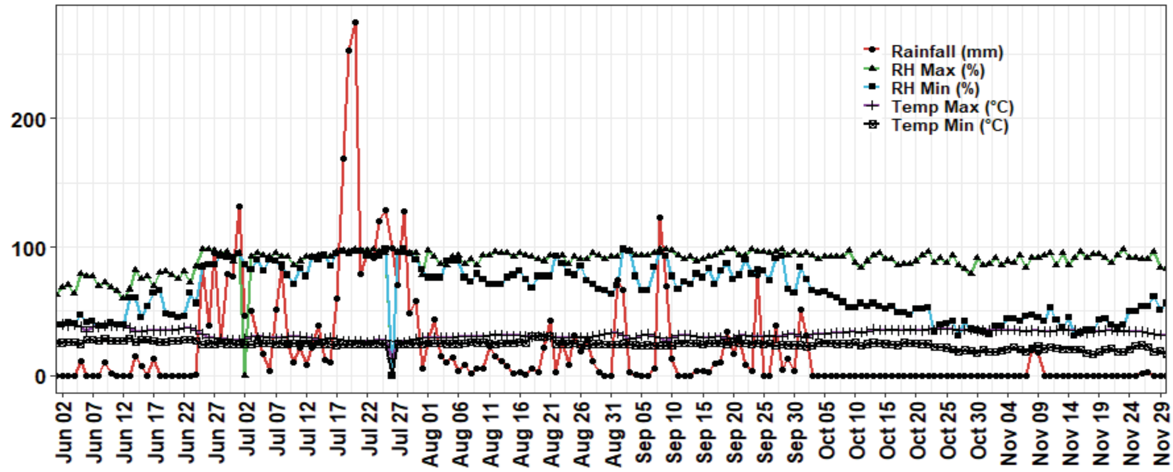
Temperature, Humidity and Rainfall recorded at Chinsura (CHN) centre during 2023



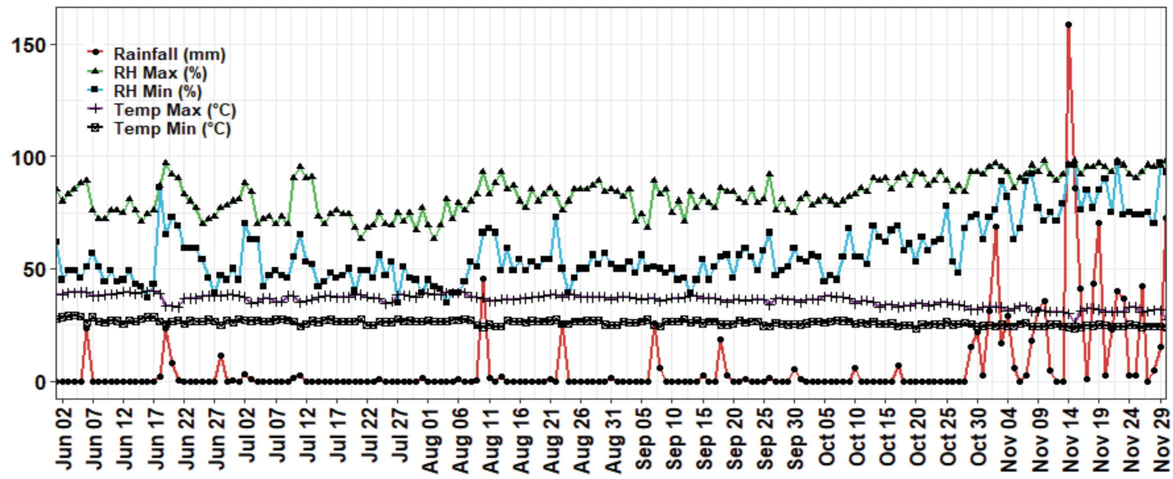
Temperature, Humidity and Rainfall recorded at IIRR, Hyderabad centre during 2023



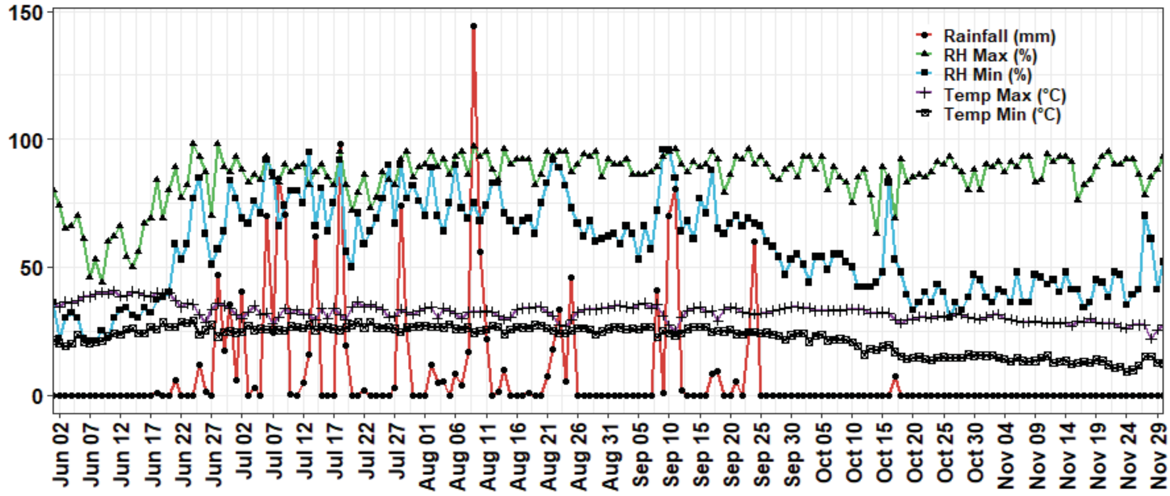
Temperature, Humidity and Rainfall recorded at KAUL centre during 2023



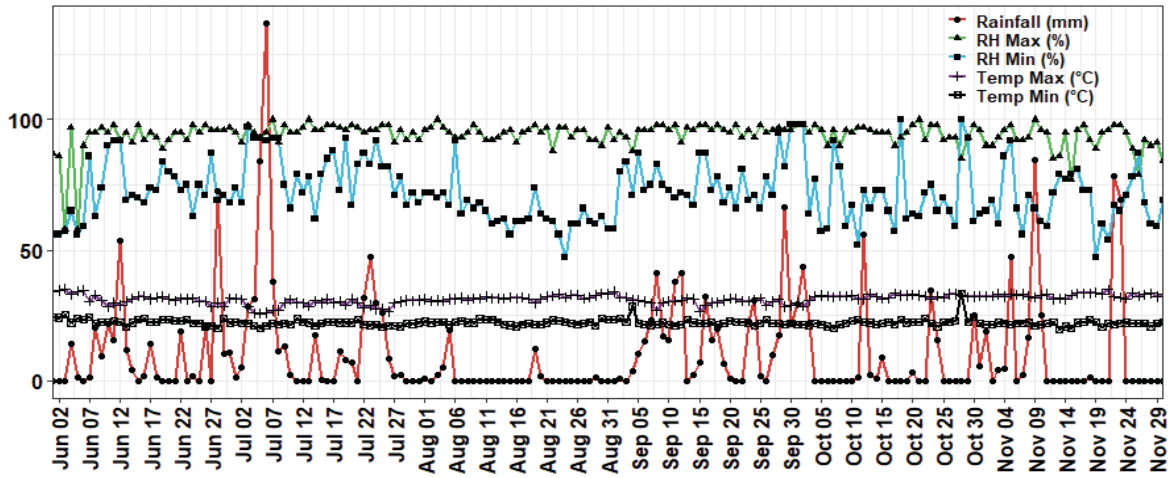
Temperature, Humidity and Rainfall recorded at Karjat (KJT) centre during 2023



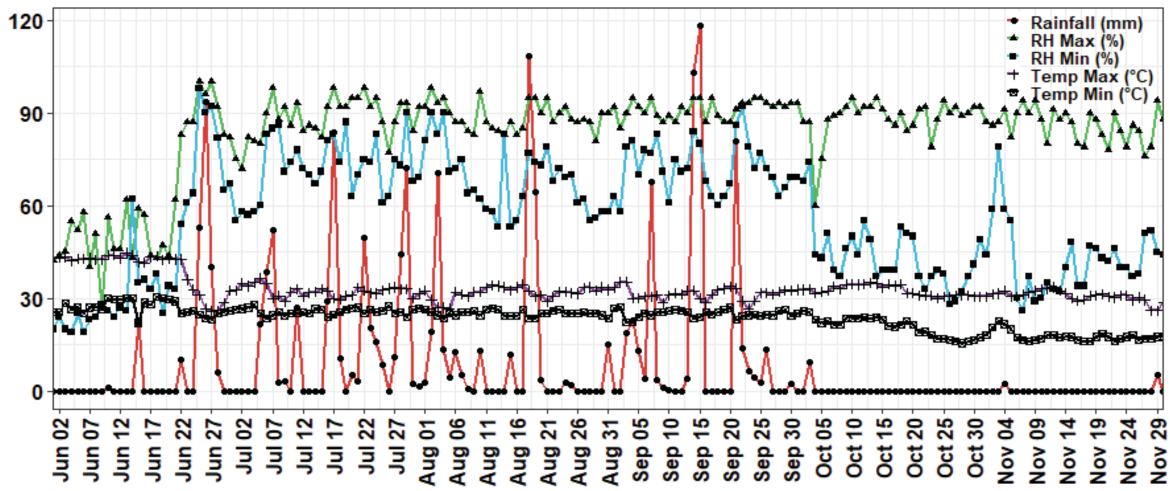
Temperature, Humidity and Rainfall recorded at Karaikal (KRK) centre during 2023



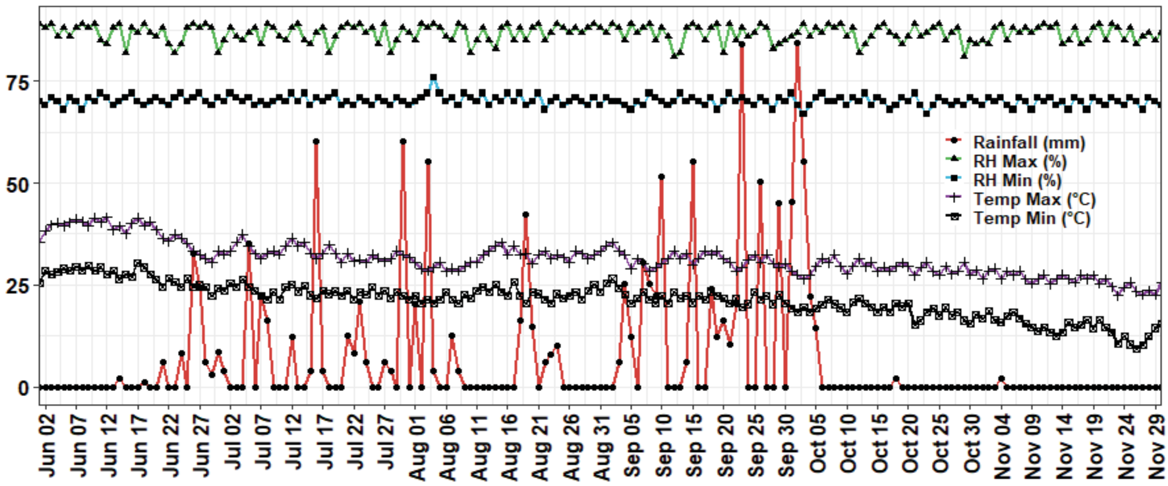
Temperature, Humidity and Rainfall recorded at Pantnagar (PNR) centre during 2023



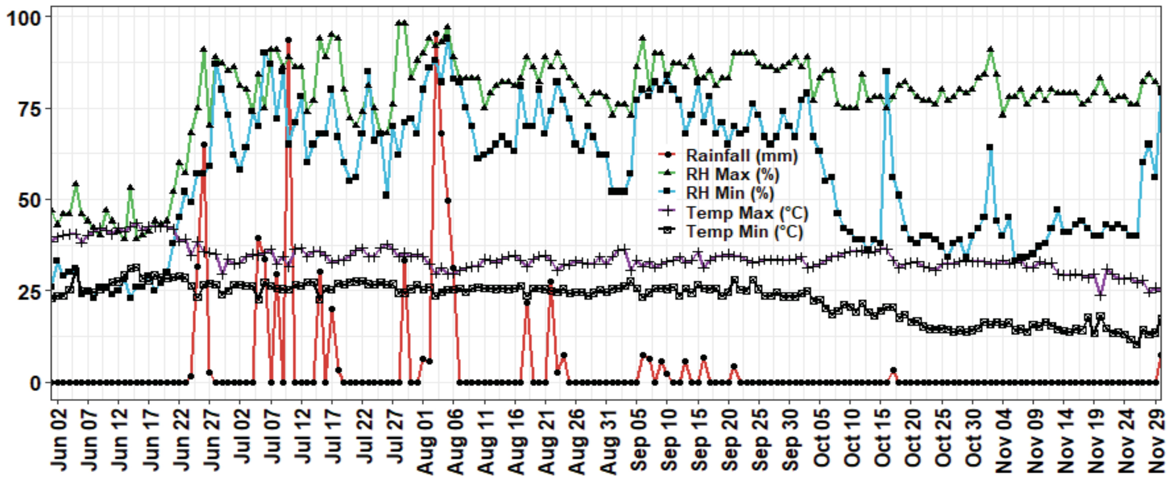
Temperature, Humidity and Rainfall recorded at Pattambi (PTB) centre during 2023



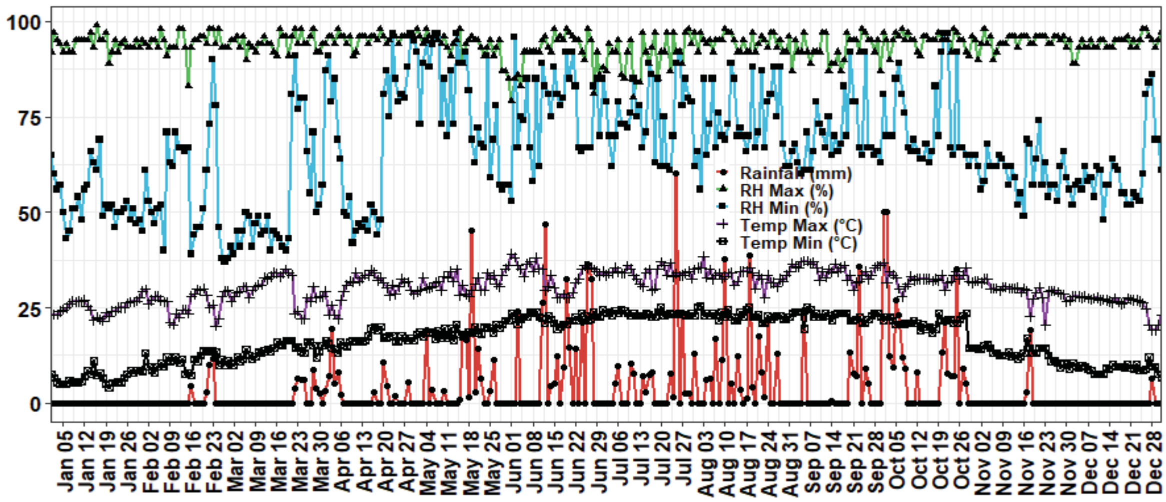
Temperature, Humidity and Rainfall recorded at IGKV, Raipur centre during 2023



Temperature, Humidity and Rainfall recorded at BAU, Ranchi centre during 2023



Temperature, Humidity and Rainfall recorded at Rewa centre during 2023



Temperature, Humidity and Rainfall recorded at AAU, Titabar centre during 2023

APPENDIX - II
Rice cultures of Physiology for Kharif 2023

	SILICON		**RFU**		**HT**		**LLS**		**MAS**		**Submergence**		
S.No	**Entries**	**S.No**	**Entries**	**S.No**	**Entries**	**S.No**	**Entries**	**S.No.**	**Entries**	**S.No.**	**Entries**	**S.No.**	
		19	IL 19241	1	IET 29859	1	IET 30367	1	IET-18727	1	IC-516 149	27	AUS 301
1	27P37	20	IL 19246	2	IL 19019	2	IET 31244	2	IC-516 149	2	IET-18716	28	KANGRI
2	27P63	21	IL 19408	3	IL 19020	3	IET 30423	3	IET-18716	3	AC-35678	29	NAVEEN
3	28P67	22	IL 19451	4	IL 19021	4	IR 8	4	AC-35678	4	AC-38209	30	BINNAFUL
4	AZ 8433 DT	23	IL 19485	5	IL 19022	5	IET 31204	5	FL478	5	FR13A	31	NDR9930111
5	HRI-174	24	IL19026	6	IL 19024	6	IET 31245	6	IC-516 366	6	IC-516 366	32	NDGR201
6	SB. Dhan	25	JB 631-1	7	IL 19185	7	IET 31215	7	AC 85	7	IET27670	33	BRR 0290-IR19X1001
7	US-312	26	JB 680-4	8	IL 19198	8	IET-31220	8	RAVANA	8	MADHUKAR	34	BRR O289-IR18A1711
8	US-314	27	JB 687-2	9	IL 19202	9	Swarna Prabha	9	MORISHAL	9	BARH-AVARODHI		
	RFU	28	Krishna Hamsa	10	IL 19211	10	IET 31237	10	AUS 131	10	RCPR90-IR09L342		
1	DRT-1	29	SB.Dhan	11	IL 19247	11	IET 31242	11	RAHASPUNJAR	11	RCPR91-IR11F195		
2	DRT-11	30	WGL-14	12	IL 19396	12	IET 31246	12	AUS 63	12	IET30697(KR19011)		
3	DRT-12			13	JB 680-2	13	IET 31250	13	AUS 103	13	SWARNA SUB1		
4	DRT-15			14	JB 683-1	14	CR Dhan 801	14	AUS 100	14	IET30695(KR19015)		
5	DRT-3			15	JB 687-3	15	IET 31253	15	AUS 73	15	OROI-5-IR 86256-6		
6	DRT-4			16	JB 689-1	16	Pooja	16	NICRA 16	16	OROI-8-IR 88228-33		
7	DRT-5			17	JBC 159-11	17	IET 30409	17	VANDANA	17	OROI-12-IR 88250-20		
8	DRT-6			18	Krishna Hamsa	18	Swarna Sub-1	18	NICRA 17	18	CR 3918-119-1		
9	DRT-8			19	MTU 1153			19	CR-3439-4-E-17-2-1-B-1-S-1	19	CR 3918-106-1		
10	DRT-9			20	MTU 1156			20	CR-4215-2-5-2-M-4-SUB-2-5-1	20	CRAC-4423-37		
11	IL 19023			21	MTU 1273			21	NDR9930111	21	SWARNA		
12	IL 19027			22	MTU 1290			22	NDGR201	22	CRAC-4423-40		
13	IL 19177			23	MTU 1293			23	NAVEEN	23	CRAC-4423-45		
14	IL 19180			24	N-22			24	CRAC-4423-3	24	CR4430-1-3-2-1		
15	IL 19182			25	NLR 3776			25	CRAC-4423-14	25	CR4430-13-19-1-1		
16	IL 19206			26	NLR 3778			26	IR29	26	SUGA PANKHA		
17	IL 19210												
18	IL 19211												

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आज़ादी का अमृत महोत्सव

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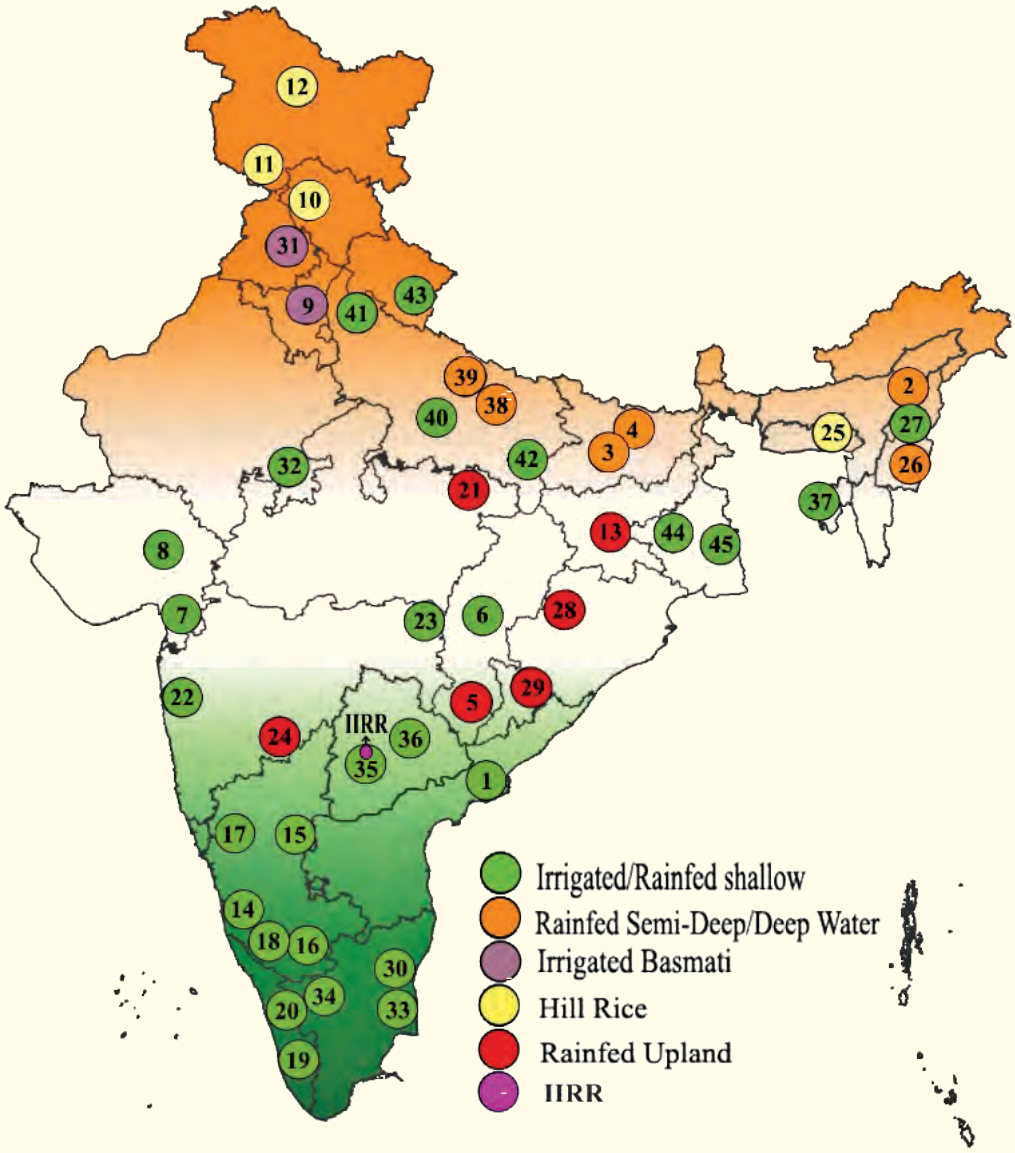

भाकृअनुप - भारतीय चावल अनुसंधान संस्थान

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