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and

PLANT PHYSIOLOGY

ALL INDIA CO-ORDINATED RICE IMPROVEMENT PROGRAMME (AICRIP)

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PREFACE

AICRIP experiments conducted by Agronomists at different locations during *rabi* 2021-22 and *Kharif* 2022 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 293 experiments at 60 locations (Funded and Voluntary) consisting of an evaluation of promising cultivars (130 cultures) belonging to 19 groups *viz.,* early hill (irrigated), medium hill (irrigated), early (TP), early (DS), irrigated mid-early, irrigated medium, late, medium slender, CSTVT, alkaline& inland saline, rainfed shallow lowland, aerobic, biofortified, NIL DRT, herbicide-resistant mutants, deep water, shallow deep water, boro and Phosphorous tolerance cultivars trials in transplanted situation, for their response to integrated nutrient management at 50 and 100 % Recommended dose of fertilizer(RDF). Also, three trials on resource conservation technologies, four 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, germplasm screening in sodic and acid soils and their management, testing/validation of computer-based nutrient management tool, Nutrient Expert, developed by IPNI for site-specific nutrient management in farmers' fields, residue management in rice-based cropping systems, identification of genotypes having high nitrogen use efficiency and collaborative trials with Agronomy and Entomology in nutrient management and bio-intensive pest management under organic farming. A total of 8 trials were conducted during rabi 2021-22 and Kharif 2022 in 16 locations (funded as well as voluntary centers and at IIRR) 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 Physilogy 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* 2021-22 and *kharif* 2022 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 48 (37 funded and 11 voluntary centers) locations consisting of evaluation of promising cultivars (130 cultures) belonging to 19 groups *viz.,* early hill (irrigated), Medium Hill (MH), early (TP and DS), IME, IM, Late, RSL, CSTVT, AL& ISTVT, Aerobic. Biofortified, DRT, DW, SDW, NIL (HT- herbicide - resistant mutant 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 on Resource Conservation, four trials each on 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. AVT-2 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* 2022. A total of 120 AVT-2 entries belonging to 18 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 - EH (Irrigated)

Cultivars IET 28890, IET 28196, IET 28206, IET 28884, IET 28883, IET 28895 & IET 28882 were evaluated with Shalimar Rice 3, Vivekdhan 86, VL Dhan 86 and local check at four locations **(Almora, Khudwani, Malan and Upper Shillong** indicated the superiority of 100% RFD over 50% and also exhibited higher nutrient recovery at all the locations. Popular

varieties like Shalimar Rice 3, Vivek Dhan-86, VL Dhan 86 and tested cultures, viz., **IET 28196, IET 28884, IET 28883, IET 28895, IET 28882** were found to be promising based on grain yield efficiency index.

4.1(b) AVT 2 - MH (Irrigated)

Cultivars IET 28224, IET 28222, IET28907 & IET 28217 were evaluated in comparison with local checks at four locations (**Khudwani**, **Malan**, **Upper Shillong** and **Wangbal**). Nutrient response (kg grain / kg N) and grain yield were higher at 100% RDF. Among the cultures, **IET 28224** and **IET 28217** were found to be promising in terms of higher grain yield efficiency index.

4.1(C) AVT 2 - Early (Transplanted)

Eleven AVT-2 entries (IET 29140, IET 28954, IET 28960, IET 29142, IET 29177, IET 28959, IET 28964, IET 28950, IET 29197, IET 27866 and IET 26898) were evaluated for their response to 50% and 100% dose of RDF at thirteen **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), Ranchi (80:40:30), Rewa (100:60:40), Sabour (100:40:20) and Varanasi (100:50:50).** In this trial, recommended input of nutrients (100% RDF) was found to be promising with 18% higher grain yield and also exhibited higher nutrient efficiency. **IET 28959** and **IET 28960** recorded higher grain yield among the cultures (5.10 and 4.85 t/ha respectively) were found to be promising entries as compared to standard and local checks.

4.1(d) AVT 2 - Irrigated Medium Early

AVT-2 IME cultures (IET 29214, IET 29233, IET 29217, IET 29212, IET 28353, IET 29235, IET 29246, IET 29238, IET 28982, IET 28128, IET 28979, IET 29236 and IET 28506) were evaluated at 17 locations. Nutrient management with 100% RDF application recorded better yield over 50% RDF at all the locations with 16% higher grain yield. **IET 29235** (5.25 t/ha) and **IET 28128** (5.22 t/ha) performed better and recorded higher mean grain yield across the locations as compared to other test entries and checks.

4.1(e) AVT 2 - Irrigated Medium

Sixteen AVT-2 entries IET 29268, IET 28489, IET 29002, IET 29002, IET 29284, IET 29014, IET 29257, IET 29301, IET 28997, IET 29256, IET 29290, IET 29001, IET 29004, IET 29009, IET 29000, IET 27908 and IET 27900 eighteen different locations indicated that cultures, **IET 29000** (5.67 t/ha) followed by **IET 29001** (5.53 t/ha) and IET 28997 (5.46 t/ha) were found promising on the basis of overall mean grain yield across the locations. Application of 100% RDF of the location (25% higher) found significantly superior to 50% RDF application at all the locations.

4.1(f) AVT 2 - Late (Irrigated)

Four AVT-2 Late entries (IET 29349, IET 29351, IET 28508 and IET 28509) were evaluated for its response to graded levels nutrients on grain yield and yield attributes at eight locations indicated that application of 100% RDF was found to be promising with 24 % 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 29351** (4.89 t/ha) recording the highest mean yields.

4.1(g) AVT 2 - CSTVT

One culture viz., IET 27851 was evaluated in comparison with standard varieties (CSR 10, Improved white ponny, FL 478 and Canning 7) at **Canning town (75:40:10), Nagina (120:60:40), Navsari (120:30:0), Panvel (100:50:50)** and **Vyttila** indicated 100% RDF was found to be promising and also exhibited higher nutrient response. AVT-2 entry **IET 27851 was found to be on par in terms of grain yield and nutrient response with local check with most of the tested centers.**

4.1(h) AVT 2 - AL & ISTVT

Saline tolerant cultures (nine) Viz., IET 29356, IET 29365, IET 29354, IET 29360, IET 29361, IET 29366, IET 29358, IET 29353 and IET 27807 at four different locations indicated superiority of **IET 29360** and **IET 29361** (3.40 and 3.39 t/ha) entries which recorded higher mean grain yield over other test entries.

4.1(i) AVT 2 - Aerobic

15 AVT-2 entries (IET 29423, IET 29422, IET 29412, IET 29396, IET 29405, IET 29411, IET 29415, IET 29424, IET 29394, IET 29436, IET 29421, IET 29409, IET 29430, IET 29410 and IET 29446) were evaluated for their response to two fertilizer levels on grain yield at eight locations showed the application of 100% RDF was found to be promising (17% higher grain yield) and also exhibited higher nutrient response. **IET 29412** and **IET 29436** were found to be promising with higher grain yield (5.18 and 4.88 t/ha) across the locations.

4.1(j) AVT 2 - Biofortified

One AVT-2 Biofortified culture IET 28694 was evaluated for its response to different levels of nutrients (50% and 100% RDF) on grain yield from seven locations indicated that nutrient management with 100% had higher grain yield and performance of standard checks were found to be promising and recorded higher mean grain yield across the locations.

4.1(k) AVT 2 - Medium Slender

Five entries (IET 29539, IET 29523, IET 29492, IET 29017 and IET 29536) of medium slender group were evaluated for their response to two levels of nutrients (50% and 100% RDF) on grain yield at eight different locations showed the application of 100% RDF was found to be promising (29% higher yield) and also exhibited higher nutrient response. Entries like **IET**

29017 and **IET 29536** (5.34 and4.95 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(l) AVT 2 - Phosphorous efficient cultivars (LPT)

The trial was conducted at five locations (Ludhiana, Mandya, Raipur, Ranchi and Varanasi) at graded levels of the Phosphorus application. Mean over the locations (five location) and among the cultures, across the locations the culture **IET 28821** (4.84 t/ha) found promising and gave better yields over other cultures and on par with checks at most of the locations.

4.1(m) AVT 2 - NIL DRT

AVT-2 NIL DRT cultures (IET 28018 and IET 28017) were evaluated for their response on grain yield at five locations indicated100% RDF was found to be promising and also exhibited higher nutrient recovery efficiency, but none of the IET entries found promising over local check in terms of grain yield and nutrient response however, the performance of **IET 28018** (4.31 t/ha) was promising with on par yield of checks.

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

Four AVT-2 entries (IET 28835, IET 28834, IET 30437 and IET 30438) were evaluated for their response to low and optimum level of nutrients application (50 and 100% RDF) on grain yield at four locations indicated application of 100% of RDF was found promising across the locations with 21% higher grain yield and **IET 30438** was found promising with higher grain yield of (4.08 t/ha) across the locations among the tested cultures.

4.1(o) AVT 2 - Deep Water

The grain yield performance of Deep Water (DW) culture (IET 26741) and response to nutrient levels of selected IET culture IET 26741 was evaluated at two locations *viz.,* **Chinsurah** and **Ghaghraghat**. **IET 26741** (4.27 t/ha) was promising with higher grain yield followed by Jal Bhavani (4.23 t/ha) and are suitable at 100% of RDN.

4.1(p) AVT 2 - Semi-Deep Water

The grain yield performance of SDW cultures and response to nutrient levels of four selected IET cultures (IET 29121, IET 29122, IET 28296 and IET 28299) were evaluated against two standard checks indicated that **IET 29121** (3.63 t/ha) was promising followed by **IET 28299** (3.46 t/ha) and suitable at 100% of RDF.

4.1(q) AVT 2 - Rainfed Shallow Lowland

Two AVT-2cultures (IET 30409 and IET 30410) of rainfed shallow land were evaluated recorded the application of 100% RDF was found to be promising and also exhibited higher nutrient recovery efficiency. Among the IET cultures, **IET 30409** (4.52 t/ha) followed by **IET 30410** (4.47 t/ha) were found promising in terms of higher mean grain yield and nutrient response.

4.1(r) AVT 2 - Boro

The grain yield performance of three boro cultures IET 28840, IET 28848 and IET 28849 and its response to nutrient levels was evaluated indicated superior performance of IET cultures **IET 28840,** and **IET 28849** (5.31 & 6.03 t/ha) at 100% of RDF application.

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

The herbicide tolerance in elite genotypes for their efficacy was taken up at **Chiplima**, **ICAR-NRRI, Nagina, IARI New Delhi** and **Ranchi**. The results indicated the superiority of the Bispyribac-sodium followed by Imazethapyr found promising herbicides in terms of higher yield. Further the results indicated the superiority of Imazethapyr among herbicides. The genotypes G_8-Pusa 1988-15-7-44-98-67 (3.04 t/ha) followed by G7 (Pusa 1988 -15-7-44-98-15) recorded mean higher grain yield of 3.04 and 2.96 t/ha respectively with no or low phytotoxicity to Imazethapyr have contributed to higher crop growth and grain yield.

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 6 locations (**Aduthurai, Karaikal, Ludhiana, Puducherry, Ranchi and Warangal**). Split plot design was adopted with 3 main plots 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 3 subplots 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 replicated three times. Among irrigation management practices, overall, across all the 5 locations the highest mean grain yield was recorded under alternate wetting and drying (5.95 t/ha). Similarly, transplanting method recorded the highest mean grain yield of 5.94 t/ha across all locations. In *rabi* season alternate wetting and drying treatment recorded the lowest cost of cultivation (Rs. 41632/- per hectare) and total water input (953 mm/ha). Similarly, mechanical transplanting method on puddle soil also recorded the lowest cost of cultivation (Rs. 34,633/- per hectare).

4.2.2.1. Developing suitable package of practices for Dry DSR

The trial is constituted to enhance the productivity of the Dry 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 15 locations with five main plots of sowing methods (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. Four subplots consist of W_1: Manual weeding (3 times); W_2: Pre + post-emergence herbicide; W_3: Pre-emergence herbicide + manual weeding (two times) and Mulching with paddy straw @ 5 t/ha at the time of sowing fb post emergence herbicide application of bispyribac sodium @ 250 ml /ha or (penoxsulam + cyhalofopbyutyl) @ 2500ml/ha. The results indicated that mechanical sowing (4.45 t/ha) followed by semi dry system sowing (4.31 t/ha) found to be promising. Among the weed management, pre – post emergent application method (4.25 t/ha) followed by manual hand weeding (4.20 t/ha) and mechanical weeding method (4.13 t/ha) were found promising. However, mechanical weeding found to be promising in-terms of higher B;C ratio in most of the location over other methods of weed management.

4.2.2.2 Developing suitable package of practices for wet DSR

Overall, among crop establishment methods, drum seeding resulted in the highest grain yield (5.12 t/ha) across all 15 locations. Similarly, among weed management practices, pre-emergence herbicide + manual weeding resulted in the highest grain yield (4.89 t/ha).

Crop Establishment methods on Pests incidence (Entomology)

Across the locations, the incidence of dead hearts caused by stem borer and leaf folder was significantly high in semi-dry rice followed by puddled direct-seeded rice while white ears were high in aerobic rice. Gall midge incidence was significantly high in puddled direct-seeded rice followed by the normal transplanting method. The incidence of whorl maggot, caseworm, and BPH was also significantly high in puddled direct-seeded rice. Overall, the incidence of insect pests was significantly high in puddled direct-seeded rice followed by the normal transplanting method while the incidence was low in direct-seeded rice, semi-dry rice, mechanical transplanting, and aerobic rice.

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** (6.94 t/ha), **Ghaghraghat** 9.74 t/ha) and **Vadagaon** (8.64 t/ha). The tillage system S-1 conventional tillage found promising at **Karjat**. The REY of the system productivity indicated superiority of the residue application at **Vadagaon** indicating the superiority of residue in rice based system.

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

In order to evaluate the performance of Sorghum hybrids in rice fallows during Rabi 2021 and *Kharif* 2022 at **Mandya** , different crop establishment methods (T_1: Transplanting and T_2: Wet Direct Seeding (line sowing under puddled conditions) during *Kharif* 2022 and

sorghum hybrids during *Rabi* 2021-22, promising sorghum hybrids IIMRH 1, IIMRH 2, IIMRH 3, IIMRH 4, IIMRH 5, IIMRH 6, AKSH 778, SPH 1943, CSH 16 and CSH 30 showed wet seeding method as promising which can reduce the labour conserve resources gave comparatively higher grain yield of 5.36 t/ha as compare to transplanting method (5.17 t/ha) . IIMRH cultures were significantly superior (IIMRH 1 (3.53 t/ha); IIMRH 6 (3.8 t/ha); and IIMRH 5 (2.91 t/ha) as compared to local (CSH 16 and CSH 30).

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

Weeds are a constant problem in crop production due to their dynamic nature. To address this, a long-term trial on fixed plot basis was conducted during ***Kharif*** season 2022 to assess the weed dynamics in different establishment methods over a period of five years at 17 locations *viz.,***Aduthurai, Chatha, Chinsurah, Chiplima, Gangavathi, Ghaghraghat, Malan, Moncompu, Nagina, Nawagam, Pantnagar, Pattambi, Pusa, Puducherry, ARI-Rajendranagar, Titabar and Varanasi** during ***Kharif*** season and Karaikal during ***Rabi*** season in replicated split plot design.The treatments consisted of 3 main plots M1 – Mechanised planting/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 controlin split plot design. The data on crop growth parameters, yield attributes, grain yield and weed parameters viz., weed population and weed biomass recorded by test locations are summarized after statistical analyses. Genus and Species wise weed population reported by eight locations showed dominance of Grasses i.e., *Echinochloa colonum/crusgalli* at five locations, *Paspalum spp, Isachne spp, Oplismaanus spp* at **Gangavathi, Moncompu** and **Pattambi** respectively. At four locations *Cyperusiria* was reported dominant and at three locations other spp of *Cyperus* were dominant. Among BLW, no commonality in dominating Genus and spp. In Un-puddled Dry DSR system, six locations reported dominance of Sedges and four locations reported dominance of Grasses. At majority of the test locations, the direct seeding system recorded higher weed population (group wise and total) compared to mechanical transplanting; dry direct seeding system recorded higher weed population (group wise and total) compared to wet direct seeded system. The dry weed biomass (group wise and total) indicated that mechanical transplanting has lowest weed biomass and un-puddled direct seeding has highest weed biomass. The dry weed biomass was significantly low with chemical weed control treatments.

The 3rdyear results are clearly showing the shift in weed group from Grasses to Sedges (*Cyperus iria, Cyperus rotundus and Fimbristylis miliaceae*) with change in system of establishment to DSR and increase in the quantum of population and biomass; In transpalanted Wet and Dry and DSR systems, *Cyperus difformis* the common sedge weed occurence was not reported by the test locations. In all establishment methods, among the grasses, *Echinochloa colonum* is reported dominant rather than usual *Echinochloa crusgalli*.

The mean grain yield across the locations varied from 2.37 t/ha at **Chatha** (Variety Basmati 370) to 6.38 t/ha at **Varanasi** with HUR 4-3. The results of the crop growth parameters, yield attributes and straw yield showed, at nine locations, mechanical transplanting

recorded significantly high grain yields. At five locations**,** Mechanized transplanting/Transplanting and puddled wet DSR were comparable. At 12 locations, chemical weed control was found superior over mechanical weed control and at three locations, mechanical weed control was superior.

4.4 INTER DISCIPLINARY TRIALS

4.4.1(a) Yield maximization of rice in different zones)

Overall, across all 16 locations 125% RDF of the location+ FYM @ 5 t/ha treatment resulted in the highest mean grain yield (5.89 t/ha) followed by location specific management practices (5.80 t/ha), 125% RDF of the location (5.68 t/ha).

4.4.1(b) Assessment of yield gap analysis (Agronomy & Economics)

The results of the data collected from various districts of five states of India revealed that the yield gaps ranged from 4 percent to 26 percent. The average yield gap was found to be 12 percent and scope to enhance the yields with better management practices.

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

In black clay soils of **Gangavathi**, integrated crop management with natural farming resulted in the highest grain yield (2.86 t/ha). However, the mean yield level of the experiment was very low (1.82 t/ha). In sandy loam soils of **Ghaghraghat**, Integrated Crop Management resulted in the highest grain yield (4.88 t/ha) followed by Integrated Crop Management (Pest management) (4.57 t/ha). Similarly, in **Raipur**, Integrated Crop Management (Pest management) treatment resulted in the highest grain yield (4.34 t/ha) followed by Integrated Crop Management (4.12 t/ha). It was noticed that natural farming treatment resulted in lower grain yield (2.89 t/ha). In ***rabi*** season, at **Karaikal** 150% N (FYM) resulted in the highest grain yield (4.36 t/ha). Similarly, the highest gross return also recorded under same treatment (Rs.1,00,285/-). In clay loam soils of **Puducherry**, ADT-54 variety, State best organic management practices resulted in the highest grain yield (6.52 t/ha). (*Detailed report in Soil Science*)

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

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 respect to the tiller, panicle numbers, yield and N uptake at **Jagdalpur Faizabad, Chata, ARI, Mandya, Pantnagar, Moncompu, Sabour, Kanpur** and **Warangal**. But the application of 75% + two sprays of nano urea was found better at **Karaikal, Kanpur, Coimbatore, Mandya, Bankura, Khudwani, Pattambi** and **Puducherry** for the tiller, panicle numbers and yield parameter. Higher NUE was observed with T2 treatments majority of the locations followed by T5 treatments at **Bankura, Khudwani** and **Karaikal**, respectively. (*Detailed report in Soil Science*)

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

During ***Kharif*** 2022, the trial was conducted Zone-wise at 13 locations viz.**, Coimbatore, Chinsurah, Gangavathi, Karjat, Mandya, Malan, Navasari, Nawagam, Pusa, Puducherry, Raipur, Titabar and Vadagaon** 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 (30 DAT & 60 DAT) and grain yields were reported and the results after statistical analyses. Across the locations, weeds, insect pests and disease incidence were significantly low in IPM plots. IPM implemented plots recorded mean grain yield advantage of 51.05 %, 25.02%, 21.39 %, 10.97%, 44.95% and 11.03% respectively in Zone-I, III, IV, V, VI and VII over the farmer practices and 17.67% during ***Rabi*** **s**eason-2021-22 at **Aduthurai** (Zone-VII). In IPM adopted fields, the mean weed population reduction over the Zones ranged from 22.52 % in Zone-V (Central areas) to 66.68 % in Zone-VII at 30 DAT; and at 60 DAT and it was 27.56 % in Zone-I (Hilly areas) to 56.13 % in Zone-I and during ***Rabi*** season-2021-22 at **Adhuthurai** (Zone-VII) 74.83%, 73.6% at 30 and 60 DAT respectively. The dry weed biomass reported by 13 locations shown that, both 30 & 60 DAT were significantly reduced by 15.65 % in Zone-V (Central areas) to 69.69% in Zone-VI (Western areas); 18.16 % in Zone-V (Central areas) to 54.09% in Zone-VI (Western areas) where as in case of *Rabi* at **Adhuthurai** (Zone-VII) 46.3 %, 66.64 % at 30 & 60 DAT respectively.

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* 2022. A total of 105 AVT-2 entries belonging to 19 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 - Early hill EH (Irrigated)

Cultivars IET 28890, IET 28196, IET 28206, IET 28884, IET 28883, IET 28895 & IET 28882 were evaluated with Shalimar Rice 3, Vivekdhan 86, VL Dhan 86 and local check at four locations **(Almora, Khudwani, Malan and Upper Shillong)** under two different recommended doses of fertiliser (50% and 100% RFD). The data received from four locations was summarized and presented in **Table 4.1(a)**.

Different doses of fertiliser exhibited varying differences in grain yield and yield attributes at all the four locations. Application of 100% RFD recorded higher yield at **Almora**, **Khudwani, Malan** and **Upper Shillong** (5.69, 5.79, 5.86 and 1.86 t/ha respectively) and was found significantly superior to 50% RFD at **Khudwani**, **Malan** and **Upper Shillong**. However, at **Almora**, the yield difference was not significant. Interaction effects of N doses and varieties was non-significant at all locations. Averaged across the locations, Nutrient response (kg grain / kg N) was higher at 100% RFD compared to 50% RFD.

The grain yield of the locations with different varieties ranged from 4.07 to 7.11 t/ha in **Almora**, 1.59 to 7.94 t/ha in **Khudwani**, 4.38 to 6.73 t/ha in Malan and 0.89 to 2.69 t/ha in **Upper Shillong**. Grain yield of cultivars differed significantly at all locations with different doses of RFD. Among the varieties tested, VL Dhan 86 (5.04 t/ha) at **Almora** and Vivek Dhan 86 (6.36 t/ha) at **Malan**, Shalimar Rice 4 (7.57 t/ha) at **Khudwani** and local check MEG-3 (2.35 t/ha) at **Upper Shillong** were found promising over other test entries. Among the cultures, IET 28196 (6.91 t/ha) at **Almora**, IET 28895 (6.86 t/ha) at **Khudwani** and IET 28883 (6.01 t/ha) at Malan were found promising. Mean over the four locations, IET 28882 (5.96 t/ha) was found promising over other tested varieties and entries.

In this trial, nutrient management with 100% RFD was found to be promising and also exhibited higher nutrient response at all the locations. Popular varieties like Shalimar Rice 3, Vivek Dhan-86, VL Dhan 86 and tested culture IET 28196, IET 28884, IET 28883, IET 28895, IET 28882 were found to be promising based on grain yield efficiency index.

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

Cultivars IET 28224, IET 28222, IET28907 & IET 28217 were evaluated in comparison with local checks at four locations (**Khudwani**, **Malan**, **Upper Shillong** and **Wangbal**) 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.(b).**

The application of 100% RFD gave significantly higher grain yield at **Khudwani** (7.04 t/ha), **Upper Shillong** (1.99 t/ha) and **Wangbal** (3.26 t/ha) and was non-significant at **Malan**. Interaction effect of varieties and fertilizer levels are non-significant at all the centers. Nutrient response (kg grain/kg fertilizer) was higher at 100% RDF as compared to 50% RDF at four locations.

The grain yield of the locations ranged from 5.00 to 7.86 t/ha at **Khudwani**, 3.08 to 5.86 t/ha at Malan, 0.80 to 2.97 at **Upper Shillong** and 2.50 to 4.13 t/ha at **Wangbal**. Among the cultivars tested IET 28217 at **Khudwani** (7.13 t/ha), IET 28222 at Malan (4.91 t/ha) and **Wangbal** (3.64 t/ha) and IET 28224 at **Upper Shillong** (2.38 t/ha) were found to be promising. Mean over the locations IET 28217, IET 28224, Vivek Dhan 62 and RC Maniphace 1 were found to be promising over other cultivars.

In this trial, integrated agronomic management with 100% RFD was found to be promising (15% higher) and also exhibited higher nutrient recovery. Among the cultures, IET 28224 and IET 28217 were found to be promising in terms of higher grain yield efficiency index.

Table 4.1(a): Summary of data on grain yield and ancillary character of selected NMT- early hill (irrigated) cultures grown under transplanted conditions at low and optimum graded levels of recommended nutrient(NPK) doses, kharif 2022.

Fertilizer-levels	Varieties	ALMORA							KHUDWANI						
		Grain Yield (t/ha)	*Rank*	Panicle/m² (No.)	Panicle Weight (g)	Test Wt(g)	Days for 50% flowering	Nutrient res. (kg grain/kg Nutrient) (Base level 50% RDF)	Grain Yield (t/ha)	*Rank*	Panicle/m² (No.)	Panicle Weight (g)	Test Wt(g)	Days for 50% flowering	Nutrient res. (kg grain/kg Nutrient) (Base level 50% RDF)
F1 - 50% RFD	V1	5.26	*12*	283	3.24	2.45	115		1.59	*20*	311	1.17	24.47	127	
	V2	6.70	*2*	337	4.60	2.57	109		4.86	*16*	277	2.30	23.70	121	
	V3	4.50	*17*	238	3.19	2.66	100		5.27	*13*	291	2.17	27.20	107	
	V4	5.79	*7*	303	2.96	1.95	106		2.83	*18*	309	1.60	17.87	125	
	V5	5.31	*10*	278	3.61	2.60	95		5.07	*15*	302	2.07	25.10	111	
	V6	5.30	*11*	250	3.74	2.78	92		6.74	*8*	285	2.57	26.60	110	
	V7	5.50	*9*	298	3.21	2.88	96		6.30	*10*	275	2.33	27.10	110	
	V8	4.07	*20*	212	2.66	2.38	84		7.13	*5*	300	3.23	27.23	100	
	V9	-		-	-	-	-		6.63	*9*	299	2.87	27.20	116	
	V10	4.90	*15*	237	3.76	2.92	93		-		-	-	-	-	
	V11	4.13	*19*	217	3.15	2.67	88		7.19	*4*	309	3.30	28.87	101	
F2 - 100% RFD	V1	6.14	*5*	318	3.11	2.48	114	8.80	2.08	*19*	312	1.63	24.97	128	4.67
	V2	7.11	*1*	360	4.86	2.62	110	4.10	5.24	*14*	283	2.23	24.70	122	3.62
	V3	5.03	*14*	258	3.37	2.68	97	5.30	5.48	*11*	339	2.73	27.43	107	2.00
	V4	6.35	*4*	347	3.16	2.13	109	5.60	3.20	*17*	361	2.07	18.53	125	3.52
	V5	6.08	*6*	312	3.95	2.57	96	7.70	5.44	*12*	301	2.27	25.27	112	3.52
	V6	5.68	*8*	290	3.95	2.79	92	3.80	6.97	*6*	295	3.23	27.07	110	2.19
	V7	6.39	*3*	318	3.57	2.93	95	8.90	6.75	*7*	282	2.43	27.23	110	4.29
	V8	4.35	*18*	250	2.66	2.51	83	2.80	7.56	*2*	310	3.50	27.23	101	4.10
	V9	-		-	-	-	-		7.20	*3*	301	3.10	27.17	117	5.43
	V10	5.18	*13*	262	4.35	2.95	93	2.80	-		-	-	-	-	
	V11	4.61	*16*	250	3.35	2.74	84	4.80	7.94	*1*	316	3.50	29.13	102	7.14
Interaction															
F at same V		NS		NS	NS	NS	NS		NS		NS	NS	NS	NS	
V at same F		NS		NS	NS	NS	NS		NS		NS	NS	NS	NS	
Means of F levels:															
F1		5.15	*2*	265	3.41	2.59	98		5.36	*2*	296	2.36	25.53	113	
F2		5.69	*1*	297	3.63	2.64	97	5.46	5.79	*1*	310	2.67	25.87	113	4.05
C.D.(0.05)		NS		12.57	NS	NS	NS		0.15		8.95	NS	NS	NS	
C.V.(%)		13.03		4.03	6.93	6.61	0.58		2.39		2.66	25.21	4.98	0.82	

Table 4.1(a): Contd.

Fertilizer-levels	Varieties	ALMORA							KHUDWANI						
		Grain Yield (t/ha)	*Rank*	Panicle/m² (No.)	Panicle Weight (g)	Test Wt(g)	Days for 50% flowering	Nutrient res. (kg grain/kg Nutrient) (Base level 50% RDF)	Grain Yield (t/ha)	*Rank*	Panicle/m² (No.)	Panicle Weight (g)	Test Wt(g)	Days for 50% flowering	Nutrient res. (kg grain/kg Nutrient) (Base level 50% RDF)
Mean of varieties:															
V1		5.70	*4*	301	3.18	2.47	114	8.80	1.84	*10*	311	1.40	24.72	128	4.67
V2		6.91	*1*	348	4.73	2.60	109	4.10	5.05	*8*	280	2.27	24.20	121	3.62
V3		4.77	*8*	248	3.28	2.67	99	5.30	5.38	*6*	315	2.45	27.32	107	2.00
V4		6.07	*2*	325	3.06	2.04	108	5.60	3.02	*9*	335	1.84	18.20	125	3.52
V5		5.70	*5*	295	3.78	2.59	96	7.70	5.26	*7*	302	2.17	25.19	112	3.52
V6		5.49	*6*	270	3.85	2.79	92	3.80	6.86	*4*	290	2.90	26.84	110	2.19
V7		5.95	*3*	308	3.39	2.91	96	8.90	6.53	*5*	279	2.38	27.17	110	4.29
V8		4.21	*10*	231	2.66	2.45	83	2.80	7.35	*2*	305	3.37	27.23	101	4.10
V9		-		-	-	-	-		6.92	*3*	300	2.99	27.19	117	5.43
V10		5.04	*7*	249	4.06	2.94	93	2.80	-		-	-	-	-	
V11		4.37	*9*	233	3.25	2.71	86	4.80	7.57	*1*	313	3.40	29.00	101	7.14
C.D.(0.05)		0.6		40.94	0.35	0.18	1.67		0.36		24.19	0.53	0.83	0.57	
C.V.(%)		0.6		12.49	8.6	5.98	1.47		5.5		6.84	18.14	2.77	0.43	
Expt. Mean		**5.42**		**281**	**3.52**	**2.61**	**98**		**5.57**		**303**	**2.52**	**25.70**	**113**	
Soil type		-							Silty clay loam						
pH		6.70							6.70						
Fertilizer levels (kg/ha)															
F1		50:30:20							60:30:15						
F2		100:60:40							120:60:30						
Varieties															
V1		IET 28890							IET 28890						
V2		IET 28196							IET 28196 (R)						
V3		IET 28206							IET 28206 (R)						
V4		IET 28884							IET 28884						
V5		IET 28883							IET 28883						
V6		IET 28895							IET 28895						
V7		IET 28882							IET 28882						
V8		Shalimar Rice 3							Shalimar Rice 3						
V9		-							Vivekdhan 86						
V10		VL Dhan 86							-						
V11		Local Check - VL Dhan 85							Local Check- SR-4						
Available NPK in Soil		345:15:188							221:16:246						

Table 4.1(a): Contd.

Fertilizer-levels	Varieties	MALAN						UPPER SHILLONG					Over All Mean	*Rank*
		Grain Yield (t/ha)	*Rank*	Panicle/m² (No.)	Panicle Weight (g)	Test Wt(g)	Nutrient res. (kg grain/kg Nutrient) (Base level 50% RDF)	Grain Yield (t/ha)	*Rank*	Panicle/m² (No.)	Test Wt(g)	Nutrient res. (kg grain/kg Nutrient) (Base level 50% RDF)		
	V1	5.21	*12*	258	2.81	26.24		-		-	-		4.02	*22*
	V2	4.85	*16*	172	2.85	26.36		-		-	-		5.47	*8*
	V3	5.69	*9*	256	2.72	26.87		0.90	*5*	130	2.49		4.09	*21*
	V4	4.78	*17*	253	1.95	20.61		-		-	-		4.47	*20*
	V5	5.28	*11*	258	3.2	25.64		-		-	-		5.22	*10*
F1 - 50% RFD	V6	5.14	*14*	232	3.17	28.63		-		-	-		5.73	*5*
	V7	4.67	*18*	246	2.55	28.24		-		-	-		5.49	*7*
	V8	4.38	*20*	194	2.61	26.16		-		-	-		5.19	*11*
	V9	5.98	*6*	260	3.03	29.39		0.89	*6*	123	2.78		4.50	*18*
	V10	-		-	-	-		-		-	-		4.90	*14*
	V11	5.21	*12*	219	2.81	29.09		2.00	*2*	143	2.5		4.63	*16*
	V1	5.54	*10*	288	2.4	26.63	3.88	-		-	-		4.59	*17*
	V2	6.03	*5*	225	2.44	26.39	13.88	-		-	-		6.13	*3*
	V3	5.75	*8*	287	2.63	26.47	0.71	1.68	*3*	162	2.52	9.75	4.49	*19*
	V4	5.07	*15*	265	1.81	20.45	3.41	-		-	-		4.87	*15*
	V5	6.73	*1*	271	2.8	26.37	17.06	-		-	-		6.08	*4*
F2 - 100% RFD	V6	5.82	*7*	241	2.91	28.91	8.00	-		-	-		6.16	*2*
	V7	6.17	*3*	307	2.37	28.02	17.65	-		-	-		6.44	*1*
	V8	4.58	*19*	242	2.65	26.73	2.35	-		-	-		5.50	*6*
	V9	6.73	*1*	289	3.72	29.12	8.82	1.20	*4*	127	2.73	3.88	5.04	*13*
	V10	-		-	-	-		-		-	-		5.18	*12*
	V11	6.17	*3*	246	2.54	29.65	11.29	2.69	*1*	183	2.58	8.63	5.35	*9*
Interaction														
F at same V		NS		19.37	0.23	NS		NS		19.37	NS			
V at same F		NS		21.98	0.23	NS		NS		21.98	NS			
Means of F levels:														
F1		5.12	*2*	235	2.77	26.72		1.26	*2*	132	2.59		4.22	*2*
F2		5.86	*1*	266	2.63	26.87	8.71	1.86	*1*	157	2.61	7.42	4.80	*1*
C.D.(0.05)		0.51		15.44	0.09	NS		0.32		18.72	NS			
C.V.(%)		8.42		5.55	3.05	1.84		10.22		6.38	6.84			

Table 4.1(a): Contd.

Fertilizer-levels	Varieties	MALAN						UPPER SHILLONG					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)	Grain Yield (t/ha)	*Rank*	Panicle/m^2 (No.)	Test Wt(g)	Nutrient res. (kg grain/kg Nutrient) (Base level 50% RDF)		
Mean of varieties:														
V1		5.38	*8*	273	2.61	26.44	3.88	-		-	-		4.30	*10*
V2		5.44	*6*	198	2.65	26.38	13.88	-		-	-		5.80	*3*
V3		5.72	*3*	271	2.68	26.67	0.71	1.29	*2*	146	2.51	9.75	4.29	*11*
V4		4.93	*9*	259	1.88	20.53	3.41	-		-	-		4.67	*9*
V5		6.01	*2*	265	3.00	26.01	17.06	-		-	-		5.65	*4*
V6		5.48	*5*	236	3.04	28.77	8.00	-		-	-		5.94	*2*
V7		5.42	*7*	276	2.46	28.13	17.65	-		-	-		5.96	*1*
V8		4.48	*10*	218	2.63	26.45	2.35	-		-	-		5.35	*5*
V9		6.36	*1*	275	3.38	29.26	8.82	1.05	*3*	125	2.76	3.88	4.77	*8*
V10		-		-	-	-		-		-	-		5.04	*6*
V11		5.69	*4*	233	2.68	29.37	11.29	2.35	*1*	163	2.54	8.63	4.99	*7*
C.D.(0.05)		0.44		13.7	0.16	0.92		0.4		16.79	0.13			
C.V.(%)		6.94		4.69	5.21	2.94		19.24		8.72	3.71			
Expt. Mean		**5.49**		**250**	**2.70**	**26.80**		**1.56**		**145**	**2.60**			
Soil type		Silty Clay Loam						Silty Clay Loam						
pH		5.90						5.90						
Fertilizer levels (kg/ha)														
F1		45:20:20						30:30:20						
F2		90:40:40						60:60:40						
Varieties														
V1		IET 28890						-						
V2		IET 28196 (R)						-						
V3		IET 28206 (R)						IET 28206 (R)						
V4		IET 28884						-						
V5		IET 28883						-						
V6		IET 28895						-						
V7		IET 28882						-						
V8		Shalimar Rice 3						-						
V9		Vivekdhan 86						Vivekdhan 86						
V10		-						-						
V11		Local Check - HPR 1068						Local Check - MEG-3						
Available NPK in Soil		311:49:243						311:49:243						

Table 4.1(b): Summary of data on grain yield and ancillary character of selected NMT- medium hill (irrigated) cultures grown under tranpslanted conditions at graded levels of recommended nurtrient(NPK) doses, kharif 2022.

Fertilizer-levels	Varieties	KHUDWANI						
		Grain Yield (t/ha)	*Rank*	Panicle/m^2 (No.)	Panicle Weight (g)	Test Wt(g)	Days for 50% flowering	Nutrient res. (kg grain/kg Nutrient) (Base level 50% RDF)
F1 - 50% RFD	V1	6.48	*7*	300	3.89	28.40	101	
	V2	6.22	*8*	262	2.54	23.93	120	
	V3	5.00	*10*	285	2.16	23.17	117	
	V4	6.58	*5*	313	3.47	29.33	103	
	V5	-		-	-	-	-	
	V6	-		-	-	-	-	
	V7	-		-	-	-	-	
	V8	6.79	*4*	314	3.54	29.83	100	
F2 - 100% RFD	V1	7.51	*3*	307	3.91	28.87	101	9.81
	V2	6.55	*6*	266	2.49	25.50	120	3.14
	V3	5.59	*9*	293	3.09	23.50	118	5.62
	V4	7.67	*2*	322	3.21	28.93	103	10.38
	V5	-		-	-	-	-	
	V6	-		-	-	-	-	
	V7	-		-	-	-	-	
	V8	7.86	*1*	326	3.62	30.50	100	10.19
Interaction								
N at same V		NS		NS	NS	NS	NS	
V at same N		NS		NS	NS	NS	NS	
Means of N levels:								
F1		6.21	*2*	295	3.12	26.93	108	
F2		7.04	*1*	303	3.26	27.46	109	7.83
C.D.(0.05)		0.65		1.99	NS	NS	NS	
C.V.(%)		6.26		0.42	7.19	2.62	0.77	
Mean of varieties:								
V1		7.00	*3*	304	3.90	28.64	101	9.81
V2		6.39	*4*	264	2.52	24.72	120	3.14
V3		5.30	*5*	289	2.63	23.34	118	5.62
V4		7.13	*2*	317	3.34	29.13	103	10.38
V5		-		-	-	-	-	
V6		-		-	-	-	-	
V7		-		-	-	-	-	
V8		7.33	*1*	320	3.58	30.17	100	10.19
C.D.(0.05)		0.25		14.79	0.65	1.13	0.60	
C.V.(%)		3.11		4.04	16.62	3.41	0.45	
Expt. Mean		**6.63**		**299**	**3.19**	**27.20**	**108**	
Soil type		Sandy clay loam						
pH		6.80						
Fertilizer levels (kg/ha)								
F1		60:30:15						
F2		120:60:30						
Varieties								
V1		IET 28224						
V2		IET 28222						
V3		IET 28907						
V4		IET 28217						
V5		-						
V6		-						
V7		-						
V8		Local check (Shalimar Rice-4)135-138 DAYS						
Available NPK in Soil		227:14:234						

Table 4.1(b): Contd.

Fertilizer -levels	Varieties	MALAN						UPPER SHILLONG				
		Grain Yield (t/ha)	*Rank*	Panicle/ m² (No.)	Panicle Weight (g)	Test Wt(g)	Nutrient res. (kg grain/kg Nutrient) (Base level 50% RDF)	Grain Yield (t/ha)	*Rank*	Panicle/m² (No.)	Test Wt(g)	Nutrient res. (kg grain/kg Nutrient) (Base level 50% RDF)
F1 - 50% RFD	V1	4.45	*9*	158	4.03	28.11		2.13	*3*	167	2.77	
	V2	4.36	*11*	160	3.71	26.05		0.80	*8*	104	2.47	
	V3	3.48	*15*	225	2.43	22.49		-		-	-	
	V4	3.08	*16*	217	2.29	28.54		-		-	-	
	V5	4.82	*7*	207	2.35	23.71		-		-	-	
	V6	5.49	*3*	152	3.04	25.49		-		-	-	
	V7	4.82	*7*	156	2.43	24.49		0.82	*7*	117	2.34	
	V8	3.93	*13*	191	2.41	25.35		1.93	*4*	163	2.69	
F2 - 100% RFD	V1	4.88	*6*	178	3.84	28.96	5.06	2.62	*2*	177	2.73	6.13
	V2	5.46	*4*	183	3.12	26.58	12.94	1.02	*6*	115	2.55	2.75
	V3	4.11	*12*	250	2.43	23.81	7.41	-		-	-	
	V4	3.77	*14*	258	2.01	28.63	8.12	-		-	-	
	V5	5.67	*2*	231	2.73	25.39	10.00	-		-	-	
	V6	5.86	*1*	182	3.72	28.67	4.35	-		-	-	
	V7	5.22	*5*	207	2.88	24.66	4.71	1.35	*5*	131	2.37	6.63
	V8	4.39	*10*	248	2.59	27.27	5.41	2.97	*1*	183	2.77	13.00
Interaction												
N at same V		NS		6.05	NS	NS		NS		NS	NS	
V at same N		NS		5.50	NS	NS		NS		NS	NS	
Means of N levels:												
F1		4.30	*2*	183	2.84	25.53		1.42	*2*	138	2.57	
F2		4.92	*1*	217	2.92	26.75	7.25	1.99	*1*	152	2.61	7.13
C.D.(0.05)		NS		21.19	NS	0.65		0.37		10.56	0.03	
C.V.(%)		10.98		8.52	9.56	2.00		12.22		4.16	0.76	
Mean of varieties:												
V1		4.67	*5*	168	3.94	28.54	5.06	2.38	*2*	172	2.75	6.13
V2		4.91	*4*	172	3.42	26.32	12.94	0.91	*4*	109	2.51	2.75
V3		3.80	*7*	238	2.43	23.15	7.41	-		-	-	
V4		3.43	*8*	237	2.15	28.59	8.12	-		-	-	
V5		5.25	*2*	219	2.54	24.55	10.00	-		-	-	
V6		5.68	*1*	167	3.38	27.08	4.35	-		-	-	
V7		5.02	*3*	181	2.66	24.58	4.71	1.09	*3*	124	2.36	6.63
V8		4.16	*6*	220	2.50	26.31	5.41	2.45	*1*	173	2.73	13.00
C.D.(0.05)		0.31		14.27	0.24	0.88		0.27		8.57	0.10	
C.V.(%)		5.75		6.03	6.98	2.86		12.45		4.71	3.07	
Expt. Mean		**4.61**		**200**	**2.88**	**26.14**		**1.71**		**145**	**2.59**	
Soil type		Silty Clay Loam						Silty Clay Loam				
pH		5.60						-				
Fertilizer levels (kg/ha)												
F1		45:20:20						30:30:20				
F2		90:40:40						60:60:40				
Varieties												
V1		IET 28224						IET 28224				
V2		IET 28222						IET 28222				
V3		IET 28907						-				
V4		IET 28217						-				
V5		RC Maniphace 1(NE)						-				
V6		Vivekdhan 62						-				
V7		V L Dhan 65(N)						V L Dhan 65(N)				
V8		Local Check - HPR 2143						Local Check - MEG-2				
Available NPK in Soil		295:46:231						156:19:80				

Table 4.1(b): Contd.

Fertilizer-levels	Varieties	WANGBAL							Over All Mean	Rank
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Weight (g)	Test Wt(g)	Days for 50% flowering	Nutrient res. (kg grain/kg Nutrient) (Base level 50% RDF)		
F1 - 50% RFD	V1	2.67	8	285	3.27	28.07	90		3.93	12
	V2	3.50	4	282	3.37	28.50	90		3.72	13
	V3	2.63	9	339	3.93	28.04	99		3.70	14
	V4	2.50	10	313	3.93	29.76	87		4.05	11
	V5	-		-	-	-	-		4.82	5
	V6	-		-	-	-	-		5.49	3
	V7	-		-	-	-	-		2.82	16
	V8	4.00	2	398	3.10	27.79	105		4.16	10
F2 - 100% RFD	V1	2.83	5	284	3.37	27.77	90	1.78	4.46	7
	V2	3.77	3	292	3.47	28.35	91	3.00	4.20	8
	V3	2.80	6	332	3.93	27.73	98	1.89	4.17	9
	V4	2.77	7	313	3.80	28.88	88	3.00	4.74	6
	V5	-		-	-	-	-		5.67	2
	V6	-		-	-	-	-		5.86	1
	V7	-		-	-	-	-		3.29	15
	V8	4.13	1	403	3.20	27.29	104	1.44	4.84	4
Interaction										
N at same V		NS		NS	NS	NS	NS			
V at same N		NS		NS	NS	NS	NS			
Means of N levels:										
F1		3.06	2	323	3.52	28.43	85		3.75	2
F2		3.26	1	325	3.55	28.00	86	2.22	4.30	1
C.D.(0.05)		0.13		NS	NS	0.30	NS			
C.V.(%)		2.65		2.11	3.72	0.68	0.51			
Mean of varieties:										
V1		2.75	3	284	3.32	27.92	90	1.78	4.20	5
V2		3.64	2	287	3.42	28.43	91	3.00	3.96	6
V3		2.72	4	336	3.93	27.89	98	1.89	3.94	7
V4		2.64	5	313	3.87	29.32	88	3.00	4.40	4
V5		-		-	-	-	-		5.25	2
V6		-		-	-	-	-		5.68	1
V7		-		-	-	-	-		3.05	8
V8		4.07	1	400	3.15	27.54	104	1.44	4.50	3
C.D.(0.05)		0.09		16.46	0.18	0.87	1.04			
C.V.(%)		2.40		4.15	4.25	2.52	0.90			
Expt. Mean		**3.16**		**324**	**3.54**	**28.22**	**94**			
Soil type		Clay Loam								
pH		6.02								
Fertilizer levels (kg/ha)										
F1		40:30:20								
F2		80:60:40								
Varieties										
V1		IET 28224								
V2		IET 28222								
V3		IET 28907								
V4		IET 28217								
V5										
V6										
V7										
V8		Local Check - Punshi- 135 DAYS								
Available NPK in Soil										

4.1(c) AVT 2 - Early (Transplanted)

Eleven AVT-2 entries (IET 29140, IET 28954, IET 28960, IET 29142, IET 29177, IET 28959, IET 28964, IET 28950, IET 29197, IET 27866 and IET 26898) 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, CO 51, PR 124 and US 314 (Hybrid) as well as local checks at thirteen **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), Ranchi (80:40:30), Rewa (100:60:40), 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(c)**.

Different doses of RDF (50% and 100%) exhibited significant differences on grain yield at most of the locations except **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** (6.15 t/ha), **Dhangain** (6.40 t/ha), **Faizabad** (4.27 t/ha), **Ghaghraghat** (4.21 t/h), **Jagdalpur** (5.32 t/ha), **Karjat** (5.18 t/ha), **Maruteru** (5.28 t/ha), **Nagina** (4.53 t/ha), **Ranchi** (4.60 t/ha), **Rewa** (4.98 t/ha), **Sabour** (4.89 t/ha) and **Varanasi** (3.55 t/ha). Nutrient response (kg grain / kg nutrient) was higher at application of 100 % RDF at **Nagina** (17.57), **Coimbatore** (15.44), **Dhangain** (13.64), **Faizabad** (12.55), **Karjat** (9.27), **Maruteru** (8.18), **Jagdalpur** (7.48), **Sabour** (6.23), **Ghaghraghat** (6.12), and **Rewa** (6.07) and while a nominal increase was reported in **Ranchi** (4.60), **Mandya** (3.42) and **Varanasi** (2.21).

Grain yield differences among the tested genotypes were significant at all the locations and found significantly superior over checks in most of the centers except **Rewa**. Significant higher mean maximum yield was recorded by IET 28964 (5.51 t/ha) followed by IET 28959 (5.49 t/ha) at **Coimbatore;** IET 29140 at **Dhangain** (7.37 t/ha); IET 28964 at **Faizabad** (4.23 t/ha); IET 26898 (4.32 t/ha) at **Ghagharaghat**; IET 28959 at **Jagdalpur** (5.90 t/ha); **Karjat** (5.64 t/ha); **Mandya** (5.79 t/ha); **Nagina** (3.94 t/ha); **Sabour** (5.21 t/ha) and **Rewa** (6.69 t/ha); IET 29140 (5.53 t/ha) at **Maruteru** and IET 28960 (5.32 t/ha) at **Ranchi** and **Varanasi** (4.60 t/ha) found promising. Mean over the locations, the performance of IET 28959 (5.10 t/ha) followed by IET 28960 (4.85 t/ha) were promising over MTU 1153 (4.46 t/ha). Interaction effects of nutrient levels x cultivars on grain yield was non-significant at most of the locations.

In this trial, recommended input of nutrients (100% RDF) was found to be promising with 18% higher grain yield and also exhibited higher nutrient efficiency. IET 28959 and IET 28960 recorded higher grain yield among the cultures (5.10 and 4.85 t/ha respectively) were found to be promising entries as compared to standard and local checks.

Table 4.1(c): 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 2022.

F-levels	Varieties	COIMBATORE						DHANGAIN						
		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)	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	3.75	32	236	1.65	20.37		6.79	5	299	5.60	18.00	83	
	V2	4.40	19	283	1.90	21.10		6.25	11	279	5.37	26.80	87	
	V3	4.04	30	263	1.83	20.87		5.88	17	275	4.63	24.33	89	
	V4	4.21	25	274	1.97	21.93		5.32	22	259	4.10	23.33	84	
	V5	3.98	31	243	1.74	21.43		5.16	24	258	4.20	21.87	94	
	V6	4.35	21	286	2.38	22.77		6.34	9	292	5.47	19.20	90	
	V7	4.43	18	277	2.21	22.27		5.69	19	272	4.40	26.80	87	
	V8	4.37	20	265	2.19	22.13		5.98	14	279	4.77	23.33	85	
	V9	4.09	27	244	1.71	21.33		-	-	-	-	-	-	
	V10	4.26	23	286	1.93	20.87		4.80	27	245	3.43	25.40	87	
	V11	4.09	27	266	1.84	20.67		5.09	25	256	3.93	20.67	85	
	V12	4.74	17	223	1.61	18.37		4.05	30	230	2.80	18.13	79	
	V13	4.07	29	267	1.84	20.07		5.93	15	279	4.87	24.27	90	
	V14	-	-	-	-	-		-	-	-	-	-	-	
	V15	4.29	22	276	1.92	20.23		5.47	21	263	4.47	23.73	84	
	V16	4.24	24	288	2.06	21.90		4.75	28	255	3.63	22.27	83	
	V17	4.21	25	265	1.92	21.17		4.25	29	244	3.37	19.60	86	
F2: Optimum input (100% NPK)	V1	5.48	15	320	2.51	20.63	13.84	7.94	1	317	6.03	19.47	84	16.43
	V2	6.54	3	379	2.76	21.37	17.12	7.29	3	293	5.47	27.40	89	14.86
	V3	5.90	13	343	2.69	21.13	14.88	6.75	6	280	5.03	25.33	90	12.43
	V4	6.22	9	357	2.83	22.20	16.08	6.23	12	267	4.73	24.67	85	13.00
	V5	5.83	14	336	2.58	21.73	14.80	6.07	13	265	4.47	24.13	95	13.00
	V6	6.62	1	393	3.37	23.23	18.16	7.50	2	303	5.67	21.07	91	16.57
	V7	6.59	2	385	3.12	22.77	17.28	6.70	7	278	4.93	27.53	89	14.43
	V8	6.49	4	372	3.05	22.37	16.96	6.89	4	289	5.03	25.47	86	13.00
	V9	6.02	10	333	2.58	21.70	15.44	-	-	-	-	-	-	-
	V10	6.29	8	364	2.77	21.07	16.24	5.65	20	251	3.63	27.07	89	12.14
	V11	5.98	11	352	2.68	20.97	15.12	5.93	15	260	4.10	22.40	86	12.00
	V12	5.44	16	312	2.45	18.50	5.60	4.96	26	238	2.97	19.87	80	13.00
	V13	5.96	12	347	2.71	20.23	15.12	6.66	8	290	5.33	25.87	91	10.43
	V14	-	-	-	-	-	-							
	V15	6.35	6	363	2.86	20.50	16.48	6.31	10	275	4.60	24.53	86	12.00
	V16	6.37	5	367	2.91	22.40	17.04	5.88	17	257	3.87	24.00	84	16.14
	V17	6.31	7	351	2.77	21.57	16.80	5.31	23	249	3.57	21.20	87	15.14

Table 4.1(c): Contd.

N-levels	Varieties	COIMBATORE						DHANGAIN						
		Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Panicle Weight (g)	Test weight (g)	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)	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)
Interaction														
F at same V		0.1		NS	NS	NS		NS		NS	NS	NS	NS	
V at same F		0.1		NS	NS	NS		NS		NS	NS	NS	NS	
F1		4.22	2	265	1.92	21.09		5.45	2	266	4.34	22.52	86	
F2		6.15	1	355	2.79	21.40	15.44	6.40	1	274	4.63	24.00	87	13.64
C.D.(0.05)		0.02		2.19	0.14	0.08		0.24		4.54	0.10	0.21	0.17	
C.V.(%)		0.35		0.8	6.72	0.42		4.42		1.85	2.48	1.00	0.21	
Mean of varieties:														
V1		4.62	16	278	2.08	20.50	13.84	7.37	1	308	5.82	18.74	83	16.43
V2		5.47	3	331	2.33	21.24	17.12	6.77	3	286	5.42	27.10	88	14.86
V3		4.97	14	303	2.26	21.00	14.88	6.32	5	278	4.83	24.83	89	12.43
V4		5.22	9	316	2.40	22.07	16.08	5.78	9	263	4.42	24.00	84	13.00
V5		4.91	15	290	2.16	21.58	14.80	5.62	10	262	4.34	23.00	94	13.00
V6		5.49	2	340	2.88	23.00	18.16	6.92	2	298	5.57	20.14	90	16.57
V7		5.51	1	331	2.67	22.52	17.28	6.20	7	275	4.67	27.17	88	14.43
V8		5.43	4	318	2.62	22.25	16.96	6.44	4	284	4.90	24.40	85	13.00
V9		5.06	11	289	2.15	21.52	15.44	-	-	-	-	-	-	-
V10		5.28	7	325	2.35	20.97	16.24	5.23	13	248	3.53	26.24	88	12.14
V11		5.04	12	309	2.26	20.82	15.12	5.51	11	258	4.02	21.54	85	12.00
V12		5.09	10	268	2.03	18.44	5.60	4.51	15	234	2.89	19.00	79	13.00
V13		5.02	13	307	2.28	20.15	15.12	6.30	6	284	5.10	25.07	91	10.43
V14		-	-	-	-	-	-	-	-	-	-	-	-	-
V15		5.32	5	320	2.39	20.37	16.48	5.89	8	269	4.54	24.13	85	12.00
V16		5.31	6	327	2.49	22.15	17.04	5.32	12	256	3.75	23.14	84	16.14
V17		5.26	8	308	2.35	21.37	16.80	4.78	14	247	3.47	20.40	87	15.14
C.D.(0.05)		0.07		9.83	0.1	0.18		0.49		26.25	0.53	1.29	0.64	
C.V. (%)		1.19		2.75	3.67	0.73		7.19		8.42	10.24	4.82	0.64	
Expt. Mean		**5.18**		**310**	**2.35**	**21.25**	**15.44**	**5.93**		**270**	**4.48**	**23.26**	**87**	**13.64**
Soil type		Clay						Clay loam						
pH		8.12						6.35						

Table 4.1(c): Contd.

N-levels	Varieties	COIMBATORE						DHANGAIN						
		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)	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)
N - levels (kg/ha)														
F1		75:25:25						40:20:10						
F2		150:50:50						80:40:20						
Recommended N:P:K (kg/ha)		150:50:50						80:40:20						
Varieties														
V1		IET 29140						IET 29140						
V2		IET 28954						IET 28954						
V3		IET 28960						IET 28960						
V4		IET 29142						IET 29142						
V5		IET 29177						IET 29177						
V6		IET 28959						IET 28959						
V7		IET 28964						IET 28964						
V8		IET 28950						IET 28950						
V9		IET 29197						-						
V10		IET 27866						IET 27866						
V11		IET 26898						IET 26898						
V12		CO-51 (NC),						CO-51 (NC),						
V13		PR-124 (N)						PR-124 (N)						
V14		-						-						
V15		MTU 1153 (S)						MTU 1153 (S)						
V16		US 314 (Hybrid)						US 314 (Hybrid)						
V17		Local Check- CO 54 (115 days)						Local Check- R. Bhagwati (115 days)						
Available N:P:K of soil (kg/ha)		212:22:434						188:40:150						

Table 4.1(c): Contd.

F-levels	Varieties	FAIZABAD							GHAGHRAGHAT						
		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)	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)
F1: Low input (50% NPK)	V1	3.33	23	195	3.31	18.53	67		3.34	24	104	4.23	18.40	61	
	V2	3.53	18	203	4.57	25.53	70		3.43	21	109	4.57	25.20	58	
	V3	3.62	16	180	4.23	28.20	68		3.35	23	104	4.07	27.90	70	
	V4	3.30	24	194	3.40	25.13	71		3.92	17	117	3.40	25.20	71	
	V5	3.34	21	203	3.43	20.00	66		3.73	20	117	3.40	20.10	62	
	V6	3.52	19	206	4.53	25.47	71		3.26	25	99	3.31	25.07	64	
	V7	3.62	16	214	3.53	27.20	73		4.03	12	98	3.43	25.23	62	
	V8	3.28	25	216	3.40	15.60	70		3.77	19	106	4.23	15.20	59	
	V9	3.22	26	198	3.63	13.60	67		4.11	11	112	3.53	14.73	61	
	V10	3.16	28	205	3.15	14.27	73		3.09	27	112	3.20	13.87	62	
	V11	3.41	20	216	4.07	24.97	72		3.96	16	98	4.53	14.77	63	
	V12	2.80	31	162	4.23	23.70	74		3.39	22	102	3.03	23.20	63	
	V13	2.78	32	157	3.20	24.53	76		-	-	-	-	-	-	
	V14	-	-	-	-	-	-		3.00	28	99	3.15	23.20	60	
	V15	3.00	30	164	4.07	23.53	76		-	-	-	-	-	-	
	V16	3.10	29	203	3.13	22.87	74		-	-	-	-	-	-	
	V17	3.20	27	153	3.07	23.20	67		3.17	26	88	3.63	17.97	63	
F2: Optimum input (100% NPK)	V1	4.24	10	243	4.26	19.60	71	11.38	4.22	9	103	4.63	19.33	62	8.00
	V2	4.33	7	245	5.23	26.47	72	10.00	4.28	4	119	4.87	25.53	59	7.73
	V3	4.61	3	230	5.60	29.13	74	12.38	4.46	2	107	4.40	28.60	72	10.09
	V4	4.59	4	243	3.93	26.10	73	16.13	3.99	13	126	3.73	25.50	72	0.64
	V5	4.71	2	192	4.23	21.20	74	17.13	4.23	7	114	3.77	20.60	65	4.55
	V6	4.45	6	274	5.10	26.17	73	11.63	4.23	7	114	3.77	25.30	66	8.82
	V7	4.83	1	296	4.43	28.40	76	15.13	4.26	5	111	3.77	25.77	61	2.09
	V8	4.17	12	245	4.27	16.53	73	11.13	3.99	13	122	4.47	15.73	59	2.00
	V9	4.26	9	234	4.37	14.87	69	13.00	4.35	3	124	3.80	15.47	64	2.18
	V10	4.23	11	240	3.77	14.53	75	13.38	3.97	15	117	3.63	14.53	64	8.00
	V11	4.46	5	243	4.60	26.40	75	13.13	4.68	1	104	5.07	15.53	62	6.55
	V12	3.68	15	210	4.70	24.87	75	11.00	3.92	17	105	3.40	24.20	64	4.82
	V13	3.88	14	212	3.73	25.53	79	13.75	-	-	-	-	-	-	-
	V14	-	-	-	-	-	-	-	4.14	10	116	3.77	23.80	61	10.36
	V15	3.34	21	220	4.60	24.07	78	4.25	-	-	-	-	-	-	-
	V16	4.17	12	243	3.40	24.20	76	13.38	-	-	-	-	-	-	-
	V17	4.32	8	243	3.63	24.40	71	14.00	4.25	6	113	4.40	18.57	65	9.82

Table 4.1(c): Contd.

N-levels	Varieties	FAIZABAD							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)	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)
Interaction															
F at same V		0.17		NS	0.3	NS	1.55		0.44		NS	NS	NS	NS	
V at same F		0.19		NS	0.37	NS	1.83		0.46		NS	NS	NS	NS	
F1		3.26	2	192	3.68	22.27	71		3.54	2	105	3.69	20.72	63	
F2		4.27	1	238	4.37	23.28	74	12.55	4.21	1	114	4.11	21.32	64	6.12
C.D.(0.05)		0.11		16.59	0.29	0.47	1.36		0.21		NS	0.22	0.13	NS	
C.V.(%)		3.31		8.78	8.26	2.36	2.13		5.82		11.88	6.06	0.65	2.2	
Mean of varieties:															
V1		3.79	8	219	3.79	19.07	69	11.38	3.78	9	104	4.43	18.87	62	8.00
V2		3.93	7	224	4.90	26.00	71	10.00	3.86	8	114	4.72	25.37	59	7.73
V3		4.12	2	205	4.92	28.67	71	12.38	3.91	6	105	4.24	28.25	71	10.09
V4		3.95	5	219	3.67	25.62	72	16.13	3.96	5	122	3.57	25.35	72	0.64
V5		4.03	3	198	3.83	20.60	70	17.13	3.98	4	116	3.59	20.35	64	4.55
V6		3.99	4	240	4.82	25.82	72	11.63	3.75	10	106	3.54	25.19	65	8.82
V7		4.23	1	255	3.98	27.80	75	15.13	4.15	3	104	3.60	25.50	62	2.09
V8		3.73	11	231	3.84	16.07	72	11.13	3.88	7	114	4.35	15.47	59	2.00
V9		3.74	10	216	4.00	14.24	68	13.00	4.23	2	118	3.67	15.10	62	2.18
V10		3.70	12	223	3.46	14.40	74	13.38	3.53	14	115	3.42	14.20	63	8.00
V11		3.94	6	230	4.34	25.69	74	13.13	4.32	1	101	4.80	15.15	63	6.55
V12		3.24	15	186	4.47	24.29	75	11.00	3.66	12	103	3.22	23.70	63	4.82
V13		3.33	14	184	3.47	25.03	78	13.75	-	-	-	-	-	-	-
V14		-	-	-	-	-	-	-	3.57	13	108	3.46	23.50	61	10.36
V15		3.17	16	192	4.34	23.80	77	4.25	-	-	-	-	-	-	-
V16		3.64	13	223	3.27	23.54	75	13.38	-	-	-	-	-	-	-
V17		3.76	9	198	3.35	23.80	69	14.00	3.71	11	101	4.02	18.27	64	9.82
C.D.(0.05)		0.12		26.18	0.22	0.44	1.09		0.31		NS	0.22	0.42	1.34	
C.V. (%)		2.76		10.54	4.64	1.66	1.31		7.01		14.01	4.97	1.72	1.84	
Expt. Mean		**3.77**		**215**	**4.03**	**22.78**	**72**	**12.55**	**3.88**		**109**	**3.90**	**21.02**	**63**	**6.12**
Soil type		Sandy loam							Sandy loam						
pH		7.40							7.40						

Table 4.1(c): Contd.

N-levels	Varieties	FAIZABAD							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)	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)
N - levels (kg/ha)															
F1		40:20:20							60:30:20						
F2		80:40:40							120:60:40						
Recommended N:P:K (kg/ha)		80:40:40							120:60:40						
Varieties															
V1		IET 29140							IET 29140						
V2		IET 28954							IET 28954						
V3		IET 28960							IET 28960						
V4		IET 29142							IET 29142						
V5		IET 29177							IET 29177						
V6		IET 28959							IET 28959						
V7		IET 28964							IET 28964						
V8		IET 28950							IET 28950						
V9		IET 29197							IET 29197						
V10		IET 27866							IET 27866						
V11		IET 26898							IET 26898						
V12		CO-51 (NC), PR-124							CO-51 (NC)						
V13		(N)							-						
V14		-							NDR 97						
V15		MTU 1153 (S)							-						
V16		US 314 (Hybrid)							-						
V17		Local Check NDR 97 (103 days)							Local Check - HUR 1309						
Available N:P:K of soil (kg/ha)		200:24:233							200:24:234						

Table 4.1(c): Contd.

F-levels	Varieties	JAGDALPUR							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)	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	3.60	29	217	1.84	17.49	75		4.00	27	229	3.56	17.90	88	
	V2	5.49	6	178	3.47	33.02	72		4.55	23	245	3.55	18.04	88	
	V3	4.94	18	185	2.99	28.22	71		4.66	21	221	3.71	19.27	90	
	V4	3.26	32	173	2.39	22.52	80		3.90	28	222	3.19	17.26	89	
	V5	4.36	27	168	2.89	27.56	71		4.83	16	258	3.21	18.21	91	
	V6	5.30	12	211	2.75	26.15	68		5.42	4	281	3.28	18.98	89	
	V7	5.33	10	177	3.40	32.89	69		4.79	18	216	3.22	19.53	95	
	V8	4.80	20	199	2.67	25.34	69		4.46	24	246	3.07	17.71	90	
	V9	4.40	26	192	2.69	25.84	73		4.15	25	217	2.56	17.61	90	
	V10	4.95	16	177	2.97	28.09	75		4.88	14	251	3.32	18.87	88	
	V11	4.72	21	188	2.75	26.24	80		4.10	26	255	2.84	18.02	86	
	V12	3.46	31	193	1.97	18.74	82		3.20	32	266	2.10	14.53	87	
	V13	4.42	25	166	2.90	27.67	70		3.21	31	224	2.73	19.01	88	
	V14	-	-	-	-	-	-		-	-	-	-	-	-	
	V15	4.67	22	195	2.66	24.98	78		3.61	29	237	3.40	17.64	90	
	V16	4.59	23	211	2.43	23.05	80		3.36	30	199	3.49	17.24	89	
	V17	4.93	19	227	2.37	22.17	73		4.85	15	276	2.79	17.80	87	
F2: Optimum input (100% NPK)	V1	4.56	24	291	1.99	18.45	77	9.60	5.66	2	293	4.51	21.16	87	16.60
	V2	6.30	3	195	3.56	33.78	74	8.10	5.41	6	280	4.47	22.08	87	8.60
	V3	6.03	4	220	2.99	28.52	72	10.90	5.39	7	241	4.64	21.58	88	7.30
	V4	3.99	28	174	2.50	23.27	82	7.30	4.68	20	274	3.92	19.08	88	7.80
	V5	5.33	10	190	3.02	27.92	72	9.70	5.05	11	303	4.00	20.56	88	2.20
	V6	6.49	1	252	2.83	26.37	72	11.90	5.85	1	304	4.38	21.78	89	4.30
	V7	6.39	2	195	3.59	33.70	71	10.60	5.38	8	267	4.30	21.91	87	5.90
	V8	6.02	5	237	2.75	25.58	71	12.20	4.92	13	276	4.01	19.79	89	4.60
	V9	4.95	16	191	2.85	26.63	74	5.50	5.34	9	239	3.70	20.31	88	11.90
	V10	5.25	13	190	3.00	28.47	77	3.00	5.42	4	294	4.02	21.10	88	5.40
	V11	5.34	9	205	2.87	26.80	84	6.20	4.81	17	279	3.56	20.28	85	7.10
	V12	3.51	30	195	2.10	19.42	85	0.50	4.71	19	304	2.70	15.68	86	15.10
	V13	4.98	15	177	3.07	28.25	77	5.60	4.58	22	238	3.62	21.18	87	13.70
	V14	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	V15	5.43	7	218	2.72	25.07	79	7.60	5.00	12	287	4.17	19.61	88	13.90
	V16	5.25	13	228	2.52	23.08	82	6.60	5.43	3	244	4.52	18.87	89	20.70
	V17	5.36	8	232	2.50	22.51	74	4.30	5.17	10	303	3.33	19.63	87	3.20

Table 4.1(c): Contd.

N-levels	Varieties	JAGDALPUR							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)	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)
Interaction															
F at same V		NS		NS	NS	NS	1.44		NS		NS	NS	NS	NS	
V at same F		NS		NS	NS	NS	1.40		NS		NS	NS	NS	NS	
F1		4.58	2	191	2.70	25.62	74		4.25	2	240	3.13	17.98	89	
F2		5.32	1	212	2.80	26.11	77	7.48	5.18	1	277	3.99	20.29	88	9.27
C.D.(0.05)		0.32		3.31	NS	0.38	0.18		0.57		28.85	0.65	0.44	0.9	
C.V.(%)		7.35		1.87	9.21	1.67	0.27		13.72		12.71	20.64	2.62	1.16	
Mean of varieties:															
V1		4.08	14	254	1.92	17.97	76	9.60	4.83	8	261	4.04	19.53	88	16.60
V2		5.90	1	186	3.52	33.40	73	8.10	4.98	6	263	4.01	20.06	88	8.60
V3		5.49	4	202	2.99	28.37	72	10.90	5.03	4	231	4.18	20.43	89	7.30
V4		3.63	15	173	2.45	22.90	81	7.30	4.29	14	248	3.56	18.17	89	7.80
V5		4.85	11	179	2.96	27.74	72	9.70	4.94	7	281	3.61	19.39	89	2.20
V6		5.90	1	231	2.79	26.26	70	11.90	5.64	1	292	3.83	20.38	89	4.30
V7		5.86	3	186	3.50	33.30	70	10.60	5.09	3	241	3.76	20.72	91	5.90
V8		5.41	5	218	2.71	25.46	70	12.20	4.69	10	261	3.54	18.75	90	4.60
V9		4.68	13	191	2.77	26.24	74	5.50	4.75	9	228	3.13	18.96	89	11.90
V10		5.10	7	183	2.99	28.28	76	3.00	5.15	2	272	3.67	19.99	88	5.40
V11		5.03	9	197	2.81	26.52	82	6.20	4.46	11	267	3.20	19.15	86	7.10
V12		3.49	16	194	2.04	19.08	83	0.50	3.96	15	285	2.40	15.11	86	15.10
V13		4.70	12	172	2.99	27.96	74	5.60	3.90	16	231	3.18	20.10	88	13.70
V14		-	-	-	-	-	-	-	-	-	-	-	-	-	-
V15		5.05	8	207	2.69	25.03	79	7.60	4.31	13	262	3.79	18.63	89	13.90
V16		4.92	10	219	2.48	23.07	81	6.60	4.40	12	221	4.01	18.06	89	20.70
V17		5.15	6	229	2.44	22.34	74	4.30	5.01	5	289	3.06	18.72	87	3.20
C.D.(0.05)		0.49		25.41	0.1	0.64	1.02		0.57		36.36	0.74	1.74	1.6	
C.V. (%)		8.54		10.93	3.19	2.14	1.17		10.41		12.19	17.95	7.89	1.57	
Expt. Mean		**4.95**		**201**	**2.75**	**25.87**	**75**		**4.71**		**258**	**3.56**	**19.13**	**88**	
Soil type		Vertisol							-						
pH		6.50							-						

Table 4.1(c): Contd.

N-levels	Varieties	JAGDALPUR							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)	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)
N - levels (kg/ha)															
F1		50:30:20							50:25:25						
F2		100:60:40							100:50:50						
Recommended N:P:K (kg/ha)		100:60:40							100:50:50						
Varieties															
V1		IET 29140							IET 29140						
V2		IET 28954							IET 28954						
V3		IET 28960							IET 28960						
V4		IET 29142							IET 29142						
V5		IET 29177							IET 29177						
V6		IET 28959							IET 28959						
V7		IET 28964							IET 28964						
V8		IET 28950							IET 28950						
V9		IET 29197							IET 29197						
V10		IET 27866							IET 27866						
V11		IET 26898							IET 26898						
V12		CO-51 (NC)							CO-51 (NC)						
V13		PR 124 (N)							PR 124 (N)						
V14		-							-						
V15		MTU 1153 (S)							MTU 1153 (S)						
V16		US 314 (Hybrid)							US 314 (Hybrid)						
V17		Local Check -Samleshwari (115 days)							Local Check -KJT - 7 (115-120 days)						
Available N:P:K of soil (kg/ha)		-							-						

Table 4.1(c): Contd.

F-levels	Varieties	MANDYA							MARUTERU						
		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)	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)
F1: Low input (50% NPK)	V1	4.81	23	326	3.41	20.88	87		5.37	9	202	3.59	20.45	92	
	V2	4.85	22	304	5.01	35.04	92		3.68	30	183	4.11	19.82	92	
	V3	5.16	13	268	5.66	31.38	92		3.79	28	175	4.36	22.05	96	
	V4	5.14	14	290	4.67	24.99	87		4.07	25	167	3.92	20.37	91	
	V5	4.57	26	322	3.85	24.66	92		4.71	16	244	3.96	20.28	97	
	V6	5.55	7	298	5.13	26.72	97		4.36	24	217	3.77	22.33	97	
	V7	5.14	14	293	4.95	31.76	93		5.23	10	238	3.99	22.02	101	
	V8	5.56	5	303	4.62	25.93	91		4.69	17	223	4.24	20.98	94	
	V9	3.78	32	354	2.77	27.80	91		4.74	14	286	3.31	19.74	95	
	V10	4.03	31	307	3.57	28.78	87		4.66	19	265	3.23	20.45	94	
	V11	4.99	20	318	3.89	27.31	84		3.88	27	213	3.87	22.12	92	
	V12	4.47	28	364	2.93	19.25	86		4.00	26	204	3.64	20.65	92	
	V13	5.09	16	314	3.60	22.33	91		4.73	15	259	3.44	20.54	94	
	V14	-	-	-	-	-	-		-	-	-	-	-	-	
	V15	5.44	8	290	4.68	25.02	87		4.55	23	249	3.47	22.49	89	
	V16	4.37	29	272	3.84	23.58	83		3.79	28	241	3.34	20.64	92	
	V17	4.87	21	352	3.62	18.32	86		-	-	-	-	-	-	
F2: Optimum input (100% NPK)	V1	5.07	18	360	3.84	18.84	87	2.60	5.69	4	210	4.04	20.24	92	3.05
	V2	5.06	19	310	5.15	35.39	93	2.10	4.60	21	201	3.88	19.48	92	8.76
	V3	5.59	3	323	5.95	32.07	92	4.30	4.83	13	204	4.43	22.10	95	9.90
	V4	5.40	9	311	4.88	24.43	87	2.60	4.97	11	171	4.02	20.33	90	8.57
	V5	4.69	24	326	4.02	27.20	93	1.20	5.56	6	258	3.37	19.90	97	8.10
	V6	6.02	1	308	5.49	27.09	97	4.70	5.53	8	205	4.07	22.04	99	11.14
	V7	5.40	9	298	5.12	31.55	92	2.60	5.64	5	185	3.16	22.34	102	3.90
	V8	5.93	2	309	5.50	25.13	92	3.70	4.67	18	215	3.35	21.00	94	-0.19
	V9	4.14	30	359	3.06	26.97	92	3.60	6.02	2	263	4.15	20.34	95	12.19
	V10	4.56	27	316	3.73	28.75	87	5.30	5.90	3	224	3.47	20.14	94	11.81
	V11	5.39	11	348	4.31	26.42	84	4.00	4.57	22	211	3.47	21.19	92	6.57
	V12	4.61	25	358	3.04	19.85	86	1.40	4.90	12	185	3.76	20.83	92	8.57
	V13	5.57	4	322	3.83	22.57	91	4.80	6.09	1	310	3.52	20.58	94	12.95
	V14	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	V15	5.56	5	309	5.28	25.04	87	1.20	5.55	7	228	3.73	22.20	89	9.52
	V16	5.09	16	316	4.63	23.98	83	7.20	4.62	20	231	3.20	20.62	93	7.90
	V17	5.21	12	382	3.90	18.85	86	3.40	-	-	-	-	-	-	-

Table 4.1(c): Contd.

N-levels	Varieties	MANDYA							MARUTERU						
		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)	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)
Interaction															
F at same V		NS		NS	NS	NS	NS		NS		30.95	0.29	NS	0.85	
V at same F		NS		NS	NS	NS	NS		NS		30.24	0.28	NS	0.82	
F1		4.86	2	311	4.14	25.86	89		4.42	2	224	3.75	21.00	94	
F2		5.21	1	328	4.48	25.88	89	3.42	5.28	1	220	3.71	20.89	94	8.18
C.D.(0.05)		NS		NS	0.33	NS	0.16		0.28		NS	0.02	NS	NS	
C.V.(%)		20.98		9.98	8.67	1.93	0.2		6.39		2.88	0.64	4.49	0.11	
Mean of varieties:															
V1		4.94	11	343	3.63	19.86	87	2.60	5.53	1	206	3.82	20.35	92	3.05
V2		4.96	10	307	5.08	35.22	92	2.10	4.14	15	192	4.00	19.65	92	8.76
V3		5.38	4	295	5.81	31.73	92	4.30	4.31	12	189	4.40	22.08	96	9.90
V4		5.27	6	301	4.78	24.71	87	2.60	4.52	10	169	3.97	20.35	91	8.57
V5		4.63	13	324	3.94	25.93	92	1.20	5.14	6	251	3.67	20.09	97	8.10
V6		5.79	1	303	5.31	26.91	97	4.70	4.95	8	211	3.92	22.19	98	11.14
V7		5.27	6	296	5.04	31.66	93	2.60	5.44	2	212	3.58	22.18	102	3.90
V8		5.75	2	306	5.06	25.53	91	3.70	4.68	9	219	3.80	20.99	94	-0.19
V9		3.96	16	356	2.92	27.39	91	3.60	5.38	4	275	3.73	20.04	95	12.19
V10		4.30	15	311	3.65	28.77	87	5.30	5.28	5	245	3.35	20.30	94	11.81
V11		5.19	8	333	4.10	26.87	84	4.00	4.23	13	212	3.67	21.66	92	6.57
V12		4.54	14	361	2.99	19.55	86	1.40	4.45	11	194	3.70	20.74	92	8.57
V13		5.33	5	318	3.72	22.45	91	4.80	5.41	3	285	3.48	20.56	94	12.95
V14		-	-	-	-	-	-	-	-	-	-	-	-	-	-
V15		5.50	3	300	4.98	25.03	87	1.20	5.05	7	238	3.60	22.35	89	9.52
V16		4.73	12	294	4.24	23.78	83	7.20	4.21	14	236	3.27	20.63	92	7.90
V17		5.04	9	367	3.76	18.59	86	3.40	-	-	-	-	-	-	-
C.D.(0.05)		0.60		34.97	0.55	1.27	0.41		0.48		21.88	0.21	0.85	0.6	
C.V. (%)		10.38		9.48	11.06	4.25	0.40		8.6		8.53	4.78	3.53	0.55	
Expt. Mean		**5.03**		**320**	**4.31**	**25.87**	**89**		**4.85**		**222**	**3.73**	**20.94**	**94**	
Soil type		Red Sandy loam							Alluvial clay						
pH		7.43							6.50						

Table 4.1(c): Contd.

N-levels	Varieties	MANDYA							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)	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)
N - levels (kg/ha)															
F1		50:25:25							45:30:30						
F2		100:50:50							90:60:60						
Recommended N:P:K (kg/ha)		100:50:50							90:60:60						
Varieties															
V1		IET 29140							IET 29140						
V2		IET 28954							IET 28954						
V3		IET 28960							IET 28960						
V4		IET 29142							IET 29142						
V5		IET 29177							IET 29177						
V6		IET 28959							IET 28959						
V7		IET 28964							IET 28964						
V8		IET 28950							IET 28950						
V9		IET 29197							IET 29197						
V10		IET 27866							IET 27866						
V11		IET 26898							IET 26898						
V12		CO-51 (NC)							CO-51 (NC)						
V13		PR 124 (N)							PR 124 (N)						
V14		-							-						
V15		MTU 1153 (S)							MTU 1153 (S)						
V16		US 314 (Hybrid)							US 314 (Hybrid)						
V17		Local Check -MSN 99 (115-120 days)							-						
Available N:P:K of soil (kg/ha)		317:60:231							172:47:286						

Table 4.1(c): Contd.

F-levels	Varieties	NAGINA							RANCHI					
		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)	Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Test weight (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: Low input (50% NPK)	V1	2.66	19	221	3.15	26.30	94		4.73	10	266	23.19	91	
	V2	2.59	21	218	3.36	26.34	89		4.42	17	250	23.17	94	
	V3	2.57	23	239	3.32	26.37	95		5.26	3	274	24.20	90	
	V4	2.27	28	244	3.40	26.42	96		4.33	20	242	24.10	95	
	V5	2.52	24	237	3.31	26.29	94		4.49	14	233	23.97	87	
	V6	3.00	15	233	3.36	26.30	93		3.47	28	195	23.55	95	
	V7	2.59	21	233	3.47	26.37	93		4.46	16	239	24.00	93	
	V8	2.80	16	244	3.18	26.30	91		4.53	12	229	24.35	94	
	V9	-	-	-	-	-	-		4.40	18	242	24.30	88	
	V10	2.75	17	258	3.41	26.47	95		4.03	24	226	24.06	87	
	V11	2.73	18	239	3.37	26.30	93		3.91	26	225	24.01	93	
	V12	2.61	20	206	2.49	25.77	83		4.67	11	263	24.26	91	
	V13	2.30	27	222	3.27	26.33	96		4.03	24	276	23.97	82	
	V14	-	-	-	-	-	-		-	-	-	-	-	
	V15	2.50	26	228	3.52	26.27	100		4.28	21	266	24.22	82	
	V16	2.52	24	226	2.92	26.85	88		-	-	-	-	-	
	V17	-	-	-	-	-	-		2.82	29	185	23.96	71	
F2: Optimum input (100% NPK)	V1	4.67	4	321	3.16	26.34	96	18.27	5.33	2	293	25.56	97	8.00
	V2	4.67	4	312	3.36	26.38	90	18.91	5.07	6	269	23.88	90	8.67
	V3	4.57	6	317	3.48	26.39	95	18.18	5.37	1	286	24.95	98	1.47
	V4	4.44	10	325	3.20	26.46	96	19.73	5.01	7	281	24.80	94	9.07
	V5	4.52	9	317	3.35	26.33	94	18.18	4.75	9	256	24.73	90	3.47
	V6	4.87	2	297	3.36	26.39	93	17.00	3.85	27	223	24.22	98	5.07
	V7	4.53	8	306	3.48	26.42	93	17.64	4.50	13	246	24.68	96	0.53
	V8	4.83	3	299	3.20	26.36	92	18.45	4.80	8	256	24.92	97	3.60
	V9	-	-	-	-	-	-	-	5.10	5	264	24.78	91	9.33
	V10	5.00	1	333	3.60	26.57	95	20.45	4.35	19	254	25.06	90	4.27
	V11	4.38	11	316	3.36	26.40	93	15.00	4.47	15	243	24.89	96	7.47
	V12	4.10	13	318	2.50	25.77	83	13.55	5.16	4	287	24.96	95	6.53
	V13	4.05	14	293	2.98	26.33	96	15.91	4.14	23	288	24.08	84	1.47
	V14	-	-	-	-	-	-	-	-	-	-	-	-	-
	V15	4.55	7	290	3.52	26.31	100	18.64	4.28	21	266	24.22	82	0.00
	V16	4.29	12	320	2.95	25.94	88	16.09	-	-	-	-	-	-
	V17	-	-	-	-	-	-	-	2.82	29	185	23.96	71	0.00

Table 4.1(c): Contd.

N-levels	Varieties	NAGINA							RANCHI					
		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)	Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Test weight (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Interaction														
F at same V		NS		NS	0.06	0.04	NS		NS		NS	NS	1.17	
V at same F		NS		NS	0.06	0.04	NS		NS		NS	NS	2.12	
F1		2.60	2	232	3.25	26.33	93		4.26	2	241	23.95	89	
F2		4.53	1	312	3.25	26.31	93	17.57	4.60	1	260	24.65	92	4.60
C.D.(0.05)		0.14		9.27	NS	0.02	NS		0.19		19	0.37	2.34	
C.V.(%)		4.32		3.63	0.87	0.08	1.00		4.69		8.37	1.67	2.85	
Mean of varieties:														
V1		3.67	4	271	3.16	26.32	95	18.27	5.03	2	280	24.38	94.33	8.00
V2		3.63	5	265	3.36	26.36	89	18.91	4.75	5	260	23.53	92.33	8.67
V3		3.57	6	278	3.40	26.38	95	18.18	5.32	1	280	24.58	94.33	1.47
V4		3.36	12	285	3.30	26.44	96	19.73	4.67	6	261	24.45	94.50	9.07
V5		3.52	10	277	3.33	26.31	94	18.18	4.62	8	245	24.35	88.67	3.47
V6		3.94	1	265	3.36	26.35	93	17.00	3.66	14	209	23.89	96.67	5.07
V7		3.56	7	270	3.48	26.40	93	17.64	4.48	9	243	24.34	94.67	0.53
V8		3.82	3	271	3.19	26.33	91	18.45	4.67	7	243	24.64	95.67	3.60
V9		-	-	-	-	-	-	-	4.75	4	253	24.54	89.67	9.33
V10		3.88	2	296	3.51	26.52	95	20.45	4.19	11	240	24.56	88.50	4.27
V11		3.56	8	278	3.37	26.35	93	15.00	4.19	11	234	24.45	94.67	7.47
V12		3.36	13	262	2.50	25.77	83	13.55	4.92	3	275	24.61	93.33	6.53
V13		3.18	14	258	3.13	26.33	96	15.91	4.09	13	282	24.03	83.33	1.47
V14		-	-	-	-	-	-	-	-	-	-	-	-	-
V15		3.53	9	259	3.52	26.29	100	18.64	4.28	10	266	24.22	82.33	0.00
V16		3.41	11	273	2.94	26.40	88	16.09	-	-	-	-	-	-
V17		-	-	-	-	-	-	-	2.82	15	185	23.96	70.67	0.00
C.D.(0.05)		0.19		15.87	0.04	0.03	0.79		0.43		26.97	0.58	0.83	
C.V. (%)		4.60		5.05	1.11	0.09	0.74		8.46		9.33	2.07	0.8	
Expt. Mean		**3.57**		**272**	**3.25**	**26.32**	**92.99**		**4.43**		**250**	**24.30**	**90.24**	
Soil type		-							Clay Loam					
pH		7.70							-					

Table 4.1(c): Contd.

N-levels	Varieties	NAGINA							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)	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)
N - levels (kg/ha)														
F1		60:30:20							40:20:10					
F2		120:60:40							80:40:20					
Recommended N:P:K (kg/ha)		120:60:40							80:40:20					
Varieties														
V1		IET 29140							IET 29140					
V2		IET 28954							IET 28954					
V3		IET 28960							IET 28960					
V4		IET 29142							IET 29142					
V5		IET 29177							IET 29177					
V6		IET 28959							IET 28959					
V7		IET 28964							IET 28964					
V8		IET 28950							IET 28950					
V9		-							IET 29197					
V10		IET 27866							IET 27866					
V11		IET 26898							IET 26898					
V12		CO-51 (NC),							CO-51 (NC),					
V13		PR-124 (N)							PR-124 (N)					
V14		-							-					
V15		MTU 1153 (S)							MTU 1153 (S)					
V16		US 314 (Hybrid)							-					
V17		**-**							**Local Check - BVD 110**					
Available N:P:K of soil (kg/ha)		-							-					

Table 4.1(c): Contd.

F-levels	Varieties	REWA							SABOUR					
		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)	Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Panicle Weight (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: Low input (50% NPK)	V1	3.97	23	262	5.30	17.60	92		4.62	19	232	2.63	83	
	V2	3.90	26	303	6.13	27.57	91		4.67	18	229	3.13	85	
	V3	4.97	10	261	4.33	27.87	63		4.79	17	234	3.13	84	
	V4	3.67	28	302	4.30	23.93	90		4.90	14	238	2.70	84	
	V5	4.53	15	353	3.70	25.47	94		4.80	16	246	2.63	81	
	V6	6.40	2	343	5.97	32.60	91		4.93	12	202	3.03	84	
	V7	3.83	27	290	4.60	26.20	94		4.86	15	243	2.80	85	
	V8	4.27	20	321	4.77	26.00	91		3.75	29	231	2.73	85	
	V9	3.33	29	318	3.93	25.40	95		3.44	31	201	3.03	84	
	V10	5.40	6	287	3.77	28.87	95		4.45	24	211	2.90	85	
	V11	4.63	13	335	5.37	26.33	93		3.11	32	227	2.90	83	
	V12	3.93	25	334	4.50	21.07	88		3.76	28	242	2.57	82	
	V13	3.23	30	220	4.40	29.20	96		4.60	20	260	3.00	83	
	V14	-	-	-	-	-	-		-	-	-	-	-	
	V15	5.30	8	394	5.93	25.70	91		4.57	21	245	2.90	85	
	V16	4.17	21	328	5.03	25.93	86		4.56	22	258	2.83	85	
	V17	-	-	-	-	-	-		4.49	23	252	3.00	85	
F2: Optimum input (100% NPK)	V1	4.40	17	273	5.63	18.07	89	4.30	5.16	6	241	2.67	83	6.75
	V2	4.50	16	317	6.63	26.63	88	6.00	5.14	7	237	3.17	85	5.88
	V3	5.53	5	272	4.63	28.37	88	5.60	5.32	4	247	3.23	84	6.63
	V4	4.40	17	310	4.80	24.33	89	7.30	5.45	2	243	2.73	85	6.88
	V5	5.03	9	367	4.93	25.93	91	5.00	5.28	5	259	2.77	81	6.00
	V6	6.97	1	355	6.43	33.43	87	5.70	5.48	1	214	3.10	84	6.88
	V7	4.40	17	332	5.20	30.00	91	5.70	5.41	3	255	2.97	85	6.88
	V8	4.90	11	330	5.23	29.80	90	6.30	4.22	25	242	2.90	85	5.88
	V9	4.10	22	332	4.37	26.17	93	7.70	3.90	27	213	3.07	85	5.75
	V10	5.83	4	332	4.17	29.33	91	4.30	4.91	13	217	2.93	85	5.75
	V11	5.33	7	347	5.90	26.97	91	7.00	3.55	30	233	3.03	83	5.50
	V12	4.70	12	345	4.97	21.40	85	7.70	4.22	25	254	2.67	82	5.75
	V13	3.97	23	328	4.93	29.33	91	7.40	5.12	9	269	3.03	83	6.50
	V14	-	-	-	-	-	-	-	-	-	-	-	-	-
	V15	5.97	3	403	6.43	26.17	90	6.70	5.04	10	255	2.97	85	5.88
	V16	4.60	14	342	5.47	26.80	84	4.30	5.13	8	265	2.97	84	7.13
	V17	-	-	-	-	-	-	-	4.95	11	264	3.07	85	5.75

Table 4.1(c): Contd.

N-levels	Varieties	REWA							SABOUR					
		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)	Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Panicle Weight (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Interaction														
F at same V		NS		NS	NS	NS	NS		NS		NS	NS	NS	
V at same F		NS		NS	NS	NS	NS		NS		NS	NS	NS	
F1		4.37	2	310	4.80	25.98	90		4.39	2	234	2.87	84	
F2		4.98	1	332	5.31	26.85	89	6.07	4.89	1	244	2.96	84	6.23
C.D.(0.05)		0.22		NS	0.16	NS	NS		0.32		2.5	NS	NS	
C.V.(%)		5.29		10.88	3.44	9.97	9.92		7.73		1.19	3.9	0.68	
Mean of varieties:														
V1		4.19	11	268	5.47	17.84	90	4.30	4.89	7	237	2.65	83	6.75
V2		4.20	10	310	6.38	27.10	89	6.00	4.91	6	233	3.15	85	5.88
V3		5.25	4	267	4.48	28.12	75	5.60	5.06	4	240	3.18	84	6.63
V4		4.04	13	306	4.55	24.13	90	7.30	5.18	2	240	2.72	84	6.88
V5		4.78	6	360	4.32	25.70	93	5.00	5.04	5	252	2.70	81	6.00
V6		6.69	1	349	6.20	33.02	89	5.70	5.21	1	208	3.07	84	6.88
V7		4.12	12	311	4.90	28.10	93	5.70	5.14	3	249	2.89	85	6.88
V8		4.59	7	325	5.00	27.90	91	6.30	3.99	14	236	2.82	85	5.88
V9		3.72	14	325	4.15	25.79	94	7.70	3.67	15	207	3.05	85	5.75
V10		5.62	3	310	3.97	29.10	93	4.30	4.68	12	214	2.92	85	5.75
V11		4.98	5	341	5.64	26.65	92	7.00	3.33	16	230	2.97	83	5.50
V12		4.32	9	340	4.74	21.24	87	7.70	3.99	13	248	2.62	82	5.75
V13		3.60	15	274	4.67	29.27	93	7.40	4.86	8	265	3.02	83	6.50
V14		-	-	-	-	-	-	-	-	-	-	-	-	-
V15		5.64	2	399	6.18	25.94	90	6.70	4.81	10	250	2.94	85	5.88
V16		4.39	8	335	5.25	26.37	85	4.30	4.85	9	261	2.90	85	7.13
V17		-	-	-	-	-	-	-	4.72	11	258	3.04	85	5.75
C.D.(0.05)		0.46		45.56	0.76	2.47	NS		0.34		20.95	0.16	0.52	
C.V. (%)		8.5		12.28	12.96	8.11	10.07		6.3		7.58	4.83	0.53	
Expt. Mean		**4.67**		**321**	**5.06**	**26.42**	**90**		**4.64**		**239**	**2.91**	**84**	
Soil type		-							-					
pH		-							7.60					

Table 4.1(c): Contd.

N-levels	Varieties	REWA							SABOUR					
		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)	Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Panicle Weight (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
N - levels (kg/ha)														
F1		50:30:20							50:20:10					
F2		100:60:40							100:40:20					
Recommended N:P:K (kg/ha)		100:60:40							100:40:20					
Varieties														
V1		IET 29140							IET 29140					
V2		IET 28954							IET 28954					
V3		IET 28960							IET 28960					
V4		IET 29142							IET 29142					
V5		IET 29177							IET 29177					
V6		IET 28959							IET 28959					
V7		IET 28964							IET 28964					
V8		IET 28950							IET 28950					
V9		IET 29197							IET 29197					
V10		IET 27866							IET 27866					
V11		IET 26898							IET 26898					
V12		CO-51 (NC),							CO-51 (NC),					
V13		PR-124 (N)							PR-124 (N)					
V14		-							-					
V15		MTU 1153 (S)							MTU 1153 (S)					
V16		US 314 (Hybrid)							US 314 (Hybrid)					
V17		-							Local Check Sabour Deept					
Available N:P:K of soil (kg/ha)		-							160:27:197					

Table 4.1(c): Contd.

F-levels	Varieties	VARANASI							Over all mean	Rank
		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	4.43	5	191	2.57	20.72	68		4.26	21
	V2	3.41	17	178	2.36	30.43	75		4.24	22
	V3	4.54	3	112	4.33	28.83	76		4.43	17
	V4	3.83	10	133	2.82	24.99	72		4.01	28
	V5	3.85	9	175	2.33	24.91	80		4.22	23
	V6	4.21	7	188	2.68	24.50	78		4.62	16
	V7	3.21	19	125	3.29	28.60	78		4.40	19
	V8	3.53	15	165	3.17	22.88	76		4.29	20
	V9	2.59	29	122	1.92	24.28	77		3.84	31
	V10	2.87	25	123	2.59	25.77	72		4.10	26
	V11	3.43	16	143	1.90	25.75	74		4.00	29
	V12	1.36	32	112	1.29	20.93	67		3.57	33
	V13	2.63	28	124	2.45	24.65	75		3.92	30
	V14	-	-	-	-	-	-		3.00	34
	V15	2.76	27	138	28.56	24.25	68		4.20	24
	V16	2.37	31	131	24.35	24.53	66		3.80	
	V17	3.59	14	194	24.08	21.95	82		4.04	27
F2: Optimum input (100% NPK)	V1	4.77	1	170	20.86	22.73	82	2.83	5.17	4
	V2	4.47	4	161	21.83	31.19	75	8.83	5.20	3
	V3	4.27	6	117	41.75	29.06	75	-2.25	5.28	2
	V4	2.45	30	124	24.12	21.95	69	-11.50	4.76	14
	V5	2.94	23	154	20.97	24.05	78	-7.58	4.92	9
	V6	4.57	2	174	34.51	25.33	79	3.00	5.57	1
	V7	3.01	22	115	26.51	29.01	77	-1.67	5.16	5
	V8	3.83	10	141	26.89	23.41	76	2.50	5.05	7
	V9	3.62	13	173	30.47	24.61	77	8.58	4.71	15
	V10	3.06	21	149	25.53	26.94	72	1.58	4.96	8
	V11	3.19	20	169	22.48	24.35	72	-2.00	4.78	12
	V12	3.35	18	145	16.30	21.07	67	16.58	4.40	18
	V13	2.77	26	134	23.36	25.13	75	1.17	4.81	11
	V14	-	-	-	-	-	-	-	4.14	25
	V15	3.65	12	132	27.76	24.27	75	7.42	5.09	6
	V16	2.88	24	163	28.62	21.67	68	4.25	4.88	
	V17	4.03	8	198	21.88	22.07	83	3.67	4.77	13

Table 4.1(c): Contd.

N-levels	Varieties	VARANASI							Over all mean	Rank
		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)		
Interaction										
F at same V		0.35		14.95	1.06	1.15	0.96			
V at same F		0.38		16.11	1.34	1.19	0.94			
F1		3.29	2	147	6.92	24.87	74		4.11	2
F2		3.55	1	151	25.87	24.80	75	2.21	4.97	1
C.D.(0.05)		0.21		NS	1.11	NS	0.16			
C.V.(%)		6.85		6.92	7.68	2.52	0.24			
Mean of varieties:										
V1		4.60	1	180	11.72	21.73	75	2.83	4.72	5
V2		3.94	4	169	12.10	30.81	75	8.83	4.72	4
V3		4.41	2	115	23.04	28.95	76	-2.25	4.85	2
V4		3.14	10	129	13.47	23.47	71	-11.50	4.38	12
V5		3.40	7	165	11.65	24.48	79	-7.58	4.57	8
V6		4.39	3	181	18.60	24.92	79	3.00	5.10	1
V7		3.11	11	120	14.90	28.81	78	-1.67	4.78	3
V8		3.68	6	153	15.03	23.15	76	2.50	4.67	6
V9		3.11	12	148	16.20	24.45	77	8.58	4.28	15
V10		2.97	13	136	14.06	26.36	72	1.58	4.53	9
V11		3.31	8	156	12.19	25.05	73	-2.00	4.39	11
V12		2.36	16	128	8.80	21.00	67	16.58	3.99	16
V13		2.70	14	129	12.91	24.89	75	1.17	4.37	13
V14		-	-	-	-	-	-	-	3.57	17
V15		3.21	9	135	28.16	24.26	72	7.42	4.64	7
V16		2.63	15	147	26.49	23.10	67	4.25	4.34	14
V17		3.81	5	196	22.98	22.01	82	3.67	4.41	10
C.D.(0.05)		0.25		10.57	0.75	0.81	0.68			
C.V. (%)		6.31		6.14	3.95	2.83	0.79			
Expt. Mean		**3.42**		**149**	**16.39**	**24.84**	**75**		4.54	
Soil type		Clay loam								
pH		7.60								

Table 4.1(c): Contd.

N-levels	Varieties	VARANASI							Over all mean	Rank
		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)		
N - levels (kg/ha)										
F1		60:30:30								
F2		120:60:60								
Recommended N:P:K (kg/ha)		120:60:60								
Varieties										
V1		IET 29140								
V2		IET 28954								
V3		IET 28960								
V4		IET 29142								
V5		IET 29177								
V6		IET 28959								
V7		IET 28964								
V8		IET 28950								
V9		IET 29197								
V10		IET 27866								
V11		IET 26898								
V12		CO-51 (NC),								
V13		PR-124 (N)								
V14		-								
V15		MTU 1153 (S)								
V16		US 314 (Hybrid)								
V17		Local Check HUR - 3022								
Available N:P:K of soil (kg/ha)		180:30:203								

4.1(d) AVT 2 - Irrigated Medium Early

AVT-2 IME cultures (IET 29214, IET 29233, IET 29217, IET 29212, IET 28353, IET 29235, IET 29246, IET 29238, IET 28982, IET 28128, IET 28979, IET 29236 and IET 28506) were evaluated at 17 locations *viz.,* **Aduthurai (150:60:60), ARI-Rajendranagar (120:60:40), 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) and Varanasi (120:60:40)** in comparison to high yielding standard checks (IR 64 Sub-1, PR 113, Lalat, Karjat 7, MTU 1010, HC-US 312, Gotra Bidhan 3 and 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(e)**.

Application of different nutrient levels significantly influenced the grain yield at all the locations except at **Gangavathi, Maruteru and Nawagam.** Application of 100% RDF recorded significantly higher grain yield at **Aduthurai** (4.44 t/ha), **ARI Rajendrangar** (6.43 t/ha), **Chinsurah** 5.89 t/ha), **Dhangain** (5.62 t/ha), **Faizabad** (4.63 t/ha), **Ghaghraghat** (4.21 t/ha), **Kanpur** (4.44 t/ha), **Karjat** (4.86 t/ha), **Kota** (4.08 t/ha), **Mandya** (6.39 t/ha), **Nagina** (4.46 t/ha), **Navsari** (4.49 t/ha), **Puducherry** (6.49 t/ha) and **Varanasi** (4.56 t/ha) with mean grain yield increase of 16% over 50% of RDF application. Nutrient response (kg grain/kg nutrient) was found to be higher (>5%) with the application of 100% RDF (9 out of 17 locations at **Chinsurah** (27.96), **ARI Rajendrangar** (18.06), **Nagina** (16.72), **Karjat** (13.18), **Faizabad** (10.45), **Mandya** (10.16), **Navsari** (8.38), **Kota** (7.40) and **Dhangain** (5.22) as compared to other locations.

Grain yield differences among the tested varieties were found to be significant at all the locations except **ARI-Rajendranagar** and **Ghaghraghat**. Highest grain yield was recorded by IET 29214 at **Aduthurai** (5.09 t/ha) and **Maruteru** (5.73 t/ha) while, IET 29235 recorded higher grain yield at **ARI-Rajendranagar** (5.66 t/ha), **Dhangain** (6.54 t/ha) and **Kota** (8.30 t/ha). Mean over the locations performance of IET 29235 (5.25 t/ha) followed by IET 28128 (5.22 t/ha) were promising in terms of higher yields. Interaction effect among RDF x varieties was found to be non-significant at all the locations except at **Faizabad**, **Gangavathi, Mandya, Puducherry** and **Varanasi** where in 100% RDF gave better yields of cultures as compared to 50% 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 16% higher grain yield. IET 29235 (5.25 t/ha) and IET 28128 (5.22 t/ha) performed better and recorded higher mean grain yield across the locations as compared to other test entries and checks.

Table 4.1(d): Summary of data on grain yield and ancillary characters of selected AVT -2 IME cultures grown under transplanted conditions at low and optimum levels of recommended fertilizer doses, kharif 2022.

F-levels	Varieties	ADUTHURAI					ARI Rajendranagar						
		Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Panicle Wt(g)	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 for 50% Flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: low input (50% NPK)	V1	4.75	4	384	2.60		4.22	32	242	2.38	25.23	109	
	V2	3.92	22	329	2.68		4.49	25	176	4.21	25.40	100	
	V3	4.21	16	282	2.53		4.16	33	152	3.89	24.30	100	
	V4	4.49	9	328	2.54		3.85	34	198	3.34	20.23	104	
	V5	3.58	30	289	2.77		4.69	18	178	4.04	24.23	98	
	V6	3.65	27	275	2.61		4.52	23	180	3.83	23.37	106	
	V7	3.42	32	250	2.67		4.47	26	207	3.38	23.00	107	
	V8	4.02	20	311	2.93		4.60	21	169	3.30	24.17	104	
	V9	4.22	15	343	2.77		4.67	19	128	3.29	25.07	98	
	V10	4.39	12	309	3.10		4.56	22	163	3.27	20.97	95	
	V11	3.83	24	307	2.73		4.47	26	187	3.91	24.23	95	
	V12	3.13	34	294	3.02		4.50	24	195	3.78	22.83	102	
	V13	3.78	25	339	2.70		4.43	30	155	3.90	25.00	113	
	V14	3.65	27	297	3.01		4.46	28	149	3.41	21.50	102	
	V15	3.60	29	278	2.81		-	-	-	-	-	-	
	V16	-	-	-	-		-	-	-	-	-	-	
	V17	-	-	-	-		-	-	-	-	-	-	
	V18	3.23	33	259	2.00		4.46	28	182	3.84	24.03	99	
	V19	-	-	-	-		-	-	-	-	-	-	
	V20	-	-	-	-		4.65	20	159	3.69	24.00	93	
	V21	3.46	31	305	2.46		4.33	31	163	3.60	21.17	95	
F2: Optimum input (100% NPK)	V1	5.43	1	391	2.72	5.04	6.43	7	319	3.05	25.27	110	20.09
	V2	4.49	9	338	2.84	4.22	6.64	4	181	4.50	26.13	101	19.55
	V3	4.69	6	288	2.66	3.56	6.32	11	166	4.04	24.53	102	19.64
	V4	5.05	2	337	2.61	4.15	6.19	15	233	4.61	20.47	107	21.27
	V5	4.12	19	300	2.88	4.00	6.37	10	183	4.14	25.40	100	15.27
	V6	4.13	17	285	2.70	3.56	6.80	1	193	4.07	23.53	109	20.73
	V7	3.93	21	261	2.75	3.78	6.08	16	218	3.43	23.30	109	14.64
	V8	4.63	7	321	2.99	4.52	6.30	12	198	3.74	24.43	106	15.45
	V9	4.72	5	356	2.84	3.70	6.39	8	178	3.76	26.77	101	15.64
	V10	4.90	3	323	3.19	3.78	6.60	6	202	3.52	21.87	101	18.55
	V11	4.39	12	326	2.80	4.15	6.63	5	205	4.27	25.23	100	19.64
	V12	3.76	26	308	3.11	4.67	6.76	3	242	4.34	23.70	108	20.55
	V13	4.55	8	352	2.79	5.70	6.39	8	190	4.28	25.43	120	17.82
	V14	4.43	11	313	2.76	5.78	6.78	2	158	4.55	22.30	103	21.09
	V15	4.23	14	289	2.91	4.67	-	-	-	-	-	-	-
	V16	-	-	-	-	-	-	-	-	-	-	-	-
	V17	-	-	-	-	-	-	-	-	-	-	-	-
	V18	3.89	23	271	2.05	4.89	6.29	13	213	4.30	24.07	103	16.64
	V19	-	-	-	-	-	-	-	-	-	-	-	-
	V20	-	-	-	-	-	6.05	17	199	3.72	24.67	93	12.73
	V21	4.13	17	318	2.55	4.96	6.29	13	224	4.00	22.07	101	17.82
Interaction													
N at same V		NS		NS	NS		NS		NS	NS	NS	NS	
V at same N		NS		NS	NS		NS		NS	NS	NS	NS	
Means of F levels:													
F1		3.84	2	305	2.70		4.44	2	176	3.59	23.5	101	
F2		4.44	1	316	2.77	4.42	6.43	1	206	4.02	24.1	104	18.06
C.D.(0.05)		0.03		0.59	0.07		0.16		17.44	NS	NS	0.86	
C.V.(%)		0.79		0.22	2.95		3.36		10.73	13.71	4.32	0.98	

Table 4.1(d): Contd.

F-levels	Varieties	ADUTHURAI					ARI Rajendranagar						
		Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Panicle Wt(g)	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 for 50% Flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Mean of varieties													
V1		5.09	*1*	387	2.66	5.04	5.33	*13*	281	2.72	25.3	110	20.09
V2		4.21	*7*	333	2.76	4.22	5.57	*5*	179	4.36	25.8	100	19.55
V3		4.45	*5*	285	2.60	3.56	5.24	*16*	159	3.97	24.4	101	19.64
V4		4.77	*2*	333	2.58	4.15	5.02	*17*	216	3.98	20.4	105	21.27
V5		3.85	*13*	294	2.83	4.00	5.53	*7*	180	4.09	24.8	99	15.27
V6		3.89	*12*	280	2.66	3.56	5.66	*1*	187	3.95	23.5	107	20.73
V7		3.68	*15*	256	2.71	3.78	5.28	*15*	212	3.41	23.2	108	14.64
V8		4.33	*6*	316	2.96	4.52	5.45	*9*	184	3.52	24.3	105	15.45
V9		4.47	*4*	350	2.81	3.70	5.53	*8*	153	3.53	25.9	100	15.64
V10		4.65	*3*	316	3.15	3.78	5.58	*4*	183	3.40	21.4	98	18.55
V11		4.11	*9*	317	2.77	4.15	5.55	*6*	196	4.09	24.7	97	19.64
V12		3.45	*17*	301	3.07	4.67	5.63	*2*	218	4.06	23.3	105	20.55
V13		4.17	*8*	346	2.75	5.70	5.41	*10*	173	4.09	25.2	116	17.82
V14		4.04	*10*	305	2.89	5.78	5.62	*3*	154	3.98	21.9	102	21.09
V15		3.92	*11*	283	2.86	4.67	-	-	-	-	-	-	-
V16		-	-	-	-	-	-	-	-	-	-	-	-
V17		-	-	-	-	-	-	-	-	-	-	-	-
V18		3.56	*16*	265	2.03	4.89	5.38	*11*	198	4.07	24.1	101	16.64
V19		-	-	-	-	-	-	-	-	-	-	-	-
V20		-	-	-	-	-	5.35	*12*	179	3.71	24.3	93	12.73
V21		3.80	*14*	312	2.51	4.96	5.31	*14*	194	3.80	21.6	98	17.82
C.D.(0.05)		0.15		5.07	0.16		NS		41.61	0.47	1.13	2.82	
C.V.(%)		3.19		1.43	5.03		10.26		19.08	10.72	4.17	2.41	
Expt. Mean		**4.14**		**311**	**2.74**		**5.44**		**191**	**3.81**	**23.8**	**103**	
Soil type		Clay Loam					Clay Loam						
pH		-					7.30						
F - levels (kg/ha)													
F1		75:30:30					60:30:20						
F2		150:60:60					120:60:40						
Recmnd N:P:K		150:60:60					120:60:40						
Varieties													
V1		IET 29214					IET 29214						
V2		IET 29233					IET 29233						
V3		IET 29217					IET 29217						
V4		IET 29212					IET 29212						
V5		IET 28353					IET 28353						
V6		IET 29235					IET 29235						
V7		IET 29246					IET 29246						
V8		IET 29238					IET 29238						
V9		IET 28982					IET 28982						
V10		IET 28128					IET 28128						
V11		IET 28979					IET 28979						
V12		IET 29236					IET 29236						
V13		IET 28506					IET 28506						
V14		Gontra Bidhan-3 (NC)					Gondhra Bidhan-3 (NC)						
V15		PR 113 (N)					-						
V16		-					-						
V17		-					-						
V18		MTU 1010 (C& S)					MTU 1010 (C& S)						
V19		-					-						
V20		-					US 312						
V21		Local Check - ADT 53					Local Check - JGL 24423 (125 days)						
Avlb NPK of soil		-					-						

Table 4.1(d): Contd.

F-levels	Varieties	CHINSURAH						DHANGAIN						
		Grain Yield (t/ha)	Rank	Panicle /m² (No.)	Panicle Wt (g)	Days for 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 for 50% Flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: low input (50% NPK)	V1	3.97	24	259	3.74	104		4.82	27	290	4.65	20.53	113	
	V2	4.59	18	277	5.35	104		5.45	16	324	5.21	26.13	106	
	V3	3.49	29	268	5.39	98		5.38	18	314	4.95	27.07	94	
	V4	3.04	32	226	4.29	87		5.31	22	295	4.78	22.27	103	
	V5	3.17	31	238	3.13	92		5.48	15	324	5.43	21.60	99	
	V6	4.44	19	225	3.88	99		5.87	5	334	7.03	23.47	97	
	V7	4.29	20	233	3.07	99		4.96	25	290	4.18	24.67	99	
	V8	4.68	17	231	3.76	98		4.27	32	270	3.91	27.87	103	
	V9	4.19	21	216	4.35	100		5.34	19	311	5.12	23.47	95	
	V10	4.11	22	220	4.03	98		5.63	11	330	6.94	24.13	94	
	V11	3.91	26	220	3.95	98		5.63	11	326	5.64	24.80	95	
	V12	3.86	28	248	3.40	98		5.54	13	327	6.40	21.87	105	
	V13	4.07	23	252	3.54	92		3.87	34	232	3.48	24.00	138	
	V14	3.89	27	190	3.70	91		5.33	20	299	5.07	21.07	95	
	V15	-	-	-	-	-		-	-	-	-	-	-	
	V16	-	-	-	-	-		-	-	-	-	-	-	
	V17	-	-	-	-	-		-	-	-	-	-	-	
	V18	3.21	30	252	3.13	95		4.48	30	283	4.37	23.07	91	
	V19	-	-	-	-	-		-	-	-	-	-	-	
	V20	3.96	25	279	3.83	99		4.40	31	271	4.10	21.33	96	
	V21	-	-	-	-	-		3.96	33	247	3.71	27.20	98	
F2: Optimum input (100% NPK)	V1	6.07	6	335	4.26	104	30.00	5.44	17	299	5.58	21.33	114	5.64
	V2	6.16	4	341	4.82	104	22.43	5.80	9	336	6.05	27.33	107	3.18
	V3	5.61	14	283	4.94	98	30.29	5.76	10	324	5.84	27.73	95	3.45
	V4	5.39	15	345	3.88	87	33.57	5.87	5	310	5.65	23.20	104	5.09
	V5	6.15	5	306	3.07	92	42.57	5.86	7	330	6.34	23.73	100	3.45
	V6	5.91	7	312	3.68	99	21.00	7.20	1	349	7.65	24.13	98	12.09
	V7	6.24	2	330	4.38	100	27.86	5.32	21	298	4.78	27.47	100	3.27
	V8	6.22	3	327	4.22	98	22.00	4.96	25	273	4.15	27.93	104	6.27
	V9	5.75	13	338	4.29	100	22.29	5.82	8	318	5.76	27.40	95	4.36
	V10	5.84	9	306	4.74	98	24.71	6.12	2	337	7.13	27.20	95	4.45
	V11	6.51	1	347	4.74	98	37.14	6.11	3	332	6.40	27.07	96	4.36
	V12	5.86	8	347	4.27	98	28.57	6.04	4	332	6.81	22.80	106	4.55
	V13	5.80	11	318	4.84	92	24.71	4.62	29	257	3.74	24.53	139	6.82
	V14	5.81	10	264	5.39	91	27.43	5.50	14	310	5.67	21.47	96	1.55
	V15	-	-	-	-	-	-	-	-	-	-	-	-	-
	V16	-	-	-	-	-	-	-	-	-	-	-	-	-
	V17	-	-	-	-	-	-	-	-	-	-	-	-	-
	V18	5.10	16	273	4.49	95	27.00	5.22	23	295	5.45	23.47	92	6.73
	V19	-	-	-	-	-	-	-	-	-	-	-	-	-
	V20	5.77	12	336	5.39	99	25.86	5.07	24	290	4.31	25.20	97	6.09
	V21	-	-	-	-	-	-	4.77	28	261	3.86	27.67	99	7.36
Interaction														
N at same V		NS		NS	0.92	NS		NS		NS	NS	NS	NS	
V at same N		NS		NS	1.06	NS		NS		NS	NS	NS	NS	
Means of F levels:														
F1		3.93	2	240	3.91	97		5.04	2	298	5.00	23.8	101	
F2		5.89	1	319	4.46	97	27.96	5.62	1	309	5.60	25.3	102	5.22
C.D.(0.05)		1.00		23.23	NS	NS		0.09		5.52	0.46	0.14	0.15	
C.V.(%)		23.16		9.47	20.08	0.36		2.09		2.13	10.15	0.69	0.17	

Table 4.1(d): Contd.

F-levels	Varieties	CHINSURAH						DHANGAIN						
		Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Panicle Wt(g)	Days for 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 for 50% Flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Mean of varieties														
	V1	5.02	*6*	297	4.00	104	30.00	5.13	*12*	294	5.12	20.9	113	5.64
	V2	5.38	*2*	309	5.09	104	22.43	5.63	*6*	330	5.63	26.7	106	3.18
	V3	4.55	*14*	275	5.17	98	30.29	5.57	*9*	319	5.40	27.4	94	3.45
	V4	4.22	*15*	286	4.09	87	33.57	5.59	*7*	302	5.22	22.7	104	5.09
	V5	4.66	*13*	272	3.10	92	42.57	5.67	*5*	327	5.89	22.7	99	3.45
	V6	5.18	*5*	269	3.78	99	21.00	6.54	*1*	341	7.34	23.8	98	12.09
	V7	5.27	*3*	282	3.73	100	27.86	5.14	*11*	294	4.48	26.1	100	3.27
	V8	5.45	*1*	279	3.99	98	22.00	4.62	*15*	271	4.03	27.9	104	6.27
	V9	4.97	*8*	277	4.32	100	22.29	5.58	*8*	314	5.44	25.4	95	4.36
	V10	4.98	*7*	263	4.39	98	24.71	5.88	*2*	334	7.04	25.7	95	4.45
	V11	5.21	*4*	284	4.35	98	37.14	5.87	*3*	329	6.02	25.9	95	4.36
	V12	4.86	*11*	298	3.84	98	28.57	5.79	*4*	330	6.61	22.3	106	4.55
	V13	4.94	*9*	285	4.19	92	24.71	4.25	*17*	244	3.61	24.3	139	6.82
	V14	4.85	*12*	227	4.55	91	27.43	5.42	*10*	305	5.37	21.3	95	1.55
	V15	-	-	-	-	-	-	-	-	-	-	-	-	-
	V16	-	-	-	-	-	-	-	-	-	-	-	-	-
	V17	-	-	-	-	-	-	-	-	-	-	-	-	-
	V18	4.16	*16*	262	3.81	95	27.00	4.85	*13*	289	4.91	23.3	92	6.73
	V19	-	-	-	-	-	-	-	-	-	-	-	-	-
	V20	4.87	*10*	307	4.61	99	25.86	4.74	*14*	281	4.21	23.3	96	6.09
	V21	-	-	-	-	-	-	4.37	*16*	254	3.79	27.4	99	7.36
	C.D.(0.05)	0.59		38.88	0.65	0.35		0.63		27.42	0.83	1.14	0.52	
	C.V.(%)	10.34		12.05	13.46	0.32		10.42		7.91	13.75	4.07	0.45	
	Expt. Mean	**4.91**		**279**	**4.19**	**97**		**5.33**		**303**	**5.30**	**24.5**	**102**	
	Soil type	Clay loam						Clay loam						
	pH	7.60						6.35						
F - levels (kg/ha)														
	F1	35:17.5:17.5						60:30:20						
	F2	70:35:35						120:60:40						
	Recmnd NPK	70:35:35						120:60:40						
Varieties														
	V1	IET 29214						IET 29214						
	V2	IET 29233						IET 29233						
	V3	IET 29217						IET 29217						
	V4	IET 29212						IET 29212						
	V5	IET 28353						IET 28353						
	V6	IET 29235						IET 29235						
	V7	IET 29246						IET 29246						
	V8	IET 29238						IET 29238						
	V9	IET 28982						IET 28982						
	V10	IET 28128						IET 28128						
	V11	IET 28979						IET 28979						
	V12	IET 29236						IET 29236						
	V13	IET 28506						IET 28506						
	V14	Gondhra Bidhan-3 (NC)						Gondhra Bidhan-3 (NC)						
	V15	-						-						
	V16	-						-						
	V17	-						-						
	V18	MTU 1010 (C& S)						MTU 1010 (C& S)						
	V19	-						-						
	V20	US 312						US 312						
	V21	-						Local Check - R. Bhagwati (110-115 days)						
Avlb NPK of soil		104:96:510						188:41:150						

Table 4.1(d): Contd.

F-levels	Varieties	FAIZABAD							GANGAVATHI						
		Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Panicle Wt(g)	Test wt(g)	Days for 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 for 50% Flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: low input (50% NPK)	V1	3.25	29	207	4.17	20.60	89		3.89	35	437	1.84	21.22	98	
	V2	3.90	17	213	4.20	29.20	91		5.83	1	295	3.82	26.61	93	
	V3	3.30	26	217	3.23	21.70	92		5.02	15	273	4.39	28.43	98	
	V4	3.33	24	225	4.23	22.57	87		4.96	16	348	2.64	24.42	98	
	V5	3.49	23	221	3.87	24.27	89		4.41	26	288	2.46	22.32	91	
	V6	3.11	32	214	3.20	23.63	91		5.11	12	291	3.44	23.94	93	
	V7	3.19	31	217	3.57	23.90	87		4.18	30	306	2.59	27.37	96	
	V8	3.70	20	209	4.20	25.30	84		4.80	23	269	2.71	26.73	93	
	V9	3.67	21	224	4.63	26.03	89		5.75	5	262	4.93	27.53	89	
	V10	2.94	34	223	4.13	23.80	82		4.90	18	241	2.72	23.40	86	
	V11	3.33	24	217	4.27	25.37	88		5.49	7	289	3.16	25.73	83	
	V12	3.74	18	233	4.37	23.60	94		4.87	21	304	2.94	22.52	93	
	V13	3.29	27	222	2.83	23.50	82		3.29	39	345	2.68	27.45	115	
	V14	3.58	22	203	3.40	23.60	89		5.15	11	272	3.49	21.55	89	
	V15	-	-	-	-	-	-		4.03	33	292	2.88	29.92	95	
	V16	-	-	-	-	-	-		3.92	34	455	2.26	27.51	86	
	V17	-	-	-	-	-	-		4.33	27	408	2.04	21.86	83	
	V18	3.07	33	204	3.23	23.83	87		4.06	32	460	2.11	24.49	83	
	V19	-	-	-	-	-	-		3.67	37	319	3.26	22.96	83	
	V20	3.22	30	197	3.87	22.73	94		5.06	13	275	3.55	21.16	90	
	V21	3.28	28	223	4.50	24.90	93		4.20	29	320	2.97	15.77	95	
F2: Optimum input (100% NPK)	V1	4.69	8	246	4.67	21.17	93	12.00	3.80	36	524	1.52	20.36	98	-0.60
	V2	4.76	5	256	4.57	29.67	92	7.17	5.49	7	397	4.59	26.97	93	-2.27
	V3	4.56	11	254	3.23	21.70	92	10.50	4.50	25	353	3.85	26.85	98	-3.47
	V4	4.72	6	274	4.23	22.57	87	11.58	5.06	13	395	2.58	23.68	98	0.67
	V5	5.00	4	264	4.67	24.87	94	12.58	4.21	28	416	2.52	20.76	91	-1.33
	V6	4.28	15	268	3.67	24.40	96	9.75	5.23	10	364	2.85	22.13	93	0.80
	V7	4.58	10	247	4.13	24.27	91	11.58	4.79	24	385	2.51	27.10	96	4.07
	V8	5.21	2	254	4.63	25.63	88	12.58	4.91	17	318	3.17	26.13	93	0.73
	V9	5.25	1	275	4.77	26.37	94	13.17	5.69	6	302	4.21	26.88	89	-0.40
	V10	3.74	18	256	4.70	24.70	88	6.67	5.76	4	323	3.47	22.99	86	5.73
	V11	4.53	12	267	4.77	26.07	91	10.00	5.82	2	312	3.41	24.39	83	2.20
	V12	4.72	6	296	4.83	24.53	96	8.17	3.34	38	327	3.17	22.51	93	-10.20
	V13	5.09	3	254	3.40	24.23	86	15.00	2.78	41	425	2.38	26.84	115	-3.40
	V14	4.32	13	256	3.90	24.10	92	6.17	5.79	3	340	4.24	20.85	89	4.27
	V15	-	-	-	-	-	-	-	4.89	20	334	3.43	29.26	95	5.73
	V16	-	-	-	-	-	-	-	2.76	42	511	2.36	27.79	86	-7.73
	V17	-	-	-	-	-	-	-	3.23	40	392	1.77	21.61	83	-7.33
	V18	4.32	13	253	3.87	24.53	93	10.42	4.82	22	457	2.43	24.34	83	5.07
	V19	-	-	-	-	-	-	-	4.15	31	274	2.39	23.80	83	3.20
	V20	4.27	16	252	4.50	23.17	97	8.75	5.28	9	266	4.25	20.96	92	1.47
	V21	4.67	9	242	4.87	25.07	97	11.58	4.90	18	327	2.88	15.74	95	4.67
Interaction															
N at same V		0.19		13.87	NS	NS	1.77		0.33		30.72	0.33	NS	NS	
V at same N		0.21		13.89	NS	NS	1.87		0.38		30.73	0.36	NS	NS	
Means of F level															
F1		3.38	2	216	3.88	24.0	89		4.62	2	321	2.99	24.4	92	
F2		4.63	1	260	4.32	24.5	92	10.45	4.63	1	369	3.05	23.9	92	0.09
C.D.(0.05)		0.13		4.48	0.05	0.44	0.96		NS		8.7	NS	0.38	NS	
C.V.(%)		3.87		2.21	1.51	2.15	1.24		7.69		3.29	9.1	2.04	0.39	

Table 4.1(d): Contd.

F-levels	Varieties	FAIZABAD							GANGAVATHI						
		Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Panicle Wt(g)	Test wt (g)	Days for 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 for 50% Flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Mean of varieties															
	V1	3.97	*9*	227	4.42	20.9	91	12.00	3.85	*18*	481	1.68	20.8	98	-0.60
	V2	4.33	*3*	235	4.39	29.4	92	7.17	5.66	*2*	346	4.21	26.8	93	-2.27
	V3	3.93	*12*	236	3.23	21.7	92	10.50	4.76	*10*	313	4.12	27.6	98	-3.47
	V4	4.03	*7*	249	4.23	22.6	87	11.58	5.01	*8*	371	2.61	24.1	98	0.67
	V5	4.25	*4*	242	4.27	24.6	91	12.58	4.31	*15*	352	2.49	21.5	91	-1.33
	V6	3.70	*15*	241	3.44	24.0	94	9.75	5.17	*6*	327	3.15	23.0	93	0.80
	V7	3.89	*13*	232	3.85	24.1	89	11.58	4.49	*12*	346	2.55	27.2	96	4.07
	V8	4.46	*2*	232	4.42	25.5	86	12.58	4.86	*9*	293	2.94	26.4	93	0.73
	V9	4.46	*1*	250	4.70	26.2	92	13.17	5.72	*1*	282	4.57	27.2	89	-0.40
	V10	3.34	*17*	240	4.42	24.3	85	6.67	5.33	*5*	282	3.10	23.2	86	5.73
	V11	3.93	*11*	242	4.52	25.7	90	10.00	5.66	*3*	301	3.29	25.1	83	2.20
	V12	4.23	*5*	265	4.60	24.1	95	8.17	4.11	*16*	315	3.06	22.5	93	-10.20
	V13	4.19	*6*	238	3.12	23.9	84	15.00	3.04	*21*	385	2.53	27.1	115	-3.40
	V14	3.95	*10*	229	3.65	23.9	91	6.17	5.47	*4*	306	3.87	21.2	89	4.27
	V15	-	-	-	-	-	-	-	4.46	*13*	313	3.16	29.6	95	5.73
	V16	-	-	-	-	-	-	-	3.34	*20*	483	2.31	27.7	86	-7.73
	V17	-	-	-	-	-	-	-	3.78	*19*	400	1.91	21.7	83	-7.33
	V18	3.70	*15*	229	3.55	24.2	90	10.42	4.44	*14*	458	2.27	24.4	83	5.07
	V19	-	-	-	-	-	-	-	3.91	*17*	297	2.83	23.4	83	3.20
	V20	3.75	*14*	225	4.19	23.0	96	8.75	5.17	*6*	271	3.90	21.1	91	1.47
	V21	3.98	*8*	233	4.69	25.0	95	11.58	4.55	*11*	323	2.93	15.8	95	4.67
	C.D.(0.05)	0.14		9.8	0.24	0.4	1.25		0.23		21.72	0.23	1.09	0.49	
	C.V.(%)	2.98		3.61	5.12	1.43	1.21		4.39		5.51	6.73	3.94	0.47	
	Expt. Mean	**4.00**		**238**	**4.10**	**24.3**	**90**		**4.62**		**345**	**3.02**	**24.2**	**92**	
	Soil type	Sandy loam							Black clay						
	pH	7.40							8.20						
F - levels (kg/ha)															
	F1	60:30:30							75:37.5:37.5						
	F2	120:60:60							150:75:75						
	Recmnd NPK	120:60:60							150:75:75						
	Varieties														
	V1	IET 29214							IET 29214						
	V2	IET 29233							IET 29233						
	V3	IET 29217							IET 29217						
	V4	IET 29212							IET 29212						
	V5	IET 28353							IET 28353						
	V6	IET 29235							IET 29235						
	V7	IET 29246							IET 29246						
	V8	IET 29238							IET 29238						
	V9	IET 28982							IET 28982						
	V10	IET 28128							IET 28128						
	V11	IET 28979							IET 28979						
	V12	IET 29236							IET 29236						
	V13	IET 28506							IET 28506						
	V14	Gondhra Bidhan-3 (NC)							Gondhra Bidhan-3 (NC)						
	V15	-							PR 113 (N)						
	V16	-							Lalat (E & NE)						
	V17	-							Karjat-7 (W)						
	V18	MTU 1010 (C& S)							MTU 1010 (C& S)						
	V19	-							IR 64 sub1(RP)						
	V20	US 312							US 312						
	V21	Local Check - NDR 3112-1 (125 days)							Local check - GGV-05-01 (135 days)						
	Avlb NPK of soil	200:24:233							-						

Table 4.1(d): Contd.

F-levels	Varieties	GHAGHRAGHAT							KANPUR				
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle Wt (g)	Test wt(g)	Days for 50% Flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)	Grain Yield (t/ha)	Rank	Panicle Wt(g)	Days for 50% Flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: low input (50% NPK)	V1	3.52	28	149	3.73	20.53	78		4.01	23	3.32	62	
	V2	3.72	19	142	4.30	21.57	78		3.81	28	3.37	66	
	V3	3.65	23	135	3.30	21.40	80		4.43	8	3.54	61	
	V4	3.75	18	148	3.53	22.60	77		4.38	11	3.42	63	
	V5	3.72	19	138	4.27	24.40	79		4.17	19	3.40	62	
	V6	3.89	17	145	3.40	23.60	75		3.71	31	3.12	59	
	V7	3.72	19	135	3.37	23.53	72		4.09	22	3.38	63	
	V8	3.59	25	143	4.33	25.23	79		3.81	28	3.06	58	
	V9	3.52	28	149	4.47	25.67	75		3.60	32	3.14	67	
	V10	3.46	30	149	4.40	23.90	78		4.50	5	3.59	59	
	V11	3.56	27	149	3.40	25.57	76		4.37	12	3.26	57	
	V12	3.95	15	129	4.43	23.97	75		3.89	26	3.18	65	
	V13	3.66	22	137	2.97	23.63	75		4.00	25	3.23	57	
	V14	3.65	23	147	3.60	25.10	74		3.88	27	3.08	59	
	V15	-	-	-	-	-	-		-	-	-	-	
	V16	-	-	-	-	-	-		-	-	-	-	
	V17	-	-	-	-	-	-		-	-	-	-	
	V18	-	-	-	-	-	-		4.01	23	3.20	67	
	V19	-	-	-	-	-	-		-	-	-	-	
	V20	-	-	-	-	-	-		3.76	30	3.22	64	
	V21	3.59	25	147	4.23	28.27	70		-	-	-	-	
F2: Optimum input (100% NPK)	V1	4.25	7	174	4.77	20.90	79	6.08	4.46	6	3.42	74	3.75
	V2	4.31	4	158	4.70	21.90	80	4.92	4.34	13	3.56	77	4.42
	V3	4.15	11	154	3.87	22.43	82	4.17	4.90	2	3.78	71	3.92
	V4	3.97	14	161	4.60	23.37	79	1.83	4.80	3	3.60	76	3.50
	V5	4.23	8	143	4.60	24.83	82	4.25	4.46	6	3.58	72	2.42
	V6	4.15	11	149	4.07	24.90	77	2.17	4.26	17	3.32	72	4.58
	V7	4.35	2	163	3.80	24.63	96	5.25	4.41	9	3.54	75	2.67
	V8	4.31	4	146	4.70	25.83	82	6.00	4.22	18	3.34	72	3.42
	V9	4.22	9	151	5.23	26.17	79	5.83	4.12	21	3.42	80	4.33
	V10	4.35	2	146	4.77	24.07	80	7.42	4.92	1	3.82	70	3.50
	V11	4.10	13	152	3.90	25.93	74	4.50	4.56	4	3.36	68	1.58
	V12	4.27	6	172	4.97	24.13	76	2.67	4.33	15	3.33	77	3.67
	V13	4.20	10	169	3.40	24.07	77	4.50	4.34	13	3.40	69	2.83
	V14	3.95	15	179	4.33	25.90	76	2.50	4.30	16	3.28	73	3.50
	V15	-	-	-	-	-	-	-	-	-	-	-	-
	V16	-	-	-	-	-	-	-	-	-	-	-	-
	V17	-	-	-	-	-	-	-	-	-	-	-	-
	V18	-	-	-	-	-	-	-	4.41	9	3.38	80	3.33
	V19	-	-	-	-	-	-	-	-	-	-	-	-
	V20	-	-	-	-	-	-	-	4.14	20	3.44	75	3.17
	V21	4.37	1	176	4.87	28.87	73	6.50	-	-	-	-	-
Interaction													
N at same V		NS		16.19	NS	0.39	NS		NS		NS	NS	
V at same N		NS		15.77	NS	0.44	NS		NS		NS	NS	
Means of F level													
F1		3.66	2	143	3.85	23.9	76		4.03	2	3.28	62	
F2		4.21	1	159	4.44	24.5	79	4.57	4.44	1	3.47	74	3.41
C.D.(0.05)		0.31		2.53	0.25	0.29	NS		0.19		0.16	9.41	
C.V.(%)		8.67		1.85	6.67	1.33	3.85		5.11		5.24	15.8	

Table 4.1(d): Contd.

F-levels	Varieties	GHAGHRAGHAT							KANPUR				
		Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Panicle Wt(g)	Test wt (g)	Days for 50% Flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)	Grain Yield (t/ha)	Rank	Panicle Wt(g)	Days for 50% Flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Mean of varieties													
	V1	3.89	*11*	161	4.25	20.7	78	6.08	4.24	*7*	3.37	68	3.75
	V2	4.02	*4*	150	4.50	21.7	79	4.92	4.08	*12*	3.47	72	4.42
	V3	3.90	*10*	145	3.59	21.9	81	4.17	4.67	*2*	3.66	66	3.92
	V4	3.86	*13*	154	4.07	23.0	78	1.83	4.59	*3*	3.51	70	3.50
	V5	3.98	*6*	141	4.44	24.6	81	4.25	4.32	*5*	3.49	67	2.42
	V6	4.02	*3*	147	3.74	24.3	76	2.17	3.99	*14*	3.22	66	4.58
	V7	4.04	*2*	149	3.59	24.1	84	5.25	4.25	*6*	3.46	69	2.67
	V8	3.95	*7*	145	4.52	25.5	81	6.00	4.02	*13*	3.20	65	3.42
	V9	3.87	*12*	150	4.85	25.9	77	5.83	3.86	*16*	3.28	74	4.33
	V10	3.91	*9*	148	4.59	24.0	79	7.42	4.71	*1*	3.71	65	3.50
	V11	3.83	*14*	151	3.65	25.8	75	4.50	4.47	*4*	3.31	63	1.58
	V12	4.11	*1*	151	4.70	24.1	76	2.67	4.11	*10*	3.26	71	3.67
	V13	3.93	*8*	153	3.19	23.9	76	4.50	4.17	*9*	3.32	63	2.83
	V14	3.80	*15*	163	3.97	25.5	75	2.50	4.09	*11*	3.18	66	3.50
	V15	-	-	-	-	-	-	-	-	-	-	-	-
	V16	-	-	-	-	-	-	-	-	-	-	-	-
	V17	-	-	-	-	-	-	-	-	-	-	-	-
	V18	-	-	-	-	-	-	-	4.21	*8*	3.29	74	3.33
	V19	-	-	-	-	-	-	-	-	-	-	-	-
	V20	-	-	-	-	-	-	-	3.95	*15*	3.33	70	3.17
	V21	3.98	*5*	161	4.55	28.6	72	6.50	-	-	-	-	-
	C.D.(0.05)	NS		11.45	0.23	0.27	1.30		0.27		0.20	NS	
	C.V.(%)	5.28		6.56	4.74	0.98	1.46		5.46		5.22	9.78	
	Expt. Mean	**3.94**		**151**	**4.14**	**24.2**	**78**		**4.23**		**3.38**	**68**	
	Soil type	Sandy Loam							Sandy loam				
	pH	7.40							7.80				
F - levels (kg/ha)													
	F1	60:30:30							60:30:30				
	F2	120:60:60							120:60:60				
	Recmnd NPK	120:60:60							120:60:60				
Varieties													
	V1	IET 29214							IET 29214				
	V2	IET 29233							IET 29233				
	V3	IET 29217							IET 29217				
	V4	IET 29212							IET 29212				
	V5	IET 28353							IET 28353				
	V6	IET 29235							IET 29235				
	V7	IET 29246							IET 29246				
	V8	IET 29238							IET 29238				
	V9	IET 28982							IET 28982				
	V10	IET 28128							IET 28128				
	V11	IET 28979							IET 28979				
	V12	IET 29236							IET 29236				
	V13	IET 28506							IET 28506				
	V14	Gondhra Bidhan-3 (NC)							Gondhra Bidhan-3 (NC)				
	V15	-							-				
	V16	-							-				
	V17	-							-				
	V18	-							MTU 1010 (C& S)				
	V19	-							-				
	V20	-							US 312				
	V21	Local check - NDR 2064							-				
	Avlb NPK of soil	200:24:234							-				

Table 4.1(d): Contd.

F-levels	Varieties	KARJAT							KOTA					
		Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Panicle Wt(g)	Test wt(g)	Days for 50% Flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)	Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Panicle Wt (g)	Days for 50% Flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: low input (50% NPK)	V1	2.19	34	245	1.84	13.26	106		5.84	27	284	3.69	98	
	V2	3.00	32	186	2.13	20.04	99		6.33	19	213	5.34	95	
	V3	3.17	29	189	2.84	22.45	93		5.33	31	184	5.17	87	
	V4	3.71	23	232	1.83	17.87	97		6.08	24	276	3.91	93	
	V5	3.28	27	270	2.49	16.08	88		6.61	16	254	4.60	89	
	V6	4.15	20	237	2.66	17.97	92		7.68	3	247	5.54	91	
	V7	3.33	26	256	2.77	15.22	99		6.18	20	277	3.91	91	
	V8	3.65	24	227	2.67	19.18	90		5.91	26	211	5.08	89	
	V9	3.92	21	230	3.39	21.04	92		6.18	20	195	5.71	87	
	V10	4.28	18	233	3.40	17.54	90		6.35	18	211	5.40	86	
	V11	3.75	22	202	3.41	18.92	89		7.32	8	249	5.15	86	
	V12	4.25	19	248	2.41	18.43	99		5.54	30	224	4.36	95	
	V13	3.22	28	243	2.43	15.74	93		-	-	-	-	-	
	V14	4.35	16	202	3.47	14.68	89		6.68	14	241	4.76	87	
	V15	-	-	-	-	-	-		5.60	29	234	4.13	91	
	V16	-	-	-	-	-	-		-	-	-	-	-	
	V17	-	-	-	-	-	-		-	-	-	-	-	
	V18	2.54	33	233	2.16	19.08	85		-	-	-	-	-	
	V19	-	-	-	-	-	-		-	-	-	-	-	
	V20	4.29	17	245	3.31	16.59	91		6.47	17	263	4.23	86	
	V21	3.17	29	260	2.06	15.99	97		5.14	32	233	3.91	82	
F2: Optimum input (100% NPK)	V1	3.11	31	288	3.12	14.32	106	9.20	6.62	15	300	4.03	99	7.09
	V2	4.62	12	223	3.92	21.29	96	16.20	6.78	12	226	5.47	95	4.09
	V3	4.66	9	253	3.90	24.74	91	14.90	6.09	23	201	5.48	87	6.91
	V4	4.63	11	271	3.12	19.37	96	9.20	6.86	11	287	4.30	94	7.09
	V5	4.59	14	304	3.48	17.68	88	13.10	7.01	10	262	4.98	90	3.64
	V6	5.63	2	251	4.00	19.79	91	14.80	8.92	1	270	6.00	92	11.27
	V7	4.65	10	283	3.64	16.8	98	13.20	6.73	13	289	4.10	92	5.00
	V8	4.56	15	253	3.63	20.54	88	9.10	7.33	7	236	5.60	91	12.91
	V9	5.58	4	249	4.01	22.93	90	16.60	7.51	5	222	6.12	88	12.09
	V10	5.45	7	288	4.72	18.21	88	11.70	7.58	4	231	5.94	88	11.18
	V11	5.57	5	261	4.58	20.42	88	18.20	8.48	2	263	5.70	87	10.55
	V12	5.47	6	292	3.41	20.18	99	12.20	5.93	25	230	4.63	96	3.55
	V13	4.69	8	306	3.73	17.97	94	14.70	-	-	-	-	-	-
	V14	5.67	1	247	4.65	17.28	88	13.20	7.49	6	256	5.12	87	7.36
	V15	-	-	-	-	-	-	-	6.11	22	243	4.46	91	4.64
	V16	-	-	-	-	-	-	-	-	-	-	-	-	-
	V17	-	-	-	-	-	-	-	-	-	-	-	-	-
	V18	3.52	25	272	2.91	19.59	84	9.80	-	-	-	-	-	-
	V19	-	-	-	-	-	-	-	-	-	-	-	-	-
	V20	5.63	2	268	4.54	17.82	90	13.40	7.22	9	275	4.62	87	6.82
	V21	4.62	12	298	3.06	16.94	95	14.50	5.61	28	241	4.20	83	4.27
Interaction														
N at same V		NS		NS	NS	NS	NS		NS		NS	NS	0.73	
V at same N		NS		NS	NS	NS	NS		NS		NS	NS	0.91	
Means of F level														
F1		3.54	2	232	2.66	17.65	93		6.20	2	237	4.68	90	
F2		4.86	1	271	3.79	19.17	92	13.18	7.02	1	252	5.05	90	7.40
C.D.(0.05)		0.42		22.14	0.4	0.66	0.15		0.60		11.33	0.16	NS	
C.V.(%)		11.85		10.34	14.58	4.2	0.18		10.38		5.27	3.81	0.93	

Table 4.1(d): Contd.

F-levels	Varieties	KARJAT							KOTA					
		Grain Yield (t/ha)	Rank	Panicle/ m² (No.)	Panicle wt (g)	Test wt(g)	Days for 50% Flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)	Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Panicle wt (g)	Days for 50% Flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Mean of varieties														
V1		2.65	*17*	266	2.48	13.79	106	9.20	6.23	*12*	292	3.86	99	7.09
V2		3.81	*15*	204	3.03	20.67	98	16.20	6.56	*9*	220	5.41	95	4.09
V3		3.92	*13*	221	3.37	23.60	92	14.90	5.71	*15*	193	5.33	87	6.91
V4		4.17	*8*	251	2.48	18.62	97	9.20	6.47	*10*	282	4.11	94	7.09
V5		3.94	*12*	287	2.99	16.88	88	13.10	6.81	*7*	258	4.79	90	3.64
V6		4.89	*3*	244	3.33	18.88	91	14.80	8.30	*1*	259	5.77	92	11.27
V7		3.99	*10*	269	3.21	16.01	99	13.20	6.46	*11*	283	4.01	91	5.00
V8		4.11	*9*	240	3.15	19.86	89	9.10	6.62	*8*	224	5.34	90	12.91
V9		4.75	*6*	239	3.70	21.99	91	16.60	6.85	*5*	208	5.92	87	12.09
V10		4.87	*4*	261	4.06	17.88	89	11.70	6.97	*4*	221	5.67	87	11.18
V11		4.66	*7*	232	4.00	19.67	89	18.20	7.90	*2*	256	5.43	87	10.55
V12		4.86	*5*	270	2.91	19.31	99	12.20	5.74	*14*	227	4.50	96	3.55
V13		3.96	*11*	274	3.08	16.86	93	14.70	-	-	-	-	-	-
V14		5.01	*1*	225	4.06	15.98	89	13.20	7.09	*3*	249	4.94	87	7.36
V15		-	-	-	-	-	-	-	5.86	*13*	239	4.30	91	4.64
V16		-	-	-	-	-	-	-	-	-	-	-	-	-
V17		-	-	-	-	-	-	-	-	-	-	-	-	-
V18		3.03	*16*	253	2.54	19.34	84	9.80	-	-	-	-	-	-
V19		-	-	-	-	-	-	-	-	-	-	-	-	-
V20		4.96	*2*	256	3.93	17.21	91	13.40	6.85	*5*	269	4.43	86	6.82
V21		3.90	*14*	279	2.56	16.47	96	14.50	5.38	*16*	237	4.06	83	4.27
C.D.(0.05)		0.28		27.79	0.38	1.08	1.03		0.41		23.79	0.42	0.51	
C.V.(%)		5.88		9.67	10.42	5.15	0.97		5.37		8.42	7.56	0.50	
Expt. Mean		**4.20**		**251**	**3.23**	**18.41**	**93**		**6.61**		**245**	**4.86**	**90**	
Soil type		-							Clay					
pH		-							7.52					
F - levels (kg/ha)														
F1		50:25:25							60:30:20					
F2		100:50:50							120:60:40					
Recmnd N:P:K		100:50:50							120:60:40					
Varieties														
V1		IET 29214							IET 29214					
V2		IET 29233							IET 29233					
V3		IET 29217							IET 29217					
V4		IET 29212							IET 29212					
V5		IET 28353							IET 28353					
V6		IET 29235							IET 29235					
V7		IET 29246							IET 29246					
V8		IET 29238							IET 29238					
V9		IET 28982							IET 28982					
V10		IET 28128							IET 28128					
V11		IET 28979							IET 28979					
V12		IET 29236							IET 29236					
V13		IET 28506							-					
V14		Gondhra Bidhan-3 (NC)							Gondhra Bidhan-3 (NC)					
V15		-							PR 113 (N)					
V16		-							-					
V17		-							-					
V18		MTU 1010 (C& S)							-					
V19		-							-					
V20		US 312							US 312					
V21		Local check - KJT - 3 (110-115 days)							Local Check - Ratna (120- 125 days)					
Avlb NPK of soil		-							176:23:529					

Table 4.1(d): 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	6.08	10	403	2.98	23.63	107	
	V2	5.78	19	326	4.10	28.26	106	
	V3	5.71	20	302	4.17	26.40	104	
	V4	5.28	26	352	3.23	25.50	110	
	V5	3.80	34	325	4.12	22.91	100	
	V6	5.59	22	266	4.45	25.53	105	
	V7	5.65	21	336	3.63	26.28	108	
	V8	4.18	33	304	4.02	27.47	100	
	V9	5.96	14	254	4.65	30.13	100	
	V10	5.88	17	305	4.37	24.47	102	
	V11	4.70	31	273	4.54	25.29	94	
	V12	5.89	16	373	4.23	25.56	100	
	V13	4.99	30	376	2.63	27.56	118	
	V14	5.49	24	324	4.56	22.35	104	
	V15	-	-	-	-	-	-	
	V16	-	-	-	-	-	-	
	V17	-	-	-	-	-	-	
	V18	5.01	29	337	3.30	24.50	93	
	V19	-	-	-	-	-	-	
	V20	5.82	18	312	4.41	21.37	104	
	V21	5.54	23	328	3.40	13.46	97	
F2: Optimum input (100% NPK)	V1	7.18	3	435	3.12	22.34	107	11.00
	V2	6.54	8	338	4.50	27.38	106	7.60
	V3	7.81	2	336	5.54	28.69	104	21.00
	V4	6.00	12	378	3.40	24.56	110	7.20
	V5	4.37	32	363	4.52	22.10	100	5.70
	V6	6.03	11	313	4.90	24.81	105	4.40
	V7	6.63	7	394	4.31	26.22	108	9.80
	V8	5.44	25	367	4.35	27.73	100	12.60
	V9	8.76	1	338	5.48	30.49	100	28.00
	V10	6.99	5	348	4.66	26.56	102	11.10
	V11	5.22	28	293	4.61	24.50	93	5.20
	V12	6.37	9	383	4.34	25.24	101	4.80
	V13	5.27	27	441	2.72	26.71	118	2.80
	V14	6.93	6	378	4.93	22.29	104	14.40
	V15	-	-	-	-	-	-	-
	V16	-	-	-	-	-	-	-
	V17	-	-	-	-	-	-	-
	V18	5.91	15	352	3.44	25.09	93	9.00
	V19	-	-	-	-	-	-	-
	V20	7.17	4	358	4.84	22.19	104	13.50
	V21	6.00	12	350	3.70	13.65	97	4.60
Interaction								
N at same V		0.9		NS	NS	NS	NS	
V at same N		1.01		NS	NS	NS	NS	
Means of F levels:								
F1		5.37	2	323	3.93	24.75	103	
F2		6.39	1	363	4.32	24.74	103	10.16
C.D.(0.05)		0.65		35.32	0.26	NS	NS	
C.V.(%)		12.92		12.08	7.27	3.69	3.11	

Table 4.1(d): 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		6.63	*3*	419	3.05	22.99	107	11.00
V2		6.16	*7*	332	4.30	27.82	106	7.60
V3		6.76	*2*	319	4.86	27.55	104	21.00
V4		5.64	*12*	365	3.32	25.03	110	7.20
V5		4.09	*17*	344	4.32	22.51	100	5.70
V6		5.81	*10*	290	4.68	25.17	105	4.40
V7		6.14	*8*	365	3.97	26.25	108	9.80
V8		4.81	*16*	336	4.19	27.60	100	12.60
V9		7.36	*1*	296	5.07	30.31	100	28.00
V10		6.44	*5*	326	4.52	25.52	102	11.10
V11		4.96	*15*	283	4.58	24.90	94	5.20
V12		6.13	*9*	378	4.29	25.40	100	4.80
V13		5.13	*14*	409	2.68	27.14	118	2.80
V14		6.21	*6*	351	4.75	22.32	104	14.40
V15		-	-	-	-	-	-	-
V16		-	-	-	-	-	-	-
V17		-	-	-	-	-	-	-
V18		5.46	*13*	344	3.37	24.80	93	9.00
V19		-	-	-	-	-	-	-
V20		6.50	*4*	335	4.63	21.78	104	13.50
V21		5.77	*11*	339	3.55	13.56	97	4.60
C.D.(0.05)		0.64		40.1	0.52	1.33	3.14	
C.V.(%)		9.5		10.23	10.98	4.7	2.67	
Expt. Mean		**5.88**		**343**	**4.12**	**24.74**	**103**	
Soil type		Red Sandy loam						
pH		7.57						
F - levels (kg/ha)								
F1		50:25:25						
F2		100:50:50						
Recommended NPK		100:50:50						
Varieties								
V1		IET 29214						
V2		IET 29233						
V3		IET 29217						
V4		IET 29212						
V5		IET 28353						
V6		IET 29235						
V7		IET 29246						
V8		IET 29238						
V9		IET 28982						
V10		IET 28128						
V11		IET 28979						
V12		IET 29236						
V13		IET 28506						
V14		Gondhra Bidhan-3 (NC)						
V15		-						
V16		-						
V17		-						
V18		MTU 1010 (C& S)						
V19		-						
V20		US 312						
V21		Local Check - RNR 15048 (125 days)						
Available N:P:K of soil (kg/ha)		297:42:181						

Table 4.1(d): 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	5.63	4	320	3.34	21.67	93	
	V2	5.17	8	278	3.97	22.82	90	
	V3	3.55	32	201	4.11	23.37	84	
	V4	5.00	10	224	3.08	21.33	90	
	V5	4.94	14	183	3.69	21.43	86	
	V6	4.78	17	160	4.22	21.32	88	
	V7	5.13	9	212	3.27	21.86	99	
	V8	4.53	21	180	3.83	23.27	100	
	V9	3.96	28	167	4.65	21.60	101	
	V10	3.84	29	138	4.57	21.66	101	
	V11	4.39	24	135	4.91	23.50	103	
	V12	4.13	26	140	3.88	22.01	104	
	V13	5.87	2	283	3.58	22.41	105	
	V14	4.95	13	198	3.94	22.40	98	
	V15	-	-	-	-	-	-	
	V16	-	-	-	-	-	-	
	V17	-	-	-	-	-	-	
	V18	4.23	25	212	3.75	22.97	100	
	V19	-	-	-	-	-	-	
	V20	4.63	18	219	3.68	22.53	101	
	V21	-	-	-	-	-	-	
F2: Optimum input (100% NPK)	V1	5.82	3	321	3.39	21.50	93	1.81
	V2	5.43	5	275	4.06	22.56	90	2.48
	V3	3.64	31	177	4.01	23.47	84	0.86
	V4	5.25	6	242	3.14	21.03	90	2.38
	V5	4.87	15	188	3.47	21.47	86	-0.67
	V6	5.25	6	188	4.21	21.70	88	4.48
	V7	4.97	12	219	3.37	22.73	99	-1.52
	V8	4.83	16	209	3.66	22.51	100	2.86
	V9	3.65	30	147	5.13	23.39	101	-2.95
	V10	4.12	27	147	4.32	22.47	102	2.67
	V11	4.56	19	154	5.04	22.05	103	1.62
	V12	4.45	22	165	3.86	21.82	104	3.05
	V13	4.44	23	191	3.76	22.73	105	-13.62
	V14	5.90	1	210	4.11	21.95	98	9.05
	V15	-	-	-	-	-	-	-
	V16	-	-	-	-	-	-	-
	V17	-	-	-	-	-	-	-
	V18	5.00	10	222	3.75	23.20	100	7.33
	V19	-	-	-	-	-	-	-
	V20	4.56	19	181	3.84	23.23	101	-0.67
	V21	-	-	-	-	-	-	-
Interaction								
N at same V		0.58		36.58	0.22	NS	NS	
V at same N		0.58		38.04	0.22	NS	NS	
Means of F levels:								
F1		4.67	2	203	3.90	22.3	96	
F2		4.80	1	202	3.95	22.4	97	1.20
C.D.(0.05)		NS		NS	NS	NS	NS	
C.V.(%)		3.52		9.99	2.87	9.43	0.48	

Table 4.1(d): 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		5.73	*1*	321	3.37	21.6	93	1.81
V2		5.30	*3*	277	4.02	22.7	90	2.48
V3		3.60	*16*	189	4.06	23.4	84	0.86
V4		5.13	*5*	233	3.11	21.2	90	2.38
V5		4.91	*8*	186	3.58	21.5	86	-0.67
V6		5.02	*7*	174	4.22	21.5	88	4.48
V7		5.05	*6*	216	3.32	22.3	99	-1.52
V8		4.68	*9*	195	3.75	22.9	100	2.86
V9		3.81	*15*	157	4.89	22.5	101	-2.95
V10		3.98	*14*	143	4.45	22.1	101	2.67
V11		4.48	*12*	144	4.98	22.8	103	1.62
V12		4.29	*13*	153	3.87	21.9	104	3.05
V13		5.16	*4*	237	3.67	22.6	105	-13.62
V14		5.43	*2*	204	4.03	22.2	98	9.05
V15		-	-	-	-	-	-	-
V16		-	-	-	-	-	-	-
V17		-	-	-	-	-	-	-
V18		4.62	*10*	217	3.75	23.1	100	7.33
V19		-	-	-	-	-	-	-
V20		4.60	*11*	200	3.76	22.9	101	-0.67
V21		-	-	-	-	-	-	-
C.D.(0.05)		0.41		25.87	0.15	0.98	0.65	
C.V.(%)		7.56		11.05	3.35	3.79	0.58	
Expt. Mean		**4.73**		**203**	**3.92**	**22.3**	**96**	
Soil type		Clay loam						
pH		6.50						
F - levels (kg/ha)								
F1		45:30:30						
F2		90:60:60						
Recommended N:P:K		90:60:60						
Varieties								
V1		IET 29214						
V2		IET 29233						
V3		IET 29217						
V4		IET 29212						
V5		IET 28353						
V6		IET 29235						
V7		IET 29246						
V8		IET 29238						
V9		IET 28982						
V10		IET 28128						
V11		IET 28979						
V12		IET 29236						
V13		IET 28506						
V14		Gondhra Bidhan-3 (NC)						
V15		-						
V16		-						
V17		-						
V18		MTU 1010 (C& S)						
V19		-						
V20		US 312						
V21		-						
Available N:P:K of soil (kg/ha)		172:47:286						

Table 4.1(d): 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	-	-	-	-	-	-	
	V2	2.51	23	233	3.36	26.30	115	
	V3	2.58	20	233	3.47	26.37	104	
	V4	2.58	20	241	3.18	26.30	112	
	V5	2.22	28	228	3.52	26.27	101	
	V6	2.46	25	226	2.92	26.39	110	
	V7	2.93	16	221	3.15	26.30	106	
	V8	3.14	15	218	3.36	26.34	98	
	V9	2.44	27	206	2.96	26.40	98	
	V10	2.83	18	255	3.57	26.67	98	
	V11	2.45	26	212	2.98	27.07	98	
	V12	2.90	17	233	3.47	26.37	118	
	V13	-	-	-	-	-	-	
	V14	2.50	24	228	3.52	26.27	96	
	V15	-	-	-	-	-	-	
	V16	-	-	-	-	-	-	
	V17	-	-	-	-	-	-	
	V18	2.52	22	226	2.92	26.85	94	
	V19	-	-	-	-	-	-	
	V20	2.61	19	206	2.49	25.77	98	
	V21	-	-	-	-	-	-	
F2: Optimum input (100% NPK)	V1	-	-	-	-	-	-	-
	V2	4.42	7	291	3.36	26.39	115	17.36
	V3	4.42	7	302	3.48	26.42	105	16.73
	V4	4.38	10	292	3.20	26.36	114	16.36
	V5	4.37	11	290	3.52	26.31	101	19.55
	V6	4.39	9	285	2.95	26.42	110	17.55
	V7	4.44	6	321	3.16	26.34	106	13.73
	V8	4.65	3	312	3.36	26.38	98	13.73
	V9	4.73	2	292	2.98	26.41	99	20.82
	V10	4.95	1	323	3.60	26.69	98	19.27
	V11	4.63	5	273	2.98	26.42	98	19.82
	V12	4.65	3	306	3.48	26.42	119	15.91
	V13	-	-	-	-	-	-	-
	V14	4.18	12	290	3.52	26.31	97	15.27
	V15	-	-	-	-	-	-	-
	V16	-	-	-	-	-	-	-
	V17	-	-	-	-	-	-	-
	V18	4.11	13	320	2.95	25.94	94	14.45
	V19	-	-	-	-	-	-	-
	V20	4.10	14	318	2.50	25.77	98	13.55
	V21	-	-	-	-	-	-	-
Interaction								
N at same V		NS		16.03	0.02	0.04	NS	
V at same N		NS		15.33	0.02	0.04	NS	
Means of F levels:								
F1		2.62	2	226	3.21	26.41	103	
F2		4.46	1	301	3.22	26.33	104	16.72
C.D.(0.05)		0.19		4.92	0.01	0.03	NS	
C.V.(%)		4.07		1.51	0.32	0.07	1.90	

Table 4.1(d): 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)
Mean of varieties:								
	V1	-	-	-	-	-	-	-
	V2	3.47	*9*	262	3.36	26.35	115	17.36
	V3	3.50	*7*	268	3.48	26.40	105	16.73
	V4	3.48	*8*	266	3.19	26.33	113	16.36
	V5	3.30	*14*	259	3.52	26.29	101	19.55
	V6	3.43	*10*	256	2.94	26.41	110	17.55
	V7	3.69	*4*	271	3.16	26.32	106	13.73
	V8	3.90	*1*	265	3.36	26.36	98	13.73
	V9	3.59	*5*	249	2.97	26.41	99	20.82
	V10	3.89	*2*	289	3.59	26.68	98	19.27
	V11	3.54	*6*	243	2.98	26.75	98	19.82
	V12	3.78	*3*	270	3.48	26.40	119	15.91
	V13	-	-	-	-	-	-	-
	V14	3.34	*12*	259	3.52	26.29	97	15.27
	V15	-	-	-	-	-	-	-
	V16	-	-	-	-	-	-	-
	V17	-	-	-	-	-	-	-
	V18	3.32	*13*	273	2.94	26.40	94	14.45
	V19	-	-	-	-	-	-	-
	V20	3.36	*11*	262	2.50	25.77	98	13.55
	V21	-	-	-	-	-	-	-
	C.D.(0.05)	0.24		11.33	0.01	0.03	1.01	
	C.V.(%)	5.65		3.86	0.34	0.08	0.91	
	Expt. Mean	**3.54**		**264**	**3.21**	**26.37**	**104**	
	Soil type	Clay						
	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	-						
	V2	IET 29233						
	V3	IET 29217						
	V4	IET 29212						
	V5	IET 28353						
	V6	IET 29235						
	V7	IET 29246						
	V8	IET 29238						
	V9	IET 28982						
	V10	IET 28128						
	V11	IET 28979						
	V12	IET 29236						
	V13	-						
	V14	Gondhra Bidhan-3 (NC)						
	V15	-						
	V16	-						
	V17	-						
	V18	MTU 1010 (C& S)						
	V19	-						
	V20	US 312						
	V21	-						
	Available N:P:K of soil (kg/ha)	21:18:209						

Table 4.1(d): 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	2.60	32	178	3.35	30.31	78	
	V2	3.24	28	180	4.62	21.67	102	
	V3	2.84	31	96	4.65	26.60	91	
	V4	4.14	22	174	3.66	20.14	102	
	V5	4.05	25	157	4.56	22.46	92	
	V6	4.26	18	89	4.64	23.83	104	
	V7	4.47	17	184	3.11	20.62	96	
	V8	4.51	16	191	3.83	19.27	106	
	V9	3.54	26	192	4.42	23.71	104	
	V10	6.24	3	178	5.15	22.95	91	
	V11	4.73	13	170	4.88	22.97	92	
	V12	1.58	35	159	3.78	21.04	102	
	V13	1.45	36	141	4.15	22.78	91	
	V14	5.97	4	191	3.69	24.59	88	
	V15	-	-	-	-	-	-	
	V16	-	-	-	-	-	-	
	V17	3.40	27	184	3.78	23.80	85	
	V18	4.12	23	173	3.55	23.11	87	
	V19	-	-	-	-	-	-	
	V20	4.67	14	179	5.17	20.75	91	
	V21	5.14	9	184	4.55	27.59	88	
F2: Optimum input (100% NPK)	V1	3.12	29	189	5.02	20.20	77	8.00
	V2	4.26	18	183	5.48	21.96	105	15.69
	V3	3.07	30	95	5.67	26.54	93	3.54
	V4	4.79	11	176	4.86	21.08	104	10.00
	V5	4.24	20	167	5.75	22.91	90	2.92
	V6	4.85	10	93	5.16	23.59	102	9.08
	V7	5.53	5	187	4.41	26.23	95	16.31
	V8	4.76	12	196	4.76	23.35	96	3.85
	V9	4.24	20	189	6.73	24.78	91	10.77
	V10	7.02	1	181	6.49	21.38	91	12.00
	V11	5.27	7	174	6.24	22.98	91	8.31
	V12	2.05	33	167	4.48	21.83	102	7.23
	V13	1.82	34	155	3.72	21.33	91	5.69
	V14	6.61	2	195	5.03	22.01	89	9.85
	V15	-	-	-	-	-	-	-
	V16	-	-	-	-	-	-	-
	V17	4.11	24	188	4.94	24.49	85	10.92
	V18	4.55	15	179	3.72	21.55	89	6.62
	V19	-	-	-	-	-	-	-
	V20	5.16	8	186	5.74	20.78	91	7.54
	V21	5.30	6	188	4.76	26.17	89	2.46
Interaction								
N at same V		NS		NS	0.67	2.8	1.23	
V at same N		NS		NS	0.71	3.04	1.48	
Means of F levels:								
F1		3.94	2	167	4.20	23.23	94	
F2		4.49	1	172	5.16	22.95	93	8.38
C.D.(0.05)		0.26		NS	0.36	NS	NS	
C.V.(%)		7.31		9.66	9.26	9.05	1.43	

Table 4.1(d): 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		2.86	*16*	184	4.19	25.26	78	8.00
V2		3.75	*14*	182	5.05	21.82	104	15.69
V3		2.96	*15*	96	5.16	26.57	92	3.54
V4		4.47	*9*	175	4.26	20.61	103	10.00
V5		4.15	*11*	162	5.16	22.69	91	2.92
V6		4.56	*8*	91	4.90	23.71	103	9.08
V7		5.00	*4*	186	3.76	23.43	96	16.31
V8		4.64	*7*	194	4.30	21.31	101	3.85
V9		3.89	*12*	191	5.58	24.25	98	10.77
V10		6.63	*1*	180	5.82	22.17	91	12.00
V11		5.00	*4*	172	5.56	22.98	92	8.31
V12		1.82	*17*	163	4.13	21.44	102	7.23
V13		1.64	*18*	148	3.94	22.06	91	5.69
V14		6.29	*2*	193	4.36	23.30	88	9.85
V15		-	-	-	-	-	-	-
V16		-	-	-	-	-	-	-
V17		3.76	*13*	186	4.36	24.15	85	10.92
V18		4.34	*10*	176	3.64	22.33	88	6.62
V19		-	-	-	-	-	-	-
V20		4.92	*6*	183	5.46	20.77	91	7.54
V21		5.22	*3*	186	4.66	26.88	89	2.46
C.D.(0.05)		0.47		12.76	0.47	1.98	0.87	
C.V.(%)		9.84		6.6	8.81	7.51	0.82	
Expt. Mean		**4.21**		**169**	**4.68**	**23.09**	**93**	
Soil type		Clay						
pH		7.87						
F - levels (kg/ha)								
F1		50:15:0						
F2		100:30:0						
Recommended N:P:K (kg/ha)		100:30:0						
Varieties								
V1		IET 29214						
V2		IET 29233						
V3		IET 29217						
V4		IET 29212						
V5		IET 28353						
V6		IET 29235						
V7		IET 29246						
V8		IET 29238						
V9		IET 28982						
V10		IET 28128						
V11		IET 28979						
V12		IET 29236						
V13		IET 28506						
V14		Gondhra Bidhan-3 (NC)						
V15		-						
V16		-						
V17		Karjat-7 (W)						
V18		MTU 1010 (C& S)						
V19		-						
V20		US 312						
V21		Local check - GNR-3 (120-125 days)						
Available N:P:K of soil (kg/ha)		275:21:856						

Table 4.1(d): Contd.

F-levels	Varieties	NAWAGAM						
		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	4.67	31	265	3.19	19.97	103	
	V2	6.83	17	212	5.05	24.70	104	
	V3	6.92	15	164	6.27	26.70	99	
	V4	6.54	25	194	3.51	24.60	105	
	V5	7.09	7	203	5.31	20.57	99	
	V6	6.66	23	197	5.99	23.80	99	
	V7	6.27	28	224	4.16	25.90	98	
	V8	6.75	21	261	3.72	26.53	106	
	V9	6.81	18	195	6.46	25.63	97	
	V10	6.49	26	210	6.22	21.00	91	
	V11	7.08	9	168	6.64	25.13	99	
	V12	6.96	13	209	5.39	20.57	109	
	V13	3.61	34	280	2.90	22.80	112	
	V14	6.74	22	160	4.63	19.60	95	
	V15	-	-	-	-	-	-	
	V16	-	-	-	-	-	-	
	V17	-	-	-	-	-	-	
	V18	5.30	30	221	3.59	22.70	98	
	V19	-	-	-	-	-	-	
	V20	6.77	20	208	4.96	20.27	95	
	V21	6.60	24	212	5.13	17.37	96	
F2: Optimum input (100% NPK)	V1	4.45	32	255	3.38	19.87	104	-4.19
	V2	7.09	7	218	4.96	23.13	105	4.95
	V3	7.19	2	169	5.55	26.73	101	5.14
	V4	7.05	10	243	4.21	23.40	106	9.71
	V5	7.11	6	215	5.28	20.30	100	0.38
	V6	6.78	19	235	5.72	25.40	100	2.29
	V7	6.40	27	230	4.11	25.67	99	2.48
	V8	6.93	14	267	4.66	28.23	107	3.43
	V9	7.03	11	203	5.64	24.70	98	4.19
	V10	7.13	5	215	6.72	20.73	93	12.19
	V11	7.27	1	186	5.83	25.10	102	3.62
	V12	7.17	4	217	6.00	21.77	110	4.00
	V13	3.78	33	296	3.59	21.13	115	3.24
	V14	6.99	12	208	5.10	20.47	96	4.76
	V15	-	-	-	-	-	-	-
	V16	-	-	-	-	-	-	-
	V17	-	-	-	-	-	-	-
	V18	5.78		239	3.66	23.30	99	9.14
	V19	-	-	-	-	-	-	-
	V20	6.91		205	5.26	21.53	96	2.67
	V21	7.19	2	237	5.09	17.90	96	11.24
Interaction								
N at same V		NS		NS	NS	NS	NS	
V at same N		NS		NS	NS	NS	NS	
Means of F levels:								
F1		6.36	2	211	4.89	22.81	100	
F2		6.60	1	226	4.99	22.90	102	4.66
C.D.(0.05)		NS		12.95	NS	NS	NS	
C.V.(%)		5.26		6.96	7.89	5.86	2.41	

Table 4.1(d): 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	4.56	*16*	260	3.29	19.92	104	-4.19
	V2	6.96	*5*	215	5.01	23.92	104	4.95
	V3	7.06	*4*	166	5.91	26.72	100	5.14
	V4	6.80	*12*	218	3.86	24.00	105	9.71
	V5	7.10	*2*	209	5.30	20.44	100	0.38
	V6	6.72	*13*	216	5.86	24.60	100	2.29
	V7	6.34	*14*	227	4.14	25.79	98	2.48
	V8	6.84	*9*	264	4.19	27.38	106	3.43
	V9	6.92	*6*	199	6.05	25.17	98	4.19
	V10	6.81	*11*	213	6.47	20.87	92	12.19
	V11	7.18	*1*	177	6.24	25.12	100	3.62
	V12	7.07	*3*	213	5.70	21.17	110	4.00
	V13	3.70	*17*	288	3.25	21.97	114	3.24
	V14	6.87	*8*	184	4.87	20.04	96	4.76
	V15	-	-	-	-	-	-	-
	V16	-	-	-	-	-	-	-
	V17	-	-	-	-	-	-	-
	V18	5.54	*15*	230	3.63	23.00	99	9.14
	V19	-	-	-	-	-	-	-
	V20	6.84	*9*	206	5.11	20.90	96	2.67
	V21	6.90	*7*	224	5.11	17.64	96	11.24
	C.D.(0.05)	0.50		20.02	0.69	2.16	1.31	
	C.V.(%)	6.80		8.03	12.16	8.25	1.14	
	Expt. Mean	**6.48**		**218**	**4.94**	**22.86**	**101**	
	Soil type	Clay loam						
	pH	8.00						
F - levels (kg/ha)								
	F1	40:12.5						
	F2	80:25:0						
	Recommended N:P:K (kg/ha)	80:25:0						
Varieties								
	V1	IET 29214						
	V2	IET 29233						
	V3	IET 29217						
	V4	IET 29212						
	V5	IET 28353						
	V6	IET 29235						
	V7	IET 29246						
	V8	IET 29238						
	V9	IET 28982						
	V10	IET 28128						
	V11	IET 28979						
	V12	IET 29236						
	V13	IET 28506						
	V14	Gondhra Bidhan-3 (NC)						
	V15	-						
	V16	-						
	V17	-						
	V18	MTU 1010 (C& S)						
	V19	-						
	V20	US 312						
	V21	Local Check - Mahisagar						
	Available N:P:K of soil (kg/ha)	-						

Table 4.1(d): 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	5.95	32	217	4.35	25.47	
	V2	6.17	26	257	5.90	30.90	
	V3	5.69	34	208	5.40	28.69	
	V4	6.06	30	226	3.56	25.97	
	V5	6.26	21	300	4.43	21.30	
	V6	6.30	17	324	6.10	27.78	
	V7	6.28	19	319	4.04	29.00	
	V8	6.33	14	341	5.76	26.78	
	V9	6.22	24	278	6.33	26.68	
	V10	6.25	22	294	6.31	21.64	
	V11	6.35	13	350	5.85	25.87	
	V12	5.83	33	201	6.36	27.60	
	V13	6.09	29	230	4.89	25.37	
	V14	6.03	31	221	4.95	19.53	
	V15	-	-	-	-	-	
	V16	-	-	-	-	-	
	V17	-	-	-	-	-	
	V18	6.12	28	240	2.79	23.70	
	V19	-	-	-	-	-	
	V20	6.19	25	272	4.93	20.50	
	V21	6.14	27	248	3.14	17.40	
F2: Optimum input (100% NPK)	V1	6.30	17	229	4.59	25.82	3.50
	V2	6.47	9	270	6.10	31.21	3.00
	V3	6.24	23	218	5.73	29.10	5.50
	V4	6.33	14	239	4.23	26.08	2.70
	V5	6.64	5	325	4.85	22.29	3.80
	V6	6.68	3	348	6.21	28.09	3.80
	V7	6.67	4	332	4.23	29.00	3.90
	V8	6.73	2	353	5.80	27.36	4.00
	V9	6.55	7	297	6.29	27.09	3.30
	V10	6.60	6	310	6.74	22.00	3.50
	V11	6.85	1	374	6.32	26.00	5.00
	V12	6.28	19	222	6.83	28.00	4.50
	V13	6.38	12	248	4.98	26.35	2.90
	V14	6.32	16	234	5.00	20.27	2.90
	V15	-	-	-	-	-	-
	V16	-	-	-	-	-	-
	V17	-	-	-	-	-	-
	V18	6.39	11	254	2.91	24.32	2.70
	V19	-	-	-	-	-	-
	V20	6.49	8	285	5.82	21.00	3.00
	V21	6.41	10	263	3.22	18.24	2.70
Interaction							
N at same V		0.01		2.79	0.35	0.37	
V at same N		0.03		2.92	0.49	0.41	
Means of F levels:							
F1		6.13	2	266	5.01	24.95	
F2		6.49	1	282	5.29	25.42	3.57
C.D.(0.05)		0.03		1.41	NS	0.24	
C.V.(%)		0.58		0.6	10.34	1.11	

Table 4.1(d): 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	6.13	*15*	223	4.47	25.65	3.50
	V2	6.32	*9*	264	6.00	31.06	3.00
	V3	5.97	*17*	213	5.57	28.90	5.50
	V4	6.20	*13*	233	3.90	26.03	2.70
	V5	6.45	*5*	312	4.64	21.80	3.80
	V6	6.49	*3*	336	6.16	27.94	3.80
	V7	6.48	*4*	325	4.14	29.00	3.90
	V8	6.53	*2*	347	5.78	27.07	4.00
	V9	6.39	*7*	288	6.31	26.89	3.30
	V10	6.43	*6*	302	6.53	21.82	3.50
	V11	6.60	*1*	362	6.09	25.94	5.00
	V12	6.06	*16*	212	6.60	27.80	4.50
	V13	6.24	*12*	239	4.94	25.86	2.90
	V14	6.18	*14*	228	4.98	19.90	2.90
	V15	-	-	-	-	-	-
	V16	-	-	-	-	-	-
	V17	-	-	-	-	-	-
	V18	6.26	*11*	247	2.85	24.01	2.70
	V19	-	-	-	-	-	-
	V20	6.34	*8*	279	5.38	20.75	3.00
	V21	6.28	*10*	256	3.18	17.82	2.70
C.D.(0.05)		0.01		1.97	0.25	0.26	
C.V.(%)		0.10		0.63	4.21	0.92	
Expt. Mean		**6.31**		**274**	**5.15**	**25.19**	
Soil type		Clay loam					
pH		6.17					
F - levels (kg/ha)							
F1		60:20:20					
F2		120:40:40					
Recommended N:P:K (kg/ha)		120:40:40					
Varieties							
V1		IET 29214					
V2		IET 29233					
V3		IET 29217					
V4		IET 29212					
V5		IET 28353					
V6		IET 29235					
V7		IET 29246					
V8		IET 29238					
V9		IET 28982					
V10		IET 28128					
V11		IET 28979					
V12		IET 29236					
V13		IET 28506					
V14		Gondhra Bidhan-3 (NC)					
V15		-					
V16		-					
V17		-					
V18		MTU 1010 (C& S)					
V19		-					
V20		US 312					
V21		Local Check - BPT 5204 (130 days)					
Available N:P:K of soil (kg/ha)		213:53:120					

Table 4.1(d): Contd.

F-levels	Varieties	VARANASI							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)		
F1: low input (50% NPK)	V1	4.27	22	226	3.04	10.39	119		4.35	33
	V2	4.87	11	198	3.05	12.89	105		4.68	23
	V3	2.93	30	144	3.29	12.37	92		4.26	34
	V4	3.65	28	234	2.93	10.92	105		4.48	29
	V5	4.58	14	229	3.38	11.09	102		4.44	31
	V6	5.30	9	186	4.56	11.85	98		4.79	17
	V7	4.47	17	248	2.90	13.20	101		4.53	27
	V8	3.74	27	179	3.41	13.32	102		4.48	28
	V9	3.99	24	146	5.20	13.61	96		4.59	24
	V10	4.51	15	191	4.67	11.04	93		4.77	20
	V11	5.93	3	173	4.88	13.52	97		4.78	19
	V12	5.50	7	232	4.96	11.63	111		4.47	30
	V13	-	-	-	-	-	-		3.97	36
	V14	3.87	25	173	3.83	10.84	98		4.72	22
	V15	-	-	-	-	-	-		4.41	32
	V16	-	-	-	-	-	-		3.92	37
	V17	-	-	-	-	-	-		3.87	38
	V18	1.38	32	232	2.74	11.03	85		3.85	39
	V19	-	-	-	-	-	-		3.67	40
	V20	4.45	18	191	3.49	10.22	92		4.73	21
	V21	4.69	13	250	2.96	10.52	101		4.56	26
F2: Optimum input (100% NPK)	V1	7.15	1	284	3.43	11.44	120	24.00	5.27	12
	V2	5.89	4	226	3.67	12.51	104	8.50	5.50	7
	V3	3.51	29	152	4.00	12.56	90	4.83	5.12	14
	V4	4.49	16	214	3.03	11.87	103	7.00	5.34	9
	V5	5.55	6	224	3.55	11.19	103	8.08	5.24	13
	V6	6.41	2	198	4.49	12.56	100	9.25	5.70	1
	V7	4.36	20	267	3.07	13.26	102	-0.92	5.30	11
	V8	4.35	21	228	3.25	13.97	103	5.08	5.31	10
	V9	5.33	8	153	5.43	14.05	98	11.17	5.61	3
	V10	4.21	23	174	4.58	11.29	93	-2.50	5.66	2
	V11	4.37	19	155	5.40	12.98	98	-13.00	5.58	4
	V12	4.95	10	198	3.92	11.21	112	-4.58	5.08	15
	V13	-	-	-	-	-	-	-	4.58	25
	V14	3.77	26	182	3.51	10.51	100	-0.83	5.57	5
	V15	-	-	-	-	-	-	-	5.08	16
	V16	-	-	-	-	-	-	-	2.76	42
	V17	-	-	-	-	-	-	-	3.67	40
	V18	2.57	31	192	2.01	11.85	86	9.92	4.79	18
	V19	-	-	-	-	-	-	-	4.15	35
	V20	4.70	12	191	3.75	10.66	91	2.08	5.50	6
	V21	5.82	5	254	3.22	10.59	103	9.42	5.39	8
Interaction										
N at same V		0.82		19.02	0.35	0.62	0.35			
V at same N		0.83		24.67	0.42	0.61	0.48			
Means of F levels:										
F1		4.26	2	202	3.71	11.78	100		4.47	2
F2		4.84	1	206	3.77	12.03	100	4.84	5.31	1
C.D.(0.05)		0.30		NS	NS	0.14	0.44			
C.V.(%)		8.16		11.92	10.31	1.39	0.51			

Table 4.1(d): Contd.

F-levels	Varieties	VARANASI							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)		
Mean of varieties:										
	V1	5.71	*2*	255	3.24	10.92	120	24.00	4.81	13
	V2	5.38	*3*	212	3.36	12.70	105	8.50	5.09	7
	V3	3.22	*15*	148	3.65	12.47	91	4.83	4.69	16
	V4	4.07	*12*	224	2.98	11.40	104	7.00	4.91	10
	V5	5.07	*7*	227	3.47	11.14	103	8.08	4.84	12
	V6	5.86	*1*	192	4.53	12.21	99	9.25	5.25	1
	V7	4.42	*10*	257	2.99	13.23	102	-0.92	4.92	9
	V8	4.05	*13*	204	3.33	13.65	102	5.08	4.90	11
	V9	4.66	*8*	150	5.32	13.83	97	11.17	5.10	6
	V10	4.36	*11*	183	4.63	11.17	93	-2.50	5.22	2
	V11	5.15	*6*	164	5.14	13.25	98	-13.00	5.18	3
	V12	5.23	*5*	215	4.44	11.42	112	-4.58	4.78	14
	V13	-	-	-	-	-	-	-	4.28	18
	V14	3.82	*14*	178	3.67	10.68	99	-0.83	5.14	4
	V15	-	-	-	-	-	-	-	4.74	15
	V16	-	-	-	-	-	-	-	3.34	21
	V17	-	-	-	-	-	-	-	3.77	20
	V18	1.98	*16*	212	2.38	11.44	86	9.92	4.32	17
	V19	-	-	-	-	-	-	-	3.91	19
	V20	4.58	*9*	191	3.62	10.44	92	2.08	5.12	5
	V21	5.26	*4*	252	3.09	10.56	102	9.42	4.97	8
	C.D.(0.05)	0.58		13.45	0.25	0.44	0.25			
	C.V.(%)	11.78		5.68	6.05	3.34	0.21			
	Expt. Mean	**4.55**		**204**	**3.74**	**11.90**	**100**		**4.89**	
	Soil type	Sandy loam								
	pH	7.60								
F - levels (kg/ha)										
	F1	60:30:30								
	F2	120:60:60								
	Recommended N:P:K (kg/ha)	120:60:60								
Varieties										
	V1	IET 29214								
	V2	IET 29233								
	V3	IET 29217								
	V4	IET 29212								
	V5	IET 28353								
	V6	IET 29235								
	V7	IET 29246								
	V8	IET 29238								
	V9	IET 28982								
	V10	IET 28128								
	V11	IET 28979								
	V12	IET 29236								
	V13	-								
	V14	Gondhra Bidhan-3 (NC)								
	V15	-								
	V16	-								
	V17	-								
	V18	MTU 1010 (C& S)								
	V19	-								
	V20	US 312								
	V21	Local Check - HUR 4-7								
	Available N:P:K of soil (kg/ha)	182:32:207								

4.1(e) AVT 2 - Irrigated Medium

Sixteen AVT-2 entries IET 29268, IET 28489, IET 29002, IET 29002, IET 29284, IET 29014, IET 29257, IET 29301, IET 28997, IET 29256, IET 29290, IET 29001, IET 29004, IET 29009, IET 29000, IET 27908 and IET 27900 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 (120:60:40), Karjat (100:50:50), Kaul (150:60:60), Kota (120:60:40), Maruteru (90:60:60), Nagina (120:60:40), Navsari (100:30:30) , Nawagam (100:25:0), Pantnagar (120:60:40), Puducherry (120:40:40), Pusa (120:60:40), ARI-Rajendranagar (100:60:40), Titabar (40:20:20)** and **Varanasi (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 (f).

Application of different nutrient levels (50 and 100% RDF) significantly influenced the grain yield at all the locations except **Dhangain**, **Marutteru, Puduchery** and **Titabar.** The overall yield improvement was to the tune of 21% with 100% RDF compared to 50% RDF (4.57 t/ha). Higher nutrient response was recorded with 100% RDF at **Chinsurah** (25.05), **Pusa** (19.72), **Titabar** (19.91), **ARI-Rajendranagar** (19.72) **Coimbatore** (19.38) due to lower nutrient available status and higher nutrient response at these locations.

Grain yield differences among the tested cultures were found to be significant at all the locations except **Chinsurah**. Among the tested entries higher grain yield was recorded by IET 28489 (5.30 t/ha) and IET 27900 (5.27 t/ha) **Coimbatore**; IET 28489 (8.71 t/ha) and IET 28997 (8.31 t/ha) at **Dhangain**; IET 28997 (4.34 t/ha) and IET 29014 (4.33 t/ha) at **Faizabad**; IET 29268 (6.94 t/ha) and IET 29009 (6.71 t/ha) at **Jagdalpur**; IET 29290 (5.25 t/ha) and IET 28997 (5.12 t/ha) at **Karjat**; IET 29009 (8.43 t/ha) and IET 29004 (8.43 t/ha) at Kaul; IET 29000 (8.01 t/ha) and IET 29268 (7.28 t/ha) at **Kota**; IET 27908 (6.24 t/ha) and IET 27900 (6.24 t/ha) at **Maruteru**; IET 29257 (3.87 t/ha) and IET 29004 (3.86 t/ha) at **Nagina**; IET 29268 (6.65 t/ha) and IET 29001 (6.46 t/ha) at **Navsari**; IET 29009 (7.43 t/ha) and IET 29001 (7.22 t/ha) at **Nawagam**; IET 29004 (5.40 t/ha) and IET 29000 (4.94 t/ha) at **Pantnagar**; IET 28249 (6.25 t/ha) and IET 27900 (6.22 t/ha) at **Puduchery**; IET 29002 (3.51 t/ha) and IET 28489 (3.46 t/ha) at **Pusa**; IET 28489 (6.33 t/ha) and IET 29257 (6.01 t/ha) at **ARI-Rajendranagar**; IET 29001 (4.75 t/ha) at **Titabar** and IET 29000 (7.16 t/ha) and IET 29290 (6.64 t/ha) at **Varanasi** were found promising with higher grain yields.

In this trial, cultures IET 29000 (5.67 t/ha) followed by IET 29001 (5.53 t/ha) and IET 28997 (5.46 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 **Coimbatore**, **Dhangain**, **Faizabad**, **Karjat**, **Nagina** and **Pantnagar** and application of 100% RFD resulted in better yields of cultivars at these locations. Application of 100% RDF of the location (25% higher) found significantly superior to 50% RDF application at all the locations.

Table 4.1(e): 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 2022.

F-levels	Varieties	CHINSURAH					
		Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Panicle wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: Low input 50% NPK	V1	3.86	32	204	4.11	113	
	V2	3.79	35	203	4.12	114	
	V3	3.96	29	175	3.17	92	
	V4	3.98	28	164	3.34	112	
	V5	3.48	37	182	3.72	97	
	V6	3.81	34	225	4.38	95	
	V7	4.19	23	220	3.53	112	
	V8	3.86	32	161	3.99	109	
	V9	4.68	20	173	3.67	111	
	V10	4.15	25	160	3.85	103	
	V11	4.11	26	233	4.32	100	
	V12	3.91	30	172	3.61	102	
	V13	4.19	23	218	3.54	101	
	V14	4.07	27	173	3.52	109	
	V15	4.30	22	233	4.19	114	
	V16	4.59	21	220	3.83	102	
	V17	3.91	30	201	4.01	105	
	V18	-	-	-	-	-	
	V19	-	-	-	-	-	
	V20	-	-	-	-	-	
	V21	-	-	-	-	-	
	V22	3.79	35	191	4.05	102	
	V23	3.47	38	175	3.85	107	
	V24	-	-	-	-	-	
	V25	-	-	-	-	-	
F2: Optimum input 100% NPK	V1	6.24	5	262	5.00	116	29.75
	V2	6.01	11	253	4.02	115	27.75
	V3	6.09	7	243	4.73	92	26.63
	V4	6.32	2	239	4.74	113	29.25
	V5	5.77	16	273	5.21	97	28.63
	V6	6.04	10	229	3.60	95	27.88
	V7	6.00	12	237	4.38	112	22.63
	V8	6.32	2	246	4.28	109	30.75
	V9	5.94	14	221	4.49	111	15.75
	V10	5.70	17	220	4.34	103	19.38
	V11	5.90	15	266	4.65	100	22.38
	V12	6.45	1	299	4.30	102	31.75
	V13	5.96	13	218	4.21	101	22.13
	V14	6.08	8	323	4.64	109	25.13
	V15	6.26	4	291	4.41	114	24.50
	V16	6.05	9	263	4.60	102	18.25
	V17	5.41	19	262	4.06	105	18.75
	V18	-	-	-	-	-	-
	V19	-	-	-	-	-	-
	V20	-	-	-	-	-	-
	V21	-	-	-	-	-	-
	V22	5.51	18	277	4.13	102	21.50
	V23	6.13	6	293	4.78	107	33.25
	V24	-	-	-	-	-	-
	V25	-	-	-	-	-	-
Interaction							
F at same V		NS		54.26	NS	0.47	
V at same F		NS		57.05	NS	0.46	
F1		4.01	2	194	3.83	105	
F2		6.01	1	259	4.45	106	25.05
C.D.(0.05)		0.91		27.74	0.2	0.08	
C.V.(%)		22.47		15.21	6.03	0.09	

Table-4.1(e) (Contd…)

F-levels	Varieties	CHINSURAH					
		Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Panicle wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Mean of varieties:							
V1		5.05	10	233	4.56	114	29.75
V2		4.90	15	228	4.07	115	27.75
V3		5.03	11	209	3.95	92	26.63
V4		5.15	5	201	4.04	113	29.25
V5		4.63	19	227	4.47	97	28.63
V6		4.93	14	227	3.99	95	27.88
V7		5.10	6	228	3.96	112	22.63
V8		5.09	7	203	4.14	109	30.75
V9		5.31	2	197	4.08	111	15.75
V10		4.93	13	190	4.10	103	19.38
V11		5.01	12	250	4.49	100	22.38
V12		5.18	4	235	3.96	102	31.75
V13		5.08	8	218	3.88	101	22.13
V14		5.08	8	248	4.08	109	25.13
V15		5.28	3	262	4.30	114	24.50
V16		5.32	1	242	4.22	102	18.25
V17		4.66	17	232	4.04	105	18.75
V18		-	-	-	-	-	-
V19		-	-	-	-	-	-
V20		-	-	-	-	-	-
V21		-	-	-	-	-	-
V22		4.65	18	234	4.09	102	21.50
V23		4.80	16	234	4.32	107	33.25
V24		-	-	-	-	-	-
V25		-	-	-	-	-	-
C.D.(0.05)		NS		38.37	NS	0.33	
C.V. (%)		9.53		14.83	15.72	0.27	
Expt. Mean		**5.01**		**226**	**4.14**	**105**	
Soil type		Clay Loam					
pH		-					
F - levels (kg/ha)		F1: 40:20:20		F2: 80:40:40		Recommended N:P:K : 80:40:40	
Varieties							
V1		IET 29268					
V2		IET 28489					
V3		IET 29002					
V4		IET 29284					
V5		IET 29014					
V6		IET 29257					
V7		IET 29301					
V8		IET 28997					
V9		IET 29256					
V10		IET 29290					
V11		IET 29001					
V12		IET 29004					
V13		IET 29009					
V14		IET 29000					
V15		IET 27908					
V16		IET 27900					
V17		NC- NDR 359					
V18		-					
V19		-					
V20		-					
V21		-					
V22		Jaya (S)					
V23		HRI 174					
V24		-					
V25		-					
Available N:P:K of soil		-					

Table-4.1(e) (Contd…)

F-levels	Varieties	COIMBATORE					
		Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Panicle wt (g)	Test wt (g)	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: Low input 50% NPK	V1	3.73	32	203	3.23	25.13	
	V2	4.15	22	265	3.44	22.10	
	V3	4.04	24	243	3.41	24.20	
	V4	3.88	28	219	3.29	21.20	
	V5	3.91	26	226	3.39	22.10	
	V6	3.90	27	230	3.31	22.93	
	V7	3.84	30	208	3.22	23.77	
	V8	3.67	34	176	3.16	22.57	
	V9	3.78	31	192	3.26	23.43	
	V10	3.63	35	180	3.12	21.23	
	V11	4.04	24	231	3.43	24.33	
	V12	3.56	38	166	2.85	24.40	
	V13	3.87	29	211	2.35	23.80	
	V14	3.43	40	155	2.87	21.83	
	V15	3.70	33	179	2.22	19.33	
	V16	4.11	23	253	2.42	22.13	
	V17	3.61	37	165	2.13	24.23	
	V18	-	-	-	-	-	
	V19	-	-	-	-	-	
	V20	-	-	-	-	-	
	V21	-	-	-	-	-	
	V22	3.52	39	159	2.82	17.27	
	V23	3.63	35	167	2.10	22.23	
	V24	-	-	-	-	-	
	V25	4.18	21	263	3.44	17.20	
F2: Optimum input 100% NPK	V1	6.22	12	296	4.34	25.57	19.92
	V2	6.44	2	372	4.56	22.50	18.32
	V3	6.41	4	352	4.52	24.37	18.96
	V4	6.31	8	323	4.42	21.47	19.44
	V5	6.36	6	333	4.51	22.43	19.60
	V6	6.33	7	339	4.47	23.20	19.44
	V7	6.25	11	312	4.38	24.17	19.28
	V8	6.16	14	247	4.25	23.17	19.92
	V9	6.27	10	308	4.40	23.47	19.92
	V10	6.16	14	259	4.26	21.43	20.24
	V11	6.39	5	346	4.50	24.53	18.80
	V12	5.98	18	233	3.96	24.73	19.36
	V13	6.28	9	318	3.41	24.33	19.28
	V14	5.87	20	208	3.93	21.17	19.52
	V15	6.21	13	283	4.36	19.40	20.08
	V16	6.42	3	361	4.58	22.57	18.48
	V17	6.14	16	245	4.28	24.53	20.24
	V18	-	-	-	-	-	-
	V19	-	-	-	-	-	-
	V20	-	-	-	-	-	-
	V21	-	-	-	-	-	-
	V22	5.93	19	220	3.98	17.37	19.28
	V23	6.05	17	257	4.19	22.40	19.36
	V24	-	-	-	-	-	-
	V25	6.46	1	371	4.59	17.47	18.24
Interaction							
F at same V		0.09		9.22	0.07	NS	
V at same F		0.1		17.59	0.11	NS	
F1		3.81	2	205	2.97	22.3	
F2		6.23	1	299	4.29	22.5	19.38
C.D.(0.05)		0.05		19.73	0.12	NS	
C.V.(%)		1.34		9.97	4.15	2.4	

Table-4.1(e) (Contd…)

F-levels	Varieties	CHINSURAH					
		Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Panicle wt (g)	Test wt (g)	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Mean of varieties:							
	V1	4.98	12	249	3.79	25.4	19.92
	V2	5.30	2	319	4.00	22.3	18.32
	V3	5.23	4	298	3.97	24.3	18.96
	V4	5.10	8	271	3.86	21.3	19.44
	V5	5.14	6	279	3.95	22.3	19.60
	V6	5.12	7	284	3.89	23.1	19.44
	V7	5.05	10	260	3.80	24.0	19.28
	V8	4.92	14	212	3.71	22.9	19.92
	V9	5.03	11	250	3.83	23.5	19.92
	V10	4.90	15	220	3.69	21.3	20.24
	V11	5.22	5	289	3.97	24.4	18.80
	V12	4.77	18	200	3.41	24.6	19.36
	V13	5.08	9	265	2.88	24.1	19.28
	V14	4.65	20	181	3.40	21.5	19.52
	V15	4.96	13	231	3.29	19.4	20.08
	V16	5.27	3	307	3.50	22.4	18.48
	V17	4.88	16	205	3.21	24.4	20.24
	V18	-	-	-	-	-	-
	V19	-	-	-	-	-	-
	V20	-	-	-	-	-	-
	V21	-	-	-	-	-	-
	V22	4.73	19	190	3.40	17.3	19.28
	V23	4.84	17	212	3.15	22.3	19.36
	V24	-	-	-	-	-	-
	V25	5.32	1	317	4.02	17.3	18.24
	C.D.(0.05)	0.06		6.52	0.05	0.36	
	C.V. (%)	1.09		2.26	1.18	1.39	
	Expt. Mean	**5.02**		**252**	**3.63**	**22.39**	
	Soil type	Clay Loam					
	pH	8.14					
F - levels (kg/ha)		F1		F2		Recommended N:P:K	
		75:25:25		150:50:50		150:50:50	
Varieties							
	V1	IET 29268					
	V2	IET 28489					
	V3	IET 29002					
	V4	IET 29284					
	V5	IET 29014					
	V6	IET 29257					
	V7	IET 29301					
	V8	IET 28997					
	V9	IET 29256					
	V10	IET 29290					
	V11	IET 29001					
	V12	IET 29004					
	V13	IET 29009					
	V14	IET 29000					
	V15	IET 27908					
	V16	IET 27900					
	V17	NC- NDR 359					
	V18	-					
	V19	-					
	V20	-					
	V21	-					
	V22	Jaya (S)					
	V23	HRI 174					
	V24	-					
	V25	Local Check - CO 52					
	Available N:P:K of soil	237:23:436					

Table-4.1(e) (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	7.91	11	300	5.43	27.80	110	
	V2	8.12	7	327	5.79	20.80	117	
	V3	7.94	10	301	6.23	27.07	97	
	V4	6.26	31	262	6.27	20.93	111	
	V5	7.07	21	278	5.33	25.20	96	
	V6	6.31	29	275	3.96	24.00	102	
	V7	4.57	42	247	3.81	17.07	124	
	V8	7.98	8	325	4.61	25.33	100	
	V9	5.81	35	261	5.07	20.00	116	
	V10	6.44	28	277	5.75	22.40	110	
	V11	7.37	16	300	5.95	24.93	100	
	V12	7.24	17	293	5.98	26.00	99	
	V13	7.22	18	291	4.87	24.93	102	
	V14	7.21	19	288	6.89	23.60	113	
	V15	7.09	20	298	5.91	23.87	120	
	V16	6.92	24	279	4.92	22.20	124	
	V17	7.07	21	281	4.95	27.67	99	
	V18	-	-	-	-	-	-	
	V19	-	-	-	-	-	-	
	V20	-	-	-	-	-	-	
	V21	-	-	-	-	-	-	
	V22	6.28	30	266	4.49	21.20	122	
	V23	7.05	23	280	4.42	23.47	100	
	V24	5.51	37	255	5.05	23.07	103	
	V25	4.84	41	258	3.40	14.80	112	
F2: Optimum input 100% NPK	V1	8.30	6	304	5.79	27.67	111	3.55
	V2	9.29	1	332	5.91	20.93	118	10.64
	V3	8.38	5	306	7.77	26.93	98	4.00
	V4	6.72	27	284	7.76	18.93	113	4.18
	V5	6.81	25	285	7.26	24.27	97	-2.36
	V6	6.24	32	282	4.97	24.27	102	-0.64
	V7	5.51	37	268	4.33	20.00	125	8.55
	V8	8.63	3	315	5.79	25.87	100	5.91
	V9	5.22	40	260	6.56	22.27	118	-5.36
	V10	6.18	33	274	6.13	22.53	111	-2.36
	V11	7.98	8	301	6.70	26.40	100	5.55
	V12	7.68	12	299	7.02	25.73	100	4.00
	V13	9.25	2	325	5.62	24.40	103	18.45
	V14	7.61	13	293	7.58	24.00	115	3.64
	V15	6.81	25	284	6.24	20.00	122	-2.55
	V16	7.53	14	287	6.23	23.33	125	5.55
	V17	7.47	15	286	6.04	27.73	99	3.64
	V18	-	-	-	-	-	-	-
	V19	-	-	-	-	-	-	-
	V20	-	-	-	-	-	-	-
	V21	-	-	-	-	-	-	-
	V22	6.17	34	271	5.72	21.60	123	-1.00
	V23	8.49	4	314	5.85	23.47	100	13.09
	V24	5.53	36	270	6.09	24.00	104	0.18
	V25	5.38	39	262	3.70	14.93	113	4.91
Interaction								
F at same V		0.9		NS	NS	NS	0.77	
V at same F		0.98		NS	NS	NS	1.03	
F1		6.77	2	283	5.19	23.2	108	
F2		7.20	1	291	6.15	23.3	109	3.88
C.D.(0.05)		NS		NS	0.49	NS	NS	
C.V.(%)		10.83		7.92	11.19	6.77	1.07	

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)
Mean of varieties:								
V1		8.11	5	302	5.61	27.7	111	3.55
V2		8.71	1	330	5.85	20.9	118	10.64
V3		8.16	4	304	7.00	27.0	97	4.00
V4		6.49	14	273	7.02	19.9	112	4.18
V5		6.94	13	282	6.30	24.7	96	-2.36
V6		6.28	16	279	4.47	24.1	102	-0.64
V7		5.04	21	257	4.07	18.5	125	8.55
V8		8.31	2	320	5.20	25.6	100	5.91
V9		5.52	19	261	5.82	21.1	117	-5.36
V10		6.31	15	275	5.94	22.5	111	-2.36
V11		7.68	7	301	6.33	25.7	100	5.55
V12		7.46	8	296	6.50	25.9	100	4.00
V13		8.24	3	308	5.25	24.7	102	18.45
V14		7.41	9	290	7.24	23.8	114	3.64
V15		6.95	12	291	6.08	21.9	121	-2.55
V16		7.23	11	283	5.58	22.8	125	5.55
V17		7.27	10	284	5.50	27.7	99	3.64
V18		-	-	-	-	-	-	-
V19		-	-	-	-	-	-	-
V20		-	-	-	-	-	-	-
V21		-	-	-	-	-	-	-
V22		6.23	17	268	5.11	21.4	123	-1.00
V23		7.77	6	297	5.14	23.5	100	13.09
V24		5.52	18	262	5.57	23.5	103	0.18
V25		5.11	20	260	3.55	14.9	112	4.91
C.D.(0.05)		0.63		28.73	0.68	1.82	0.55	
C.V. (%)		7.94		8.76	10.44	6.87	0.44	
Expt. Mean		**6.99**		**287**	**5.67**	**23.23**	**109**	
Soil type		Clay loam						
pH		6.35						
F - levels (kg/ha)		F1		F2		Recommended N:P:K (kg/ha)		
		60:30:20		**120:60:40**		120:60:40		
Varieties								
V1		IET 29268						
V2		IET 28489						
V3		IET 29002						
V4		IET 29284						
V5		IET 29014						
V6		IET 29257						
V7		IET 29301						
V8		IET 28997						
V9		IET 29256						
V10		IET 29290						
V11		IET 29001						
V12		IET 29004						
V13		IET 29009						
V14		IET 29000						
V15		IET 27908						
V16		IET 27900						
V17		NC- NDR 359						
V18		-						
V19		-						
V20		-						
V21		-						
V22		Jaya (S)						
V23		HRI 174						
V24		Hybrid Check PA 6444						
V25		Local Check R. Sweta (140-150 days)						
Available N:P:K of soil		252:42:189						

Table-4.1(e) (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	28	207	2.60	28.60	102	
	V2	3.31	28	196	2.77	21.07	105	
	V3	3.36	24	217	3.40	25.43	103	
	V4	3.02	36	196	3.37	18.37	106	
	V5	3.14	35	217	2.73	18.47	103	
	V6	3.39	23	208	2.40	24.53	103	
	V7	2.63	40	185	3.37	22.70	101	
	V8	3.45	22	222	3.37	27.53	106	
	V9	3.33	27	213	4.60	19.13	108	
	V10	3.36	24	223	2.60	22.87	102	
	V11	2.77	38	194	2.17	18.60	104	
	V12	3.35	26	223	2.63	25.20	102	
	V13	3.26	32	211	3.40	18.13	103	
	V14	3.31	28	196	3.40	20.23	105	
	V15	2.87	37	181	2.53	18.63	102	
	V16	3.17	34	218	3.40	18.87	106	
	V17	3.23	33	213	3.40	28.60	108	
	V18	-	-	-	-	-	-	
	V19	-	-	-	-	-	-	
	V20	-	-	-	-	-	-	
	V21	-	-	-	-	-	-	
	V22	2.69	39	170	2.60	20.87	106	
	V23	3.29	31	209	3.13	24.53	108	
	V24	-	-	-	-	-	-	
	V25	3.52	21	218	3.30	24.40	104	
F2: Optimum input 100% NPK	V1	4.55	14	263	3.20	29.53	105	10.33
	V2	5.08	4	247	3.60	22.30	108	14.75
	V3	4.93	7	252	3.93	25.80	108	13.08
	V4	5.10	3	270	4.17	19.07	109	17.33
	V5	5.52	1	243	3.37	19.13	106	19.83
	V6	4.95	6	256	3.40	24.97	105	13.00
	V7	4.02	18	250	3.93	23.60	104	11.58
	V8	5.23	2	245	3.93	28.07	108	14.83
	V9	4.77	10	242	4.87	20.23	111	12.00
	V10	4.39	16	275	3.17	23.40	106	8.58
	V11	3.98	19	257	2.77	19.13	106	10.08
	V12	4.65	13	252	3.40	26.10	104	10.83
	V13	4.93	7	265	3.73	18.43	108	13.92
	V14	4.66	11	252	3.93	20.87	108	11.25
	V15	5.08	4	257	3.43	19.07	105	18.42
	V16	4.44	15	277	3.87	19.07	108	10.58
	V17	4.66	11	245	4.40	29.07	110	11.92
	V18	-	-	-	-	-	-	-
	V19	-	-	-	-	-	-	-
	V20	-	-	-	-	-	-	-
	V21	-	-	-	-	-	-	-
	V22	3.89	20	229	2.90	21.77	109	10.00
	V23	4.22	17	240	3.40	25.03	110	7.75
	V24	-	-	-	-	-	-	-
	V25	4.93	7	266	3.87	25.40	107	11.75
Interaction								
F at same V		0.22		13.56	0.33	NS	NS	
V at same F		0.23		14.38	0.38	NS	NS	
F1		3.19	2	206	3.06	22.3	104	
F2		4.70	1	254	3.66	23.0	107	12.59
C.D.(0.05)		0.12		7.29	0.27	0.47	0.93	
C.V.(%)		3.78		4.03	10.06	2.65	1.12	

Table-4.1(e) (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)
Mean of varieties:								
V1		3.93	14	235	2.90	29.1	104	10.33
V2		4.20	4	222	3.19	21.7	107	14.75
V3		4.15	6	234	3.67	25.6	106	13.08
V4		4.06	8	233	3.77	18.7	108	17.33
V5		4.33	2	230	3.05	18.8	105	19.83
V6		4.17	5	232	2.90	24.8	104	13.00
V7		3.33	19	218	3.65	23.2	102	11.58
V8		4.34	1	234	3.65	27.8	107	14.83
V9		4.05	9	227	4.74	19.7	109	12.00
V10		3.88	15	249	2.89	23.1	104	8.58
V11		3.38	18	226	2.47	18.9	105	10.08
V12		4.00	10	238	3.02	25.7	103	10.83
V13		4.10	7	238	3.57	18.3	106	13.92
V14		3.99	11	224	3.67	20.6	106	11.25
V15		3.98	12	219	2.98	18.9	104	18.42
V16		3.81	16	247	3.64	19.0	107	10.58
V17		3.95	13	229	3.90	28.8	109	11.92
V18		-	-	-	-	-	-	-
V19		-	-	-	-	-	-	-
V20		-	-	-	-	-	-	-
V21		-	-	-	-	-	-	-
V22		3.29	20	199	2.75	21.3	108	10.00
V23		3.76	17	225	3.27	24.8	109	7.75
V24		-	-	-	-	-	-	-
V25		4.23	3	242	3.59	24.9	105	11.75
C.D.(0.05)		0.15		9.59	0.23	0.37	1.3	
C.V. (%)		3.43		3.65	6.06	1.42	1.08	
Expt. Mean		**3.94**		**230**	**3.36**	**22.67**	**106**	
Soil type		Sandy loam		pH :	7.40			
F - levels (kg/ha)		F1		F2		Recommended N:P:K (kg/ha)		
		60:30:30		120:60:60		120:60:60:25		
Varieties								
V1		IET 29268						
V2		IET 28489						
V3		IET 29002						
V4		IET 29284						
V5		IET 29014						
V6		IET 29257						
V7		IET 29301						
V8		IET 28997						
V9		IET 29256						
V10		IET 29290						
V11		IET 29001						
V12		IET 29004						
V13		IET 29009						
V14		IET 29000						
V15		IET 27908						
V16		IET 27900						
V17		NC- NDR 359						
V18		-						
V19		-						
V20		-						
V21		-						
V22		Jaya (S)						
V23		HRI 174						
V24		-						
V25		Local Check - NDR 2065 (135 days)						
Available N:P:K of soil		205:24:233						

Table-4.1(e) (Contd…)

F-levels	Varieties	JAGDALPUR						
		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	6.36	11	170	3.45	32.04	75	
	V2	4.67	38	173	3.43	23.72	84	
	V3	6.11	17	203	3.61	25.92	64	
	V4	4.36	40	184	3.80	20.65	85	
	V5	5.41	34	191	3.69	24.63	66	
	V6	5.61	29	186	3.53	26.10	88	
	V7	4.58	39	188	3.33	21.34	77	
	V8	5.44	33	178	3.58	25.81	83	
	V9	5.69	27	186	3.42	25.60	80	
	V10	4.94	37	173	3.42	24.20	76	
	V11	5.99	21	191	3.47	27.14	89	
	V12	5.33	35	178	3.58	25.77	92	
	V13	6.30	14	193	3.59	27.68	86	
	V14	5.74	26	199	3.48	23.93	80	
	V15	6.25	16	196	3.41	26.03	78	
	V16	5.94	24	216	3.15	23.93	72	
	V17	6.35	12	190	3.38	26.49	91	
	V18	-	-	-	-	-	-	
	V19	-	-	-	-	-	-	
	V20	-	-	-	-	-	-	
	V21	-	-	-	-	-	-	
	V22	5.51	32	180	3.42	25.23	73	
	V23	5.96	23	195	3.43	24.91	89	
	V24	-	-	-	-	-	-	
	V25	5.13	36	186	3.36	23.46	73	
F2: Optimum input 100% NPK	V1	7.52	2	190	3.23	32.81	77	11.60
	V2	6.04	20	202	3.43	24.31	85	13.70
	V3	6.38	10	208	3.21	26.65	66	2.70
	V4	5.59	30	204	3.44	21.76	86	12.30
	V5	6.07	19	199	3.55	25.17	69	6.60
	V6	6.57	6	198	2.31	26.98	90	9.60
	V7	5.68	28	206	3.40	23.47	80	11.00
	V8	6.40	9	201	3.14	26.91	85	9.60
	V9	6.26	15	204	3.61	26.31	82	5.70
	V10	6.08	18	207	3.34	25.80	77	11.40
	V11	6.44	8	204	3.57	27.27	91	4.50
	V12	6.33	13	214	3.52	25.82	94	10.00
	V13	7.11	3	220	4.16	27.98	89	8.10
	V14	6.54	7	213	3.67	26.59	82	8.00
	V15	5.98	22	209	3.32	24.98	80	-2.70
	V16	6.80	5	234	3.64	24.62	76	8.60
	V17	7.97	1	228	3.35	29.31	94	16.20
	V18	-	-	-	-	-	-	-
	V19	-	-	-	-	-	-	-
	V20	-	-	-	-	-	-	-
	V21	-	-	-	-	-	-	-
	V22	5.93	25	198	3.24	25.18	76	4.20
	V23	6.90	4	215	3.63	27.86	91	9.40
	V24	-	-	-	-	-	-	-
	V25	5.53	31	206	3.42	23.14	75	4.00
Interaction								
F at same V		NS		NS	NS	NS	NS	
V at same F		NS		NS	NS	NS	NS	
F1		5.58	2	188	3.48	25.2	80	
F2		6.41	1	208	3.41	26.1	82	8.23
C.D.(0.05)		0.19		3.46	NS	0.71	0.90	
C.V.(%)		4.13		2.22	9.83	3.51	1.40	

Table-4.1(e) (Contd…)

F-levels	Varieties	JAGDALPUR						
		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	6.94	2	180	3.34	32.4	76	11.60
	V2	5.36	17	187	3.43	24.0	85	13.70
	V3	6.25	6	206	3.41	26.3	65	2.70
	V4	4.98	20	194	3.62	21.2	86	12.30
	V5	5.74	14	195	3.62	24.9	68	6.60
	V6	6.09	10	192	2.92	26.5	89	9.60
	V7	5.13	19	197	3.37	22.4	79	11.00
	V8	5.92	12	190	3.36	26.4	84	9.60
	V9	5.98	11	195	3.52	26.0	81	5.70
	V10	5.51	16	190	3.38	25.0	77	11.40
	V11	6.22	7	198	3.52	27.2	90	4.50
	V12	5.83	13	196	3.55	25.8	93	10.00
	V13	6.71	3	207	3.88	27.8	88	8.10
	V14	6.14	8	206	3.58	25.3	81	8.00
	V15	6.12	9	202	3.37	25.5	79	-2.70
	V16	6.37	5	225	3.40	24.3	74	8.60
	V17	7.16	1	209	3.37	27.9	93	16.20
	V18	-	-	-	-	-	-	-
	V19	-	-	-	-	-	-	-
	V20	-	-	-	-	-	-	-
	V21	-	-	-	-	-	-	-
	V22	5.72	15	189	3.33	25.2	74	4.20
	V23	6.43	4	205	3.53	26.4	90	9.40
	V24	-	-	-	-	-	-	-
	V25	5.33	18	196	3.39	23.3	74	4.00
	C.D.(0.05)	0.57		16.35	NS	1.17	0.85	
	C.V. (%)	8.36		7.23	10.66	4	0.91	
	Expt. Mean	**5.99**		**198**	**3.44**	**25.69**	**81**	
	Soil type	Vertisol						
	pH	6.58						
F - levels (kg/ha)		F1		F2		Recommended N:P:K (kg/ha)		
		50:30:20		100:60:40		100:60:40		
Varieties								
	V1	IET 29268						
	V2	IET 28489						
	V3	IET 29002						
	V4	IET 29284						
	V5	IET 29014						
	V6	IET 29257						
	V7	IET 29301						
	V8	IET 28997						
	V9	IET 29256						
	V10	IET 29290						
	V11	IET 29001						
	V12	IET 29004						
	V13	IET 29009						
	V14	IET 29000						
	V15	IET 27908						
	V16	IET 27900						
	V17	NC- NDR 359						
	V18	-						
	V19	-						
	V20	-						
	V21	-						
	V22	Jaya (S)						
	V23	HRI 174						
	V24	-						
	V25	Local Check - Samleshwari (110-115 days)						
	Available N:P:K of soil	222:12:295						

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: Low input 50% NPK	V1	4.44	22	210	3.49	24.00	108	
	V2	2.76	40	227	2.04	16.04	114	
	V3	2.91	39	169	2.88	20.52	95	
	V4	3.70	30	230	2.34	15.00	102	
	V5	4.13	27	233	2.90	18.87	96	
	V6	3.69	31	210	2.25	18.10	102	
	V7	3.45	36	216	2.92	15.45	119	
	V8	4.82	15	225	3.17	20.26	101	
	V9	3.63	32	218	2.33	16.11	115	
	V10	4.81	16	209	3.78	16.24	100	
	V11	4.19	26	221	2.73	21.24	99	
	V12	4.42	23	187	3.45	19.83	99	
	V13	4.30	25	190	3.48	20.05	102	
	V14	4.62	18	219	3.14	18.48	115	
	V15	3.52	34	228	2.18	16.97	119	
	V16	3.46	35	223	3.00	19.70	120	
	V17	3.28	37	182	3.56	22.33	96	
	V18	-	-	-	-	-	-	
	V19	-	-	-	-	-	-	
	V20	-	-	-	-	-	-	
	V21	-	-	-	-	-	-	
	V22	3.13	38	241	3.41	18.37	95	
	V23	4.45	21	219	3.41	18.58	99	
	V24	-	-	-	-	-	-	
	V25	3.91	28	222	2.01	17.74	107	
F2: Optimum input 100% NPK	V1	5.53	5	258	3.76	25.30	106	10.90
	V2	3.71	29	260	2.73	17.46	113	9.50
	V3	3.59	33	249	3.94	21.30	94	6.80
	V4	4.65	17	269	4.12	17.12	112	9.50
	V5	5.27	12	268	4.77	19.01	92	11.40
	V6	5.24	13	272	2.98	18.34	92	15.50
	V7	5.58	2	277	4.29	16.17	117	21.30
	V8	5.42	9	260	4.43	21.50	97	6.00
	V9	4.35	24	239	3.82	17.18	113	7.20
	V10	5.69	1	268	4.45	17.12	93	8.80
	V11	5.53	5	237	4.47	22.17	96	13.40
	V12	5.57	3	216	4.85	20.02	96	11.50
	V13	5.30	11	193	4.54	20.42	99	10.00
	V14	5.08	14	252	4.17	19.69	113	4.60
	V15	5.49	8	261	3.64	17.02	117	19.70
	V16	4.46	20	269	3.88	20.05	117	10.00
	V17	5.52	7	220	4.37	23.82	95	22.40
	V18	-	-	-	-	-	-	-
	V19	-	-	-	-	-	-	-
	V20	-	-	-	-	-	-	-
	V21	-	-	-	-	-	-	-
	V22	4.59	19	271	4.12	18.99	96	14.60
	V23	5.32	10	225	4.30	18.65	95	8.70
	V24	-	-	-	-	-	-	-
	V25	5.56	4	246	2.59	18.74	98	16.50
Interaction								
F at same V		0.49		NS	NS	NS	4.18	
V at same F		0.74		NS	NS	NS	4.89	
F1		3.88	2	214	2.92	18.69	105	
F2		5.07	1	250	4.01	19.50	103	11.92
C.D.(0.05)		0.72		12.42	0.82	0.52	NS	
C.V.(%)		20.6		6.81	29.94	3.44	4.28	

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)
Mean of varieties:								
	V1	4.99	4	234	3.63	24.65	107	10.90
	V2	3.24	20	243	2.39	16.75	114	9.50
	V3	3.25	19	209	3.41	20.91	95	6.80
	V4	4.18	15	249	3.23	16.06	107	9.50
	V5	4.70	10	250	3.84	18.94	94	11.40
	V6	4.47	13	241	2.62	18.22	97	15.50
	V7	4.52	11	246	3.61	15.81	118	21.30
	V8	5.12	2	242	3.80	20.88	99	6.00
	V9	3.99	16	229	3.08	16.65	114	7.20
	V10	5.25	1	239	4.12	16.68	97	8.80
	V11	4.86	6	229	3.60	21.71	97	13.40
	V12	5.00	3	202	4.15	19.93	98	11.50
	V13	4.80	8	191	4.01	20.24	100	10.00
	V14	4.85	7	235	3.66	19.09	114	4.60
	V15	4.51	12	245	2.91	17.00	118	19.70
	V16	3.96	17	246	3.44	19.88	119	10.00
	V17	4.40	14	201	3.97	23.08	96	22.40
	V18	-	-	-	-	-	-	-
	V19	-	-	-	-	-	-	-
	V20	-	-	-	-	-	-	-
	V21	-	-	-	-	-	-	-
	V22	3.86	18	256	3.77	18.68	96	14.60
	V23	4.89	5	222	3.86	18.62	97	8.70
	V24	-	-	-	-	-	-	-
	V25	4.74	9	234	2.30	18.24	103	16.50
	C.D.(0.05)	0.35		30.47	0.62	0.64	2.95	
	C.V. (%)	6.77		11.48	15.66	2.91	2.49	
	Expt. Mean	**4.48**		**232**	**3.47**	**19.10**	**104**	
	Soil type	-						
	pH	-						
F - levels (kg/ha)		F1		F2			Recommended N:P:K (kg/ha)	
		50:25:25		100:50:50		100:50:50		
Varieties								
	V1	IET 29268						
	V2	IET 28489						
	V3	IET 29002						
	V4	IET 29284						
	V5	IET 29014						
	V6	IET 29257						
	V7	IET 29301						
	V8	IET 28997						
	V9	IET 29256						
	V10	IET 29290						
	V11	IET 29001						
	V12	IET 29004						
	V13	IET 29009						
	V14	IET 29000						
	V15	IET 27908						
	V16	IET 27900						
	V17	NC- NDR 359						
	V18	-						
	V19	-						
	V20	-						
	V21	-						
	V22	Jaya (S)						
	V23	HRI 174						
	V24	-						
	V25	Local Check - KJT-3 (110-115 days)						
	Available N:P:K of soil	-						

Table-4.1(e) (Contd…)

F-levels	Varieties	KAUL					
		Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Panicle wt (g)	Test wt (g)	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: Low input 50% NPK	V1	6.82	25	271	2.81	27.93	
	V2	5.75	31	282	2.27	23.03	
	V3	6.69	27	264	2.81	23.77	
	V4	5.90	30	233	2.82	21.56	
	V5	7.07	24	269	2.75	22.77	
	V6	5.38	32	292	2.04	20.68	
	V7	6.82	25	307	2.47	16.62	
	V8	7.22	21	274	2.96	24.97	
	V9	-	-	-	-	-	
	V10	6.61	28	270	2.71	18.36	
	V11	7.23	20	244	3.35	24.69	
	V12	7.42	17	248	3.34	24.80	
	V13	7.75	15	269	3.20	24.50	
	V14	7.51	16	254	3.27	23.21	
	V15	-	-	-	-	-	
	V16	-	-	-	-	-	
	V17	-	-	-	-	-	
	V18	7.24	19	289	2.68	26.44	
	V19	-	-	-	-	-	
	V20	-	-	-	-	-	
	V21	-	-	-	-	-	
	V22	-	-	-	-	-	
	V23	7.97	13	264	3.31	26.51	
	V24	-	-	-	-	-	
	V25	7.10	23	279	2.84	25.34	
F2: Optimum input 100% NPK	V1	8.56	7	335	2.83	27.72	12.89
	V2	7.42	17	333	2.47	24.37	12.37
	V3	7.97	13	309	2.87	23.43	9.48
	V4	7.18	22	281	2.84	21.80	9.48
	V5	7.98	12	322	2.76	21.77	6.74
	V6	6.38	29	348	2.04	20.77	7.41
	V7	8.12	9	358	2.52	17.08	9.63
	V8	9.04	6	329	3.07	25.53	13.48
	V9	-	-	-	-	-	-
	V10	8.12	9	326	2.78	18.83	11.19
	V11	9.06	5	299	3.38	24.27	13.56
	V12	9.17	2	303	3.38	24.80	12.96
	V13	9.11	3	312	3.23	24.73	10.07
	V14	9.11	3	309	3.28	23.44	11.85
	V15	-	-	-	-	-	-
	V16	-	-	-	-	-	-
	V17	-	-	-	-	-	-
	V18	7.99	11	330	2.68	26.86	5.56
	V19	-	-	-	-	-	-
	V20	-	-	-	-	-	-
	V21	-	-	-	-	-	-
	V22	-	-	-	-	-	-
	V23	9.42	1	315	3.33	26.83	10.74
	V24	-	-	-	-	-	-
	V25	8.44	8	331	2.85	25.82	9.93
Interaction							
F at same V		NS		NS	NS	NS	
V at same F		NS		NS	NS	NS	
F1		6.91	2	269	2.85	23.45	
F2		8.32	1	321	2.89	23.63	10.46
C.D.(0.05)		1.06		15.89	NS	NS	
C.V.(%)		9.44		3.51	8.01	8.68	

Table-4.1(e) (Contd…)

F-levels	Varieties	KAUL					
		Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Panicle wt (g)	Test wt (g)	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Mean of varieties:							
V1		7.69	8	303	2.82	27.83	12.89
V2		6.59	14	307	2.37	23.70	12.37
V3		7.33	13	286	2.84	23.60	9.48
V4		6.54	15	257	2.83	21.68	9.48
V5		7.53	10	295	2.76	22.27	6.74
V6		5.88	16	320	2.04	20.73	7.41
V7		7.47	11	333	2.50	16.85	9.63
V8		8.13	6	302	3.02	25.25	13.48
V9		-	-	-	-	-	-
V10		7.37	12	298	2.75	18.60	11.19
V11		8.15	5	272	3.37	24.48	13.56
V12		8.30	4	276	3.36	24.80	12.96
V13		8.43	2	290	3.22	24.62	10.07
V14		8.31	3	282	3.28	23.33	11.85
V15		-	-	-	-	-	-
V16		-	-	-	-	-	-
V17		-	-	-	-	-	-
V18		7.62	9	310	2.68	26.65	5.56
V19		-	-	-	-	-	-
V20		-	-	-	-	-	-
V21		-	-	-	-	-	-
V22		-	-	-	-	-	-
V23		8.70	1	290	3.32	26.67	10.74
V24		-	-	-	-	-	-
V25		7.77	7	305	2.85	25.58	9.93
C.D.(0.05)		0.65		20.84	0.16	2.06	
C.V. (%)		8.02		6.42	4.36	6.43	
Expt. Mean		**7.61**		**295**	**2.87**		
Soil type		Clay Loam					
pH		8.00					
F - levels (kg/ha)		F1		F2		Recommended N:P:K (kg/ha)	
		75:30:30		150:60:60		150:60:60	
Varieties							
V1		IET 29268					
V2		IET 28489					
V3		IET 29002					
V4		IET 29284					
V5		IET 29014					
V6		IET 29257					
V7		IET 29301					
V8		IET 28997					
V9		-					
V10		IET 29290					
V11		IET 29001					
V12		IET 29004					
V13		IET 29009					
V14		IET 29000					
V15		-					
V16		-					
V17		-					
V18		PR121 (N)					
V19		-					
V20		-					
V21		-					
V22		-					
V23		HRI 174					
V24		-					
V25		Local Check - HKR 127 (140 days)					
Available N:P:K of soil		160:16:320					

Table-4.1(e) (Contd…)

F-levels	Varieties	KOTA					
		Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Panicle wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: Low input 50% NPK	V1	7.04	7	234	4.24	104	
	V2	6.35	18	227	4.13	110	
	V3	5.90	26	170	5.41	95	
	V4	6.08	23	187	5.11	104	
	V5	4.86	39	150	5.23	96	
	V6	4.51	40	225	3.00	98	
	V7	5.05	35	218	3.74	114	
	V8	5.20	32	192	4.49	99	
	V9	5.19	33	196	4.64	108	
	V10	5.62	29	195	4.70	103	
	V11	6.84	9	202	5.27	99	
	V12	6.47	15	187	5.36	99	
	V13	6.13	22	200	5.06	103	
	V14	7.63	2	224	5.20	111	
	V15	5.92	25	209	4.52	111	
	V16	6.36	17	209	4.60	112	
	V17	4.98	37	189	3.78	99	
	V18	4.93	38	240	3.31	102	
	V19	-	-	-	-	-	
	V20	5.29	31	235	3.99	100	
	V21	-	-	-	-	-	
	V22	5.17	34	216	3.69	97	
	V23	-	-	-	-	-	
	V24	-	-	-	-	-	
	V25	-	-	-	-	-	
F2: Optimum input 100% NPK	V1	7.51	3	260	4.53	105	4.27
	V2	6.79	11	248	4.44	110	4.00
	V3	6.42	16	197	5.72	95	4.73
	V4	6.90	8	197	5.54	105	7.45
	V5	5.39	30	176	5.41	97	4.82
	V6	5.03	36	249	3.40	99	4.73
	V7	6.24	20	255	4.21	114	10.82
	V8	6.48	14	243	4.99	100	11.64
	V9	6.35	18	223	5.07	108	10.55
	V10	6.74	12	207	5.17	103	10.18
	V11	7.46	4	222	5.63	100	5.64
	V12	7.08	6	206	5.89	100	5.55
	V13	7.32	5	210	5.55	103	10.82
	V14	8.38	1	248	5.54	112	6.82
	V15	6.55	13	217	4.91	111	5.73
	V16	6.81	10	231	4.77	112	4.09
	V17	6.19	21	207	4.18	100	11.00
	V18	5.82	27	255	3.70	102	8.09
	V19	-	-	-	-	-	-
	V20	5.98	24	249	4.53	101	6.27
	V21	-	-	-	-	-	-
	V22	5.75	28	242	4.07	97	5.27
	V23	-	-	-	-	-	-
	V24	-	-	-	-	-	-
	V25	-	-	-	-	-	-
Interaction							
F at same V		NS		NS	NS	NS	
V at same F		NS		NS	NS	NS	
F1		5.78	2	205	4.47	103	
F2		6.56	1	227	4.86	104	7.12
C.D.(0.05)		0.46		8.13	0.24	NS	
C.V.(%)		9.41		4.79	6.56	1.02	

Table-4.1(e) (Contd…)

F-levels	Varieties	KOTA					
		Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Panicle wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Mean of varieties:							
	V1	7.28	2	247	4.39	104	4.27
	V2	6.57	7	238	4.29	110	4.00
	V3	6.16	11	183	5.57	95	4.73
	V4	6.49	8	192	5.33	105	7.45
	V5	5.13	19	163	5.32	96	4.82
	V6	4.77	20	237	3.20	98	4.73
	V7	5.65	14	237	3.98	114	10.82
	V8	5.84	12	218	4.74	99	11.64
	V9	5.77	13	210	4.86	108	10.55
	V10	6.18	10	201	4.94	103	10.18
	V11	7.15	3	212	5.45	100	5.64
	V12	6.78	4	196	5.63	100	5.55
	V13	6.73	5	205	5.31	103	10.82
	V14	8.01	1	236	5.37	112	6.82
	V15	6.24	9	213	4.72	111	5.73
	V16	6.59	6	220	4.69	112	4.09
	V17	5.59	16	198	3.98	99	11.00
	V18	5.38	18	248	3.51	102	8.09
	V19	-	-	-	-	-	-
	V20	5.64	15	242	4.26	101	6.27
	V21	-	-	-	-	-	-
	V22	5.46	17	229	3.88	97	5.27
	V23	-	-	-	-	-	-
	V24	-	-	-	-	-	-
	V25	-	-	-	-	-	-
C.D.(0.05)		0.45		21.41	0.34	0.54	
C.V. (%)		6.4		8.67	6.39	0.46	
Expt. Mean		**6.17**		**216**	**4.67**	**103**	
Soil type		Clay					
pH		7.35					
F - levels (kg/ha)		F1		F2		Recommended N:P:K (kg/ha)	
		60:30:20		120:60:40		120:60:40	
Varieties							
	V1	IET 29268					
	V2	IET 28489					
	V3	IET 29002					
	V4	IET 29284					
	V5	IET 29014					
	V6	IET 29257					
	V7	IET 29301					
	V8	IET 28997					
	V9	IET 29256					
	V10	IET 29290					
	V11	IET 29001					
	V12	IET 29004					
	V13	IET 29009					
	V14	IET 29000					
	V15	IET 27908					
	V16	IET 27900					
	V17	NC- NDR 359					
	V18	PR121 (N)					
	V19	-					
	V20	Karma Mahsuri (C)					
	V21	-					
	V22	Jaya (S)					
	V23	-					
	V24	-					
	V25	-					
Available N:P:K of soil		195:30:514					

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: Low input 50% NPK	V1	5.81	10	264	3.43	23.22	102	
	V2	5.23	14	245	4.10	21.56	107	
	V3	6.03	8	259	3.79	22.29	101	
	V4	4.84	23	186	4.21	22.85	112	
	V5	3.79	37	152	3.63	22.39	109	
	V6	4.80	24	241	3.33	23.73	107	
	V7	5.73	11	296	3.22	22.53	106	
	V8	6.30	2	295	3.89	22.41	100	
	V9	4.00	31	266	3.65	22.12	112	
	V10	3.87	33	240	3.57	22.93	100	
	V11	4.48	27	226	3.44	21.62	98	
	V12	4.03	30	191	3.89	23.06	100	
	V13	3.84	36	189	4.03	21.42	98	
	V14	6.07	7	300	3.62	21.66	108	
	V15	6.23	4	293	3.54	22.03	106	
	V16	5.06	20	280	3.92	21.87	108	
	V17	5.22	17	252	4.25	21.54	103	
	V18	-	-	-	-	-	-	
	V19	-	-	-	-	-	-	
	V20	-	-	-	-	-	-	
	V21	-	-	-	-	-	-	
	V22	4.78	25	309	3.89	23.09	108	
	V23	3.87	33	201	3.53	21.87	106	
	V24	-	-	-	-	-	-	
	V25	-	-	-	-	-	-	
F2: Optimum input 100% NPK	V1	5.98	9	275	3.53	23.08	102	1.62
	V2	5.16	18	244	4.21	22.23	107	-0.67
	V3	6.10	5	290	3.98	22.30	101	0.67
	V4	4.65	26	243	4.62	22.63	112	-1.81
	V5	4.05	29	196	3.51	21.68	109	2.48
	V6	5.02	21	210	3.21	24.40	107	2.10
	V7	5.63	12	307	3.52	22.34	106	-0.95
	V8	6.10	5	283	3.95	23.73	100	-1.90
	V9	5.12	19	242	3.98	22.10	112	10.67
	V10	4.10	28	246	3.55	22.93	100	2.19
	V11	4.87	22	195	3.42	22.49	98	3.71
	V12	3.96	32	183	4.04	22.83	100	-0.67
	V13	3.85	35	212	3.87	22.10	98	0.10
	V14	6.34	1	198	3.87	22.50	108	2.57
	V15	6.25	3	322	3.46	22.20	106	0.19
	V16	5.23	14	292	3.91	21.70	108	1.62
	V17	5.45	13	228	4.21	22.70	103	2.19
	V18	-	-	-	-	-	-	-
	V19	-	-	-	-	-	-	-
	V20	-	-	-	-	-	-	-
	V21	-	-	-	-	-	-	-
	V22	5.23	14	302	4.03	22.96	108	4.29
	V23	3.69	38	189	3.62	21.69	106	-1.71
	V24	-	-	-	-	-	-	-
	V25	-	-	-	-	-	-	-
Interaction								
F at same V		NS		29.66	0.14	NS	NS	
V at same F		NS		39.49	0.14	NS	NS	
F1		4.95	2	247	3.73	22.33	105	
F2		5.09	1	245	3.82	22.56	105	1.40
C.D.(0.05)		NS		NS	0.02	NS	NS	
C.V.(%)		3.99		17.49	0.55	5.1	0.18	

Table-4.1(e) (Contd…)

F-levels	Varieties	MARUTERU						
		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	5.90	5	270	3.48	23.15	102	1.62
	V2	5.20	8	245	4.16	21.90	107	-0.67
	V3	6.07	4	274	3.89	22.30	101	0.67
	V4	4.75	12	215	4.42	22.74	112	-1.81
	V5	3.92	17	174	3.57	22.04	109	2.48
	V6	4.91	11	225	3.27	24.07	107	2.10
	V7	5.68	6	301	3.37	22.44	106	-0.95
	V8	6.20	3	289	3.92	23.07	100	-1.90
	V9	4.56	14	254	3.82	22.11	112	10.67
	V10	3.99	16	243	3.56	22.93	100	2.19
	V11	4.68	13	211	3.43	22.06	98	3.71
	V12	4.00	15	187	3.97	22.95	100	-0.67
	V13	3.85	18	201	3.95	21.76	98	0.10
	V14	6.21	2	249	3.75	22.08	108	2.57
	V15	6.24	1	307	3.50	22.12	106	0.19
	V16	5.15	9	286	3.92	21.79	108	1.62
	V17	5.34	7	240	4.23	22.12	103	2.19
	V18	-	-	-	-	-	-	-
	V19	-	-	-	-	-	-	-
	V20	-	-	-	-	-	-	-
	V21	-	-	-	-	-	-	-
	V22	5.01	10	306	3.96	23.03	108	4.29
	V23	3.78	19	195	3.58	21.78	106	-1.71
	V24	-	-	-	-	-	-	-
	V25	-	-	-	-	-	-	-
C.D.(0.05)		0.39		20.97	0.1	0.73	0.34	
C.V. (%)		6.86		7.46	2.34	2.86	0.28	
Expt. Mean		**5.02**		**246**	**3.77**	**22.44**	**105**	
Soil type		Alluvial clay						
pH		6.50						
F - levels (kg/ha)		F1		F2			Recommended N:P:K (kg/ha)	
		45:30:30		90:60:60		90:60:60		
Varieties								
	V1	IET 29268						
	V2	IET 28489						
	V3	IET 29002						
	V4	IET 29284						
	V5	IET 29014						
	V6	IET 29257						
	V7	IET 29301						
	V8	IET 28997						
	V9	IET 29256						
	V10	IET 29290						
	V11	IET 29001						
	V12	IET 29004						
	V13	IET 29009						
	V14	IET 29000						
	V15	IET 27908						
	V16	IET 27900						
	V17	NC- NDR 359						
	V18	-						
	V19	-						
	V20	-						
	V21	-						
	V22	Jaya (S)						
	V23	HRI 174						
	V24	-						
	V25	-						
Available N:P:K of soil		172:46:286						

Table-4.1(e) (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	2.73	14	255	2.77	23.45	98	
	V2	-	-	-	-	-	-	
	V3	2.68	16	251	2.76	23.47	99	
	V4	-	-	-	-	-	-	
	V5	2.59	18	224	2.74	22.13	98	
	V6	2.87	12	238	2.72	22.36	100	
	V7	-	-	-	-	-	-	
	V8	2.73	14	244	2.74	23.13	99	
	V9	-	-	-	-	-	-	
	V10	-	-	-	-	-	-	
	V11	2.59	18	237	2.77	22.87	100	
	V12	2.92	11	242	2.77	23.17	98	
	V13	2.64	17	237	2.66	21.23	101	
	V14	-	-	-	-	-	-	
	V15	-	-	-	-	-	-	
	V16	-	-	-	-	-	-	
	V17	2.78	13	235	2.66	26.00	100	
	V18	-	-	-	-	-	-	
	V19	-	-	-	-	-	-	
	V20	-	-	-	-	-	-	
	V21	-	-	-	-	-	-	
	V22	-	-	-	-	-	-	
	V23	2.59	18	230	2.62	23.63	102	
	V24	-	-	-	-	-	-	
	V25	-	-	-	-	-	-	
F2: Optimum input 100% NPK	V1	4.89	3	355	2.86	23.52	102	19.64
	V2	-	-	-	-	-	-	-
	V3	4.92	1	374	2.84	23.48	101	20.36
	V4	-	-	-	-	-	-	-
	V5	4.90	2	357	2.84	22.16	99	21.00
	V6	4.87	5	360	2.84	22.38	101	18.18
	V7	-	-	-	-	-	-	-
	V8	4.74	8	342	2.85	23.14	100	18.27
	V9	-	-	-	-	-	-	-
	V10	-	-	-	-	-	-	-
	V11	4.88	4	372	2.84	22.88	100	20.82
	V12	4.80	6	368	2.85	23.23	100	17.09
	V13	4.77	7	305	2.71	21.41	105	19.36
	V14	-	-	-	-	-	-	-
	V15	-	-	-	-	-	-	-
	V16	-	-	-	-	-	-	-
	V17	3.95	9	320	2.73	26.02	103	10.64
	V18	-	-	-	-	-	-	-
	V19	-	-	-	-	-	-	-
	V20	-	-	-	-	-	-	-
	V21	-	-	-	-	-	-	-
	V22	-	-	-	-	-	-	-
	V23	3.95	9	323	2.84	27.08	101	12.36
	V24	-	-	-	-	-	-	-
	V25	-	-	-	-	-	-	-
Interaction								
F at same V		0.52		17.7	0.02	0.13	1.88	
V at same F		0.56		17.48	0.02	0.17	1.96	
F1		2.71	2	239	2.72	23.14	100	
F2		4.67	1	348	2.82	23.53	101	17.77
C.D.(0.05)		0.33		6.25	0	0.14	1.03	
C.V.(%)		8.03		1.92	0.05	0.54	0.93	

Table-4.1(e) (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)
Mean of varieties:								
	V1	3.81	3	305	2.82	23.49	100	19.64
	V2	-	-	-	-	-	-	-
	V3	3.80	4	312	2.80	23.48	100	20.36
	V4	-	-	-	-	-	-	-
	V5	3.75	5	291	2.79	22.15	99	21.00
	V6	3.87	1	299	2.78	22.37	101	18.18
	V7	-	-	-	-	-	-	-
	V8	3.74	6	293	2.80	23.14	99	18.27
	V9	-	-	-	-	-	-	-
	V10	-	-	-	-	-	-	-
	V11	3.74	7	305	2.81	22.88	100	20.82
	V12	3.86	2	305	2.81	23.20	99	17.09
	V13	3.71	8	271	2.69	21.32	103	19.36
	V14	-	-	-	-	-	-	-
	V15	-	-	-	-	-	-	-
	V16	-	-	-	-	-	-	-
	V17	3.37	9	278	2.70	26.01	102	10.64
	V18	-	-	-	-	-	-	-
	V19	-	-	-	-	-	-	-
	V20	-	-	-	-	-	-	-
	V21	-	-	-	-	-	-	-
	V22	-	-	-	-	-	-	-
	V23	3.27	10	276	2.73	25.36	102	12.36
	V24	-	-	-	-	-	-	-
	V25	-	-	-	-	-	-	-
C.D.(0.05)		0.37		12.51	0.02	0.09	1.33	
C.V. (%)		8.56		3.66	0.47	0.34	1.14	
Expt. Mean		**3.69**		**293**	**2.77**	**23.34**	**100**	
Soil type		-						
pH		7.70						
F - levels (kg/ha)		F1		F2			Recommended N:P:K (kg/ha)	
		60:30:20		120:60:40		120:60:40		
Varieties								
	V1	IET 29268						
	V2	-						
	V3	IET 29002						
	V4	-						
	V5	IET 29014						
	V6	IET 29257						
	V7	-						
	V8	IET 28997						
	V9	-						
	V10	-						
	V11	IET 29001						
	V12	IET29004						
	V13	IET 29009						
	V14	-						
	V15	-						
	V16	-						
	V17	NDR359						
	V18	-						
	V19	-						
	V20	-						
	V21	-						
	V22	-						
	V23	HRI174						
	V24	-						
	V25	-						
Available N:P:K of soil		-						

Table-4.1(e) (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)
F1: Low input 50% NPK	V1	5.86	16	195	3.19	22.46	91	
	V2	5.75	20	174	3.96	22.70	102	
	V3	5.11	32	212	4.64	20.57	92	
	V4	4.98	33	207	4.00	20.31	100	
	V5	5.76	19	239	4.43	22.58	89	
	V6	4.70	34	190	3.52	23.58	90	
	V7	4.17	39	232	3.36	22.30	95	
	V8	5.69	21	214	4.30	23.55	94	
	V9	2.89	44	213	4.64	20.15	95	
	V10	4.66	36	244	4.09	22.59	95	
	V11	5.69	21	221	4.38	23.34	91	
	V12	3.29	42	211	3.58	20.37	96	
	V13	5.44	27	184	4.84	21.87	96	
	V14	5.29	29	199	3.65	20.63	95	
	V15	3.02	43	175	4.03	21.60	103	
	V16	4.00	40	211	5.33	20.58	106	
	V17	4.60	37	207	4.33	20.57	97	
	V18	-	-	-	-	-	-	
	V19	-	-	-	-	-	-	
	V20	-	-	-	-	-	-	
	V21	5.32	28	191	5.12	25.43	96	
	V22	5.67	23	181	5.30	22.44	95	
	V23	6.39	13	178	4.19	23.77	93	
	V24	5.99	15	173	5.44	25.62	91	
	V25	5.65	25	165	4.38	20.87	86	
F2: Optimum input 100% NPK	V1	7.44	1	205	3.87	25.36	94	24.31
	V2	6.75	4	190	4.91	23.35	101	15.38
	V3	6.52	8	229	5.70	25.34	91	21.69
	V4	6.41	11	231	5.47	23.44	100	22.00
	V5	6.54	7	260	5.89	24.98	90	12.00
	V6	6.31	14	203	4.19	23.63	89	24.77
	V7	4.67	35	244	4.29	24.44	96	7.69
	V8	6.56	6	237	4.95	24.47	93	13.38
	V9	3.84	41	224	5.71	20.44	91	14.62
	V10	5.24	30	279	5.45	23.49	95	8.92
	V11	7.22	2	241	5.25	23.85	92	23.54
	V12	4.33	38	234	4.40	21.76	96	16.00
	V13	5.82	17	199	5.56	22.83	94	5.85
	V14	5.81	18	215	5.39	21.83	94	8.00
	V15	5.49	26	188	4.85	22.32	101	38.00
	V16	5.14	31	235	5.86	24.78	104	17.54
	V17	5.67	23	225	4.94	27.24	97	16.46
	V18	-	-	-	-	-	-	-
	V19	-	-	-	-	-	-	-
	V20	-	-	-	-	-	-	-
	V21	6.46	10	207	6.08	26.92	97	17.54
	V22	6.52	8	215	6.48	29.28	96	13.08
	V23	7.11	3	199	5.61	24.65	97	11.08
	V24	6.59	5	196	6.35	29.94	96	9.23
	V25	6.41	11	172	5.38	20.64	86	11.69
Interaction								
F at same V		NS		NS	NS	1.84	1.81	
V at same F		NS		NS	NS	2.08	2	
F1		5.00	2	201	4.30	22.2	95	
F2		6.04	1	219	5.30	24.3	95	16.03
C.D.(0.05)		0.39		13.78	0.29	1.36	NS	
C.V.(%)		9.51		8.75	8.11	7.8	1.72	

Table-4.1(e) (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	6.65	2	200	3.53	23.9	92	24.31
	V2	6.25	5	182	4.44	23.0	101	15.38
	V3	5.82	11	221	5.17	23.0	91	21.69
	V4	5.70	12	219	4.74	21.9	100	22.00
	V5	6.15	6	250	5.16	23.8	90	12.00
	V6	5.51	15	197	3.86	23.6	90	24.77
	V7	4.42	19	238	3.83	23.4	96	7.69
	V8	6.13	7	226	4.63	24.0	94	13.38
	V9	3.37	22	219	5.18	20.3	93	14.62
	V10	4.95	17	262	4.77	23.0	95	8.92
	V11	6.46	3	231	4.82	23.6	92	23.54
	V12	3.81	21	223	3.99	21.1	96	16.00
	V13	5.63	13	192	5.20	22.4	95	5.85
	V14	5.55	14	207	4.52	21.2	94	8.00
	V15	4.26	20	182	4.44	22.0	102	38.00
	V16	4.57	18	223	5.60	22.7	105	17.54
	V17	5.14	16	216	4.64	23.9	97	16.46
	V18	-	-	-	-	-	-	-
	V19	-	-	-	-	-	-	-
	V20	-	-	-	-	-	-	-
	V21	5.89	10	199	5.60	26.2	96	17.54
	V22	6.10	8	198	5.89	25.9	95	13.08
	V23	6.75	1	188	4.90	24.2	95	11.08
	V24	6.29	4	185	5.90	27.8	94	9.23
	V25	6.03	9	169	4.88	20.8	86	11.69
	C.D.(0.05)	0.58		17.33	0.36	1.3	1.28	
	C.V. (%)	9.22		7.22	6.6	4.89	1.18	
	Expt. Mean	**5.52**		**210**	**4.80**	**23.25**	**95**	
	Soil type	Clay						
	pH	7.84						
F - levels (kg/ha)		F1		F2		Recommended N:P:K (kg/ha)		
		50:15:0		100:30:0		100:30:0		
Varieties								
	V1	IET 29268						
	V2	IET 28489						
	V3	IET 29002						
	V4	IET 29284						
	V5	IET 29014						
	V6	IET 29257						
	V7	IET 29301						
	V8	IET 28997						
	V9	IET 29256						
	V10	IET 29290						
	V11	IET 29001						
	V12	IET 29004						
	V13	IET 29009						
	V14	IET 29000						
	V15	IET 27908						
	V16	IET 27900						
	V17	NC- NDR 359						
	V18	-						
	V19	-						
	V20	-						
	V21	Akshaydhan (W)						
	V22	Jaya (S)						
	V23	HRI 174						
	V24	Hybrid check GNR-3						
	V25	Local check - GRH-2 (120-125 days)						
	Available N:P:K of soil	278:22:789						

Table-4.1(e) (Contd…)

F-levels	Varieties	NAWAGAM						
		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	5.34	27	273	5.34	32.20	110	
	V2	4.91	35	234	4.91	20.27	111	
	V3	6.66	9	197	7.20	25.90	103	
	V4	6.37	13	179	6.86	18.53	111	
	V5	6.65	10	202	7.90	22.90	99	
	V6	4.81	38	251	4.81	22.43	104	
	V7	4.02	40	264	4.02	14.37	118	
	V8	6.06	16	243	6.06	24.30	110	
	V9	4.99	34	266	5.19	19.93	115	
	V10	5.18	30	259	6.18	22.63	110	
	V11	6.95	6	269	6.95	25.17	105	
	V12	6.74	7	203	6.74	26.08	104	
	V13	7.09	4	206	7.09	24.47	102	
	V14	4.91	35	187	4.91	19.93	110	
	V15	5.72	23	184	5.72	18.10	113	
	V16	5.28	28	205	5.28	18.60	110	
	V17	5.94	21	203	5.94	28.40	100	
	V18	-	-	-	-	-	-	
	V19	-	-	-	-	-	-	
	V20	-	-	-	-	-	-	
	V21	-	-	-	-	-	-	
	V22	4.91	35	195	4.91	17.53	116	
	V23	5.65	24	181	5.65	24.33	103	
	V24	-	-	-	-	-	-	
	V25	5.17	31	221	5.17	17.63	96	
F2: Optimum input 100% NPK	V1	5.50	26	285	5.50	31.10	111	2.56
	V2	5.03	33	235	5.03	21.17	112	1.92
	V3	6.72	8	206	6.72	24.90	105	0.96
	V4	6.59	11	195	6.59	19.00	113	3.52
	V5	7.36	3	212	7.36	21.87	101	11.36
	V6	5.19	29	266	4.58	20.93	106	6.08
	V7	4.40	39	274	4.40	15.27	119	6.08
	V8	6.58	12	263	6.58	25.37	110	8.32
	V9	5.74	22	288	5.18	21.23	115	12.00
	V10	6.18	14	288	5.15	21.37	110	16.00
	V11	7.49	2	287	7.49	26.28	105	8.64
	V12	7.09	4	241	7.09	28.20	106	5.60
	V13	7.76	1	232	7.76	26.43	104	10.72
	V14	5.95	18	235	5.95	20.43	113	16.64
	V15	5.95	18	218	5.07	17.57	115	3.68
	V16	5.54	25	237	5.54	19.67	111	4.16
	V17	6.08	15	273	6.08	30.07	101	2.24
	V18	-	-	-	-	-	-	-
	V19	-	-	-	-	-	-	-
	V20	-	-	-	-	-	-	-
	V21	-	-	-	-	-	-	-
	V22	5.12	32	221	5.12	19.25	116	3.36
	V23	5.95	18	237	5.95	23.83	104	4.80
	V24	-	-	-	-	-	-	-
	V25	6.06	16	243	6.06	18.57	96	14.24
Interaction								
F at same V		NS		NS	NS	NS	NS	
V at same F		NS		NS	NS	NS	NS	
F1		5.67	2	221	5.84	22.19	108	
F2		6.11	1	247	5.96	22.63	109	7.14
C.D.(0.05)		NS		NS	NS	NS	NS	
C.V.(%)		18.02		14.08	25.21	8.03	2.08	

Table-4.1(e) (Contd…)

F-levels	Varieties	NAWAGAM						
		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		5.42	14	279	5.42	31.65	111	2.56
V2		4.97	19	234	4.97	20.72	111	1.92
V3		6.69	5	201	6.96	25.40	104	0.96
V4		6.48	6	187	6.73	18.77	112	3.52
V5		7.01	3	207	7.63	22.39	100	11.36
V6		5.00	18	258	4.70	21.68	105	6.08
V7		4.21	20	269	4.21	14.82	119	6.08
V8		6.32	7	253	6.32	24.84	110	8.32
V9		5.37	16	277	5.19	20.58	115	12.00
V10		5.68	11	274	5.67	22.00	110	16.00
V11		7.22	2	278	7.22	25.73	105	8.64
V12		6.92	4	222	6.92	27.14	105	5.60
V13		7.43	1	219	7.43	25.45	103	10.72
V14		5.43	13	211	5.43	20.18	112	16.64
V15		5.84	9	201	5.40	17.84	114	3.68
V16		5.41	15	221	5.41	19.14	111	4.16
V17		6.01	8	238	6.01	29.24	101	2.24
V18		-	-	-	-	-	-	-
V19		-	-	-	-	-	-	-
V20		-	-	-	-	-	-	-
V21		-	-	-	-	-	-	-
V22		5.02	17	208	5.02	18.39	116	3.36
V23		5.80	10	209	5.80	24.08	104	4.80
V24		-	-	-	-	-	-	-
V25		5.62	12	232	5.62	18.10	96	14.24
C.D.(0.05)		0.87		28.14	0.92	2.19	1.09	
C.V. (%)		12.9		10.53	13.59	8.53	0.88	
Expt. Mean		**5.89**		**234**	**5.90**	**22.41**	**108**	
Soil type		Clay loam						
pH		8.00						
F - levels (kg/ha)		F1		F2		Recommended N:P:K (kg/ha)		
		50:12.5:0		100:25:0		100:25:0		
Varieties								
V1		IET 29268						
V2		IET 28489						
V3		IET 29002						
V4		IET 29284						
V5		IET 29014						
V6		IET 29257						
V7		IET 29301						
V8		IET 28997						
V9		IET 29256						
V10		IET 29290						
V11		IET 29001						
V12		IET 29004						
V13		IET 29009						
V14		IET 29000						
V15		IET 27908						
V16		IET 27900						
V17		NC- NDR 359						
V18		-						
V19		-						
V20		-						
V21		-						
V22		Jaya (S)						
V23		HRI 174						
V24		-						
V25		Local Check - Mahisagar						
Available N:P:K of soil		-						

Table-4.1(e) (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: Low input 50% NPK	V1	2.83	33	158	2.08	26.08	105	
	V2	3.11	29	165	2.28	21.20	98	
	V3	3.19	28	158	2.43	26.32	96	
	V4	3.38	24	151	2.59	20.32	108	
	V5	3.08	30	139	2.67	20.77	98	
	V6	2.32	34	161	1.99	23.60	102	
	V7	-	-	-	-	-	-	
	V8	2.94	31	156	2.20	24.63	102	
	V9	-	-	-	-	-	-	
	V10	2.91	32	170	2.00	20.78	103	
	V11	3.55	20	143	2.75	26.23	100	
	V12	4.63	12	185	3.11	25.72	100	
	V13	3.33	27	143	2.89	24.15	103	
	V14	3.36	25	173	2.26	25.87	103	
	V15	3.39	23	158	2.42	19.70	104	
	V16	2.18	36	162	1.98	29.53	98	
	V17	3.57	19	194	2.12	21.73	99	
	V18	3.42	22	180	2.11	26.20	101	
	V19	-	-	-	-	-	-	
	V20	-	-	-	-	-	-	
	V21	-	-	-	-	-	-	
	V22	-	-	-	-	-	-	
	V23	3.35	26	166	2.36	26.58	101	
	V24	-	-	-	-	-	-	
	V25	2.27	35	200	1.37	25.42	96	
F2: Optimum input 100% NPK	V1	3.61	18	194	2.30	25.62	98	7.09
	V2	3.69	16	194	2.35	22.37	111	5.27
	V3	3.43	21	191	2.30	26.13	98	2.18
	V4	4.83	6	196	2.88	21.42	106	13.18
	V5	4.69	10	193	2.88	25.80	101	14.64
	V6	3.67	17	204	2.15	23.12	99	12.27
	V7	-	-	-	-	-	-	-
	V8	4.79	8	199	2.82	25.73	98	16.82
	V9	-	-	-	-	-	-	-
	V10	4.81	7	214	2.59	21.12	104	17.27
	V11	4.89	5	214	2.70	26.88	101	12.18
	V12	6.16	2	238	2.97	26.65	103	13.91
	V13	4.32	13	177	2.73	24.53	101	9.00
	V14	6.51	1	246	3.00	25.37	104	28.64
	V15	4.78	9	217	2.73	21.30	104	12.64
	V16	4.66	11	208	2.56	28.17	101	22.55
	V17	5.15	4	232	2.70	21.00	101	14.36
	V18	5.32	3	244	2.67	25.55	98	17.27
	V19	-	-	-	-	-	-	-
	V20	-	-	-	-	-	-	-
	V21	-	-	-	-	-	-	-
	V22	-	-	-	-	-	-	-
	V23	4.10	15	221	2.26	24.60	100	6.82
	V24	-	-	-	-	-	-	-
	V25	4.28	14	224	2.18	26.35	96	18.27
Interaction								
F at same V		0.16		8.52	0.16	0.32	5	
V at same F		0.16		8.91	0.17	0.45	5.68	
F1		3.16	2	165	2.31	24.16	101	
F2		4.65	1	211	2.60	24.54	101	13.58
C.D.(0.05)		0.02		4.24	0.09	NS	NS	
C.V.(%)		0.6		2.72	4.4	2.11	4.52	

Table-4.1(e) (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	3.22	17	176	2.19	25.85	102	7.09
	V2	3.40	14	180	2.32	21.79	105	5.27
	V3	3.31	15	174	2.37	26.23	97	2.18
	V4	4.11	6	173	2.74	20.87	107	13.18
	V5	3.89	8	166	2.78	23.29	100	14.64
	V6	3.00	18	183	2.07	23.36	101	12.27
	V7	-	-	-	-	-	-	-
	V8	3.87	9	177	2.51	25.18	100	16.82
	V9	-	-	-	-	-	-	-
	V10	3.86	10	192	2.30	20.95	104	17.27
	V11	4.22	5	178	2.73	26.56	101	12.18
	V12	5.40	1	211	3.04	26.19	102	13.91
	V13	3.83	11	160	2.81	24.34	102	9.00
	V14	4.94	2	209	2.63	25.62	104	28.64
	V15	4.09	7	187	2.58	20.50	104	12.64
	V16	3.42	13	185	2.27	28.85	100	22.55
	V17	4.36	4	213	2.41	21.37	100	14.36
	V18	4.37	3	212	2.39	25.88	100	17.27
	V19	-	-	-	-	-	-	-
	V20	-	-	-	-	-	-	-
	V21	-	-	-	-	-	-	-
	V22	-	-	-	-	-	-	-
	V23	3.73	12	194	2.31	25.59	101	6.82
	V24	-	-	-	-	-	-	-
	V25	3.28	16	212	1.78	25.89	96	18.27
C.D.(0.05)		0.11		6.02	0.12	0.23	3.53	
C.V. (%)		2.56		2.8	4.13	0.81	3.05	
Expt. Mean		**3.90**		**188**	**2.46**	**24.35**	**101**	
Soil type		Silt Loam						
pH		7.50						
F - levels (kg/ha)		F1		F2			Recommended N:P:K (kg/ha)	
		60:30:20		120:60:40		120:60:40		
Varieties								
	V1	IET 29268						
	V2	IET 28489						
	V3	IET 29002						
	V4	IET 29284						
	V5	IET 29014						
	V6	IET 29257						
	V7	-						
	V8	IET 28997						
	V9	-						
	V10	IET 29290						
	V11	IET 29001						
	V12	IET 29004						
	V13	IET 29009						
	V14	IET 29000						
	V15	IET 27908						
	V16	IET 27900						
	V17	NC- NDR 359						
	V18	PR121 (N)						
	V19	-						
	V20	-						
	V21	-						
	V22	-						
	V23	HRI 174						
	V24	-						
	V25	Local Check - PD-26 (130 -145 days)						
Available N:P:K of soil		230:22:221						

Table-4.1(e) (Contd…)

F-levels	Varieties	PUDUCHERRY					
		Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Panicle wt (g)	Test wt (g)	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: Low input 50% NPK	V1	5.84	30	260	4.25	34.03	
	V2	6.10	14	340	4.66	22.05	
	V3	6.07	18	323	5.20	26.88	
	V4	5.96	24	282	6.16	20.99	
	V5	6.00	23	290	4.88	22.93	
	V6	6.03	21	304	3.90	23.12	
	V7	5.89	27	276	3.33	25.88	
	V8	5.72	35	221	5.21	23.91	
	V9	5.87	29	268	4.49	23.88	
	V10	5.77	34	228	4.42	21.80	
	V11	6.04	20	316	4.57	26.58	
	V12	5.63	38	195	3.03	28.66	
	V13	5.93	25	275	4.01	25.63	
	V14	5.55	40	172	2.45	21.75	
	V15	5.80	32	255	3.67	18.81	
	V16	6.08	16	327	5.69	21.78	
	V17	5.68	36	213	5.51	27.65	
	V18	-	-	-	-	-	
	V19	-	-	-	-	-	
	V20	-	-	-	-	-	
	V21	-	-	-	-	-	
	V22	5.59	39	181	2.30	16.86	
	V23	5.67	37	204	4.08	22.92	
	V24	-	-	-	-	-	
	V25	5.78	33	235	3.92	17.88	
F2: Optimum input 100% NPK	V1	6.17	11	286	4.38	34.23	3.30
	V2	6.39	1	360	4.84	22.15	2.90
	V3	6.34	3	341	5.38	27.18	2.70
	V4	6.23	7	310	6.30	21.14	2.70
	V5	6.26	6	319	5.49	23.00	2.60
	V6	6.28	5	324	4.58	23.25	2.50
	V7	6.19	9	299	4.29	26.07	3.00
	V8	6.08	16	238	6.10	24.00	3.60
	V9	6.18	10	293	5.59	24.12	3.10
	V10	6.10	14	245	4.88	21.85	3.30
	V11	6.31	4	338	5.29	26.91	2.70
	V12	5.93	25	219	3.15	28.71	3.00
	V13	6.22	8	304	4.92	25.74	2.90
	V14	5.81	31	193	2.58	21.78	2.60
	V15	6.15	12	274	4.37	19.06	3.50
	V16	6.36	2	349	6.10	22.08	2.80
	V17	6.05	19	230	6.51	27.72	3.70
	V18	-	-	-	-	-	-
	V19	-	-	-	-	-	-
	V20	-	-	-	-	-	-
	V21	-	-	-	-	-	-
	V22	5.89	27	210	2.85	16.93	3.00
	V23	6.01	22	241	4.80	22.77	3.40
	V24	-	-	-	-	-	-
	V25	6.13	13	262	4.47	17.87	3.50
Interaction							
F at same V		NS		7.79	0.07	NS	
V at same F		NS		26.98	0.08	NS	
F1		5.85	2	258	4.29	23.70	
F2		6.15	1	282	4.84	23.83	3.04
C.D.(0.05)		NS		NS	0.05	0.03	
C.V.(%)		18.37		16.61	1.42	0.18	

Table-4.1(e) (Contd…)

F-levels	Varieties	PUDUCHERRY					
		Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Panicle wt (g)	Test wt (g)	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Mean of varieties:							
V1		6.01	11	273	4.32	34.13	3.30
V2		6.25	1	350	4.75	22.10	2.90
V3		6.21	3	332	5.29	27.03	2.70
V4		6.10	7	296	6.23	21.07	2.70
V5		6.13	6	304	5.19	22.97	2.60
V6		6.16	5	314	4.24	23.19	2.50
V7		6.04	9	288	3.81	25.98	3.00
V8		5.90	15	229	5.66	23.96	3.60
V9		6.03	10	281	5.04	24.00	3.10
V10		5.94	14	236	4.65	21.83	3.30
V11		6.18	4	327	4.93	26.75	2.70
V12		5.78	18	207	3.09	28.69	3.00
V13		6.08	8	290	4.47	25.69	2.90
V14		5.68	20	183	2.52	21.77	2.60
V15		5.98	12	265	4.02	18.94	3.50
V16		6.22	2	338	5.90	21.93	2.80
V17		5.87	16	222	6.01	27.69	3.70
V18		-	-	-	-	-	-
V19		-	-	-	-	-	-
V20		-	-	-	-	-	-
V21		-	-	-	-	-	-
V22		5.74	19	196	2.58	16.90	3.00
V23		5.84	17	222	4.44	22.85	3.40
V24		-	-	-	-	-	-
V25		5.96	13	248	4.20	17.88	3.50
C.D.(0.05)		0.06		5.51	0.05	0.17	
C.V. (%)		0.94		1.78	0.9	0.63	
Expt. Mean		**6.00**		**270**	**4.57**	**23.76**	
Soil type		Clay loam					
pH		6.39					
F - levels (kg/ha)		F1		F2			Recommended N:P:K (kg/ha)
		60:20:20		120:40:40			120:40:40
Varieties							
V1		IET 29268					
V2		IET 28489					
V3		IET 29002					
V4		IET 29284					
V5		IET 29014					
V6		IET 29257					
V7		IET 29301					
V8		IET 28997					
V9		IET 29256					
V10		IET 29290					
V11		IET 29001					
V12		IET 29004					
V13		IET 29009					
V14		IET 29000					
V15		IET 27908					
V16		IET 27900					
V17		NC- NDR 359					
V18		-					
V19		-					
V20		-					
V21		-					
V22		Jaya (S)					
V23		HRI 174					
V24		-					
V25		Local check - White Ponni (135 days)					
Available N:P:K of soil		145:35:106					

Table-4.1(e) (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 50% RDF)
F1: Low input 50% NPK	V1	1.98	29	178	2.28	20.50	74	
	V2	2.13	22	192	2.43	19.83	75	
	V3	1.92	31	173	2.22	21.47	67	
	V4	2.16	21	194	2.46	20.67	75	
	V5	2.08	25	187	2.38	20.47	64	
	V6	1.91	32	172	2.21	21.43	63	
	V7	1.76	38	158	2.06	21.63	81	
	V8	1.73	40	156	2.03	21.50	64	
	V9	2.03	27	183	2.34	20.33	85	
	V10	1.88	33	169	2.18	20.47	73	
	V11	1.88	33	169	2.17	20.83	74	
	V12	2.00	28	180	2.30	21.53	74	
	V13	1.85	35	167	2.15	21.50	85	
	V14	1.95	30	175	2.25	20.33	73	
	V15	2.09	24	188	2.39	20.90	81	
	V16	2.11	23	190	2.41	20.67	84	
	V17	1.83	36	165	2.13	20.83	74	
	V18	-	-	-	-	-	-	
	V19	-	-	-	-	-	-	
	V20	-	-	-	-	-	-	
	V21	-	-	-	-	-	-	
	V22	1.75	39	158	2.05	19.67	85	
	V23	2.04	26	184	2.34	20.33	75	
	V24	-	-	-	-	-	-	
	V25	1.81	37	163	2.45	20.83	75	
F2: Optimum input 100% NPK	V1	4.45	9	223	2.88	21.13	80	22.45
	V2	4.79	2	237	3.03	20.53	77	24.18
	V3	3.90	19	218	2.82	22.17	67	18.00
	V4	4.85	1	239	3.06	21.37	77	24.45
	V5	4.67	5	232	2.98	21.30	65	23.55
	V6	4.30	11	217	2.81	22.13	67	21.73
	V7	3.96	17	203	2.66	22.10	88	20.00
	V8	3.89	20	201	2.63	21.40	70	19.64
	V9	4.56	7	228	2.93	21.03	85	23.00
	V10	4.23	12	214	2.78	21.17	75	21.36
	V11	4.21	13	214	2.78	21.53	75	21.18
	V12	4.49	8	225	2.90	22.23	75	22.64
	V13	4.16	14	212	2.75	22.20	85	21.00
	V14	4.37	10	220	2.85	21.03	75	22.00
	V15	4.70	4	233	2.99	21.60	90	23.73
	V16	4.74	3	235	3.01	21.37	90	23.91
	V17	4.11	15	210	2.73	21.53	75	20.73
	V18	-	-	-	-	-	-	-
	V19	-	-	-	-	-	-	-
	V20	-	-	-	-	-	-	-
	V21	-	-	-	-	-	-	-
	V22	3.93	18	203	2.65	20.37	90	19.82
	V23	4.58	6	229	2.94	21.03	77	23.09
	V24	-	-	-	-	-	-	-
	V25	4.07	16	208	3.05	21.53	76	20.55
Interaction								
F at same V		NS		NS	NS	NS	2.58	
V at same F		NS		NS	NS	NS	2.62	
F1		1.94	2	175	2.26	20.79	75	
F2		4.35	1	220	2.86	21.44	78	21.85
C.D.(0.05)		0.18		0.03	0	0.02	0.94	
C.V.(%)		7.18		0.02	0.11	0.11	1.57	

Table-4.1(e) (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 50% RDF)
Mean of varieties:								
V1		3.22	9	201	2.58	20.82	77	22.45
V2		3.46	2	214	2.73	20.18	76	24.18
V3		2.91	17	195	2.52	21.82	67	18.00
V4		3.51	1	217	2.76	21.02	76	24.45
V5		3.38	5	210	2.68	20.89	65	23.55
V6		3.11	11	195	2.51	21.78	65	21.73
V7		2.86	18	181	2.36	21.87	85	20.00
V8		2.81	20	178	2.33	21.45	67	19.64
V9		3.30	7	205	2.64	20.68	85	23.00
V10		3.06	12	192	2.48	20.82	74	21.36
V11		3.05	13	191	2.48	21.18	75	21.18
V12		3.25	8	203	2.60	21.88	75	22.64
V13		3.01	14	189	2.45	21.85	85	21.00
V14		3.16	10	198	2.55	20.68	74	22.00
V15		3.40	4	211	2.69	21.25	86	23.73
V16		3.43	3	212	2.71	21.02	87	23.91
V17		2.97	15	187	2.43	21.18	75	20.73
V18		-	-	-	-	-	-	-
V19		-	-	-	-	-	-	-
V20		-	-	-	-	-	-	-
V21		-	-	-	-	-	-	-
V22		2.84	19	180	2.35	20.02	88	19.82
V23		3.31	6	206	2.64	20.68	76	23.09
V24		-	-	-	-	-	-	-
V25		2.94	16	185	2.75	21.18	76	20.55
C.D.(0.05)		0.24		12.89	0.15	0.49	1.82	
C.V. (%)		6.59		5.71	4.96	2.04	2.09	
Expt. Mean		**3.15**		**197**	**2.56**	**21.11**	**76**	
Soil type		Sandy loam						
pH		8.20						
F - levels (kg/ha)		F1		F2		Recommended N:P:K (kg/ha)		
		60:30:20		120:60:40		120:60:40		
Varieties								
V1		IET 29268						
V2		IET 28489						
V3		IET 29002						
V4		IET 29284						
V5		IET 29014						
V6		IET 29257						
V7		IET 29301						
V8		IET 28997						
V9		IET 29256						
V10		IET 29290						
V11		IET 29001						
V12		IET 29004						
V13		IET 29009						
V14		IET 29000						
V15		IET 27908						
V16		IET 27900						
V17		NC- NDR 359						
V18		-						
V19		-						
V20		-						
V21		-						
V22		Jaya (S)						
V23		HRI 174						
V24		Hybrid Check						
V25		Local check - Rajendra Bhagwati (125 days)						
Available N:P:K of soil		235:13:145						

Table-4.1(e) (Contd…)

F-levels	Varieties	Rajendrangar ARI						
		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	3.57	39	150	4.29	24.77	109	
	V2	5.03	23	207	3.88	26.23	110	
	V3	4.17	37	168	4.88	28.40	100	
	V4	4.51	33	185	4.48	22.73	110	
	V5	3.27	40	145	3.99	23.63	104	
	V6	5.10	22	207	2.91	24.40	109	
	V7	5.20	21	211	4.03	21.53	110	
	V8	4.19	36	169	3.51	22.73	108	
	V9	4.63	29	196	3.50	19.47	111	
	V10	4.40	34	185	2.40	22.70	104	
	V11	4.78	28	198	3.00	21.87	104	
	V12	4.58	30	193	2.67	23.80	105	
	V13	4.91	26	202	3.79	23.87	104	
	V14	5.02	24	205	3.44	26.87	114	
	V15	4.54	31	188	2.98	23.60	114	
	V16	4.83	27	200	3.46	23.27	112	
	V17	4.98	25	203	3.10	24.77	103	
	V18	-	-	-	-	-	-	
	V19	-	-	-	-	-	-	
	V20	-	-	-	-	-	-	
	V21	-	-	-	-	-	-	
	V22	3.99	38	157	2.59	25.40	122	
	V23	4.54	31	189	3.15	20.87	108	
	V24	-	-	-	-	-	-	
	V25	4.32	35	183	3.04	25.77	106	
F2: Optimum input 100% NPK	V1	6.33	14	219	4.32	28.63	110	27.60
	V2	7.62	1	261	3.95	30.67	116	25.90
	V3	6.03	19	197	5.18	29.50	102	18.60
	V4	6.47	11	223	4.90	24.07	113	19.60
	V5	5.94	20	175	4.18	24.27	106	26.70
	V6	6.91	2	251	3.38	28.37	111	18.10
	V7	6.43	12	222	4.44	24.13	113	12.30
	V8	6.60	6	234	4.53	26.40	110	24.10
	V9	6.30	15	211	4.17	23.53	112	16.70
	V10	6.22	18	206	3.76	23.30	105	18.20
	V11	6.67	5	236	3.71	28.07	108	18.90
	V12	6.37	13	219	4.30	27.93	109	17.90
	V13	6.59	7	234	5.11	24.53	109	16.80
	V14	6.74	3	242	3.80	27.70	115	17.20
	V15	6.28	16	209	3.74	27.50	117	17.40
	V16	6.70	4	238	4.26	28.17	115	18.70
	V17	6.48	10	224	3.81	25.63	108	15.00
	V18	-	-	-	-	-	-	-
	V19	-	-	-	-	-	-	-
	V20	-	-	-	-	-	-	-
	V21	-	-	-	-	-	-	-
	V22	6.54	8	229	4.35	26.30	125	25.50
	V23	6.53	9	224	3.85	24.20	109	19.90
	V24	-	-	-	-	-	-	-
	V25	6.25	17	207	4.31	26.33	108	19.30
Interaction								
F at same V		NS		NS	0.7	NS	NS	
V at same F		NS		NS	0.81	NS	NS	
F1		4.53	2	187	3.45	23.83	108	
F2		6.50	1	223	4.20	26.46	111	19.72
C.D.(0.05)		0.33		10.73	0.57	1.13	1.81	
C.V.(%)		7.53		6.66	19.05	5.71	2.10	

Table-4.1(e) (Contd…)

F-levels	Varieties	Rajendrangar ARI						
		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		4.95	19	184	4.31	26.70	110	27.60
V2		6.33	1	234	3.92	28.45	113	25.90
V3		5.10	18	183	5.03	28.95	101	18.60
V4		5.49	10	204	4.69	23.40	111	19.60
V5		4.61	20	160	4.09	23.95	105	26.70
V6		6.01	2	229	3.15	26.39	110	18.10
V7		5.82	4	217	4.24	22.83	112	12.30
V8		5.40	14	202	4.02	24.57	109	24.10
V9		5.47	12	203	3.84	21.50	111	16.70
V10		5.31	15	195	3.08	23.00	104	18.20
V11		5.73	8	217	3.36	24.97	106	18.90
V12		5.48	11	206	3.49	25.87	107	17.90
V13		5.75	6	218	4.45	24.20	107	16.80
V14		5.88	3	223	3.62	27.29	114	17.20
V15		5.41	13	199	3.36	25.55	115	17.40
V16		5.77	5	219	3.86	25.72	114	18.70
V17		5.73	7	214	3.46	25.20	105	15.00
V18		-	-	-	-	-	-	-
V19		-	-	-	-	-	-	-
V20		-	-	-	-	-	-	-
V21		-	-	-	-	-	-	-
V22		5.27	17	193	3.47	25.85	124	25.50
V23		5.54	9	206	3.50	22.54	109	19.90
V24		-	-	-	-	-	-	-
V25		5.29	16	195	3.68	26.05	107	19.30
C.D.(0.05)		0.59		25.15	0.49	2.22	2.06	
C.V. (%)		9.4		10.73	11.28	7.71	1.64	
Expt. Mean		**5.51**		**205**	**3.83**	**25.15**	**110**	
Soil type		Clay loam						
pH		-						
F - levels (kg/ha)		F1		F2		Recommended N:P:K (kg/ha)		
		50:30:20		100:60:40		100:60:40		
Varieties								
V1		IET 29268						
V2		IET 28489						
V3		IET 29002						
V4		IET 29284						
V5		IET 29014						
V6		IET 29257						
V7		IET 29301						
V8		IET 28997						
V9		IET 29256						
V10		IET 29290						
V11		IET 29001						
V12		IET 29004						
V13		IET 29009						
V14		IET 29000						
V15		IET 27908						
V16		IET 27900						
V17		NC- NDR 359						
V18		-						
V19		-						
V20		-						
V21		-						
V22		Jaya (S)						
V23		HRI 174						
V24		Hybrid Check						
V25		Local check - Rajendra Bhagwati (125 days)						
Available N:P:K of soil		235:13:145						

Table-4.1(e) (Contd…)

F-levels	Varieties	TITABAR						
		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	3.44	38	212	4.47	28.33	110	
	V2	3.61	35	230	4.37	20.80	117	
	V3	3.71	32	239	5.05	21.70	97	
	V4	3.36	40	210	4.52	21.23	108	
	V5	3.72	31	239	6.20	20.63	93	
	V6	3.54	36	229	2.85	20.03	95	
	V7	3.81	29	240	4.81	18.47	119	
	V8	4.00	26	243	4.01	19.83	97	
	V9	3.26	41	210	4.87	21.03	117	
	V10	3.19	43	199	4.23	21.67	118	
	V11	4.14	24	268	5.67	22.37	95	
	V12	3.20	42	223	5.01	21.30	108	
	V13	3.46	37	222	4.27	21.07	95	
	V14	3.40	39	235	5.55	21.60	111	
	V15	3.11	45	199	4.12	23.27	92	
	V16	3.17	44	230	4.89	20.60	118	
	V17	3.80	30	243	4.81	23.03	97	
	V18	-	-	-	-	-	-	
	V19	3.85	28	256	5.08	21.57	97	
	V20	-	-	-	-	-	-	
	V21	2.73	46	232	4.05	28.73	100	
	V22	3.63	34	223	4.05	21.97	87	
	V23	4.07	25	249	4.20	20.57	100	
	V24	4.42	20	296	4.85	21.03	92	
	V25	3.70	33	229	4.26	23.57	102	
F2: Optimum input 100% NPK	V1	4.68	14	237	4.57	29.63	116	20.67
	V2	4.77	11	245	4.47	21.97	118	19.33
	V3	4.60	15	254	5.15	22.77	98	14.83
	V4	4.58	17	225	4.62	22.57	110	20.33
	V5	4.94	8	254	6.30	21.63	94	20.33
	V6	4.74	12	244	2.95	21.03	96	20.00
	V7	5.01	6	255	4.91	19.60	120	20.00
	V8	5.23	4	258	4.11	21.07	98	20.50
	V9	4.47	18	225	4.97	22.57	118	20.17
	V10	4.43	19	214	4.33	22.97	119	20.67
	V11	5.36	2	283	5.77	23.20	97	20.33
	V12	4.37	21	238	5.11	22.43	109	19.50
	V13	4.73	13	237	4.37	22.17	96	21.17
	V14	4.59	16	250	5.65	22.80	112	19.83
	V15	4.29	23	214	4.22	24.60	93	19.67
	V16	4.33	22	245	4.99	21.80	119	19.33
	V17	4.97	7	258	4.91	24.50	98	19.50
	V18	-	-	-	-	-	-	-
	V19	5.05	5	271	5.18	22.63	98	20.00
	V20	-	-	-	-	-	-	-
	V21	3.93	27	247	4.15	30.00	101	20.00
	V22	4.83	10	238	4.15	23.23	87	20.00
	V23	5.30	3	264	4.30	21.30	101	20.50
	V24	5.73	1	311	4.95	22.10	93	21.83
	V25	4.87	9	244	4.36	24.47	103	19.50
Interaction								
F at same V		NS		NS	0.47	1.41	NS	
V at same F		NS		NS	0.47	1.40	NS	
F1		3.58	2	233	4.62	21.93	103	
F2		4.77	1	248	4.72	23.09	104	19.91
C.D.(0.05)		NS		18.29	0.19	0.53	1.00	
C.V.(%)		18.16		6.35	3.76	2.04	0.95	

Table-4.1(e) (Contd…)

F-levels	Varieties	TITABAR						
		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	4.06	15	225	4.52	28.98	113	20.67
	V2	4.19	11	238	4.42	21.39	118	19.33
	V3	4.16	12	247	5.10	22.24	97	14.83
	V4	3.97	17	218	4.57	21.90	109	20.33
	V5	4.33	8	247	6.25	21.13	93	20.33
	V6	4.14	13	236	2.90	20.53	96	20.00
	V7	4.41	6	248	4.86	19.04	120	20.00
	V8	4.62	4	251	4.06	20.45	98	20.50
	V9	3.87	18	217	4.92	21.80	118	20.17
	V10	3.81	19	206	4.28	22.32	118	20.67
	V11	4.75	2	275	5.72	22.79	96	20.33
	V12	3.79	20	231	5.06	21.87	109	19.50
	V13	4.10	14	230	4.32	21.62	96	21.17
	V14	4.00	16	243	5.60	22.20	111	19.83
	V15	3.70	22	207	4.17	23.94	92	19.67
	V16	3.75	21	238	4.94	21.20	118	19.33
	V17	4.39	7	251	4.86	23.77	97	19.50
	V18	-	-	-	-	-	-	-
	V19	4.45	5	264	5.13	22.10	98	20.00
	V20	-	-	-	-	-	-	-
	V21	3.33	23	240	4.10	29.37	101	20.00
	V22	4.23	10	231	4.10	22.60	87	20.00
	V23	4.69	3	257	4.25	20.94	101	20.50
	V24	5.08	1	304	4.90	21.57	92	21.83
	V25	4.29	9	236	4.31	24.02	102	19.50
	C.D.(0.05)	0.74		27.02	0.33	0.99	1.82	
	C.V. (%)	15.72		8.93	6.41	3.62	1.64	
	Expt. Mean	**4.18**		**241**	**4.67**	**22.51**	**103**	
	Soil type	Clay Loam						
	pH	5.62						
F - levels (kg/ha)		F1		F2			Recommended N:P:K (kg/ha)	
		30:10:20		60:20:40		60:20:40		
	Varieties							
	V1	IET 29268						
	V2	IET 28489						
	V3	IET 29002						
	V4	IET 29284						
	V5	IET 29014						
	V6	IET 29257						
	V7	IET 29301						
	V8	IET 28997						
	V9	IET 29256						
	V10	IET 29290						
	V11	IET 29001						
	V12	IET 29004						
	V13	IET 29009						
	V14	IET 29000						
	V15	IET 27908						
	V16	IET 27900						
	V17	NC- NDR 359						
	V18	-						
	V19	CR Dhan 300 (E & NE)						
	V20	-						
	V21	Akshaydhan (W)						
	V22	Jaya (S)						
	V23	HRI 174						
	V24	Hybrid Check						
	V25	Local Check - Numali (135 days)						
	Available N:P:K	-						

Table-4.1(e) (Contd…)

F-levels	Varieties	VARANASI							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.)		
F1: Low input 50% NPK	V1	5.52	14	182	4.46	28.57	110		4.80	31
	V2	5.29	19	205	4.66	21.45	115		4.71	35
	V3	5.11	21	179	5.04	28.54	107		4.75	34
	V4	5.10	22	146	4.21	22.45	110		4.58	39
	V5	4.25	35	178	4.48	24.02	101		4.46	42
	V6	3.55	38	245	2.60	26.54	104		4.24	48
	V7	4.75	29	223	3.07	18.94	115		4.40	44
	V8	5.05	23	214	3.80	26.28	100		4.78	33
	V9	4.33	34	194	5.09	21.08	112		4.27	47
	V10	6.57	4	203	4.17	22.16	103		4.59	38
	V11	5.52	14	189	4.01	27.82	104		4.90	30
	V12	5.14	20	179	4.57	28.44	102		4.66	36
	V13	4.58	33	187	4.36	26.18	104		4.78	32
	V14	6.87	2	243	4.28	24.11	112		5.06	28
	V15	4.89	26	198	4.63	21.25	118		4.53	41
	V16	5.37	17	208	5.09	22.70	115		4.54	40
	V17	3.49	40	177	4.04	26.86	102		4.37	45
	V18	-	-	-	-	-	-		5.20	26
	V19	-	-	-	-	-	-		3.85	50
	V20	-	-	-	-	-	-		5.29	25
	V21	-	-	-	-	-	-		4.03	49
	V22	4.89	26	202	3.83	21.84	112		4.35	46
	V23	4.08	36	208	4.10	25.50	100		4.59	37
	V24	-	-	-	-	-	-		5.31	24
	V25	4.75	29	284	3.16	23.79	106		4.44	43
F2: Optimum input 100% NPK	V1	5.72	12	192	3.96	29.34	111	1.82	6.07	5
	V2	6.04	9	216	4.29	21.62	114	6.82	5.94	9
	V3	5.98	11	165	4.75	28.85	104	7.91	5.82	13
	V4	6.13	7	168	4.81	22.65	110	9.36	5.85	11
	V5	4.75	29	157	5.19	24.53	100	4.55	5.74	15
	V6	3.52	39	173	2.38	26.67	105	-0.27	5.42	21
	V7	4.69	32	234	3.34	19.82	116	-0.55	5.52	20
	V8	5.60	13	214	3.16	26.57	100	5.00	6.10	4
	V9	4.77	28	214	3.87	21.50	112	4.00	5.34	23
	V10	6.70	3	185	3.12	23.69	103	1.18	5.71	16
	V11	6.35	5	209	4.78	28.07	105	7.55	6.17	3
	V12	6.24	6	194	5.11	28.55	102	10.00	5.93	10
	V13	5.37	17	199	4.97	26.19	104	7.18	6.05	6
	V14	7.45	1	252	4.60	24.48	113	5.27	6.29	2
	V15	6.12	8	223	4.90	21.68	116	11.18	5.77	14
	V16	5.99	10	194	4.87	22.93	116	5.64	5.70	17
	V17	3.89	37	166	4.42	27.32	102	3.64	5.60	19
	V18	-	-	-	-	-	-	-	6.38	1
	V19	-	-	-	-	-	-	-	5.05	29
	V20	-	-	-	-	-	-	-	5.98	7
	V21	-	-	-	-	-	-	-	5.20	27
	V22	4.94	25	194	3.53	22.15	111	0.45	5.38	22
	V23	5.50	16	213	3.81	25.75	102	12.91	5.84	12
	V24	-	-	-	-	-	-	-	5.95	8
	V25	4.96	24	314	3.34	24.64	108	1.91	5.67	18
Interaction										
F at same V		0.48		24	0.43	0.43	0.86			
V at same F		0.52		24.9	0.48	0.43	0.9			
F1		4.96	2	202	4.18	24.43	108		4.57	2
F2		5.54	1	204	4.16	24.85	108	5.28	5.80	1
C.D.(0.05)		0.3		NS	NS	0.12	NS			
C.V.(%)		7.34		6.89	9.31	0.61	0.52			

Table-4.1(e) (Contd…)

F-levels	Varieties	VARANASI							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)		
Mean of varieties										
	V1	5.62	7	187	4.21	28.96	111	1.82	5.43	7
	V2	5.67	6	210	4.48	21.54	115	6.82	5.33	9
	V3	5.55	9	172	4.90	28.70	106	7.91	5.29	11
	V4	5.62	8	157	4.51	22.55	110	9.36	5.22	12
	V5	4.50	18	168	4.84	24.28	100	4.55	5.10	17
	V6	3.54	20	209	2.49	26.61	105	-0.27	4.83	22
	V7	4.72	16	229	3.21	19.38	116	-0.55	4.96	20
	V8	5.33	11	214	3.48	26.43	100	5.00	5.44	6
	V9	4.55	17	204	4.48	21.29	112	4.00	4.81	23
	V10	6.64	2	194	3.65	22.93	103	1.18	5.15	15
	V11	5.94	3	199	4.40	27.95	105	7.55	5.53	5
	V12	5.69	4	186	4.84	28.50	102	10.00	5.29	10
	V13	4.98	12	193	4.67	26.19	104	7.18	5.42	8
	V14	7.16	1	247	4.44	24.30	112	5.27	5.67	2
	V15	5.51	10	211	4.77	21.47	117	11.18	5.15	14
	V16	5.68	5	201	4.98	22.82	116	5.64	5.12	16
	V17	3.69	19	172	4.23	27.09	102	3.64	4.98	19
	V18	-	-	-	-	-	-	-	5.79	1
	V19	-	-	-	-	-	-	-	4.45	25
	V20	-	-	-	-	-	-	-	5.64	3
	V21	-	-	-	-	-	-	-	4.61	24
	V22	4.92	13	198	3.68	22.00	112	0.45	4.87	21
	V23	4.79	15	211	3.96	25.63	101	12.91	5.22	13
	V24	-	-	-	-	-	-	-	5.63	4
	V25	4.86	14	299	3.25	24.22	107	1.91	5.05	18
	C.D.(0.05)	0.34		16.97	0.3	0.3	0.6			
	C.V. (%)	5.66		7.31	6.31	1.08	0.49			
	Expt. Mean	**5.25**		**203**	**4.17**	**24.64**	**108**		5.18	
	Soil type	Loam								
	pH	7.60								
F - levels (kg/ha)		F1: 60:30:20		F2: 120:60:40		Recommended N:P:K (kg/ha) 120:60:40				
Varieties										
	V1	IET 29268								
	V2	IET 28489								
	V3	IET 29002								
	V4	IET 29284								
	V5	IET 29014								
	V6	IET 29257								
	V7	IET 29301								
	V8	IET 28997								
	V9	IET 29256								
	V10	IET 29290								
	V11	IET 29001								
	V12	IET 29004								
	V13	IET 29009								
	V14	IET 29000								
	V15	IET 27908								
	V16	IET 27900								
	V17	NC- NDR 359								
	V18	-								
	V19	-								
	V20	-								
	V21	-								
	V22	Jaya (S)								
	V23	HRI 174								
	V24	-								
	V25	Local Check - HUR 105								
	Available N:P:K	-								

4.1(f) AVT 2 - Late

Four AVT-2 Late entries (IET 29349, IET 29351, IET 28508 and IET 28509) were evaluated for its response to graded levels nutrients on grain yield and yield attributes at eight locations i.e. **Aduthurai (150:60:60), Chinsurah (80:40:40), Chiplima (80:40:40), Dhangain (120:60:40), Karjat (150:50:50), Mandya (100:50:50), Maruteru** (90:60:60) and **Pusa (120:50:40)** under two levels of RDF (50% and 100% RDF). The details and data received from these locations are summarized and presented in Table 4.1.1 (g).

Application of nutrients significantly influenced the grain yield at all locations except **Chinsurah**, **Mandya**, **Maruteru** and **Pusa** and the maximum grain yield was recorded at all the locations with 100% RDF with average increase of 24%. Application of 100% RDF had higher grain yields at **Aduthurai** (4.63 t/ha), **Chiplima** (5.47 t/ha), **Dhangain** (7.07 t/ha), and **Karjat** (4.56 t/ha). Higher nutrient response (kg grain/kg nutrient) was recorded with 100% RDF over 50% RDF at **Dhangain** (18.11), **Chinsurah**(17.48) and **Karjat** (17.43) .

Grain yield differences among the tested varieties were found to be significant at all the locations except **Chinsurah**. Significantly higher mean maximum grain yield was recorded by IET 29349 (4.59 t/ha) at **Aduthurai**; IET 28508 (5.55 t/ha) at **Chiplima**; IET 29351 (4.57 t/ha) at **Karjat**; IET 28509 (6.15 t/ha) at **Mandya** were found significant while at other locations performance of standard checks promissing. Interaction effects among RDF x varieties was found to be non-significant at all the location except **Karjat**. Mean over the locations the performance of IET 29351 (4.89 t/ha) was promising over other cultures at 100% RDF application.

In this trial, 100% RDF was found to be promising with 24 % 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 however IET 29351 (4.89 t/ha) recorded better mean yields.

Table 4.1(f): 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 2022.

F-levels	Varieties	ADUTHURAI					CHINSURAH					
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt(g)	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)	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	V1	4.26	9	346	2.85		3.90	7	229	3.19	114	
	V2	3.99	13	293	2.55		3.47	12	194	3.16	113	
	V3	4.07	10	299	2.64		3.90	7	234	2.93	127	
	V4	3.87	14	302	2.67		3.63	10	217	3.12	110	
	V5	4.06	11	276	2.58		3.73	9	211	3.21	118	
	V6	4.02	12	291	1.86		3.62	11	222	3.07	118	
	V7	3.72	16	286	2.92		-	-	-	-	-	
	V8	3.86	15	277	2.62		-	-	-	-	-	
F2	V1	4.91	1	362	2.95	4.81	5.13	3	353	2.93	114	15.38
	V2	4.69	3	306	2.64	5.19	5.15	2	272	3.22	114	21.00
	V3	4.62	5	311	2.72	4.07	5.29	1	335	2.71	128	17.38
	V4	4.40	8	315	2.77	3.93	5.04	4	337	3.20	111	17.63
	V5	4.79	2	288	2.65	5.41	5.03	5	286	3.53	120	16.25
	V6	4.63	4	311	1.94	4.52	5.00	6	307	4.24	119	17.25
	V7	4.53	6	302	3.01	6.00	-	-	-	-	-	-
	V8	4.49	7	289	2.70	4.67	-	-	-	-	-	-
Interaction												
F at same V		NS		NS	NS		NS		NS	0.51	0.55	
V at same F		NS		NS	NS		NS		NS	0.53	0.84	
F1		3.98	2	296	2.59		3.71	2	218	3.11	117	
F2		4.63	1	310	2.67	4.82	5.11	1	315	3.31	118	17.48
C.D.(0.05)		0.01		1.82	0.03		NS		59.63	NS	0.86	
C.V.(%)		0.24		0.48	0.86		26.27		15.61	6.97	0.51	
Mean of varieties												
V1		4.59	1	354	2.90	4.81	4.52	2	291	3.06	114	15.38
V2		4.34	4	300	2.60	5.19	4.31	5	233	3.19	114	21.00
V3		4.35	3	305	2.68	4.07	4.60	1	285	2.82	127	17.38
V4		4.14	7	308	2.72	3.93	4.34	4	277	3.16	111	17.63
V5		4.43	2	282	2.62	5.41	4.38	3	249	3.37	119	16.25
V6		4.33	5	301	1.90	4.52	4.31	5	265	3.66	119	17.25
V7		4.13	8	294	2.97	6.00	-	-	-	-	-	-
V8		4.18	6	283	2.66	4.67	-	-	-	-	-	-
C.D.(0.05)		0.17		4.22	0.09		NS		29.11	0.36	0.39	
C.V. (%)		3.38		1.18	2.77		9.97		9.07	9.31	0.28	
Expt. Mean		**4.31**		**303**	**2.63**		**4.41**		**266**	**3.21**	**117**	
Soil type		Clay					Clay Loam					
pH		7.20					-					
N - levels (kg/ha)												
		75:30:3										
F1		0					40:20:20					
F2		150:60:60					80:40:40					
Recmnd NPK		150:60:60					80:40:40					
Varieties												
V1		IET 29349					IET 29349					
V2		IET 29351					IET 29351					
V3		IET 28508					IET 28508					
V4		IET 28509					IET 28509					
V5		Swarna (NC)					Swarna (NC)					
V6		NDR 8002 (E &C)					NDR 8002 (E &C)					
V7		PA 6444 (Hybrid)					-					
V8		Local check - ADT-54					-					
Avlb NPK of soil		29:73:132					-					

Table 4.1(f): Contd.

F-levels	Varieties	CHIPLIMA					
		Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Test wt(g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1	V1	5.01	13	210	20.47	101	
	V2	5.25	7	194	20.73	100	
	V3	5.23	8	251	20.87	99	
	V4	4.56	15	228	20.47	98	
	V5	5.20	9	261	20.83	112	
	V6	4.36	16	239	20.67	117	
	V7	4.77	14	224	20.50	94	
	V8	5.09	10	245	20.77	84	
F2	V1	5.61	3	264	20.83	103	7.50
	V2	5.57	4	233	20.97	102	4.00
	V3	5.87	1	240	21.00	101	8.00
	V4	5.27	6	232	21.07	114	8.88
	V5	5.87	1	232	21.13	120	8.38
	V6	5.06	11	241	20.70	110	8.75
	V7	5.05	12	249	20.73	97	3.50
	V8	5.49	5	231	20.77	85	5.00
Interaction							
F at same V		NS		NS	0.17	1.04	
V at same F		NS		NS	0.17	1.71	
F1		4.93	2	232	20.66	101	
F2		5.47	1	240	20.90	104	6.75
C.D.(0.05)		0.12		NS	0.05	1.82	
C.V.(%)		1.83		9.4	0.21	1.43	
Mean of varieties:							
V1		5.31	4	237	20.65	102	7.50
V2		5.41	3	214	20.85	101	4.00
V3		5.55	1	246	20.94	100	8.00
V4		4.92	6	230	20.77	106	8.88
V5		5.54	2	247	20.98	116	8.38
V6		4.71	8	240	20.69	113	8.75
V7		4.91	7	236	20.62	96	3.50
V8		5.29	5	238	20.77	85	5.00
C.D.(0.05)		0.25		NS	0.12	0.74	
C.V. (%)		4.14		10.71	0.49	0.61	
Expt. Mean		**5.20**		**236**	**21**	**102**	
Soil type		Sandy loam					
pH		-					
N - levels (kg/ha)							
F1		40:20:20					
F2		80:40:40					
Recomnd NPK (kg/ha)		80:40:40					
Varieties							
V1		IET 29349					
V2		IET 29351					
V3		IET 28508					
V4		IET 28509					
V5		Swarna (NC)					
V6		NDR 8002 (E &C)					
V7		PA 6444 (Hybrid)					
V8		Local check - MTU-1156					
Avbl NPK of soil		-					

Table 4.1(f): 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	4.67	15	272	3.56	23.80	115	
	V2	5.31	11	281	5.16	25.93	112	
	V3	4.89	14	276	4.13	20.93	116	
	V4	4.41	16	270	3.49	19.47	117	
	V5	5.22	12	282	4.74	23.60	116	
	V6	4.98	13	278	4.42	27.40	117	
	V7	5.67	9	294	6.21	24.60	99	
	V8	5.49	10	293	5.20	22.93	116	
F2	V1	6.41	7	282	4.75	24.80	116	15.82
	V2	7.54	3	305	5.45	26.80	113	20.27
	V3	6.69	6	293	4.80	21.73	117	16.36
	V4	5.94	8	279	4.57	20.40	118	13.91
	V5	7.31	4	296	4.91	25.60	117	19.00
	V6	7.12	5	295	4.82	27.73	118	19.45
	V7	7.94	1	309	7.05	26.80	100	20.64
	V8	7.63	2	307	6.07	23.47	117	19.45
Interaction								
F at same V		NS		NS	NS	NS	NS	
V at same F		NS		NS	NS	NS	NS	
F1		5.08	2	281	4.61	23.58	113	
F2		7.07	1	296	5.30	24.67	114	18.11
C.D.(0.05)		0.36		9.43	0.26	0.4	0.31	
C.V.(%)		4.72		2.63	4.15	1.35	0.22	
Mean of varieties:								
V1		5.54	7	277	4.16	24.30	115	15.82
V2		6.43	3	293	5.31	26.37	113	20.27
V3		5.79	6	284	4.47	21.33	117	16.36
V4		5.18	8	275	4.03	19.94	118	13.91
V5		6.27	4	289	4.83	24.60	117	19.00
V6		6.05	5	287	4.62	27.57	117	19.45
V7		6.81	1	301	6.63	25.70	99	20.64
V8		6.56	2	300	5.64	23.20	117	19.45
C.D.(0.05)		0.68		NS	1.19	0.97	0.45	
C.V. (%)		9.42		8.87	20.26	3.39	0.33	
Expt. Mean		**6.08**		**288**	**4.96**	**24**	**114**	
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 29349						
V2		IET 29351						
V3		IET 28508						
V4		IET 28509						
V5		Swarna (NC)						
V6		NDR 8002 (E &C)						
V7		PA 6444 (Hybrid)						
V8		Local check - R. Mahsuri- 1 (150-155 days)						
Available N:P:K of soil (kg/ha)		188:41:150						

Table 4.1(f): 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	2.94	13	241	3.17	16.61	111	
	V2	3.73	7	257	3.28	17.66	110	
	V3	3.69	8	247	3.26	14.78	107	
	V4	3.00	12	172	2.69	15.42	113	
	V5	3.23	11	236	2.90	14.89	111	
	V6	1.63	16	206	3.07	18.00	105	
	V7	2.39	14	203	3.27	15.66	99	
	V8	1.92	15	215	2.59	15.74	103	
F2	V1	4.04	6	295	3.81	17.74	110	11.00
	V2	5.40	1	313	4.07	19.26	108	16.70
	V3	5.10	4	288	4.03	16.32	106	14.10
	V4	3.68	10	208	4.10	17.33	113	6.80
	V5	5.21	2	292	3.90	17.10	110	19.80
	V6	4.20	5	246	4.03	18.99	104	25.70
	V7	5.15	3	240	3.99	16.96	97	27.60
	V8	3.69	8	271	3.93	17.48	108	17.70
Interaction								
F at same V		0.38		NS	NS	NS	1.05	
V at same F		0.4		NS	NS	NS	0.99	
F1		2.82	2	222	3.03	16.10	107	
F2		4.56	1	269	3.98	17.65	107	17.43
C.D.(0.05)		0.25		9.28	0.14	1.01	0.18	
C.V.(%)		5.46		3.04	3.12	4.84	0.13	
Mean of varieties:								
V1		3.49	5	268	3.49	17.18	110	11.00
V2		4.57	1	285	3.68	18.46	109	16.70
V3		4.40	2	267	3.65	15.55	106	14.10
V4		3.34	6	190	3.40	16.38	113	6.80
V5		4.22	3	264	3.40	16.00	110	19.80
V6		2.92	7	226	3.55	18.50	105	25.70
V7		3.77	4	221	3.63	16.31	98	27.60
V8		2.81	8	243	3.26	16.61	105	17.70
C.D.(0.05)		0.27		40.69	NS	1.53	0.74	
C.V. (%)		6.09		14.01	7.42	7.67	0.59	
Expt. Mean		**3.69**		**246**	**3.51**	**17**	**107**	
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 29349						
V2		IET 29351						
V3		IET 28508						
V4		IET 28509						
V5		Swarna (NC)						
V6		NDR 8002 (E &C)						
V7		PA 6444 (Hybrid)						
V8		Local check - KJT - 2 (140-142 days)						
Available N:P:K of soil (kg/ha)		-						

Table 4.1(f): 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	V1	4.83	14	298	4.13	25.48	83	
	V2	5.56	5	264	4.84	26.84	78	
	V3	4.73	15	327	3.51	21.21	87	
	V4	5.70	4	273	4.92	21.43	85	
	V5	3.92	16	298	3.07	22.68	89	
	V6	4.87	13	304	3.76	34.00	77	
	V7	5.38	8	300	5.09	26.47	78	
	V8	4.93	11	323	3.55	24.76	84	
F2	V1	5.49	7	325	4.16	25.30	84	6.60
	V2	6.07	3	306	5.31	26.84	77	5.10
	V3	4.97	10	339	3.65	21.74	87	2.40
	V4	6.59	1	313	4.96	22.30	85	8.90
	V5	4.89	12	333	3.36	22.87	90	9.70
	V6	5.21	9	315	4.37	36.33	77	3.40
	V7	6.20	2	305	5.40	28.00	78	8.20
	V8	5.52	6	290	3.46	24.34	85	5.90
Interaction								
F at same V		NS		31.05	NS	NS	NS	
V at same F		NS		29.81	NS	NS	NS	
F1		4.99	2	298	4.11	25.36	83	
F2		5.62	1	316	4.33	25.97	83	6.28
C.D.(0.05)		NS		8.55	0.19	NS	NS	
C.V.(%)		13.21		2.24	3.69	10.86	0.7	
Mean of varieties:								
V1		5.16	5	312	4.15	25.39	84	6.60
V2		5.82	2	285	5.08	26.84	78	5.10
V3		4.85	7	333	3.58	21.48	87	2.40
V4		6.15	1	293	4.94	21.87	85	8.90
V5		4.41	8	316	3.22	22.78	90	9.70
V6		5.04	6	310	4.07	35.17	77	3.40
V7		5.79	3	303	5.25	27.24	78	8.20
V8		5.23	4	306	3.51	24.55	85	5.90
C.D.(0.05)		0.77		21.96	0.54	2.47	0.8	
C.V. (%)		12.25		6.05	10.8	8.13	0.82	
Expt. Mean		**5.30**		**307**	**4.22**	**25.7**	**83**	
Soil type		Red Sandy Loam						
pH		7.43						
N - levels (kg/ha)								
F1		50:25:25						
F2		100:50:50						
Recommended N:P:K (kg/ha)		100:50:50						
Varieties								
V1		IET 29349						
V2		IET 29351						
V3		IET 28508						
V4		IET 28509						
V5		Swarna (NC)						
V6		NDR 8002 (E &C)						
V7		PA 6444 (Hybrid)						
V8		Local check - BR 2655 (150-155 days)						
Available N:P:K of soil (kg/ha)		351:48:225						

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	V1	4.23	14	237	4.13	20.57	108	
	V2	4.63	12	243	4.11	23.44	111	
	V3	4.96	8	302	3.93	19.92	110	
	V4	5.80	2	250	3.71	20.98	115	
	V5	5.63	3	285	3.58	20.79	108	
	V6	5.26	5	254	3.43	19.57	110	
	V7	4.82	9	215	3.40	19.85	106	
	V8	-	-	-	-	-	-	
F2	V1	4.32	13	230	4.12	20.16	108	0.86
	V2	4.82	9	230	4.14	22.91	111	1.81
	V3	5.20	6	306	3.79	20.29	110	2.29
	V4	5.91	1	245	3.70	21.49	115	1.05
	V5	5.58	4	289	3.73	19.74	108	-0.48
	V6	5.15	7	239	3.61	19.67	110	-1.05
	V7	4.78	11	221	3.45	19.52	106	-0.38
	V8	-	-	-	-	-	-	-
Interaction								
F at same V		NS		NS	NS	0.71	NS	
V at same F		NS		NS	NS	0.83	NS	
F1		5.05	2	255	3.76	20.73	110	
F2		5.11	1	251	3.79	20.54	110	0.59
C.D.(0.05)		NS		NS	NS	NS	NS	
C.V.(%)		2.83		2.97	1.01	2.37	0.37	
Mean of varieties:								
V1		4.28	7	234	4.13	20.37	108	0.86
V2		4.73	6	237	4.13	23.18	111	1.81
V3		5.08	4	304	3.86	20.11	110	2.29
V4		5.86	1	248	3.71	21.24	115	1.05
V5		5.61	2	287	3.66	20.27	108	-0.48
V6		5.21	3	247	3.52	19.62	110	-1.05
V7		4.80	5	218	3.43	19.69	106	-0.38
V8		-	-	-	-	-	-	-
C.D.(0.05)		0.31		24.37	0.11	0.5	0.44	
C.V. (%)		5.15		8.08	2.43	2.05	0.33	
Expt. Mean		**5.08**		**253**	**3.77**	**20.6**	**110**	
Soil type		Alluvial clay						
pH		6.50						
N - levels (kg/ha)								
F1		45:30:30						
F2		90:60:60						
Recommended N:P:K (kg/ha)		90:60:60						
Varieties								
V1		IET 29349						
V2		IET 29351						
V3		IET 28508						
V4		IET 28509						
V5		Swarna (NC)						
V6		NDR 8002 (E &C)						
V7		PA 6444 (Hybrid)						
V8		-						
Available N:P:K of soil (kg/ha)		172:47:286						

Table 4.1(f): Contd.

F-levels	Varieties	PUSA			Over all mean	Rank
		Grain Yield (t/ha)	Rank	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)		
F1	V1	3.06	9		4.11	14
	V2	2.93	12		4.36	9
	V3	2.80	15		4.28	10
	V4	2.81	14		4.22	13
	V5	2.80	15		4.22	12
	V6	2.92	13		3.96	16
	V7	2.95	11		4.24	11
	V8	3.01	10		4.05	15
F2	V1	4.30	2	11.27	5.03	8
	V2	4.09	4	10.55	5.42	2
	V3	3.87	8	9.73	5.20	4
	V4	3.90	6	9.91	5.09	6
	V5	3.88	7	9.82	5.32	3
	V6	4.08	5	10.55	5.06	7
	V7	4.55	1	14.55	5.46	1
	V8	4.22	3	11.00	5.17	5
Interaction						
F at same V		NS				
V at same F		NS				
F1		2.91	2		4.18	2
F2		4.11	1	10.92	5.21	1
C.D.(0.05)		NS				
C.V.(%)		2.83				
Mean of varieties:						
V1		3.68	2	11.27	4.57	7
V2		3.51	4	10.55	4.89	1
V3		3.34	8	9.73	4.74	4
V4		3.36	6	9.91	4.66	5
V5		3.34	7	9.82	4.77	3
V6		3.50	5	10.55	4.51	8
V7		3.75	1	14.55	4.85	2
V8		3.62	3	11.00	4.61	6
C.D.(0.05)		0.31				
C.V. (%)		5.15				
Expt. Mean		**3.51**			4.70	
Soil type		Loam				
pH		8.20				
N - levels (kg/ha)						
F1		60:30:20				
F2		120:60:40				
Recommended N:P:K (kg/ha)		120:60:40				
Varieties						
V1		IET 29349				
V2		IET 29351				
V3		IET 28508				
V4		IET 28509				
V5		Swarna (NC)				
V6		NDR 8002 (E &C)				
V7		PA 6444 (Hybrid)				
V8		Local check - Rajendra mansuri				
Available N:P:K of soil (kg/ha)		245:14:155				

4.1(g) AVT 2 - CSTVT

One culture Viz., IET 27851 was evaluated in comparison with standard varieties (CSR 10, Improved white ponny, FL 478 and Canning 7) at **Canning town (75:40:10), Nagina (120:60:40), Navsari (120:30:0), Panvel (100:50:50)** and **Vyttila** under two recommended level of input (50 and 100% RDF). The data is summarized and presented in Table 4.1(i).

Different levels of RDF did not exhibit significant differences in grain yield and yield attributes at both locations, **Navsari** and **Panvel** but significant at **Canning town, Vyttila** and **Nagina**. Application of 100% RDF recorded higher yield of 4.72 t/ha at C**anning town;** 3.63 t/ha at **Vyttila** and **Nagina** (3.74 t/ha). Nutrient response (kg grain / kg Nutrients) was higher at 100% RDF 16.33 at **Vyttila**; (13.38) at **Canning town** followed by **Panvel** (8.08).

Average yield of varieties ranged from 3.07 to 5.53 t/ha. IET 27851 (3.76 3.44 and 6.85 t/ha) was found to be promising over other test entries at **Nagina**, **Navsari** and **Panvel** respectively. Interaction effects of N levels and varieties were found to be non-significant at **Nagina** and **Panvel** locations.

In this trial, 100% RDF was found to be promising and also exhibited higher nutrient response. AVT-2 entry IET 27851 was found to be on par in terms of grain yield and nutrient response with local check with most of the tested centers.

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

Saline tolerant cultures (nine) Viz., IET 29356, IET 29365, IET 29354, IET 29360, IET 29361, IET 29366, IET 29358, IET 29353 and IET 27807 were evaluated for its response to different doses of nutrients on grain yield at four different locations i.e. **Kanpur (120:60:40), Navsari (120:30:0), Lucknow (150:60:40)** and **Pusa (120:60:40)**. The details and data received from these locations are summarized and presented in Table 4.1(h).

RDF doses significantly influenced the grain yield at all locations**.** Maximum increase in grain yield was observed with 100% RDF (3.54, 3.42, 4.26 and 4.14 t/ha) respectively at **Kanpur**, **Navsari, Lucknow** and **Pusa** over 50% RDF application. Application of 100% RDF recorded higher grain yields of 38% and higher nutrient response (kg grain / kg nutrient) was recorded at **Lucknow** and **Pusa** (16.56 and 13.34).

Grain yield differences among the tested cultures were found to be significant at all the locations and IET 29361 (3.86 t/ha) recorded higher yield at **Pusa**. Interaction effects among RFD x varieties on grain yield was found to be non-significant at all locations. Mean over the locations, standard and local checks performance was superior over test entries.

In this trial, 100% RDF was found to be promising with 3% higher yield and also exhibited higher nutrient efficiency, IET 29360 and IET 29361 (3.40 and 3.39 t/ha) were found to be promising entries and recorded higher mean grain yield over other test entries, while most of the locations the performance of standard checks was promising.

Table 4.1(g): 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 2022.

F-levels	Varieties	CANNING TOWN				NAGINA						
		Grain Yield (t/ha)	Rank	Panicle/ m^2 (No.)	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: Low input (50% NPK)	V1	4.16	6	484		3.32	2	251	2.16	23.87	109	
	V2	4.32	5	425		-	-	-	-	-	-	-
	V3	-	-	-	-	-	-	-	-	-	-	-
	V4	5.41	3	455		-	-	-	-	-	-	-
	V5	2.07	10	396		2.94	4	244	2.45	22.58	92	
	V6	3.48	8	425		-	-	-	-	-	-	-
F2: Optimum input (100% NPK)	V1	5.04	4	499	14.08	4.20	1	284	2.16	23.21	111	8.00
	V2	5.74	2	469	22.72	-	-	-	-	-	-	-
	V3	-	-	-	-	-	-	-	-	-	-	-
	V4	5.93	1	484	8.32	-	-	-	-	-	-	-
	V5	2.81	9	425	11.84	3.28	3	270	2.45	22.85	93	3.09
	V6	4.10	7	469	9.92	-	-	-	-	-	-	-
Interation												
F at same V		NS		NS		NS		NS	NS	NS	NS	
V at same F		NS		NS		NS		NS	NS	NS	NS	
F1		3.89	2	437		3.13	2	248	2.31	23.23	101	
F2		4.72	1	469	13.38	3.74	1	277	2.31	23.03	102	5.55
C.D.(0.05)		0.68		NS		0.47		24.47	NS	NS	NS	
C.V.(%)		10.03		14.51		5.53		3.76	0.45	2.38	0.99	
Mean of varieties:												
V1		4.60	3	491	14.08	3.76	1	268	2.16	23.54	110	8.00
V2		5.03	2	447	22.72	-	-	-	-	-	-	-
V3		-	-	-	-	-	-	-	-	-	-	-
V4		5.67	1	469	8.32	-	-	-	-	-	-	-
V5		2.44	5	411	11.84	3.11	2	257	2.45	22.72	93	3.09
V6		3.79	4	447	9.92	-	-	-	-	-	-	-
C.D.(0.05)		0.6		NS		0.19		NS	0.02	NS	0.59	
C.V. (%)		11.37		9.95		5.28		4.47	0.66	3.55	0.57	
Expt. Mean		**4.31**		**453**		**3.44**		**262**	**2.31**	**23.13**	**101**	
Soil type		Clay				-						
pH		6.58				7.70						
F - levels (kg/ha)												
F1		37.5:20:5				60:30:20						
F2		75:40:10				120:60:40						
Recommended		75:40:10				120:60:40						
Varieties												
V1		IET 27851				IET 27851						
V2		CSR-10				-						
V3		-				-						
V4		Improved White Ponny				-						
V5		Hybrid Check (FL 478)				Hybrid Check (FL 478)						
V6		Local Check - Canning 7 (130)				-						
Available N:P:K of soil (kg/ha)		160:15:290				21:18:209						

Table 4.1(g): Contd.

F-levels	Varieties	NAVSARI							PANVEL						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.)	Grain Yield (t/ha)	Rank	Panicle/ m^2 (No.)	Panicle wt (g)	Test wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.)
F1: Low input (50% NPK)	V1	3.31	2	320	3.10	23.13	119		6.38	5	316	1.88	22.1	111	
	V2	2.54	8	276	2.73	23.93	90		5.53	6	416	1.66	20.8	98	
	V3	-	-	-	-	-	-		6.71	4	302	2.29	19.6	115	
	V4	-	-	-	-	-	-		-	-	-	-	-	-	
	V5	2.79	7	318	2.83	24.07	96		2.20	10	288	1.37	26.3	83	
	V6	3.18	4	298	3.34	24.13	106		4.91	8	276	1.74	30.2	93	
F2: Optimum input (100% NPK)	V1	3.56	1	340	3.21	24.20	118	3.33	7.32	2	388	2.12	22.2	111	9.40
	V2	2.88	6	282	2.75	24.67	89	4.53	7.61	1	439	1.84	20.5	99	20.80
	V3	-	-	-	-	-	-	-	6.88	3	345	2.84	20.0	116	1.70
	V4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	V5	3.04	5	305	3.01	24.60	95	3.33	2.70	9	360	1.58	26.2	83	5.00
	V6	3.26	3	327	3.61	25.73	102	1.07	5.26	7	327	2.40	26.2	93	3.50
Interation															
F at same V		NS		19.77	NS	NS	NS		NS		NS	NS	0.57	NS	
V at same F		NS		21.88	NS	NS	NS		NS		NS	NS	0.54	NS	
F1		2.96	2	303	3.00	23.82	103		5.15	2	320	1.79	23.8	100	
F2		3.19	1	313	3.15	24.80	101	3.07	5.95	1	372	2.16	23.0	100	8.08
C.D.(0.05)		NS		NS	NS	0.31	NS		NS		31.41	0.15	0.25	NS	
C.V.(%)		6.35		3.19	5.81	0.73	1.22		9.32		5.78	4.69	0.68	1.11	
Mean of varieties:															
V1		3.44	1	330	3.16	23.67	118	3.33	6.85	1	352	2.00	22.2	111	9.40
V2		2.71	4	279	2.74	24.30	90	4.53	6.57	3	428	1.75	20.7	98	20.80
V3		-	-	-	-	-	-	-	6.80	2	324	2.57	19.8	115	1.70
V4		-	-	-	-	-	-	-	-	-	-	-	-	-	-
V5		2.92	3	311	2.92	24.34	95	3.33	2.45	5	324	1.48	26.3	83	5.00
V6		3.22	2	312	3.48	24.93	104	1.07	5.09	4	301	2.07	28.2	93	3.50
C.D.(0.05)		0.41		13.98	0.21	0.58	1.15		0.84		19.76	0.26	0.40	0.80	
C.V. (%)		10.68		3.61	5.47	1.89	0.9		12.4		4.67	10.81	1.40	0.65	
Expt. Mean		**3.07**		**308**	**3.07**	**24.31**	**102**		**5.55**		**346**	**1.97**	**23.4**	**100**	
Soil type		Clay							Clay Loam						
pH		8.58							7.40						
F - levels (kg/ha)															
F1		60:15:0							50:25:25						
F2		120:30:0							100:50:50						
Recommended		120:30:0							100:50:50						
Varieties															
V1		IET 27851							IET 27851						
V2		CSR-10							CSR-10 (CHK)						
V3		-							Jaya						
V4		-							-						
V5		Hybrid Check (FL 478)							FL478 (CHK)						
V6		Local Check - GNR 5 (130 days)							Local Check - Goa dhan 3						
Available N:P:K of soil (kg/ha)		294:43:1162							278:42:1285						

Table 4.1(g): Contd.

F-levels	Varieties	VYTTILA						Over all mean	Rank
		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: Low input (50% NPK)	V1	1.31	6	183	1.99	101		3.70	10
	V2	-	-	-	-	-		4.13	8
	V3	-	-	-	-	-		6.71	2
	V4	-	-	-	-	-		5.41	4
	V5	4.14	3	360	2.90	80		2.83	12
	V6	3.47	4	315	2.88	89		3.76	9
F2: Optimum input (100% NPK)	V1	1.70	5	211	2.27	100	9.75	4.36	6
	V2	-	-	-	-	-	-	5.41	4
	V3	-	-	-	-	-	-	6.88	1
	V4	-	-	-	-	-	-	5.93	3
	V5	4.57	2	423	2.98	80	10.75	3.28	11
	V6	4.61	1	385	2.92	89	28.50	4.31	7
Interation									
F at same V		0.22		NS	0.11	NS			
V at same F		0.29		NS	0.09	NS			
F1		2.97	2	286	2.59	90		3.62	2
F2		3.63	1	340	2.72	90	16.33	4.25	1
C.D.(0.05)		0.29		NS	0.02	NS			
C.V.(%)		4.31		9.8	0.39	0.26			
Mean of varieties:									
V1		1.51	3	197	2.13	101	9.75	4.03	5
V2		-	-	-	-	-	-	4.77	3
V3		-	-	-	-	-	-	6.80	1
V4		-	-	-	-	-	-	5.67	2
V5		4.36	1	391	2.94	80	10.75	3.05	6
V6		4.04	2	350	2.90	89	28.50	4.03	4
C.D.(0.05)		0.16		26.99	0.08	1.86			
C.V. (%)		3.55		6.48	2.15	1.55			
Expt. Mean		**3.30**		**313**	**2.66**	**90**		3.93	
Soil type		Clay loam							
pH		4.22							
F - levels (kg/ha)									
F1		10:20:10							
F2		20:40:20							
Recommended N:P:K (kg/ha)		20:40:20							
Varieties									
V1		IET 27851							
V2		-							
V3		-							
V4		-							
V5		FL478 (CHK)							
V6		Local Check - VTL-8 (120 days)							
Available N:P:K of soil (kg/ha)		353:27:369							

Table 4.1(h): Summary of data on grain yield and ancillary characters of selected AET AL&ISTVT cultures grown under transplanted conditions at graded levels of RDF, kharif 2022.

F-levels	Varieties	KANPUR				NAVSARI						
		Grain Yield (t/ha)	Rank	Panicle wt (g)	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: Low input (50% NPK)	V1	2.61	20	2.7		3.22	23	273	3.12	24.27	106	
	V2	2.71	16	2.85		2.96	29	262	2.93	24.43	105	
	V3	2.71	16	2.99		2.81	30	251	3.11	23.17	106	
	V4	3.05	12	3.19		3.12	27	266	3.07	23.57	106	
	V5	2.70	18	2.82		3.25	21	275	2.83	24.30	105	
	V6	2.62	19	2.9		3.28	20	277	2.81	24.13	104	
	V7	2.93	15	3		3.24	22	262	2.89	22.70	103	
	V8	3.20	9	3.16		3.31	19	269	3.19	24.00	106	
	V9	3.00	13	3.1		3.07	28	259	3.01	24.17	104	
	V10	3.25	8	3.33		3.13	26	255	3.15	23.97	106	
	V11	-	-	-		3.40	10	262	2.94	23.50	95	
	V12	-	-	-		3.39	12	253	3.01	23.93	97	
	V13	-	-	-		3.36	13	257	2.97	23.43	109	
	V14	-	-	-		3.33	17	270	2.97	22.77	109	
	V15	-	-	-		3.34	16	308	3.23	24.37	104	
F2: Optimum input (100% NPK)	V1	3.26	7	3.12	5.91	3.55	2	297	3.24	25.23	105	4.40
	V2	3.10	11	3.24	3.55	3.22	23	279	3.19	24.80	103	3.47
	V3	3.34	6	3.38	5.73	3.14	25	262	3.24	24.27	104	4.40
	V4	3.92	2	3.52	7.91	3.36	13	275	3.17	25.00	103	3.20
	V5	3.20	9	3.18	4.55	3.45	6	282	2.91	24.80	104	2.67
	V6	2.97	14	3.3	3.18	3.41	9	317	2.88	25.07	102	1.73
	V7	3.68	5	3.35	6.82	3.33	17	277	3.04	23.37	102	1.20
	V8	3.92	2	3.49	6.55	3.42	8	279	3.28	24.80	105	1.47
	V9	3.88	4	3.44	8.00	3.36	13	279	3.12	24.90	104	3.87
	V10	4.15	1	3.64	8.18	3.47	5	277	3.28	24.33	105	4.53
	V11	-	-	-	-	3.52	3	273	3.04	25.00	94	1.60
	V12	-	-	-	-	3.48	4	277	3.13	24.80	96	1.20
	V13	-	-	-	-	3.43	7	291	3.06	24.23	108	0.93
	V14	-	-	-	-	3.40	10	290	3.07	23.40	107	0.93
	V15	-	-	-	-	3.80	1	310	3.33	24.70	103	6.13
Interaction												
F at same V		NS		NS		NS		NS	NS	NS	NS	
V at same F		NS		NS		NS		NS	NS	NS	NS	
F1		2.88	2	3.00		3.21	2	267	3.02	23.78	104	
F2		3.54	1	3.37	5.31	3.42	1	284	3.13	24.58	103	2.78
C.D.(0.05)		0.09		0.12		0.2		16.99	0.1	0.76	0.57	
C.V.(%)		2.66		3.47		6.61		6.8	3.52	3.47	0.61	

Table 4.1(h): Contd.

F-levels	Varieties	KANPUR				NAVSARI						
		Grain Yield (t/ha)	Rank	Panicle wt (g)	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	2.94	8	2.91	5.91	3.39	5	285	3.18	24.75	106	4.40
	V2	2.91	9	3.05	3.55	3.09	14	271	3.06	24.62	104	3.47
	V3	3.03	6	3.19	5.73	2.98	15	257	3.18	23.72	105	4.40
	V4	3.49	3	3.36	7.91	3.24	12	271	3.12	24.29	105	3.20
	V5	2.95	7	3.00	4.55	3.35	8	278	2.87	24.55	104	2.67
	V6	2.80	10	3.10	3.18	3.35	9	297	2.85	24.60	103	1.73
	V7	3.31	5	3.18	6.82	3.29	11	270	2.97	23.04	103	1.20
	V8	3.56	2	3.33	6.55	3.37	6	274	3.24	24.40	106	1.47
	V9	3.44	4	3.27	8.00	3.22	13	269	3.07	24.54	104	3.87
	V10	3.70	1	3.49	8.18	3.30	10	266	3.22	24.15	106	4.53
	V11	-	-	-	-	3.46	2	267	2.99	24.25	95	1.60
	V12	-	-	-	-	3.44	3	265	3.07	24.37	97	1.20
	V13	-	-	-	-	3.40	4	274	3.02	23.83	108	0.93
	V14	-	-	-	-	3.37	6	280	3.02	23.09	108	0.93
	V15	-	-	-	-	3.57	1	309	3.28	24.54	104	6.13
C.D.(0.05)		0.21		0.21		0.3		13.34	0.12	0.84	1.27	
C.V. (%)		5.49		5.75		7.78		4.19	3.41	3	1.06	
Expt. Mean		**3.21**		**3.19**		**3.32**		**276**	**3.07**	**24.18**	**104**	
Soil type		Sandy clay loam				Clay						
pH		9.92				8.54						
F - levels (kg/ha)												
F1		60;30:20				60:15:0						
F2		120:60:40				120:30:0						
Recommended N:P:K (kg/ha)		120:60:40				120:30:0						
Varieties												
	V1	IET 29356				IET 29356						
	V2	IET 29365				IET 29365						
	V3	IET 29354				IET 29354						
	V4	IET 29360				IET 29360						
	V5	IET 29361				IET 29361						
	V6	IET 29366				IET 29366						
	V7	IET 29358				IET 29358						
	V8	IET 29353				IET 29353						
	V9	IET 27807				IET 27807						
	V10	CSR 36 (Alkaline)				CSR 36 (Alkaline)						
	V11	-				CSR 10 (Early)						
	V12	-				FL 478 (Saline Tolerant)						
	V13	-				CSR 23 (Inland Saline)						
	V14	-				Pusa 44 (Sensitive)						
	V15	-				Local check - GNR 5						
Available N:P:K of soil (kg/ha)		120:26:326				287:38:1079						

Table 4.1(h): Contd.

F-levels	Varieties	LUCKNOW				PUSA						Overall mean	Rank
		Grain Yield (t/ha)	Rank	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)	Nutri. res. (kg grain/kg Nutri.)		
F1: Low input (50% NPK)	V1	1.55	24	94		2.76	15	168	2.28	20.00		2.54	30
	V2	2.30	17	85		2.29	21	182	2.43	20.40		2.57	28
	V3	3.11	14	82		2.68	18	163	2.22	21.47		2.83	22
	V4	2.93	15	89		2.65	19	184	2.46	20.67		2.94	21
	V5	-	-	-		3.11	12	177	2.38	20.47		3.02	19
	V6	1.82	21	88		2.46	20	162	2.21	21.00		2.55	29
	V7	2.03	20	88		2.20	22	148	2.06	21.63		2.60	27
	V8	1.73	23	88		2.70	16	146	2.03	21.50		2.74	25
	V9	1.77	22	90		2.70	16	173	2.33	20.33		2.64	26
	V10	2.63	16	95		2.79	14	159	2.18	20.47		2.95	20
	V11	2.23	18	90		-	-	-	-	-		2.82	23
	V12	-	-	-		-	-	-	-	-		3.39	16
	V13	2.23	18	89		-	-	-	-	-		2.80	24
	V14	-	-	-		-	-	-	-	-		3.33	17
	V15	3.40	12	88		3.08	13	167	2.22	20.23		3.27	18
F2: Optimum input (100% NPK)	V1	4.53	5	91	23.84	4.26	3	183	3.48	21.50	13.64	3.90	5
	V2	3.87	9	85	12.56	3.79	10	197	3.63	21.90	13.64	3.50	13
	V3	3.80	10	81	5.52	4.18	7	178	3.42	22.97	13.64	3.62	11
	V4	4.00	7	92	8.56	4.16	8	199	3.66	22.17	13.73	3.86	6
	V5	-	-	-	-	4.61	1	192	3.58	21.97	13.64	3.75	9
	V6	4.57	4	90	22.00	3.96	9	177	3.41	22.50	13.64	3.73	10
	V7	3.33	13	85	10.40	3.70	11	163	3.26	23.13	13.64	3.51	12
	V8	3.60	11	86	14.96	4.20	5	161	3.23	23.00	13.64	3.79	8
	V9	3.97	8	88	17.60	4.20	5	188	3.53	21.83	13.64	3.85	7
	V10	4.83	2	95	17.60	4.29	2	174	3.38	21.97	13.64	4.19	2
	V11	4.70	3	91	19.76	-	-	-	-	-	-	4.11	3
	V12	-	-	-	-	-	-	-	-	-	-	3.48	14
	V13	4.40	6	90	17.36	-	-	-	-	-	-	3.92	4
	V14	-	-	-	-	-	-	-	-	-	-	3.40	15
	V15	5.47	1	92	16.56	4.21	4	167	3.40	21.73	10.27	4.49	1
Interaction													
F at same V		NS		NS		NS		NS	NS	NS			
V at same F		NS		NS		NS		NS	NS	NS			
F1		2.31	2	89		2.67	2	166	2.25	20.74		2.77	2
F2		4.26	1	89	15.56	4.14	1	180	3.45	22.24	13.34	3.84	1
C.D.(0.05)		0.38		NS		0.07		0.17	0.01	0			
C.V.(%)		7.19		0.77		1.84		0.09	0.21	0.01			

Table 4.1(h): Contd.

F-levels	Varieties	LUCKNOW				PUSA						Overall mean	Rank
		Grain Yield (t/ha)	Rank	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.)	Grain Yield (t/ha)	Rank	Panicle/ m^2 (No.)	Panicle wt (g)	Test wt (g)	Nutri. res. (kg grain/kg Nutri.)		
Mean of varieties													
V1		3.04	9	92	23.84	3.51	4	176	2.88	20.75	13.64	3.22	12
V2		3.09	8	85	12.56	3.04	10	189	3.03	21.15	13.64	3.03	15
V3		3.46	5	82	5.52	3.43	7	170	2.82	22.22	13.64	3.22	11
V4		3.47	3	91	8.56	3.41	8	192	3.06	21.42	13.73	3.40	5
V5		-	-	-	-	3.86	1	185	2.98	21.22	13.64	3.39	6
V6		3.20	7	89	22.00	3.21	9	170	2.81	21.75	13.64	3.14	13
V7		2.68	11	86	10.40	2.95	11	156	2.66	22.38	13.64	3.06	14
V8		2.67	12	87	14.96	3.45	5	153	2.63	22.25	13.64	3.26	9
V9		2.87	10	89	17.60	3.45	5	180	2.93	21.08	13.64	3.24	10
V10		3.73	2	95	17.60	3.54	3	167	2.78	21.22	13.64	3.57	2
V11		3.47	3	90	19.76	-	-	-	-	-	-	3.46	3
V12		-	-	-	-	-	-	-	-	-	-	3.44	4
V13		3.32	6	90	17.36	-	-	-	-	-	-	3.36	8
V14		-	-	-	-	-	-	-	-	-	-	3.37	7
V15		4.44	1	90	16.56	3.65	2	167	2.81	20.98	10.27	3.88	1
C.D.(0.05)		NS		1.6		0.29		12.31	0.14	0.47			
C.V. (%)		19.53		1.5		7.32		6.09	4.24	1.87			
Expt. Mean		**3.28**		**89**		**3.41**		**173**	**2.85**	**21.49**		3.30	
Soil type		-				Sandy loam							
pH		8.90				8.20							
F - levels (kg/ha)													
F1		75:30:20				60;30:20							
F2		150:60:40				120:60:40							
Recommended		150:60:40				120:60:40							
Varieties													
V1		IET 29356				IET 29356							
V2		IET 29365				IET 29365							
V3		IET 29354				IET 29354							
V4		IET 29360				IET 29360							
V5		-				IET 29361							
V6		IET 29366				IET 29366							
V7		IET 29358				IET 29358							
V8		IET 29353				IET 29353							
V9		IET 27807				IET 27807							
V10		CSR 36 (Alkaline)				CSR 36 (Alkaline)							
V11		CSR 10 (Early)				-							
V12		-				-							
V13		CSR 23 (Inland Saline)				-							
V14		-				-							
V15		Local check - CSR 46				Local check - Rajendra sweta (145 days)							
Available N:P:K of soil (kg/ha)		123:28:320				225:12:155							

4.1(i) AVT 2 - Aerobic

Aerobic rice cultivation is a system where rice is grown under aerated conditions without standing water as against the usual transplanted rice which is grown under unaerated flooded conditions. Rice is grown on dry but irrigated soil 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 irrigated rice.

15 AVT-2 entries (IET 29423, IET 29422, IET 29412, IET 29396, IET 29405, IET 29411, IET 29415, IET 29424, IET 29394, IET 29436, IET 29421, IET 29409, IET 29430, IET 29410 and IET 29446) were evaluated for their response to two fertilizer levels on grain yield at eight locations viz., **Jagdalpur (120:60:40), Kaul (100:60:40), Kota (120:60:40), Ludhiana (150:30:30), Nawagam (80:25:0), Pantnagar (120:60:40), Raipur (100:60:40) and Varanasi (120:60:60).** The data received from these locations are summarized and presented in Table 4.1(i).

Different doses of RDF exhibited significant differences on grain yield at all the locations except **Ludhiana** and **Nawagam**. Application of 100% RDF recorded higher yield at **Jagdalpur** (4.50 t/ha), **Kaul** (5.27 t/ha), **Kota** (4.46 t/ha), **Nawagam** (5.05 t/ha), **Pantnagar** (4.05 t/ha), **Raipur** (4.07 t/ha) and **Varanasi** (3.78 t/ha). Nutrient response (kg grain / kg N) was higher at 100 % RDF over 50% RDF at **Pantnagar** (12.36), **Ludhiana** (7.54) and **Nawagam** (7.00).

Grain yield of cultures differed significantly at all locations. Among the entries tested, IET 29436 recorded higher yield at **Kota** (5.24 t/ha), and **Varanasi** (4.27 t/ha), IET 29412 at **Ludhiana** (7.64 t/ha) and **Nawagam** (5.58 t/ha), **Pantnagar** (4.27 t/ha) and **Raipur (5.28 t/ha)** over other entries. Average over the locations, the performance of IET 29412 (5.18 t/ha) was found to be promising culture followed by IET 29436 (4.88t/ha). Interaction effects of RDF doses and varieties was found to be non-significant at all the locations except **Nawagam, Pantnagar** and **Varanasi** where, 100% RDF realised higher grain yield with test cultures.

Summarized over the locations, application of 100% RDF was found to be promising (17% higher grain yield) and also exhibited higher nutrient response. IET 29412 and IET 29436 were found to be promising with higher grain yield (5.18 and 4.88 t/ha) across the locations.

Table 4.1(i): Summary of data on grain yield and ancillary characters of selected AET Aerobic cultures at graded levels of recommended fertilizer doses, kharif 2022.

F-levels	Varieties	JAGDALPUR						
		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	4.17	25	191	3.61	24.58	62	
	V2	4.44	18	186	3.80	27.24	68	
	V3	4.59	14	188	3.69	24.66	63	
	V4	4.68	10	178	3.53	25.52	57	
	V5	3.80	30	186	3.33	25.40	60	
	V6	4.21	23	173	3.58	27.29	66	
	V7	3.90	29	191	3.42	22.63	59	
	V8	4.23	21	178	3.42	26.87	65	
	V9	3.37	36	193	3.47	27.03	59	
	V10	4.22	22	199	3.58	26.37	65	
	V11	4.14	26	196	3.59	21.71	55	
	V12	4.66	12	216	3.48	23.22	57	
	V13	2.51	38	190	3.41	26.00	71	
	V14	3.54	34	170	3.15	24.36	53	
	V15	4.35	19	173	3.38	25.16	56	
	V16	4.09	27	203	3.42	25.57	62	
	V17	-	-	-	-	-	-	
	V18	3.40	35	216	3.45	24.73	71	
	V19	5.28	3	190	3.43	24.70	60	
	V20	5.20	4	180	3.61	22.46	61	
F2	V1	4.59	14	204	3.31	24.36	63	4.20
	V2	4.64	13	214	3.40	27.43	69	2.00
	V3	4.96	6	220	3.14	24.93	64	3.70
	V4	4.75	7	213	3.61	25.69	59	0.70
	V5	4.07	28	209	3.34	25.46	62	2.70
	V6	4.74	9	234	3.57	26.86	68	5.30
	V7	4.19	24	228	3.52	23.27	261	2.90
	V8	4.75	7	198	4.16	27.11	69	5.20
	V9	3.76	32	215	3.67	27.78	61	3.90
	V10	4.59	14	206	3.32	26.45	68	3.70
	V11	4.32	20	195	3.64	21.58	58	1.80
	V12	4.98	5	186	3.35	23.17	59	3.20
	V13	2.76	37	190	3.24	25.78	73	2.50
	V14	3.79	31	202	3.63	24.29	56	2.50
	V15	4.68	10	208	3.42	25.29	58	3.30
	V16	4.50	17	204	3.70	25.54	64	4.10
	V17	-	-	-	-	-	-	-
	V18	3.66	33	206	3.52	24.69	74	2.60
	V19	5.86	2	201	4.16	24.63	61	5.80
	V20	5.87	1	204	3.67	22.74	64	6.70
Interaction								
F at same V		NS		23.38	0.42	NS	NS	
V at same F		NS		22.86	0.43	NS	NS	
Mean of F levels								
F1		4.15	2	189	3.49	25.03	62	
F2		4.50	1	207	3.55	25.11	74	3.52
C.D.(0.05)		0.31		2.90	NS	NS	NS	
C.V.(%)		9.00		1.82	6.16	1.56	80.92	

Table 4.1(i): Contd.

F-levels	Varieties	JAGDALPUR						
		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		4.38	11	197	3.46	24.47	63	4.20
V2		4.54	6	200	3.60	27.34	69	2.00
V3		4.78	4	204	3.42	24.80	63	3.70
V4		4.72	5	196	3.57	25.61	58	0.70
V5		3.94	15	197	3.34	25.43	61	2.70
V6		4.48	9	203	3.58	27.08	67	5.30
V7		4.05	14	210	3.47	22.95	160	2.90
V8		4.49	8	188	3.79	26.99	67	5.20
V9		3.57	17	204	3.57	27.41	60	3.90
V10		4.41	10	202	3.45	26.41	66	3.70
V11		4.23	13	195	3.62	21.65	57	1.80
V12		4.82	3	201	3.42	23.20	58	3.20
V13		2.64	19	190	3.33	25.89	72	2.50
V14		3.67	16	186	3.39	24.33	55	2.50
V15		4.52	7	190	3.40	25.23	57	3.30
V16		4.30	12	204	3.56	25.56	63	4.10
V17		-	-	-	-	-	-	-
V18		3.53	18	211	3.49	24.71	73	2.60
V19		5.57	1	196	3.80	24.67	61	5.80
V20		5.54	2	192	3.64	22.60	63	6.70
C.D.(0.05)		0.5		NS	NS	0.67	NS	
C.V. (%)		10.12		7.29	7.33	2.32	82.68	
Expt. Mean		**4.32**		**198**	**3.52**	**25.07**	**68**	
Soil type		Vertisol						
pH		6.10						
N - levels (kg/ha)								
F1		50:30:20						
F2		100:60:40						
Recommended N:P:K (kg/ha)		100:60:40						
Varieties								
V1		IET 29423						
V2		IET 29422						
V3		IET 29412						
V4		IET 29396						
V5		IET 29405						
V6		IET 29411						
V7		IET 29415						
V8		IET 29424						
V9		IET 29394						
V10		IET 29436						
V11		IET 29421						
V12		IET 29409						
V13		IET 29430						
V14		IET 29410						
V15		IET 29446						
V16		CR Dhan 201(NC)						
V17		-						
V18		MAS 946-1 (S)						
V19		PA 6129						
V20		Local Check - Samleshwari (110-115 days)						
Available N:P:K of soil (kg/ha)		225:14:298						

Table 4.1(i): 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 50% RDF)
F1	V1	4.06	32	197	2.06	18.50	
	V2	3.99	33	234	1.71	18.27	
	V3	4.73	21	203	2.32	20.80	
	V4	4.67	23	248	1.88	20.07	
	V5	4.35	27	174	2.50	22.10	
	V6	4.22	30	187	2.26	23.40	
	V7	3.73	36	215	1.74	18.63	
	V8	4.39	26	224	1.96	22.30	
	V9	3.88	35	193	2.01	22.23	
	V10	4.79	19	205	2.34	24.30	
	V11	4.83	17	205	2.36	21.70	
	V12	3.91	34	240	1.63	16.60	
	V13	4.31	29	212	2.03	23.03	
	V14	4.67	23	189	2.47	23.83	
	V15	4.20	31	231	1.82	23.10	
	V16	5.08	14	214	2.39	20.30	
	V17	-	-	-	-	-	
	V18	-	-	-	-	-	
	V19	4.94	15	211	2.35	23.10	
	V20	4.35	27	223	1.95	21.73	
F2	V1	4.88	16	235	2.07	18.50	6.07
	V2	4.74	20	280	1.70	18.30	5.56
	V3	5.57	5	239	2.33	20.60	6.22
	V4	5.45	7	286	1.90	20.33	5.78
	V5	5.42	9	213	2.54	22.23	7.93
	V6	5.25	10	231	2.27	23.37	7.63
	V7	4.59	25	251	1.83	18.70	6.37
	V8	5.56	6	283	1.97	22.70	8.67
	V9	4.80	18	237	2.03	22.20	6.81
	V10	5.60	4	240	2.33	24.17	6.00
	V11	5.66	3	239	2.37	21.60	6.15
	V12	4.71	22	285	1.65	16.87	5.93
	V13	5.21	11	259	2.02	22.83	6.67
	V14	5.45	7	219	2.48	23.93	5.78
	V15	5.17	13	280	1.85	23.07	7.19
	V16	5.88	1	239	2.45	20.33	5.93
	V17	-	-	-	-	-	-
	V18	-	-	-	-	-	-
	V19	5.81	2	244	2.38	23.40	6.44
	V20	5.19	12	265	1.96	21.57	6.22
Interaction							
F at same V		NS		NS	NS	NS	
V at same F		NS		NS	NS	NS	
Mean of F levels							
F1		4.39	2	211	2.10	21.33	
F2		5.27	1	251	2.12	21.37	6.52
C.D.(0.05)		0.2		8.46	0.01	NS	
C.V.(%)		4.93		4.41	0.35	5.19	

Table 4.1(i): 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 50% RDF)
Mean of varieties:							
V1		4.47	14	216	2.07	18.50	6.07
V2		4.37	15	257	1.71	18.29	5.56
V3		5.15	5	221	2.33	20.70	6.22
V4		5.06	6	267	1.89	20.20	5.78
V5		4.89	9	194	2.52	22.17	7.93
V6		4.74	12	209	2.27	23.39	7.63
V7		4.16	18	233	1.79	18.67	6.37
V8		4.98	8	253	1.97	22.50	8.67
V9		4.34	16	215	2.02	22.22	6.81
V10		5.20	4	222	2.34	24.24	6.00
V11		5.25	3	222	2.37	21.65	6.15
V12		4.31	17	263	1.64	16.74	5.93
V13		4.76	11	236	2.03	22.93	6.67
V14		5.06	6	204	2.48	23.88	5.78
V15		4.69	13	256	1.84	23.09	7.19
V16		5.48	1	226	2.42	20.32	5.93
V17		-	-	-	-	-	-
V18		-	-	-	-	-	-
V19		5.38	2	227	2.37	23.25	6.44
V20		4.77	10	244	1.96	21.65	6.22
C.D.(0.05)		0.40		17.06	0.07	2.13	
C.V. (%)		7.27		6.45	3.07	8.72	
Expt. Mean		**4.83**		**231**	**2.11**	**21.35**	
Soil type		Clay loam					
pH		8.00					
N - levels (kg/ha)							
F1		75:30:30					
F2		150:60:60					
Recommended N:P:K (kg/ha)		150:60:60					
Varieties							
V1		IET 29423					
V2		IET 29422					
V3		IET 29412					
V4		IET 29396					
V5		IET 29405					
V6		IET 29411					
V7		IET 29415					
V8		IET 29424					
V9		IET 29394					
V10		IET 29436					
V11		IET 29421					
V12		IET 29409					
V13		IET 29430					
V14		IET 29410					
V15		IET 29446					
V16		CR Dhan 201(NC)					
V17		-					
V18		-					
V19		PA 6129 (Hybrid)					
V20		Local Check - HKR 47 (135 days)					
Available N:P:K of soil (kg/ha)		160:16:320					

Table 4.1(i): Contd.

F-levels	Varieties	KOTA					
		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	V1	3.48	30	227	3.16	80	
	V2	3.83	22	234	3.60	82	
	V3	4.44	11	243	3.95	85	
	V4	3.42	35	225	3.47	79	
	V5	3.48	30	233	2.98	83	
	V6	4.22	16	245	3.25	83	
	V7	3.71	27	201	3.78	79	
	V8	4.62	9	248	3.71	82	
	V9	3.79	25	217	3.75	80	
	V10	5.04	4	247	3.44	83	
	V11	3.61	28	229	3.05	78	
	V12	3.79	25	208	3.53	81	
	V13	3.44	33	222	3.17	92	
	V14	3.21	37	199	3.54	81	
	V15	2.79	38	191	3.20	79	
	V16	3.83	22	273	2.78	83	
	V17	3.56	29	226	3.34	80	
	V18	3.28	36	218	3.27	79	
	V19	3.44	33	209	3.62	80	
	V20	-	-	-	-	-	
F2	V1	4.12	19	243	3.47	79	5.82
	V2	4.77	6	259	3.79	83	8.55
	V3	5.32	2	259	4.31	85	8.00
	V4	4.01	21	239	3.89	79	5.36
	V5	4.23	15	255	3.40	82	6.82
	V6	4.79	5	260	3.53	82	5.18
	V7	4.44	11	225	4.11	80	6.64
	V8	5.32	2	268	3.95	82	6.36
	V9	4.18	17	230	4.08	82	3.55
	V10	5.43	1	258	3.76	84	3.55
	V11	4.16	18	238	3.51	79	5.00
	V12	4.52	10	221	3.84	83	6.64
	V13	4.30	14	239	3.60	92	7.82
	V14	3.80	24	215	3.90	82	5.36
	V15	3.46	32	213	3.56	80	6.09
	V16	4.73	7	284	2.99	82	8.18
	V17	4.67	8	241	3.56	81	10.09
	V18	4.08	20	238	3.55	80	7.27
	V19	4.39	13	222	3.92	79	8.64
	V20	-	-	-	-	-	-
Interaction							
F at same V		NS		NS	NS	0.89	
V at same F		NS		NS	NS	0.93	
Mean of F levels							
F1		3.74	2	226	3.40	81	
F2		4.46	1	242	3.72	82	6.57
C.D.(0.05)		0.16		7.67	0.06	NS	
C.V.(%)		4.86		4.06	2.08	0.64	

Table 4.1(i): Contd.

F-levels	Varieties	KOTA					
		Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Panicle wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
Mean of varieties:							
V1		3.80	15	235	3.32	80	5.82
V2		4.30	5	246	3.70	83	8.55
V3		4.88	3	251	4.13	85	8.00
V4		3.72	16	232	3.68	79	5.36
V5		3.86	14	244	3.19	82	6.82
V6		4.51	4	252	3.39	83	5.18
V7		4.08	9	213	3.95	79	6.64
V8		4.97	2	258	3.83	82	6.36
V9		3.99	10	224	3.92	81	3.55
V10		5.24	1	252	3.60	84	3.55
V11		3.89	12	233	3.28	78	5.00
V12		4.16	7	214	3.69	82	6.64
V13		3.87	13	231	3.39	92	7.82
V14		3.51	18	207	3.72	82	5.36
V15		3.13	19	202	3.38	79	6.09
V16		4.28	6	279	2.89	82	8.18
V17		4.12	8	234	3.45	80	10.09
V18		3.68	17	228	3.41	80	7.27
V19		3.92	11	216	3.77	80	8.64
V20		-	-	-	-	-	-
C.D.(0.05)		0.37		16.97	0.31	0.63	
C.V. (%)		7.85		6.34	7.73	0.68	
Expt. Mean		**4.10**		**234**	**3.56**	**82**	
Soil type		Clay					
pH		7.56					
N - levels (kg/ha)							
F1		60:30:20					
F2		120:60:40					
Recommended N:P:K (kg/ha)		120:60:40					
Varieties							
V1		IET 29423					
V2		IET 29422					
V3		IET 29412					
V4		IET 29396					
V5		IET 29405					
V6		IET 29411					
V7		IET 29415					
V8		IET 29424					
V9		IET 29394					
V10		IET 29436					
V11		IET 29421					
V12		IET 29409					
V13		IET 29430					
V14		IET 29410					
V15		IET 29446					
V16		CR Dhan 201(NC)					
V17		CR Dhan 202 (N, E, NE & C)					
V18		MAS 946-1 (S)					
V19		PA 6129 (Hybrid)					
V20		-					
Available N:P:K of soil (kg/ha)		182:27:512					

Table 4.1(i): Contd.

F-levels	Varieties	LUDHIANA						
		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	5.84	22	291	2.87	23.37	86	
	V2	5.46	27	316	3.07	25.60	85	
	V3	7.46	6	276	3.68	25.25	88	
	V4	-	-	-	-	-	-	
	V5	5.46	27	263	3.15	25.00	87	
	V6	6.07	19	298	3.01	24.32	90	
	V7	6.62	12	285	3.49	21.83	84	
	V8	7.19	8	311	3.50	25.12	87	
	V9	5.10	31	296	3.76	26.83	85	
	V10	7.12	9	317	3.71	25.66	88	
	V11	5.75	23	284	3.04	21.84	85	
	V12	6.06	20	302	3.12	21.37	88	
	V13	5.01	32	307	2.94	23.89	94	
	V14	4.10	34	301	3.01	22.68	89	
	V15	5.54	25	304	2.70	20.74	82	
	V16	5.22	30	348	2.63	23.69	88	
	V17	-	-	-	-	-	-	
	V18	-	-	-	-	-	-	
	V19	4.31	33	272	3.72	23.19	85	
	V20	7.11	10	303	3.32	21.31	82	
F2	V1	6.13	17	298	2.78	23.41	88	2.76
	V2	6.14	16	344	3.02	25.56	86	6.48
	V3	7.81	2	313	3.81	25.19	88	3.33
	V4	-	-	-	-	-	-	-
	V5	6.48	13	284	3.09	25.20	89	9.71
	V6	7.72	4	333	3.62	24.31	90	15.71
	V7	7.31	7	319	3.56	21.81	86	6.57
	V8	7.51	5	340	3.57	24.97	89	3.05
	V9	5.34	29	317	3.82	26.68	85	2.29
	V10	8.05	1	368	3.70	25.70	89	8.86
	V11	6.45	14	318	2.97	21.84	87	6.67
	V12	5.96	21	304	3.13	21.43	91	-0.95
	V13	5.54	25	326	3.07	23.70	95	5.05
	V14	6.09	18	325	3.06	22.73	91	18.95
	V15	6.71	11	335	2.76	20.61	83	11.14
	V16	6.19	15	382	2.80	23.79	90	9.24
	V17	-	-	-	-	-	-	-
	V18	-	-	-	-	-	-	-
	V19	5.67	24	293	3.98	23.18	85	12.95
	V20	7.77	3	324	3.37	21.34	82	6.29
Interaction								
F at same V		NS		NS	NS	NS	1.20	
V at same F		NS		NS	NS	NS	1.96	
Mean of F levels								
F1		5.85	2	298	3.22	23.63	87	
F2		6.64	1	325	3.30	23.61	88	7.54
C.D.(0.05)		NS		19.39	NS	NS	NS	
C.V.(%)		16.39		7.30	15.49	12.76	2.75	

Table 4.1(i): 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)
Mean of varieties:								
V1		5.99	10	294	2.83	23.39	87	2.76
V2		5.80	12	330	3.05	25.58	86	6.48
V3		7.64	1	295	3.75	25.22	88	3.33
V4		-	-	-	-	-	-	-
V5		5.97	11	273	3.12	25.10	88	9.71
V6		6.90	6	316	3.32	24.32	90	15.71
V7		6.97	5	302	3.53	21.82	85	6.57
V8		7.35	4	325	3.54	25.05	88	3.05
V9		5.22	15	306	3.79	26.76	85	2.29
V10		7.59	2	343	3.71	25.68	88	8.86
V11		6.10	8	301	3.01	21.84	86	6.67
V12		6.01	9	303	3.13	21.40	90	-0.95
V13		5.28	14	316	3.01	23.80	95	5.05
V14		5.10	16	313	3.04	22.71	90	18.95
V15		6.13	7	320	2.73	20.68	83	11.14
V16		5.71	13	365	2.72	23.74	89	9.24
V17		-	-	-	-	-	-	-
V18		-	-	-	-	-	-	-
V19		4.99	17	282	3.85	23.19	85	12.95
V20		7.44	3	314	3.35	21.33	82	6.29
C.D.(0.05)		0.69		19.67	0.29	1.77	0.85	
C.V. (%)		9.65		5.52	7.71	6.56	0.85	
Expt. Mean		**6.24**		**312**	**3.26**	**23.62**	**87**	
Soil type		Sandy Loam						
pH		7.50						
N - levels (kg/ha)								
F1		75:15:15						
F2		150:30:30						
Recommended N:P:K (kg/ha)		150:30:30						
Varieties								
V1		IET 29423						
V2		IET 29422						
V3		IET 29412						
V4		-						
V5		IET 29405						
V6		IET 29411						
V7		IET 29415						
V8		IET 29424						
V9		IET 29394						
V10		IET 29436						
V11		IET 29421						
V12		IET 29409						
V13		IET 29430						
V14		IET 29410						
V15		IET 29446						
V16		CR Dhan 201(NC)						
V17		-						
V18		-						
V19		PA 6129						
V20		Local Check - PR 126						
Available N:P:K of soil (kg/ha)		279:23:318						

Table 4.1(i): 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	5.08	16	179	4.20	24.13	80	
	V2	4.55	25	169	3.93	27.40	74	
	V3	5.41	9	192	5.47	26.13	72	
	V4	4.31	32	143	3.95	25.40	76	
	V5	3.93	36	165	4.33	23.87	77	
	V6	4.52	26	161	5.47	27.80	77	
	V7	4.78	22	164	5.12	23.53	79	
	V8	4.87	20	143	4.87	28.17	81	
	V9	4.07	35	163	5.51	29.40	77	
	V10	4.09	34	181	4.82	28.55	80	
	V11	5.23	14	181	4.34	20.87	76	
	V12	5.37	10	195	5.50	22.77	78	
	V13	4.41	29	188	6.08	23.17	85	
	V14	4.33	30	159	4.81	25.40	77	
	V15	4.56	24	168	4.69	21.90	72	
	V16	4.32	31	191	4.11	22.60	81	
	V17	-	-	-	-	-	-	
	V18	3.02	38	135	4.07	22.03	85	
	V19	5.34	12	184	6.32	25.43	76	
	V20	5.36	11	191	4.74	21.93	74	
F2	V1	5.45	7	180	5.38	23.30	80	5.92
	V2	5.53	5	184	4.91	27.33	74	15.68
	V3	5.75	2	202	6.75	27.33	73	5.44
	V4	4.68	23	180	5.51	26.83	77	5.92
	V5	4.15	33	173	5.58	20.77	78	3.52
	V6	5.24	13	167	5.72	28.70	78	11.52
	V7	5.04	17	170	6.10	24.10	79	4.16
	V8	5.55	4	173	5.68	27.63	81	10.88
	V9	4.44	28	168	5.94	29.77	77	5.92
	V10	5.80	1	196	5.79	30.67	80	27.36
	V11	4.51	27	188	5.13	22.10	77	-11.52
	V12	5.58	3	197	6.42	24.07	77	3.36
	V13	4.83	21	152	5.38	22.83	85	6.72
	V14	5.02	18	178	5.77	25.70	78	11.04
	V15	5.15	15	177	4.96	23.90	72	9.44
	V16	4.95	19	202	4.76	23.53	81	10.08
	V17	-	-	-	-	-	-	-
	V18	3.26	37	144	4.62	21.03	85	3.84
	V19	5.42	8	198	5.48	27.60	75	1.28
	V20	5.51	6	197	5.78	21.17	73	2.40
Interaction								
F at same V		0.69		20.68	NS	NS	NS	
V at same F		0.77		21.18	NS	NS	NS	
Mean of F levels								
F1		4.61	2	171	4.86	24.76	78	
F2		5.05	1	180	5.56	25.18	78	7.00
C.D.(0.05)		NS		8.49	NS	NS	NS	
C.V.(%)		12.39		6.00	34.20	21.46	4.28	

Table 4.1(i): Contd.

F-levels	Varieties	NAWAGAM						
		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	5.27	5	179	4.79	23.72	80	5.92
	V2	5.04	7	176	4.42	27.37	74	15.68
	V3	5.58	1	197	6.11	26.73	72	5.44
	V4	4.50	16	161	4.73	26.12	77	5.92
	V5	4.04	18	169	4.96	22.32	78	3.52
	V6	4.88	10	164	5.60	28.25	78	11.52
	V7	4.91	9	167	5.61	23.82	79	4.16
	V8	5.21	6	158	5.28	27.90	81	10.88
	V9	4.26	17	165	5.73	29.59	77	5.92
	V10	4.95	8	189	5.31	29.61	80	27.36
	V11	4.87	11	184	4.74	21.49	76	-11.52
	V12	5.48	2	196	5.96	23.42	78	3.36
	V13	4.62	15	170	5.73	23.00	85	6.72
	V14	4.68	13	168	5.29	25.55	78	11.04
	V15	4.86	12	173	4.83	22.90	72	9.44
	V16	4.64	14	197	4.44	23.07	81	10.08
	V17	-	-	-	-	-	-	-
	V18	3.14	19	140	4.35	21.53	85	3.84
	V19	5.38	4	191	5.90	26.52	76	1.28
	V20	5.44	3	194	5.26	21.55	74	2.40
	C.D.(0.05)	0.49		14.62	0.95	2.93	0.87	
	C.V. (%)	8.81		7.28	15.92	10.25	0.97	
	Expt. Mean	**4.83**		**176**	**5.21**	**24.97**	**78**	
	Soil type	Clay loam						
	pH	7.87						
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 29423						
	V2	IET 29422						
	V3	IET 29412						
	V4	IET 29396						
	V5	IET 29405						
	V6	IET 29411						
	V7	IET 29415						
	V8	IET 29424						
	V9	IET 29394						
	V10	IET 29436						
	V11	IET 29421						
	V12	IET 29409						
	V13	IET 29430						
	V14	IET 29410						
	V15	IET 29446						
	V16	CR Dhan 201(NC)						
	V17	-						
	V18	MAS 946-1 (S)						
	V19	PA 6129						
	V20	Local Check - Mahisagar						
	Available N:P:K of soil (kg/ha)	-						

Table 4.1(i): Contd.

F-levels	Varieties	PANTNAGAR						
		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	3.15	23	227	1.62	28.08	104	
	V2	3.21	22	222	1.72	26.38	101	
	V3	3.59	12	263	1.61	25.52	97	
	V4	3.53	16	261	1.60	24.55	96	
	V5	3.50	18	265	1.54	24.42	97	
	V6	2.58	25	266	1.31	26.30	97	
	V7	3.30	21	234	1.67	21.82	98	
	V8	2.80	24	253	1.46	27.95	101	
	V9	2.28	32	220	1.31	28.37	95	
	V10	2.40	27	213	1.56	26.38	99	
	V11	2.42	26	228	1.45	23.00	93	
	V12	2.20	34	213	1.48	21.92	99	
	V13	2.18	35	219	1.43	27.15	106	
	V14	2.21	33	239	1.18	26.42	104	
	V15	2.31	30	210	1.61	25.15	96	
	V16	2.04	36	197	1.64	26.92	103	
	V17	-	-	-	-	-	-	
	V18	-	-	-	-	-	-	
	V19	2.36	28	227	1.34	24.42	93	
	V20	2.29	31	197	1.43	30.07	104	
F2	V1	4.16	10	241	2.03	24.50	104	9.18
	V2	4.24	9	243	1.98	27.63	96	9.36
	V3	4.94	1	287	2.02	24.65	96	12.27
	V4	4.92	2	285	1.99	24.52	97	12.64
	V5	4.84	3	282	1.95	24.45	95	12.18
	V6	4.34	8	268	1.90	26.93	101	16.00
	V7	4.63	5	245	2.18	23.62	100	12.09
	V8	4.64	4	253	2.08	26.90	101	16.73
	V9	3.67	11	236	2.31	27.37	98	12.64
	V10	3.58	13	230	1.87	26.45	99	10.73
	V11	3.34	20	236	1.77	23.45	96	8.36
	V12	3.52	17	228	1.80	23.08	97	12.00
	V13	3.56	15	239	1.68	27.62	108	12.55
	V14	3.49	19	243	1.65	24.72	103	11.64
	V15	3.57	14	246	1.68	25.40	104	11.45
	V16	2.36	28	210	1.65	27.00	103	2.91
	V17	-	-	-	-	-	-	-
	V18	-	-	-	-	-	-	-
	V19	4.45	7	244	2.22	22.48	98	19.00
	V20	4.58	6	229	2.44	31.45	105	20.82
Interaction								
F at same V		0.26		13.78	0.12	0.4	NS	
V at same F		0.26		16.4	0.14	0.4	NS	
Mean of F levels								
F1		2.69	2	231	1.50	25.82	99	
F2		4.05	1	247	1.96	25.68	100	12.36
C.D.(0.05)		0.08		12.16	0.11	0.14	NS	
C.V.(%)		2.76		6.15	7.39	0.64	6.79	

Table 4.1(i): 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		3.66	7	234	1.83	26.29	104	9.18
V2		3.73	5	232	1.85	27.01	98	9.36
V3		4.27	1	275	1.82	25.09	97	12.27
V4		4.23	2	273	1.80	24.54	97	12.64
V5		4.17	3	273	1.75	24.44	96	12.18
V6		3.46	8	267	1.61	26.62	99	16.00
V7		3.97	4	240	1.93	22.72	99	12.09
V8		3.72	6	253	1.77	27.43	101	16.73
V9		2.98	12	228	1.81	27.87	97	12.64
V10		2.99	11	221	1.72	26.42	99	10.73
V11		2.88	14	232	1.61	23.23	95	8.36
V12		2.86	16	220	1.64	22.50	98	12.00
V13		2.87	15	229	1.56	27.39	107	12.55
V14		2.85	17	241	1.42	25.57	104	11.64
V15		2.94	13	228	1.65	25.28	100	11.45
V16		2.20	18	203	1.65	26.96	103	2.91
V17		-	-	-	-	-	-	-
V18		-	-	-	-	-	-	-
V19		3.41	10	235	1.78	23.45	96	19.00
V20		3.44	9	213	1.94	30.76	104	20.82
C.D.(0.05)		0.18		9.75	0.08	0.28	4.82	
C.V. (%)		4.81		3.57	4.19	0.96	4.23	
Expt. Mean		**3.37**		**239**	**1.73**	**25.75**	**100**	
Soil type		Silt Loam						
pH		7.50						
N - levels (kg/ha)								
F1		60:30:20						
F2		120:60:40						
Recommended N:P:K (kg/ha)		120:60:40						
Varieties								
V1		IET 29423						
V2		IET 29422						
V3		IET 29412						
V4		IET 29396						
V5		IET 29405						
V6		IET 29411						
V7		IET 29415						
V8		IET 29424						
V9		IET 29394						
V10		IET 29436						
V11		IET 29421						
V12		IET 29409						
V13		IET 29430						
V14		IET 29410						
V15		IET 29446						
V16		CR Dhan 201(NC)						
V17		-						
V18		-						
V19		PA 6129 (Hybrid)						
V20		Local Check - PD-26 (130-145 days)						
Available N:P:K of soil (kg/ha)		-						

Table 4.1(i): Contd.

F-levels	Varieties	RAIPUR					
		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	V1	2.88	36	273	3.09	87	
	V2	3.25	31	308	2.38	82	
	V3	5.01	3	311	3.91	84	
	V4	4.17	11	283	2.75	76	
	V5	3.45	26	244	3.12	84	
	V6	4.13	14	315	3.29	85	
	V7	4.18	10	280	3.79	81	
	V8	3.63	24	277	3.04	92	
	V9	2.83	37	243	3.25	84	
	V10	4.12	16	320	2.67	81	
	V11	3.64	23	261	2.71	84	
	V12	3.90	18	254	3.62	91	
	V13	3.07	34	216	2.44	97	
	V14	2.55	38	175	3.18	80	
	V15	3.83	19	305	3.02	78	
	V16	3.79	21	309	2.37	90	
	V17	-	-	-	-	-	
	V18	3.12	33	307	2.75	79	
	V19	4.31	9	259	3.89	77	
	V20	3.41	28	232	3.18	77	
F2	V1	3.33	30	280	3.30	87	4.50
	V2	3.56	25	350	2.53	82	3.10
	V3	5.54	1	321	4.25	85	5.30
	V4	4.43	7	302	2.98	76	2.60
	V5	3.69	22	253	3.62	84	2.40
	V6	4.52	6	323	3.55	85	3.90
	V7	4.77	4	314	3.96	82	5.90
	V8	4.14	13	320	3.23	92	5.10
	V9	3.16	32	259	3.55	85	3.30
	V10	4.68	5	335	3.18	81	5.60
	V11	4.01	17	272	2.91	85	3.70
	V12	4.40	8	271	4.02	91	5.00
	V13	3.34	29	226	2.65	97	2.70
	V14	3.01	35	194	3.42	81	4.60
	V15	4.13	14	321	3.23	78	3.00
	V16	4.16	12	320	2.76	90	3.70
	V17	-	-	-	-	-	-
	V18	3.42	27	322	3.02	79	3.00
	V19	5.30	2	298	4.34	77	9.90
	V20	3.83	19	260	3.52	78	4.20
Interaction							
F at same V		NS		NS	NS	NS	
V at same F		NS		NS	NS	NS	
Mean of F levels							
F1		3.65	2	272	3.08	84	
F2		4.07	1	292	3.37	84	4.29
C.D.(0.05)		0.13		4.8	0.05	0.08	
C.V.(%)		4.15		2.11	1.81	0.11	

Table 4.1(i): Contd.

F-levels	Varieties	RAIPUR					
		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)
Mean of varieties:							
	V1	3.11	17	277	3.20	87	4.50
	V2	3.41	14	329	2.46	82	3.10
	V3	5.28	1	316	4.08	85	5.30
	V4	4.30	6	292	2.87	76	2.60
	V5	3.57	13	249	3.37	84	2.40
	V6	4.33	5	319	3.42	85	3.90
	V7	4.48	3	297	3.88	82	5.90
	V8	3.89	10	299	3.14	92	5.10
	V9	3.00	18	251	3.40	85	3.30
	V10	4.40	4	328	2.93	81	5.60
	V11	3.83	11	266	2.81	85	3.70
	V12	4.15	7	262	3.82	91	5.00
	V13	3.21	16	221	2.55	97	2.70
	V14	2.78	19	185	3.30	81	4.60
	V15	3.98	8	313	3.13	78	3.00
	V16	3.98	9	315	2.57	90	3.70
	V17	-	-	-	-	-	-
	V18	3.27	15	314	2.89	79	3.00
	V19	4.81	2	279	4.12	77	9.90
	V20	3.62	12	246	3.35	78	4.20
C.D.(0.05)		0.2		15.55	0.15	0.63	
C.V. (%)		4.43		4.83	4.16	0.65	
Expt. Mean		**3.86**		**282**	**3.22**	**84**	
Soil type		Vertisols					
pH		7.02					
N - levels (kg/ha)							
F1		50:30:20					
F2		100:60:40					
Recommended N:P:K (kg/ha)		100:60:40					
Varieties							
V1		IET 29423					
V2		IET 29422					
V3		IET 29412					
V4		IET 29396					
V5		IET 29405					
V6		IET 29411					
V7		IET 29415					
V8		IET 29424					
V9		IET 29394					
V10		IET 29436					
V11		IET 29421					
V12		IET 29409					
V13		IET 29430					
V14		IET 29410					
V15		IET 29446					
V16		CR Dhan 201(NC)					
V17		-					
V18		MAS 946-1 (S)					
V19		PA 6129 (Hybrid)					
V20		Indira aerobic-1 (115 days)					
Available N:P:K of soil (kg/ha)		209:22:368					

Table 4.1(i): Contd.

F-levels	Varieties	VARANASI							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	3.41	22	287	1.46	21.71	96		4.01	30
	V2	2.83	37	230	0.95	22.21	92		3.95	32
	V3	3.85	11	347	1.29	21.65	91		4.89	8
	V4	3.32	26	258	1.09	21.81	83		4.01	29
	V5	2.93	34	200	1.81	21.90	91		3.86	34
	V6	3.16	31	147	1.49	23.21	99		4.14	26
	V7	3.69	15	234	1.58	21.44	98		4.24	22
	V8	3.40	23	180	1.32	23.54	96		4.39	20
	V9	2.90	35	192	1.77	22.92	85		3.53	37
	V10	3.95	7	194	2.15	24.13	79		4.47	17
	V11	3.69	15	179	1.70	20.78	76		4.16	25
	V12	3.75	13	227	1.92	19.74	88		4.21	24
	V13	2.83	37	189	1.62	24.81	101		3.47	38
	V14	3.08	32	182	1.60	22.34	87		3.46	39
	V15	3.37	24	194	1.04	21.87	89		3.87	33
	V16	3.47	19	207	1.15	21.62	91		3.98	31
	V17	-	-	-	-	-	-		3.56	36
	V18	3.25	30	189	1.37	22.99	101		3.21	40
	V19	3.69	15	271	1.67	23.48	87		4.21	23
	V20	3.34	25	272	0.90	21.00	99		4.44	19
F2	V1	3.29	28	228	1.76	21.05	98	-1.00	4.49	16
	V2	3.30	27	259	1.15	23.06	91	3.92	4.62	11
	V3	3.95	7	284	1.75	22.05	90	0.83	5.48	1
	V4	3.44	20	252	1.52	21.12	83	1.00	4.53	15
	V5	3.77	12	222	2.12	21.57	92	7.00	4.58	12
	V6	3.95	7	224	1.75	23.42	97	6.58	5.07	6
	V7	4.13	3	231	1.75	21.73	98	3.67	4.89	7
	V8	3.90	10	194	1.78	23.24	96	4.17	5.17	4
	V9	3.27	29	157	1.93	23.14	85	3.08	4.08	27
	V10	4.58	1	233	1.43	24.46	78	5.25	5.29	2
	V11	3.98	5	230	1.80	20.62	78	2.42	4.55	14
	V12	4.09	4	224	2.30	20.24	88	2.83	4.72	9
	V13	3.03	33	188	2.65	25.34	100	1.67	4.07	28
	V14	3.43	21	189	1.64	21.66	88	2.92	4.26	21
	V15	2.85	36	190	1.91	21.88	88	-4.33	4.47	18
	V16	3.71	14	226	1.25	21.80	91	2.00	4.56	13
	V17	-	-	-	-	-	-	-	4.67	10
	V18	3.97	6	276	1.53	22.76	103	6.00	3.68	35
	V19	4.14	2	264	1.70	23.07	87	3.75	5.13	5
	V20	3.56	18	363	1.45	20.76	103	1.83	5.19	3
Interaction										
F at same V		0.20		8.37	0.30	0.4	1.18			
V at same F		0.20		8.56	0.28	0.4	1.59			
Mean of F levels										
F1		3.36	2	220	1.47	22.27	91		4.05	2
F2		3.70	1	233	1.75	22.26	91	2.82	4.72	1
C.D.(0.05)		0.07		NS	0.04	0.14	NS			
C.V.(%)		5.82		2.31	5.22	0.64	3.86			

Table 4.1(i): Contd.

F-levels	Varieties	VARANASI							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 50% RDF)		
Mean of varieties:										
V1		3.35	13	257	1.61	21.38	97	-1.00	4.25	13
V2		3.07	18	245	1.05	22.64	92	3.92	4.28	10
V3		3.90	5	315	1.52	21.85	91	0.83	5.18	1
V4		3.38	12	255	1.31	21.47	83	1.00	4.27	12
V5		3.35	13	211	1.97	21.74	91	7.00	4.22	14
V6		3.56	10	185	1.62	23.32	98	6.58	4.60	6
V7		3.91	4	233	1.67	21.59	98	3.67	4.56	7
V8		3.65	7	187	1.55	23.39	96	4.17	4.78	4
V9		3.09	17	175	1.85	23.03	85	3.08	3.80	18
V10		4.27	1	214	1.79	24.30	79	5.25	4.88	2
V11		3.84	6	205	1.75	20.70	77	2.42	4.36	9
V12		3.92	2	226	2.11	19.99	88	2.83	4.46	8
V13		2.93	19	189	2.14	25.08	101	1.67	3.77	19
V14		3.26	15	185	1.62	22.00	87	2.92	3.86	17
V15		3.11	16	192	1.48	21.88	88	-4.33	4.17	15
V16		3.59	9	217	1.20	21.71	91	2.00	4.27	11
V17		-	-	-	-	-	-	-	4.12	16
V18		3.61	8	233	1.45	22.88	102	6.00	3.45	20
V19		3.92	3	268	1.69	23.28	87	3.75	4.67	5
V20		3.45	11	318	1.18	20.88	101	1.83	4.81	3
C.D.(0.05)		0.14		5.92	0.21	0.28	0.83			
C.V. (%)		10.8		3.17	28.00	0.96	2.10			
Expt. Mean		**3.53**		**227**	**1.61**	**22.27**	**91**		4.39	
Soil type		-								
pH		7.60								
N - levels (kg/ha)										
F1		60:30:30								
F2		120:60:60								
Recommended N:P:K (kg/ha)		120:60:60								
Varieties										
V1		IET 29423								
V2		IET 29422								
V3		IET 29412								
V4		IET 29396								
V5		IET 29405								
V6		IET 29411								
V7		IET 29415								
V8		IET 29424								
V9		IET 29394								
V10		IET 29436								
V11		IET 29421								
V12		IET 29409								
V13		IET 29430								
V14		IET 29410								
V15		IET 29446								
V16		CR Dhan 201(NC)								
V17		-								
V18		MAS 946-1 (S)								
V19		PA 6129 (Hybrid)								
V20		Local Check								
Available N:P:K of soil (kg/ha)		-								

4.1(j) AVT 2 - Biofortified

One AVT-2 Biofortified culture IET 28694 was evaluated for its response to different levels of nutrients (50% and 100% RDF) on grain yield from seven locations *viz*., **Cuttack (120:60:40), Kaul (150:60:60), Kota (120:60:40), Nagina (120:60:40), Pusa (120:60:40), Raipur (150:60:40) and Warangal (120:60:60).** The details and data received from these locations are summarized and presented in Table 4.1(l).

Application of different nutrient levels registered significantly higher grain yield at all locations except at **Cuttack**. Application of 100% RDF recorded significantly higher grain yields at **Kaul** (6.71 t/ha), **Kota** (5.88 t/ha), **Nagina** (4.51 t/ha), **Pusa** (4.43 t/ha), **Raipur** (4.36 t/ha) and **Warangal** (5.75 t/ha). Higher nutrient response was recorded with 100% RDF over 50% RDF at **Nagina** (19.39); **Kaul** (10.63) and **Pusa** (10.23) indicating need for higher nutrient application for better yields at these centers. The percentage mean grain yield increase was 25% with application of 100% RFD over 50% of the RFD application.

Grain yield differences among the tested cultures were found to be significant at all the locations. Highest grain yield was recorded by IET 28694 (3.71 t/ha) at **Nagina** and found promising over other test cultures. Mean over the locations, BPT 5204 followed by IR 64 performed better and were found superior over IET culture. Interaction effects among RDF x varieties was found to be non-significant at all the locations except at **Kota** and **Pusa** where significant interaction was noted.

In this trial, mean over the locations nutrient management with 100% had higher grain yield and performance of standard checks were found to be promising and recorded higher mean grain yield across the locations.

Table 4.1(j): Summary of data on grain yield and ancillary characters of selected AET Biofortifed cultures grown under transplanted conditions at graded levels of recommended fertilizer doses, kharif 2022.

F-levels	Varieties	CUTTACK					
		Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Panicle wt (g)	Test wt (g)	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1	V1	2.73	6	3.10	29.00	62	
	V2	4.49	2	2.67	20.00	77	
	V3	3.73	4	2.87	29.00	61	
	V4	-	-	-	-	-	
	V5	-	-	-	-	-	
F2	V1	3.2	5	3.13	29.00	64	4.27
	V2	4.68	1	2.77	20.67	87	1.73
	V3	4.07	3	3.03	29.00	63	3.09
	V4	-	-	-	-	-	-
	V5	-	-	-	-	-	-
Interaction							
F at same V		NS		NS	NS	3.32	
V at same F		NS		NS	NS	3.04	
F1		3.65	2	3	26.00	66.78	
F2		3.98	1	3	26.22	71.22	3.03
C.D.(0.05)		NS		NS	NS	1.72	
C.V.(%)		11.53		5.03	5.03	1.23	
Mean of varieties:							
V1		2.97	3	3	29.00	62.84	4.27
V2		4.59	1	3	20.34	82.17	1.73
V3		3.90	2	3	29.00	62.00	3.09
V4		-	-	-	-	-	-
V5		-	-	-	-	-	-
C.D.(0.05)		0.42		NS	1.98	2.35	
C.V. (%)		8.36		11.97	5.71	2.56	
Expt. Mean		**3.82**		**3**	**26.11**	**69.00**	
Soil type		Sandy clay loam					
pH		6.02					
N - levels (kg/ha)							
F1		60:30:20					
F2		120:60:40					
Recommended N:P:K (kg/ha)		120:60:40					
Varieties							
V1		IET 28694					
V2		BPT 5204					
V3		IR 64					
V4		-					
V5		-					
Available N:P:K of soil (kg/ha)		245:22:120					

Table 4.1(j): Cntd..

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	4.93	8	267	2.04	21.61	
	V2	5.74	5	356	1.78	14.14	
	V3	5.24	6	308	1.89	23.99	
	V4	-	-	-	-	-	
	V5	5.17	7	284	2.06	25.23	
F2	V1	6.36	4	336	2.09	21.91	10.59
	V2	7.04	1	430	1.81	13.83	9.63
	V3	6.67	3	383	1.94	24.40	10.59
	V4	-	-	-	-	-	-
	V5	6.75	2	369	2.06	24.99	11.70
Interaction							
F at same V		NS		NS	NS	NS	
V at same F		NS		NS	NS	NS	
F1		5.27	2	304	1.94	21.24	
F2		6.71	1	379	1.98	21.28	10.63
C.D.(0.05)		0.12		36.99	NS	NS	
C.V.(%)		1.13		6.17	5.71	6.98	
Mean of varieties:							
V1		5.65	4	301	2.07	21.76	10.59
V2		6.39	1	393	1.80	13.99	9.63
V3		5.96	3	345	1.92	24.20	10.59
V4		-	-	-	-	-	-
V5		5.96	2	327	2.06	25.11	11.70
C.D.(0.05)		0.42		16.86	0.14	2.17	
C.V. (%)		5.57		3.92	5.85	8.12	
Expt. Mean		**5.99**		**342**	**1.96**	**21.26**	
Soil type		Clay loam					
pH		8.00					
N - levels (kg/ha)							
F1		75:30:30					
F2		150:60:60					
Recommended N:P:K (kg/ha)		150:60:60					
Varieties							
V1		IET 28694					
V2		BPT 5204					
V3		IR 64					
V4		-					
V5		Local check - HKR 47 (135 days)					
Available N:P:K of soil (kg/ha)		160:16:320					

Table 4.1(j): Cntd.

F-levels	Varieties	KOTA						
		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	4.33	8	176	4.44	23.32	93	
	V2	4.61	6	265	2.83	14.52	110	
	V3	4.61	6	242	3.45	26.41	88	
	V4	-	-	-	-	-	-	
	V5	5.72	4	217	4.60	28.75	99	
F2	V1	5.78	3	233	4.63	23.94	93	13.18
	V2	5.28	5	291	2.92	14.95	111	6.09
	V3	6.00	2	284	3.57	27.74	89	12.64
	V4	-	-	-	-	-	-	-
	V5	6.47	1	249	5.04	29.43	98	6.82
Interaction								
F at same V		0.46		NS	NS	NS	NS	
V at same F		0.53		NS	NS	NS	NS	
F1		4.82	2	225	3.83	23.25	97	
F2		5.88	1	264	4.04	24.02	98	9.68
C.D.(0.05)		0.45		34.43	0.14	0.7	NS	
C.V.(%)		4.76		8.01	2.02	1.7	0.21	
Mean of varieties:								
V1		5.06	3	205	4.54	23.63	93	13.18
V2		4.95	4	278	2.88	14.74	110	6.09
V3		5.31	2	263	3.51	27.08	89	12.64
V4		-	-	-	-	-	-	-
V5		6.10	1	233	4.82	29.09	99	6.82
C.D.(0.05)		0.32		18.32	0.46	0.71	0.73	
C.V. (%)		4.82		5.95	9.39	2.4	0.59	
Expt. Mean		**5.35**		**245**	**3.94**	**23.63**	**98**	
Soil type		Clay loam						
pH		7.52						
N - levels (kg/ha)								
F1		60:30:20						
F2		120:60:40						
Recommended N:P:K (kg/ha)		120:60:40						
Varieties								
V1		IET 28694						
V2		BPT 5204						
V3		IR 64						
V4		-						
V5		Local check - PR 113 (130-135 days)						
Available N:P:K of soil (kg/ha)		207:37:564						

Table 4.1(j): Cntd.

F-levels	Varieties	NAGINA					
		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	2.57	4	216	2.54	24.31	
	V2	2.28	5	196	2.20	21.93	
	V3	2.28	5	212	2.15	22.50	
	V4	-	-	-	-	-	
	V5	-	-	-	-	-	
F2	V1	4.84	1	272	2.61	23.56	20.64
	V2	4.26	3	234	2.40	22.16	18.00
	V3	4.43	2	258	2.16	23.87	19.55
	V4	-	-	-	-	-	-
	V5	-	-	-	-	-	-
Interaction							
F at same V		NS		NS	0.04	0.87	
V at same F		NS		NS	0.08	1.02	
F1		2.38	2	208	2.30	22.91	
F2		4.51	1	255	2.39	23.20	19.39
C.D.(0.05)		0.04		11.59	0.1	NS	
C.V.(%)		0.53		2.47	2.01	1.99	
Mean of varieties:							
V1		3.71	1	244	2.58	23.94	20.64
V2		3.27	3	215	2.30	22.05	18.00
V3		3.36	2	235	2.16	23.19	19.55
V4		-	-	-	-	-	-
V5		-	-	-	-	-	-
C.D.(0.05)		0.17		15.17	0.03	0.62	
C.V. (%)		3.62		4.92	0.96	2.01	
Expt. Mean		**3.44**		**231**	**2.34**	**23.06**	
Soil type		Sandy Loam					
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 28694					
V2		BPT 5204					
V3		IR 64					
V4		-					
V5		-					
Available N:P:K of soil (kg/ha)		-					

Table 4.1(j): Cntd.

F-levels	Varieties	PUSA					RAIPUR					
		Grain Yield (t/ha)	Rank	Panicle wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)	Grain Yield (t/ha)	Rank	Panicle/ m² (No.)	Panicle wt (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1	V1	2.85	8	2.52	87		3.43	7	206	3.25	88	
	V2	3.00	7	2.61	83		4.35	3	237	2.64	101	
	V3	3.08	6	2.15	83		4.34	4	223	2.71	89	
	V4	-	-	-	-		3.16	8	220	2.24	103	
	V5	4.27	4	2.53	88		-	-	-	-	-	
F2	V1	4.35	3	3.12	92	13.64	3.84	5	250	3.85	88	4.10
	V2	4.50	2	3.17	88	13.64	5.05	1	287	3.00	102	7.00
	V3	4.58	1	3.00	88	13.64	4.97	2	277	3.34	89	6.30
	V4	-	-	-	-	-	3.56	6	273	2.62	104	4.00
	V5	4.27	4	3.53	85	0.00	-	-	-	-	-	-
Interaction												
F at same V		0.22		NS	4.32		NS		NS	NS	NS	
V at same F		0.19		NS	4.00		NS		NS	NS	NS	
F1		3.30	2	2.45	85		3.82	2	222	2.71	95	
F2		4.43	1	3.21	88	10.23	4.36	1	272	3.20	96	5.35
C.D.(0.05)		0.00		0.34	1.79		0.32		14.73	0.10	NS	
C.V.(%)		0.02		6.76	1.17		4.51		3.40	1.94	0.57	
Mean of varieties:												
V1		3.60	4	2.82	89	13.64	3.64	3	228	3.55	88	4.10
V2		3.75	3	2.89	86	13.64	4.70	1	262	2.82	102	7.00
V3		3.83	2	2.58	86	13.64	4.66	2	250	3.03	89	6.30
V4		-	-	-	-	-	3.36	4	247	2.43	104	4.00
V5		4.27	1	3.03	87	0.00	-	-	-	-	-	-
C.D.(0.05)		0.16		NS	NS		0.17		13.12	0.15	0.59	
C.V. (%)		3.26		9.04	2.80		3.25		4.23	4.14	0.49	
Expt. Mean		**3.86**		**2.83**	**87**		**4.09**		**247**	**2.96**	**96**	
Soil type		Sandy Loam					Vertisols					
pH		8.20					7.08					
N - levels (kg/ha)												
F1		60:30:20					50:30:20					
F2		120:60:40					100:60:40					
Recommended		120:60:40					100:60:40					
Varieties												
V1		IET 28694					IET 28694					
V2		BPT 5204					BPT 5204					
V3		IR 64					IR 64					
V4		-					Kalanamak					
V5		Local check - Rajendra nilam (125 days)					-					
Available N:P:K of soil (kg/ha)		235:13:145					212:19:294					

Table 4.1(j): Cntd.

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	V1	5.10	7	287	4.98	24.03	96		3.71	8
	V2	4.60	8	282	4.09	15.00	116		4.15	6
	V3	5.37	5	293	4.06	24.97	94		4.09	7
	V4	-	-	-	-	-	-	-	3.16	10
	V5	5.60	4	263	6.16	21.00	105		5.19	3
F2	V1	5.87	2	325	5.43	24.27	96	7.00	4.89	5
	V2	5.23	6	329	4.58	15.23	116	5.73	5.15	4
	V3	5.73	3	324	4.42	25.22	95	3.27	5.21	2
	V4	-	-	-	-	-	-	-	3.56	9
	V5	6.17	1	294	7.51	21.53	106	5.18	5.92	1
Interaction										
F at same V		NS		NS	NS	NS	NS			
V at same F		NS		NS	NS	NS	NS			
F1		5.17	2	281	4.82	21.25	103		4.06	2
F2		5.75	1	318	5.49	21.56	103	5.30	5.09	1
C.D.(0.05)		0.41		6.98	NS	NS	NS			
C.V.(%)		4.31		1.33	14.52	0.88	0.40			
Mean of varieties:										
V1		5.49	3	306	5.21	24.15	96	7.00	4.30	4
V2		4.92	4	306	4.34	15.12	116	5.73	4.65	2
V3		5.55	2	309	4.24	25.10	94	3.27	4.65	3
V4		-	-	-	-	-	-	-	3.36	5
V5		5.89	1	279	6.84	21.27	105	5.18	5.55	1
C.D.(0.05)		0.48		17.56	0.56	0.42	1.11			
C.V. (%)		6.98		4.66	8.71	1.55	0.86			
Expt. Mean		**5.46**		**300**	**5.15**	**21.41**	**103**		4.57	
Soil type		Clay Loam								
pH		7.30								
N - levels (kg/ha)										
F1		60:30:20								
F2		120:60:40								
Recommended N:P:K (kg/ha)		120:60:40								
Varieties										
V1		IET 28694								
V2		BPT 5204								
V3		IR 64								
V4		-								
V5		Local Check - WGL 739 (135 Days)								
Available N:P:K of soil (kg/ha)		210:62:326								

4.1(k) AVT 2 - MS

Five entries (IET 29539, IET 29523, IET 29492, IET 29017 and IET 29536) of medium slender group were evaluated for their response to two levels of nutrients (50% and 100% RDF) on grain yield at eight different locations i.e., **Dhangain (120:60:40), Faizabad (120:60:40), Karjat (100:50:50), Kaul (150:60:60), Mandya (100:50:50), Maruteru (90:60:60), Nagina (120:60:40)** and **Raipur (120:60:40)**. The details and data received from these locations are summarized and presented in Table 4.1 (k).

RDF doses significantly influenced the grain yield at seven locations (**except Maruteru** 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 **Dhangain** (6.41 t/ha), **Faizabad** (4.47 t/ha), **Karjat** (4.62 t/ha), **Kaul** (7.65 t/ha), **Mandya** (5.69 t/ha), **Nagina** (4.49 t/ha) and **Raipur** (5.31 t/ha). Average over the locations, higher mean grain yield of 5.44 t/ha was recorded with 100% RDF with 29% higher yield over 50% of RDF. Higher nutrient response was (kg grain/kg nutrient) recorded with 100% RDF at **Nagina** (16.08), **Dhangain** (15.53), **Karjat** (14.18), **Faizabad** (12.31) and **Kaul** (11.22) over other centres.

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 29523 at **Dhangain** (6.18 t/ha), IET 29492 at **Maruteru** (4.24 t/ha), and **Kaul** (8.72 t/ha); while IET 29017 at **Mandya** (6.43 t/ha), **Nagina** (3.92 t/ha) and **Raipur** (5.27 t/ha). The interaction effect between fertilizer levels and varieties was found to be significant at all the locations except at **Dhangain, Kaul, Mandya** and **Maruteru** only. Mean over the locations, cultivar IET 29017 (5.34 t/ha) followed by IET 29536 (4.95 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 (29% higher yield) and also exhibited higher nutrient response. Entries like IET 29017 and IET 29536 (5.34 and4.95 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(l) 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. 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 five locations (**Ludhiana, Mandya, Raipur, Ranchi and Varanasi**). Split plot design was adopted with 4 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 4.1l** and the salient findings are as followed.

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

Application of 'P' significantly influenced the grain yield at **Mandya, Raipur, Ranchi** and **Varanasi**. Mean maximum grain yield was with 100% RDP (5.30 t/ha) followed by 50% of RDP (4.94 t/ha) and average increase with 50 and 100% RDP was to the tune of 14 and 22% over no 'P' application.

The performance of cultures was significant for grain yield at all locations except at **Mandya**. Among the cultures tested, IET 28821 (5.69 t/ha) at **Raipur**; and **Varanasi** (4.71 t/ha) was found promising with better yields and promising over checks. At **Ludhiana** and **Ranchi**, the standard checks were found promising and gave better yields over checks.

Mean over the locations (five location) all the cultures were 'P' responsive except at **Mandya** where in soil 'P' level is very high. Among the cultures, across the locations the culture IET 28821 (4.84 t/ha) found promising and gave better yields over other cultures and on par with checks at most of the locations.

4.1(m) AVT 2 - NIL DRT

AVT-2 NIL DRT cultures (IET 28018 and IET 28017) were evaluated for their response on grain yield at **Jagdalpur (100:60:40); Maruteru (90:60:60); Nagina (120:60:40); Pantnagar (120:60:40)** and **Warangal (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 4.1m**.

RDF doses of nutrient application did not influence the grain yield significantly at **Jagdalpur, Maruteru** and **Warangal**. However, significantly maximum increase in grain yield was recorded with 100% RDF (4.61 t/ha) at **Nagina** and **Pantnagar** (4.79 t/ha). Overall increase in grain yield is to the tune of 26% due to 100% RDF application over 50% RDF.

Grain yield differences among the tested varieties were significant with higher mean maximum grain yield was recorded by IET 28018 (3.68 and 4.29 t/ha) at **Nagina** and **Pantnagar**. The range of grain yield was lower with IET cultures in other test centers. Interaction effects among RFD x varieties was found to be non-significant at all centers except at **Pantnagar**.

In this trial, 100% RDF was found to be promising and also exhibited higher nutrient recovery efficiency, but none of the IET entries found promising over local check in terms of grain yield and nutrient response however, the performance of IE 28018 (4.31 t/ha) was promising with on par yield of checks.

Table 4.1k: 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 2022.

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: Low input (50% NPK)	V1	4.84	14	301	4.37	14.80	116	
	V2	5.19	11	304	4.41	20.00	108	
	V3	5.13	12	301	4.76	17.07	107	
	V4	4.35	18	285	3.74	18.40	101	
	V5	4.78	15	298	4.05	19.33	108	
	V6	4.55	17	289	3.82	17.60	111	
	V7	4.73	16	295	3.90	14.93	114	
	V8	3.96	20	264	3.50	15.20	104	
	V9	5.31	10	311	5.04	17.87	105	
	V10	4.14	19	272	3.62	14.53	114	
F2: Optimum input (100% NPK)	V1	6.89	4	316	4.45	16.00	117	18.64
	V2	7.17	2	326	5.10	20.53	109	18.00
	V3	7.08	3	320	4.78	17.87	107	17.73
	V4	5.83	8	298	3.89	18.73	103	13.45
	V5	6.77	5	314	4.23	19.53	109	18.09
	V6	6.16	7	303	3.97	18.53	112	14.64
	V7	6.47	6	311	4.00	16.00	115	15.82
	V8	4.89	13	279	3.54	15.80	105	8.45
	V9	7.46	1	338	5.49	18.67	106	19.55
	V10	5.34	9	287	3.83	15.87	116	10.91
Interaction								
F at same V		NS		NS	NS	NS	NS	
V at same F		NS		NS	NS	NS	NS	
F1		4.70	2	292	4.12	16.97	109	
F2		6.41	1	309	4.33	17.75	110	15.53
C.D.(0.05)		0.12		NS	0.42	0.61	2.08	
C.V.(%)		1.79		22.13	6.28	2.17	1.38	
Mean of varieties:								
V1		5.87	4	309	4.41	15.40	116	18.64
V2		6.18	2	315	4.76	20.27	109	18.00
V3		6.11	3	311	4.77	17.47	107	17.73
V4		5.09	8	292	3.82	18.57	102	13.45
V5		5.78	5	306	4.14	19.43	109	18.09
V6		5.36	7	296	3.90	18.07	112	14.64
V7		5.60	6	303	3.95	15.47	115	15.82
V8		4.43	10	272	3.52	15.50	105	8.45
V9		6.39	1	324	5.27	18.27	105	19.55
V10		4.74	9	280	3.73	15.20	115	10.91
C.D.(0.05)		0.31		NS	0.65	0.54	1.62	
C.V. (%)		5.41		12.57	10.82	2.14	1.20	
Expt. Mean		**5.55**		**301**	**4.22**	**17.36**	**110**	
Soil type		Clay loam						
pH		6.35						
F - levels (kg/ha)								
F1		60:30:20						
F2		120:60:40						
Recommended		120:60:40						
Varieties								
V1		IET 29539						
V2		IET 29523						
V3		IET 29492						
V4		IET 29017						
V5		IET 29536						
V6		WGL 14 (NC 1)						
V7		BPT 5204 (NC 2)						
V8		ADT-49 (S)						
V9		27P63 (HC)						
V10		R. Sweta (LC)						
Available N:P:K of soil (kg/ha)		188:40.6:150.4						

Table 4.1k: 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)
F1: Low input (50% NPK)	V1	2.84	16	205	2.30	18.30	110	
	V2	3.23	13	207	3.40	22.03	112	
	V3	3.43	11	186	2.40	21.20	108	
	V4	2.63	19	218	3.40	21.43	106	
	V5	3.22	15	229	2.60	16.63	109	
	V6	2.59	20	186	2.60	16.47	113	
	V7	2.77	17	177	2.40	14.87	112	
	V8	2.70	18	206	2.97	20.03	110	
	V9	3.28	12	210	3.47	13.87	107	
	V10	3.23	13	196	2.33	14.60	111	
F2: Optimum input (100% NPK)	V1	4.26	6	266	2.97	19.00	112	11.83
	V2	4.66	4	247	3.90	23.10	115	11.92
	V3	5.04	1	251	2.90	21.87	111	13.42
	V4	5.00	2	255	3.97	22.20	108	19.75
	V5	4.93	3	276	3.23	16.93	110	14.25
	V6	3.91	10	245	2.93	17.13	116	11.00
	V7	4.24	8	233	3.30	16.33	115	12.25
	V8	3.99	9	246	3.60	20.47	113	10.75
	V9	4.25	7	253	3.93	14.77	109	8.08
	V10	4.41	5	253	3.40	15.67	115	9.83
Interaction								
F at same V		0.23		NS	NS	NS	NS	
V at same F		0.22		NS	NS	NS	NS	
F1		2.99	2	202	2.79	17.94	110	
F2		4.47	1	253	3.41	18.75	112	12.31
C.D.(0.05)		0.02		14.66	0.32	0.23	1.27	
C.V.(%)		0.38		5.81	9.3	1.13	1.03	
Mean of varieties:								
V1		3.55	7	235	2.64	18.65	111	11.83
V2		3.95	3	227	3.65	22.57	113	11.92
V3		4.24	1	219	2.65	21.54	110	13.42
V4		3.82	5	237	3.69	21.82	107	19.75
V5		4.08	2	253	2.92	16.78	110	14.25
V6		3.25	10	216	2.77	16.80	115	11.00
V7		3.51	8	205	2.85	15.60	114	12.25
V8		3.35	9	226	3.29	20.25	112	10.75
V9		3.77	6	231	3.70	14.32	108	8.08
V10		3.82	4	224	2.87	15.14	113	9.83
C.D.(0.05)		0.16		11.27	0.23	0.45	1.1	
C.V. (%)		3.75		4.25	6.45	2.12	0.85	
Expt. Mean		**3.73**		**227**	**3.10**	**18.35**	**111**	
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		120:60:60						
Varieties								
V1		IET 29539						
V2		IET 29523						
V3		IET 29492						
V4		IET 29017						
V5		IET 29536						
V6		WGL 14 (NC 1)						
V7		BPT 5204 (NC 2)						
V8		ADT-49 (S)						
V9		27P63 (HC)						
V10		Sambha Mahsuri-Sub 1 (LC)						
Available N:P:K of soil (kg/ha)		205.4:23.5:232.5						

Table 4.1k: 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%
F1: Low input (50% NPK)	V1	2.58	19	171	2.63	14.21	108	
	V2	3.14	16	173	2.43	15.33	101	
	V3	2.82	17	168	1.61	14.17	100	
	V4	3.52	13	168	2.76	16.69	99	
	V5	3.38	14	179	2.30	14.93	98	
	V6	2.78	18	179	1.94	14.23	101	
	V7	3.59	12	190	1.52	13.31	102	
	V8	3.73	11	222	1.38	13.08	101	
	V9	4.06	8	249	2.51	14.65	98	
	V10	2.37	20	201	1.97	12.96	108	
F2: Optimum input (100% NPK)	V1	4.63	7	224	3.10	15.98	107	20.50
	V2	4.65	6	225	3.05	17.96	104	15.10
	V3	3.85	10	217	2.48	17.46	98	10.30
	V4	4.84	5	218	3.68	18.31	103	13.20
	V5	5.26	2	221	2.99	18.01	98	18.80
	V6	3.32	15	224	3.11	17.50	104	5.40
	V7	5.13	3	245	2.58	16.12	105	15.40
	V8	5.08	4	276	2.45	16.57	100	13.50
	V9	5.42	1	299	3.84	17.40	95	13.60
	V10	3.97	9	258	2.73	15.96	108	16.00
Interaction								
F at same V		0.33		NS	NS	NS	1.46	
V at same F		0.38		NS	NS	NS	1.7	
F1		3.20	2	190	2.11	14.36	102	
F2		4.62	1	241	3.00	17.13	102	14.18
C.D.(0.05)		0.27		13.48	0.26	0.15	NS	
C.V.(%)		6.33		5.63	9.24	0.89	1.1	
Mean of varieties:								
V1		3.61	7	198	2.87	15.10	108	20.50
V2		3.90	6	199	2.74	16.65	103	15.10
V3		3.34	8	192	2.05	15.82	99	10.30
V4		4.18	5	193	3.22	17.50	101	13.20
V5		4.32	4	200	2.65	16.47	98	18.80
V6		3.05	10	201	2.53	15.87	103	5.40
V7		4.36	3	218	2.05	14.72	103	15.40
V8		4.41	2	249	1.92	14.83	101	13.50
V9		4.74	1	274	3.18	16.03	97	13.60
V10		3.17	9	229	2.35	14.46	108	16.00
C.D.(0.05)		0.24		18.47	0.27	1.89	1.03	
C.V. (%)		5.19		7.35	9.02	10.29	0.87	
Expt. Mean		**3.91**		**215**	**2.55**	**15.74**	**102**	
Soil type		-						
pH		-						
F - levels (kg/ha)								
F1		50:25:25						
F2		100:50:50						
Recommended Varieties		100:50:50						
V1		IET 29539						
V2		IET 29523						
V3		IET 29492						
V4		IET 29017						
V5		IET 29536						
V6		WGL 14 (NC 1)						
V7		BPT 5204 (NC 2)						
V8		ADT-49 (S)						
V9		27P63 (HC)						
V10		KJT - 6 (LC)						
Available N:P:K of soil (kg/ha)		-						

Table 4.1k: Contd.

F-levels	Varieties	KAUL					
		Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Panicle wt (g)	Test wt (g)	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: Low input (50% NPK)	V1	-	-	-	-	-	
	V2	6.06	8	325	2.10	16.53	
	V3	4.58	12	390	1.27	14.77	
	V4	7.96	4	322	2.76	15.43	
	V5	5.96	9	321	2.03	17.23	
	V6	4.95	11	330	1.66	14.93	
	V7	-	-	-	-	-	
	V8	-	-	-	-	-	
	V9	7.27	5	320	2.56	15.57	
	V10	-	-	-	-	-	
F2: Optimum input (100% NPK)	V1	-	-	-	-	-	
	V2	8.75	2	380	2.58	16.90	19.93
	V3	5.60	10	448	1.37	14.98	7.56
	V4	9.48	1	383	2.79	15.57	11.26
	V5	7.12	6	381	2.05	17.37	8.59
	V6	6.24	7	388	1.79	15.17	9.56
	V7	-	-	-	-	-	
	V8	-	-	-	-	-	
	V9	8.68	3	361	2.65	15.97	10.44
	V10	-	-	-	-	-	
Interaction							
F at same V		NS		NS	NS	NS	
V at same F		NS		NS	NS	NS	
F1		6.13	2	335	2.06	15.74	
F2		7.65	1	390	2.21	15.99	11.22
C.D.(0.05)		0.7		34.96	NS	NS	
C.V.(%)		7.13		6.72	5.23	10.23	
Mean of varieties:							
V1		-	-	-	-	-	
V2		7.41	3	353	2.34	16.72	19.93
V3		5.09	6	419	1.32	14.88	7.56
V4		8.72	1	352	2.78	15.50	11.26
V5		6.54	4	351	2.04	17.30	8.59
V6		5.60	5	359	1.73	15.05	9.56
V7		-	-	-	-	-	
V8		-	-	-	-	-	
V9		7.98	2	341	2.61	15.77	10.44
V10		-	-	-	-	-	
C.D.(0.05)		0.56		40.98	0.2	NS	
C.V. (%)		6.81		9.39	7.8	15.57	
Expt. Mean		**6.89**		**363**	**2.13**	**15.87**	
Soil type		Clay loam					
pH		8.00					
F - levels (kg/ha)							
F1		75:30:30					
F2		150:60:60					
Recommended		150:60:60					
Varieties							
V1		-					
V2		IET 29523					
V3		IET 29492					
V4		IET 29017					
V5		IET 29536					
V6		WGL 14 (NC 1)					
V7		-					
V8		-					
V9		27P63 (HC)					
V10		-					
Available N:P:K of soil (kg/ha)		160:16:320					

Table 4.1k: 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%
F1: Low input (50% NPK)	V1	5.48	9	330	3.64	15.87	96	
	V2	4.70	16	307	4.17	18.46	102	
	V3	4.05	18	367	2.70	16.08	95	
	V4	5.61	8	321	5.12	19.38	97	
	V5	5.24	13	336	3.94	18.24	97	
	V6	3.08	20	362	3.56	16.25	101	
	V7	4.69	17	393	2.95	14.82	104	
	V8	5.09	14	325	2.83	15.24	98	
	V9	5.84	7	320	4.60	16.86	95	
	V10	6.30	4	322	4.71	20.22	89	
F2: Optimum input (100% NPK)	V1	6.15	6	371	3.82	16.64	96	6.70
	V2	5.26	12	332	4.33	18.12	103	5.60
	V3	4.89	15	423	2.88	16.34	95	8.40
	V4	7.25	1	349	5.32	19.06	97	16.40
	V5	5.30	11	353	4.04	18.78	97	0.60
	V6	3.11	19	381	3.74	16.15	101	0.30
	V7	5.39	10	409	3.09	16.33	104	7.00
	V8	6.84	2	333	3.03	15.18	98	17.50
	V9	6.22	5	338	4.72	17.19	95	3.80
	V10	6.50	3	334	4.74	20.24	89	2.00
Interaction								
F at same V		NS		NS	NS	NS	NS	
V at same F		NS		NS	NS	NS	NS	
F1		5.01	2	338	3.82	17.14	97	
F2		5.69	1	362	3.97	17.40	98	6.83
C.D.(0.05)		0.3		NS	NS	NS	NS	
C.V.(%)		5.11		8.77	7.76	10.11	0.4	
Mean of varieties:								
V1		5.82	5	350	3.73	16.26	96	6.70
V2		4.98	8	319	4.25	18.29	103	5.60
V3		4.47	9	395	2.79	16.21	95	8.40
V4		6.43	1	335	5.22	19.22	97	16.40
V5		5.27	6	344	3.99	18.51	97	0.60
V6		3.10	10	371	3.65	16.20	101	0.30
V7		5.04	7	401	3.02	15.58	104	7.00
V8		5.97	4	329	2.93	15.21	98	17.50
V9		6.03	3	329	4.66	17.03	95	3.80
V10		6.40	2	328	4.73	20.23	89	2.00
C.D.(0.05)		0.8		24.18	0.45	0.83	0.55	
C.V. (%)		12.76		5.92	9.89	4.12	0.49	
Expt. Mean		**5.35**		**350**	**3.90**	**17.27**	**97**	
Soil type		Red sandy loam						
pH		8.14						
F - levels (kg/ha)								
F1		50:25:25						
F2		100:50:50						
Recommended		100:50:50						
Varieties								
V1		IET 29539						
V2		IET 29523						
V3		IET 29492						
V4		IET 29017						
V5		IET 29536						
V6		WGL 14 (NC 1)						
V7		BPT 5204 (NC 2)						
V8		ADT-49 (S)						
V9		27P63 (HC)						
V10		KRH 4 (LC)						
Available N:P:K of soil (kg/ha)		283:52.21:217.48						

Table 4.1k: Contd.

F-levels	Varieties	MARUTERU						
		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	4.54	15	222	2.64	14.96	101	
	V2	3.88	18	206	3.20	15.12	98	
	V3	4.64	10	213	2.35	14.62	102	
	V4	5.24	5	200	2.73	15.63	98	
	V5	4.33	16	206	2.65	14.66	95	
	V6	5.66	2	208	2.68	15.21	101	
	V7	5.18	6	206	2.69	15.25	111	
	V8	4.55	13	202	2.27	14.23	100	
	V9	4.63	11	195	2.45	14.57	102	
	V10	-		-	-	-	-	
F2: Optimum input (100% NPK)	V1	4.81	8	231	2.69	15.30	102	2.57
	V2	4.24	17	210	16.38	15.08	98	3.43
	V3	5.31	4	214	2.50	14.62	102	6.38
	V4	5.37	3	194	2.68	15.95	98	1.24
	V5	4.73	9	205	2.72	15.43	96	3.81
	V6	5.68	1	217	2.59	14.91	101	0.19
	V7	5.03	7	223	2.71	16.23	110	-1.43
	V8	4.62	12	204	2.34	14.65	101	0.67
	V9	4.55	13	216	2.51	13.79	102	-0.76
	V10	-		-	-	-	-	
Interaction								
F at same V		NS		NS	NS	0.68	NS	
V at same F		NS		NS	NS	1.29	NS	
F1		4.74	2	206	2.63	14.92	101	
F2		4.93	1	213	4.12	15.11	101	1.79
C.D.(0.05)		NS		NS	NS	NS	NS	
C.V.(%)		8.86		10.17	160.55	8.32	0.27	
Mean of varieties:								
V1		4.68	5	227	2.67	15.13	101	2.57
V2		4.06	9	208	9.79	15.10	98	3.43
V3		4.98	4	214	2.43	14.62	102	6.38
V4		5.31	2	197	2.71	15.79	98	1.24
V5		4.53	8	206	2.69	15.05	96	3.81
V6		5.67	1	213	2.64	15.06	101	0.19
V7		5.11	3	215	2.70	15.74	110	-1.43
V8		4.59	7	203	2.31	14.44	101	0.67
V9		4.59	6	206	2.48	14.18	102	-0.76
V10		-		-	-	-	-	
C.D.(0.05)		0.25		NS	NS	0.48	0.68	
C.V. (%)		4.5		6.88	161.01	2.73	0.58	
Expt. Mean		**4.83**		**210**	**3.38**	**15.01**	**101**	
Soil type		Alluvial clay						
pH		6.50						
F - levels (kg/ha)								
F1		45:30:30						
F2		90:60:60						
Recommended		90:60:60						
Varieties								
V1		IET 29539						
V2		IET 29523						
V3		IET 29492						
V4		IET 29017						
V5		IET 29536						
V6		WGL 14 (NC 1)						
V7		BPT 5204 (NC 2)						
V8		ADT-49 (S)						
V9		27P63 (HC)						
V10		-						
Available N:P:K of soil (kg/ha)		172:46.5:286						

Table 4.1k: 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	2.89	11	221	2.86	25.02	113	
	V2	2.84	15	212	3.06	25.06	109	
	V3	2.88	12	197	3.06	25.07	112	
	V4	3.02	10	206	3.18	25.10	102	
	V5	2.85	14	205	3.11	25.05	104	
	V6	2.86	13	199	2.90	25.04	107	
	V7	2.21	18	190	3.22	24.99	115	
	V8	2.24	17	220	3.12	24.88	103	
	V9	2.73	16	218	3.08	24.96	105	
	V10	-		-	-	-	-	
F2: Optimum input (100% NPK)	V1	4.60	3	338	3.16	26.36	114	15.55
	V2	4.53	4	317	3.38	26.39	109	15.36
	V3	4.48	5	311	3.43	26.40	113	14.55
	V4	4.82	2	337	3.50	26.43	102	16.36
	V5	4.88	1	326	3.47	26.38	104	18.45
	V6	4.41	6	313	3.21	26.38	107	14.09
	V7	4.19	9	336	3.52	26.32	116	18.00
	V8	4.24	8	330	3.46	26.27	103	18.18
	V9	4.29	7	321	3.45	26.29	106	14.18
	V10	-		-	-	-	-	
Interaction								
F at same V		0.13		NS	0.03	NS	NS	
V at same F		0.13		NS	0.04	NS	NS	
F1		2.72	2	208	3.07	25.02	108	
F2		4.49	1	326	3.40	26.36	108	16.08
C.D.(0.05)		0.05		4.91	0.04	0.04	NS	
C.V.(%)		1.24		1.57	1.07	0.15	0.38	
Mean of varieties:								
V1		3.75	3	280	3.01	25.69	113	15.55
V2		3.69	4	265	3.22	25.73	109	15.36
V3		3.68	5	254	3.25	25.74	112	14.55
V4		3.92	1	271	3.34	25.77	102	16.36
V5		3.87	2	266	3.29	25.72	104	18.45
V6		3.64	6	256	3.06	25.71	107	14.09
V7		3.20	9	263	3.37	25.66	116	18.00
V8		3.24	8	275	3.29	25.58	103	18.18
V9		3.51	7	270	3.27	25.63	106	14.18
V10		-		-	-	-	-	
C.D.(0.05)		0.1		NS	0.02	0.02	0.9	
C.V. (%)		2.26		5.86	0.54	0.08	0.72	
Expt. Mean		**3.61**		**267**	**3.23**	**25.69**	**108**	
Soil type		-						
pH		7.70						
F - levels (kg/ha)								
F1		60:30:20						
F2		120:60:40						
Recommended		120:60:40						
Varieties								
V1		IET 29539						
V2		IET 29523						
V3		IET 29492						
V4		IET 29017						
V5		IET 29536						
V6		WGL 14 (NC 1)						
V7		BPT 5204 (NC 2)						
V8		ADT-49 (S)						
V9		27P63 (HC)						
V10		-						
Available N:P:K of soil (kg/ha)		21:18.3:209						

Table 4.1k: Contd.

F-levels	Varieties	RAIPUR						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.)		
F1: Low input (50% NPK)	V1	4.25	15	260	3.51	100		3.92	18
	V2	4.28	14	214	3.70	100		4.17	14
	V3	3.82	16	298	2.67	99		3.92	17
	V4	4.82	10	203	3.95	81		4.64	12
	V5	4.43	12	210	3.42	81		4.27	13
	V6	3.81	17	213	3.50	98		3.79	19
	V7	4.38	13	248	2.83	104		3.94	16
	V8	3.62	18	243	2.60	99		3.70	20
	V9	4.85	9	214	3.83	100		4.75	10
	V10	-		-	-	-		4.01	15
F2: Optimum input (100% NPK)	V1	5.14	6	283	4.25	100	8.09	5.21	5
	V2	5.47	4	251	4.15	100	10.82	5.59	4
	V3	5.22	5	331	3.14	99	12.73	5.18	6
	V4	5.71	2	238	4.33	82	8.09	6.04	1
	V5	6.06	1	233	3.84	81	14.82	5.63	3
	V6	5.09	8	231	3.86	98	11.64	4.74	11
	V7	5.14	6	311	3.45	104	6.91	5.08	7
	V8	4.44	11	298	2.92	98	7.45	4.87	9
	V9	5.51	3	256	4.23	100	6.00	5.80	2
	V10	-		-	-	-		5.06	8
Interaction									
F at same V		0.35		18.04	NS	NS			
V at same F		0.37		19.32	NS	NS			
F1		4.25	2	234	3.33	96		4.22	2
F2		5.31	1	270	3.80	96	9.62	5.44	1
C.D.(0.05)		0.23		11.73	0.11	NS			
C.V.(%)		4.05		3.97	2.69	0.38			
Mean of varieties:									
V1		4.70	6	272	3.88	100	8.09	4.56	5
V2		4.88	4	232	3.93	100	10.82	4.88	4
V3		4.52	7	315	2.91	99	12.73	4.55	6
V4		5.27	1	221	4.14	82	8.09	5.34	1
V5		5.25	2	222	3.63	81	14.82	4.95	3
V6		4.45	8	222	3.68	98	11.64	4.26	10
V7		4.76	5	279	3.14	104	6.91	4.51	8
V8		4.03	9	270	2.76	99	7.45	4.29	9
V9		5.18	3	235	4.03	100	6.00	5.27	2
V10		-		-	-	-		4.53	7
C.D.(0.05)		0.24		12.75	0.14	0.59			
C.V. (%)		4.38		4.34	3.41	0.53			
Expt. Mean		**4.78**		**252**	**3.57**	**96**		4.83	
Soil type		Vertisols							
pH		7.08							
F - levels (kg/ha)									
F1		60:30:20							
F2		120:60:40							
Recommended N:P:K (kg/ha)		120:60:40							
Varieties									
V1		IET 29539							
V2		IET 29523							
V3		IET 29492							
V4		IET 29017							
V5		IET 29536							
V6		WGL 14 (NC 1)							
V7		BPT 5204 (NC 2)							
V8		ADT-49 (S)							
V9		27P63 (HC)							
V10		-							
Available N:P:K of soil (kg/ha)		212:19.4:205							

Table 4.1(l): 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 2022.

P-levels	Varieties	LUDHIANA						
		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	4.13	*7*	343	3.36	22.26	112	
	V2	5.13	*6*	354	2.31	20.48	123	
	V3	-	-	-	-	-	-	
	V4	-	-	-	-	-	-	
	V5	-	-	-	-	-	-	
	V6	5.73	*3*	356	3.31	20.20	92	
P2: 50% of recommended P dose (N and K is constant)	V1	4.10	*9*	343	3.39	22.29	113	-2.00
	V2	5.19	*4*	352	2.36	20.57	123	4.00
	V3	-	-	-	-	-	-	
	V4	-	-	-	-	-	-	
	V5	-	-	-	-	-	-	
	V6	5.81	*2*	350	3.28	20.23	93	5.33
P3: 100% of recommended P dose	V1	4.12	*8*	347	3.36	22.38	114	-0.33
	V2	5.15	*5*	349	2.38	20.53	124	0.67
	V3	-	-	-	-	-	-	
	V4	-	-	-	-	-	-	
	V5	-	-	-	-	-	-	
	V6	5.84	*1*	350	3.27	20.33	92	3.67
Interaction								
P at same V		NS		NS	NS	NS	NS	
V at same P		NS		NS	NS	NS	NS	
P1		5.00	*3*	351	2.99	20.98	109	
P2		5.03	*2*	348	3.01	21.03	110	2.44
P3		5.04	*1*	348	3.00	21.08	110	2.67
C.D.(0.05)		NS		NS	NS	NS	0.2	
C.V.(%)		6.53		5.33	7.32	10.08	0.22	
Mean of varieties:								
V1		4.12	*3*	344	3.37	22.3	113.00	-1.17
V2		5.16	*2*	352	2.35	20.5	123.33	2.33
V3		-	-	-	-	-	-	
V4		-	-	-	-	-	-	
V5		-	-	-	-	-	-	
V6		5.79	*1*	352	3.29	20.3	92.33	4.50
C.D.(0.05)		0.21		NS	0.21	1.6	0.82	
C.V.(%)		4.15		4.85	6.86	7.43	0.72	
Expt. Mean		**5.02**		**349**	**3.00**	**21.03**	**110**	
Soil type		Sandy loam						
pH		7.4						
P - levels (kg/ha)								
P1 (0%)		0						
P2 (50%)		15						
P3 (100%)		30						
Recommended NPK (kg/ha)		105:30:30						
Varieties								
V1		IET 28821						
V2		Swarna						
V3		-						
V4		-						
V5		-						
V6		PR 126 (LC)						
Availabe NPK of soil (kg/ha)		268;21.4:267						

Table 4.1(l): Contd.

P-levels	Varieties	MANDYA						
		Grain Yield (t/ha)	*Rank*	Panicle/m² (No.)	Panicle wt (g)	Test 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	4.38	*12*	299	2.51	30.12	100	
	V2	3.78	*15*	299	1.97	24.50	112	
	V3	4.94	*9*	304	2.01	24.35	93	
	V4	-	-	-	-	-	-	
	V5	3.99	*14*	311	1.87	16.61	107	
	V6	4.22	*13*	331	1.95	19.42	103	
P2: 50% of recommended P dose (N and K is constant)	V1	5.34	*4*	337	2.59	29.78	100	38.40
	V2	5.40	*3*	331	2.03	25.31	112	64.80
	V3	4.72	*10*	355	2.51	23.07	93	-8.80
	V4	-	-	-	-	-	-	
	V5	5.15	*7*	341	1.91	17.14	107	46.40
	V6	4.53	*11*	349	2.02	19.45	103	12.40
P3: 100% of recommended P dose	V1	5.31	*5*	377	2.63	29.51	100	18.60
	V2	5.49	*2*	333	2.18	24.53	112	34.20
	V3	5.79	*1*	366	2.61	23.05	93	17.00
	V4	-	-	-	-	-	-	
	V5	5.31	*5*	403	2.05	16.77	106	26.40
	V6	4.97	*8*	354	2.41	19.14	103	15.00
Interaction								
P at same V		NS		NS	NS	NS	NS	
V at same P		NS		NS	NS	NS	NS	
P1		4.26	*3*	309	2.06	23.00	103	
P2		5.03	*2*	342	2.21	22.95	103	30.64
P3		5.37	*1*	367	2.38	22.60	103	22.24
C.D.(0.05)		0.43		13.92	NS	NS	NS	
C.V.(%)		13.72		6.33	14.99	5.32	1.1	
Mean of varieties:								
V1		5.01	*2*	338	2.58	29.8	99.89	28.50
V2		4.89	*3*	321	2.06	24.8	112.00	49.50
V3		5.15	*1*	341	2.38	23.5	93.22	4.10
V4		-	-	-	-	-	-	
V5		4.82	*4*	352	1.94	16.8	106.78	36.40
V6		4.57	*5*	345	2.13	19.3	103.00	13.70
C.D.(0.05)		NS		NS	0.2	1.42	1	
C.V.(%)		12.64		6.41	9.42	6.4	1	
Expt. Mean		**4.89**		**339**	**2.22**	**22.85**	**103**	

Soil type	Red sandy loam
pH	8.7
P - levels (kg/ha)	
P1 (0%)	0
P2 (50%)	25
P3 (100%)	50
Recommended NPK (kg/ha)	105:50:50
Varieties	
V1	IET 28821
V2	Swarna
V3	Rasi
V4	-
V5	BPT 5204
V6	DRR Dhan 60 (LC)
Availabe NPK of soil (kg/ha)	344.25;48.7:277.96

Table 4.1(I): 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)
P1: 0% of recommended P dose (N and K is constant)	V1	4.63	*9*	214	2.17	27.20	106	
	V2	3.77	*10*	256	1.72	20.03	110	
	V3	-	-	-	-	-	-	
	V4	3.67	*11*	275	1.54	15.63	106	
	V5	3.65	*12*	223	2.06	19.33	105	
	V6	-	-	-	-	-	-	
P2: 50% of recommended P dose (N and K is constant)	V1	5.97	*3*	236	2.43	27.93	107	44.67
	V2	5.93	*4*	310	1.92	20.80	110	72.00
	V3	-	-	-	-	-	-	
	V4	4.96	*7*	320	1.75	16.37	106	43.00
	V5	4.70	*8*	240	2.17	19.80	105	35.00
	V6	-	-	-	-	-	-	
P3: 100% of recommended P dose	V1	6.46	*1*	265	2.66	28.63	107	30.50
	V2	6.32	*2*	338	2.09	21.30	110	42.50
	V3	-	-	-	-	-	-	
	V4	5.32	*5*	354	1.90	16.83	106	27.50
	V5	5.23	*6*	270	2.26	20.43	105	26.33
	V6	-	-	-	-	-	-	
Interaction								
P at same V		0.23		NS	NS	NS	NS	
V at same P		0.23		NS	NS	NS	NS	
P1		3.93	*3*	242	1.87	20.55	107	
P2		5.39	*2*	277	2.07	21.23	107	48.67
P3		5.83	*1*	307	2.23	21.80	107	31.71
C.D.(0.05)		0.19		7.42	0.11	0.33	NS	
C.V.(%)		5.2		3.72	7.21	2.12	0.62	
Mean of varieties:								
V1		5.69	*1*	238	2.42	27.9	106.56	37.58
V2		5.34	*2*	301	1.91	20.7	110.22	57.25
V3		-	-	-	-	-	-	
V4		4.65	*3*	316	1.73	16.3	106.22	35.25
V5		4.53	*4*	244	2.16	19.9	104.89	30.67
V6		-	-	-	-	-	-	
C.D.(0.05)		0.13		9.36	0.12	0.58	0.37	
C.V.(%)		2.64		3.43	5.97	2.78	0.35	
Expt. Mean		**5.05**		**275**	**2.06**	**21.19**	**107**	
Soil type		Vertisols						
pH		7.1						
P - levels (kg/ha)								
P1 (0%)		0						
P2 (50%)		30						
P3 (100%)		60						
Recommended NPK (kg/ha)		100:60:40						
Varieties								
V1		IET 28821						
V2		Swarna						
V3		-						
V4		Improved Samba Mahsuri						
V5		BPT 5204						
V6		-						
Availabe NPK of soil (kg/ha)		198;15.6:312						

Table 4.1(l): Contd.

P-levels	Varieties	RANCHI				
		Grain Yield (t/ha)	*Rank*	Panicle/m^2 (No.)	Panicle wt (g)	Phosphorous res. (kg grain/kg P) (Base level 0% RDP)
P1: 0% of recommended P dose (N and K is constant)	V1	4.32	*15*	230	3.12	
	V2	5.07	*6*	268	4.16	
	V3	4.68	*13*	245	4.01	
	V4	4.75	*11*	253	3.96	
	V5	4.75	*11*	253	3.84	
	V6	-		-	-	
P2: 50% of recommended P dose (N and K is constant)	V1	4.62	*14*	245	3.28	10.00
	V2	5.21	*5*	277	4.52	4.67
	V3	4.96	*7*	264	4.42	9.33
	V4	4.88	*8*	258	4.40	4.33
	V5	4.82	*10*	257	4.34	2.33
	V6	-		-	-	
P3: 100% of recommended P dose	V1	4.87	*9*	189	3.96	9.17
	V2	5.65	*1*	300	4.76	9.67
	V3	5.23	*4*	277	4.52	9.17
	V4	5.47	*2*	289	4.49	12.00
	V5	5.40	*3*	285	4.42	10.83
	V6	-		-	-	
Interaction						
P at same V		NS		NS	NS	
V at same P		NS		NS	NS	
P1		4.71	*3*	250	3.82	
P2		4.90	*2*	260	4.19	6.13
P3		5.32	*1*	268	4.43	10.17
C.D.(0.05)		0.19		NS	0.15	
C.V.(%)		6.01		17.23	5.48	
Mean of varieties:						
V1		4.60	*5*	221	3.45	9.58
V2		5.31	*1*	282	4.48	7.17
V3		4.96	*4*	262	4.32	9.25
V4		5.03	*2*	267	4.28	8.17
V5		4.99	*3*	265	4.20	6.58
V6		-		-	-	
C.D.(0.05)		0.37		NS	0.17	
C.V.(%)		7.59		15.95	4.29	
Expt. Mean		**4.98**		**259**	**4.15**	
Soil type		-				
pH		-				
P - levels (kg/ha)						
P1 (0%)		0				
P2 (50%)		30				
P3 (100%)		60				
Recommended NPK (kg/ha)		100:60:40				
Varieties						
V1		IET 28821				
V2		Swarna				
V3		Rasi				
V4		Improved Samba Mahsuri				
V5		BPT 5204				
V6		-				
Availabe NPK of soil (kg/ha)		220;41.3:156				

Table 4.1(I): 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	4.20	*9*	149	2.99	24.06	98		4.33	*15*
	V2	3.86	*10*	164	2.98	17.29	104		4.32	*16*
	V3	-	-	-	-	-	-		4.81	*12*
	V4	3.56	*11*	143	2.08	19.12	105		3.99	*17*
	V5	3.29	*12*	132	1.91	19.36	98		3.92	*18*
	V6	-	-	-	-	-	-		4.98	*9*
P2: 50% of recommended P dose (N and K is constant)	V1	4.69	*4*	167	3.62	25.18	101	16.33	4.94	*10*
	V2	4.29	*6*	179	3.09	18.25	111	14.33	5.20	*6*
	V3	-	-	-	-	-	-		4.84	*11*
	V4	4.23	*7*	171	2.11	20.99	108	22.33	4.69	*14*
	V5	4.21	*8*	154	2.02	20.34	106	30.67	4.72	*13*
	V6	-	-	-	-	-	-		5.17	*7*
P3: 100% of recommended P dose	V1	5.42	*1*	179	4.06	26.18	108	20.33	5.24	*5*
	V2	4.61	*5*	204	3.42	19.63	117	12.50	5.44	*2*
	V3	-	-	-	-	-	-		5.51	*1*
	V4	4.98	*2*	145	2.29	22.33	111	23.67	5.26	*4*
	V5	4.73	*3*	180	2.22	22.35	108	24.00	5.17	*8*
	V6	-	-	-	-	-	-		5.41	*3*
Interaction										
P at same V		NS		13.61	0.1	NS	0.37			
V at same P		NS		12.23	0.08	NS	0.34			
P1		3.73	*3*	147	2.49	19.96	101		4.33	*3*
P2		4.36	*2*	168	2.71	21.19	107	20.92	4.94	*2*
P3		4.94	*1*	177	3.00	22.62	111	20.13	5.30	*1*
C.D.(0.05)		0.13		5.74	0.02	0.32	0.21			
C.V.(%)		3.99		4.83	1	2.07	0.27			
Mean of varieties:										
V1		4.77	*1*	165	3.56	25.1	102.22	18.33	4.84	*4*
V2		4.25	*3*	182	3.16	18.4	110.78	13.42	4.99	*3*
V3		-	-	-	-	-	-		5.05	*2*
V4		4.26	*2*	153	2.16	20.8	108.00	23.00	4.65	*5*
V5		4.08	*4*	155	2.05	20.7	104.00	27.33	4.60	*6*
V6		-	-	-	-	-	-		5.18	*1*
C.D.(0.05)		0.17		7.86	0.06	0.34	0.21			
C.V.(%)		3.88		4.83	2.05	1.62	0.2			
Expt. Mean		**4.34**		**164**	**2.73**	**21.26**	**106**		4.86	
Soil type		-								
pH		7.6								
P - levels (kg/ha)										
P1 (0%)		0								
P2 (50%)		30								
P3 (100%)		60								
Recommended NPK (kg/ha)		120:60:60								
Varieties										
V1		IET 28821								
V2		Swarna								
V3		-								
V4		Improved Samba Mahsuri								
V5		BPT 5204								
V6		-								
Availabe NPK of soil (kg/ha)		-								

Table 4.1m: Summary of data on grain yield and ancillary characters of selected AET DRT cultures grown under transplanted conditions at graded levels of recommended fertilizer doses, kharif 2022.

F-levels	Varieties	JAGDALPUR						
		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	3.43	7	215	3.20	23.56	72	
	V2	3.14	8	196	3.23	23.41	70	
	V3	3.81	5	205	3.29	23.95	68	
	V4	4.19	3	203	3.26	24.31	82	
	V5	-		-	-	-	-	
F2: Optimum input (100% NPK)	V1	4.31	2	223	3.24	23.40	75	8.80
	V2	3.51	6	225	3.31	24.45	72	3.70
	V3	4.18	4	228	3.20	23.61	72	3.70
	V4	4.45	1	226	3.25	24.27	84	2.60
	V5	-		-	-	-	-	
Interation								
F at same V		NS		NS	NS	NS	NS	
V at same F		NS		NS	NS	NS	NS	
F1		3.64	2	205	3.25	23.81	73	
F2		4.11	1	226	3.25	23.93	76	4.70
C.D.(0.05)		NS		NS	NS	NS	2	
C.V.(%)		9.03		6.2	2.05	2.49	1.53	
Mean of varieties:								
V1		3.87	3	219	3.22	23.48	74	8.80
V2		3.33	4	210	3.27	23.93	71	3.70
V3		4.00	2	217	3.25	23.78	70	3.70
V4		4.32	1	215	3.26	24.29	83	2.60
V5		-		-	-	-	-	
C.D.(0.05)		0.42		NS	NS	NS	1.43	
C.V. (%)		8.67		13.15	2.83	4.47	1.53	
Expt. Mean		**3.88**		**215**	**3.25**	**23.87**	**74**	
Soil type		Alfisol						
pH		6.35						
N - levels (kg/ha)								
F1		50:30:20						
F2		100:60:40						
Recommended N:P:K (kg/ha)		100:60:40						
Varieties								
V1		IET 28018						
V2		IET 28017						
V3		Pusa 44 (RP)						
V4		MTU 1010						
V5		Local check						
Available N:P:K of soil (kg/ha)		-						

Table 4.1m: Contd.

F-levels	Varieties	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	4.48	5	223	3.66	21.85	92	
	V2	4.26	7	221	3.55	21.65	94	
	V3	4.60	3	217	3.27	21.55	92	
	V4	4.23	8	212	3.75	22.97	101	
	V5	-		-	-	-	-	
F2: Optimum input (100% NPK)	V1	4.58	4	223	3.67	21.75	93	0.95
	V2	4.40	6	220	3.70	21.49	94	1.33
	V3	4.63	2	223	3.56	22.01	91	0.29
	V4	5.00	1	222	3.75	23.20	101	7.33
	V5	-		-	-	-	-	
Interation								
F at same V		NS		NS	NS	NS	NS	
V at same F		NS		NS	NS	NS	NS	
F1		4.39	2	218	3.56	22.01	95	
F2		4.65	1	222	3.67	22.11	95	2.48
C.D.(0.05)		NS		NS	NS	NS	NS	
C.V.(%)		5.5		4.04	1.81	3.56	0.78	
Mean of varieties:								
V1		4.53	3	223	3.67	21.80	92	0.95
V2		4.33	4	220	3.63	21.57	94	1.33
V3		4.62	1	220	3.42	21.78	92	0.29
V4		4.62	1	217	3.75	23.09	101	7.33
V5		-		-	-	-	-	
C.D.(0.05)		NS		NS	0.22	1.05	0.76	
C.V. (%)		6.55		9.99	4.91	3.77	0.63	
Expt. Mean		**4.52**		**220**	**3.61**	**22.06**	**95**	
Soil type		Alluvial clay						
pH		6.50						
N - levels (kg/ha)								
F1		45:30:30						
F2		90:60:60						
Recommended N:P:K (kg/ha)		90:60:60						
Varieties								
V1		IET 28018						
V2		IET 28017						
V3		Pusa 44 (RP)						
V4		MTU 1010						
V5		Local check						
Available N:P:K of soil (kg/ha)		172:46.5:286						

Table 4.1m: Contd.

F-levels	Varieties	NAGINA						
		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	2.56	5	233	3.47	26.37	113	
	V2	2.45	6	244	3.18	26.30	112	
	V3	2.35	7	226	2.92	26.85	112	
	V4	2.22	8	206	2.49	25.77	97	
	V5	-		-	-	-	-	
F2: Optimum input (100% NPK)	V1	4.80	1	297	3.36	26.39	114	20.36
	V2	4.77	2	306	3.48	26.42	112	21.09
	V3	4.48	3	290	3.52	26.31	112	19.36
	V4	4.39	4	320	2.95	25.94	98	19.73
	V5	-		-	-	-	-	
Interation								
F at same V		NS		21.28	0.02	0.03	NS	
V at same F		NS		22.89	0.02	0.02	NS	
F1		2.40	2	227	3.02	26.32	109	
F2		4.61	1	303	3.33	26.27	109	20.14
C.D.(0.05)		0.09		17.19	0.01	0.01	NS	
C.V.(%)		1.54		3.69	0.17	0.02	0.65	
Mean of varieties:								
V1		3.68	1	265	3.42	26.38	114	20.36
V2		3.61	2	275	3.33	26.36	112	21.09
V3		3.42	3	258	3.22	26.58	112	19.36
V4		3.31	4	263	2.72	25.86	97	19.73
V5		-		-	-	-	-	
C.D.(0.05)		0.16		NS	0.01	0.02	1.03	
C.V. (%)		3.68		4.51	0.29	0.06	0.75	
Expt. Mean		**3.50**		**265**	**3.17**	**26.29**	**109**	
Soil type		Alluvial clay						
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 28018						
V2		IET 28017						
V3		Pusa 44 (RP)						
V4		MTU 1010						
V5		Local check						
Available N:P:K of soil (kg/ha)		-						

Table 4.1m: Contd.

F-levels	Varieties	PANTNAGAR						
		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	3.66	4	221	1.94	25.92	107	
	V2	3.07	6	237	1.55	26.62	109	
	V3	3.64	5	193	2.19	25.30	108	
	V4	-		-	-	-	-	
	V5	-		-	-	-	-	
F2: Optimum input (100% NPK)	V1	4.91	1	250	2.44	25.90	109	11.36
	V2	4.65	3	273	2.12	25.62	108	14.36
	V3	4.81	2	210	2.85	25.88	108	10.64
	V4	-		-	-	-	-	
	V5	-		-	-	-	-	
Interation								
F at same V		0.09		NS	NS	0.26	NS	
V at same F		0.09		NS	NS	0.23	NS	
F1		3.46	2	217	1.89	25.95	108	
F2		4.79	1	244	2.47	25.80	108	12.12
C.D.(0.05)		0.07		3.95	0.06	0.1	NS	
C.V.(%)		0.84		0.84	1.37	0.2	2.3	
Mean of varieties:								
V1		4.29	1	235	2.19	25.91	108	11.36
V2		3.86	3	255	1.84	26.12	108	14.36
V3		4.23	2	202	2.52	25.59	108	10.64
V4		-		-	-	-	-	
V5		-		-	-	-	-	
C.D.(0.05)		0.06		10.19	0.13	0.18	NS	
C.V. (%)		1.17		3.32	4.64	0.53	1.81	
Expt. Mean		**4.12**		**231**	**2.18**	**25.87**	**108**	
Soil type		Silt Loam						
pH		7.50						
N - levels (kg/ha)								
F1		60:30:20						
F2		120:60:40						
Recommended N:P:K (kg/ha)		120:60:40						
Varieties								
V1		IET 28018						
V2		IET 28017						
V3		Pusa 44 (RP)						
V4		-						
V5		Local check						
Available N:P:K of soil (kg/ha)		-						

Table 4.1m: 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 to 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 100% RDF)		
F1: Low input (50% NPK)	V1	4.93	8	260	5.51	24.43	101		3.81	8
	V2	4.40	10	269	5.25	24.73	99		3.46	10
	V3	4.53	9	268	5.55	22.75	102		3.79	9
	V4	5.73	3	277	3.25	24.63	89		4.09	7
	V5	5.47	4	280	4.49	13.55	102		5.47	2
F2: Optimum input (100% NPK)	V1	5.47	4	284	6.02	24.52	101	4.91	4.81	4
	V2	5.00	7	279	5.86	24.81	100	5.45	4.47	6
	V3	5.07	6	285	5.03	22.82	102	4.91	4.63	5
	V4	6.30	1	302	3.82	24.71	89	5.18	5.04	3
	V5	6.00	2	304	4.95	13.65	103	4.82	6.00	1
Interation										
F at same V		NS		NS	0.51	NS	NS			
V at same F		NS		NS	0.55	NS	NS			
F1		5.01	2	271	4.81	22.02	99		3.78	2
F2		5.57	1	291	5.14	22.10	99	5.05	4.75	1
C.D.(0.05)		NS		3.44	NS	0.04	0.29			
C.V.(%)		12.85		0.78	5.07	0.11	0.18			
Mean of varieties:										
V1		5.20	3	272	5.77	24.48	101	4.91	4.31	2
V2		4.70	5	274	5.56	24.77	100	5.45	3.97	4
V3		4.80	4	277	5.29	22.79	102	4.91	4.21	3
V4		6.02	1	290	3.54	24.67	89	5.18	4.56	1
V5		5.74	2	292	4.72	13.60	103	4.82	5.74	
C.D.(0.05)		0.69		8.28	0.36	0.31	1			
C.V. (%)		10.62		2.41	5.96	1.16	0.83			
Expt. Mean		**5.29**		**281**	**4.97**	**22.06**	**99**		**4.26**	
Soil type		Silt Loam								
pH		7.20								
N - levels (kg/ha)										
F1		60:30:20								
F2		120:60:40								
Recommended N:P:K (kg/ha)		120:60:40								
Varieties										
V1		IET 28018								
V2		IET 28017								
V3		Pusa 44 (RP)								
V4		MTU 1010								
V5		WGL 962 (LC)								
Available N:P:K of soil (kg/ha)		210:64:340								

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

Four AVT-2 entries (IET 28835, IET 28834, IET 30437 and IET 30438) 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, PS 4 at four locations **viz. Coimbatore (100:50:50), Jagdalpur (100:50:25), Ranchi (60:30:20)** and **Rewa (100:60:40).** 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 4.1n**.

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** (3.98 t/ha), **Ranchi** (3.81 t/ha) and **Rewa** (5.76 t/ha). Nutrient response (kg grain / kg nutrient) was higher at 100 % RDF at **Ranchi** (17.00) followed by **Coimbatore** (11.57) 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 30438 at **Jagdalpur** (4.44 t/ha), while IET 30437 at **Ranchi** (2.79 t/ha) found better in recording higher yields.

In conclusion, 100% of RDF was found promising across the locations with 21% higher grain yield and IET 30438 was found promising with higher grain yield of (4.08 t/ha) across the locations among the tested cultures.

4.1(o) AVT 2 - Deep Water

The grain yield performance of Deep Water (DW) culture (IET 26741) and response to nutrient levels of selected IET culture, IET 26741 was evaluated against two standard checks (CR Dhan 500 and Jal Bhavani) along with one local check under two graded levels of RDF (50 and100% of recommended dose of NPK) at two locations *viz.,* **Chinsurah** and **Ghaghraghat**. The data received from these locations are summarized and presented in **Table 4.1 (o).**

The cultivars did not differ significantly for grain yield at both the locations. The mean maximum grain yield was recorded by IET 26741 at **Ghaghraghat** (4.28 t/ha). The performance of standard checks was at par with test entries at **Chinsurah**.

Nutrient dose significantly influenced the grain yield at **Chinsurah** only and significantly higher grain yield of 5.01 t/ha at this location at 100% RDF. Interaction effects between cultivars x Nutrient levels for grain yield were non-significant at both locations.

In this trial, IET 26741was evaluated against two high yielding standard checks (CR Dhan 500 and Jal Bhavani) at two locations. Over the locations, maximum grain yield was recorded by IET 26741 (4.27 t/ha) followed by Jal Bhavani (4.23t/ha) and are suitable at 100% of RDN.

Table 4.1n: Summary of data on grain yield and ancillary characters of selected AET Early (Direct Seeded) cultures grown under transplanted conditions at low and optimum recommended fertilizer doses, kharif 2022.

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	2.72	11	172	1.63	
	V2	3.01	8	194	1.80	
	V3	2.40	12	164	1.59	
	V4	2.80	10	159	1.66	
	V5	2.93	9	186	1.74	
	V6	3.06	7	203	1.71	
F2: Medium input (100% NPK)	V1	3.81	5	254	2.31	10.90
	V2	4.18	2	275	2.52	11.70
	V3	3.64	6	236	2.28	12.40
	V4	3.90	4	264	2.34	11.00
	V5	4.11	3	272	2.38	11.80
	V6	4.22	1	282	2.47	11.60
Interaction						
F at same V		NS		12.02	NS	
V at same F		NS		13.14	NS	
Mean of F level						
F1		2.82	2	180	1.69	
F2		3.98	1	264	2.38	11.57
C.D.(0.05)		0.1		9.21	0.02	
C.V.(%)		1.96		2.89	0.59	
Mean of varieties:						
V1		3.27	5	213	1.97	10.90
V2		3.60	2	235	2.16	11.70
V3		3.02	6	200	1.94	12.40
V4		3.35	4	212	2.00	11.00
V5		3.52	3	229	2.06	11.80
V6		3.64	1	243	2.09	11.60
C.D.(0.05)		0.06		8.5	0.04	
C.V. (%)		1.55		3.18	1.81	
Expt. Mean		**3.40**		**222**	**2.04**	
Soil type		Clay loam				
pH		8.07				
F - levels (kg/ha)						
F1		50:25:25				
F2		100:50:50				
Recommended N:P:K (kg/ha)		100:50:50				
Varieties						
V1		IET 28835 (R)				
V2		IET 28834 (R)				
V3		IET 30437				
V4		IET 30438				
V5		NC: Sahabhagidhan				
V6		CO 53 (LC)				
Available N:P:K of soil (kg/ha)		212:22:434				

Table 4.1n: Contd.

F-levels	Varieties	JAGDALPUR						
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Test weight (g)	Days 50% flowering	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: Low input (50% NPK)	V1	3.55	11	235	2.73	25.90	43	
	V2	3.87	9	210	2.80	26.17	43	
	V3	4.20	7	228	2.66	24.86	66	
	V4	4.32	5	241	2.65	25.19	65	
	V5	3.55	11	232	2.70	25.20	71	
	V6	3.93	8	237	2.66	25.17	69	
F2: Medium input (100% NPK)	V1	4.35	4	248	3.04	27.97	44	9.14
	V2	4.31	6	237	2.77	25.44	32	5.03
	V3	4.63	1	242	2.72	24.75	69	4.91
	V4	4.55	2	259	2.90	26.63	67	2.63
	V5	3.80	10	258	2.87	26.43	72	2.86
	V6	4.42	3	273	2.91	27.10	73	5.60
Interaction								
F at same V		NS		NS	NS	1.28	NS	
V at same F		NS		NS	NS	1.25	NS	
Mean of F level								
F1		3.90	2	231	2.70	25	59	
F2		4.34	1	253	2.87	26	60	5.03
C.D.(0.05)		NS		11.55	0.08	0.55	NS	
C.V.(%)		12.5		3.33	1.88	1.48	11.63	
Mean of varieties:								
V1		3.95	5	242	2.89	27	43	9.14
V2		4.09	4	223	2.79	26	37	5.03
V3		4.42	2	235	2.69	25	68	4.91
V4		4.44	1	250	2.78	26	66	2.63
V5		3.68	6	245	2.79	26	72	2.86
V6		4.18	3	255	2.79	26	71	5.60
C.D.(0.05)		0.5		NS	NS	0.91	8.23	
C.V. (%)		10.02		7.45	4.37	2.9	11.49	
Expt. Mean		**4.12**		**242**	**2.78**	**25.90**	**60**	
Soil type		Alfisols						
pH		6.30						
F - levels (kg/ha)								
F1		50:25:12.5						
F2		100:50:25						
Recommended N:P:K (kg/ha)		100:50:25						
Varieties								
V1		IET 28835 (R)						
V2		IET 28834 (R)						
V3		IET 30437						
V4		IET 30438						
V5		NC: Sahabhagidhan						
V6		MTU 1010 (LC)						
Available N:P:K of soil (kg/ha)		-						

Table 4.1n: Contd.

F-levels	Varieties	RANCHI					
		Grain Yield (t/ha)	Rank	Panicle/m² (No.)	Panicle Weight (g)	Days 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 50% RDF)
F1: Low input (50% NPK)	V1	1.93	8	133	2.68	77	
	V2	1.82	10	125	2.62	80	
	V3	2.12	7	145	2.89	86	
	V4	1.87	9	127	2.70	79	
	V5	1.76	11	121	2.67	80	
	V6	1.73	12	125	2.74	64	
F2: Medium input (100% NPK)	V1	2.85	2	196	3.52	81	16.73
	V2	2.67	4	183	3.32	85	15.45
	V3	3.45	1	236	4.02	89	24.18
	V4	2.82	3	192	3.51	82	17.27
	V5	2.43	6	166	3.48	83	12.18
	V6	2.62	5	180	3.09	67	16.18
Interaction							
F at same V		NS		NS	0.2	0.92	
V at same F		NS		NS	0.2	1.06	
Mean of F level							
F1		1.87	2	129	2.72	78	
F2		2.81	1	192	3.49	81	17.00
C.D.(0.05)		0.34		10.98	0.08	0.83	
C.V.(%)		10.04		4.76	1.9	0.73	
Mean of varieties:							
V1		2.39	2	165	3.10	79	16.73
V2		2.25	4	154	2.97	83	15.45
V3		2.79	1	191	3.46	88	24.18
V4		2.35	3	160	3.11	81	17.27
V5		2.10	6	144	3.08	82	12.18
V6		2.18	5	153	2.92	66	16.18
C.D.(0.05)		0.27		20.28	0.14	0.65	
C.V. (%)		9.49		10.48	3.8	0.68	
Expt. Mean		**2.34**		**161**	**3.10**	**80**	
Soil type		-					
pH		-					
F - levels (kg/ha)							
F1		30:15:10					
F2		60:30:20					
Recommended N:P:K (kg/ha)		60:30:20					
Varieties							
V1		IET 28835 (R)					
V2		IET 28834 (R)					
V3		IET 30437					
V4		IET 30438					
V5		NC: Sahabhagidhan					
V6		BVD 111 (LC)					
Available N:P:K of soil (kg/ha)		-					

Table 4.1n: Contd.

F-levels	Varieties	REWA							Over all mean	Rank
		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	4.33	10	190	2.96	18.07	71		3.13	11
	V2	5.03	8	185	3.07	18.80	73		3.43	10
	V3	5.17	7	198	2.97	18.77	81		3.47	8
	V4	5.97		219	2.97	19.23	80		3.74	6
	V5	-		-	-	-	-		2.75	12
	V6	6.23	3	207	2.90	20.87	77		3.74	7
F2: Medium input (100% NPK)	V1	4.53	9	140	3.03	18.40	71	2.00	3.89	5
	V2	5.33	6	198	3.09	19.20	73	3.00	4.12	4
	V3	5.73	5	217	3.11	19.33	80	5.60	4.36	3
	V4	6.43		239	3.09	19.73	80	4.60	4.43	2
	V5	-		-	-	-	-		3.45	9
	V6	6.80	1	222	3.16	21.23	76	5.70	4.52	1
Interaction										
F at same V		NS		NS	NS	NS	NS			
V at same F		NS		NS	NS	NS	NS			
Mean of F level										
F1		5.35	2	200	2.97	19.15	77		3.49	2
F2		5.76	1	203	3.10	19.58	76	4.18	4.22	1
C.D.(0.05)		0.18		NS	0.06	0.21	NS			
C.V.(%)		2.05		13.87	1.36	0.68	1.66			
Mean of varieties:										
V1		4.43	5	165	3.00	18.24	71	2.00	3.51	5
V2		5.18	4	192	3.08	19.00	73	3.00	3.78	4
V3		5.45	3	208	3.04	19.05	80	5.60	3.92	3
V4		6.20	2	229	3.03	19.48	80	4.60	4.08	2
V5		-		-	-	-	-		3.10	6
V6		6.52	1	214	3.03	21.05	77	5.70	4.13	1
C.D.(0.05)		0.57		NS	NS	0.64	1.22			
C.V. (%)		8.31		17.51	2.84	2.71	1.31			
Expt. Mean		**5.56**		**201**	**3.04**	**19.36**	**76**		**3.85**	
Soil type		-								
pH		-								
F - levels (kg/ha)										
F1		50:30:20								
F2		100:60:40								
Recommended N:P:K (kg/ha)		100:60:40								
Varieties										
V1		IET 28835 (R)								
V2		IET 28834 (R)								
V3		IET 30437								
V4		IET 30438								
V5		-								
V6		PS 4 (LC)								
Available N:P:K of soil (kg/ha)		-								

Table 4.1o: Summary of data on grain yield and ancillary characters of selected AVT-2 AET DW cultures grown under transplanted conditions at graded levels of recommended fertilizer doses, kharif 2022.

F-levels	Varieties	CHINSURAH						GHAGHRAGHAT							Over all mean	*Rank*
		Grain Yield (t/ha)	*Rank*	Panicle/m² (No.)	Panicle wt (g)	Days to 50% flowering	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	3.37	*5*	227	2.80	117		4.08	*3*	136	2.77	26.27	129		3.73	*5*
	V2	3.10	*6*	220	3.07	122		3.89	*6*	152	2.17	25.60	127		3.50	*6*
	V3	3.95	*4*	227	3.21	119		4.02	*5*	144	3.30	25.93	121		3.99	*4*
F2: Optimum input (100% NPK)	V1	5.16	*1*	254	3.12	122	29.83	4.48	*1*	168	3.40	26.57	132	3.64	4.82	*1*
	V2	5.07	*2*	260	3.28	123	32.83	4.08	*3*	162	2.53	26.17	129	1.73	4.58	*2*
	V3	4.79	*3*	246	3.44	123	14.00	4.15	*2*	165	4.07	26.40	123	1.18	4.47	*3*
Interaction																
N at same V		NS		NS	NS	NS		NS		9.96	NS	NS	NS			
V at same N		NS		NS	NS	NS		NS		13.44	NS	NS	NS			
F1		3.47	*2*	225	3.03	119		4.00	*2*	144	2.75	25.93	126		3.74	*2*
F2		5.01	*1*	253	3.28	123	25.56	4.24	*1*	165	3.33	26.38	128	2.18	4.62	*1*
C.D.(0.05)		0.98		NS	NS	NS		NS		13.77	0.19	0.1	0.83			
C.V.(%)		11.43		14.4	6.64	1.66		8.89		4.39	3.1	0.18	0.32			
Mean of varieties:																
V1		4.27	*2*	241	2.96	120	29.83	4.28	*1*	152	3.09	26.42	131	3.64	4.27	*1*
V2		4.09	*3*	240	3.18	122	32.83	3.99	*3*	157	2.35	25.89	128	1.73	4.04	*3*
V3		4.37	*1*	237	3.33	121	14.00	4.09	*2*	154	3.69	26.17	122	1.18	4.23	*2*
C.D.(0.05)		NS		NS	0.28	NS		NS		NS	0.34	0.4	1.44			
C.V.(%)		9.77		7.47	6.63	1.64		10.17		3.42	8.43	1.16	0.85			
Expt. Mean		**4.24**		**239**	**3.15**	**121**		**4.12**		**154**	**3.04**	**26.16**	**127**		**4.18**	
Soil type		-						Sandy 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 26741						IET 26741								
V2		NC: CR Dhan 500						NC: CR Dhan 500								
V3		Local check						JALBHAVANI (LC)								
Availabe NPK of soil (kg/ha)		-						200:24:234								

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

The grain yield performance of SDW cultures and response to nutrient levels of four selected IET cultures (IET 29121, IET 29122, IET 28296 and IET 28299) were evaluated against two standard checks (CR Dhan 506, Rajdeep and Sambha Sub 1) at two locations *viz.,* **Chinsurah** and **Ghaghraghat**. The data received from these locations are summarized and presented in **Table 4.1(p).**

The cultivars differed significantly for grain yield at both the locations. The mean maximum grain yield was recorded by IET 29121 at **Chinsurah** (4.89 t/ha) and **Ghaghraghat** (2.37 t/ha). The performance of standard checks was at par to test cultures at both the locations.

RDF dose significantly influenced the grain yield at **Chinsurah** location and the increase in grain yield with 100% of RDF was to the tune of 30%. Interaction effects between cultivars RDF dose for grain yield were non-significant

In this trial, IET 29121, IET 29122, IET 28296 and IET 28299 cultures were evaluated against high yielding standard checks (CR Dhan 506 and Rajdeep) along with one local check at two locations. Over the locations, maximum grain yield was recorded by IET 29121 (3.63 t/ha) followed by IET 28299 (3.46 t/ha) and are suitable at 100% of RDF.

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

Two AVT-2cultures (IET 30409 and IET 30410) 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(q).**

RDF doses of nutrient application significantly influenced the grain yield at all the locations except at **Ghaghraghat** and **Maruteru**. The mean maximum increase in grain yield was recorded with 100% RDF (4.97 t/ha) with higher nutrient response ranging from 2.52 to 22.41 kg grain/kg nutrient over 50% RDF at different locations.

Grain yield differences among the tested cultures were significant at **Maruteru** only wherein IET 30410 (5.11 t/ha) followed by IET 30409 (5.06 t/ha) recorded significantly higher grain yield followed by check variety. Interaction effects between cultures and nutrient levels were non-significant at all locations. All the cultivars were found to be promising and significant at 100% RDF over 50% RDF. The mean maximum grain yield recorded (4.52 t/ha) with IET 30409.

In this trial, 100% RDF was found to be promising and also exhibited higher nutrient recovery efficiency. Among the IET cultures, IET 30409 (4.52 t/ha) followed by IET 30410 (4.47 t/ha) were found promising in terms of higher mean grain yield and nutrient response.

Table 4.1p: Summary of data on grain yield and ancillary characters of selected AVT-2 AET SDW cultures grown under transplanted conditions at graded levels of recommended fertilizer doses, kharif 2022.

F-levels	Varieties	CHINSURAH					GHAGHRAGHAT							Over all mean	Rank
		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	4.20	8	212	3.28		1.88	8	183	3.80	25.20	116		3.04	7
	V2	4.25	7	198	3.07		1.75	10	165	3.50	24.27	117		3.00	8
	V3	3.82	10	207	3.13		1.71	11	177	3.63	24.40	119		2.77	11
	V4	3.40	12	229	3.64		2.16	7	175	3.63	21.20	117		2.78	10
	V5	3.53	11	241	2.94		1.68	12	171	2.60	24.87	118		2.61	12
	V6	3.95	9	218	2.97		1.80	9	165	3.23	15.20	114		2.88	9
F2: Optimum input (100% NPK)	V1	5.57	1	306	3.14	22.83	2.85	2	189	4.37	25.33	118	8.82	4.21	1
	V2	5.17	2	307	3.51	15.33	2.44	6	166	4.77	24.53	119	6.27	3.81	4
	V3	5.17	2	325	3.33	22.50	2.57	4	183	4.40	24.87	120	7.82	3.87	3
	V4	5.14	4	312	3.33	29.00	3.15	1	179	3.87	21.97	119	9.00	4.15	2
	V5	4.45	6	290	3.55	15.33	2.54	5	173	3.13	25.10	120	7.82	3.50	6
	V6	4.79	5	279	3.46	14.00	2.75	3	170	3.70	15.90	116	8.64	3.77	5
Interaction															
N at same V		NS		NS	NS		NS		NS	NS	NS	0.49			
V at same N		NS		NS	NS		NS		NS	NS	NS	0.55			
F1		3.86	2	218	3.17		1.83	2	173	3.40	22.52	117		2.84	2
F2		5.05	1	303	3.39	19.83	2.72	1	176	4.04	22.95	119	8.06	3.88	1
C.D.(0.05)		0.46		21.42	NS		NS		NS	0.31	0.4	0.41			
C.V.(%)		7.16		5.73	7.74		45.59		6.08	5.83	1.23	0.25			
Mean of varieties:															
V1		4.89	1	259	3.21	22.83	2.37	2	186	4.09	25.27	117	8.82	3.63	1
V2		4.71	2	253	3.29	15.33	2.10	6	165	4.14	24.40	118	6.27	3.40	3
V3		4.50	3	266	3.23	22.50	2.14	4	180	4.02	24.64	120	7.82	3.32	5
V4		4.27	5	271	3.49	29.00	2.66	1	177	3.75	21.59	118	9.00	3.46	2
V5		3.99	6	266	3.25	15.33	2.11	5	172	2.87	24.99	119	7.82	3.05	6
V6		4.37	4	249	3.22	14.00	2.28	3	167	3.47	15.55	115	8.64	3.32	4
C.D.(0.05)		NS		NS	NS		NS		NS	0.33	0.41	0.35			
C.V.(%)		11.21		9.73	9.1		17.83		8.81	7.45	1.51	0.25			
Expt. Mean		**4.45**		**261**	**3.28**		**2.27**		**175**	**3.72**	**22.74**	**118**		**3.36**	
Soil type		-					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		80:40:40					120:60:40								
Varieties															
V1		IET 29121					IET 29121								
V2		IET 29122					IET 29122								
V3		IET 28296					IET 28296								
V4		IET 28299					IET 28299								
V5		NC: CR Dhan 506					NC: CR Dhan 506								
V6		Rajdeep (LC)					Sambha Sub 1 (LC)								
Availabe NPK of soil (kg/ha)		-					200:24:234								

Table 4.1(q): Summary of data on grain yield and ancillary characters of selected NMT RSL cultures grown under transplanted conditions at graded levels of recommended fertilizer doses, kharif 2022.

F-levels	Varieties	CHINSURAH						DHANGAIN						
		Grain Yield (t/ha)	Rank	Panicle/ m^2 (No.)	Panicle wt (g)	Days to 50% flowering	Nutri. res. (kg grain/ kg Nutri.) (Base level 100% RDF)	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	3.23	6	283	2.86	121		4.87	5	308	4.76	25.73	121	
	V2	3.28	5	199	2.77	116		4.29	7	290	3.81	17.07	126	
	V3	3.02	7	270	2.86	127		4.41	6	307	4.44	20.00	115	
	V4	2.77	8	302	3.14	112		4.14	8	276	3.76	16.67	121	
F2: Optimum input (100% NPK)	V1	4.73	3	300	3.07	124	18.75	6.52	1	342	7.84	27.20	122	15.00
	V2	4.6	4	259	3.28	118	16.50	5.81	3	310	5.61	17.47	125	13.82
	V3	5.32	1	325	3.13	127	28.75	6.24	2	318	5.80	22.53	117	16.64
	V4	4.82	2	326	3.64	112	25.63	5.45	4	303	4.80	17.87	122	11.91
Interation														
F at same V		NS		NS	NS	NS		NS		NS	NS	NS	0.55	
V at same F		NS		NS	NS	NS		NS		NS	NS	NS	0.68	
F1		3.08	2	264	2.91	119		4.43	2	295	4.19	19.87	121	
F2		4.87	1	303	3.28	120	22.41	6.01	1	318	6.01	21.27	121	14.34
C.D.(0.05)		0.83		NS	0.25	0.72		0.63		17.97	1.11	NS	0.62	
C.V.(%)		11.95		11.79	4.54	0.34		6.87		3.34	12.42	4.51	0.29	
Mean of varieties:														
V1		3.98	2	291	2.97	123	18.75	5.70	1	325	6.30	26.47	121	15.00
V2		3.94	3	229	3.03	117	16.50	5.05	3	300	4.71	17.27	125	13.82
V3		4.17	1	298	3.00	127	28.75	5.33	2	312	5.12	21.27	116	16.64
V4		3.80	4	314	3.39	112	25.63	4.80	4	289	4.28	17.27	121	11.91
C.D.(0.05)		NS		26.97	0.15	1.82		NS		22.08	1.1	1.39	0.39	
C.V. (%)		12.3		7.58	3.76	1.21		10.33		5.72	17.07	5.36	0.26	
Expt. Mean		**3.97**		**283**	**3.09**	**120**		**5.22**		**307**	**5.10**	**20.57**	**121**	
Soil type		-						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		NC: Swarna Sub 1						NC: Swarna Sub 1						
V4		Sujala (LC)						Pooja(LC)						
Available N:P:K of soil (kg/ha)		-						188:40.6:150.4						

Table 4.1(q): Contd.

F-levels	Varieties	GHAGHRAGHAT						MARUTERU						
		Grain Yield (t/ha)	Rank	Panicle /m² (No.)	Panicle wt (g)	Test 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	3.38	7	185	3.37	23.2		4.89	6	285	3.65	18.9	116	
	V2	3.46	5	189	3.80	25.2		4.95	5	281	3.91	18.8	121	
	V3	3.39	6	163	2.63	20.3		4.54	8	289	3.97	20.8	109	
	V4	2.70	8	164	2.97	14.8		5.45	2	262	3.81	17.6	113	
F2: Optimum input (100% NPK)	V1	3.74	3	210	3.90	23.9	3.00	5.22	4	305	3.76	20.1	116	3.14
	V2	4.08	1	219	4.07	25.9	5.17	5.26	3	297	4.07	18.8	121	2.95
	V3	3.62	4	196	3.40	21.6	1.92	4.82	7	305	3.83	20.5	109	2.67
	V4	3.82	2	206	3.37	15.8	9.33	5.59	1	290	3.88	17.4	113	1.33
Interation														
F at same V		NS		NS	NS	NS		NS		NS	NS	NS	NS	
V at same F		NS		NS	NS	NS		NS		NS	NS	NS	NS	
F1		3.23	2	175	3.19	20.9		4.96	2	279	3.84	19.0	115	
F2		3.82	1	208	3.69	21.8	4.85	5.22	1	299	3.89	19.2	115	2.52
C.D.(0.05)		NS		24.26	0.18	0.09		NS		NS	NS	NS	NS	
C.V.(%)		19.93		7.21	2.97	0.25		6.68		4.76	2.74	1.71	0.18	
Mean of varieties:														
V1		3.56	2	197	3.64	23.6	3.00	5.06	3	295	3.71	19.5	116	3.14
V2		3.77	1	204	3.94	25.6	5.17	5.11	2	289	3.99	18.8	121	2.95
V3		3.51	3	179	3.02	21.0	1.92	4.68	4	297	3.90	20.7	109	2.67
V4		3.26	4	185	3.17	15.3	9.33	5.52	1	276	3.85	17.5	113	1.33
C.D.(0.05)		NS		6.81	0.26	0.45		0.3		NS	0.19	0.71	0.49	
C.V. (%)		17.06		2.83	6.06	1.66		4.73		6.06	3.86	2.95	0.34	
Expt. Mean		**3.52**		**191**	**3.44**	**21.3**		**5.09**		**289**	**3.86**	**19.1**	**115**	
Soil type		Sand 32.2,Silt 48.6 & Clay 16.2						Alluvial clay						
pH		7.40						6.50						
N - levels (kg/ha)														
F1		60:30:30						45:30:30						
F2		120:60:60						90:60:60						
Recommended NPK (kg/ha)		120:60:60						90:60:60						
Varieties														
V1		IET 30409						IET 30409						
V2		IET 30410						IET 30410						
V3		NC: Swarna Sub 1						NC: Swarna Sub 1						
V4		Sambha Sub 1(LC)						(LC)						
Available N:P:K of soil (kg/ha)		200:24:234						172:46.5:286						

Table 4.1(q): Contd.

F-levels	Varieties	TITABAR						Over all mean	Rank
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Test wt (g)	Days to 50% flowering	Nutri. res. (kg grain/kg Nutri.) (Base level 100% RDF)		
F1: Low input (50% NPK)	V1	3.73	5	246	21.63	99		4.02	5
	V2	3.88	4	249	21.60	118		3.97	6
	V3	-		-	-	-		3.84	7
	V4	3.70	6	229	23.57	102		3.75	8
F2: Optimum input (100% NPK)	V1	4.93	2	261	22.87	100	20.00	5.03	1
	V2	5.08	1	264	23.13	119	20.00	4.97	3
	V3	-		-	-	-		5.00	2
	V4	4.87	3	244	24.47	103	19.50	4.91	4
Interation									
F at same V		NS		NS	NS	NS			
V at same F		NS		NS	NS	NS			
F1		3.77	2	241	22.27	106		3.89	2
F2		4.96	1	256	23.49	107	19.83	4.97	1
C.D.(0.05)		0.05		0.01	0.13	0.96			
C.V.(%)		0.59		0	0.27	0.44			
Mean of varieties:									
V1		4.33	2	253	22.25	100	20.00	4.52	1
V2		4.48	1	257	22.37	119	20.00	4.47	2
V3		-		-	-	-		4.42	3
V4		4.29	3	236	24.02	102	19.50	4.33	4
C.D.(0.05)		NS		15.65	0.59	1.31			
C.V. (%)		8.39		4.72	1.95	0.92			
Expt. Mean		**4.37**		**249**	**22.88**	**107**		4.43	
Soil type		Clay loam							
pH		5.62							
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		-							
V4		Numali(LC)							
Available N:P:K of soil (kg/ha)		-							

4.1(r) AVT 2 - Boro

The grain yield performance of three boro cultures IET 28840, IET 28848 and IET 28849 and its response to nutrient levels was evaluated against two standard checks (Rajlaxmi and IR 64) along with one local check (Sukumar) under two graded levels of nutrient (50 and100% of recommended dose of nutrient) at **Chinsurah** during 2021-22 *boro* season. The data received this location is summarized and presented in **Table 4.1r.**

The cultures differed significantly for grain yield at **Chinsurah** location. The mean maximum grain yield was recorded by IET 28840 (6.31 t/ha) followed by IET 28849 (6.03 t/ha) and the performance of standard checks were not promising except Rajlaxmi (5.66 t/ha).

RDF doses significantly influenced the grain yield and the increase in grain yield with 100% of RDF was 27% with better nutrient response of 9.13 kg grain/kg nutrient. Interaction effects between cultivars x RDF levels for grain yield was non-significant.

In this trial, three IET cultures (IET 28840, IET 28848 and IET 28849) were evaluated against two high yielding standard checks (Rajlaxmi and IR 64) along with one local check (Sukumar) at **Chinsurah**. The maximum grain yield was recorded by IET cultures IET 28840, and IET 28849 (5.31 & 6.03 t/ha) and found promising over standard checks at 100% of RDF application.

Table 4.1(r): 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 2021-22.

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	5.20	8	260	4.04	111		5.20	8
	V2	5.09	9	282	4.23	113		5.09	9
	V3	5.32	7	290	4.48	111		5.32	7
	V4	3.63	12	291	4.17	108		3.63	12
	V5	5.43	6	311	4.04	119		5.43	6
	V6	4.14	11	299	3.51	108		4.14	11
F2	V1	7.41	1	349	5.14	119	15.79	7.41	1
	V2	6.12	3	363	4.12	116	7.36	6.12	3
	V3	6.73	2	349	5.12	113	10.07	6.73	2
	V4	4.82	10	363	4.24	111	8.50	4.82	10
	V5	5.88	4	400	4.71	122	3.21	5.88	4
	V6	5.52	5	319	4.21	113	9.86	5.52	5
Interation									
F at same V		NS		NS	NS	1.54			
V at same F		NS		NS	NS	2.05			
F1		4.80	2	289	4.08	112		4.80	2
F2		6.08	1	357	4.59	116	9.13	6.08	1
C.D.(0.05)		0.12		6.23	0.25	2.19			
C.V.(%)		1.62		1.84	4.72	1.02			
Mean of varieties:									
V1		6.31	1	305	4.59	115	15.79	6.31	1
V2		5.61	4	322	4.18	115	7.36	5.61	4
V3		6.03	2	320	4.80	112	10.07	6.03	2
V4		4.23	6	327	4.21	110	8.50	4.23	6
V5		5.66	3	355	4.38	121	3.21	5.66	3
V6		4.83	5	309	3.86	111	9.86	4.83	5
C.D.(0.05)		0.12		7.09	0.13	1.44			
C.V. (%)		1.87		2.50	2.90	0.80			
Expt. Mean		**5.44**		**323**	**4.33**	**114**		5.44	
Soil type		-							
pH		-							
F - levels (kg/ha)									
F1		70:35:35							
F2		90:45:45							
Recommended N:P:K (kg/ha)		140:70:70							
Varieties									
V1		IET 28840							
V2		IET 28848							
V3		IET 28849							
V4		IR 64							
V5		Rajlaxmi							
V6		Sukumar (L C)							
Available N:P:K of soil (kg/ha)		-							

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

Rice crop suffers more from weed competition, unlike other cereal crops. Efficient cultures will reduce weed competition and enhance productivity with reduced input. The present investigation to study the herbicide tolerance in elite genotypes for their efficacy taken up at **Chiplima**, **ICAR-NRRI, Nagina, IARI New Delhi** and **Ranchi** during *Kharif* 2022. The trial was conducted in replicated split-plot design with weed control treatments (T1–Imazethapyr 10% SL post-emergence application; T2–Bispyribac-sodium 10% SC post-emergence application; T3–Weed free check) and T4-Weedy check as main plots and genotypes (G_1-IET 30284 (CR 4332-184-2-2-1), G_2- IET 30281 (CR 4332-37-2-1-1), G_3-Naveen (Recurrent Parent), G_4 - IET 30437 (CR 4333-181-1-2-1), G_5- IET 30438 (CR 4333-35-2-2-1), G_6- Sahbhagidhan (Recurrent Parent), G_7 - Pusa 1988 -15-7-44-98-15, G_8-Pusa 1988-15-7-44-98-67, G_9 - Pusa 44 (Recurrent Parent), G_{10} - CBHTR 22001, G_{11} - CBHTR 22002, G_{12} - CO 51 (Recurrent parent) and G_{13}- Robin (Herbicide Tolerant Check)) in sub-plots. The data on crop growth parameters, yield attributes, yield and weed parameters were recorded in the crop season and results are presented in **Tables 4.1(r).** The data from **Chiplima, Nagina** and **Ranchi** were not included due to the no sign of mortality in recurring parents in these centers for Imazethapyr treatment.

The mean grain yield at different locations ranged from 2.99 to 0.73 t/ha at **Cuttack** and **New Delhi**. Irrespective of the genotypes, weedy check has resulted in significantly lower plant growth and yield attributes *viz*., no of panicles, panicle weight, test weight, grain yield (1.32 t/ha). Among the weed management treatments, weed free followed by Bispyribacsodium and the application of Imazethapyr (10% SL) resulted in the higher grain yields (4.90 and 5.08 t/ha) and significantly superior to weedy check at **Cuttack**. Out of nine genotypes higher grain yields recorded with G_8-Pusa 1988-15-7-44-98-67 followed by G_7 - Pusa 1988 -15-7-44-98-15 (5.11 and 5.06 t/ha) were superior over checks (Naveen, Sahabhagidhan, Pusa 44 and Robin). All the HT genotypes performed superior over recurring parent (Naveen, Sahabhagidhan, Pusa 44 and CO 51). The pattern of the result followed in similar way at both the locations. Among the herbicides, Imazethapyr (1.49 t/ha) at **IARI, New Delhi** was promising with significantly higher grain yields. The culture G_1-IET 30284 (CR 4332-184-2-2-1) with higher grain yield (1.16 t/ha) followed by G_4 - IET 30437 (CR 4333-181-1-2-1) (1.13 t/ha) was also found promising.

The results of HT NIL experiment conducted at two locations indicated the superiority of Imazethapyr followed by weed free check. The genotypes G_8-Pusa 1988-15-7-44-98-67, G_7 - Pusa 1988 -15-7-44-98-15, G1 (CR 4332-184-2-2-1) and G_2- IET 30281 (CR 4332-37-2-1-1) recorded mean higher grain yield (3.04, 2.96, 2.91 and 2.77 respectively) with no or low phytotoxicity to Imazethapyr had contributed to higher crop growth and grain yield with standard pre and post-emergence applications of Imazethapyr and Bispyribacsodium.

Table 4.1(s): Summary of data on grain yield and ancillary characters of selected NIL -HT cultures grown under transplanted conditions at different weed control management, kharif 2022.

Main plot	Sub plot	CUTTACK					CUTTACK Log transformed values				
		Grain Yield (t/ha)	Rank	Straw Yield (t/ha)	Panicle/m^2 (No.)	Test wt (g)	Grain Yield (t/ha)	Rank	Straw Yield (t/ha)	Panicle/m^2 (No.)	Test wt (g)
T1: Imazethapyr	G1	5.78	9	6.50	336	21.7	0.89	7	0.93	2.53	1.37
	G2	5.71	11	6.37	357	21.7	0.89	7	0.92	2.55	1.37
	G3	0.00	49	0.00	0	0.0	0.30	49	0.30	0.30	0.30
	G4	4.72	22	6.33	341	21.4	0.83	21	0.92	2.54	1.37
	G5	4.89	19	6.75	366	21.8	0.84	15	0.94	2.56	1.38
	G6	0.00	49	0.00	0	0.0	0.30	49	0.30	0.30	0.30
	G7	6.11	4	6.95	341	23.3	0.91	2	0.95	2.53	1.40
	G8	6.15	3	7.37	343	23.3	0.91	2	0.97	2.54	1.40
	G9	0.00	49	0.00	0	0.0	0.30	49	0.30	0.30	0.30
	G10	4.94	17	6.52	309	20.7	0.84	15	0.93	2.49	1.36
	G11	4.74	21	6.43	299	20.6	0.83	21	0.93	2.48	1.35
	G12	0.00	49	0.00	0	0.0	0.30	49	0.30	0.30	0.30
	G13	3.50	34	4.72	295	21.6	0.74	33	0.83	2.47	1.37
T2: Bispyribacsodium (National Check)	G1	5.48	14	6.71	324	21.3	0.87	13	0.94	2.51	1.37
	G2	5.49	13	6.61	356	21.7	0.87	13	0.93	2.55	1.37
	G3	4.47	30	5.60	315	21.8	0.81	29	0.88	2.50	1.38
	G4	4.58	26	5.73	342	21.4	0.82	25	0.89	2.54	1.37
	G5	4.68	25	5.94	368	22.1	0.82	25	0.90	2.57	1.38
	G6	3.99	32	5.36	336	21.8	0.78	32	0.87	2.53	1.38
	G7	5.98	5	6.76	337	23.6	0.90	5	0.94	2.53	1.41
	G8	5.95	6	6.93	360	23.2	0.90	5	0.95	2.56	1.40
	G9	5.67	12	6.67	359	23.4	0.88	12	0.94	2.56	1.40
	G10	4.90	18	6.06	300	20.5	0.84	15	0.91	2.48	1.35
	G11	4.71	24	5.72	293	20.2	0.83	21	0.89	2.47	1.35
	G12	4.54	28	5.47	340	20.5	0.82	25	0.87	2.53	1.35
	G13	3.30	35	4.60	289	20.3	0.72	35	0.82	2.46	1.35
T3: Weed free check (with out weeds)	G1	5.79	8	6.89	350	21.8	0.89	7	0.95	2.54	1.38
	G2	5.75	10	7.10	340	21.4	0.89	7	0.96	2.53	1.37
	G3	4.53	29	6.32	297	21.2	0.81	29	0.92	2.47	1.37
	G4	4.72	23	5.92	352	21.1	0.83	21	0.90	2.55	1.36
	G5	4.94	16	6.07	351	22.2	0.84	15	0.91	2.55	1.38
	G6	4.12	31	5.32	342	21.2	0.79	31	0.86	2.54	1.36
	G7	6.21	2	7.87	347	23.1	0.91	2	0.99	2.54	1.40
	G8	6.26	1	7.77	352	23.1	0.92	1	0.99	2.55	1.40
	G9	5.85	7	7.59	320	23.2	0.89	7	0.98	2.51	1.40
	G10	4.98	15	6.72	299	20.4	0.84	15	0.94	2.48	1.35
	G11	4.85	20	6.30	331	20.7	0.84	15	0.92	2.52	1.36
	G12	4.57	27	6.15	359	20.5	0.82	25	0.91	2.56	1.35
	G13	3.54	33	4.85	291	20.4	0.74	33	0.84	2.47	1.35
T4: Weedy check (No weeding to be done)	G1	1.58	44	2.19	170	21.0	0.55	44	0.62	2.24	1.36
	G2	1.53	46	2.38	192	20.6	0.55	44	0.64	2.28	1.35
	G3	1.41	48	1.97	191	20.0	0.53	48	0.60	2.28	1.34
	G4	2.04	38	2.70	193	21.6	0.61	37	0.67	2.29	1.37
	G5	1.83	42	2.08	183	21.3	0.58	42	0.61	2.26	1.37
	G6	1.56	45	1.90	208	20.7	0.55	44	0.59	2.31	1.36
	G7	1.96	40	2.24	181	23.3	0.59	40	0.62	2.26	1.40
	G8	2.27	36	2.72	192	23.4	0.63	36	0.67	2.29	1.40
	G9	1.88	41	2.80	170	23.3	0.59	40	0.68	2.23	1.40
	G10	1.97	39	2.49	180	20.3	0.60	39	0.65	2.26	1.35
	G11	2.11	37	3.19	215	20.4	0.61	37	0.71	2.33	1.35
	G12	1.72	43	2.06	202	20.5	0.57	43	0.61	2.31	1.35
	G13	1.45	47	1.89	204	20.7	0.54	47	0.59	2.31	1.36

Table 4.1(r): Cntd..

Main plot	Sub plot	CUTTACK					CUTTACK Log transformed values				
		Grain Yield (t/ha)	Rank	Straw Yield (t/ha)	Panicle/m^2 (No.)	Test wt (g)	Grain Yield (t/ha)	Rank	Straw Yield (t/ha)	Panicle/m^2 (No.)	Test wt (g)
Mean of Factor 1											
	T1	3.58	3	4.46	230	15.08	0.68	3	0.73	1.84	1.05
	T2	4.90	2	6.01	332	21.68	0.84	2	0.90	2.52	1.37
	T3	5.08	1	6.53	333	21.56	0.85	1	0.93	2.52	1.37
	T4	1.79	4	2.35	191	21.32	0.58	4	0.64	2.28	1.37
C.D.(0.05)							0.01		0.01	0.04	0.01
C.V.(%)							3.62		2.35	3.05	1.15
Mean of Factor 2											
	G1	4.66	3	5.57	295	21.4	0.80	3	0.86	2.46	1.37
	G2	4.62	4	5.62	311	21.3	0.80	3	0.86	2.48	1.37
	G3	2.60	12	3.47	201	15.8	0.61	12	0.67	1.89	1.10
	G4	4.01	8	5.17	307	21.4	0.77	7	0.84	2.48	1.37
	G5	4.09	7	5.21	317	21.9	0.77	7	0.84	2.49	1.38
	G6	2.42	13	3.14	222	15.9	0.60	13	0.66	1.92	1.10
	G7	5.06	2	5.96	301	23.3	0.83	2	0.88	2.47	1.40
	G8	5.16	1	6.20	312	23.3	0.84	1	0.90	2.48	1.40
	G9	3.35	9	4.27	212	17.5	0.67	10	0.73	1.90	1.13
	G10	4.20	5	5.45	272	20.5	0.78	5	0.86	2.43	1.35
	G11	4.10	6	5.41	285	20.5	0.78	5	0.86	2.45	1.35
	G12	2.71	11	3.42	225	15.4	0.63	11	0.67	1.92	1.09
	G13	2.95	10	4.02	270	20.8	0.69	9	0.77	2.43	1.36
C.D.(0.05)							0.02		0.02	0.03	0.01
C.V.(%)							3.13		3.01	1.54	0.58
Interactions											
C.D.(0.05)							0.04		0.04	0.06	0.01
C.V.(%)							0.04		0.04	0.06	0.01
Exp mean		2.99		2.99	281	19.59	0.74		0.80	2.29	1.29

G1 IET 30284 (CR 4332-184-2-2-1)
G2 IET 30281 (CR 4332-37-2-1-1)
G3 Naveen (Recurrent Parent)
G4 CR 4333-181-1-2-1 (IET 30437)
G5 CR 4333-35-2-2-1 (IET 30438)
G6 Sahbhagidhan (Recurrent Parent)
G7 Pusa 1988 -15-7-44-98-15
G8 Pusa 1988-15-7-44-98-67
G9 Pusa 44 (Recurrent Parent)
G10 CBHTR 22001
G11 CBHTR 22002
G12 CO 51 (Recurrent parent)
G13 Robin (Herbicide Tolerant Check)

Table 4.1(r): Cntd..

Main plot	Sub plot	NEW DELHI			NEW DELHI log transformed values			Over all mean	Rank
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)		
T1: Imazethapyr	G1	2.89	1	329	0.67	1	2.48	4.34	1
	G2	2.55	2	327	0.66	2	2.50	4.13	4
	G3	0.00	42	0	0.30	42	0.30	0.00	49
	G4	2.49	3	334	0.65	3	2.52	3.61	5
	G5	2.13	6	359	0.61	6	2.55	3.51	6
	G6	0.00	42	0	0.30	42	0.30	0.00	49
	G7	2.24	5	344	0.62	5	2.49	4.17	3
	G8	2.35	4	271	0.63	4	2.41	4.25	2
	G9	0.00	42	0	0.30	42	0.30	0.00	49
	G10	1.67	8	271	0.56	8	2.44	3.31	13
	G11	1.22	10	207	0.50	10	2.28	2.98	19
	G12	0.00	42	0	0.30	42	0.30	0.00	49
	G13	1.86	7	220	0.58	7	2.33	2.68	24
T2: Bispyribacsodium (National Check)	G1	0.76	21	67	0.44	20	1.47	3.12	15
	G2	0.24	35	209	0.35	34	2.16	2.87	21
	G3	0.47	27	104	0.39	27	1.73	2.47	29
	G4	0.31	33	64	0.37	30	1.47	2.44	30
	G5	0.56	25	40	0.41	24	1.64	2.62	27
	G6	0.51	26	70	0.40	26	1.51	2.25	32
	G7	0.97	14	6	0.47	12	0.55	3.48	7
	G8	0.96	15	92	0.47	12	1.28	3.46	8
	G9	0.37	30	4	0.37	30	0.50	3.02	17
	G10	0.41	28	94	0.38	28	1.22	2.66	25
	G11	1.06	11	22	0.49	11	0.72	2.88	20
	G12	0.22	37	11	0.34	37	0.63	2.38	31
	G13	0.87	17	18	0.46	16	1.35	2.08	34
T3: Weed free check (with out weeds)	G1	0.86	18	178	0.45	18	2.22	3.33	11
	G2	0.92	16	123	0.46	16	2.07	3.33	10
	G3	0.74	22	44	0.44	20	1.70	2.63	26
	G4	1.38	9	125	0.53	9	1.45	3.05	16
	G5	0.76	20	213	0.44	20	2.30	2.85	22
	G6	0.37	31	85	0.37	30	1.89	2.24	33
	G7	0.23	36	56	0.35	34	1.73	3.22	14
	G8	0.37	29	45	0.38	28	1.36	3.32	12
	G9	1.00	12	61	0.47	12	1.31	3.43	9
	G10	0.99	13	107	0.47	12	2.05	2.98	18
	G11	0.81	19	23	0.45	18	0.82	2.83	23
	G12	0.64	23	42	0.42	23	1.29	2.60	28
	G13	0.58	24	88	0.41	24	1.51	2.06	35
T4: Weedy check (No weeding to be done)	G1	0.13	40	6	0.33	38	0.63	0.85	44
	G2	0.00	42	0	0.30	42	0.30	0.76	48
	G3	0.17	38	8	0.33	38	0.68	0.79	46
	G4	0.34	32	20	0.36	33	0.80	1.19	36
	G5	0.09	41	5	0.32	41	0.30	0.96	42
	G6	0.00	42	0	0.30	42	0.30	0.78	47
	G7	0.00	42	0	0.30	42	0.30	0.98	41
	G8	0.00	42	0	0.30	42	0.30	1.14	37
	G9	0.13	39	6	0.33	38	0.30	1.00	39
	G10	0.00	42	0	0.30	42	0.30	0.99	40
	G11	0.00	42	0	0.30	42	0.30	1.06	38
	G12	0.00	42	0	0.30	42	0.30	0.86	43
	G13	0.26	34	7	0.35	34	0.66	0.85	45

Table 4.1(r): Cntd..

Main plot	Sub plot	NEW DELHI			NEW DELHI log transformed values			Over all mean	Rank
		Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)	Grain Yield (t/ha)	Rank	Panicle/m^2 (No.)		
Mean of Factor 1									
	T1	1.49	1	205	0.51	1	1.79	2.54	3
	T2	0.59	3	62	0.41	3	1.25	2.75	2
	T3	0.74	2	91	0.43	2	1.67	2.91	1
	T4	0.09	4	4	0.32	4	0.42	0.94	4
C.D.(0.05)					0.04		0.34		
C.V.(%)					16.45		48.32		
Mean of Factor 2									
	G1	1.16	1	145	0.47	2	1.70	2.91	3
	G2	0.93	3	165	0.44	5	1.76	2.77	4
	G3	0.34	11	39	0.37	10	1.10	1.47	11
	G4	1.13	2	136	0.48	1	1.56	2.57	5
	G5	0.88	6	154	0.44	5	1.70	2.49	6
	G6	0.22	12	39	0.34	12	1.00	1.32	13
	G7	0.86	7	101	0.44	5	1.27	2.96	2
	G8	0.92	4	102	0.45	3	1.34	3.04	1
	G9	0.38	10	18	0.37	10	0.60	1.86	10
	G10	0.77	9	118	0.43	8	1.50	2.48	7
	G11	0.77	8	63	0.43	8	1.03	2.44	8
	G12	0.21	13	13	0.34	12	0.63	1.46	12
	G13	0.89	5	83	0.45	3	1.46	1.92	9
C.D.(0.05)					0.04		0.41		
C.V.(%)					11.22		39.39		
Interactions									
C.D.(0.05)					0.08		0.82		
C.V.(%)					0.08		0.83		
Exp mean		0.73		90.49	0.42		1.28	1.86	

G1	IET 30284 (CR 4332-184-2-2-1)
G2	IET 30281 (CR 4332-37-2-1-1)
G3	Naveen (Recurrent Parent)
G4	CR 4333-181-1-2-1 (IET 30437)
G5	CR 4333-35-2-2-1 (IET 30438)
G6	Sahbhagidhan (Recurrent Parent)
G7	Pusa 1988 -15-7-44-98-15
G8	Pusa 1988-15-7-44-98-67
G9	Pusa 44 (Recurrent Parent)
G10	CBHTR 22001
G11	CBHTR 22002
G12	CO 51 (Recurrent parent)
G13	Robin (Herbicide Tolerant Check)

4.1(t) Grain Yield Efficiency Index values (GYEI):

Grain yield is the best measure for evaluation of given genotype in the screening experiments for its efficiency. Further, field screening results can be interpreted using the grain yield efficiency index (GYEI) for identifying efficient, stable, suitable and promising cultures at various levels of nutrient application.

Grain yield efficiency Index (GYEI) was computed for genotype evaluation using the following formula in the present Nitrogen variety evaluation trial.

$$\text{GYEI} = \frac{\textbf{(Yield at low nutrient level) (Yield at high nutrient level)}}{\textbf{(Experimental mean yield at low nutrient level) X (Experimental mean yield at high nutrient level)}}$$

Tolerant genotypes have a (GYEI) of 1 or higher and the susceptible ones have a GYEI in the range of 0 to 0.50 and the genotypes between these two limits (0.50 to 1.00) are considered intermediate types. The results of these trials, if utilized meticulously not only aid to develop promising cultivars but also to reduce the cost of cultivation in rice production.

Based on the GYEI values few promising cultivars identified in different groups is furnished below:

Based on the Grain yield efficiency index GYEI values (stable and efficient genotypes), the identified cultures were *viz*., IET 28196 (1.65), IET 28884 (1.07), IET 28883 (1.57), IET 28895 (1.74) and IET 28882 (1.74) in AVT-2 EH; IET 28224 (1.09) and IET 28217 (1.19) in AVT-2 MH; IET 29140 (1.08), IET 28954 (1.08), IET 28960 (1.14), IET 29177 (1.02), IET 28959 (1.26), IET 28964 (1.11) and IET 28950 (1.06) in AVT-2 E-TP; IET 30437 (1.03) and IET 30438 (1.12) in AVT-2 E(DS); IET 29233 (1.08), IET 29212 (1.01), IET 29235 (1.15), IET 29246 (1.01), IET 29238 (1.00), IET 28982 (1.08), IET 28128 (1.14) and IET 28979 (1.12) in AVT-2 IME; IET 29268 (1.10), IET 28489 (1.06), IET 29002 (1.04), IET 29284 (1.01), IET 28997 (1.10), IET 29001 (1.14), IET 29004 (1.04), IET 29009 (1.09) and IET 29000 (1.20) in AVT-IM; IET 29351 (1.08) and IET 28508 (1.02) in AVT-2 L; IET 30409 (1.04) and IET 30410 (1.02) in AVT-2 RSL; IET 27851 (1.05) in AVT-2 CSTVT; IET 29360 (1.07) and IET 29361 (1.07) in AL&ISTVT; IET 29412 (1.40), IET 29411 (1.10), IET 29415 (1.08), IET 29424 (1.19), IET 29436 (1.24) and IET 29409 (1.04) in AVT-2 Aerobic; IET 29523 (1.01), IET 29017 (1.22) and IET 29536 (1.05) in AVT-2 MS; IET 28018 (1.02) in NIL DRT; IET 26741 (1.04) in AVT-2 DW; IET 29121 (1.16), IET 29122 (1.03) and IET 28299 (1.04) in AVT-2 SDW; IET 28840 (1.32), IET 28848 (1.07) and IET 28849 (1.23) in AVT-2 BORO; were identified as higher nutrient use and efficient cultures during Kharif 2022. These cultures can be recommended for low input management.

With regards to evaluate to identify phosphorous use efficient cultures, IET 28821 in AVT-2 LPT was found promising with higher mean GYEI value for Phosphorous. This culture can be recommended for low Phosphorous application.

Table. 4.1(t): Identification of cultures based on the GYEI values in different groups of cultivars.

AVT-2 EH (Irrigated)			AVT-2 MH (Irrigated)			AVT-2 E-TP			AVT-2 E-DS		
Nutrient-Levels	**Varieties**	**GYEI**	**Nutrient-Level**	**Varieties**	**GYEI**	**Nutrient-Level**	**Varieties**	**GYEI**	**Nutrient-Level**	**Varieties**	**GYEI**
F2	IET 28890	0.91	**F2**	IET 28224	1.09	**F2**	IET 29140	1.08	**F2**	IET 28835 (R)	0.83
	IET 28196	1.65		IET 28222	0.97		IET 28954	1.08		IET 28834 (R)	0.96
	IET 28206	0.91		IET 28907	0.96		IET 28960	1.14		IET 30437	1.03
	IET 28884	1.07		IET 28217	1.19		IET 29142	0.93		IET 30438	1.12
	IET 28883	1.57		RC Maniphace 1	1.69		IET 29177	1.02		NC: Sahabhagidhan	0.64
	IET 28895	1.74		Vivekdhan 62	1.99		IET 28959	1.26		Local Check	1.15
	IET 28882	1.74		V L Dhan 65(N)	0.57		IET 28964	1.11			
	Shalimar Rice 3	1.41		Local Check	1.25		IET 28950	1.06			
	Vivekdhan 86	1.12					IET 29197	0.89			
	VL Dhan 86	1.25					IET 27866	0.99			
	Local Check	1.22					IET 26898	0.94			
							CO-51 (NC),	0.77			
							PR-124 (N)	0.92			
							NDR 97	0.61			
							MTU 1153 (S)	1.05			
							US 314 (Hybrid)	0.91			
							Local Check	0.94			
	Mean	**1.33**		**Mean**	**1.21**		**Mean**	**0.98**		**Mean**	**0.96**

Table. 4.1(t): Cntd…

AVT-2-IME (TP)			AVT-2 IM (TP)			AVT-2 Late			AVT 2 - RSL		
Nutrient-Level	**Varieties**	**GYEI**	**Nutrient-Level**	**Varieties**	**GYEI**	**Nutrient-Level**	**Varieties**	**GYEI**	**Nutrient-Level**	**Varieties**	**GYEI**
F2	IET 29214	0.97	**F2**	IET 29268	1.10	**F2**	IET 29349	0.95	**F2**	IET 30409	1.04
	IET 29233	1.08		IET 28489	1.06		IET 29351	1.08		IET 30410	1.02
	IET 29217	0.92		IET 29002	1.04		IET 28508	1.02		NC: Swarna Sub 1	0.99
	IET 29212	1.01		IET 29284	1.01		IET 28509	0.99		Local check	0.95
	IET 28353	0.98		IET 29014	0.97		Swarna (NC)	1.03			
	IET 29235	1.15		IET 29257	0.87		NDR 8002 (E &C)	0.92			
	IET 29246	1.01		IET 29301	0.92		PA 6444 (Hybrid)	1.06			
	IET 29238	1.00		IET 28997	1.10		Local check	0.96			
	IET 28982	1.08		IET 29256	0.86						
	IET 28128	1.14		IET 29290	0.99						
	IET 28979	1.12		IET 29001	1.14						
	IET 29236	0.96		IET 29004	1.04						
	IET 28506	0.77		IET 29009	1.09						
	Gondhra Bidhan-3	1.11		IET 29000	1.20						
	PR 113 (N)	0.94		IET 27908	0.99						
	Lalat (E & NE)	0.46		IET 27900	0.98						
	Karjat-7 (W)	0.60		NC- NDR 359	0.92						
	MTU 1010 (C& S)	0.78		PR121 (N)	1.25						
	IR 64 sub1(RP)	0.64		CR Dhan 300 (E & NE)	0.73						
	US 312	1.10		Karma Mahsuri (C)	1.19						
	Local check	1.03		Akshaydhan (W)	0.79						
				Jaya (S)	0.88						
				HRI 174	1.01						
				Hybrid check GNR-3	1.19						
				Local check	0.95						
	Mean	**0.95**		**Mean**	**1.01**		**Mean**	**1.00**		**Mean**	**1.00**

Table. 4.1(t): Cntd…

AVT 2 -CSTVT			AL & ISTVT			AVT-2 Aerobic			AVT-2 Biofortified		
Nutrient-Level	**Varieties**	**GYEI**	**Nutrient-Level**	**Varieties**	**GYEI**	**Nutrient-Level**	**Varieties**	**GYEI**	**Nutrient-Level**	**Varieties**	**GYEI**
F2	IET 27851	1.05	**F2**	IET 29356	0.93	**F2**	IET 29423	0.94	**F2**	IET 28694	0.88
	CSR-10	1.45		IET 29365	0.84		IET 29422	0.95		BPT 5204	1.04
	Jaya	3.00		IET 29354	0.96		IET 29412	1.40		IR 64	1.03
	Improved White Ponny	2.09		IET 29360	1.07		IET 29396	0.95		Kalanamak	0.55
	Hybrid Check (FL 478)	0.60		IET 29361	1.07		IET 29405	0.93		Local Check	1.49
	Local Check	1.05		IET 29366	0.89		IET 29411	1.10			
				IET 29358	0.86		IET 29415	1.08			
				IET 29353	0.97		IET 29424	1.19			
				IET 27807	0.95		IET 29394	0.75			
				CSR 36 (Alkaline)	1.16		IET 29436	1.24			
				CSR 10 (Early)	1.09		IET 29421	0.99			
				FL 478 (Saline Tolerant)	1.11		IET 29409	1.04			
				CSR 23 (Inland Saline)	1.03		IET 29430	0.74			
				Pusa 44 (Sensitive)	1.06		IET 29410	0.77			
				Local check	1.38		IET 29446	0.90			
							CR Dhan 201(NC)	0.95			
							CR Dhan 202 (N, E, NE & C)	0.87			
							MAS 946-1 (S)	0.62			
							PA 6129 (Hybrid)	1.13			
							Local check	1.20			
	Mean	**1.54**		**Mean**	**1.03**		**Mean**	**0.99**		**Mean**	**1.00**

Table. 4.1(t): Cntd…

AVT-2 MS			AVT-2 DRT			AVT-2 DW			AVT-2 SDW			AVT-2 BORO		
Nutrient-Level	Varieties	GYEI	Nutrient-Level	Varieties	GYEI	Nutrient-Level	Varieties	GYEI	Nutrient-Level	Varieties	GYEI	Nutrient-Level	Varieties	GYEI
F2	IET 29539	0.89	F2	IET 28018	1.02	F2	IET 26741	1.04	F2	IET 29121	1.16	F2	IET 28840	1.32
	IET 29523	1.01		IET 28017	0.86		NC: CR Dhan 500	0.93		IET 29122	1.03		IET 28848	1.07
	IET 29492	0.88		Pusa 44 (RP)	0.98		Local check	1.03		IET 28296	0.97		IET 28849	1.23
	IET 29017	1.22		MTU 1010	1.15					IET 28299	1.04		IR 64	0.60
	IET 29536	1.05		Local check	1.83					NC: CR Dhan 506	0.82		Rajlaxmi	1.09
	WGL 14 (NC 1)	0.78								Local check	0.98		Local check	0.78
	BPT 5204 (NC 2)	0.87												
	ADT-49 (S)	0.78												
	27P63 (HC)	1.20												
	Local Check	0.88												
	Mean	**0.94**		**Mean**	**1.17**		**Mean**	**1.00**		**Mean**	**1.00**		**Mean**	**1.01**

AVT-2 LPT						
Nutrient-Level	Varieties	GYEI (P2-P1)	Nutrient-Level	Varieties	GYEI (P3-P2)	Mean GYEI
P2	IET 28821	1.00	P3	IET 28821	0.99	1.00
	Swarna	1.05		Swarna	1.08	1.07
	Rasi	1.09		Rasi	1.02	1.05
	Improved Samba Mahsuri	0.88		Improved Samba Mahsuri	0.94	0.91
	BPT 5204	0.87		BPT 5204	0.93	0.90
	Local check	1.20		Local check	1.07	1.14
	Mean	**1.01**		**Mean**	**1.00**	**1.01**

Table. 4.1. (u): Identification of cultures performing better with low level of Nutrients application based on the % yield reduction at 50 % of RDN and 100% of RDN

Group	Group	Entry No	50	100	Diffrence -50	(%) Reduction
EH	V1	IET 28890	4.02	4.59	0.57	12.35
	V2	IET 28196	5.47	6.13	0.66	10.72
	V3	IET 28206	4.09	4.49	0.40	8.81
	V4	IET 28884	4.47	4.87	0.41	8.34
	V5	IET 28883	5.22	6.08	0.86	14.19
	V6	IET 28895	5.73	6.16	0.43	6.98
	V7	IET 28882	5.49	6.44	0.95	14.71
	V8	Shalimar Rice 3	5.19	5.50	0.30	5.52
	V9	Vivekdhan 86	4.50	5.04	0.54	10.77
	V10	VL Dhan 86	4.90	5.18	0.28	5.41
	V11	Local Check	4.63	5.35	0.72	13.45
MH	V1	IET 28224	3.93	4.46	0.53	11.83
	V2	IET 28222	3.72	4.20	0.48	11.43
	V3	IET 28907	3.70	4.17	0.46	11.12
	V4	IET 28217	4.05	4.74	0.68	14.43
	V5	RC Maniphace 1	4.82	5.67	0.85	14.99
	V6	Vivekdhan 62	5.49	5.86	0.37	6.31
	V7	V L Dhan 65(N)	2.82	3.29	0.47	14.16
	V8	Local Check	4.16	4.84	0.68	13.95
E(TP)	V1	IET 29140	4.26	5.17	0.91	17.55
	V2	IET 28954	4.24	5.20	0.96	18.46
	V3	IET 28960	4.43	5.28	0.85	16.10
	V4	IET 29142	4.01	4.76	0.75	15.69
	V5	IET 29177	4.22	4.92	0.70	14.25
	V6	IET 28959	4.62	5.57	0.95	17.01
	V7	IET 28964	4.40	5.16	0.76	14.66
	V8	IET 28950	4.29	5.05	0.76	15.03
	V9	IET 29197	3.84	4.71	0.87	18.44
	V10	IET 27866	4.10	4.96	0.85	17.22
	V11	IET 26898	4.00	4.78	0.77	16.16
	V12	CO-51 (NC),	3.57	4.40	0.83	18.90
	V13	PR-124 (N)	3.92	4.81	0.90	18.61
	V14	NDR 97	3.00	4.14	1.14	27.54
	V15	MTU 1153 (S)	4.20	5.09	0.88	17.35
	V16	US 314 (Hybrid)	3.80	4.88	1.08	22.14
	V17	Local Check	4.04	4.77	0.73	15.40
E(DS)	V1	IET 28835 (R)	3.13	3.89	0.75	19.37
	V2	IET 28834 (R)	3.43	4.12	0.69	16.74
	V3	IET 30437	3.47	4.36	0.89	20.40
	V4	IET 30438	3.74	4.43	0.69	15.48
	V5	NC: Sahabhagidhan	2.75	3.45	0.70	20.31
	V6	Local Check	3.74	4.52	0.78	17.22

Table. 4.1. (u): Cntd….

Group	Group	Entry No	50	100	Diffrence -50	(%) Reduction
IME (TP)	V1	IET 29214	4.35	5.27	0.92	17.39
	V2	IET 29233	4.68	5.50	0.82	14.85
	V3	IET 29217	4.26	5.12	0.87	16.94
	V4	IET 29212	4.48	5.34	0.86	16.16
	V5	IET 28353	4.44	5.24	0.80	15.27
	V6	IET 29235	4.79	5.70	0.91	15.91
	V7	IET 29246	4.53	5.30	0.77	14.49
	V8	IET 29238	4.48	5.31	0.83	15.64
	V9	IET 28982	4.59	5.61	1.02	18.21
	V10	IET 28128	4.77	5.66	0.89	15.70
	V11	IET 28979	4.78	5.58	0.80	14.31
	V12	IET 29236	4.47	5.08	0.61	11.97
	V13	IET 28506	3.97	4.58	0.61	13.30
	V14	Gondhra Bidhan-3	4.72	5.57	0.86	15.38
	V15	PR 113 (N)	4.41	5.08	0.67	13.13
	V16	Lalat (E & NE)	3.92	2.76	-1.16	-42.03
	V17	Karjat-7 (W)	3.87	3.67	-0.20	-5.31
	V18	MTU 1010 (C& S)	3.85	4.79	0.94	19.67
	V19	IR 64 sub1(RP)	3.67	4.15	0.48	11.57
	V20	US 312	4.73	5.50	0.77	14.02
	V21	Local check	4.56	5.39	0.83	15.47

Group	Group	Entry No	50	100	Diffrence -50	(%) Reduction
IM (TP)	V1	IET 29268	4.80	6.07	1.27	20.89
	V2	IET 28489	4.71	5.94	1.23	20.75
	V3	IET 29002	4.75	5.82	1.06	18.29
	V4	IET 29284	4.58	5.85	1.27	21.78
	V5	IET 29014	4.46	5.74	1.28	22.28
	V6	IET 29257	4.24	5.42	1.19	21.89
	V7	IET 29301	4.40	5.52	1.12	20.28
	V8	IET 28997	4.78	6.10	1.32	21.67
	V9	IET 29256	4.27	5.34	1.07	20.00
	V10	IET 29290	4.59	5.71	1.12	19.66
	V11	IET 29001	4.90	6.17	1.27	20.57
	V12	IET 29004	4.66	5.93	1.27	21.37
	V13	IET 29009	4.78	6.05	1.26	20.91
	V14	IET 29000	5.06	6.29	1.23	19.61
	V15	IET 27908	4.53	5.77	1.25	21.59
	V16	IET 27900	4.54	5.70	1.16	20.36
	V17	NC- NDR 359	4.37	5.60	1.23	21.90
	V18	PR121 (N)	5.20	6.38	1.18	18.50
	V19	CR Dhan 300 (E & NE)	3.85	5.05	1.20	23.76
	V20	Karma Mahsuri (C)	5.29	5.98	0.69	11.54
	V21	Akshaydhan (W)	4.03	5.20	1.17	22.52
	V22	Jaya (S)	4.35	5.38	1.03	19.15
	V23	HRI 174	4.59	5.84	1.25	21.34
	V24	Hybrid check GNR-3	5.31	5.95	0.64	10.81
	V25	Local check	4.44	5.67	1.23	21.68

Group	Group	Entry No	50	100	Diffrence -50	(%) Reduction
Late	V1	IET 29349	4.11	5.03	0.91	18.18
	V2	IET 29351	4.36	5.42	1.06	19.52
	V3	IET 28508	4.28	5.20	0.92	17.64
	V4	IET 28509	4.22	5.09	0.87	17.06
	V5	Swarna (NC)	4.22	5.32	1.10	20.61
	V6	NDR 8002 (E &C)	3.96	5.06	1.10	21.73
	V7	PA 6444 (Hybrid)	4.24	5.46	1.21	22.25
	V8	Local check	4.05	5.17	1.12	21.71

Table. 4.1. (u): Cntd….

Group	Group	Entry No	50	100	Diffrence -50	(%) Reduction
RSL	**V1**	IET 30409	4.02	5.03	1.01	20.05
	V2	IET 30410	3.97	4.97	0.99	20.02
	V3	NC: Swarna Sub 1	3.84	5.00	1.16	23.20
	V4	Local check	3.75	4.91	1.16	23.58
Group	**Group**	**Entry No**	**50**	**100**	**Diffrence -50**	**(%) Reduction**
CSTVT	**V1**	IET 27851	3.70	4.36	0.67	15.31
	V2	CSR-10	4.13	5.41	1.28	23.66
	V3	Jaya	6.71	6.88	0.17	2.47
	V4	Improved White Ponny	5.41	5.93	0.52	8.77
	V5	Hybrid Check (FL 478)	2.83	3.28	0.45	13.78
	V6	Local Check	3.76	4.31	0.55	12.71
Group	**Group**	**Entry No**	**50**	**100**	**Diffrence -50**	**(%) Reduction**
AL&ISTVT	**V1**	IET 29356	2.54	3.90	1.37	35.00
	V2	IET 29365	2.57	3.50	0.93	26.61
	V3	IET 29354	2.83	3.62	0.79	21.78
	V4	IET 29360	2.94	3.86	0.92	23.90
	V5	IET 29361	3.02	3.75	0.73	19.54
	V6	IET 29366	2.55	3.73	1.18	31.72
	V7	IET 29358	2.60	3.51	0.91	25.93
	V8	IET 29353	2.74	3.79	1.05	27.74
	V9	IET 27807	2.64	3.85	1.22	31.60
	V10	CSR 36 (Alkaline)	2.95	4.19	1.24	29.51
	V11	CSR 10 (Early)	2.82	4.11	1.30	31.51
	V12	FL 478 (Saline Tolerant)	3.39	3.48	0.09	2.59
	V13	CSR 23 (Inland Saline)	2.80	3.92	1.12	28.61
	V14	Pusa 44 (Sensitive)	3.33	3.40	0.07	2.06
	V15	Local check	3.27	4.49	1.22	27.15
Group	**Group**	**Entry No**	**50**	**100**	**Diffrence -50**	**(%) Reduction**
Aerobic	**V1**	IET 29423	4.01	4.49	0.48	10.79
	V2	IET 29422	3.95	4.62	0.67	14.52
	V3	IET 29412	4.89	5.48	0.59	10.86
	V4	IET 29396	4.01	4.53	0.51	11.30
	V5	IET 29405	3.86	4.58	0.72	15.69
	V6	IET 29411	4.14	5.07	0.93	18.35
	V7	IET 29415	4.24	4.89	0.65	13.27
	V8	IET 29424	4.39	5.17	0.78	15.08
	V9	IET 29394	3.53	4.08	0.55	13.49
	V10	IET 29436	4.47	5.29	0.82	15.55
	V11	IET 29421	4.16	4.55	0.39	8.56
	V12	IET 29409	4.21	4.72	0.52	10.91
	V13	IET 29430	3.47	4.07	0.60	14.77
	V14	IET 29410	3.46	4.26	0.80	18.75
	V15	IET 29446	3.87	4.47	0.60	13.35
	V16	CR Dhan 201(NC)	3.98	4.56	0.58	12.72
	V17	CR Dhan 202 (N, E, NE & C)	3.56	4.67	1.11	23.77
	V18	MAS 946-1 (S)	3.21	3.68	0.46	12.62
	V19	PA 6129 (Hybrid)	4.21	5.13	0.92	17.96
	V20	Local check	4.44	5.19	0.75	14.46

Group	Group	Entry No	50	100	Diffrence -50	(%) Reduction
Biofortified	**V1**	IET 28694	3.71	4.89	1.19	24.24
	V2	BPT 5204	4.15	5.15	1.00	19.34
	V3	IR 64	4.09	5.21	1.11	21.40
	V4	Kalanamak	3.16	3.56	0.40	11.24
	V5	Local Check	5.19	5.92	0.73	12.26

Table. 4.1. (u): Cntd….

Group	Group	Entry No	50	100	Diffrence -50	(%) Reduction
MS	V1	IET 29539	3.92	5.21	1.29	24.84
	V2	IET 29523	4.17	5.59	1.43	25.51
	V3	IET 29492	3.92	5.18	1.27	24.40
	V4	IET 29017	4.64	6.04	1.39	23.08
	V5	IET 29536	4.27	5.63	1.36	24.11
	V6	WGL 14 (NC 1)	3.79	4.74	0.96	20.15
	V7	BPT 5204 (NC 2)	3.94	5.08	1.15	22.59
	V8	ADT-49 (S)	3.70	4.87	1.17	24.08
	V9	27P63 (HC)	4.75	5.80	1.05	18.13
	V10	Local Check	4.01	5.06	1.05	20.67

Group	Group	Entry No	50	100	Diffrence -50	(%) Reduction
DRT	V1	IET 28018	3.81	4.81	1.00	20.81
	V2	IET 28017	3.46	4.47	1.00	22.44
	V3	Pusa 44 (RP)	3.79	4.63	0.85	18.30
	V4	MTU 1010	4.09	5.04	0.94	18.72
	V5	Local check	5.47	6.00	0.53	8.83

Group	Group	Entry No	50	100	Diffrence -50	(%) Reduction
DW	V1	IET 26741	3.73	4.82	1.10	22.72
	V2	NC: CR Dhan 500	3.50	4.58	1.08	23.61
	V3	Local check	3.99	4.47	0.49	10.85

Group	Group	Entry No	50	100	Diffrence -50	(%) Reduction
SDW	V1	IET 29121	3.04	4.21	1.17	27.79
	V2	IET 29122	3.00	3.81	0.81	21.16
	V3	IET 28296	2.77	3.87	1.11	28.55
	V4	IET 28299	2.78	4.15	1.37	32.93
	V5	NC: CR Dhan 506	2.61	3.50	0.89	25.46
	V6	Local check	2.88	3.77	0.90	23.74

Group	Group	Entry No	50	100	Diffrence -50	(%) Reduction
BORO	V1	IET 28840	5.20	7.41	2.21	29.82
	V2	IET 28848	5.09	6.12	1.03	16.83
	V3	IET 28849	5.32	6.73	1.41	20.95
	V4	IR 64	3.63	4.82	1.19	24.69
	V5	Rajlaxmi	5.43	5.88	0.45	7.65
	V6	Local check	4.14	5.52	1.38	25.00

Group	Group	Entry No	0% RDP	50% RDP	100% RDP	0-50% difference	Reduction %	50-100% difference	Reduction %	Mean Grain Yield difference	Mean Reduction %
AVT 2 LPT	V1	IET 28821	4.33	4.94	5.24	0.61	12.38	0.29	5.58	0.45	8.98
	V2	Swarna	4.32	5.20	5.44	0.88	16.95	0.24	4.41	0.56	10.68
	V3	Rasi	4.81	4.84	5.51	0.03	0.62	0.67	12.16	0.35	6.39
	V4	Improved Samba Mahsuri	3.99	4.69	5.26	0.70	14.85	0.57	10.78	0.63	12.82
	V5	BPT 5204	3.92	4.72	5.17	0.80	16.95	0.45	8.66	0.62	12.80
	V6	Local check	4.98	5.17	5.41	0.20	3.77	0.23	4.35	0.22	4.06

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 6 locations (**Aduthurai, Karaikal, Ludhiana, Puducherry, Ranchi and Warangal**). Split plot design was adopted with 3 main plots 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 3 subplots 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 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 irrigation management and crop establishment methods on grain yield was found to be significant. Flooding throughout crop growth (3 + / - 2 cm) along with transplanting method resulted in the highest grain yield (6.16 t/ha). Among irrigation management practices, grain yield did not differ significantly. Among crop establishment methods, manual transplanting resulted in the highest grain yield (5.93 t/ha), however, at par with mechanical transplanting (5.69 t/ha). The highest water input was recorded in flooding throughout crop growth (3 + / - 2 cm) (1235 mm/ha). However, it was interesting to note that the water input was similar under all three establishment methods (1026 mm/ha). Among irrigation management practices, the cost of cultivation varied from Rs. 47939/- to Rs. 48989/- . However, among establishment methods, the highest cost of cultivation was recorded under transplanting method (Rs. 51349/-) followed by mechanical transplanting (Rs. 47787/-) and the lowest in wet direct seeding (Rs. 46330/-). In clay loam soils of **Karaikal**, ADT 36 variety was grown. Interaction and main plot effect was found to be non-significant on grain yield. All water management practices were found equally effective in producing grain yield ranging from 3.96 to 4.96 t/ha. Among establishment methods, wet direct seeding resulted the highest grain yield (4.87 t/ha), however, at par with mechanical transplanting (4.56 t/ha). Among water management practices alternate wetting and drying required less water input (1067 mm/ha), similarly, among establishment methods, mechanical transplanting recorded equal water input with transplanting method (1083 mm/ha). At sandy loam soils of Ludhiana, Interaction, main

plots and sub plots effects on grain yield was non-significant. Among irrigation managements, the grain yield was ranged from 7.44 t/ha to 7.56 t/ha. Similarly, among crop establishment methods, the grain yield was ranged from 7.42 t/ha to 7.60 t/ha. The cost of cultivation was higher in transplanting method (Rs. 55559/-) than mechanical transplanting (Rs. 53680/-) and wet direct seeding (Rs. 53332/-). In clay loam soils of **Puducherry**, interaction of irrigation management and crop establishment methods on grain yield was found to be non-significant. Among irrigation managements, the highest grain yield was recorded in alternate wetting and drying plots (6.93 t/ha). Among crop establishment methods, the highest grain yield was recorded in mechanical transplanting plots (6.91 t/ha). Similarly, alternate wetting and drying irrigated plots received less water (797 mm/ha) than flooding (1197 mm/ha). The cost of cultivation was Rs. 57080/- under wet direct seeding than transplanting (Rs. 59780/-). In Ranchi, the interaction effect and crop establishment effect on grain yield was found to be non-significant. Among irrigation managements, flooding recorded the highest grain yield (5.21 t/ha). The cost of cultivation was higher in alternate wetting and drying (Rs. 37263/-) than flooding (Rs. 34175/-). The cost of cultivation in mechanical transplanting (Rs. 34677/-), wet direct seeding (Rs. 31187/-) were much lower than transplanting (Rs. 39750/-). In clay loam soils of Warangal, the interaction effect on grain yield was found to be non-significant. Among irrigation managements, alternate wetting and drying recorded the highest grain yield (6.22 t/ha). Among crop establishment methods, the highest grain yield was recorded in manual transplanted plots (6.31 t/ha). Among irrigation management practices, overall, across all the 5 locations the highest mean grain yield was recorded under alternate wetting and drying (5.95 t/ha). Similarly, transplanting method recorded the highest mean grain yield of 5.94 t/ha across all locations.

Rabi:

Water management for enhancing water use efficiency and productivity of mechanical transplanted rice (Rabi)

The trial was conducted at 2 locations (**Karaikal and Puducherry**). In clay loam soils of **Karaikal**, the interaction effect and irrigation management effect on grain yield was found to be non-significant. ADT 46 produced the highest grain yield under alternate wetting and drying (5.21 t/ha). Among crop establishment methods, the highest grain yield was recorded in manual transplanted plots (5.20 t/ha). Alternate wetting and drying treatment recorded the lowest cost of cultivation (Rs. 41632/- per hectare) and total water input (953 mm/ha). Similarly, mechanical transplanting method on puddle soil also recorded the lowest cost of cultivation (Rs. 34,633/- per hectare). Normal transplanting method showed lowest total water input (1053 mm/ha). In clay loam soils of **Puducherry**, interaction effect on grain yield was found to be non-significant. Alternate wetting and drying treatment resulted in the highest grain yield (7.15 t/ha) and total water input (818 mm/ha). Similarly, mechanical transplanting on puddled soil recorded the highest grain yield (7.24 t/ha). Among crop establishment methods, direct wet seeding on puddled soil recorded the lowest cost of cultivation (Rs. 56850/- per hectare).

Table 4.2.1: Evaluation of Water management for enhancing Water use efficiency and productivity of mechanical transplanted rice, Kharif-2022.

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)	Total water input (mm)	Water productivity (kg/ha-mm)	Cost of cultivation (Rs/ha)
I 1- Flooding throughout crop growth (3 +/- 2cm) after 15 days	M1	5.78	3	94.67	289	2.94	17.50	1235	4.68	48288
	M2	5.29	8	93.00	308	2.94	18.03	1235	4.28	46831
	M3	6.16	1	91.67	332	3.12	18.53	1235	4.99	51847
I 2- Irrigation at Saturation (No flooding)	M1	5.61	6	91.33	294	2.99	18.00	976	5.75	47836
	M2	5.12	9	87.33	322	3.07	18.53	976	5.25	46380
	M3	5.97	2	84.33	342	3.13	18.67	976	6.12	51399
I 3- Alternate wetting and drying	M1	5.69	4	90.67	292	2.97	17.97	866	6.57	47238
	M2	5.56	7	91.00	318	3.08	18.20	866	6.42	45780
	M3	5.67	5	90.33	339	3.09	18.30	866	6.55	50800
Mean of Irrigation										
I1		5.74	1	93.11	310	3.00	18.02	1235	4.65	48989
I2		5.56	3	87.67	319	3.06	18.40	976	5.70	48538
I3		5.64	2	90.67	316	3.04	18.16	866	6.51	47939
C.D. (0.05)		NS		2.52	NS	0.02	0.16			
C.V. (%)		4.22		3.32	2.05	0.85	1.08			
Method of Methods										
M1		5.69	2	92.22	291.56	2.97	17.82	1026	5.55	47787
M2		5.32	3	90.44	316.11	3.03	18.26	1026	5.19	46330
M3		5.93	1	88.78	337.67	3.11	18.50	1026	5.78	51349
CD (0.05)		0.18		2.54	6.72	0.05	0.16			
C.V. (%)		3.17		2.73	2.08	1.67	0.83			
Interaction										
I and M		0.32		NS	NS	NS	0.27			
M and I		0.28		NS	NS	NS	0.24			
Experimental Mean		5.65		90.48	315.11	3.04	18.19	1026		48489
Soil type		-								
pH		-								
EC		-								
Variety		-								
Available NPK kg/ha		-								

M_1 - Mechanical Transplanting

M_2 - Direct wet seeding on puddled soil

M_3 - Manual transplanting

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/m² (No.)	Panicle wt (g)	Test wt (g)	Total water input (mm)	Water productivity (kg/ha-mm)
I 1- Flooding throughout crop growth (3 +/- 2cm) after 15 days	M1	5.19	1	7.79	114.4	343	4.89	21.12	1150	4.51
	M2	5.13	2	6.93	110.2	277	4.78	20.51	1200	4.28
	M3	4.58	5	7.75	114.1	480	4.56	21.33	1150	3.98
I 2- Irrigation at Saturation (No flooding)	M1	3.80	8	6.84	112.0	442	4.36	21.64	1050	3.62
	M2	4.41	6	7.60	115.7	299	5.54	22.10	1130	3.90
	M3	3.67	9	6.70	113.5	480	4.06	21.33	1050	3.50
I 3- Alternate wetting and drying	M1	4.70	4	6.60	110.1	537	4.99	21.72	1050	4.48
	M2	5.08	3	7.57	113.4	320	5.11	21.30	1100	4.62
	M3	3.96	7	5.70	110.0	548	4.24	21.43	1050	3.77
Mean of Irrigation										
I1		4.96	1	7.49	112.9	367	4.74	20.99	1167	4.25
I2		3.96	3	7.05	113.7	407	4.65	21.69	1077	3.68
I3		4.58	2	6.62	111.1	468.20	4.78	21.48	1067	4.29
C.D. (0.05)		NS		0.30	NS	NS	NS	NS		
C.V. (%)		14.20		5.01	5.47	16.64	11.06	3.77		
Method of Methods										
M1		4.56	2	7.08	112.2	441	4.75	21.50	1083	4.21
M2		4.87	1	7.37	113.1	299	5.14	21.31	1143	4.26
M3		4.07	3	6.71	112.5	503	4.29	21.36	1083	3.76
CD (0.05)		0.49		NS	NS	50.43	0.43	NS		
C.V. (%)		10.52		8.70	2.66	11.86	8.89	2.85		
Interaction										
I and M		NS		1.09	NS	NS	NS	NS		
M and I		NS		0.90	NS	NS	NS	NS		
Experimental Mean		**4.50**		**7.05**	**112.6**	**414**	**4.73**	**21.39**	**1103**	
Soil type		Clay loam								
pH		-								
EC		-								
Variety		ADT 36								
Available NPK kg/ha		-								

M_1 - Mechanical Transplanting

M_2 - Direct wet seeding on puddled soil

M_3 - Manual transplanting

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	Cost of cultivation (Rs/ha)
I 1- Flooding throughout crop growth (3 +/- 2cm) after 15 days	M1	7.79	1	10.17	98.97	361	4.06	21.49	97	54222
	M2	7.20	9	10.71	97.17	363	3.58	21.48	86	53873
	M3	7.46	6	10.14	99.20	310	4.01	21.54	91	56462
I 2- Irrigation at Saturation (No flooding)	M1	7.63	2	9.26	92.53	353	4.18	21.49	97	53680
	M2	7.51	5	8.88	87.60	345	3.63	21.37	86	53332
	M3	7.54	3	9.20	90.67	306	4.17	21.47	91	55378
I 3- Alternate wetting and drying	M1	7.38	8	9.66	90.67	351	4.22	21.57	98	53138
	M2	7.54	3	8.87	90.67	318	3.86	21.45	86	52790
	M3	7.42	7	9.05	87.40	321	4.22	21.47	92	54837
Mean of Irrigation										
I1		7.48	2	10.34	98.44	345	3.88	21.50	91	54852
I2		7.56	1	9.11	90.27	335	3.99	21.44	92	54130
I3		7.44	3	9.19	89.58	330	4.10	21.50	92	53588
C.D. (0.05)		NS		0.63	2.33	NS	NS	NS	NS	319
C.V. (%)		7.15		7.87	3.00	6.13	7.63	2.77	0.84	1
Method of Methods										
M1		7.60	1	9.70	94.06	355	4.15	21.52	97	53680
M2		7.42	3	9.49	91.81	342	3.69	21.43	86	53332
M3		7.47	2	9.46	92.42	312	4.13	21.49	92	55559
CD (0.05)		NS		NS	NS	27.97	0.19	NS	0.84	84
C.V. (%)		4.10		5.34	3.19	8.09	4.75	6.70	0.89	0
Interaction										
I and M		NS		NS	NS	NS	NS	NS	NS	146
M and I		NS		NS	NS	NS	NS	NS	NS	250
Experimental Mean		**7.50**		**9.55**	**92.76**	**336**	**3.99**	**21.48**	**92**	**54190**
Soil type		Sandy loam								
pH		7.40								
EC		-								
Variety		PR 126								
Available NPK kg/ha		287:23:233								

M_1 - Mechanical Transplanting

M_2 - Direct wet seeding on puddled soil

M_3 - Manual transplanting

Table 4.2.1: Contd.

Treatment		PUDUCHERY									
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)	Total water input (mm)	Water productivity (kg/ha-mm)	Cost of cultivation (Rs/ha)
I 1- Flooding throughout crop growth (3 +/- 2cm) after 15 days	M1	6.63	6	10.86	124.8	357	3.95	19.48	1197	5.54	58955
	M2	6.07	9	9.86	115.8	336	3.74	19.04	1197	5.07	57080
	M3	6.48	7	10.5	122.6	346	3.96	19.26	1197	5.41	59780
I 2- Irrigation at Saturation (No flooding)	M1	6.96	3	11.61	126.7	365	4.01	19.65	997	6.98	58955
	M2	6.34	8	10.43	117.2	338	3.73	19.12	997	6.36	57080
	M3	6.69	4	11.13	125.1	359	3.98	19.35	997	6.71	59780
I 3- Alternate wetting and drying	M1	7.14	1	12.13	127.4	370	4.06	19.67	797	8.96	58955
	M2	6.68	5	11.42	121.2	351	3.88	19.24	797	8.38	57080
	M3	6.97	2	11.87	125.6	365	4.03	19.59	797	8.75	59780
Mean of Irrigation											
I1		6.39	3	10.41	121.1	346	3.88	19.26	1197	5.34	58605
I2		6.66	2	11.06	123.0	354	3.91	19.37	997	6.68	58605
I3		6.93	1	11.8	124.7	362	3.99	19.5	797	8.70	58605
C.D. (0.05)		0.06		0.13	1.67	4.17	0.03	NS			
C.V. (%)		1.04		1.45	1.63	1.4	0.77	1.65			
Method of Methods											
M1		6.91	1	11.53	126.3	364	4.01	19.6	997	6.93	58955
M2		6.36	3	10.57	118.1	342	3.79	19.13	997	6.38	57080
M3		6.71	2	11.17	124.4	357	3.99	19.4	997	6.73	59780
CD (0.05)		0.11		0.18	1.76	2.99	0.06	0.16			
C.V. (%)		1.54		1.59	1.39	0.82	1.5	0.8			
Interaction											
I and M		NS		NS	NS	5.18	NS	NS			
M and I		NS		NS	NS	4.95	NS	NS			
Experimental Mean		**6.66**		**11.09**	**122.9**	**354**	**3.93**	**19.38**	**997**	**6.68**	**58605**
Soil type		Clay loam									
pH		6.87									
EC		0.13									
Variety		ADT 54									
Available NPK kg/ha		134:47:124									

M_1 - Mechanical Transplanting

M_2 - Direct wet seeding on puddled soil

M_3 - Manual transplanting

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/m² (No.)	Test wt (g)	Cost of cultivation (Rs/ha)
I 1- Flooding throughout crop growth (3 +/- 2cm) after 15 days	M1	5.15	2	7.89	279	24.68	33640
	M2	5.07	4	7.81	269	24.5	30135
	M3	5.42	1	8.23	296	24.79	38750
I 2- Irrigation at Saturation (No flooding)	M1	4.63	8	7.14	250	24.57	33640
	M2	4.42	9	6.88	238	24.55	30135
	M3	4.83	5	7.37	264	24.53	38750
I 3- Alternate wetting and drying	M1	4.82	6	7.42	260	24.58	36750
	M2	4.67	7	7.19	251	24.47	33290
	M3	5.12	3	7.94	277	24.61	41750
Mean of Irrigation							
I1		5.21	1	7.98	281	24.66	34175
I2		4.63	3	7.13	251	24.55	34175
I3		4.87	2	7.52	263	24.55	37263
C.D. (0.05)		0.25		0.27	11.7	NS	
C.V. (%)		6.2		4.27	5.28	1.49	
Method of Methods							
M1		4.87	2	7.48	263	24.61	34677
M2		4.72	3	7.29	253	24.51	31187
M3		5.12	1	7.85	279	24.64	39750
CD (0.05)		NS		NS	NS	NS	
C.V. (%)		10.77		8.63	8.86	2.19	
Interaction							
I and M		NS		NS	NS	NS	
M and I		NS		NS	NS	NS	
Experimental Mean		**4.9**		**7.54**	**265**	**24.59**	**35204**
Soil type		-					
pH		-					
EC		-					
Variety		Naveen					
Available NPK kg/ha		-					

M_1 - Mechanical Transplanting

M_2 - Direct wet seeding on puddled soil

M_3 - Manual transplanting

Table 4.2.1: Contd.

Treatment		WARANGAL								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	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						
I 1- Flooding throughout crop growth (3 +/- 2cm) after 15 days	M1	5.05	9	5.67	109.13	290	3.61	11.88	90	5.93	4	48776	5	4.91	7
	M2	5.37	8	6.00	112.37	323	3.99	11.91	85	5.69	7	46980	8	4.54	9
	M3	5.88	4	6.45	115.63	322	4.12	11.94	92	6.00	1	51710	2	4.79	8
I 2- Irrigation at Saturation (No flooding)	M1	5.40	7	6.10	111.00	305	4.89	11.78	90	5.67	8	48528	6	5.45	4
	M2	5.87	5	6.57	114.10	332	3.90	11.79	85	5.61	9	46732	9	5.17	6
	M3	6.30	2	7.00	117.93	336	4.75	11.92	92	5.83	6	51327	3	5.44	5
I 3- Alternate wetting and drying	M1	5.83	6	6.80	113.30	327	4.36	11.82	90	5.93	5	49020	4	6.67	1
	M2	6.10	3	7.20	114.97	340	4.32	12.00	85	5.94	3	47235	7	6.47	2
	M3	6.73	1	7.53	122.63	372	4.50	12.01	92	5.98	2	51792	1	6.35	3
Mean of Irrigation															
I1		5.43	3	6.04	112.38	312	3.91	11.91	89	5.87	2	49155	2	4.75	3
I2		5.86	2	6.56	114.34	324	4.51	11.83	89	5.71	3	48862	3	5.35	2
I3		6.22	1	7.18	116.97	346	4.39	11.94	89	5.95	1	49349	1	6.50	1
C.D. (0.05)		0.24		0.15	1.48	5.80	NS	NS	NS						
C.V. (%)		4.85		2.76	1.55	2.12	13.07	2.98	0.37						
Method of Methods															
M1		5.43	3	6.19	111.14	307	4.29	11.83	90	5.84	2	48775	2	5.56	1
M2		5.78	2	6.59	113.81	332	4.07	11.90	85	5.75	3	46982	3	5.28	3
M3		6.31	1	6.99	118.73	343	4.46	11.95	92	5.94	1	51609	1	5.42	2
CD (0.05)		0.37		0.38	2.80	25.93	NS	NS	0.66						
C.V. (%)		6.16		5.61	2.38	7.71	9.53	3.92	0.72						
Interaction															
I and M		NS		NS	NS	NS	NS	NS	NS						
M and I		NS		NS	NS	NS	NS	NS	NS						
Experimental Mean		**5.84**		**6.59**	**114.56**	**327**	**4.27**	**11.89**	**89**	**5.84**					
Soil type		Clay loam													
pH		7.30													
EC		-													
Variety		RNR 15048													
Available NPK kg/ha		210:62:350													

M_1 - Mechanical Transplanting

M_2 - Direct wet seeding on puddled soil

M_3 - Manual transplanting

4.2.2 Developing suitable package of practices for dry and wet DSR

4.2.2.1. Developing suitable package of practices for dry DSR

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 15 locations (**Gangavathi**, **Chatha, Jagdalpur, Mandya, Nawagam, Pantnagar, Raipur, Rewa, Rajendranagar-ARI, Vadgaon, Varanasi, Khudwani, Ludhiana, Nagina** and **Pusa)**. Split plot design was adopted with five main plots of sowing methods (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. Four subplots consist of W_1: Manual weeding (3 times); W_2: Pre + post-emergence herbicide; W_3: Pre-emergence herbicide + manual weeding (two times) and Mulching with paddy straw @ 5 t/ha at the time of sowing fb post emergence herbicide application of bispyribac sodium @ 250 ml /ha or (penoxsulam + cyhalofopbyutyl) @ 2500ml/ha. The results were summarized and presented in **Table 4.2.2.1** and the salient findings are as followed.

Interaction effect of grain yield between crop establishment methods and weed management practices was found to be non-significant at all locations except at **Gangavathi**, **Chatha, Jagdalpur** and **Varanasi**. In black clay soils of **Gangavathi**, GGV-05-01 variety under raised bed sowing with 3 manual weedings resulted the highest grain yield (7.06 t/ha). In sandy clay soils of **Chatha**, Basmati 370 variety resulted the highest grain yield under semi-dry system applied with pre-emergence herbicide and two times manual weeding (3.39 t/ha). Interaction effect on weed population was found to be significant. The lowest total weed dry matter at panicle initiation stage was recorded in W_4: mulching with paddy straw then herbicide application (42.04 g/m^2). Similarly, at harvest stage the lowest total weed dry matter was recorded in plots treated with pre-emergence and post emergence application (636.83 g/m^2). Among crop establishment methods, at active tillering stage the lowest total weed biomass was recorded in Semi-dry system (605.42 g/m^2). In silty clay loam soils of **Jagdalpur**, Bhaleshwari variety resulted the highest grain yield (4.90 t/ha) with improved system of that particular region with pre-emergence herbicide + 2 manual weedings followed by Raised bed sowing of Dry DSR (4.67 t/ha). The experimental lowest cost of cultivation was Rs. 39,750/-, with

mechanized line sowing method. In loamy soils of **Varanasi**, among crop establishment methods, HUR 3022 with Raised bed line sowing pre and post emergence herbicide application resulted in the highest grain yield (4.42 t/ha) and on par with manual weeding (4.42 t/ha). Similarly, mean over weed control methods, pre and post emergence herbicide application resulted in the highest grain yield (3.16 t/ha), followed by manual weeding (3 times).

Among the different methods of crop establishment, Semi-dry system was promising at **Chatha** (3.29 t/ha), **Mandya** (4.88 t/ha), while raised bed system of crop establishment at **Vadgaon** (5.55 t/ha), **Varanasi** (3.29 t/ha), **Khudwani** (6.91 t/ha), **Ludhiana** (4.54 t/ha). The mechanized sowing which reduces the labour cost significantly was promising at **Mandya** (4.65 t/ha), **Pantnagar** (4.39 t/ha), Raipur (4.89 t/ha), **Rajemdranagar-ARI** (4.32 t/ha), **Ludhiana** (4.12 t/ha), **Nagina** (5.06 t/ha).

Among the weed control methods, W1 – Manual weeding was promising at **Raipur** (4.54 t/ha) only, while W2 – Pre-post emergence application was found significant at **Mandya** (4.87 t/ha), **Varanasi** (3.16 t/ha). Application of Pre-emergence followed by Manual weeding (W3) was promising at **Nawagam** (4.80 t/ha), **Pantnagar** (4.40 t/ha), **Rajendranagar-ARI** (4.42 t/ha), **Ludhiana** (4.02 t/ha) and **Nagina** (4.90 t/ha). Further, mulching with paddy straw fb post emergence application of Bispyribacsodium also found promising at **Jagdalpur** (4.60 t/ha), **Vadgaon** (5.10 t/ha) and **Khudwani** (7.28 t/ha) indicating site specific weed management practice for better weed management in Dry DSR method.

Over the locations, mechanical sowing (4.45 t/ha) followed by semi dry system sowing (4.31 t/ha) found to be promising. Among the weed management, pre – post emergent application method (4.25 t/ha) followed by manual hand weeding (4.20 t/ha) and mechanical weeding method (4.13 t/ha) were found promising. However, mechanical weeding found to be promising in-terms of higher B;C ratio in most of the location over other methods of weed management.

Table 4.2.2.1: Development of suitable package of practices for higher yield in Dry Direct Seeded Rice system, Kharif-2021.

Methods of crop establishment	Sub plot	CHATHA													
		Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m²		Plant height (cm)	Tillers/m² (No.)	Panicle/m² (No.)	Panicle wt (g)	Test wt (g)	Days for 50% flowering	Dry mater accumulation (g/m2) at Harvest	Weed population (no/m²)	Weed biomass (g/m²)
					At 10 DAS	At 20 DAS								At panicle initiation	At panicle initiation
S1	W1	2.68	9	5.90	75	111	109.00	221	197	1.35	20.47	107	635.00	65.33(8.11)	81.00
	W2	2.52	12	5.54	75	114	97.33	211	187	1.28	20.07	108	618.67	67.33(8.24)	84.17
	W3	2.61	10	5.74	72	114	105.33	218	193	1.33	20.23	108	627.00	64.67(8.07)	80.83
	W4	2.57	11	5.66	74	117	101.33	216	191	1.31	20.17	107	622.33	35.67(6.01)	44.58
S2	W1	3.13	5	6.88	86	119	136.33	238	206	1.43	21.13	105	674.67	46.00(6.82)	57.50
	W2	2.98	8	6.55	86	118	124.33	224	187	1.37	20.73	104	654.00	49.00(7.04)	61.25
	W3	3.10	6	6.82	84	123	129.67	236	196	1.41	20.97	104	671.00	44.00(6.67)	55.00
	W4	3.08	7	6.77	82	124	126.67	228	193	1.38	20.87	105	664.00	35.00(5.96)	43.75
S3	W1	2.48	13	5.40	64	97	95.67	208	174	1.31	19.90	111	617.33	52.00(7.24)	65.00
	W2	2.33	16	5.13	63	95	87.00	199	164	1.23	19.63	109	592.67	56.67(7.56)	70.83
	W3	2.43	14	5.35	63	96	94.00	205	171	1.28	19.77	110	610.33	53.00(7.31)	66.25
	W4	2.38	15	5.24	64	92	91.67	202	168	1.27	19.73	111	601.33	32.00(5.70)	40.00
S4	W1	3.36	1	7.40	91	127	147.67	268	219	1.53	21.73	102	711.33	41.00(6.44)	51.25
	W2	3.21	4	7.06	94	129	137.67	253	201	1.43	21.13	101	682.00	43.33(6.62)	54.17
	W3	3.31	2	7.29	94	127	144.67	265	213	1.51	21.47	102	695.33	48.00(6.96)	60.00
	W4	3.28	3	7.22	93	127	142.33	260	206	1.49	21.33	101	702.67	32.00(5.70)	40.00
S5	W1	-		-	-	-	-	-	-	-	-	-	-	-	-
	W2	-		-	-	-	-	-	-	-	-	-	-	-	-
	W3	-		-	-	-	-	-	-	-	-	-	-	-	-
	W4	-		-	-	-	-	-	-	-	-	-	-	-	-
Mean of Methods															
S1		2.60	3	5.71	74	114	103.25	217	192	1.32	20.23	108	625.75	58.25(7.61)	72.65
S2		3.07	2	6.75	84	121	129.25	232	196	1.40	20.93	105	665.92	43.50(6.62)	54.38
S3		2.41	4	5.28	63	95	92.08	203	169	1.27	19.76	110	605.42	48.42(6.95)	60.52
S4		3.29	1	7.24	93	128	143.08	262	210	1.49	21.42	102	697.83	41.08(6.43)	51.35
S5		-		-	-	-	-	-	-	-	-	-	-	-	-
C.D. (0.05)		0.01		0.03	2.43	2.43	1.26	4.2	1.55	0.02	0.07	0.52	2.75	0.09	1.44
C.V. (%)		0.36		0.45	3.09	2.13	1.08	1.84	0.81	1.16	0.33	0.49	0.42	1.27	2.42

Table 4.2.2.1: Contd.

Methods of crop establishment	Sub plot	CHATHA													
		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	Dry mater accumulation (g/m2) at Harvest	Weed population (no/m^2)	Weed biomass (g/m^2)
					At 10 DAS	At 20 DAS								At panicle initiation	At panicle initiation
Mean of sub plot															
W1		2.91	1	6.39	79	113	122.17	234	199	1.41	20.81	106	659.58	51.08(7.15)	63.69
W2		2.76	4	6.07	79	114	111.58	222	185	1.33	20.39	106	636.83	54.08(7.36)	67.60
W3		2.86	2	6.30	78	115	118.42	231	194	1.38	20.61	106	650.92	52.42(7.26)	65.52
W4		2.83	3	6.22	78	115	115.50	226	190	1.36	20.53	106	647.58	33.67(5.84)	42.08
CD (0.05)		0.01		0.02	NS	NS	1.78	1.85	1.49	0.01	0.05	0.34	1.94	0.09	1.53
C.V. (%)		0.38		0.39	2.78	2.23	1.81	0.96	0.92	0.52	0.3	0.39	0.35	1.61	3.04
Interaction															
M and S		0.02		0.04	NS	NS	NS	NS	2.98	0.01	NS	0.69	3.88	0.19	3.06
S and M		0.02		0.04	NS	NS	NS	NS	2.85	0.02	NS	0.72	3.96	0.18	2.88
Experimental Mean		**2.84**		**6.25**	**79**	**114**	**116.92**	**228**	**192**	**1.37**	**20.58**	**106**	**648.73**	**6.9**	**59.72**
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:

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 or (penoxsulam + cyhalofopbyutyl) @ 2500ml/ha

Table 4.2.2.1: Contd.

Methods of crop establishment	Sub plot	GANGAVATHI														
		Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m² At 20 DAS	Plant height (cm)	Tillers/m² (No.)	Panicle/m² (No.)	Panicle wt (g)	Test wt (g)	Weed population (no/m²) At active tillering	Weed population (no/m²) At panicle initiation	Weed biomass (g/m²) At active tillering	Weed biomass (g/m²) At panicle initiation	Total water input mm/ha	Cost of cultivation Rs/ha
S1	W1	4.77	7	5.48	691	100.33	317	339	2.42	17.10	15.67(4.01)	15.67(3.96)	3.30	25.47	925	75486
	W2	3.52	13	4.04	603	102.33	213	219	2.86	16.17	33.00(5.78)	58.67(7.69)	14.43	62.43	925	50143
	W3	4.79	6	5.51	601	101.67	263	259	3.40	15.41	13.67(3.76)	15.67(4.01)	6.93	10.17	925	57821
	W4	3.04	14	3.49	710	96.33	307	243	2.42	15.73	25.00(5.05)	33.33(5.81)	13.83	126.10	925	58567
S2	W1	5.05	5	5.80	986	104.00	353	440	3.03	16.70	11.00(3.38)	12.33(3.57)	5.13	18.63	925	76094
	W2	3.70	10	4.25	986	101.33	373	298	3.29	16.53	26.33(5.17)	71.33(8.47)	11.23	94.67	925	50712
	W3	5.06	4	5.82	913	97.67	347	315	2.59	15.69	14.33(3.84)	20.33(4.55)	6.40	15.33	925	58425
	W4	3.04	14	3.49	1166	96.33	343	308	2.30	16.46	21.33(4.67)	38.00(6.18)	14.03	99.03	925	59133
S3	W1	7.06	1	8.12	854	101.33	390	471	3.65	16.04	23.00(4.84)	24.67(5.01)	6.27	40.47	925	78120
	W2	3.63	11	4.18	873	100.00	337	329	3.05	15.92	35.33(5.98)	72.00(8.49)	21.07	97.63	925	51937
	W3	6.21	2	7.14	946	101.00	347	341	3.75	15.70	19.00(4.40)	12.67(3.58)	6.70	14.67	925	60116
	W4	3.53	12	4.06	876	101.33	367	318	3.10	16.10	37.33(6.15)	44.00(6.67)	21.30	103.50	925	59930
S4	W1	5.74	3	6.60	1016	99.33	377	373	2.74	16.29	18.67(4.38)	15.33(3.93)	5.83	15.07	925	76360
	W2	3.85	9	4.43	865	104.33	410	337	3.26	16.61	31.67(5.67)	76.00(8.73)	11.30	71.83	925	50771
	W3	4.45	8	5.12	935	95.67	357	310	2.86	15.70	15.33(3.97)	14.67(3.85)	8.13	12.80	925	58191
	W4	3.02	16	3.47	1434	88.00	303	279	2.40	15.88	19.67(4.49)	54.67(7.41)	16.70	124.63	925	58880
S5	W1	-		-	-	-	-	-	-	-	-	-	-	-	-	-
	W2	-		-	-	-	-	-	-	-	-	-	-	-	-	-
	W3	-		-	-	-	-	-	-	-	-	-	-	-	-	-
	W4	-		-	-	-	-	-	-	-	-	-	-	-	-	-
Mean of Methods																
S1		4.03	4	4.63	651	100.17	275	265	2.77	16.10	21.83(4.65)	30.83(5.37)	9.63	56.04	925	60504
S2		4.21	3	4.84	1013	99.83	354	340	2.80	16.34	18.25(4.27)	35.50(5.69)	9.20	56.92	925	61091
S3		5.11	1	5.87	887	100.92	360	365	3.39	15.94	28.67(5.34)	38.33(5.94)	13.83	64.07	925	62526
S4		4.27	2	4.90	1062	96.83	362	325	2.81	16.12	21.33(4.62)	40.17(5.98)	10.49	56.08	925	61051
S5		-		-	-	-	-	-	-	-	-	-	-	-	-	-
C.D. (0.05)		0.16		0.18	NS	NS	NS	18.04	0.2	NS	0.11	NS	1.69	NS		
C.V. (%)		3.56		3.56	44.41	5	37.24	5.58	6.87	2	2.39	8.86	15.68	23.63		

Table 4.2.2.1: Contd.

Methods of crop establishment	Sub plot	GANGAVATHI														
		Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m²	Plant height (cm)	Tillers/m² (No.)	Panicle/m² (No.)	Panicle wt (g)	Test wt (g)	Weed population (no/m²)		Weed biomass (g/m²)		Total water input mm/ha	Cost of cultivation Rs/ha
					At 20 DAS						At active tillering	At panicle initiation	At active tillering	At panicle initiation		
Mean of sub plot																
W1		5.65	1	6.50	887	101.25	359	406	2.96	16.53	17.08(4.15)	17.00(4.12)	5.13	24.91	925	76515
W2		3.67	3	4.23	832	102.00	333	296	3.12	16.31	31.58(5.65)	69.50(8.34)	14.51	81.64	925	50891
W3		5.13	2	5.90	849	99.00	328	306	3.15	15.62	15.58(3.99)	15.83(4.00)	7.04	13.24	925	58638
W4		3.15	4	3.63	1046	95.50	330	287	2.55	16.04	25.83(5.09)	42.50(6.52)	16.47	113.32	925	59128
CD (0.05)		0.14		0.16	130.52	4.12	NS	11.81	0.18	0.51	0.26	0.46	1.57	12.42		
C.V. (%)		3.79		3.79	17.14	4.92	22.89	4.33	7.15	3.77	6.62	9.59	17.27	25.29		
Interaction																
M and S		0.28		0.32	NS	NS	NS	23.61	0.35	NS	0.53	0.93	3.14	24.84		
S and M		0.27		0.31	NS	NS	NS	24.63	0.34	NS	0.46	0.89	3.02	23.99		
Experimental Mean		**4.40**		**5.06**	**903**	**99.44**	**338**	**324**	**2.94**	**16.13**	**4.72**	**5.74**	**10.79**	**58.28**		
Soil type		Black clay														
pH		8.3														
EC		0.24														
Variety & Duration		GGV-05-01, 135 days														
Applied NPK kg/ha		150:75:75:20														
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: -

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 or (penoxsulam + cyhalofopbyutyl) @ 2500ml/ha

Table 4.2.2.1: Contd.

Methods of crop establishment	Sub plot	JAGDALPUR														
		Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m²		Plant height (cm)	Panicle/m² (No.)	Panicle wt (g)	Test wt (g)	Days for 50% flowering	Dry mater accumulation (g/m2)			Weed population (no/m²)	Cost of cultivation Rs/ha
					At 10 DAS	At 20 DAS						At 45 DAS	At 75 DAS	At 105 DAS	At active tillering	
S1	W1	3.86	17	5.42	45	44	100.67	139	3.58	25.09	81	306.19	417.53	835.06	1.80(1.51)	46000
	W2	3.78	18	5.32	42	41	100.67	112	3.42	24.94	80	300.15	409.29	818.59	1.30(1.31)	38000
	W3	4.24	14	5.92	44	43	103.00	145	3.42	25.12	81	335.53	457.54	915.07	0.42(0.96)	40000
	W4	4.01	16	5.64	51	49	98.67	180	3.47	25.55	82	318.55	434.39	868.77	4.43(2.12)	42000
S2	W1	4.29	12	5.94	50	49	103.00	188	3.58	25.04	80	337.74	460.55	921.10	0.97(1.16)	43000
	W2	3.58	19	4.97	51	49	101.00	149	3.59	24.62	81	282.05	384.62	769.23	1.47(1.39)	35000
	W3	4.29	12	5.94	49	49	102.33	172	3.48	25.37	81	337.72	460.52	921.04	1.30(1.33)	37000
	W4	4.56	8	6.32	50	49	100.67	163	3.41	24.83	81	359.03	489.59	979.19	3.90(2.02)	44000
S3	W1	4.84	3	6.74	43	42	100.33	115	3.15	25.24	79	382.30	521.31	1042.63	5.67(2.41)	49000
	W2	4.67	6	6.49	45	44	95.67	160	3.38	25.13	79	368.42	502.39	1004.78	1.33(1.35)	45000
	W3	4.43	9	6.17	46	44	102.33	157	3.42	25.21	80	350.02	477.29	954.59	7.33(2.76)	47000
	W4	4.75	5	6.65	50	49	100.00	149	3.43	25.06	81	376.41	513.29	1026.58	7.20(2.71)	43000
S4	W1	4.33	11	6.03	42	40	97.67	103	3.36	24.43	80	342.03	466.40	932.80	0.92(1.17)	46000
	W2	3.52	20	4.88	42	42	97.00	104	3.23	25.07	79	277.24	378.05	756.10	0.80(1.12)	38000
	W3	4.22	15	5.88	46	44	99.33	109	3.43	24.84	79	333.34	454.56	909.12	2.20(1.54)	40000
	W4	4.42	10	6.20	49	47	91.67	106	3.21	25.25	81	350.51	477.97	955.94	0.72(1.05)	42000
S5	W1	4.67	6	6.52	47	46	104.33	179	3.44	25.17	82	369.26	503.53	1007.07	0.30(0.89)	51000
	W2	4.77	4	6.67	46	44	102.00	136	3.59	25.13	80	377.52	514.81	1029.61	0.37(0.91)	46000
	W3	4.88	2	6.78	48	46	104.33	154	3.48	25.33	81	384.55	524.39	1048.77	0.48(0.96)	48000
	W4	5.27	1	7.36	49	49	102.33	156	3.41	25.11	81	416.86	568.44	1136.89	0.95(1.16)	47000
Mean of Methods																
S1		3.97	5	5.58	46	44	100.75	144	3.47	25.17	81	315.10	429.69	859.37	1.99(1.48)	41500
S2		4.18	3	5.79	50	49	101.75	168	3.52	24.97	81	329.13	448.82	897.64	1.91(1.47)	39750
S3		4.67	2	6.52	46	45	99.58	146	3.34	25.16	80	369.29	503.57	1007.15	5.38(2.31)	46000
S4		4.12	4	5.75	45	43	96.42	106	3.31	24.90	80	325.78	444.24	888.49	1.16(1.22)	41500
S5		4.90	1	6.83	47	46	103.25	156	3.48	25.18	81	387.05	527.79	1055.58	0.52(0.98)	48000
C.D. (0.05)		0.22		0.27	1.56	2.29	2.21	17.47	NS	NS	NS	15.63	21.31	42.62	0.31	
C.V. (%)		5.25		4.68	3.54	5.36	2.34	12.9	7.32	1.32	1.93	4.81	4.81	4.81	22.24	

Table 4.2.2.1: Contd.

Methods of crop establishment	Sub plot	JAGDALPUR														
		Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m²		Plant height (cm)	Panicle/m² (No.)	Panicle wt (g)	Test wt (g)	Days for 50% flowering	Dry mater accumulation (g/m2)			Weed population (no/m²)	Cost of cultivation Rs/ha
					At 10 DAS	At 20 DAS						At 45 DAS	At 75 DAS	At 105 DAS	At active tillering	
Mean of sub plot																
W1		4.40	3	6.13	45	44	101.20	145	3.42	24.99	80	347.50	473.87	947.73	1.93(1.43)	47000
W2		4.06	4	5.67	45	44	99.27	132	3.44	24.98	80	321.08	437.83	875.66	1.05(1.22)	40400
W3		4.41	2	6.14	46	45	102.27	148	3.45	25.17	80	348.23	474.86	949.72	2.35(1.51)	42400
W4		4.60	1	6.43	50	48	98.67	151	3.38	25.16	81	364.27	496.74	993.47	3.44(1.81)	43600
CD (0.05)		0.13		0.19	1.98	1.81	1.54	NS	NS	NS	NS	10.51	14.33	28.66	0.36	
C.V. (%)		4.01		4.2	5.67	5.35	2.06	15	6.54	1.69	1.85	4.08	4.08	4.08	32.76	
Interaction																
M and S		0.29		0.43	NS	NS	NS	35.97	NS	NS	NS	23.5	32.05	64.09	NS	
S and M		0.3		0.42	NS	NS	NS	33.86	NS	NS	NS	23.5	32.05	64.1	NS	
Experimental Mean		**4.37**		**6.09**	**47**	**45**	**100.35**	**144**	**3.42**	**25.08**	**80**	**345.27**	**470.82**	**941.65**	**1.49**	
Soil type		Alfisols														
pH		6.25														
EC		-														
Variety & Duration		Bamleshwari, 130-135 days														
Applied NPK kg/ha		120:60:35														
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- Any improved system in that particular location

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 or (penoxsulam + cyhalofopbyutyl) @ 2500ml/ha

Table 4.2.2.1: Contd.

Methods of crop establishment	Sub plot	MANDYA																		
		Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m²		Plant height (cm)	Tillers/m² (No.)	Panicle/m² (No.)	Panicle length (cm)	Panicle wt (g)	Test wt (g)	Days for 50% flowering	Dry mater accumulation (g/m2)			Weed population (no/m²)		Weed biomass (g/m²)	
					At 10 DAS	At 20 DAS								At 45 DAS	At 75 DAS	At 105 DAS	At active tillering	At panicle initiation	At active tillering	At panicle initiation
S1	W1	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	W2	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	W3	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	W4	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S2	W1	4.04	11	5.50	64	82	76.61	334	306	22.86	3.34	21.08	83	136.19	486.91	1115.14	20.00(4.51)	20.00(4.49)	16.47	22.83
	W2	5.15	2	7.46	67	87	82.05	352	315	22.33	3.48	22.61	82	217.78	494.72	1371.22	4.00(1.65)	14.67(3.80)	2.17	13.60
	W3	4.77	5	6.11	62	82	81.37	335	310	23.02	3.51	22.24	83	148.99	515.69	1215.02	14.67(3.87)	17.33(4.20)	8.41	19.73
	W4	4.63	7	7.02	68	89	82.65	329	302	22.72	3.56	22.67	82	132.99	503.36	1098.39	41.33(6.46)	29.33(5.33)	20.95	28.33
S3	W1	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	W2	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	W3	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	W4	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S4	W1	4.78	4	6.48	64	84	80.39	340	301	22.74	3.34	22.44	83	140.39	483.62	1177.47	13.33(3.71)	20.00(4.51)	14.43	22.43
	W2	5.18	1	6.73	66	82	80.22	351	319	23.82	3.79	22.13	83	180.18	532.13	1388.19	4.00(1.91)	17.33(4.05)	3.83	20.20
	W3	4.72	6	6.53	66	87	82.29	342	303	22.37	3.66	22.60	83	167.98	502.12	1331.07	10.67(3.33)	24.00(4.94)	9.67	26.80
	W4	4.83	3	6.65	63	82	82.58	328	299	21.99	3.92	23.37	83	157.38	430.39	1121.35	44.00(6.62)	42.67(6.28)	19.50	35.57
S5	W1	3.61	12	5.00	27	46	74.61	334	288	21.87	3.27	22.00	83	159.98	380.65	1061.06	24.00(4.94)	29.33(5.45)	22.20	28.17
	W2	4.28	8	5.68	23	34	75.41	359	312	22.37	3.69	22.62	84	147.79	480.75	1172.27	6.67(2.39)	16.00(4.04)	5.93	19.83
	W3	4.20	9	5.18	25	39	75.98	347	306	23.33	3.65	21.36	84	147.79	461.43	1070.37	16.00(4.04)	20.00(4.48)	12.40	21.80
	W4	4.13	10	5.80	22	37	78.24	358	307	23.19	4.00	22.36	83	137.79	407.99	1041.41	38.67(6.24)	22.67(4.76)	25.83	28.67
Mean of Methods																				
S1		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S2		4.65	2	6.53	65	85	80.67	337	308	22.73	3.47	22.15	82	158.98	500.17	1199.94	20.00(4.12)	20.33(4.45)	12.00	21.13
S3		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S4		4.88	1	6.60	65	84	81.37	340	305	22.73	3.68	22.63	83	161.48	487.07	1254.52	18.00(3.89)	26.00(4.95)	11.86	26.25
S5		4.06	3	5.41	24	39	76.06	350	303	22.69	3.65	22.08	84	148.34	432.70	1086.28	21.33(4.40)	22.00(4.68)	16.59	24.62
C.D. (0.05)		0.23		NS	5.38	7.73	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
C.V. (%)		7.13		15.05	14.46	15.4	8.33	14.11	12.08	6.35	16	5.92	2.16	7.71	19.08	15.86	29.1	21.14	28.46	26.34

Table 4.2.2.1: Contd.

Methods of crop establishment	Sub plot	MANDYA																		
		Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m²		Plant height (cm)	Tillers/m² (No.)	Panicle/m² (No.)	Panicle length (cm)	Panicle wt (g)	Test wt (g)	Days for 50% flowering	Dry mater accumulation (g/m2)			Weed population (no/m²)		Weed biomass (g/m²)	
					At 10 DAS	At 20 DAS								At 45 DAS	At 75 DAS	At 105 DAS	At active tillering	At panicle initiation	At active tillering	At panicle initiation
Mean of sub plot																				
W1		4.14	4	5.66	52	71	77.20	336	298	22.49	3.32	21.84	83	145.52	450.40	1117.89	19.11(4.39)	23.11(4.82)	17.70	24.48
W2		4.87	1	6.63	52	68	79.23	354	315	22.84	3.65	22.45	83	181.92	502.53	1310.56	4.89(1.98)	16.00(3.96)	3.98	17.88
W3		4.56	2	5.94	51	69	79.88	341	306	22.91	3.60	22.06	83	154.92	493.08	1205.49	13.78(3.75)	20.44(4.54)	10.16	22.78
W4		4.53	3	6.49	51	69	81.16	338	303	22.63	3.83	22.80	83	142.72	447.24	1087.05	41.33(6.44)	31.56(5.46)	22.09	30.86
CD (0.05)		0.29		0.55	NS	NS	NS	NS	NS	NS	NS	NS	NS	26.99	NS	142.6	0.81	0.93	4.65	6.64
C.V. (%)		6.46		8.93	8.27	11.83	3.94	8.63	8.79	5.28	13.78	4.33	0.73	17.43	14.15	12.19	19.77	19.91	34.77	27.92
Interaction																				
M and S		NS		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
S and M		NS		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Experimental Mean		**4.53**		**6.18**	**51**	**69**	**79.37**	**342**	**306**	**22.72**	**3.60**	**22.29**	**83**	**156.27**	**473.31**	**1180.25**	**4.14**	**4.69**	**13.48**	**24.00**
Soil type		-																		
pH		6.85																		
EC		0.34																		
Variety & Duration		KMP 175,125-130 days																		
Applied NPK kg/ha		100:50:50:20																		
Available NPK kg/ha		276.75:119.99:219.6																		

S1:
S2: Mechanized line sowing of seeds (Dribbler, Happy seeder or any Drum Seeder: Spacing as per the equipment specifications)
S3: -
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

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 or (penoxsulam + cyhalofopbyutyl) @ 2500ml/ha

*Pre emergence herbicide = Pendimethalin 30 EC @ 3.33 lit./ha at 3 DAS(Rs. 660/lit.) ; Post emergence herbicide = Penoxsulam 1.02% + Cyholofop-P- butuly 5.1% OD @ 2.5 lit./ha at 20 DAS (Rs. 1600/lit.)

Table 4.2.2.1: Contd.

Methods of crop establishment	Sub plot	NAWAGAM																
		Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m²		Plant height (cm)	Tillers/m² (No.)	Panicle/m² (No.)	Panicle wt (g)	Test wt (g)	Days for 50% flowering	Weed population (no/m²)		Weed biomass (g/m²)		Cost of cultivation Rs/ha
					At 10 DAS	At 20 DAS							At active tillering	At panicle initiation	At active tillering	At panicle initiation	
S1	W1	4.73	8	5.28	50	71	110.60	145	72	4.03	18.52	70	42.75(6.39)	89.25(9.22)	14.88	31.39	44554
	W2	4.59	13	5.14	62	84	115.50	143	71	4.25	18.59	71	55.00(7.23)	103.03(9.72)	20.44	20.55	43284
	W3	4.59	13	5.19	62	85	117.95	151	71	5.31	17.84	70	50.50(6.77)	111.05(10.37)	19.19	29.06	41483
	W4	4.02	20	4.60	60	80	117.60	160	68	4.55	19.11	72	39.75(6.26)	79.50(8.73)	14.81	30.01	44366
S2	W1	4.50	17	5.07	49	68	116.70	136	88	4.47	18.30	72	27.00(5.15)	73.70(8.53)	9.39	15.35	42850
	W2	4.96	2	5.55	52	73	109.40	138	87	4.63	18.85	71	28.75(5.23)	73.75(8.49)	10.05	17.19	41387
	W3	4.87	7	5.42	61	79	113.95	123	92	4.28	19.00	72	38.00(5.88)	72.00(8.27)	13.68	14.31	42609
	W4	4.71	9	5.18	55	75	116.35	144	98	4.05	19.80	70	34.75(5.68)	98.75(9.84)	12.26	19.51	42793
S3	W1	4.31	19	4.47	44	62	107.95	118	72	3.89	19.88	72	70.75(8.32)	128.27(11.15)	26.23	35.00	43144
	W2	4.42	18	4.51	48	69	104.25	148	90	3.71	19.84	71	41.75(6.14)	81.00(8.50)	15.86	24.47	41671
	W3	4.71	9	4.87	52	74	110.93	163	99	4.19	19.85	70	51.25(6.95)	102.50(9.88)	19.48	29.44	42879
	W4	4.53	16	4.62	52	74	111.80	133	81	4.36	20.78	71	57.50(7.23)	109.50(9.99)	20.61	42.06	43076
S4	W1	4.89	6	5.26	50	71	117.15	148	88	4.36	18.02	72	61.50(7.64)	115.50(10.52)	23.49	32.28	44486
	W2	4.69	11	5.02	50	71	115.25	160	97	4.61	18.33	72	39.75(6.18)	86.00(9.07)	15.50	26.82	43027
	W3	4.93	3	5.30	61	81	110.95	148	90	4.96	18.27	72	52.50(6.82)	113.00(10.36)	20.48	32.18	44291
	W4	4.66	12	4.93	53	72	119.00	148	90	4.40	18.80	72	58.25(7.43)	97.90(9.70)	22.69	38.40	44341
S5	W1	5.08	1	5.59	47	53	109.65	144	88	4.25	18.58	71	65.50(7.94)	125.50(10.93)	25.63	24.89	44494
	W2	4.90	5	5.31	52	57	109.65	147	90	4.08	17.92	71	60.25(7.65)	110.00(10.39)	23.23	22.90	43014
	W3	4.92	4	5.41	58	63	112.55	159	97	4.42	19.92	70	59.25(7.63)	108.00(10.29)	22.13	22.51	44245
	W4	4.59	13	4.98	54	60	112.95	151	92	4.59	19.25	72	65.00(8.04)	122.75(11.03)	25.11	24.70	44388
Mean of Methods																	
S1		4.48	5	5.06	58	80	115.41	150	70	4.53	18.52	71	47.00(6.66)	95.71(9.51)	17.33	27.75	43422
S2		4.76	3	5.31	54	74	114.10	135	91	4.36	18.99	71	32.13(5.48)	79.55(8.78)	11.35	16.59	42410
S3		4.49	4	4.62	49	70	108.73	140	86	4.04	20.09	71	55.31(7.16)	105.32(9.88)	20.55	32.74	42692
S4		4.79	2	5.13	53	74	115.59	151	91	4.58	18.36	72	53.00(7.02)	103.10(9.91)	20.54	32.42	44036
S5		4.87	1	5.32	53	58	111.20	150	92	4.33	18.92	71	62.50(7.82)	116.56(10.66)	24.03	23.75	44035
C.D. (0.05)		NS		0.38	3.03	3.51	4.9	10.71	6.47	0.3	NS	NS	1.03	NS	5.78	7.69	234.86
C.V. (%)		8.56		9.65	7.33	6.41	5.63	9.58	9.76	8.82	9.9	4.37	19.63	23.37	40.01	37.46	0.7

Table 4.2.2.1: Contd.

Methods of crop establishment	Sub plot	NAWAGAM															
		Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m²		Plant height (cm)	Tillers/m² (No.)	Panicle/m² (No.)	Panicle wt (g)	Test wt (g)	Days for 50% flowering	Weed population (no/m²)		Weed biomass (g/m²)		Cost of cultivation Rs/ha
					At 10 DAS	At 20 DAS							At active tillering	At panicle initiation	At active tillering	At panicle initiation	
Mean of sub plot																	
W1		4.70	3	5.14	48	65	112.41	138	81	4.20	18.66	71	53.50(7.09)	106.44(10.07)	19.92	27.78	43905
W2		4.71	2	5.11	52	71	110.81	147	87	4.25	18.70	71	45.10(6.49)	90.76(9.23)	17.02	22.38	42476
W3		4.80	1	5.24	59	76	113.26	149	90	4.63	18.98	71	50.30(6.81)	101.31(9.83)	18.99	25.50	43101
W4		4.50	4	4.86	55	72	115.54	147	86	4.39	19.55	71	51.05(6.93)	101.68(9.86)	19.10	30.94	43792
CD (0.05)		0.21		0.25	2.32	2.55	2.76	6.46	5.79	0.29	NS	NS	NS	NS	NS	NS	274.23
C.V. (%)		7.2		7.72	6.84	5.67	3.86	7.04	10.64	10.33	5.88	4.04	31.9	26.4	61.18	38.92	1
Interaction																	
M and S		NS		NS	NS	NS	NS	14.46	NS	NS	NS	NS	NS	NS	NS	NS	613.21
S and M		NS		NS	NS	NS	NS	14.81	NS	NS	NS	NS	NS	NS	NS	NS	559.49
Experimental Mean		**4.68**		**5.09**	**54**	**71**	**113.01**	**145**	**86**	**4.37**	**18.97**	**71**	**6.83**	**9.75**	**18.76**	**26.65**	**43319**
Soil type		Caly loam															
pH		7.87															
EC		0.33															
Variety & Duration		-															
Applied NPK kg/ha		80:25:0:25															
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- Any improved system in that particular location

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 or (penoxsulam + cyhalofopbyutyl) @ 2500ml/ha

Table 4.2.2.1: Contd.

Methods of crop establishment	Sub plot	PANTNAGAR																
		Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m²		Plant height (cm)	Tillers/m² (No.)	Panicle/m² (No.)	Panicle wt (g)	Test wt (g)	Days for 50% flowering	Dry mater accumulation (g/m2) at 105 DAS	Weed population (no/m²)		Weed biomass (g/m²)		Cost of cultivation Rs/ha
					At 10 DAS	At 20 DAS								At active tillering	At panicle initiation	At active tillering	At panicle initiation	
S1	W1	3.95	10	4.70	31	50	106.67	261	244	1.83	21.85	88	223.33	17.33(4.18)	36.00(5.84)	48.59	36.45	44090
	W2	3.31	14	3.78	22	36	107.33	250	242	1.62	21.55	94	180.67	48.00(6.95)	13.33(3.71)	48.60	39.11	38768
	W3	3.97	9	4.67	27	39	106.67	248	240	1.89	21.99	93	189.00	28.00(5.31)	24.00(4.94)	49.49	39.12	43105
	W4	2.87	16	3.56	23	37	105.67	223	218	1.57	21.48	94	171.00	137.33(11.74)	97.33(9.89)	41.00	34.17	40187
S2	W1	4.75	2	5.29	35	47	108.00	320	309	1.80	21.83	86	212.67	34.67(5.93)	22.67(4.80)	48.91	37.23	45230
	W2	4.27	5	4.89	36	66	107.00	301	293	1.69	21.83	87	207.67	61.33(7.84)	33.33(5.80)	46.29	33.67	39908
	W3	4.81	1	5.43	30	53	107.00	318	310	1.85	22.04	88	249.00	36.00(6.02)	25.33(5.06)	48.91	33.35	43885
	W4	3.75	11	4.52	33	51	111.33	280	273	1.72	21.61	88	191.67	176.00(13.27)	118.67(10.92)	43.56	38.43	45255
S3	W1	4.17	6	4.46	39	51	108.00	296	282	1.74	22.01	86	187.67	24.00(4.94)	33.33(5.80)	48.28	37.41	47750
	W2	3.36	13	3.74	35	47	107.67	278	266	1.72	20.87	88	209.00	18.67(4.36)	33.33(5.81)	47.00	38.48	42428
	W3	4.11	7	4.46	37	47	107.00	299	288	1.71	21.45	88	174.00	37.33(6.10)	28.00(5.33)	48.97	32.92	46765
	W4	3.16	15	3.66	40	53	105.67	268	256	1.62	20.76	86	142.33	128.00(11.32)	108.00(10.41)	47.59	35.63	39135
S4	W1	4.61	4	4.80	35	53	110.67	323	303	1.71	20.76	86	175.67	24.00(4.94)	6.67(2.65)	47.95	36.44	39110
	W2	4.01	8	4.65	36	54	111.00	284	273	1.80	20.44	88	129.00	24.00(4.88)	12.00(3.50)	48.39	36.37	39548
	W3	4.71	3	5.39	35	55	108.33	321	301	1.85	20.89	88	181.33	32.00(5.69)	16.00(4.04)	49.80	39.41	43885
	W4	3.47	12	3.71	36	53	109.67	269	261	1.63	20.36	86	170.33	110.67(10.54)	94.67(9.75)	49.07	34.33	36615
S5	W1	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	W2	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	W3	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	W4	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mean of Methods																		
S1		3.53	4	4.18	25	41	106.58	246	236	1.73	21.72	92	191.00	57.67(7.05)	42.67(6.09)	46.92	37.21	41538
S2		4.39	1	5.03	34	54	108.33	305	296	1.77	21.83	87	215.25	77.00(8.27)	50.00(6.64)	46.92	35.67	43570
S3		3.70	3	4.08	38	50	107.08	285	273	1.70	21.27	87	178.25	52.00(6.68)	50.67(6.84)	47.96	36.11	44020
S4		4.20	2	4.64	36	54	109.92	299	284	1.75	20.61	87	164.08	47.67(6.51)	32.33(4.99)	48.80	36.64	39790
S5		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C.D. (0.05)		0.19		0.31	2.07	3.1	NS	7.71	9.76	NS	0.13	1.55	7.87	0.42	0.61	NS	NS	
C.V. (%)		4.75		6.84	6.26	6.26	3.24	2.72	3.59	4.59	0.62	1.76	4.21	5.88	10.01	3.82	4.88	

Table 4.2.2.1: Contd.

Methods of crop establishment	Sub plot	PANTNAGAR																
		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	Dry mater accumulation (g/m2) at 105 DAS	Weed population (no/m^2)		Weed biomass (g/m^2)		Cost of cultivation Rs/ha
					At 10 DAS	At 20 DAS								At active tillering	At panicle initiation	At active tillering	At panicle initiation	
Mean of sub plot																		
W1		4.37	2	4.81	35	50	108.33	300	285	1.77	21.61	87	199.83	25.00(5.00)	24.67(4.77)	48.43	36.88	44045
W2		3.74	3	4.27	32	51	108.25	278	268	1.71	21.17	89	181.58	38.00(6.01)	23.00(4.71)	47.57	36.91	40163
W3		4.40	1	4.99	32	49	107.25	297	285	1.83	21.59	89	198.33	33.33(5.78)	23.33(4.84)	49.29	36.20	44410
W4		3.31	4	3.86	33	49	108.08	260	252	1.64	21.05	88	168.83	138.00(11.72)	104.67(10.24)	45.30	35.64	40298
CD (0.05)		0.15		0.25	1.94	NS	NS	5.8	5.17	0.06	0.13	1.2	9.11	0.56	0.56	1.71	NS	
C.V. (%)		4.65		6.52	6.97	5.53	2.24	2.43	2.25	3.8	0.74	1.61	5.78	9.37	10.82	4.27	4.87	
Interaction																		
M and S		NS		NS	3.88	4.62	NS	11.61	10.34	0.11	0.27	NS	18.22	1.13	1.12	3.43	2.99	
S and M		NS		NS	3.72	4.66	NS	11.66	11.59	0.11	0.25	NS	16.92	1.03	1.08	3.28	2.92	
Experimental Mean		**3.96**		**4.48**	**33**	**50**	**107.98**	**284**	**272**	**1.74**	**21.36**	**88**	**187.15**	**7.13**	**6.14**	**47.65**	**36.41**	
Soil type		Silt Loam																
pH		7.5																
EC		0.35																
Variety & Duration		-																
Applied NPK kg/ha		120:60:40																
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: -

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 or (penoxsulam + cyhalofopbyutyl) @ 2500ml/ha

Table 4.2.2.1: Contd.

Methods of crop establishment	Sub plot	RAIPUR										REWA						
		Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant height (cm)	Panicle/m^2 (No.)	Panicle height (cm)	Panicle wt (g)	Test wt (g)	Filled grain / panicle	unfilled grain / panicle	Grain yield (t/ha)	Rank	Tillers/m^2 (No.)	Panicle/m^2 (No.)	Test wt (g)	Days for 50% flowering	Weed population (no/m2) At active tillering
S1	W1	4.68	7	6.15	105.10	318	21.70	3.58	31.80	106	20	4.03	16	265	278	25.20	110	8.00(2.91)
	W2	4.36	9	5.73	103.10	297	21.33	3.31	31.23	101	19	4.10	15	272	255	22.83	107	9.00(3.08)
	W3	4.56	8	6.05	104.80	310	21.50	3.44	31.40	104	19	4.23	14	279	266	22.43	113	8.67(3.03)
	W4	-		-	-	-	-	-	-	-	-	4.40	13	301	250	22.93	111	9.00(3.08)
S2	W1	4.98	1	6.57	107.10	262	22.43	4.44	32.47	133	24	5.73	4	285	259	22.03	112	4.67(2.27)
	W2	4.79	5	6.29	104.77	252	22.30	4.18	32.13	121	22	5.90	3	290	243	23.77	113	3.00(1.86)
	W3	4.91	3	6.48	106.13	258	22.40	4.29	32.40	129	23	6.00	2	266	253	23.93	113	2.00(1.56)
	W4	-		-	-	-	-	-	-	-	-	6.57	1	268	255	23.87	114	1.33(1.34)
S3	W1	3.56	10	4.72	108.77	190	22.53	3.96	31.63	120	22	-		-	-	-	-	-
	W2	3.36	12	4.39	105.13	183	22.33	3.71	32.17	111	22	-		-	-	-	-	-
	W3	3.41	11	4.49	107.40	186	22.40	3.88	31.57	115	21	-		-	-	-	-	-
	W4	-		-	-	-	-	-	-	-	-	-		-	-	-	-	-
S4	W1	-		-	-	-	-	-	-	-	-	5.03	8	272	261	23.47	113	4.33(2.20)
	W2	-		-	-	-	-	-	-	-	-	5.17	7	266	249	23.27	115	3.33(1.95)
	W3	-		-	-	-	-	-	-	-	-	5.37	6	261	250	23.73	114	3.67(2.04)
	W4	-		-	-	-	-	-	-	-	-	5.67	5	245	953	24.73	112	2.67(1.77)
S5	W1	4.94	2	6.48	106.27	258	23.00	4.31	32.33	129	23	4.73	12	269	251	23.60	114	4.67(2.27)
	W2	4.72	6	6.21	104.47	244	22.40	4.09	31.13	113	21	4.83	11	269	261	23.33	112	3.67(2.04)
	W3	4.86	4	6.41	105.87	255	22.77	4.21	31.73	122	22	5.00	9	270	260	25.27	113	3.00(1.86)
	W4	-		-	-	-	-	-	-	-	-	4.93	10	267	263	24.73	111	2.33(1.66)
Mean of Methods																		
S1		4.53	3	5.98	104.33	308	21.51	3.44	31.48	104	19	4.19	4	279	262	23.35	110	8.67(3.02)
S2		4.89	1	6.45	106.00	257	22.38	4.30	32.33	128	23	6.05	1	277	253	23.40	113	2.75(1.76)
S3		3.44	4	4.53	107.10	186	22.42	3.85	31.79	115	22	-		-	-	-	-	-
S4		-		-	-	-	-	-	-	-	-	5.31	2	261	428	23.80	114	3.50(1.99)
S5		4.84	2	6.37	105.53	252	22.72	4.20	31.73	121	22	4.88	3	269	259	24.23	112	3.42(1.96)
C.D. (0.05)		0.25		0.34	NS	14.32	NS	0.19	NS	9.5	2.12	0.07		4.89	NS	NS	1.6	0.28
C.V. (%)		4.81		5.13	3.31	4.95	3.23	4.22	2.75	7.04	8.53	1.38		1.8	101.83	6.64	1.43	12.87

Table 4.2.2.1: Contd.

Methods of crop establishment	Sub plot	RAIPUR										REWA						
		Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant height (cm)	Panicle/m^2 (No.)	Panicle height (cm)	Panicle wt (g)	Test wt (g)	Filled grain / panicle	unfilled grain / panicle	Grain yield (t/ha)	Rank	Tillers/m^2 (No.)	Panicle/m^2 (No.)	Test wt (g)	Days for 50% flowering	Weed population (no/m2) At active tillering
Mean of sub plot																		
W1		4.54	1	5.98	106.81	257	22.42	4.07	32.06	122	22	4.88	4	273	262	23.58	112	5.42(2.41)
W2		4.31	3	5.66	104.37	244	22.09	3.82	31.67	112	21	5.00	3	274	252	23.30	112	4.75(2.23)
W3		4.43	2	5.86	106.05	252	22.27	3.96	31.77	118	21	5.15	2	269	257	23.84	113	4.33(2.12)
W4		-		-	-	-	-	-	-	-	-	5.39	1	270	430	24.07	112	3.83(1.96)
CD (0.05)		0.12		0.2	NS	10.14	NS	0.13	NS	5.68	NS	0.12		NS	NS	NS	NS	0.15
C.V. (%)		3.26		3.99	2.94	4.67	2.88	3.66	2.62	5.61	5.13	2.83		2.86	102.39	4.12	1.62	8.09
Interaction																		
M and S		NS		NS	NS	NS	NS	NS	NS	NS	NS	0.24		13.1	NS	1.65	NS	0.3
S and M		NS		NS	NS	NS	NS	NS	NS	NS	NS	0.22		11.97	NS	1.85	NS	0.33
Experimental Mean		**4.43**		**5.83**	**105.74**	**251**	**22.26**	**3.95**	**31.83**	**117**	**22**	**5.11**		**271**	**300**	**23.70**	**112**	**2.18**
Soil type		Vertisols										-						
pH		7.1										-						
EC		-										-						
Variety & Duration		IGKV R1, 125 days										-						
Applied NPK kg/ha		100:60:40										-						
Available NPK kg/ha		210;21.6:334										-						

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: -
S5- Any improved system in that particular location - Mechaniseed seeding with Inclined Plate Planter with specific spacing

W1: Manual weeding (three times)
W2: Pre + post-emergence herbicide
W3: Pre-emergence herbicide + Manual weeding (two times)
W4: -

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

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 or (penoxsulam + cyhalofopbyutyl) @ 2500ml/ha

Table 4.2.2.1: Contd.

Methods of crop establishment	Sub plot	RAJENDRANAGAR-ARI												
		Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant height (cm)	Tillers/m^2 (No.)	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days for 50% flowering	Dry mater accumulation (g/m2) at 105 DAS	Weed population (no/m^2)		Weed biomass (g/m^2)
												At active tillering	At panicle initiation	At panicle initiation
S1	W1	4.06	8	5.12	97.58	355	279	2.94	26.50	95	654.76	12.00(3.53)	54.00(7.38)	34.00
	W2	3.63	11	5.16	96.76	305	266	2.79	26.47	94	629.11	30.00(5.50)	79.33(8.93)	65.67
	W3	4.30	4	5.87	96.83	335	297	3.01	26.50	95	723.36	23.33(4.85)	37.67(6.17)	24.33
	W4	3.43	12	4.81	93.73	278	257	2.75	26.43	92	574.05	43.67(6.64)	117.33(10.85)	84.67
S2	W1	4.41	3	5.27	91.13	360	352	3.45	27.03	64	773.37	9.67(3.19)	33.00(5.78)	29.33
	W2	4.24	5	5.41	94.95	424	350	3.31	26.93	95	717.93	24.67(5.02)	46.33(6.84)	53.00
	W3	4.53	1	6.02	95.27	371	367	3.35	27.20	94	805.24	19.67(4.48)	15.33(3.84)	20.00
	W4	4.10	6	5.63	97.58	371	331	3.14	27.03	94	714.86	26.67(5.20)	81.33(9.04)	75.00
S3	W1	4.08	7	5.36	93.37	408	330	3.08	26.77	95	693.60	9.33(3.11)	41.33(6.46)	41.00
	W2	3.98	9	5.07	94.87	404	315	3.06	26.70	93	672.69	25.00(5.03)	59.33(7.73)	59.33
	W3	4.42	2	5.81	94.85	422	330	3.12	26.87	95	733.97	22.00(4.72)	26.33(5.14)	29.33
	W4	3.89	10	5.33	92.93	366	310	3.03	26.60	94	667.85	29.33(5.46)	101.00(10.07)	93.00
S4	W1	-		-	-	-	-	-	-	-	-	-	-	-
	W2	-		-	-	-	-	-	-	-	-	-	-	-
	W3	-		-	-	-	-	-	-	-	-	-	-	-
	W4	-		-	-	-	-	-	-	-	-	-	-	-
S5	W1	-		-	-	-	-	-	-	-	-	-	-	-
	W2	-		-	-	-	-	-	-	-	-	-	-	-
	W3	-		-	-	-	-	-	-	-	-	-	-	-
	W4	-		-	-	-	-	-	-	-	-	-	-	-
Mean of Methods														
S1		3.86	3	5.24	96.22	318	275	2.87	26.47	94	645.32	27.25(5.13)	72.08(8.33)	52.17
S2		4.32	1	5.58	94.73	382	350	3.31	27.05	87	752.85	20.17(4.47)	44.00(6.38)	44.33
S3		4.09	2	5.39	94.00	400	321	3.07	26.73	94	692.03	21.42(4.58)	57.00(7.35)	55.67
S4		-		-	-	-	-	-	-	-	-	-	-	-
S5		-		-	-	-	-	-	-	-	-	-	-	-
C.D. (0.05)		0.22		NS	NS	9.9	16.13	NS	0.22	NS	39.77	0.13	0.35	2.24
C.V. (%)		7.28		6.93	2.88	3.72	7.05	12.57	1.12	17	7.87	3.94	6.55	6.1

Table 4.2.2.1: Contd.

Methods of crop establishment	Sub plot	RAJENDRANAGAR-ARI												
		Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant height (cm)	Tillers/m^2 (No.)	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days for 50% flowering	Dry mater accumulation (g/m2) at 105 DAS	Weed population (no/m^2)		Weed biomass (g/m^2)
												At active tillering	At panicle initiation	At panicle initiation
Mean of sub plot														
W1		4.18	2	5.25	94.02	374	321	3.16	26.77	85	707.24	10.33(3.28)	42.78(6.54)	34.78
W2		3.95	3	5.21	95.53	378	310	3.06	26.70	94	673.24	26.56(5.18)	61.67(7.83)	59.33
W3		4.42	1	5.90	95.65	376	331	3.16	26.86	95	754.19	21.67(4.69)	26.44(5.05)	24.56
W4		3.81	4	5.26	94.74	338	299	2.97	26.69	93	652.26	33.22(5.76)	99.89(9.99)	84.22
CD (0.05)		0.35		0.55	NS	NS	18.97	NS	NS	NS	50.75	0.45	0.53	3.52
C.V. (%)		8.55		10.2	3.25	13.11	6.07	10.88	1.14	17.49	7.35	9.7	7.28	7.01
Interaction														
M and S		NS		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
S and M		NS		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Experimental Mean		**4.09**		**5.40**	**94.99**	**367**	**315**	**3.09**	**26.75**	**92**	**696.73**	**4.73**	**7.35**	**50.72**
Soil type		-												
pH		7.4												
EC		-												
Variety & Duration		-												
Applied NPK kg/ha		150:60:40												
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: -
S5: -

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 or (penoxsulam + cyhalofopbyutyl) @ 2500ml/ha

Table 4.2.2.1: Contd.

Methods of crop establishment	Sub plot	VADGAON								
		Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant height (cm)	Tillers/m^2 (No.)	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days for 50% flowering
S1	W1	3.76	19	4.03	86.05	174	171	3.49	20.66	98
	W2	3.42	20	3.66	83.84	158	156	3.18	20.13	96
	W3	3.80	18	4.07	86.94	176	173	3.53	20.87	97
	W4	3.88	17	4.15	88.71	179	177	3.60	21.30	97
S2	W1	5.38	7	5.83	97.60	249	245	4.99	22.32	96
	W2	5.27	8	5.72	95.64	244	240	4.89	21.87	96
	W3	5.43	5	5.89	98.60	251	247	5.04	22.55	97
	W4	5.54	3	6.01	99.34	256	252	5.14	22.71	98
S3	W1	5.48	4	5.95	98.57	254	250	5.09	22.54	96
	W2	5.43	5	5.89	96.60	251	247	5.03	22.09	97
	W3	5.60	2	6.07	99.08	259	255	5.20	22.77	96
	W4	5.71	1	6.20	100.07	264	260	5.30	22.94	96
S4	W1	5.05	12	5.46	91.74	234	230	4.69	20.98	96
	W2	4.90	15	5.29	88.95	227	223	4.55	20.34	97
	W3	5.13	10	5.54	93.18	237	234	4.76	21.31	98
	W4	5.24	9	5.66	95.08	242	239	4.86	21.74	96
S5	W1	4.95	14	5.32	89.91	229	226	4.59	20.56	96
	W2	4.80	16	5.16	87.17	222	219	4.46	19.93	96
	W3	5.03	13	5.41	91.31	233	229	4.67	20.88	97
	W4	5.13	10	5.52	93.18	237	234	4.76	21.31	98
Mean of Methods										
S1		3.72	5	3.98	86.38	172	169	3.45	20.74	97
S2		5.40	2	5.86	97.80	250	246	5.01	22.36	97
S3		5.55	1	6.03	98.58	257	253	5.15	22.59	96
S4		5.08	3	5.49	92.24	235	231	4.71	21.09	97
S5		4.98	4	5.35	90.39	230	227	4.62	20.67	97
C.D. (0.05)		0.07		0.08	1.4	3.69	3.72	0.07	0.31	NS
C.V. (%)		1.95		1.96	1.95	2.09	2.14	1.96	1.85	1

Table 4.2.2.1: Contd.

Methods of crop establishment	Sub plot	VADGAON								
		Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant height (cm)	Tillers/m^2 (No.)	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days for 50% flowering
Mean of sub plot										
W1		4.92	3	5.32	92.77	228	224	4.57	21.41	96
W2		4.76	4	5.14	90.44	220	217	4.42	20.87	96
W3		5.00	2	5.40	93.82	231	228	4.64	21.68	97
W4		5.10	1	5.51	95.28	236	232	4.73	22.00	97
CD (0.05)		0.04		0.04	0.92	1.75	1.73	0.04	0.21	NS
C.V. (%)		1.21		1.2	1.57	1.21	1.21	1.21	1.56	1.27
Interaction										
M and S		NS		NS	NS	NS	NS	NS	NS	1.73
S and M		NS		NS	NS	NS	NS	NS	NS	1.6
Experimental Mean		**4.95**		**5.34**	**93.08**	**229**	**225**	**4.59**	**21.49**	**97**
Soil type		Medium								
pH		7.71								
EC		0.16								
Variety & Duration		Phule Samruddhi, 125-130 days								
Applied NPK kg/ha		100;50:50								
Available NPK kg/ha		192;20.1:248								

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 - Line sowing at 22.5cm by traditional seed dril

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 or (penoxsulam + cyhalofopbyutyl) @ 2500ml/ha

Table 4.2.2.1: Contd.

Methods of crop establishment	Sub plot	VARANASI																Over all Mean	Rank
		Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant height (cm)			Tillers/m² (No.)			Panicle/m² (No.)	Panicle wt (g)	Test wt (g)	Weed population (no/m²)		Weed biomass (g/m²)			
					At 30 DAS	At 60 DAS	At 90 DAS	At 30 DAS	At 60 DAS	At 90 DAS				At active tillering	At panicle initiation	At active tillering	At panicle initiation		
S1	W1	2.49	15	4.24	28.72	62.45	81.02	104	156	302	197	1.18	21.67	136.67(11.68)	31.00(5.59)	75.61	23.81	3.90	17
	W2	2.97	7	6.66	29.52	61.17	80.95	106	163	318	256	1.58	21.40	69.00(8.31)	29.67(5.49)	45.87	20.31	3.62	19
	W3	2.11	18	6.30	28.42	58.33	75.11	110	183	316	277	1.70	22.93	60.00(7.66)	32.00(5.69)	77.63	17.40	3.92	16
	W4	2.32	16	6.91	29.39	65.27	73.50	104	170	291	285	1.76	22.97	97.00(9.86)	33.33(5.81)	73.32	24.58	3.39	20
S2	W1	2.84	9	4.06	29.12	60.67	76.00	136	205	327	280	1.76	22.63	90.67(9.53)	32.67(5.75)	101.69	20.37	4.46	4
	W2	2.61	12	6.23	29.30	61.31	72.63	138	231	321	289	1.78	23.00	61.00(7.82)	34.00(5.87)	91.54	18.44	4.31	9
	W3	2.59	13	6.24	29.03	61.88	78.09	142	248	306	306	1.91	23.00	69.33(8.32)	40.67(6.41)	94.12	24.26	4.58	1
	W4	2.98	6	6.15	28.16	62.94	82.31	141	252	305	317	1.94	22.67	86.33(9.30)	43.33(6.62)	63.61	24.70	4.30	10
S3	W1	3.44	2	6.72	27.83	65.62	83.19	140	260	342	305	1.91	21.10	104.00(10.22)	40.67(6.41)	100.80	21.07	4.38	7
	W2	4.42	1	6.35	26.29	58.98	77.46	142	261	332	317	2.01	22.60	88.33(9.41)	21.00(4.62)	74.88	12.15	3.96	15
	W3	3.13	4	6.17	28.15	61.26	71.95	141	240	340	297	1.84	23.63	70.33(8.39)	29.67(5.44)		19.36	4.27	12
	W4	2.16	17	5.39	27.81	59.54	70.67	138	226	317	281	1.76	21.40	102.00(10.11)	45.33(6.77)	106.91	22.60	3.76	18
S4	W1	2.81	10	5.29	30.14	69.95	79.05	124	195	276	139	1.13	23.20	15.00(3.90)	17.33(4.22)	24.73	6.85	4.51	2
	W2	3.01	5	6.40	28.59	76.01	88.32	124	168	286	157	1.13	23.70	5.67(2.47)	18.67(4.38)	14.15	9.08	4.17	13
	W3	2.93	8	5.97	30.18	77.23	85.71	123	170	281	149	1.15	24.53	7.33(2.79)	18.67(4.35)	16.61	7.75	4.42	6
	W4	2.50	14	0.90	27.93	65.01	77.11	126	174	283	140	1.18	24.10	8.00(2.90)	11.67(3.48)	22.36	7.97	4.12	14
S5	W1	3.36	3	6.34	27.78	62.54	78.56	139	228	326	286	1.76	22.07	92.67(9.65)	29.67(5.49)	51.99	18.56	4.48	3
	W2	2.79	11	6.11	26.41	62.11	75.39	144	235	354	307	1.98	22.47	64.00(8.02)	33.67(5.84)	57.96	16.60	4.44	5
	W3	1.66	20	6.61	27.97	63.07	79.12	142	248	349	293	1.89	22.00	62.67(7.91)	36.67(6.09)	110.28	25.45	4.36	8
	W4	1.69	19	6.14	28.88	63.33	78.34	142	245	348	311	2.05	21.97	100.00(10.02)	37.67(6.14)	91.97	26.86	4.29	11
Mean of Methods																			
S1		2.47	4	6.03	29.01	61.81	77.64	106	168	307	254	1.56	22.24	90.67(9.38)	31.50(5.64)	68.11	21.53	3.74	5
S2		2.75	3	5.67	28.90	61.70	77.26	139	234	315	298	1.84	22.82	76.83(8.74)	37.67(6.16)	87.74	21.94	4.42	1
S3		3.29	1	6.16	27.52	61.35	75.82	140	247	333	300	1.88	22.18	91.17(9.53)	34.17(5.81)	94.20	18.79	4.08	4
S4		2.81	2	4.64	29.21	72.05	82.55	124	177	282	146	1.15	23.88	9.00(3.02)	16.58(4.11)	19.46	7.91	4.31	3
S5		2.38	5	6.30	27.76	62.76	77.85	142	239	344	300	1.92	22.12	79.83(8.90)	34.42(5.89)	78.05	21.87	4.42	2
C.D. (0.05)		0.27		0.95	NS	1.07	1.06	12.8	10.97	10.94	11.89	0.12	1.04	0.46	0.41	34.11	3.63		
C.V. (%)		10.54		17.5	7.55	1.78	1.43	10.44	5.47	3.68	4.87	7.69	4.89	6.23	7.81	55.91	20.95		

Table 4.2.2.1: Contd.

Methods of crop establishment	Sub plot	VARANASI																Over all Mean	Rank
		Grain yield (t/ha)	Rank	Straw yield (t/ha)	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 30 DAS	At 60 DAS	At 90 DAS	At 30 DAS	At 60 DAS	At 90 DAS				At active tillering	At panicle initiation	At active tillering	At panicle initiation		
Mean of sub plot																			
W1		2.99	2	5.33	28.72	64.25	79.57	128	209	314	241	1.55	22.13	87.80(9.00)	30.27(5.49)	70.96	18.13	4.33	1
W2		3.16	1	6.35	28.02	63.92	78.95	131	212	322	265	1.70	22.63	57.60(7.21)	27.40(5.24)	56.88	15.31	4.09	3
W3		2.48	3	6.26	28.75	64.35	78.00	132	218	318	264	1.70	23.22	53.93(7.01)	31.53(5.60)	74.66	18.84	4.33	2
W4		2.33	4	5.10	28.43	63.22	76.39	130	214	309	267	1.74	22.62	78.67(8.44)	34.27(5.76)	71.63	21.34	3.96	4
CD (0.05)		0.15		0.57	NS	NS	0.59	NS	5.89	5.89	6.69	0.08	0.68	0.51	0.3	8.4	3.36		
C.V. (%)		7.57		13.33	3.31	2.22	1.01	2.92	3.71	2.5	3.46	6.19	4.05	8.59	7.26	17.39	24.51		
Interaction																			
M and S		0.35		1.28	1.57	2.37	1.32	NS	13.17	13.16	14.96	0.17	NS	1.13	0.67	18.79	NS		
S and M		0.36		1.32	2.01	2.21	1.39	NS	14.03	14.02	15.71	0.17	NS	1.04	0.66	29.54	NS		
Experimental Mean		**2.74**		**5.76**	**28.48**	**63.93**	**78.22**	**130**	**213**	**316**	**259**	**1.67**	**22.65**	**7.91**	**5.52**	**64.80**	**18.41**	**4.19**	
Soil type		Loam																	
pH		7.2																	
EC		0.21																	
Variety & Duration		HUR 3022, 115-120 days																	
Applied NPK kg/ha		120:60:60:15																	
Available NPK kg/ha		180:30:208																	

S1: Broadcasting of seeds
S2: Mechanized line sowing of seeds (Dribbler, Happy seeder of 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)- Sowing in dry soil fb wetting
S5- Any improved system in that particular location(Dibbling)

W1: Manual weeding (three times)
W2: Pre + post-emergence herbicide
W3: Pre-emergence herbicide + Manual weeding (two times)
W4: Mechanical weeding (2-3 times start from 15 DAS at 15-20 days interval)

Table 4.2.2.1: Contd.

Methods of crop establishment	Sub plot	KHUDWANI																	
		Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m²		Plant height (cm)	Tillers/m² (No.)	Panicle/m² (No.)	Panicle wt (g)	Test wt (g)	Days for 50% flowering	Dry mater accumulation (g/m2)			Weed population (no/m²)		Weed biomass (g/m²)	
					At 10 DAS	At 20 DAS							At 45 DAS	At 75 DAS	At 105 DAS	At active tillering	At panicle initiation	At active tillering	At panicle initiation
S1	W1	6.15	16	6.31	121	124	115.00	328	267	3.13	29.00	101	419.00	648.66	971.67	9.07(3.00)	8.00(2.90)	21.87	14.40
	W2	5.69	20	5.84	86	90	108.07	261	226	2.77	29.00	100	392.00	581.12	960.00	18.13(4.29)	13.00(3.65)	43.40	23.40
	W3	6.80	11	6.93	95	96	110.13	318	269	3.52	28.57	101	470.67	567.04	966.33	14.93(3.89)	7.67(2.85)	28.60	18.03
	W4	7.57	2	7.68	111	116	121.07	336	278	2.81	28.77	101	518.67	714.24	1124.00	11.73(3.43)	10.67(3.33)	26.53	19.20
	W5	6.70	13	6.84	94	99	117.20	330	271	3.16	29.20	101	464.33	723.09	1121.00	20.27(4.52)	15.33(3.96)	45.07	27.60
S2	W1	7.17	7	7.25	119	121	112.07	324	283	3.15	29.23	100	494.33	781.86	1192.67	10.67(3.32)	9.00(3.06)	20.17	19.93
	W2	6.03	18	6.15	88	91	105.33	281	264	3.17	27.90	100	422.33	704.65	1146.00	13.87(3.74)	15.33(3.96)	32.93	27.60
	W3	6.46	15	6.53	100	103	112.63	349	272	2.77	29.07	100	434.67	618.51	3780.00	13.87(3.78)	10.33(3.28)	31.60	18.60
	W4	6.73	12	7.18	110	114	117.47	331	274	3.04	28.93	101	497.00	804.85	1267.33	12.80(3.63)	13.67(3.74)	30.73	33.47
	W5	7.49	4	7.60	95	99	113.47	326	273	2.77	29.03	100	515.33	835.47	1378.67	12.27(3.45)	9.33(3.12)	23.23	16.80
S3	W1	7.12	8	7.25	121	123	111.67	288	281	3.08	29.33	101	483.67	738.26	1075.33	9.07(3.08)	9.00(3.06)	20.53	16.20
	W2	6.08	17	6.17	90	94	106.13	277	238	3.21	29.27	100	426.33	735.59	1070.33	18.67(4.35)	12.33(3.58)	43.60	22.20
	W3	6.53	14	6.32	102	105	123.10	287	301	2.93	29.00	101	444.00	772.09	4048.00	18.67(4.35)	11.00(3.38)	54.13	26.93
	W4	7.50	3	7.62	115	119	123.07	327	321	2.69	29.33	101	518.33	855.20	1344.67	11.20(3.41)	12.00(3.52)	23.33	21.60
	W5	7.32	6	7.54	105	109	125.23	354	314	2.73	29.30	100	514.67	643.33	1051.00	17.07(4.18)	12.67(3.62)	39.53	22.80
S4	W1	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	W2	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	W3	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	W4	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	W5	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S5	W1	7.02	9	7.10	70	72	111.47	279	296	3.14	29.47	100	486.33	648.13	1155.33	13.87(3.74)	9.67(3.18)	46.73	17.40
	W2	5.97	19	6.03	63	65	111.50	228	259	2.90	28.53	100	417.67	651.56	1025.00	25.60(5.09)	16.67(4.14)	62.30	40.97
	W3	7.64	1	7.82	71	72	112.13	306	322	3.06	29.13	101	540.33	713.24	1179.33	16.53(4.10)	11.67(3.46)	46.50	30.70
	W4	7.33	5	7.45	72	72	123.03	288	305	2.97	29.27	101	509.33	865.87	1322.67	21.87(4.69)	17.67(4.24)	48.17	40.27
	W5	6.89	10	7.02	67	69	122.10	303	316	3.07	29.43	101	478.00	669.20	1207.33	19.73(4.47)	14.33(3.84)	34.13	28.00
Mean of Methods																			
S1		6.58	4	6.72	101	105	114.29	315	262	3.08	28.91	101	452.93	646.83	1028.60	14.83(3.83)	10.93(3.34)	33.09	20.53
S2		6.78	3	6.94	103	106	112.19	322	273	2.98	28.83	101	472.73	749.07	1752.93	12.69(3.58)	11.53(3.43)	27.73	23.28
S3		6.91	2	6.98	107	110	117.84	307	291	2.93	29.25	101	477.40	748.89	1717.87	14.93(3.87)	11.40(3.43)	36.23	21.95
S4		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S5		6.97	1	7.08	68	70	116.05	281	300	3.03	29.17	101	486.33	709.60	1177.93	19.52(4.42)	14.00(3.77)	47.57	31.47
C.D. (0.05)		NS		NS	7.07	7.52	2.65	NS	NS	NS	NS	NS	NS	73.72	NS	NS	NS	12.67	7.15
C.V. (%)		12.63		12.78	8.35	8.62	2.58	12.53	10.86	17.93	2.71	0.29	12.4	11.56	85.22	24.16	15.56	39.21	32.92

Table 4.2.2.1: Contd.

Methods of crop establishment	Sub plot	KHUDWANI																	
		Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m²		Plant height (cm)	Tillers/m² (No.)	Panicle/m² (No.)	Panicle wt (g)	Test wt (g)	Days for 50% flowering	Dry mater accumulation (g/m2)			Weed population (no/m²)		Weed biomass (g/m²)	
					At 10 DAS	At 20 DAS							At 45 DAS	At 75 DAS	At 105 DAS	At active tillering	At panicle initiation	At active tillering	At panicle initiation
Mean of sub plot																			
W1		6.86	3	6.98	108	110	112.55	305	282	3.13	29.26	101	470.83	704.23	1098.75	10.67(3.28)	8.92(3.05)	27.33	16.98
W2		5.94	5	6.05	82	85	107.76	262	247	3.01	28.68	100	414.58	668.23	1050.33	19.07(4.37)	14.33(3.83)	45.56	28.54
W3		6.86	3	6.90	92	94	114.50	315	291	3.07	28.94	101	472.42	667.72	2493.42	16.00(4.03)	10.17(3.24)	40.21	23.57
W4		7.28	1	7.48	102	105	121.16	321	295	2.88	29.08	101	510.83	810.04	1264.67	14.40(3.79)	13.50(3.71)	32.19	28.63
W5		7.10	2	7.25	90	94	119.50	328	294	2.93	29.24	101	493.08	717.77	1189.50	17.33(4.15)	12.92(3.63)	35.49	23.80
CD (0.05)		0.55		0.59	6.21	6.14	2.55	22.3	27.77	NS	NS	NS	39.76	55.4	NS	0.49	0.3	8.52	4.32
C.V. (%)		9.72		10.27	7.95	7.62	2.68	8.83	11.96	14.48	2.67	0.62	10.2	9.41	107.31	15.14	10.24	28.56	21.57
Interaction																			
M and S		NS		NS	NS	NS	5.09	NS	NS	NS	NS	NS	NS	110.8	NS	NS	NS	17.04	8.65
S and M		NS		NS	NS	NS	5	NS	NS	NS	NS	NS	NS	114.29	NS	NS	NS	18.08	9.47
Experimental Mean		**6.81**		**6.93**	**95**	**98**	**115.09**	**306**	**281**	**3.00**	**29.04**	**101**	**472.35**	**713.60**	**1419.33**	**3.92**	**3.49**	**36.16**	**24.31**
Soil type		Silty clay loam																	
pH		6.8																	
EC		0.45																	
Variety & Duration		Shalimar Rice -4(SR-4), 135-138 days																	
Applied NPK kg/ha		120:60:30																	
Available NPK kg/ha		223;19.5:245																	

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- -
S5- Any improved system in that particular location - SRI dibbling

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 or (penoxsulam + cyhalofopbyutyl) @ 2500ml/ha
W5:Mechanical weedings+Post emergence herbicide

Table 4.2.2.1: Contd.

Methods of crop establishment	Sub plot	LUDHIANA										
		Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m² At 20 DAS	Plant height (cm)	Panicle/m² (No.)	Panicle wt (g)	Days for 50% flowering	Weed population (no/m²) At panicle initiation	Weed biomass (g/m²) At panicle initiation	Sterility %
S1	W1	3.61	16		55	91.07	348	2.04	81	64.67(8.07)	111.73	16.85
	W2	3.78	10	6.58	57	94.73	368	2.17	80	30.67(5.55)	55.60	16.18
	W3	3.78	10	6.59	54	91.07	353	2.15	80	29.00(5.42)	48.67	17.09
	W4	3.74	15	6.45	55	93.67	352	2.17	82	31.33(5.63)	74.20	16.45
S2	W1	3.83	10	6.73	54	93.87	352	2.21	81	34.67(5.93)	83.67	17.07
	W2	4.24	3	7.38	54	94.73	385	2.28	81	26.67(5.21)	45.00	16.73
	W3	4.17	5	7.24	55	93.80	368	2.21	81	26.33(5.17)	43.60	14.15
	W4	4.10	8	7.13	55	93.67	370	2.37	79	33.33(5.81)	53.30	17.81
S3	W1	3.82	12	6.66	55	91.73	352	2.12	80	50.00(7.10)	79.43	15.05
	W2	4.27	3	7.33	54	94.07	378	2.25	79	34.00(5.87)	48.73	16.65
	W3	4.39	2	7.62	53	89.80	396	2.12	79	29.33(5.42)	49.20	14.85
	W4	4.22	5	7.44	54	93.27	380	2.23	81	32.67(5.76)	48.67	14.20
S4	W1	3.74	21	6.46	55	88.60	353	2.01	81	52.67(7.29)	77.80	15.22
	W2	3.75	19	6.39	58	91.20	387	2.22	81	33.33(5.81)	51.53	15.27
	W3	3.75	19	6.49	54	89.60	347	2.09	81	31.33(5.62)	48.87	15.91
	W4	3.91	13	6.61	53	91.07	358	2.01	82	32.67(5.76)	52.33	18.99
Mean of Methods												
S1		3.73		6.47	55	92.63	355	2.13	81	38.92(6.17)	72.55	16.64
S2		4.12		7.20	55	93.92	371	2.23	81	30.08(5.52)	55.23	15.54
S3		4.14		7.19	54	92.32	374	2.22	79	36.67(6.05)	57.67	16.09
S4		3.79		6.49	55	90.12	361	2.08	81	37.50(6.12)	57.63	16.35
C.D. (0.05)		0.24		0.24	NS	1.95	NS	0.08	1.09	NS	10.81	NS
C.V. (%)		6.02		3.5	10.39	2.12	10.39	3.49	1.36	8.97	17.81	14.18

Table 4.2.2.1: Contd.

Methods of crop establishment	Sub plot	LUDHIANA										
		Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m² At 20 DAS	Plant height (cm)	Panicle/m² (No.)	Panicle wt (g)	Days for 50% flowering	Weed population (no/m²) At panicle initiation	Weed biomass (g/m²) At panicle initiation	Sterility %
Mean of sub plot												
W1		3.75		6.52	55	91.32	351	2.10	81	50.50(7.10)	88.16	16.05
W2		4.01		6.92	56	93.68	379	2.23	80	31.17(5.61)	50.22	16.21
W3		4.02		6.98	54	91.07	366	2.14	81	29.00(5.41)	47.58	15.50
W4		4.00		6.91	54	92.92	365	2.19	81	32.50(5.74)	57.13	16.86
CD (0.05)		NS		0.26	NS	2	NS	NS	NS	0.32	8.4	NS
C.V. (%)		6.59		4.56	7.18	2.57	6.67	6.34	0.96	6.37	16.41	13.5
Interaction												
M and S		NS		NS	NS	NS	NS	NS	NS	0.64	NS	NS
S and M		NS		NS	NS	NS	NS	NS	NS	0.69	NS	NS
Experimental Mean		**3.94**		**6.83**	**55**	**92.25**	**365**	**2.17**	**81**	**5.96**	**60.77**	**16.15**
Soil type		Sandy loam										
pH		7.6										
EC		-										
Variety & Duration		Pusa Basmati 1509, 115 days										
Applied NPK kg/ha		-										
Available NPK kg/ha		-										

S1: Broadcasting of seeds
S2: Manual line sowing of seeds (20 cm row spacing sown in solid row)
S3: Raised bed sowing (4 rows on 1 mt wide bed)
S4: Any improved system - Raised bed sowing (2 rows on 67.5 wide bed)

W1: Manual weeding (20,30 and 40 DAS)
W2: Pre + post-emergence herbicide at 20 DAS
W3: Pre-emergence herbicide + Manual weeding at 30 and 40 DAS
W4: Mechanical weeding (2-3 times start from 15 DAS at 15-20 days interval) - (20 and 30 DAS)

*Pre-emergence: Pendimethalin 0.75 kg/ha *Post-emegence: Bispyribac sodium 25 g/ha

Table 4.2.2.1: Contd.

Methods of crop establishment	Sub plot	NAGINA									
		Grain yield (t/ha)	Rank	Plant height (cm)	Tillers/m^2 (No.)	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days for 50% flowering	Weed population (no/m^2)	Weed biomass (g/m^2)
										At active tillering	At active tillering
S1	W1	4.49	10	128.75	293	282	3.57	26.51	103	4.79(2.29)	2.25
	W2	4.59	8	129.25	293	286	3.58	26.52	102	5.69(2.48)	3.71
	W3	4.77	6	129.50	306	295	3.60	26.55	105	5.45(2.42)	2.72
	W4	4.43	12	128.75	289	292	3.56	26.49	103	8.08(2.91)	4.39
S2	W1	4.91	3	130.50	319	310	3.63	26.52	107	3.94(2.05)	2.39
	W2	5.15	2	130.50	326	314	3.66	26.54	108	3.62(2.00)	2.18
	W3	5.31	1	132.00	325	325	3.68	26.56	106	2.86(1.81)	1.92
	W4	4.89	4	129.50	312	304	3.63	26.52	106	3.38(1.95)	2.34
S3	W1	-		-	-	-	-	-	-	-	-
	W2	-		-	-	-	-	-	-	-	-
	W3	-		-	-	-	-	-	-	-	-
	W4	-		-	-	-	-	-	-	-	-
S4	W1	4.48	11	131.50	308	301	3.63	26.51	104	4.51(2.20)	2.66
	W2	4.70	7	131.00	314	312	3.65	24.02	104	4.16(2.14)	2.63
	W3	4.80	5	132.25	324	317	3.67	27.55	106	3.50(1.98)	2.29
	W4	4.56	9	129.25	310	303	3.63	26.53	104	5.18(2.37)	2.98
S5	W1	-		-	-	-	-	-	-	-	-
	W2	-		-	-	-	-	-	-	-	-
	W3	-		-	-	-	-	-	-	-	-
	W4	-		-	-	-	-	-	-	-	-
Mean of Methods											
S1		4.57	3	129.06	295	289	3.58	26.52	103	6.00(2.53)	3.27
S2		5.06	1	130.63	320	313	3.65	26.54	107	3.45(1.95)	2.21
S3		-		-	-	-	-	-	-	-	-
S4		4.63	2	131.00	314	308	3.64	26.15	104	4.34(2.17)	2.64
S5		-		-	-	-	-	-	-	-	-
C.D. (0.05)		0.06		0.6	10.74	9.37	0.01	NS	0.75	0.36	NS
C.V. (%)		1.5		0.53	4.01	3.57	0.28	6.34	0.83	18.96	35.74

Table 4.2.2.1: Contd.

Methods of crop establishment	Sub plot	NAGINA									
		Grain yield (t/ha)	Rank	Plant height (cm)	Tillers/m^2 (No.)	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Days for 50% flowering	Weed population (no/m^2) At active tillering	Weed biomass (g/m^2) At active tillering
Mean of sub plot											
W1		4.63	3	130.25	307	298	3.61	26.51	105	4.42(2.18)	2.43
W2		4.81	2	130.25	311	304	3.63	25.69	105	4.49(2.21)	2.84
W3		4.96	1	131.25	318	312	3.65	26.88	106	3.93(2.07)	2.31
W4		4.62	4	129.17	304	300	3.61	26.51	104	5.55(2.41)	3.23
CD (0.05)		0.11		0.82	8.99	10.75	0.01	NS	0.89	NS	NS
C.V. (%)		2.65		0.75	3.46	4.23	0.37	5.38	1.01	16.18	32.43
Interaction											
M and S		NS		NS	NS	NS	NS	NS	1.54	NS	NS
S and M		NS		NS	NS	NS	NS	NS	1.45	NS	NS
Experimental Mean		**4.75**		**130.23**	**310**	**303**	**3.62**	**26.40**	**105**	**2.22**	**2.70**
Soil type		-									
pH		-									
EC		-									
Variety & Duration		NDR 359									
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: -
S4- Semi-Dry system (Sowing in dry soil and Wet after one month of sowing)
S5: -

W1: Manual weeding (three times)
W2: Pre + post-emergence herbicide
W3: Pre-emergence herbicide + Manual weeding (two times)
W4: Mechanical weeding (2 - 3 times start from 15 DAS at 15-20 days interval)@ 2500ml/ha

Table 4.2.2.1: Contd.

Methods of crop establishment	Sub plot	PUSA																			
		Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m²		Plant height (cm)	Tillers/m² (No.)	Panicle/m² (No.)	Panicle wt (g)	Test wt (g)	Days for 50% flowering	Dry mater accumulation (g/m2)			Weed population (no/m²)		Weed biomass (g/m²)		Total water input mm/ha	Cost of cultivation Rs/ha
					At 10 DAS	At 20 DAS							At 455 DAS	At 75 DAS	At 105 DAS	At active tillering	At panicle initiation	At active tillering	At panicle initiation		
S1	W1	4.58	3	5.92	43	49	110.00	299	286	2.67	20.88	81	221.67	566.67	566.67	8.00(2.86)	12.00(3.50)	3.04	16.20	848.30	53250
	W2	4.25	10	5.70	38	46	108.67	286	266	2.69	20.35	81	190.00	536.67	536.67	10.67(3.30)	17.33(4.18)	4.05	23.40	848.30	41500
	W3	4.42	8	5.75	39	48	108.00	293	271	2.54	20.28	81	191.67	548.33	548.33	5.33(2.39)	10.67(3.33)	2.03	14.40	848.30	45050
	W4	4.57	5	5.78	38	47	105.67	297	281	2.55	20.78	81	216.67	561.67	561.67	10.67(3.33)	14.67(3.80)	4.05	19.80	848.30	42250
S2	W1	4.50	6	6.76	36	46	114.33	342	321	3.00	21.45	81	227.67	606.67	606.67	5.33(2.39)	12.00(3.50)	2.03	16.20	848.30	55500
	W2	4.12	16	5.99	36	47	108.67	324	297	2.70	20.48	81	208.00	570.00	570.00	8.00(2.86)	12.00(3.50)	3.04	16.20	848.30	43250
	W3	4.17	12	6.06	37	48	110.33	322	303	2.86	20.61	81	213.00	575.00	575.00	9.33(3.12)	10.67(3.24)	3.55	14.40	848.30	47012
	W4	4.00	18	6.70	37	46	106.67	328	314	2.82	21.18	80	232.33	596.67	596.67	6.67(2.65)	13.33(3.66)	2.53	18.00	848.30	44112
S3	W1	4.48	7	6.04	39	48	114.67	303	278	2.57	21.48	82	227.67	598.33	598.33	8.00(2.59)	9.33(3.12)	3.04	12.60	848.30	57500
	W2	4.17	12	5.56	39	49	111.67	288	269	2.47	20.51	81	193.33	563.33	563.33	9.33(3.03)	12.00(3.50)	3.55	16.20	848.30	45050
	W3	4.08	17	5.60	40	50	111.67	298	273	2.49	20.41	81	197.67	570.00	570.00	10.67(3.33)	12.00(3.50)	4.05	16.20	848.30	49012
	W4	4.15	15	6.06	41	49	108.33	295	273	2.53	21.08	81	223.67	591.67	591.67	12.00(3.50)	17.33(4.22)	4.56	23.40	848.30	46150
S4	W1	4.65	2	6.49	39	47	111.67	340	319	2.89	20.95	80	231.00	598.33	598.33	9.33(3.12)	12.00(3.50)	3.55	16.33	848.30	55250
	W2	4.58	3	5.97	41	50	116.00	309	288	2.64	20.21	81	198.67	560.00	560.00	10.67(3.33)	15.67(3.93)	4.05	21.15	848.30	42612
	W3	4.17	12	6.03	38	47	116.67	312	293	2.60	20.35	81	203.67	566.67	566.67	8.00(2.86)	12.00(3.50)	3.04	16.20	848.30	46500
	W4	3.98	20	6.40	37	46	108.67	330	319	2.69	20.58	81	225.00	596.67	596.67	12.00(3.50)	16.00(4.04)	4.56	21.60	848.30	43600
S5	W1	4.73	1	6.33	41	49	112.00	326	297	2.83	21.28	81	227.67	603.33	603.33	9.33(3.12)	11.67(3.46)	3.55	15.75	848.30	55500
	W2	4.25	10	6.04	40	49	109.00	306	276	2.57	20.38	80	193.33	543.33	543.33	13.33(3.71)	17.33(4.18)	5.07	23.40	848.30	43250
	W3	4.35	9	6.12	39	49	111.33	310	280	2.48	20.48	81	203.33	543.33	543.33	8.00(2.86)	20.00(4.51)	3.04	27.00	848.30	47250
	W4	4.00	18	6.26	40	47	113.33	296	277	2.79	21.05	81	221.67	593.33	593.33	12.00(3.50)	18.67(4.34)	4.56	25.20	848.30	44250
Mean of Methods																					
S1		4.45	1	5.79	40	48	108.08	294	276	2.61	20.57	81	205.00	553.33	553.33	8.67(2.97)	13.67(3.70)	3.29	18.45	848.30	45513
S2		4.20	5	6.38	37	47	110.00	329	309	2.84	20.93	81	220.25	587.08	587.08	7.33(2.75)	12.00(3.48)	2.79	16.20	848.30	47469
S3		4.22	4	5.81	40	49	111.58	296	273	2.52	20.87	81	210.58	580.83	580.83	10.00(3.11)	12.67(3.59)	3.80	17.10	848.30	49428
S4		4.35	2	6.22	39	48	113.25	323	305	2.70	20.52	81	214.58	580.42	580.42	10.00(3.20)	13.92(3.75)	3.80	18.82	848.30	46991
S5		4.33	3	6.19	40	48	111.42	309	283	2.67	20.80	81	211.50	570.83	570.83	10.67(3.30)	16.92(4.12)	4.05	22.84	848.30	47563
C.D. (0.05)		NS		0.31	1.29	1.39	3.09	NS	NS	0.13	NS	NS	NS	NS	NS	NS	NS	NS	NS		
C.V. (%)		5.82		5.34	3.52	3.09	2.96	11.18	12.24	5.06	2.52	0.92	6.07	4.97	4.97	21.4	20.63	41.68	43.02		

Table 4.2.2.1: Contd.

Methods of crop establishment	Sub plot	PUSA																			
		Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant population no/m²		Plant height (cm)	Tillers/m² (No.)	Panicle/m² (No.)	Panicle wt (g)	Test wt (g)	Days for 50% flowering	Dry mater accumulation (g/m2)			Weed population (no/m²)		Weed biomass (g/m²)		Total water input mm/ha	Cost of cultivation Rs/ha
					At 10 DAS	At 20 DAS							At 455 DAS	At 75 DAS	At 105 DAS	At active tillering	At panicle initiation	At active tillering	At panicle initiation		
Mean of sub plot																					
W1		4.59	1	6.31	39	48	112.53	322	300	2.79	21.21	81	227.13	594.67	594.67	8.00(2.82)	11.40(3.42)	3.04	15.42	848.30	55400
W2		4.27	2	5.85	39	48	110.80	302	279	2.61	20.39	81	196.67	554.67	554.67	10.40(3.25)	14.87(3.86)	3.95	20.07	848.30	43132
W3		4.24	3	5.91	39	48	111.60	307	284	2.59	20.43	81	201.87	560.67	560.67	8.27(2.91)	13.07(3.62)	3.14	17.64	848.30	46965
W4		4.14	4	6.24	38	47	108.53	309	293	2.68	20.93	81	223.87	588.00	588.00	10.67(3.30)	16.00(4.01)	4.05	21.60	848.30	44072
CD (0.05)		NS		0.14	NS	NS	2.76	8.2	9.81	0.08	0.31	NS	5.63	7.13	7.13	NS	NS	NS	NS		
C.V. (%)		10.31		3.16	4.44	3.9	3.33	3.55	4.55	4.07	2.02	1.28	3.55	1.67	1.67	21.37	17.49	39.12	35.12		
Interaction																					
M and S		NS		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS		
S and M		NS		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS		
Experimental Mean		**4.31**		**6.08**	**39**	**48**	**110.87**	**310**	**289**	**2.67**	**20.74**	**81**	**212.38**	**574.50**	**574.50**	**3.07**	**3.73**	**3.55**	**18.68**		
Soil type		-																			
pH		8.2																			
EC		-																			
Variety & Duration		Rajendra Nilam, 125 days																			
Applied NPK kg/ha		120:60:40:25																			
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- Any improved system in that particular location (Tar Vattar method of DSR)

W1: Manual weeding (three times)
W2: Pre + post-emergence herbicide
W3: Pre-emergence herbicide + Manual weeding (two times)
W4: Post-emergence herbicide (bispyribac sodium @ 20 g/ha)

4.2.2.2. Developing suitable package of practices for wet DSR

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 15 locations (**Varanasi, Aduthurai, Chiplima, Coimbatore, Karjat, Moncompu, Mandya, Navsari, Nawagam, Puducherry, Pusa, Rewa, Titabar, Vadagaon** and **Warangal**). Split plot design was adopted with 4 main plots S_1: manual broadcasting of seeds; S_2: Mechanical line sowing of seeds, S_3: Semi dry system, S_4: Any improved system in that particular location; four sub plots are W_1: Manual weeding (three times),W_2: Pre + post-emergence herbicide (for first flush - 20-25 days), W_3: Pre-emergence herbicide + Manual weeding (two times) and W_4: Pre + post-emergence herbicide two times (for first and second flush 20-25 days and 40-45 DAS, respectively). The results were summarized and presented in **Table 4.2.2.2** and the salient findings are as followed.

At **Varanasi**, interaction effect of establishment methods and weed management practices on grain yield was found to be significant. HUR 306 resulted in the highest grain yield (4.01 t/ha) under improved system of the region with application of pre and post-emergence herbicide.

In clay soils of **Aduthurai**, interaction effect on grain yield was found to be non-significant. Among crop establishment methods, mechanized line sowing of seeds resulted in the highest grain yield (4.58 t/ha). Among weed management, Pre + post-emergence herbicide two times (for first and second flush 20-25 days and 40-45 DAS, respectively) resulted in the highest grain yield (4.37 t/ha).

At **Chiplima**, interaction and main plots effect on MTU 1156 grain yield was found to be non-significant. Among weed management practices, pre + post-emergence herbicide two times (for first and second flush 20-25 days and 40-45 DAS, respectively) resulted in the highest grain yield (5.53 t/ha). Similarly, in clay loam soils of **Coimbatore**, local management practices such as paddy + dhaincha drum seeding method resulted the highest grain yield (5.60

t/ha). Among weed management practices, manual weeding 3 times resulted in the highest grain yield (4.97 t/ha).

At **Karjat**, among crop establishment methods, KJT-3 variety under best local management practices (drum seeding with spacing of 22.5 cm) produced the highest grain yield (4.19 t/ha), however at par with semi dry systems (4.13 t/ha). Among weed management practices, manual weeding 3 times resulted in the highest grain yield (4.11 t/ha), on par with pre-emergence application of oxadiargyl + two times manual weeding (4.04 t/ha). In red sandy loam soils of **Mandya**, among weed management practices, pre + post-emergence herbicide two times (for first and second flush 20-25 days and 40-45 DAS, respectively) resulted in the highest grain yield (5.63 t/ha), however, on par with pre + post-emergence herbicide (5.55 t/ha). At **Moncompu**, interaction of broadcasting of weeds along with pre-emergence herbicide application + two times manual weeding resulted the highest grain yield (6.36 t/ha). Among crop establishment methods, broadcasting of seeds resulted in the highest grain yield (5.75 t/ha). Among weed management practices, application of pre-emergence herbicide + three times manual weeding resulted in the highest grain yield (5.90 t/ha). Similarly, in clay soils of **Navsari**, among crop establishment methods, mechanized line sowing resulted in the highest grain yield (5.40 t/ha), however, on par with semi dry system (5.16 t/ha) and improved local system (5.18 t/ha). Among weed management practices, manual weeding thrice resulted in the highest grain yield (5.46 t/ha), however, on par with application of pre-emergence herbicide + three times manual weeding (5.22 t/ha). In clay loam soils of **Nawagam**, among crop establishment methods, mechanized line sowing resulted in the highest grain yield (5.09 t/ha). Among weed management practices, application of pre-emergence herbicide + three times manual weeding resulted in the highest grain yield (5.02 t/ha). At **Puducherry**, 2 main plots (semi dry system and improved local management practices) were not taken up in lay out of trial. The interaction effect of mechanized line sowing and pre + post-emergence herbicide two times (for first and second flush 20-25 days and 40-45 DAS, respectively) resulted in the highest grain yield (6.42 t/ha). At **Pusa**, interaction, main plots and sub plots effect on grain yield was found to be non-significant. In clay loam soils of **Titabar**, interaction and main plots effect on grain yield was non-significant. Among weed management practices, pre + post-emergence herbicide two times (for first and second flush 20-25 days and 40-45 DAS, respectively) resulted in the highest grain yield (3.53 t/ha). At **Vadgaon**, interaction effect of mechanized line sowing and pre + post-emergence herbicide two times (for first and second flush 20-25 days and 40-45 DAS, respectively) resulted in the highest grain yield (5.80 t/ha). Among crop establishment methods, mechanized line sowing resulted in the highest grain yield (5.66 t/ha). Among weed management practices, pre + post-emergence herbicide two times (for first and second flush 20-25 days and 40-45 DAS, respectively) resulted in the highest grain yield (5.22 t/ha). In clay loam soils of **Warangal**, among crop establishment methods, mechanized line sowing resulted in the highest grain yield (6.48 t/ha). Among weed management practices, manual weeding thrice resulted in the highest grain yield (6.46 t/ha).

Overall, among crop establishment methods, mechanical line sowing resulted in the highest grain yield (5.12 t/ha) across all locations. Similarly, among weed management

practices, pre + post-emergence herbicide two times (for first and second flush 20-25 days and 40-45 DAS, respectively) resulted in the highest grain yield (5.01 t/ha).

The trial was conducted in RBD design instead of Split Plot design at **Rewa**. Mechanical line sowing + post-emergence herbicide + mechanical weeding once + 4 split application of N resulted in the highest grain yield (5.38 t/ha).

Trial 4.2.2.2: Developing a suitable package of practices for higher yield in Wet DSR system, Kharif 2022.

Main Plot-Crop Establishing Methods	Sub plots	ADUTHURAI												
		Grain yield (t/ha)	Plant height (cm)	Tillers/m^2 (No.)	Productive tillers/m^2 (No.)	Panicle wt (g)	Test wt (g)	Weed population (no/m^2)			Weed dry weight (g/m^2)			Cost of cultivation (Rs/ha)
								Grasses	Sedges	BLW	Grasses	Sedges	BLW	
S_1 - Broadcasting of seeds	W1	3.52	85.25	245	233	2.44	16.42	8.25(2.96)	10.00(3.24)	6.28(2.60)	1.68	1.44	1.33	45926
	W2	3.56	75.50	236	224	2.66	17.11	14.45(3.86)	6.55(2.65)	5.95(2.54)	2.43	1.63	1.37	41352
	W3	3.68	79.50	245	234	2.84	17.35	13.00(3.66)	9.80(3.20)	5.07(2.36)	2.34	1.53	1.33	43468
	W4	3.82	75.50	259	246	2.77	17.42	7.13(2.76)	6.25(2.59)	5.37(2.42)	1.62	1.42	1.26	42326
S_2 - Mechanized line sowing of seeds	W1	4.43	102.25	268	248	2.52	17.40	14.47(3.87)	11.15(3.41)	8.23(2.95)	1.73	1.54	1.36	46873
	W2	4.52	100.25	262	241	2.72	17.42	13.98(3.78)	10.63(3.33)	9.15(3.11)	2.45	1.54	1.32	43365
	W3	4.63	100.25	279	265	2.88	17.60	18.08(4.29)	12.15(3.55)	9.13(3.10)	2.71	1.63	1.43	45436
	W4	4.74	103.00	264	244	2.73	17.42	11.25(3.42)	10.02(3.24)	7.22(2.78)	1.75	1.54	1.36	44220
S_3 – Semi-Dry System	W1	4.21	93.50	255	239	2.43	17.42	16.15(4.08)	10.32(3.28)	6.63(2.67)	1.72	1.53	1.24	47982
	W2	4.40	93.75	250	235	2.64	17.38	11.15(3.41)	9.78(3.18)	9.32(3.13)	1.92	1.63	1.41	45435
	W3	4.41	95.00	275	259	2.76	17.58	16.67(4.13)	10.10(3.25)	7.25(2.78)	2.47	1.53	1.34	47766
	W4	4.52	93.00	272	260	2.70	17.50	11.95(3.52)	9.93(3.23)	5.63(2.47)	1.73	1.43	1.16	46622
S_4 – Any improved system in that particular location	W1	4.18	92.50	260	246	2.44	17.22	10.90(3.37)	5.45(2.44)	5.60(2.47)	1.72	1.54	1.32	46736
	W2	4.26	95.00	265	253	2.76	17.55	10.77(3.35)	5.40(2.42)	6.63(2.67)	1.73	1.46	1.41	44574
	W3	4.31	94.00	281	265	2.94	17.47	16.65(4.14)	6.50(2.63)	7.97(2.91)	2.15	1.44	1.33	46528
	W4	4.41	90.50	268	254	2.84	17.55	12.88(3.65)	4.82(2.31)	5.32(2.41)	1.64	1.35	1.22	45433
Mean of Factor-1														
S1		3.64	78.94	246	234	2.68	17.08	10.71(3.31)	8.15(2.92)	5.67(2.48)	2.02	1.51	1.32	43268
S2		4.58	101.44	268	250	2.71	17.46	14.44(3.84)	10.99(3.38)	8.43(2.99)	2.16	1.56	1.37	44974
S3		4.39	93.81	263	248	2.63	17.47	13.98(3.79)	10.03(3.24)	7.21(2.76)	1.96	1.53	1.29	46951
S4		4.29	93.00	269	254	2.74	17.45	12.80(3.63)	5.54(2.45)	6.38(2.62)	1.81	1.45	1.32	45818
CD(0.05)		0.19	3.6	4.17	4.44	0.02	0.11	0.17	0.1	0.05	0.03	0.01	0.01	
CV(%)		5.5	4.91	2	2.25	0.76	0.82	5.94	4.36	2.2	1.68	1.15	1.39	

Trial 4.2.2.2: Contd.

Main Plot-Crop Establishing Methods	Sub plots	ADUTHURAI												
		Grain yield (t/ha)	Plant height (cm)	Tillers/m^2 (No.)	Productive tillers/m^2 (No.)	Panicle wt (g)	Test wt (g)	Weed population (no/m^2)			Weed dry weight (g/m^2)			Cost of cultivation (Rs/ha)
								Grasses	Sedges	BLW	Grasses	Sedges	BLW	
Mean of Factor-2														
W1		4.08	93.38	257	241	2.46	17.12	12.44(3.57)	9.23(3.09)	6.68(2.67)	1.71	1.51	1.31	46879
W2		4.18	91.13	253	238	2.69	17.37	12.59(3.60)	8.09(2.90)	7.76(2.86)	2.13	1.56	1.38	43682
W3		4.26	92.19	270	256	2.85	17.50	16.10(4.06)	9.64(3.16)	7.36(2.79)	2.42	1.53	1.36	45800
W4		4.37	90.50	266	251	2.76	17.47	10.80(3.34)	7.76(2.84)	5.89(2.52)	1.69	1.43	1.25	44650
CD(0.05)		0.19	NS	3.88	4.28	0.02	0.15	0.13	0.09	0.05	0.02	0.01	0.01	
CV(%)		6.39	4.9	2.08	2.43	1.14	1.19	5.17	4.03	2.45	1.67	0.93	1.25	
Interaction														
M and T		NS	NS	7.75	8.57	0.04	0.29	0.27	0.17	0.1	0.05	0.02	0.02	
T and M		NS	NS	7.42	8.14	0.04	0.27	0.27	0.17	0.09	0.05	0.02	0.02	
Experimental Mean		**4.22**	**91.80**	**261**	**246**	**2.69**	**17.36**	**3.64**	**3**	**2.71**	**1.99**	**1.51**	**1.32**	
Soil type		Clay												
pH		7.2												
EC		0.15												
Variety		ADT 53												
Applied NPK kg/ha)		150:60:60:25												
Available NPK kg/ha		285:41.6;246												

S1 – Broadcasting
S2 - Drum Seeding
S3 – Line sowing
S4 – Direct planting system

W1 – Manual weeding
W2 – Pre + Post emergece herbicide
W3 – Pre emergece herbicide + Manual weeding
W4 – Pre + early Post emergence & Post emegence herbicide two times 20 and 45 DAS N application

Trial 4.2.2.2: Contd.

Main Plot-Crop Establishing Methods	Sub plots	CHIPLIMA												
		Grain yield (t/ha)	Straw yield (t/ha)	Plant population/m2	Plant height (cm)	Tillers/m^2 (No.)	Panicle no. /m^2	Test wt (g)	Days to 50% flowering	Dry matter accumulation (g/m^2)			Weed population (no/m^2)	
				At 10 DAS						At 45 DAS	At 75 DAS	At 105 DAS	At active tillering	At panicle initiation
S_1 - Broadcasting of seeds	W1	4.87	5.44	42	105.00	235	147	20.63	90	26.87	84.30	153.37	44.67(6.72)	52.33(7.27)
	W2	5.13	5.65	46	107.11	257	163	20.60	89	27.50	89.53	168.43	40.00(6.36)	46.00(6.82)
	W3	5.30	5.52	45	108.44	291	176	20.63	91	27.77	96.30	181.07	30.67(5.58)	38.00(6.20)
	W4	5.37	5.54	46	107.33	290	169	20.67	91	27.70	95.10	176.83	29.67(5.49)	36.00(6.04)
S_2 - Mechanized line sowing of seeds	W1	5.07	5.48	40	109.19	245	164	20.67	91	32.83	92.47	167.47	41.33(6.47)	43.00(6.60)
	W2	5.30	5.95	40	107.81	297	185	21.07	91	39.03	92.53	175.17	34.33(5.90)	40.67(6.41)
	W3	5.57	4.99	41	108.86	298	235	21.03	91	41.27	95.77	190.17	27.00(5.24)	35.67(6.01)
	W4	5.77	6.93	40	110.08	294	242	21.17	91	41.13	96.40	193.40	26.00(5.15)	33.00(5.79)
S_3 – Semi-Dry System	W1	5.03	5.80	39	107.22	266	159	20.73	90	32.37	90.73	175.53	41.67(6.49)	48.00(6.96)
	W2	5.27	5.64	39	108.44	275	176	20.97	91	33.67	94.67	178.10	35.00(5.96)	38.67(6.26)
	W3	5.43	5.39	40	107.17	295	228	21.13	91	41.23	94.33	197.10	30.67(5.58)	35.33(5.99)
	W4	5.47	5.64	41	111.64	304	245	21.10	91	41.17	96.03	199.17	26.67(5.21)	32.33(5.73)
S_4 – Any improved system in that particular location	W1	-	-	-	-	-	-	-	-	-	-	-	-	-
	W2	-	-	-	-	-	-	-	-	-	-	-	-	-
	W3	-	-	-	-	-	-	-	-	-	-	-	-	-
	W4	-	-	-	-	-	-	-	-	-	-	-	-	-
Mean of Factor-1														
S1		5.17	5.53	45	106.97	268	164	20.63	90	27.46	91.31	169.92	36.25(6.04)	43.08(6.58)
S2		5.43	5.84	40	108.99	284	207	20.98	91	38.57	94.29	181.55	32.17(5.69)	38.08(6.20)
S3		5.30	5.62	40	108.62	285	202	20.98	91	37.11	93.94	187.48	33.50(5.81)	38.58(6.23)
S4														
CD(0.05)		NS	NS	0.69	NS	NS	7.4	0.18	NS	0.86	0.58	3.68	0.09	0.11
CV(%)		4.46	24.87	2.28	3.49	7	5.35	1.22	1.01	3.47	0.85	2.82	2.14	2.4

Trial 4.2.2.2: Contd.

Main Plot-Crop Establishing Methods	Sub plots	CHIPLIMA												
		Grain yield (t/ha)	Straw yield (t/ha)	Plant population/m2	Plant height (cm)	Tillers/m^2 (No.)	Panicle no. /m^2	Test wt (g)	Days to 50% flowering	Dry matter accumulation (g/m^2)			Weed population (no/m^2)	
				At 10 DAS						At 45 DAS	At 75 DAS	At 105 DAS	At active tillering	At panicle initiation
Mean of Factor-2														
W1		4.99	5.57	40	107.14	249	157	20.68	90	30.69	89.17	165.46	42.56(6.56)	47.78(6.94)
W2		5.23	5.75	42	107.79	276	175	20.88	90	33.40	92.24	173.90	36.44(6.07)	41.78(6.50)
W3		5.43	5.30	42	108.16	295	213	20.93	91	36.76	95.47	189.44	29.44(5.47)	36.33(6.07)
W4		5.53	6.04	42	109.69	296	219	20.98	91	36.67	95.84	189.80	27.44(5.28)	33.78(5.85)
CD(0.05)		0.14	NS	0.79	NS	27.24	6.88	0.2	NS	1.44	1.93	4.88	0.16	0.13
CV(%)		2.7	14.22	1.91	2.3	9.85	3.64	0.96	1.08	4.24	2.09	2.74	2.69	2.08
Interaction														
M and T		NS	NS	1.36	NS	NS	11.91	NS	NS	2.5	3.34	NS	NS	NS
T and M		NS	NS	1.25	NS	NS	11.25	NS	NS	2.22	2.91	NS	NS	NS
Experimental Mean		**5.30**	**5.66**	**42**	**108.19**	**279**	**191**	**20.87**	**91**	**34.38**	**93.18**	**179.65**	**5.85**	**6.34**
Soil type		-												
pH		-												
EC		-												
Variety		MTU-1156												
Applied NPK kg/ha)		-												
Available NPK kg/ha		-												

S1 – Broadcasting
S2 - Drum Seeding
S3 – Sowing in dry soil and Wet after one month of sowing
S4 - -

W1: Manual weeding (three times)
W2: Pre + post-emergence herbicide
W3: Pre-emergence herbicide + Manual weeding (two times)
W4: Pre + post-emergence herbicide two times (for first and second flush - 20-25 days and 40-45 DAS, respectively)

Trial 4.2.2.2: Contd.

Main Plot-Crop Establishing Methods	Sub plots	COIMBATORE										
		Grain yield (t/ha)	Straw yield (t/ha)	Plant height (cm)	Tillers/m^2 (No.)	Panicle no. /m^2	Panicle wt (g)	Test wt (g)	Weed population (no/m^2) at active tillering	Weed dry weight (g/m2) at active tillering	Cost of cultivation (Rs/ha)	Total water input mm/ha
S_1 - Broadcasting of seeds	W1	3.92	5.89	78.33	267	245	2.74	14.07	8.23(2.95)	2.69	45423	1143
	W2	3.82	5.72	76.43	262	233	2.60	14.13	11.27(3.43)	3.47	41578	1143
	W3	3.90	5.87	79.10	272	242	2.76	14.10	8.60(3.02)	2.59	43544	1143
	W4	3.88	5.82	77.10	273	241	2.67	14.13	7.13(2.76)	2.53	42186	1143
S_2 - Mechanized line sowing of seeds	W1	4.88	6.74	83.40	336	305	2.89	14.20	8.20(2.95)	2.51	47742	1143
	W2	4.72	6.63	81.23	316	293	2.76	14.23	10.67(3.34)	3.13	44132	1143
	W3	4.87	6.71	84.23	343	301	2.90	14.20	8.27(2.96)	2.44	46543	1143
	W4	4.82	6.69	82.57	340	299	2.82	14.30	6.77(2.70)	2.25	44785	1143
S_3 – Semi-Dry System	W1	5.42	7.28	86.60	358	327	3.26	14.23	7.13(2.76)	2.18	46535	1143
	W2	5.30	7.03	83.33	348	313	3.15	14.27	9.47(3.15)	2.63	43225	1143
	W3	5.40	7.26	86.23	360	322	3.27	14.10	7.27(2.79)	1.98	45436	1143
	W4	5.37	7.22	85.40	357	318	3.24	14.13	6.00(2.55)	1.74	44178	1143
S_4 – Any improved system in that particular location	W1	5.65	7.48	87.53	383	358	3.41	14.13	6.37(2.62)	1.87	46877	1143
	W2	5.51	7.37	84.53	374	339	3.29	14.20	8.97(3.08)	2.14	43786	1143
	W3	5.62	7.45	87.23	385	352	3.42	14.23	6.50(2.65)	1.71	46324	1143
	W4	5.60	7.41	86.53	383	348	3.38	14.27	4.53(2.24)	1.35	45317	1143
Mean of Factor-1												
S1		3.88	5.83	77.74	268	240	2.69	14.11	8.81(3.04)	2.82	43182.75	1143
S2		4.83	6.69	82.86	334	300	2.84	14.23	8.48(2.99)	2.58	45800.5	1143
S3		5.37	7.20	85.39	356	320	3.23	14.18	7.47(2.81)	2.13	44843.5	1143
S4		5.60	7.43	86.46	381	349	3.37	14.21	6.59(2.65)	1.77	45576	1143
CD(0.05)		0.04	0.04	0.75	3.5	3.59	0.05	NS	0.07	0.09		
CV(%)		0.91	0.61	0.91	1.05	1.19	1.58	0.61	2.46	3.71		

Trial 4.2.2.2: Contd.

Main Plot-Crop Establishing Methods	Sub plots	COIMBATORE										
		Grain yield (t/ha)	Straw yield (t/ha)	Plant height (cm)	Tillers/m^2 (No.)	Panicle no. /m^2	Panicle wt (g)	Test wt (g)	Weed population (no/m^2) at active tillering	Weed dry weight (g/m2) at active tillering	Cost of cultivation (Rs/ha)	Total water input mm/ha
Mean of Factor-2												
W1		4.97	6.85	83.97	336	309	3.08	14.16	7.48(2.82)	2.31	46644.25	1143
W2		4.84	6.69	81.38	325	295	2.95	14.21	10.09(3.25)	2.84	43180.25	1143
W3		4.95	6.82	84.20	340	304	3.09	14.16	7.66(2.85)	2.18	45461.75	1143
W4		4.92	6.78	82.90	338	301	3.03	14.21	6.11(2.56)	1.97	44116.5	1143
CD(0.05)		0.03	0.05	0.52	4.96	2.94	0.04	NS	0.07	0.04		
CV(%)		0.75	0.89	0.75	1.76	1.15	1.74	0.56	2.69	2.22		
Interaction												
M and T		NS	NS	NS	NS	NS	NS	NS	NS	0.09		
T and M		NS	NS	NS	NS	NS	NS	NS	NS	0.1		
Experimental Mean		**4.92**	**6.79**	**83.11**	**335**	**302**	**3.03**	**14.18**	**2.87**	**2.33**		
Soil type		Clay loam										
pH		8.13										
EC		-										
Variety		CO 52, 135 days										
Applied NPK kg/ha)		150:50:50										
Available NPK kg/ha		258:23:462										

S1 – Broadcasting
S2 - Line sowing(Manual)
S3 – Drum seeder
S4- Paddy + Daincha drum seeding

W1: Manual weeding (three times)
W2: Pre + post-emergence herbicide
W3: Pre-emergence herbicide + Manual weeding (two times)
W4: Pre + post-emergence herbicide two times (for first and second flush - 20-25 days and 40-45 DAS, respectively)

Trial 4.2.2.2: Contd.

Main Plot-Crop Establishing Methods	Sub plots	KARJAT														
		Grain yield (t/ha)	Straw yield (t/ha)	Plant population/m2 at 20 DAS	Plant height (cm)	Tillers/m^2 (No.)	Panicle no. /m^2	Panicle wt (g)	Test wt (g)	Days to 50% flowering	Weed population (no/m^2)		Weed dry weight (g/m2)		Cost of cultivation (Rs/ha)	Gross return (Rs/ha)
											At active tillering	At panicle initiation	At active tillering	At panicle initiation		
S_1 - Broadcasting of seeds	W1	3.76	5.25	396	96.49	260	259.59	1.72	18.94	84	19.04(4.39)	31.80(5.62)	7.47	12.67	82930	83462
	W2	3.58	4.99	376	90.23	239	231.28	1.62	16.92	82	24.70(5.01)	42.00(6.50)	11.33	17.63	66495	79384
	W3	3.70	5.16	385	95.03	273	255.17	1.63	18.72	83	19.70(4.49)	33.00(5.78)	8.00	13.38	78755	82147
	W4	3.66	5.11	383	94.69	273	237.46	1.63	18.24	84	22.04(4.73)	37.20(6.11)	10.91	16.83	67735	81325
S_2 - Mechanized line sowing of seeds	W1	4.06	6.40	400	96.49	364	331.89	1.85	19.18	78	14.15(3.80)	21.50(4.65)	7.04	9.24	89530	91541
	W2	3.77	5.99	390	95.89	275	232.92	1.53	17.29	78	19.15(4.42)	29.00(5.40)	9.79	15.16	73095	85067
	W3	4.00	6.32	398	96.62	321	305.49	1.79	18.75	77	17.82(4.28)	27.00(5.24)	7.43	12.54	85355	90224
	W4	3.98	6.30	396	96.57	351	271.2	1.72	18.12	77	18.82(4.37)	28.50(5.36)	9.35	13.05	74335	89900
S_3 – Semi-Dry System	W1	4.30	6.63	402	99.81	372	332.56	1.87	19.14	76	14.27(3.81)	19.07(4.38)	5.43	8.29	94030	96712
	W2	3.91	6.06	395	99.28	275	270.89	1.77	17.82	77	20.27(4.52)	26.87(5.18)	8.92	12.57	77595	87909
	W3	4.22	6.50	400	98.21	376	320.35	1.87	18.87	78	15.60(4.01)	20.80(4.61)	7.38	8.88	89855	94786
	W4	4.12	6.37	399	97.28	336	275.27	1.84	18.50	77	17.60(4.24)	23.40(4.87)	7.68	12.11	78835	92592
S_4 – Any improved system in that particular location	W1	4.32	6.65	400	100.34	395	336.53	2.07	19.23	81	13.54(3.74)	15.77(4.03)	4.39	6.14	88130	97158
	W2	4.03	6.24	397	99.28	375	301.01	1.60	17.80	82	17.54(4.23)	20.17(4.54)	8.12	11.37	74695	90566
	W3	4.25	6.56	400	99.21	409	324.26	1.88	18.96	82	16.21(4.08)	18.70(4.37)	5.35	7.48	83955	95621
	W4	4.16	6.43	401	100.55	388	307.81	1.87	18.45	84	16.54(4.12)	19.07(4.41)	5.69	7.97	75935	93643
Mean of Factor-1																
S1		3.68	5.13	385	94.11	261	245.87	1.65	18.20	83	21.37(4.66)	36.00(6.00)	9.43	15.13	73979	81580
S2		3.95	6.25	396	96.39	328	285.38	1.72	18.33	78	17.49(4.22)	26.50(5.16)	8.40	12.50	80579	89183
S3		4.13	6.39	399	98.64	340	299.77	1.83	18.58	77	16.93(4.14)	22.53(4.76)	7.35	10.47	85079	93000
S4		4.19	6.47	399	99.84	392	317.4	1.86	18.61	82	15.96(4.04)	18.42(4.34)	5.89	8.24	80679	94247
CD(0.05)		0.35	0.49	4.49	3.92	44.39	18.11	0.13	0.28	1.17	0.42	0.77	2.24	3.24		
CV(%)		8.71	8.09	1.14	4.03	13.46	6.32	7.3	1.52	1.47	9.9	15.29	28.82	27.98		

Trial 4.2.2.2: Contd.

Main Plot-Crop Establishing Methods	Sub plots	KARJAT														
		Grain yield (t/ha)	Straw yield (t/ha)	Plant population/m2 at 20 DAS	Plant height (cm)	Tillers/m^2 (No.)	Panicle no. /m^2	Panicle wt (g)	Test wt (g)	Days to 50% flowering	Weed population (no/m^2)		Weed dry weight (g/m2)		Cost of cultivation (Rs/ha)	Gross return (Rs/ha)
											At active tillering	At panicle initiation	At active tillering	At panicle initiation		
Mean of Factor-2																
W1		4.11	6.23	399	98.28	348	315.14	1.88	19.12	80	15.25(3.94)	22.03(4.67)	6.08	9.09	88655	92218
W2		3.82	5.82	390	96.17	291	259.02	1.63	17.46	80	20.42(4.55)	29.51(5.41)	9.54	14.18	72970	85732
W3		4.04	6.14	396	97.27	345	301.32	1.79	18.82	80	17.33(4.22)	24.88(5.00)	7.04	10.57	84480	90694
W4		3.98	6.05	395	97.27	337	272.93	1.76	18.33	81	18.75(4.37)	27.04(5.19)	8.41	12.49	74210	89365
CD(0.05)		0.21	0.29	2.93	NS	29.17	15.28	0.14	1.01	NS	0.36	0.43	2.01	3.11		
CV(%)		6.17	5.71	0.88	6	10.49	6.32	9.33	6.51	0.86	10.05	10.08	30.68	31.89		
Interaction																
M and T		NS	NS	5.85	NS	NS	NS	NS	NS	1.16	NS	NS	NS	NS		
T and M		NS	NS	6.11	NS	NS	NS	NS	NS	1.34	NS	NS	NS	NS		
Experimental Mean		**3.99**	**6.06**	**395**	**97.25**	**330**	**287.1**	**1.77**	**18.43**	**80**	**4.27**	**5.07**	**7.77**	**11.58**		
Soil type		-														
pH		-														
EC		-														
Variety		KJT-3, 110-115 Days														
Applied NPK kg/ha)		100;50:50														
Available NPK kg/ha		-														

S1 – Broadcasting
S2 - Drum Seeding
S3 – Sowing in dry soil and Wet after one month of sowing
S4: Wet seeding (Drum seeder on puddle condition. Spacing 22.5 cm)

W1: Manual weeding (three time – 20, 40, 60 DAS)
W2: Pre emergence (Oxadiargyl 80% Wp @ 100 gm a.i/ha) + post-emergence herbicide (bispyribac sodium 10 sc@ 20gm a.i /ha 20 DAS)
W3: Pre-emergence (Oxadiargyl 80% Wp @ 100 gm a.i/ha) herbicide + Manual weeding (two times – 20 and 40 DAS)
W4: Pre emergence (Oxadiargyl 80% Wp @ 100 gm a.i/ha) + post-emergence herbicide (bispyribac sodium 10 sc@ 20gm a.i /ha two times – 20 and 40 DAS)

Trial 4.2.2.2: Contd.

Main Plot-Crop Establishing Methods	Sub plots	MANDYA																		
		Grain yield (t/ha)	Straw yield (t/ha)	Plant population/m2		Plant height (cm)	Tillers/m^2 (No.)	Panicle length cm/m^2	Panicle no. /m^2	Panicle wt (g)	Test wt (g)	Days to 50% flowering	Dry matter accumulation (g/m^2)			Weed population (no/m^2)		Weed dry weight (g/m2)		Cost of cultivation (Rs/ha)
				At 10 DAS	At 20 DAS								At 45 DAS	At 75 DAS	At 105 DAS	At active tillering	At panicle initiation	At active tillering	At panicle initiation	
S_1 - Broadcasting of seeds	W1	4.56	6.09	67	73	56.08	491	20.48	436	2.00	25.59	84	174.90	528.86	1181.38	18.00(4.30)	13.33(3.71)	8.93	13.40	57243
	W2	5.17	6.94	77	85	56.01	562	21.23	489	2.09	25.64	84	160.77	526.93	1211.07	2.00(1.56)	7.00(2.73)	1.05	8.33	50259
	W3	4.66	6.74	65	72	57.87	577	22.43	492	2.15	26.59	84	163.73	465.97	1261.04	17.00(4.15)	7.33(2.73)	8.33	8.00	48976
	W4	5.19	7.54	77	83	58.39	626	22.41	516	2.17	26.94	84	149.82	536.67	1263.32	1.33(1.29)	1.00(1.10)	0.20	0.97	52278
S_2 - Mechanized line sowing of seeds	W1	5.24	5.87	51	69	57.43	496	23.11	419	2.35	25.74	84	151.92	565.67	1282.42	11.00(3.36)	6.00(2.51)	7.00	8.60	52376
	W2	6.12	7.52	56	70	59.45	568	24.03	467	2.53	24.79	85	210.50	586.77	1449.19	3.00(1.79)	5.67(2.46)	0.81	7.27	51915
	W3	5.55	7.41	55	68	56.51	533	23.94	455	2.53	25.99	84	164.00	631.73	1424.39	9.00(3.06)	6.33(2.59)	4.37	9.17	50625
	W4	6.15	7.74	52	63	57.81	535	24.43	481	2.79	26.20	85	147.78	639.67	1486.33	1.00(1.10)	0.33(0.88)	0.28	0.70	53856
S_3 – Semi-Dry System	W1	4.99	5.90	35	51	59.65	453	23.75	387	2.24	24.53	84	148.80	549.95	1304.71	21.00(4.63)	8.00(2.83)	10.22	9.73	50906
	W2	5.36	6.72	36	49	60.11	523	24.16	447	2.63	26.08	85	195.70	602.45	1413.65	3.67(1.86)	8.00(2.86)	1.52	9.43	50701
	W3	5.08	7.07	35	53	57.83	531	23.80	451	2.50	26.40	84	183.87	612.81	1420.03	10.33(3.26)	4.00(2.08)	5.20	6.37	49625
	W4	5.55	6.97	34	47	58.55	556	24.52	473	2.55	26.52	84	188.17	555.38	1456.08	5.33(2.35)	2.00(1.56)	2.47	1.18	52706
S_4 – Any improved system in that particular location	W1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	W2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	W3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	W4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mean of Factor-1																				
S1		4.89	6.83	71	78	57.09	564	21.64	483	2.10	26.19	84	162.30	514.60	1229.20	9.58(2.83)	7.17(2.57)	4.63	7.68	52189
S2		5.77	7.14	53	67	57.80	533	23.88	456	2.55	25.68	85	168.55	605.96	1410.58	6.00(2.33)	4.58(2.11)	3.11	6.43	52193
S3		5.24	6.66	35	50	59.04	516	24.06	440	2.48	25.88	84	179.13	580.15	1398.62	10.08(3.03)	5.50(2.33)	4.85	6.68	50984
S4		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CD(0.05)		NS	NS	3.92	3.75	NS	NS	0.6	NS	0.14	NS	NS	NS	41.36	NS	0.27	NS	NS	NS	
CV(%)		15.46	17.17	10.14	7.93	7.28	15.19	3.58	6.78	8.15	3.95	0.69	9.62	10.06	11.03	13.75	21.77	42.54	33.26	

Trial 4.2.2.2: Contd.

Main Plot-Crop Establishing Methods	Sub plots	MANDYA																		
		Grain yield (t/ha)	Straw yield (t/ha)	Plant population/m2		Plant height (cm)	Tillers/m^2 (No.)	Panicle length cm/m^2	Panicle no. /m^2	Panicle wt (g)	Test wt (g)	Days to 50% flowering	Dry matter accumulation (g/m^2)			Weed population (no/m^2)		Weed dry weight (g/m2)		Cost of cultivation (Rs/ha)
				At 10 DAS	At 20 DAS								At 45 DAS	At 75 DAS	At 105 DAS	At active tillering	At panicle initiation	At active tillering	At panicle initiation	
Mean of Factor-2																				
W1		4.93	5.95	51	64	57.72	480	22.45	414	2.20	25.29	84	158.54	548.16	1256.17	16.67(4.10)	9.11(3.02)	8.72	10.58	53508
W2		5.55	7.06	56	68	58.52	551	23.14	468	2.42	25.50	84	188.99	572.05	1357.97	2.89(1.73)	6.89(2.68)	1.13	8.34	50958
W3		5.10	7.08	52	64	57.40	547	23.39	466	2.39	26.33	84	170.53	570.17	1368.49	12.11(3.49)	5.89(2.47)	5.97	7.84	49742
W4		5.63	7.42	54	64	58.25	572	23.79	490	2.51	26.55	84	161.92	577.24	1401.91	2.56(1.58)	1.11(1.18)	0.98	0.95	52947
CD(0.05)		0.35	0.44	NS	NS	NS	42.66	NS	28.83	0.2	0.87	NS	18.35	NS	NS	0.61	0.54	1.81	3.16	
CV(%)		6.6	6.41	8.88	6.59	3.85	8.01	4.21	6.33	8.58	3.4	0.55	10.89	7.66	11.37	22.68	23.28	43.6	46	
Interaction																				
M and T		NS	NS	NS	7.37	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	
T and M		NS	NS	NS	6.75	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	
Experimental Mean		**5.30**	**6.88**	**53**	**65**	**57.97**	**537**	**23.19**	**459**	**2.38**	**25.92**	**84**	**170.00**	**566.90**	**1346.14**	**2.73**	**2.34**	**4.20**	**6.93**	
Soil type		Red sandy loam																		
pH		7.68																		
EC		0.15																		
Variety		KMP 225, 120 to 125 days																		
Applied NPK kg/ha)		100;50:50																		
Available NPK kg/ha		249.75:90.91:224.72																		

S1 – Broadcasting - Sprouted rice
S2 - Drum Seeding
S3 – Semi-Dry system
S4 - -

W1: Manual weeding (three times)
W2: Pre + post-emergence herbicide
W3: Pre-emergence herbicide + Manual weeding (two times)
W4: Pre + post-emergence herbicide two times (for first and second flush - 20-25 days and 40-45 DAS, respectively)

Trial 4.2.2.2: Contd.

Main Plot-Crop Establishing Methods	Sub plots	MONCOMPU																
		Grain yield (t/ha)	Straw yield (t/ha)	Plant population/m2		Plant height (cm)	Tillers/m^2 (No.)	Panicle no. /m^2	Panicle wt (g)	Test wt (g)	Days to 50% flowering	Dry matter accumulation (g/m^2)		Weed population (no/m^2)		Weed dry weight (g/m2)		Cost of cultivation (Rs/ha)
				At 10 DAS	At 20 DAS							At 45 DAS	At 75 DAS	At active tillering	At panicle initiation	At active tillering	At panicle initiation	
S_1 - Broadcasting of seeds	W1	5.76	6.32	225	172	93.07	321	261	3.30	30.93	79	1720.83	2674.16	10.00(3.23)	4.67(2.26)	3.65	11.83	93870
	W2	4.96	6.04	228	181	91.00	303	235	4.05	25.33	79	1183.67	2295.01	11.00(3.36)	21.33(4.60)	9.63	80.27	72370
	W3	6.36	7.08	221	185	93.40	345	251	3.70	27.80	78	2037.88	3087.88	8.67(3.00)	23.33(4.86)	11.27	22.09	93120
	W4	5.90	6.85	225	197	90.57	356	294	3.27	25.67	76	1157.08	2293.75	5.67(2.46)	16.00(4.04)	4.80	14.24	77370
S_2 - Mechanized line sowing of seeds	W1	5.43	6.21	131	60	97.00	318	281	3.68	25.97	89	901.87	1342.54	22.00(4.70)	28.00(5.18)	18.51	15.28	94060
	W2	3.55	4.88	126	87	92.73	272	236	3.46	24.70	88	586.97	1155.25	12.00(3.50)	31.00(5.61)	16.64	15.83	72500
	W3	5.46	6.47	135	98	99.53	327	299	3.63	25.80	90	1430.33	2129.67	26.33(5.08)	19.00(4.37)	15.03	7.16	93310
	W4	4.63	4.85	152	69	93.17	297	249	2.82	27.17	83	795.35	1227.85	59.00(7.70)	25.67(5.10)	54.32	19.28	77560
S_3 – Semi-Dry System	W1	6.32	7.15	220	166	98.57	403	330	3.40	27.20	80	1701.48	2841.48	28.33(5.35)	12.67(3.58)	17.16	18.68	93870
	W2	3.92	5.07	224	158	99.13	413	311	3.39	26.07	78	1190.58	2327.25	41.33(6.46)	46.67(6.87)	32.20	51.71	72370
	W3	5.90	7.15	215	172	101.77	404	327	3.43	29.27	80	1255.10	2350.10	19.00(4.33)	16.00(4.04)	15.26	13.32	93120
	W4	5.42	6.00	212	176	95.60	384	320	3.02	28.67	78	1299.71	2513.04	33.00(5.78)	31.33(5.62)	25.59	45.65	77370
S_4 – Any improved system in that particular location	W1	5.17	6.25	194	99	94.67	325	279	3.19	26.43	80	1515.00	2390.00	28.67(5.20)	18.33(4.30)	18.67	17.33	95110
	W2	5.07	6.39	189	91	98.47	330	280	3.69	29.53	80	1295.19	2094.52	43.33(6.55)	17.33(4.22)	38.92	21.20	73550
	W3	5.86	7.29	196	106	95.93	353	347	3.29	26.63	80	1302.38	2282.38	12.00(3.39)	19.33(4.40)	12.41	5.61	94360
	W4	5.83	7.15	185	92	100.37	395	333	3.56	27.83	78	1259.02	2209.02	14.67(3.80)	11.00(3.37)	9.26	21.29	78610
Mean of Factor-1																		
S1		5.75	6.57	225	184	92.01	331	260	3.58	27.43	78	1524.87	2587.70	8.83(3.01)	16.33(3.94)	7.34	32.11	84183
S2		4.77	5.60	136	78	95.61	303	266	3.40	25.91	87	928.63	1463.83	29.83(5.25)	25.92(5.07)	26.12	14.39	84358
S3		5.39	6.34	218	168	98.77	401	322	3.31	27.80	79	1361.72	2507.97	30.42(5.48)	26.67(5.03)	22.55	32.34	84183
S4		5.48	6.77	191	97	97.36	351	310	3.43	27.61	80	1342.90	2243.98	24.67(4.74)	16.50(4.07)	19.81	16.36	85408
CD(0.05)		0.46	0.71	13.43	15.24	NS	16.31	20.75	0.15	NS	1.2	265.95	279.51	0.36	0.62	6.15	12.05	
CV(%)		8.6	11.32	6.99	11.58	5.6	4.71	7.18	4.48	8.26	1.48	20.64	12.71	7.89	13.76	32.45	50.67	

Trial 4.2.2.2: Contd.

Main Plot-Crop Establishing Methods	Sub plots	MONCOMPU																
		Grain yield (t/ha)	Straw yield (t/ha)	Plant population/m2		Plant height (cm)	Tillers/m^2 (No.)	Panicle no. /m^2	Panicle wt (g)	Test wt (g)	Days to 50% flowering	Dry matter accumulation (g/m^2)		Weed population (no/m^2)		Weed dry weight (g/m2)		Cost of cultivation (Rs/ha)
				At 10 DAS	At 20 DAS							At 45 DAS	At 75 DAS	At active tillering	At panicle initiation	At active tillering	At panicle initiation	
Mean of Factor-2																		
W1		5.67	6.48	192	124	95.83	342	288	3.39	27.63	82	1459.79	2312.04	22.25(4.62)	15.92(3.83)	14.50	15.78	94228
W2		4.37	5.59	192	129	95.33	330	265	3.65	26.41	81	1064.10	1968.01	26.92(4.97)	29.08(5.32)	24.35	42.25	72698
W3		5.90	7.00	192	140	97.66	357	306	3.51	27.38	82	1506.42	2462.51	16.50(3.95)	19.42(4.42)	13.49	12.05	93478
W4		5.44	6.21	193	133	94.93	358	299	3.17	27.33	79	1127.79	2060.91	28.08(4.93)	21.00(4.53)	23.49	25.12	77728
CD(0.05)		0.32	0.41	NS	NS	NS	18.52	16.97	0.22	NS	0.92	241.67	313.2	NS	0.56	8.62	14.95	
CV(%)		7.08	7.64	6.75	10.66	3.88	6.34	6.96	7.63	8.98	1.34	22.24	16.89	21.06	14.77	53.94	74.55	
Interaction																		
M and T		0.64	0.81	NS	NS	NS	37.05	33.94	0.44	NS	1.83	NS	NS	1.64	1.13	17.23	29.9	
T and M		0.65	0.89	NS	NS	NS	34.49	33.44	0.4	NS	1.83	NS	NS	1.45	1.09	15.67	27.54	
Experimental Mean		**5.35**	**6.32**	**192**	**132**	**95.94**	**347**	**290**	**3.43**	**27.19**	**81**	**1289.53**	**2200.87**	**4.62**	**4.53**	**18.96**	**23.80**	
Soil type		-																
pH		5.5																
EC		-																
Variety		Uma -125 days																
Applied NPK kg/ha)		90;45:45																
Available NPK kg/ha		320:35;250																

S1 – Broadcasting - Sprouted rice
S2 - Drum Seeding
S3 – Modified Drum Seeding (Framers practice-Wet seeded line sowing - drum seeding with all holes open)
S4 - -

W1: Manual weeding (three times)
W2: Pre + post-emergence herbicide
W3: Pre-emergence herbicide + Manual weeding (thrice times)
W4: Pre + post-emergence herbicide two times (for first and second flush - 20-25 days and 40-45 DAS, respectively)

Trial 4.2.2.2: Contd.

Main Plot-Crop Establishing Methods	Sub plots	NAVSARI															
		Grain yield (t/ha)	Straw yield (t/ha)	Crop stand at 15 DAS /M²	Plant height at 15 DAS /M²	Panicle length cm	Panicle no. /m²	Panicle wt (g)	Test wt (g)	Days to 50% flowering	Dry matter accumulation (g/m²)		Weed population (no/m²)		Weed dry weight (g/m2)		Cost of cultivation (Rs/ha)
											At Max. Tillering	At panicle initiation	At active tillering	At panicle initiation	At active tillering	At panicle initiation	
S_1 - Broadcasting of seeds	W1	4.96	9.32	82.33	19.74	20.47	278	4.22	30.40	84	383.68	588.26	10.67(3.33)	16.00(4.06)	11.69	24.50	67108
	W2	4.54	8.50	72.33	16.58	20.25	245	3.77	29.20	82	364.19	562.65	22.00(4.74)	27.67(5.31)	16.67	33.07	67667
	W3	4.60	9.14	74.33	17.99	20.11	266	3.57	28.73	82	349.98	566.09	13.67(3.76)	21.33(4.67)	14.77	30.24	66131
	W4	4.71	8.88	75.33	20.29	20.13	261	3.50	29.64	83	339.31	559.75	18.67(4.37)	25.33(5.08)	16.42	32.52	71902
S_2 - Mechanized line sowing of seeds	W1	5.96	9.95	77.67	23.17	20.93	301	4.50	29.89	82	408.02	617.91	8.00(2.91)	16.00(4.06)	10.54	22.39	67216
	W2	4.83	9.07	73.00	19.73	21.20	270	3.80	29.57	84	361.72	550.72	15.00(3.93)	23.33(4.87)	15.04	30.55	67667
	W3	5.57	9.70	75.33	22.14	20.79	292	4.10	29.60	83	389.80	593.32	10.67(3.34)	19.33(4.45)	13.44	27.27	66534
	W4	5.27	9.33	74.00	21.90	21.75	277	3.80	29.17	83	350.72	561.72	12.33(3.58)	20.00(4.53)	13.54	29.25	71902
S_3 – Semi-Dry System	W1	5.33	9.30	63.33	10.67	20.50	291	3.94	29.01	85	388.34	583.96	8.67(3.03)	15.00(3.94)	11.15	23.85	67305
	W2	4.78	8.29	60.33	9.22	21.51	247	3.66	28.42	86	319.42	549.24	20.00(4.52)	27.33(5.27)	16.75	33.42	67667
	W3	5.34	8.99	62.00	8.87	21.11	268	4.14	28.93	85	343.59	560.18	12.00(3.53)	20.33(4.56)	16.19	30.57	66181
	W4	5.20	8.64	62.33	10.20	21.19	258	4.04	27.69	83	282.74	521.73	17.33(4.22)	25.67(5.11)	16.85	33.88	71902
S_4 – Any improved system in that particular location	W1	5.57	9.69	75.00	22.87	21.25	285	4.00	29.20	85	400.03	618.08	8.00(2.91)	14.33(3.85)	10.50	24.19	64664
	W2	4.78	9.07	71.00	20.87	21.83	270	3.78	28.93	84	329.75	539.49	18.00(4.30)	26.33(5.18)	16.04	30.73	64878
	W3	5.38	9.46	75.67	22.45	21.38	275	3.92	29.62	84	360.24	603.39	10.67(3.34)	17.67(4.26)	13.66	29.68	66131
	W4	4.99	9.31	76.67	21.05	21.38	281	3.64	28.95	83	357.79	554.10	18.67(4.38)	23.00(4.85)	15.54	31.77	71902
Mean of Factor-1																	
S1		4.70	8.96	76.08	18.65	20.24	263	3.76	29.49	83	359.29	569.19	16.25(4.05)	22.58(4.78)	14.89	30.08	68202
S2		5.40	9.51	75.00	21.74	21.17	285	4.05	29.56	83	377.56	580.92	11.50(3.44)	19.67(4.48)	13.14	27.36	68330
S3		5.16	8.81	62.00	9.74	21.08	266	3.95	28.51	85	333.52	553.78	14.50(3.83)	22.08(4.72)	15.24	30.43	68264
S4		5.18	9.38	74.58	21.81	21.46	278	3.83	29.18	84	361.95	578.77	13.83(3.73)	20.33(4.53)	13.93	29.09	66894
CD(0.05)		0.45	NS	3.62	1.59	NS	16.54	NS	NS	1.19	28.6	NS	0.2	0.18	1.07	NS	NS
CV(%)		8.84	8.02	5.04	8.86	4.64	6.07	8.15	4.55	1.42	7.99	8.04	5.33	3.84	7.47	7.75	3.42

Trial 4.2.2.2: Contd.

Main Plot-Crop Establishing Methods	Sub plots	NAVSARI															
		Grain yield (t/ha)	Straw yield (t/ha)	Crop stand at 15 DAS /M²	Plant height at 15 DAS /M²	Panicle length cm	Panicle no. /m²	Panicle wt (g)	Test wt (g)	Days to 50% flowering	Dry matter accumulation (g/m²)		Weed population (no/m²)		Weed dry weight (g/m2)		Cost of cultivation (Rs/ha)
											At Max. Tillering	At panicle initiation	At active tillering	At panicle initiation	At active tillering	At panicle initiation	
Mean of Factor-2																	
W1		5.46	9.56	74.58	19.11	20.79	289	4.16	29.63	84	395.02	602.05	8.83(3.04)	15.33(3.98)	10.97	23.73	66573
W2		4.73	8.73	69.17	16.60	21.20	258	3.75	29.03	84	343.77	550.52	18.75(4.37)	26.17(5.16)	16.13	31.94	66970
W3		5.22	9.32	71.83	17.86	20.84	275	3.93	29.22	84	360.91	580.74	11.75(3.49)	19.67(4.49)	14.52	29.44	66244
W4		5.04	9.04	72.08	18.36	21.11	269	3.75	28.86	83	332.64	549.33	16.75(4.14)	23.50(4.89)	15.59	31.86	71902
CD(0.05)		0.38	0.59	2.65	1.24	NS	15.14	0.24	NS	NS	23.85	35.8	0.19	0.16	1.56	1.78	1163.15
CV(%)		8.77	7.67	4.36	8.2	3.99	6.58	7.29	4.14	1.14	7.9	7.44	5.97	4.13	12.94	7.22	2.03
Interaction																	
M and T		NS	NS	NS	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	NS	NS	NS
Experimental Mean		**5.11**	**9.16**	**71.92**	**17.98**	**20.99**	**273**	**3.90**	**29.18**	**84**	**358.08**	**570.66**	**3.76**	**4.63**	**14.30**	**29.24**	**67923**
Soil type		Clay															
pH		7.68															
EC		0.46															
Variety		-															
Applied NPK kg/ha)		100:30;0															
Available NPK kg/ha		273-25-753															

S1 – Broadcasting - Sprouted rice

S2 - Drum Seeding

S3 – Semi-Dry system

S4 - -

W1: Manual weeding (three times)

W2: Pre + post-emergence herbicide

W3: Pre-emergence herbicide + Manual weeding (thrice times)

W4: Pre + post-emergence herbicide two times (for first and second flush - 20-25 days and 40-45 DAS, respectively)

Trial 4.2.2.2: Contd.

Main Plot-Crop Establishing Methods	Sub plots	NAWAGAM														
		Grain yield (t/ha)	Straw yield (t/ha)	Plant population/m2		Plant height (cm)	Tillers/m^2 (No.)	Panicle no. /m^2	Panicle wt (g)	Test wt (g)	Days to 50% flowering	Weed population (no/m^2)		Weed dry weight (g/m2)		Cost of cultivation (Rs/ha)
				At 10 DAS	At 20 DAS							At active tillering	At panicle initiation	At active tillering	At panicle initiation	
S_1 - Broadcasting of seeds	W1	4.59	4.94	38	50	102.35	153	105	4.04	18.15	69	82.75(9.10)	109.25(10.46)	30.43	31.39	44554
	W2	4.49	5.04	50	63	100.53	140	96	4.15	18.24	69	70.25(8.30)	96.00(9.78)	20.23	20.55	43284
	W3	4.63	5.18	50	64	101.20	156	104	3.85	17.65	69	78.75(8.87)	91.50(9.54)	20.22	29.06	41483
	W4	4.48	4.94	48	59	100.05	162	112	3.99	18.34	70	82.00(9.03)	100.25(10.01)	30.65	30.01	44366
S_2 - Mechanized line sowing of seeds	W1	4.75	5.59	37	47	103.80	133	92	4.40	18.17	70	55.00(7.43)	112.00(10.58)	16.43	15.35	42850
	W2	5.11	5.68	40	52	111.45	140	93	4.75	18.38	70	50.50(6.97)	63.50(7.81)	14.37	17.19	41387
	W3	5.24	5.87	49	58	109.20	131	87	3.93	18.00	70	69.75(8.22)	73.50(8.43)	14.72	14.31	42609
	W4	5.24	5.96	43	54	113.50	141	97	4.18	18.66	70	74.75(8.63)	77.50(8.52)	18.38	19.51	42793
S_3 – Semi-Dry System	W1	4.68	5.15	32	41	105.25	129	89	4.29	18.15	72	93.50(9.69)	108.50(10.40)	34.03	35.00	43144
	W2	4.95	5.19	36	48	115.75	126	85	4.40	18.44	71	68.25(8.16)	89.25(9.25)	21.74	24.47	41671
	W3	5.08	5.48	40	53	115.25	125	81	3.99	18.00	71	58.50(7.54)	80.00(8.81)	24.71	29.44	42879
	W4	4.55	4.98	40	53	110.75	123	85	3.97	18.62	70	74.75(8.56)	85.50(9.12)	39.00	42.06	43076
S_4 – Any improved system in that particular location	W1	4.48	4.97	38	50	103.75	143	99	4.47	17.88	71	83.75(9.16)	107.75(10.37)	24.72	32.28	44486
	W2	4.54	5.00	38	50	113.50	147	101	4.31	18.77	71	44.50(6.64)	94.75(9.68)	18.03	26.82	43027
	W3	5.14	5.82	49	60	112.50	152	100	4.47	17.75	69	77.50(8.78)	95.50(9.68)	25.30	32.18	44291
	W4	4.73	5.34	41	51	111.95	161	111	4.00	18.52	70	85.25(9.24)	87.25(9.21)	26.90	38.40	44341
Mean of Factor-1																
S1		4.55	5.02	46	59	101.03	153	104	4.01	18.09	69	78.44(8.83)	99.25(9.95)	25.38	27.75	43422
S2		5.09	5.78	42	53	109.49	136	92	4.32	18.30	70	62.50(7.81)	81.63(8.83)	15.97	16.59	42410
S3		4.82	5.20	37	49	111.75	126	85	4.16	18.30	71	73.75(8.49)	90.81(9.40)	29.87	32.74	42692
S4		4.72	5.28	41	53	110.42	151	103	4.31	18.23	70	72.75(8.46)	96.31(9.74)	23.74	32.42	44036
CD(0.05)		0.36	0.43	3.23	3.95	5.65	9.29	6.86	0.22	NS	NS	NS	NS	6.92	7.57	
CV(%)		9.49	10.13	9.65	9.27	6.53	8.22	8.93	6.57	9.7	3.29	17.34	15.31	36.44	34.59	

Trial 4.2.2.2: Contd.

Main Plot-Crop Establishing Methods	Sub plots	NAWAGAM														
		Grain yield (t/ha)	Straw yield (t/ha)	Plant population/m2		Plant height (cm)	Tillers/m^2 (No.)	Panicle no. /m^2	Panicle wt (g)	Test wt (g)	Days to 50% flowering	Weed population (no/m^2)		Weed dry weight (g/m2)		Cost of cultivation (Rs/ha)
				At 10 DAS	At 20 DAS							At active tillering	At panicle initiation	At active tillering	At panicle initiation	
Mean of Factor-2																
W1		4.63	5.16	36	47	103.79	140	96	4.30	18.09	70	78.75(8.85)	109.38(10.45)	26.40	28.51	43758
W2		4.77	5.23	41	53	110.31	138	94	4.40	18.46	70	58.38(7.52)	85.88(9.13)	18.59	22.26	42342
W3		5.02	5.59	47	59	109.54	141	93	4.06	17.85	70	71.13(8.36)	85.13(9.12)	21.24	26.25	42815
W4		4.75	5.31	43	54	109.06	147	101	4.03	18.54	70	79.19(8.86)	87.63(9.21)	28.73	32.50	43644
CD(0.05)		0.23	0.32	2.52	2.83	4.63	NS	4.02	0.3	NS	NS	0.85	1.05	6.21	NS	
CV(%)		6.84	8.4	8.45	7.42	5.99	6.73	5.86	9.98	5.06	3.2	14.13	15.53	36.62	38.99	
Interaction																
M and T		NS	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	NS	
Experimental Mean		**4.79**	**5.32**	**42**	**53**	**108.17**	**141**	**96**	**4.20**	**18.23**	**69.98**	**8.4**	**9.48**	**23.74**	**27.38**	
Soil type		Clay Loam														
pH		7.76														
EC		-														
Variety		-														
Applied NPK kg/ha)		85:25;0:25														
Available NPK kg/ha		320:35;250														

S1: Broadcasting of seeds

S2: Mechanized line sowing of seeds (Dribbler, Happy seeder or any Drum Seeder: Spacing as per the equipment specifications)

S3- Semi-Dry system (Sowing in dry soil and Wet after one month of sowing)

S4- Any improved system in that particular location

W1: Manual weeding (three times)
W2: Pre + post-emergence herbicide
W3: Pre-emergence herbicide + Manual weeding (thrice times)
W4: Pre + post-emergence herbicide two times (for first and second flush - 20-25 days and 40-45 DAS, respectively)

Trial 4.2.2.2: Contd.

Main Plot-Crop Establishing Methods	Sub plots	PUDUCHERRY											
		Grain yield (t/ha)	Straw yield (t/ha)	Plant height (cm)	Tillers/m^2 (No.)	Panicle no. /m^2	Panicle wt (g)	Test wt (g)	Weed population (no/m^2)		Weed dry weight (g/m2)		Cost of cultivation (Rs/ha)
									At active tillering	At panicle initiation	At active tillering	At panicle initiation	
S_1 - Broadcasting of seeds	W1	5.71	8.39	118.39	262	239	3.53	17.99	53.00(7.31)	35.00(5.96)	53.00	22.20	58580
	W2	5.23	7.69	109.89	227	201	3.25	17.09	74.00(8.63)	52.10(7.25)	74.00	38.50	56205
	W3	5.75	8.46	115.77	244	222	3.49	17.58	63.24(7.98)	48.14(6.97)	63.24	32.23	58080
	W4	5.92	8.70	121.00	288	256	3.62	18.11	45.08(6.75)	27.83(5.32)	45.08	15.75	58830
S_2 - Mechanized line sowing of seeds	W1	6.20	9.11	122.00	296	277	3.70	18.21	38.00(6.20)	25.50(5.10)	38.00	14.90	59330
	W2	5.72	8.41	115.00	258	234	3.59	17.85	51.00(7.18)	38.90(6.28)	51.00	25.20	56830
	W3	6.05	8.90	118.60	278	257	3.65	17.95	44.88(6.74)	31.21(5.63)	44.88	20.04	58830
	W4	6.42	9.45	123.59	311	291	3.73	18.38	32.34(5.73)	19.40(4.46)	32.34	10.19	59580
S_3 – Semi-Dry System	W1	-	-	-	-	-	-	-	-	-	-	-	-
	W2	-	-	-	-	-	-	-	-	-	-	-	-
	W3	-	-	-	-	-	-	-	-	-	-	-	-
	W4	-	-	-	-	-	-	-	-	-	-	-	-
S_4 – Any improved system in that particular location	W1	-	-	-	-	-	-	-	-	-	-	-	-
	W2	-	-	-	-	-	-	-	-	-	-	-	-
	W3	-	-	-	-	-	-	-	-	-	-	-	-
	W4	-	-	-	-	-	-	-	-	-	-	-	-
Mean of Factor-1													
S1		5.65	8.31	116.26	255	230	3.47	17.69	58.83(7.67)	40.77(6.38)	58.83	27.17	57924
S2		6.10	8.97	119.80	286	265	3.67	18.10	41.56(6.46)	28.75(5.37)	41.56	17.58	58643
S3		-	-	-	-	-	-	-	-	-	-	-	-
S4		-	-	-	-	-	-	-	-	-	-	-	-
CD(0.05)		0.02	0.02	1.47	4.5	4.22	0.06	0.28	0.05	0.04	1.41	0.89	
CV(%)		0.23	0.16	0.71	0.95	0.97	0.91	0.9	0.4	0.41	1.6	2.28	

Trial 4.2.2.2: Contd.

Main Plot-Crop Establishing Methods	Sub plots	PUDUCHERRY											
		Grain yield (t/ha)	Straw yield (t/ha)	Plant height (cm)	Tillers/m^2 (No.)	Panicle no. /m^2	Panicle wt (g)	Test wt (g)	Weed population (no/m^2)		Weed dry weight (g/m2)		Cost of cultivation (Rs/ha)
									At active tillering	At panicle initiation	At active tillering	At panicle initiation	
Mean of Factor-2													
W1		5.95	8.75	120.20	279	258	3.62	18.10	45.50(6.76)	30.25(5.53)	45.50	18.55	58955
W2		5.48	8.05	112.44	242	217	3.42	17.47	62.50(7.90)	45.50(6.76)	62.50	31.85	56518
W3		5.90	8.68	117.18	261	240	3.57	17.76	54.06(7.36)	39.68(6.30)	54.06	26.14	58455
W4		6.17	9.07	122.29	300	274	3.67	18.24	38.71(6.24)	23.62(4.89)	38.71	12.97	59205
CD(0.05)		0.06	0.09	1.81	3.97	3.61	0.05	0.25	0.05	0.04	0.8	0.45	
CV(%)		0.82	0.85	1.22	1.17	1.16	1.12	1.11	0.58	0.6	1.27	1.6	
Interaction													
M and T		0.09	0.13	NS	5.61	NS	0.07	NS	0.07	0.06	1.13	0.64	
T and M		0.08	0.11	NS	6.02	NS	0.08	NS	0.07	0.06	1.48	0.89	
Experimental Mean		**5.88**	**8.64**	**118.03**	**270**	**247**	**3.57**	**17.89**	**7.07**	**5.87**	**50.19**	**22.38**	
Soil type		Clay Loam											
pH		6.72											
EC		0.13											
Variety		ADT 54, 130-135 days											
Applied NPK kg/ha)		120;40:40											
Available NPK kg/ha		156.8:35.1:106											

S1: Broadcasting of seeds

S2: Mechanized line sowing of seeds (Dribbler, Happy seeder or any Drum Seeder: Spacing as per the equipment specifications)

S3- -

S4- -

W1: Manual weeding (three times)
W2: Pre + post-emergence herbicide
W3: Pre-emergence herbicide + Manual weeding (thrice times)
W4: Pre + post-emergence herbicide two times (for first and second flush - 20-25 days and 40-45 DAS, respectively)

Trial 4.2.2.2: Contd.

Main Plot-Crop Establishing Methods	Sub plots	PUSA															
		Grain yield (t/ha)	Straw yield (t/ha)	Plant population/m2		Plant height (cm)	Tillers/m^2 (No.)	Panicle no. /m^2	Panicle wt (g)	Test wt (g)	Days to 50% flowering	Weed population (no/m^2)		Weed dry weight (g/m2)		Total ater imput mm/ha	Cost of cultivation (Rs/ha)
				At 10 DAS	At 20 DAS							At active tillering	At panicle initiation	At active tillering	At panicle initiation		
S_1 - Broadcasting of seeds	W1	4.60	6.57	43	56	118.33	295	278	2.43	21.20	83	4.00(1.91)	1.33(1.18)	1.52	1.53	848.30	53250
	W2	4.41	6.75	38	53	115.00	282	259	2.44	21.00	83	2.67(1.65)	4.00(1.91)	55.51	4.60	848.30	41500
	W3	4.62	7.49	39	55	115.00	290	264	2.44	21.50	83	1.33(1.18)	1.33(1.18)	0.51	1.53	848.30	48750
	W4	5.16	6.99	38	54	113.33	294	274	2.41	21.67	83	8.00(2.86)	4.00(1.91)	2.59	4.60	848.30	43500
S_2 - Mechanized line sowing of seeds	W1	5.54	7.11	36	53	118.33	339	314	2.75	22.17	84	4.00(1.91)	0.00(0.71)	1.52	0.00	848.30	54250
	W2	4.60	6.92	36	54	113.33	322	290	2.60	21.17	83	4.00(1.91)	4.00(1.91)	1.52	4.60	848.30	42500
	W3	4.75	7.30	37	55	115.00	325	296	2.76	21.67	85	6.67(2.65)	2.67(1.65)	2.53	3.07	848.30	49750
	W4	5.36	7.13	37	53	116.67	328	307	2.73	21.83	82	6.67(2.59)	8.00(2.86)	2.53	9.20	848.30	44500
S_3 – Semi-Dry System	W1	4.57	4.67	39	55	120.00	300	270	2.47	21.67	85	2.67(1.44)	2.67(1.65)	1.01	3.07	848.30	54250
	W2	4.60	7.04	39	56	115.00	285	262	2.37	21.33	84	4.00(1.91)	5.33(2.18)	1.52	6.13	848.30	42500
	W3	4.39	6.15	40	57	116.67	295	265	2.39	21.50	84	5.33(2.18)	0.00(0.71)	2.03	0.00	848.30	49750
	W4	4.20	6.35	41	56	118.33	298	266	2.43	22.00	83	8.00(2.86)	4.00(1.91)	3.04	4.60	848.30	44500
S_4 – Any improved system in that particular location	W1	4.50	6.70	39	54	121.67	337	312	2.69	21.83	84	5.33(2.18)	1.33(1.18)	2.03	1.53	848.30	54250
	W2	4.73	7.57	41	57	121.00	306	281	2.54	21.33	84	5.33(2.39)	5.33(2.39)	2.03	6.13	848.30	42500
	W3	4.71	6.80	38	54	120.00	309	286	2.50	21.50	84	4.00(2.12)	2.67(1.44)	1.52	3.07	848.30	49750
	W4	4.87	7.12	37	53	121.67	320	305	2.68	21.80	84	8.00(2.86)	8.00(2.86)	3.04	9.20	848.30	44500
Mean of Factor-1																	
S1		4.70	6.95	40	55	115.42	290	269	2.43	21.34	83	4.00(1.90)	2.67(1.55)	15.03	3.07	848.30	46750
S2		5.06	7.11	37	54	115.83	329	302	2.71	21.71	84	5.33(2.27)	3.67(1.78)	2.03	4.22	848.30	47750
S3		4.44	6.05	40	56	117.50	294	266	2.42	21.63	84	5.00(2.10)	3.00(1.61)	1.90	3.45	848.30	47750
S4		4.70	7.05	39	55	121.08	318	296	2.60	21.62	84	5.67(2.39)	4.33(1.97)	2.15	4.98	848.30	47750
CD(0.05)		NS	0.66	1.03	1.45	NS	NS	NS	0.12	NS	NS	NS	NS	NS	NS		
CV(%)		15.22	9.78	2.67	2.66	4.11	12.22	13.36	4.74	3.71	1.3	23.16	48.55	443.6	87.26		

Trial 4.2.2.2: Contd.

Main Plot-Crop Establishing Methods	Sub plots	PUSA															
		Grain yield (t/ha)	Straw yield (t/ha)	Plant population/m2		Plant height (cm)	Tillers/m^2 (No.)	Panicle no. /m^2	Panicle wt (g)	Test wt (g)	Days to 50% flowering	Weed population (no/m^2)		Weed dry weight (g/m2)		Total ater imput mm/ha	Cost of cultivation (Rs/ha)
				At 10 DAS	At 20 DAS							At active tillering	At panicle initiation	At active tillering	At panicle initiation		
Mean of Factor-2																	
W1		4.80	6.26	39	55	119.58	318	293	2.58	21.72	84	4.00(1.86)	1.33(1.18)	1.52	1.53	848.30	54000
W2		4.58	7.07	38	55	116.08	299	273	2.49	21.21	84	4.00(1.97)	4.67(2.10)	15.14	5.37	848.30	42250
W3		4.62	6.94	39	55	116.67	305	278	2.52	21.54	84	4.33(2.03)	1.67(1.24)	1.65	1.92	848.30	49500
W4		4.90	6.90	38	54	117.50	310	288	2.56	21.83	83	7.67(2.79)	6.00(2.39)	2.80	6.90	848.30	44250
CD(0.05)		NS	NS	NS	NS	NS	7.42	8.04	0.06	0.41	NS	NS	0.79	NS	3.34		
CV(%)		13.51	15.03	4.47	3.64	3.38	2.86	3.37	2.68	2.27	2.42	46.93	54.4	449.93	100.92		
Interaction																	
M and T		NS	NS	2.91	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS		
T and M		NS	NS	2.64	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS		
Experimental Mean		**4.72**	**6.79**	**39**	**55**	**117.46**	**308**	**283**	**2.54**	**21.57**	**84**	**2.16**	**1.73**	**5.28**	**3.93**		
Soil type		-															
pH		8.2															
EC		-															
Variety		Rajendra Nilam, 120-125 days															
Applied NPK kg/ha)		160:60:40:25															
Available NPK kg/ha		245;12.5:145															

S1: Broadcasting of seeds
S2: Drum seeding sowing of seeds (20 cm row spacing sown in solid row)
S3: Semi Dry Sowing (sowing in dry soil wet after one month of sowing)
S4: Manual Line sowing

W1: Manual weeding (three times)
W2: Pre + post-emergence herbicide
W3: Pre-emergence herbicide + Manual weeding (two times)
W4: Pre + post-emergence herbicide two times (for first and second flush - 20-25 days and 40-45 DAS, respectively) (pendimethalin @ 1 kg/ha PE + Bispyribac sodium @20 g/ha twice

Trial 4.2.2.2: Contd.

Main Plot-Crop Establishing Methods	Sub plots	TITABAR								VADGAON							
		Grain yield (t/ha)	Straw yield (t/ha)	Plant population/m2 At 20 DAS	Plant height (cm)	Tillers/m^2 (No.)	Panicle no. /m^2	Panicle wt (g)	Days to 50% flowering	Grain yield (t/ha)	Straw yield (t/ha)	Plant height (cm)	Tillers/m^2 (No.)	Panicle no. /m^2	Panicle wt (g)	Test wt (g)	Days to 50% flowering
S_1 - Broadcasting of seeds	W1	2.80	7.20	99	114.50	283	271	2.65	105	3.94	4.21	83.49	193	190	3.68	20.87	98
	W2	2.65	7.43	131	114.75	288	276	3.27	105	3.58	3.83	83.14	176	173	3.35	20.79	96
	W3	2.88	7.98	127	120.13	288	276	3.72	105	3.98	4.26	84.35	195	192	3.72	21.09	98
	W4	3.02	6.78	164	128.00	296	284	3.88	105	4.06	4.34	86.07	199	197	3.79	21.52	97
S_2 - Mechanized line sowing of seeds	W1	3.05	5.38	171	121.00	287	275	3.85	105	5.63	6.10	95.64	276	273	5.27	22.77	96
	W2	3.28	6.65	177	123.25	292	280	4.20	105	5.51	5.98	93.73	271	267	5.16	22.32	96
	W3	3.60	6.35	183	123.75	348	336	4.68	105	5.68	6.17	96.63	279	276	5.32	23.01	97
	W4	3.75	6.47	190	127.25	374	362	4.93	105	5.80	6.29	98.60	285	281	5.43	23.48	98
S_3 – Semi-Dry System	W1	3.13	5.63	147	130.25	290	278	3.35	105	5.29	5.71	89.90	260	256	4.94	21.41	96
	W2	3.25	5.82	159	136.75	295	283	4.03	105	5.13	5.54	87.17	252	249	4.79	20.75	98
	W3	3.20	6.43	160	137.88	295	283	4.15	105	5.46	5.89	92.76	268	265	5.10	22.09	97
	W4	3.80	6.00	153	139.25	310	298	4.20	106	5.57	6.01	94.66	273	270	5.20	22.54	96
S_4 – Any improved system in that particular location	W1	-	-	-	-	-	-	-	-	5.18	5.57	88.11	255	251	4.84	20.98	96
	W2	-	-	-	-	-	-	-	-	5.02	5.40	85.42	247	244	4.70	20.34	97
	W3	-	-	-	-	-	-	-	-	5.35	5.75	90.91	263	259	5.00	21.64	98
	W4	-	-	-	-	-	-	-	-	5.46	5.87	92.76	268	265	5.10	22.09	96
Mean of Factor-1																	
S1		2.84	7.34	130	119.34	289	277	3.38	105	3.89	4.16	84.26	191	188	3.63	21.07	97
S2		3.42	6.21	180	123.81	325	313	4.41	105	5.66	6.14	96.15	278	274	5.30	22.89	97
S3		3.34	5.97	155	136.03	297	285	3.93	105	5.36	5.79	91.12	263	260	5.01	21.70	97
S4		-	-	-	-	-	-	-	-	5.25	5.65	89.30	258	255	4.91	21.26	97
CD(0.05)		NS	NS	NS	9.25	21.89	21.89	0.42	NS	0.05	0.05	0.29	2.34	2.34	0.04	0.05	NS
CV(%)		44.71	59.76	33.22	8.46	8.33	8.68	12.45	0.77	0.93	0.96	0.33	0.95	0.96	0.9	0.23	0.46

Trial 4.2.2.2: Contd.

Main Plot-Crop Establishing Methods	Sub plots	TITABAR								VADGAON							
		Grain yield (t/ha)	Straw yield (t/ha)	Plant population/m2 At 20 DAS	Plant height (cm)	Tillers/m^2 (No.)	Panicle no. /m^2	Panicle wt (g)	Days to 50% flowering	Grain yield (t/ha)	Straw yield (t/ha)	Plant height (cm)	Tillers/m^2 (No.)	Panicle no. /m^2	Panicle wt (g)	Test wt (g)	Days to 50% flowering
Mean of Factor-2																	
W1		2.99	6.07	139	121.92	286	274	3.28	104.83	5.01	5.40	89.29	246	242	4.68	21.51	97
W2		3.06	6.63	156	124.92	291	279	3.83	105.17	4.81	5.19	87.37	236	233	4.50	21.05	97
W3		3.22	6.92	157	127.25	311	299	4.18	105	5.12	5.52	91.16	251	248	4.78	21.96	97
W4		3.53	6.42	169	131.50	327	315	4.33	105.17	5.22	5.63	93.02	256	253	4.88	22.40	97
CD(0.05)		0.22	0.54	20.33	5.32	13.65	13.65	0.24	NS	0	0	0.07	0.23	0.23	0	0.02	NS
CV(%)		8.23	9.93	15.65	5.02	5.37	5.59	7.2	1.48	0.11	0.11	0.09	0.11	0.11	0.1	0.09	1.43
Interaction																	
M and T		NS	NS	NS	NS	23.64	23.64	NS	NS	0.01	0.01	0.13	0.46	0.46	0.01	0.03	NS
T and M		NS	NS	NS	NS	26.32	26.32	NS	NS	0.03	0.04	0.24	1.71	1.71	0.03	0.05	NS
Experimental Mean		**3.20**	**6.51**	**155**	**126.40**	**304**	**292**	**3.91**	**105**	**5.04**	**5.43**	**90.21**	**248**	**244**	**4.71**	**21.73**	**97**
Soil type		Clay loam								Medium							
pH		5.48								7.65							
EC		-								0.14							
Variety		-								Phule Samruddhi 125 to 130 days							
Applied NPK kg/ha)		60;20:40								100;50:50							
Available NPK kg/ha		-								172:18.6;230							

S1: Broadcasting of seeds

S2: Drum seeding sowing of seeds (20 cm row spacing sown in solid row)

S3: Semi Dry Sowing (sowing in dry soil wet after one month of sowing)

S4: -

W1: Manual weeding (three times)
W2: Pre (Pyrazosulfuron ethyl)+ post-emergence herbicide (Bispyribac-Na)
W3: Pre-emergence herbicide (Pyrazosulfuron ethyl)+ Manual weeding (two times)
W4: Pre (Pyrazosulfuron ethyl) + post-emergence (Bispyribac-Na) herbicide two times (for first and second flush - 20-25 days and 40-45 DAS, respectively)

S1: Broadcasting of seeds

S2: Mechanized line sowing of seeds (Dribbler, Happy seeder or any Drum Seeder: Spacing as per the equipment specifications)

S3- Semi-Dry system (Sowing in dry soil and Wet after one month of sowing)

S4- Any improved system in that particular location

W1: Manual weeding (three times)
W2: Pre + post-emergence herbicide
W3: Pre-emergence herbicide + Manual weeding (thrice times)
W4: Pre + post-emergence herbicide two times (for first and second flush - 20-25 days and 40-45 DAS, respectively)

Trial 4.2.2.2: Contd.

Main Plot-Crop Establishing Methods	Sub plots	VARANASI													
		Grain yield (t/ha)	Plant population/m2	Plant height (cm)			Tillers/m^2 (No.)		Panicle no. /m^2	Panicle wt (g)	Test wt (g)	Weed population (no/m^2)		Weed dry weight (g/m2)	
			At 10 DAS	At 30	At 60	At 90	At 30	At 60				At active tillering	At panicle initiation	At active tillering	At panicle initiation
S_1 - Broadcasting of seeds	W1	3.11	80	18.57	40.53	66.63	129	198	243	1.11	21.71	184.33(13.56)	104.67(10.15)	61.80	82.88
	W2	3.36	82	16.87	35.97	66.30	122	194	273	1.26	22.21	73.33(8.54)	62.33(7.80)	40.18	38.04
	W3	3.18	80	12.53	41.73	78.80	134	227	257	1.23	21.65	106.00(10.19)	74.00(8.43)	51.64	52.30
	W4	3.02	96	20.43	44.17	72.17	138	220	213	0.97	21.81	150.67(12.28)	80.67(8.99)	53.87	94.76
S_2 - Mechanized line sowing of seeds	W1	3.37	96	21.47	41.27	76.03	162	255	229	0.97	21.90	122.33(10.95)	60.33(7.69)	43.73	34.16
	W2	3.95	98	20.57	44.77	78.80	160	228	267	1.28	23.21	54.00(7.31)	20.00(4.52)	12.64	18.58
	W3	3.41	95	20.90	43.80	77.80	145	250	262	1.05	21.44	77.67(8.81)	38.33(6.20)	20.06	28.63
	W4	3.18	94	20.23	41.17	75.83	130	237	227	0.89	23.54	138.00(11.75)	113.33(10.60)	46.06	41.85
S_3 – Semi-Dry System	W1	3.39	78	20.43	42.53	65.27	141	274	175	1.35	22.92	114.33(10.70)	73.33(8.21)	34.96	31.77
	W2	3.85	84	19.80	45.60	71.50	126	241	249	1.63	24.13	51.00(7.14)	35.33(5.95)	19.84	17.88
	W3	3.35	81	18.70	45.33	73.27	152	212	188	1.35	20.78	96.67(9.85)	50.67(7.10)	30.08	23.04
	W4	3.07	87	19.77	41.20	63.40	132	240	170	1.35	19.74	157.00(12.53)	111.67(10.55)	47.70	51.24
S_4 – Any improved system in that particular location	W1	3.29	95	19.17	46.10	80.47	160	260	259	0.87	21.12	91.00(9.50)	55.67(7.32)	24.22	22.58
	W2	4.01	96	22.33	46.57	70.30	152	241	326	1.03	21.57	23.67(4.87)	25.00(4.98)	14.75	14.46
	W3	3.92	99	22.93	54.93	77.10	156	252	272	0.88	23.42	35.00(5.92)	43.00(6.58)	22.37	21.11
	W4	3.48	96	21.50	49.07	80.40	142	205	264	0.77	21.73	76.67(8.65)	66.00(8.13)	49.03	46.81
Mean of Factor-1															
S1		3.16	84	17.10	40.60	70.97	131	210	247	1.14	21.84	128.58(11.14)	80.42(8.84)	51.87	67.00
S2		3.48	96	20.79	42.75	77.12	150	242	246	1.05	22.52	98.00(9.71)	58.00(7.25)	30.62	30.80
S3		3.41	83	19.67	43.67	68.36	138	242	195	1.42	21.89	104.75(10.06)	67.75(7.95)	33.15	30.98
S4		3.67	96	21.48	49.17	77.07	153	240	280	0.89	21.96	56.58(7.23)	47.42(6.75)	27.59	26.24
CD(0.05)		0.19	4.42	NS	3.37	4.87	4.26	20.54	7.67	0.15	NS	1.26	1.32	NS	NS
CV(%)		5.52	4.92	20.78	7.65	6.64	2.99	8.81	3.17	13.28	5.24	13.23	17.15	64.79	153.07

Trial 4.2.2.2: Contd.

Main Plot-Crop Establishing Methods	Sub plots	VARANASI													
		Grain yield (t/ha)	Plant population/m2	Plant height (cm)			Tillers/m² (No.)		Panicle no. /m²	Panicle wt (g)	Test wt (g)	Weed population (no/m²)		Weed dry weight (g/m2)	
			At 10 DAS	At 30	At 60	At 90	At 30	At 60				At active tillering	At panicle initiation	At active tillering	At panicle initiation
Mean of Factor-2															
W1		3.29	87	19.91	42.61	72.10	148	247	227	1.08	21.91	128.00(11.18)	73.50(8.34)	41.18	42.85
W2		3.79	90	19.89	43.23	71.72	140	226	279	1.30	22.78	50.50(6.97)	35.67(5.81)	21.85	22.24
W3		3.46	89	18.77	46.45	76.74	147	235	245	1.13	21.82	78.83(8.69)	51.50(7.08)	31.04	31.27
W4		3.19	93	20.48	43.90	72.95	136	225	219	1.00	21.70	130.58(11.30)	92.92(9.57)	49.16	58.66
CD(0.05)		0.09	NS	NS	NS	NS	3.52	14.47	9.56	0.18	NS	1.03	1.13	12.47	18.17
CV(%)		3.26	6.17	10.28	12.75	6.72	2.93	7.36	4.68	19.31	6.49	12.82	17.44	41.31	55.65
Interaction															
M and T		0.19	NS	3.42	NS	8.31	7.04	28.93	19.12	NS	2.41	NS	NS	NS	NS
T and M		0.22	NS	4.26	NS	8.11	6.92	29.57	17.6	NS	2.27	NS	NS	NS	NS
Experimental Mean		**3.43**	**90**	**19.76**	**44.05**	**73.38**	**143**	**233**	**242**	**1.13**	**22.05**	**9.53**	**7.7**	**35.81**	**38.76**
Soil type		-													
pH		7.6													
EC		-													
Variety		HUR 306													
Applied NPK kg/ha)		120;60:60													
Available NPK kg/ha		183:31:209													

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

W1: Manual weeding (three times)
W2: Pre + post-emergence herbicide
W3: Pre-emergence herbicide + Manual weeding (two times)
W4: Pre + post-emergence herbicide two times (for first and second flush - 20-25 days and 40-45 DAS, respectively)

Trial 4.2.2.2: Contd.

Main Plot-Crop Establishing Methods	Sub plots	WARANGAL																		Over all mean	Rank
		Grain yield (t/ha)	Straw yield (t/ha)	Plant population/m2		Plant height (cm)	Tillers/m^2 (No.)	Panicle length cm/m^2	Panicle no. /m^2	Panicle wt (g)	Test wt (g)	Days to 50% flowering	Dry matter accumulation (g/m^2)			Weed population (no/m^2)		Weed dry weight (g/m2)			
				At 10 DAS	At 20 DAS								At 45 DAS	At 75 DAS	At 105 DAS	At active tillering	At panicle initiation	At active tillering	At panicle initiation		
S_1- Broadcasting of seeds	W1	6.93	7.67	164	84	112.63	427	24.53	402	4.71	14.67	78	40.00	74.67	96.33	2.55(1.68)	3.00(1.86)	0.29	0.23	4.50	15
	W2	5.10	6.13	117	75	105.63	350	24.47	307	3.56	14.66	80	37.67	73.33	92.67	6.00(2.53)	7.00(2.50)	0.59	0.45	4.26	16
	W3	6.37	7.10	153	76	111.17	418	24.40	326	4.30	14.80	79	40.33	74.00	92.00	3.00(1.86)	3.33(1.94)	0.23	0.33	4.54	14
	W4	5.80	6.67	150	76	106.97	343	24.47	326	4.06	14.61	79	39.00	74.00	92.67	5.33(2.31)	6.33(2.60)	0.57	0.80	4.57	13
S_2- Mechanized line sowing of seeds	W1	7.10	7.73	39	34	112.90	474	24.20	442	4.82	14.99	79	43.00	76.00	99.67	2.33(1.64)	2.67(1.72)	0.27	0.27	5.05	3
	W2	5.63	6.33	35	33	106.27	352	24.33	327	3.72	14.89	78	37.33	72.67	95.00	6.33(2.60)	6.00(2.53)	0.71	0.81	4.76	9
	W3	6.97	7.67	38	34	112.30	436	24.47	356	4.40	14.57	79	40.00	75.00	97.00	2.67(1.72)	3.00(1.86)	0.27	0.23	5.10	1
	W4	6.23	6.87	36	34	107.43	410	24.33	342	4.25	14.64	79	39.00	73.67	95.00	3.33(1.94)	5.33(2.31)	0.33	0.57	5.10	2
S_3 – Semi-Dry System	W1	5.33	6.10	35	34	108.37	396	24.40	332	4.55	14.81	79	38.00	72.33	92.67	8.33(2.96)	8.00(2.88)	1.18	0.99	4.77	7
	W2	4.83	5.57	30	31	103.57	284	24.53	268	3.43	14.79	79	32.33	69.00	86.33	15.67(3.80)	15.67(3.80)	1.54	1.83	4.58	12
	W3	5.13	5.90	31	34	105.50	326	24.67	303	4.13	14.97	80	37.00	71.33	90.00	9.00(3.04)	9.00(3.04)	1.33	1.33	4.80	6
	W4	5.10	5.87	30	34	104.67	320	24.87	301	4.04	14.91	80	36.33	70.67	88.00	12.00(3.50)	12.00(3.50)	1.60	1.60	4.76	8
S_4 – Any improved system in that particular location	W1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.70	10
	W2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.66	11
	W3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.95	4
	W4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.84	5
Mean of Factor-1																					
S1		6.05	6.89	146	78	109.10	385	24.47	340	4.16	14.68	79	39.25	74.00	93.42	4.22(2.09)	4.92(2.23)	0.42	0.45	4.47	4
S2		6.48	7.15	37	34	109.72	418	24.33	367	4.30	14.77	79	39.83	74.33	96.67	3.67(1.98)	4.25(2.10)	0.40	0.47	5.00	1
S3		5.10	5.86	31	33	105.52	331	24.62	301	4.04	14.87	79	35.92	70.83	89.25	11.25(3.32)	11.17(3.30)	1.41	1.44	4.73	3
S4		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.79	2
CD(0.05)		0.27	0.3	10.63	5.51	NS	39.98	NS	21.72	NS	NS	NS	1.36	NS	NS	0.54	0.5	0.46	NS		
CV(%)		6.32	6.34	20.55	15.72	3.08	14.59	1.62	8.92	16.14	3.65	0.86	4.91	3.94	5.89	29.99	26.91	85.68	98.33		

Trial 4.2.2.2: Contd.

Main Plot-Crop Establishing Methods	Sub plots	WARANGAL																		Over all mean	Rank
		Grain yield (t/ha)	Straw yield (t/ha)	Plant population/m 2		Plant height (cm)	Tillers/m^2 (No.)	Panicle length cm/m^2	Panicle no. /m^2	Panicle wt (g)	Test wt (g)	Days to 50% flowering	Dry matter accumulation (g/m^2)			Weed population (no/m^2)		Weed dry weight (g/m2)			
				At 10 DAS	At 20 DAS								At 45 DAS	At 75 DAS	At 105 DAS	At active tillering	At panicle initiation	At active tillering	At panicle initiation		
Mean of Factor-2																					
W1		6.46	7.17	79	51	111.30	432	24.38	392	4.70	14.82	79	40.33	74.33	96.22	4.41(2.09)	4.56(2.15)	0.58	0.50	4.81	3
W2		5.19	6.01	60	46	105.16	329	24.44	300	3.57	14.78	79	35.78	71.67	91.33	9.33(2.98)	9.56(2.94)	0.95	1.03	4.60	4
W3		6.16	6.89	74	48	109.66	393	24.51	328	4.28	14.78	79	39.11	73.44	93.00	4.89(2.21)	5.11(2.28)	0.61	0.63	4.89	1
W4		5.71	6.47	72	48	106.36	358	24.56	323	4.12	14.72	79	38.11	72.78	91.89	6.89(2.58)	7.89(2.80)	0.84	0.99	4.88	2
CD(0.05)		0.47	0.46	9.03	NS	2.06	35.35	NS	29.21	0.47	NS	NS	NS	NS	NS	0.64	NS	NS	NS		
CV(%)		8.05	7.04	12.77	13.36	1.92	9.44	1.87	8.77	11.35	2.19	1.11	9.24	3.17	4.9	26.12	31.66	44.29	60.44		
Interaction																					
M and T		NS	NS	15.64	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS		
T and M		NS	NS	15.04	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS		
Experimental Mean		**5.88**	**6.63**	**71**	**48**	**108.12**	**378**	**24.47**	**336**	**4.17**	**14.78**	**79**	**38.33**	**73.06**	**93.11**	**2.46**	**2.55**	**0.74**	**0.79**	**4.80**	
Soil type		Clay loam																			
pH		7.3																			
EC		0.37																			
Variety		WGL 1119, 120 Days																			
Applied NPK kg/ha)		120;60:40:50																			
Available NPK kg/ha		210:62:350																			

S1: Broadcasting of seeds
S2: Mechanized line sowing of seeds (Dribbler, Happy seeder or any Drum Seeder: Spacing as per the equipment specifications)
S3- Semi-Dry system (Sowing in dry soil and Wet after one month of sowing)
S4- -

W1: Manual weeding (three times)
W2: Pre + post-emergence herbicide
W3: Pre-emergence herbicide + Manual weeding (two times)
W4: Pre + post-emergence herbicide two times (for first and second flush - 20-25 days and 40-45 DAS, respectively)

Trial 4.2.2.2: Contd.

Crop Establishing Methods	REWA										
	Grain yield (t/ha)	Straw yield (t/ha)	Tillers/m^2 (No.)	Panicle no. /m^2	Panicle wt (g)	Test wt (g)	Days to 50% flowering	Weed population (no/m^2)		Weed dry weight (g/m2)	
								At active tillering	At panicle initiation	At active tillering	At panicle initiation
S1	3.98	4.65	266.5	2.5	2.43	24.75	72.75	6.25(2.59)	26.48(5.19)	9.6	3.43
S2	4.38	4.95	273.5	2.7	2.68	25.45	77.5	6.25(2.60)	25.28(5.08)	9.3	3.95
S3	4.58	5.15	281.75	2.9	2.93	24.98	80.75	6.75(2.69)	26.03(5.15)	10.78	3.8
S4	5.05	5.4	299.25	3.35	3.45	26.35	84.5	5.25(2.39)	10.88(3.37)	3.5	2.58
S5	4.83	5.48	287.5	3.13	3.15	25.5	81.5	5.75(2.50)	24.03(4.94)	11.33	3.33
S6	5.38	5.63	289.5	3.03	2.98	24.75	78	7.25(2.78)	11.30(3.43)	4.55	2.73
S7	4.08	4.6	267.75	2.35	2.25	26.35	72	4.50(2.23)	24.45(4.99)	7.35	2.38
Experimental Mean	**4.61**	**5.12**	**280.82**	**2.85**	**2.84**	**25.45**	**78.14**	**2.54**	**4.59**	**8.06**	**3.17**
CD(0.05)	0.3	0.09	10.05	0.18	0.14	1.19	3.36	0.22	0.22	2.3	0.73
CV(%)	4.32	1.24	2.41	4.21	3.22	3.16	2.9	5.96	3.15	19.18	15.44
Soil type	-										
pH	-										
EC	-										
Variety	-										
Applied NPK kg/ha)	-										
Available NPK kg/ha	-										

S1-Broadcasting of seeds (Flat sowing) + manual weeding (once)

S2-Mechanized line sowing of seeds (Drum seeder, any seeder used in wet condition) + post-emergence herbicide

S3- Broadcasting of seeds (Flat sowing) + post-emergence herbicide

S4- Mechanized line sowing of seeds (Drum seeder, any seeder used in wet condition) + mechanical weeding twice

S5- Mechanized line sowing of seeds (Drum seeder, any seeder used in wet condition) + post-emergence herbicide + mechanical weeding once

S6 - Mechanized line sowing of seeds (Drum seeder, any seeder used in wet condition) + post-emergence herbicide + mechanical weeding once + 4 split N application 25% each at basal, active tillering, panicle initiation and heading stage

S7 - Optional (local wet direct seeded practices)

Establishment Methods on Pest Incidence (IEMP)

During Kharif 2022, observations on insect pest incidence were recorded at 11 locations, **Aduthurai, Chatha, Jagdalpur, Malan, Moncompu, Nawagam, Pantnagar, Pattambi, Pusa, Rajendranagar** and **Titabar**.

Across locations, the incidence of stem borer, gall midge, leaf folder, hispa, whorl maggot, BPH, and WBPH was observed in all the crop establishment methods. In general, the incidence of insect pests was low during Kharif 2022. The incidence of dead hearts was significantly high in semi-dry rice (11.9% DH) and was at par with puddled direct-seeded rice (Figure 1). In all other methods, the incidence was low. The incidence of white ears caused by stem borer was relatively high in aerobic rice (9.03% WE) followed by puddled direct seeding (8.32% WE). Gall midge incidence was significantly high in puddled direct seeding (19.23% SS) followed by the normal transplanting method (12.24% SS). Gall midge incidence was very low (<3% SS) in direct-seeded, semi-dry, and aerobic rice.

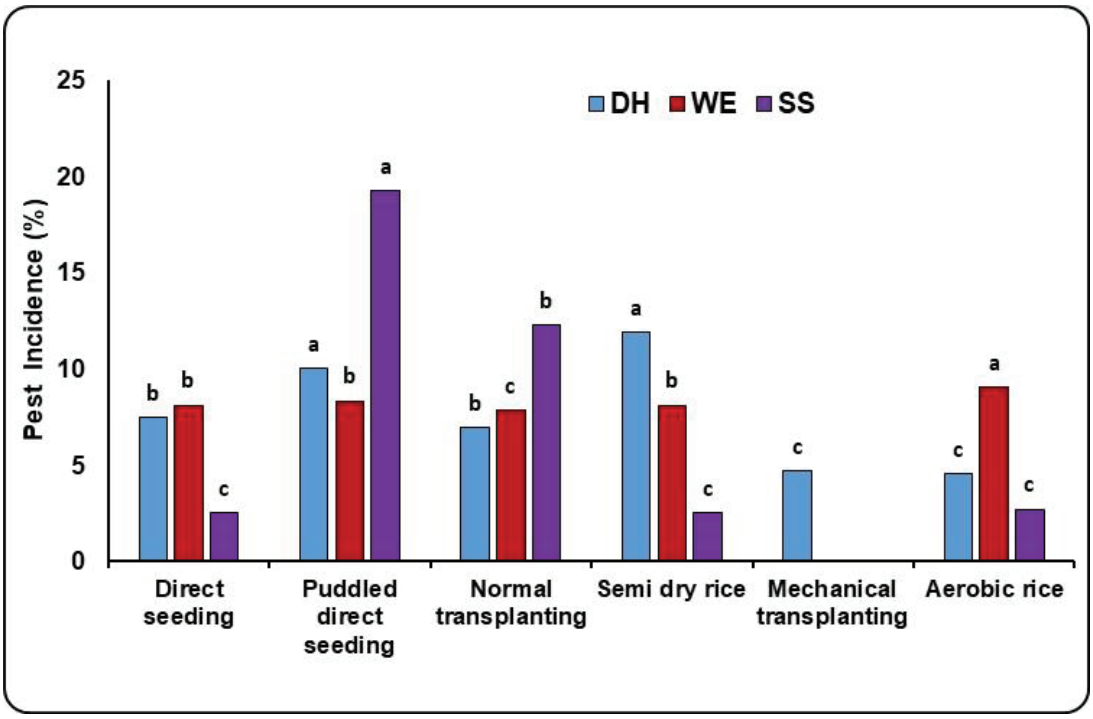


Figure 1. Incidence of stem borer and gall midge in different crop establishment methods across locations

Among the foliage-feeding insects, leaf folder incidence was significantly high in semi-dry rice (14.78% LFDL) and was at par in all the other establishment methods (Figure 2). In the puddled direct-seeding method, the incidence of whorl maggot (11.48% WMDL) and caseworm (15.98% CWDL) was significantly high compared to the other methods. The incidence of hispa and thrips was very low (<5%) in all the crop establishment methods.

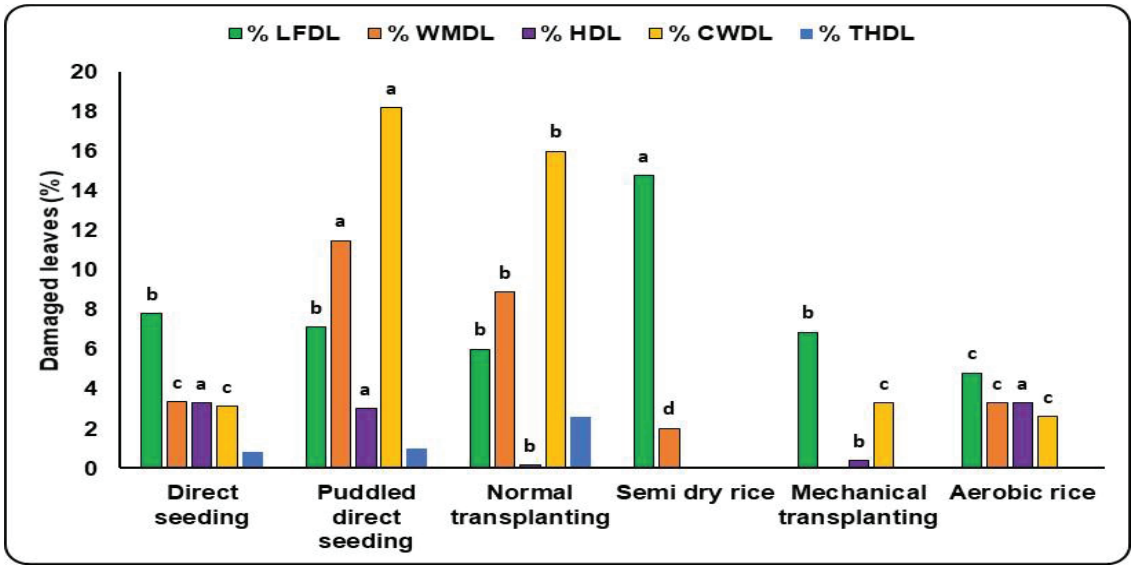


Figure 2. Incidence of foliage-feeding insects in different crop establishment methods across locations

In general, the incidence of sucking pests like BPH and WBPH was low in all the crop establishment methods (Figure 3). However, BPH incidence was relatively high in puddled direct-seeded rice (16/5 hills).

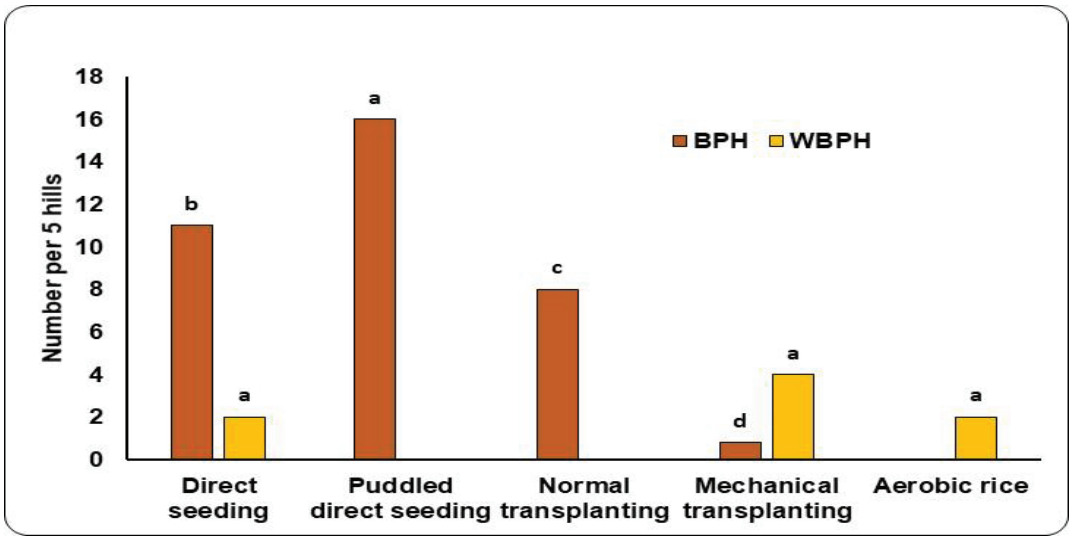


Figure 3. Incidence of sucking pests in different crop establishment methods across locations

Across the locations, the incidence of dead hearts caused by stem borer and leaf folder was significantly high in semi-dry rice followed by puddled direct-seeded rice while white ears were high in aerobic rice. Gall midge incidence was significantly high in puddled direct-seeded rice followed by the normal transplanting method. The incidence of whorl maggot, caseworm, and BPH was also significantly high in puddled direct-seeded rice. Overall, the incidence of insect pests was significantly high in puddled direct-seeded rice followed by the normal transplanting method while the incidence was low in direct-seeded rice, semi-dry rice, mechanical transplanting, and aerobic rice.

RICE BASED CROP DIVERSIFICATION SYSTEM TRIALS

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

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, 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* 2022, 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* 2022 at four locations continued at **Ghaghraghat, 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 three different residue/straw managements (S_1: No residue, S_2: 15cm height of rice straw from ground, S_3: 30 cm height of rice straw from the ground) to be superimposed for *Rabi* crops. The results are summarized and presented in Table 4.4.1 and the salient findings are summarized below.

Wet season 2022

Crop establishment methods influenced the grain yield significantly at all locations. At **Vadagaon**, results revealed that $M_{1:}$ Transplanting of rice recorded significantly higher yield attributes and grain yield (5.43 t/ha) as compared to other crop establishment methods (5.12 to 5.23 t/ha). Similarly, the grain yields were higher at **Titabar** (4.33 t/ha), **Ghagraghat** (5.20

t/ha) and **Karjat** (4.68 t/ha) also during Kharif 2022. The results are in accordance to earlier *Kharif* 2021. 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 5.40 t/ha over minimum tillage (5.13 t/ha). **Vadagoan** with significant reduction in weed population and weed dry matter. Similar trend of the higher grain yield with conventional tillage (4.00 t/ha) was found over minimum tillage at **Titabar** also.

The system productivity analysis (Kharif and rabi) indicated the superiority of transplanting at **Karjat** (6.94 t/ha), **Ghaghraghat** (9.74 t/ha) and **Vadagaon** (8.64 t/ha). The tillage system S-1 conventional tillage found promising at **Karjat**.

The REY of the system productivity indicated superiority of the residue application at **Vadagaon** indicating the superiority of residue in rice based system.

Table 4.4.1: Summary of data on grain yield and ancillary characters of conservation Agriculture/system based management practices in rice and rice based cropping systems to utilise the resources and enhancing the profitability and productivity, Kharif 2022.

Main Methods	GHAGHRAGHAT											
	Grain Yield (t/ha)	Straw Yield (t/ha)	Tillers/m2 (No.)	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	5.20	8.30	243	234	3.01	24.90	106	3.71	3.83	2.20	2.45	95751
M2- Wet seeding (Line sowing under puddle condition)	4.30	7.37	208	205	2.14	24.67	104	4.12	4.09	3.22	2.55	85255
M3- Aerobic rice - - Dry rice cultivation	3.40	6.53	164	167	1.99	24.60	102	4.58	4.65	4.28	3.25	85355
Exp. mean	**4.30**	**7.40**	**205**	**202**	**2.38**	**24.72**	**104.00**	**4.14**	**4.19**	**3.23**	**2.75**	
CD(0.05)	0.13	0.32	19.25	18.13	0.04	0.56	1.67	0.14	0.09	0.05	0.04	
CV	2.12	2.97	6.47	6.20	1.20	1.55	1.11	2.29	1.44	1.02	1.11	
Variety	-											
Soil type	Sandy loam											
pH	7.4											
RDF N:P:K (kg/ha)	120:60:40											
Aval. NPK of soil (kg/ha)	200:24:234											

Table 4.4.1: Contd.

Main Methods	KARJAT											Over all mean	Rank
	Grain Yield (t/ha)	Straw Yield (t/ha)	Tillers/m2 (No.)	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)		
M1- Transplanting	4.68	6.52	304	298	3.32	23.55	94.33	4.67	5.70	2.56	4.80	4.94	1
M2- Wet seeding (Line sowing under puddle condition)	4.34	6.02	289	279	3.18	23.05	93.33	4.81	5.87	2.72	5.10	4.32	2
M3- Aerobic rice - - Dry rice cultivation	3.98	5.45	277	267	2.68	22.73	94.00	4.92	6.00	2.84	5.33	3.69	3
Exp. mean	**4.34**	**6.00**	**290**	**281**	**3.06**	**23.11**	**93.89**	**4.80**	**5.86**	**2.71**	**5.07**	**4.32**	
CD(0.05)	0.27	0.37	14.95	32.25	0.57	1.27	1.93	0.10	0.06	0.12	0.11		
CV	4.32	4.31	3.56	7.91	12.74	3.79	1.42	1.46	0.73	2.96	1.48		
Variety	-												
Soil type	-												
pH	-												
RDF N:P:K (kg/ha)	100:50:50												
Aval. NPK of soil (kg/ha)	-												

Table 4.4.1: Contd.

Main plot	Sub plots	VADAGAON											
		Grain Yield (t/ha)	Straw yield (t/ha)	Germination %	Tillers/m2 (No.)	Panicle/m2 (No.)	Panicle weight (g)	Test weigjt (g)	Days for 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)
M1-Transplanting	S1	5.54	5.93	98.33	272	268	3.49	22.19	96	7.45(2.80)	9.08(3.08)	10.43	12.71
	S2	5.33	5.65	98.33	264	261	3.36	21.34	97	9.31(3.11)	11.35(3.43)	13.04	18.61
M2- Wet seeding	S1	5.38	5.73	98.00	266	263	3.39	21.56	96	10.31(3.28)	13.11(3.68)	14.95	19.01
	S2	5.07	5.35	98.33	249	246	3.20	20.41	97	12.88(3.66)	16.39(4.10)	19.20	24.42
M3- Aerobic rice	S1	5.27	5.62	98.00	257	254	3.32	21.19	97	11.80(3.50)	14.75(3.90)	17.58	21.98
	S2	4.98	5.33	98.00	237	234	3.14	20.15	96	14.75(3.89)	18.44(4.35)	21.98	27.47
Mean of main plots													
M1		5.43	5.79	98.33	268	265	3.42	21.77	97	8.38(2.96)	10.21(3.26)	11.74	15.66
M2		5.23	5.54	98.17	257	255	3.29	20.98	97	11.60(3.47)	14.75(3.89)	17.07	21.71
M3		5.12	5.48	98.00	247	244	3.23	20.67	97	13.27(3.70)	16.59(4.12)	19.78	24.73
C.D.(0.05)		0.01	0.01	NS	0.66	0.63	0.01	0.09	NS	0.18	0.13	1.67	1.15
C.V.(%)		0.18	0.18	0.78	0.25	0.24	0.24	0.43	1.83	5.26	3.46	10.03	5.44
Mean of Sub plots													
S1-Conventional tillage		5.40	5.76	98.11	265	262	3.40	21.65	96	9.85(3.19)	12.31(3.56)	14.32	17.90
S2-Minimum tillage		5.13	5.44	98.22	250	247	3.23	20.63	97	12.32(3.55)	15.39(3.96)	18.07	23.50
C.D.(0.05)		0.05	0.05	NS	2.41	2.39	0.03	0.24	NS	0.03	0.03	0.58	2.16
C.V. (%)		0.83	0.82	1.13	0.81	0.81	0.74	0.97	0.93	0.79	0.64	3.09	9.03
Interaction													
N at same V		NS	NS	NS	4.18	4.14	NS	NS	NS	NS	0.05	1.00	NS
V at same N		NS	NS	NS	2.96	2.92	NS	NS	NS	NS	0.10	1.33	NS
Expt. Mean		**5.26**	**5.60**	**98.17**	**257**	**254**	**3.32**	**21.14**	**97**	**3.37**	**3.76**	**16.20**	**20.70**
Variety		-											
Soil type		-											
pH		7.78											
RDF N:P:K (kg/ha)		100:50:50											
Aval. N:P:K of soil (kg/ha)		196:18:287											

S1-Conventional tillage
S2-Minimum tillage

Table 4.4.1: Contd.

Main plot	Sub plots	TITABAR								Over all mean	Rank
		Grain Yield (t/ha)	Tillers/m2 (No.)	Panicle/m2 (No.)	Panicle weight (g)	Test weigjt (g)	Days for 50% flowering	Weed population at 30 DAS (No/m2)	Weed population at 60 DAS (No/m2)		
M1- Transplanting	S1	4.50	272	247	5.00	27.27	120	43.67(6.64)	54.00(7.38)	5.02	1
	S2	4.17	264	238	4.73	25.93	119	47.00(6.89)	62.33(7.92)	4.75	3
M2- Wet seeding	S1	4.17	248	260	4.30	30.57	119	43.67(6.64)	49.33(7.04)	4.78	2
	S2	3.90	236	250	4.03	28.83	119	42.67(6.55)	39.00(6.27)	4.49	4
M3- Aerobic rice	S1	3.33	250	237	4.20	25.50	118	58.00(7.65)	69.33(8.35)	4.30	5
	S2	3.13	231	227	3.57	20.40	117	44.00(6.67)	56.67(7.55)	4.06	6
Mean of main plots											
M1		4.33	268	243	4.87	26.60	120	45.33(6.76)	58.17(7.65)	4.88	1
M2		4.03	242	255	4.17	29.70	119	43.17(6.60)	44.17(6.65)	4.63	2
M3		3.23	240	232	3.88	22.95	118	51.00(7.16)	63.00(7.95)	4.18	3
C.D.(0.05)		0.23	NS	NS	0.13	NS	NS	NS	0.59		
C.V.(%)		5.78	10.30	7.08	3.05	16.68	1.61	6.16	7.82		
Mean of Sub plots											
S1-Conventional tillage		4.00	256	248	4.50	27.78	119.1	48.44(6.98)	57.56(7.59)	4.70	1
S2-Minimum tillage		3.73	244	238	4.11	25.06	118.2	44.56(6.70)	52.67(7.25)	4.43	2
C.D.(0.05)		0.21	NS	NS	0.12	1.81	NS	0.26	NS		
C.V. (%)		4.68	5.95	4.49	2.32	5.93	0.97	3.32	5.91		
Interaction											
N at same V		NS	NS	NS	0.20	NS	NS	0.45	NS		
V at same N		NS	NS	NS	0.16	NS	NS	0.42	NS		
Expt. Mean		**3.87**	**250**	**243**	**4.31**	**26.42**	**119**	**6.84**	**7.42**	**4.57**	
Variety		-									
Soil type		Clay loam									
pH		5.2									
RDF N:P:K (kg/ha)		-									
AvalN:P:K of soil (kg/ha)		272:13:167									

S1-Conventional tillage
S2-Minimum tillage

Table 4.4.1 (R): Summary of data on grain yield and ancillary characters of conservation Agriculture/system based management practices in rice and rice based cropping systems to utilise the resources and enhancing the profitability and productivity, Rabi 2021-22.

Main plot	Sub plots	GHAGHRAGHAT											
		Grain Yield (t/ha)	Straw Yield (t/ha)	Tillers/m^2 (No.)	Panicle/m^2 (No.)	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)	Kh 2021	REY	REY (K+R)
M1- Transplanting	S1	4.23	5.72	202	200	72.00	4.40(2.21)	1.22	8.27(2.96)	1.5	5.93	4.31	10.24
	S2	3.60	4.86	186	185	68.67	6.82(2.70)	1.63	11.62(3.48)	1.55	5.93	3.66	9.59
	S3	3.40	4.59	153	147	73.00	8.16(2.94)	2.01	13.75(3.77)	1.93	5.93	3.46	9.39
M2- Wet seeding	S1	3.63	4.91	173	171	67.67	7.72(2.87)	2	11.50(3.46)	1.68	5.07	3.70	8.77
	S2	3.17	4.28	157	159	67.00	13.27(3.71)	2.17	14.20(3.83)	1.97	5.07	3.23	8.30
	S3	2.60	3.51	137	135	71.00	15.20(3.95)	2.45	15.81(4.03)	2.2	5.07	2.65	7.72
M3- Aerobic rice	S1	2.77	3.73	155	152	65.00	10.23(3.28)	2.29	13.07(3.68)	2.16	3.80	2.82	6.62
	S2	2.30	3.11	144	142	68.00	14.98(3.93)	2.75	15.47(4.00)	2.77	3.80	2.34	6.14
	S3	1.93	2.61	131	129	72.00	19.07(4.42)	3.13	19.50(4.47)	2.58	3.80	1.96	5.76
Mean of main plots													
M1		3.74	5.06	180	177	71.22	6.46(2.62)	1.62	11.21(3.41)	1.66	5.93	3.81	9.74
M2		3.13	4.23	156	155	68.56	12.06(3.51)	2.21	13.84(3.78)	1.95	5.07	3.19	8.26
M3		2.33	3.15	143	141	68.33	14.76(3.88)	2.72	16.01(4.05)	2.5	3.80	2.37	6.17
C.D.(0.05)		0.21	0.29	5.79	3.98	0.98	0.11	0.05	0.13	0.15			
C.V.(%)		8.29	8.29	4.32	3.01	1.69	3.92	2.59	4.15	9.05			
Mean of Sub plots													
S1		3.54	4.79	177	174	68.22	7.45(2.78)	1.84	10.95(3.37)	1.78	4.93	3.60	8.53
S2		3.02	4.08	163	162	67.89	11.69(3.45)	2.18	13.76(3.77)	2.1	4.93	3.07	8.00
S3		2.64	3.57	140	137	72.00	14.14(3.77)	2.53	16.35(4.09)	2.24	4.93	2.69	7.62
C.D.(0.05)		0.17	0.23	4.88	5.05	1.17	0.13	0.04	0.12	0.07			
C.V. (%)		5.52	5.52	2.97	3.11	1.64	3.87	1.93	3.07	3.56			
Interaction													
M at same S		NS	NS	8.45	8.74	2.03	NS	0.08	NS	0.13			
S at same M		NS	NS	7.72	7.46	1.74	NS	0.07	NS	0.15			
Expt. Mean		**3.07**	**4.15**	**160**	**158**	**69.37**	**3.34**	**2.18**	**3.74**	**2.04**		**3.13**	**3.13**
Crop-Variety		Wheat - HD 2967											
Soil type		Sandy loam											
pH		7.4											
RDF N:P:K (kg/ha)		120:60:40											
Aval. N:P:K of soil (kg/ha)		200:24:234											

S1 - No residue
S2 - 15cm height of rice straw from ground
S3 - 30cm height of rice straw from ground

MSP for wheat = Rs 1975/q

Table 4.4.1 (R): Contd.

Main plot	Sub plots	VADAGAON					Over all mean	Rank
		Grain Yield (t/ha)	Germination %	Kh 2021	REY	REY (K+R)		
M1- Transplanting	S1	0.99	98	5.05	2.60	7.65	2.61	1
	S2	1.19	97	5.83	3.13	8.96	2.40	2
	S3	1.26	98	5.99	3.31	9.30	2.33	3
M2- Wet seeding	S1	0.93	97	4.78	2.44	7.22	2.28	4
	S2	1.09	97	5.61	2.87	8.48	2.13	5
	S3	1.18	98	5.89	3.10	8.99	1.89	6
M3- Aerobic rice	S1	0.89	98	4.61	2.34	6.95	1.83	7
	S2	1.06	98	5.45	2.79	8.24	1.68	8
	S3	1.13	98	5.7	2.97	8.67	1.53	9
Mean of main plots								
M1		1.15	98	5.62	3.02	8.64	2.45	1
M2		1.07	97	5.43	2.81	8.24	2.10	2
M3		1.03	98	5.25	2.71	7.96	1.68	3
C.D.(0.05)		0.02	NS	0.01				
C.V.(%)		2.52	1.38	0.12				
Mean of Sub plots								
S1		0.94	98	4.81	2.47	7.28	2.24	1
S2		1.11	97	5.63	2.92	8.55	2.07	2
S3		1.19	98	5.86	3.13	8.99	1.92	3
C.D.(0.05)		0.03	NS	0.17				
C.V. (%)		2.60	0.78	3.02				
Interaction								
M at same S		NS	NS	NS				
S at same M		NS	NS	NS				
Expt. Mean		**1.08**	**98**	**5.43**	**3.81**	**9.24**	**2.08**	
Crop-Variety		Gram						
Soil type		-						
pH		-						
RDF N:P:K (kg/ha)		-						
Aval. N:P:K of soil (kg/ha)		-						

S1 - No residue
S2 - 15cm height of rice straw from ground
S3 - 30cm height of rice straw from ground

MSP for Gram = Rs 5100/q

Table 4.4.1 (R): Contd.

Crop Establishment Methods	Sub plots	Sub-Sub plot	Grain Yield (t/ha)	Straw Yield (t/ha)	Germination (%)	Days to 50% flowering	Test weight (g)	Weed population at 30DAS (no/m2)	Weed dry weight at 30DAS (g/m2)	Weed population at 60DAS (no/m2)	Weed dry weight at 60 DAS (no/m2)	Cost of cultivation (Rs./ ha)	Kharif 2021	REY	REY (K + R)
M1: Transplanting	S1-Conventional tillage	C1	3.81	4.27	95.67	63.00	184.96	13.24	4.71	16.09	4.00	50009	4.33	3.67	8.00
		C2	1.05	1.59	95.67	45.00	2.08	14.30	3.10	17.48	4.44	34569	4.33	2.52	6.85
		C3	2.49	2.01	96.00	52.33	29.67	7.97	3.11	11.93	4.06	47299	4.33	2.54	6.87
		C4	1.10	0.85	96.67	58.00	145.63	12.63	2.92	13.82	3.45	40651	4.33	2.88	7.21
	S2-Minimum tillage	C1	2.86	3.13	95.33	61.00	183.94	30.87	7.68	14.43	4.74	46309	4.33	2.75	7.08
		C2	0.92	1.38	95.33	45.33	1.78	23.67	5.53	16.90	5.33	33869	4.33	2.22	6.55
		C3	1.62	1.25	96.67	53.00	28.33	16.31	10.17	23.09	19.67	42999	4.33	1.65	5.98
		C4	1.02	0.76	95.67	56.67	144.68	18.00	7.24	15.74	11.36	36351	4.33	2.67	7.00
M2: Wet seeding (Line sowing under puddle condition)	S1-Conventional tillage	C1	3.72	4.17	97.00	64.67	184.94	23.56	8.02	13.71	6.12	50009	3.96	3.59	7.55
		C2	1.01	1.53	95.33	45.67	2.06	17.96	3.68	13.06	4.09	34569	3.96	2.41	6.37
		C3	2.46	1.98	96.00	52.33	29.23	17.45	10.90	18.81	12.51	47299	3.96	2.51	6.47
		C4	1.08	0.84	95.67	58.67	144.82	14.78	10.92	9.41	2.12	40651	3.96	2.85	6.81
	S2-Minimum tillage	C1	2.73	2.99	96.00	62.33	183.84	37.18	8.55	20.36	11.93	46309	3.96	2.64	6.60
		C2	0.87	1.30	96.00	43.33	1.77	25.06	4.63	21.63	6.29	33869	3.96	2.09	6.05
		C3	1.54	1.19	96.00	52.00	28.09	19.71	16.43	24.82	15.77	42999	3.96	1.57	5.53
		C4	1.00	0.75	95.67	57.67	144.49	22.51	7.45	19.30	10.11	36351	3.96	2.62	6.58
M3: Aerobic rice - Dry rice cultivation	S1-Conventional tillage	C1	3.70	4.15	96.33	63.00	184.48	25.06	6.92	16.13	7.29	50009	3.79	3.57	7.36
		C2	0.99	1.50	95.33	45.00	2.03	19.82	3.95	19.62	8.78	34569	3.79	2.37	6.16
		C3	2.45	1.97	96.33	51.67	29.02	23.26	7.77	19.82	6.38	47299	3.79	2.49	6.28
		C4	1.07	0.82	95.67	56.00	144.52	27.52	5.10	15.03	10.17	40651	3.79	2.80	6.59
	S2-Minimum tillage	C1	2.71	2.97	95.00	63.00	183.57	29.84	13.12	22.76	11.75	46309	3.79	2.61	6.40
		C2	0.86	1.27	96.67	43.00	1.76	19.62	7.55	27.59	16.73	33869	3.79	2.05	5.84
		C3	1.53	1.18	95.67	51.33	27.74	25.44	20.32	26.66	13.13	42999	3.79	1.55	5.34
		C4	0.98	0.74	96.33	58.00	144.34	18.77	8.28	19.66	12.16	36351	3.79	2.58	6.37

Table 4.4.1 (R): Contd.

Crop Establishment Methods	Sub plots	Sub-Sub plot	Grain Yield (t/ha)	Straw Yield (t/ha)	Germination (%)	Days to 50% flowering	Test weight (g)	Weed population at 30DAS (no/m2)	Weed dry weight at 30DAS (g/m2)	Weed population at 60DAS (no/m2)	Weed dry weight at 60 DAS (no/m2)	Cost of cultivation (Rs./ ha)	Kharif 2021	REY	REY (K + R)
Mean of methods															
M1			1.86	1.90	95.88	54.29	90.13	17.12	5.56	16.18	7.13	41507	4.33	2.61	6.94
M2			1.80	1.84	95.96	54.58	89.90	22.28	8.82	17.64	8.62	41507	3.96	2.53	6.49
M3			1.79	1.83	95.92	53.88	89.68	23.67	9.13	20.91	10.80	41507	3.79	2.51	6.30
C.D.			NS	NS	NS	0.514	NS	4.353	2.695	3.355	1.751				
SE(m)			0.039	0.044	0.132	0.132	0.293	1.115	0.69	0.859	0.449				
Mean of sub plot															
S1-Conventional tillage			2.08	2.14	95.97	54.61	90.29	18.13	5.92	15.41	6.12	43132	4.03	2.85	6.88
S2-Minimum tillage			1.55	1.58	95.86	53.89	89.53	23.92	9.75	21.08	11.58	39882	4.03	2.25	6.28
C.D.					NS										
SE(m)			0.2	0.216	0.124	0.571	0.728	3.55	1.846	2.236	2.807				
Mean of sub ub plot			0.058	0.063		0.166	0.211	1.029	0.535	0.648	0.813				
C1-Maize			3.26	3.61	95.89	62.83	184.29	26.62	8.17	17.25	7.64	48159	8.12	3.14	11.25
C2-Mustard			0.95	1.43	95.72	44.56	1.91	20.07	4.74	19.38	7.61	34219	7.42	2.28	9.70
C3-Wheat			2.02	1.60	96.11	52.11	28.68	18.35	11.45	20.85	11.92	45149	6.98	2.05	9.03
C4-Chickpea			1.04	0.79	95.94	57.50	144.75	19.04	6.99	15.49	8.23	38501	7.42	2.73	10.16
C.D.			0.161	0.174	NS	0.794	1.379	5.703	3.596	3.412	3.342				
SE(m)			0.056	0.061	0.19	0.277	0.481	1.988	1.253	1.189	1.165				
Interaction															
Interaction															
Interaction A X B			NS	NS	NS	NS	NS	NS	NS	NS	NS				
Interaction A X C			NS	NS	NS	NS	NS	NS	NS	NS	NS				
Interaction B X C			0.23	0.25	NS	NS	NS	NS	NS	NS	NS				
Interaction A X B X C			NS	NS	NS	NS	NS	NS	NS	NS	NS				

Maize MSP	1870/q
Mustard MSP	4650/q
Wheat MSP	1975/q
Chickpea MSP	5100/q

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

In rice-fallows, sorghum cultivation was found to be high yield potential with labour and inputs intensive cropping system. It is found that use of high inputs Viz., pesticides, weedicides, fertilizers, labourers, and skillful management of all the innovative practices including irrigations, were resulted into the high yield. It is implied that the farmers were highly profit oriented and obtained high returns from the sorghum cultivation. Their profit margin could be further increased by mechanization and introducing standard package of practices. Keeping the yield benefits in view, the farmers innovative knowledge should be validated on their fields to develop standardize location-specific production technologies so that the productivity and soil health will sustain in long run. These innovative farmers would be able to educate and transfer the viable technologies more effectively among the other sorghum growers in rice-fallows as change agent. Further very efficient genotypes had been developed which are very much suitable for rice fallows. There is need to test these cultivars in rice fallows of different locations to gain the benefit of the Rice sorghum cropping system.

A trial was laid out with four replications during *Kharif* 2022 at **Mandya** to assess the effect of different crop establishment methods (T_1: Transplanting and T_2: Wet Direct Seeding (line sowing under puddled conditions) during *Kharif* 2022 and during *Rabi* 2021-22, promising sorghum hybrids IIMRH 1, IIMRH 2, IIMRH 3, IIMRH 4, IIMRH 5, IIMRH 6, AKSH 778, SPH 1943, CSH 16 and CSH 30 were assessed at **Mandya**. The results are summarized and presented in Table 4.3.2.

Among crop establishment methods, wet seeding gave comparatively higher grain yield of 5.36 t/ha as compare to transplanting method (5.17 t/ha).

During Rabi 2021-22, the effect of promising cultivars of sorghum in rice fallows indicated significant difference at **Mandya** and mean grain yield ranged from 2.16 t/ha to 3.72.

IIMRH cultures were significantly superior (IIMRH 1 (3.53 t/ha); IIMRH 6 (3.8 t/ha); and IIMRH 5 (2.91 t/ha) as compared to local (CSH 16 and CSH 30).

In conclusion, wet seeded rice was found promising and performance of sorghum hybrids in rice fallows showed promising (IIMRH 1, IIMRH 6 and IIMRH 5 (2.91 to 3.53 t/ha) yield in rice-sorghum cropping system at **Mandya**.

Table 4.3.2: Assessing the performance and yielding ability of kharif sorghum hybrids in Rice-Sorghum sequence cropping system,Kharif-2022.

Treatments	MANDYA										Overall Mean	Rank
	Grain Yield (t/ha)	Straw Yield (t/ha)	Plant height(cm)	Panicle No./m^2	Panicle length (cm)	Panicle wt (g)	Test wt (g)	Days for 50% flowering	filled grains/ panicle	Spikelet sterility %		
T1	5.28	7.4	65.47	337.2	21.7	2.12	26.57	85	122.33	11.87	**5.28**	2
T2	5.39	8.07	67.81	359.83	20.13	2.13	26.38	81.33	109.33	12.36	**5.39**	1
Expt. Mean	5.34	7.74	66.64	348.52	20.92	2.13	26.48	83.17	115.83	12.11	**5.34**	
CD(0.05)	0.97	2.36	4.09	63.03	1.69	0.51	6.07	3.8	52.17	5.45		
CV(%)	5.19	8.67	1.75	5.15	2.3	6.85	6.52	1.3	12.82	12.8		
Variety	MTU 1001											
Soil type	Red sandy clay loam											
pH	8.26											
Available NPK kg/ha	306.4;68. 50:278											
Fertilizer applied kglha	100:50:50:20											

T1: Transplanting
T2: Wet DSR

Table- 4.3.2(R): Assessing the performance and yielding ability of kharif sorghum hybrids in Rice-Sorghum sequence cropping system, Rabi 2021-22.

Main plot: Fertilizer treatments	Sub plot: Cultivars	MANDYA									
		Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant height (cm)	Panicle length (cm)	Panicle No./m²	Panicle wt (g)	Test wt (g)	Kh - 2021	REY
M1: Transplanting	V1	3.33	2	10.45	155.39	24.95	28	51.83	34.69	5.17	4.62
	V2	2.25	16	9.46	132.27	24.21	27	34.53	34.30	5.17	3.12
	V3	2.91	6	9.11	161.50	25.88	27	50.70	33.60	5.17	4.03
	V4	2.14	20	8.87	115.01	21.13	27	41.40	34.78	5.17	2.97
	V5	2.96	5	10.10	144.17	25.62	27	43.90	31.97	5.17	4.10
	V6	3.06	4	9.36	127.27	22.58	26	42.83	38.12	5.17	4.24
	V7	2.43	13	9.08	173.53	26.51	27	42.67	33.57	5.17	3.37
	V8	2.16	19	6.87	138.77	23.77	24	44.91	39.54	5.17	2.99
	V9	2.51	10	9.93	176.66	26.93	29	42.80	38.29	5.17	3.48
	V10	2.21	18	9.88	150.39	23.82	25	29.40	40.18	5.17	3.06
M2: Wet seeding	V1	3.72	1	11.39	160.26	26.70	28	59.72	34.35	5.36	5.16
	V2	2.48	12	9.12	124.93	23.47	26	35.44	33.88	5.36	3.44
	V3	2.70	8	10.19	161.81	23.89	26	44.85	37.35	5.36	3.74
	V4	2.33	14	7.64	113.58	20.72	27	38.90	34.41	5.36	3.23
	V5	2.86	7	10.07	144.21	25.99	27	43.48	31.35	5.36	3.96
	V6	3.10	3	9.68	127.27	23.70	23	39.12	38.75	5.36	4.30
	V7	2.56	9	9.12	165.45	25.79	26	38.46	34.37	5.36	3.55
	V8	2.24	17	7.84	149.77	23.75	27	41.37	39.35	5.36	3.11
	V9	2.49	11	9.78	175.52	27.29	25	43.54	38.52	5.36	3.45
	V10	2.30	15	9.06	150.98	23.59	25	30.57	40.34	5.36	3.19
Mean of Factor-1											
M1		2.60	2	9.31	147.49	24.54	27	42.50	35.90	5.17	3.60
M2		2.68	1	9.39	147.38	24.49	26	41.55	36.27	5.36	3.72
CD(0.05)		NS		NS	NS	NS	NS	NS	NS		
CV(%)		21.54		7.25	1.91	4.07	12.76	6.62	4.25		
Mean of Factor-2											
V1	IIMRH 1-SPH 1883	3.53	1	10.92	157.82	25.82	28	55.77	34.52		4.89
V2	IIMRH 2-SHD 153	2.36	7	9.29	128.60	23.84	26	34.99	34.09		3.27
V3	IIMRH 3-AKSH 771	2.81	4	9.65	161.66	24.88	26	47.78	35.48		3.90
V4	IIMRH 4	2.23	9	8.25	114.30	20.92	27	40.15	34.60		3.09
V5	IIMRH 5	2.91	3	10.09	144.19	25.80	27	43.69	31.66		4.03
V6	IIMRH 6	3.08	2	9.52	127.27	23.14	24	40.98	38.43		4.27
V7	AKSH 778	2.50	5	9.10	169.49	26.15	27	40.56	33.97		3.47
V8	SPH 1943	2.20	10	7.35	144.27	23.76	25	43.14	39.45		3.05
V9	CSH 16	2.50	5	9.85	176.09	27.11	27	43.17	38.40		3.47
V10	CSH 30	2.26	8	9.47	150.68	23.70	25	29.99	40.26		3.13
CD(0.05)		0.45		1.17	9.59	2.17	NS	12.47	1.36		
CV(%)		14.57		10.7	5.58	7.59	10.64	25.44	3.24		
Interaction											
M and T		NS		NS	NS	NS	NS	NS	NS		
T and M		NS		NS	NS	NS	NS	NS	NS		
Experimental Mean		**2.64**		**9.35**	**147.44**	**24.51**	**26**	**42.02**	**36.09**		**3.66**

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. Because of the diversity and plasticity of weed communities, weed management should include diverse approaches and to be viewed as a continuous process. 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. Other crop management practices, especially nitrogen use (organic/inorganic/integrated nutrient management) is likely to change the crop-weed ecology as well as herbicide activity and herbicide residue in the soil. Long term efficacy and sustainability issues are also the driving forces behind the reconsideration of herbicide dependent weed management. With these aspects in view, a long term trial on fixed plot basis has been continued during *Kharif* season 2022 with the objective of assessing the weed dynamics in different establishment methods over a period of five years, the trial was conducted at 17 locations viz., **Aduthurai, Chatha, Chinsurah, Chiplima, Gangavathi, Ghaghraghat, Malan, Moncompu, Nagina, Nawagam, Pantnagar, Pattambi, Pusa, Puducherry, ARI-Rajendranagar, Titabar and Varanasi in** replicated split plot design. **Jagdalpur** and **Rewa** locations have not reported weed dry biomass information. No information from four locations viz., **NRRI-Cuttack, Parbhani**, **Ranchi** and **Tuljapur**. The treatments consisted of 3 main plots M1-Mechanised planting/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 may be followed). The data on crop growth parameters, yield attributes, grain yield and weed parameters viz., weed population and weed biomass recorded by test locations are summarized after statistical analyses and presented in **Tables 4.3.3.**

Species wise weed population and biomass was reported by **Chatha, Gangavathi, Malan, Moncompu, Pattambi, Titabar** and **Varanasi** except weed biomass by **Pusa**. Group wise weed population and biomass reported by **Aduthurai, Chinsurah, Nagina, Nawagam, Pusa, Puducherry** and **ARI-Rajendranagar.**

The weed flora reported in the test locations included **GRASSES:** *Cynodon dactylon, Dactylactenium aegyptium, Digitaria marginata, Dinebra retroflexa, Echinochloa colona, Echinochloa crusgalli, Eleusine indica, Isachne miliacea, Leptochloa chinensis, Leersia hexandra, Panicum repens, Paspalum scrobiculatum, Oplismenus burmannii,* Weedy rice (*Oryaza sativa f. spontanea*)*;* **SEDGES:** *Cyperus difformis, Cyperus hapens, Cyperus iria, Cyperus rotundus, Fimbristylis miliacea;* **BLW:** *Ammania baccifera, Astercantha longifolia, Alternanthera spp, Centella asiatica, Cynotis cristata, Eclipta alba, Eclipta prostrata, Ludwigia parviflora, Ludwigia hyssopifolia, Monochoria vaginalis, Physalis minima, Phyllanthus niruri, Parthenium hysterophorous, Solanum nigrum.* **AQUATIC WEEDS:** *Blyxa japonica, Vallisneria americana.*

Weed Population

The Genus and Species wise weed population was reported by eight locations viz., **Chatha, Gangavathi, Malan**, **Moncompu, Pusa, Pattambi**, **Titabar** and **Varanasi**. The Grass weed infestation in the order of dominance is *Echinochloa spp, Dactylactenium spp, Cynodon spp, Eleusine* spp at **Chatha**; *Paspalum spp, Echinochloa spp, Panicum* spp and *Dinebra spp* at **Gangavathi**; *Echinochloa colona*, *E. crusgalli*, *Panicum spp* at **Malan**; *Isachne miliaceae, Echinochloa spp*, Weedy rice and *Leptochloa* spp at **Moncompu**; *Echinochloa colonum, Leptochloa spp, Echinochloa crusgalli and Paspalum spp* at **Pusa**; *Oplismenus burmanii* at **Pattambi**; *Echinochloa crusgalli, Leersia hexandra* at **Titabar**; *Echinochloa colona, Cynodon dactylon* at **Varanasi**. Among the Sedges, the order of dominance reported was *Cyperus spp* at **Chatha**; *Cyperus iria* at **Gangavathi**; *Cyperus iria* ,*Cyperus difformis, Cyperus rotumdus* at Malan; *Cyperus difformis, Cyperus haspens, Fimbristyli spp* at **Moncompu**; *Cyperus iria, Cyperus difformis* at **Pusa**; *Fimbristylis spp* at **Pattambi**; *Cyperus iria* at **Titabar**; *Cyperus rotundus, Cyperus iria* at **Varanasi**. Among BLW infestation, *Physalis minima, Solanum nigrum* at **Chatha**; *Astercantha spp, Cyanotis spp, Ammania spp* at Gangavathi; *Monochoria spp, Alternanthera spp, Eclipta spp* at Malan; *Ludwigia spp, Monochoria spp* at **Moncompu**; *Caesulia spp, Eclipta, Ludwigia spp* and *Ammania spp* at **Pusa**; *Alternanthera spp* at **Titabar**; *Phyllanthus spp, Solanum spp* and *Parthenium spp* at **Varanasi**.

The Genus and Species wise weed population at critical crop growth stages was reported by eight locations viz., **Chatha**, **Gangavathi**, **Malan**, **Moncompu**, **Pusa**, , **Pattambi**, **Titabar** and **Varanasi**, and the efforts in deriving weed shifts in changing establishment methods are appreciable. Seven locations viz., **Aduthurai**, **Chinsurah, Nagina, Puducherry, Nawagam, Pantnagar and ARI- Rajendranagar** have reported the group-wise weed population and two locations (**Chiplima** and **Ghaghraghat**), total weed population. Weed population showed progressive increase from active tillering stage to heading stage at **Chiplima**, whereas at **Puducherry**, progressive decrease was reported. At **Chatha, Chinsurah, Ghaghraghat, Malan, Moncompu, Nawagam, Pantnagar, Titabar and Varanasi** weed population increased from active tillering stage to panicle initiation stage. At **Gangavathi, Pattambi, Pusa** and **ARI-Rajendranagar**, the group wise and total weed population decreased from active tillering to panicle initiation stage.

The data on relative dominance of group wise weeds was worked out at active tillering stage and panicle initiation stage and reported by nine locations viz., **Chatha, Gangavathi, Malan, Moncompu, Nawagam, Pantnagar, Pattambi, Pusa** and **Titabar**. At active tillering stage, the common and prevalent group wise weed population in rice cultivation system is the order of Grasses>Sedges>BLW. The mean of the establishment methods and weed control practices over the locations viz., **Aduthurai, Chinsurah, Malan, Moncompu, Nagina, Pantnagar, Pattambi, Puducherry, Pusa** and **Titabar** showed similar trend. At 5 locations viz., **Chatha, Gangavathi, Nawagam, ARI-Rajendranagar** and **Varanasi**, the Sedge group was predominant followed by Grasses and BLW.

At majority of the locations, un-puddled direct seeding system recorded highest total and group wise weed population and mechanical transplanting system recorded lowest and all the three systems are significantly different except at **Moncompu, Nawagam, Pantnagar** and **Pattambi,** where at active tillering stage, no significant difference in weed population among different establishment methods was reported. In both mechanical transplanting and wet DSR systems, Grasses were dominant followed by Sedges. In unpuddled dry DSR system, the order of dominance was Grasses>Sedges>BLW at **Aduthurai**; Sedges>Grasses>BLW at **Chatha** and **Malan**; Sedges>BLW>Grasses at **Gangavathi** and **Nagina**; Sedges at **Varanasi**; Sedges and BLW at **ARI-Rajendranagar**; Grasses and BLW at **Titabar**; Grasses at **Moncompu, Nawagam, Pattambi** and **Pusa.** Among the weed control practices, chemical weed control practices recorded significantly low total population at **Aduthurai, Chiplima, Chinsurah, Gangavathi, Ghagraghat, Malan, Moncompu, Nagina, Nawagam, Pantnagar, Pattambi**, **Puducherry, ARI-Rajendranagar and Titabar** locations. Mechanical weed control was reported as superior with minimum weed population at **Chatha;** at **Pusa** both mechanical, weed control and chemical weed control were statistically on par and at **Varanasi** no significant difference among weed control practices.

At panicle initiation stage, groupwise weed population was reported by 14 locations viz., **Chatha, Chinsurah, Gangavathi, Malan, Moncompu, Nagina, Nawagam, Pantnagar, Pattambi, Puducherry, Pusa, Ari-Rajendranagar, Titabar, and Varanasi**. The order of group dominance at **Chatha, Chinsurah, Moncompu, Nawagam, Pantnagar, Puducherry** was Grasses>Sedges>BLW; Whereas Grasses>BLW>Sedges at **Pattambi, Malan, Pusa, Titabar**. Unlike earlier years, third year of study, Sedges>Grasses>BLW was the order of dominance at **Gangavathi, Nagina, Ari Rajendranagar and Varanasi**. Irrespective of the location, unpuddled Dry DSR recorded higher total, group wise, Genus and species wise population followed by Puddled Wet DSR except at **Moncompu and Pantnagar and Pattambi** where wet DSR recorded significantly higher weed population. At **Nawagam** no significance difference was recorded among establishment methods. At **Pantnagar** Grasses and Sedges were significantly higher under wet DSR; at **Pattambi** and **Pusa** only Grasses were significantly higher under wet DSR system. Among weed control practices, chemical weed control recorded lowest population at majority of the test locations. At **Chatha,** mechanical weed control recorded lowest Sedge weed population; at **Chinsurah** and **Pusa,** BLW population was effectively reduced by mechanical weeding; at **Pattambi** aquatic weed population was minimum by mechanical weeding.

The Third year study results from majority of the locations confirmed that the system of establishment does not influence the occurrence of group wise weed flora, but influences the quantity of group wise, genus and species wise population and shift in weed flora was within the same Genus.

Weed Dry Biomass

At active tillering and panicle initiation stages of the crop, the individual weed dry biomass of the Genus and Species was reported by seven locations viz., **Chatha, Gangavathi,**

Malan, Moncompu, Pattambi, 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 methods. Group wise weed dry biomass (g/m^2) was reported by 15 locations **Aduthurai, Chatha, Chinsurah, Gangavathi, Malan, Moncompu, Nagina, Nawagam, Pantnagar, Pattambi, Puducherry, Pusa, ARI-Rajendranagar, Titabar and Varanasi**. Total biomass was reported by **Chiplima** and **Ghaghraghat**. The order of dominance in terms of biomass was Sedges>Grasses>BLW at **Nawagam**, **Varanasi**; Sedges>BLW>Grasses at **Aduthurai, Chinsurah** and **Gangavathi**; Grasses>BLW>Sedges at **Pusa** and **Titabar**; BLW>Sedges>Grasses at **Pantnagar**; BLW>Grasses>Sedges at **Malan** and equal proportion at **Nagina**. The common and prevalent order of Grasses>Sedges>BLW at **Chatha, Moncompu, Puducheery** and **ARI-Rajendranagar**.

At **Chatha**, *Echinochloa spp* (Grass) was dominant and recorded highest mean dry biomass followed by *Cyperus spp* (Sedge) at active tillering stage and at Panicle initiation stage *Echinochloa spp* (Grass) fb *Eleusine indica* fb *Solanum nigrum* (BLW). At **Malan**, *Echinochloa colonum* (Grass) fb *Eclipta spp* and *Monochoria spp* (BLW); at **Titabar**, *Echinochloa crusgalli* (Grass) fb *Alternanthera spp* (BLW) recorded significantly higher weed dry biomass. At two locations Sedges recorded highest weed biomass viz., **Gangavathi** reported highest biomass of *Cyperus iria* (Sedge) at active tillering fb *Asteracantha longifolia* (BLW) and *Cyperus iria* (Sedge) fb *Paspalum scrobiculatum* (Grass) at panicle initiation stage; **Varanasi** reported highest biomass of *Cyperus rotundus* (Sedge) fb *Echinochloa colona* at active tillering stage and *Cyperus rotundus* (Sedge) fb *Cyanodan dactylon* (Grass) fb *Echinochloa colona* . **Moncompu** *Isachnae miliaceae* (Grass) recorded highest weed biomass fb *Fimbristylis miliaceae* (Sedge) at active tillering stage and *Isachnae miliaceae* (Grass) fb *Echinochloa crusgalli* (Grass) at panicle initiation stage; while **Pattambi** recorded highest weed biomass of *Oplismenus burmaunii* (Grass) at active tillering stage fb *Fimbristylis miliaceae* (Sedge), and *Oplismenus burmaunii* (Grass) fb *Monochoria spp* (BLW) fb *Cyperus iria* (Sedge) at panicle initiation stage.

The dry weed biomass of Grasses, Sedges and BLW were highest in unpuddled dry DSR system at **Chatha, Chiplima, Malan** and **Puducherry.** No significant difference among establishment methods regarding total and all groups of weeds at **Ghaghraghat, Pusa**; Sedgesand BLW at **Chinsurah, Moncompu**, **Nagina, Nawagam, Pantnagar, Pattambi**; sedges at **ARI-Rajendranagar, Titabar**; Grasses and BLW at **Varanasi.** Among the weed control practices, chemical weed control recorded lowest weed biomass of all groups. Interactions under shows that all systems of establishment, chemical weed control recorded lowest biomass and chemical weed control under mechanized transplanting was found superior. At **Chinsurah, Gangavathi, Ghaghraghat, Pantnagar** wet and dry DSR systems were statistically on par at **Moncompu.**

Weed Control Efficiency

Weed control efficiency of different treatments was reported by 11 locations viz., **Aduthurai, Chatha, Gangavathi, Malan, Moncompu, Nagina, Nawagam, Pantnagar,**

Pattambi, Pusa ,Titabar at Active tillering stage (Tables 4.3.3). At six locations Chemical weed control under Mechanical transplanting recorded higher weed control efficiency; at three locations viz., **Moncompu, Pantnagar** and **Pattambi**; Chemical weed control under unpuddled dry DSR system recorded highest weed control efficiency; whereas mechanical weed control under unpuddled dry DSR system was superior at **Aduthurai and Chatha.**

Weed control efficiency at panicle initiation stage was reported by 10 locations viz., **Chatha, Gangavathi, Malan, Moncompu, Nagina, Nawagam, Pantnagar, Pattambi, Pusa** and **Titabar.** At five locations, Chemical weed control under mechanized transplanting recorded higher weed control efficiency. At two locations viz., **Nawagam and Titabar** Unpuddled Dry DSR system recorded highest efficiency; at two locations **Malan** and **Pattambi**, Chemical weed control under Wet DSR was superior and at **Pantnagar** both wet and Dry DSR systems higher weed control with Chemical control.

Crop growth, Yield attributes and Yield

At maximum tillering stage, the mean tiller no/ m^2 varied from 367 at **Chinsurah** to 131 at **Pattambi**. All the locations have reported the tillering parameters except **Aduthurai**. At five locations viz., **Chinsurah, Ghaghraghat, Moncompu, Nawagam** establishment methods did not differ significantly. At Maximum tillering stage seven locations showed superiority of mechanical transplanting over other establishment methods. At all locations the tiller number was high with chemical weed control except **Nawagam** and **Pusa** where both mechanical weed control and Chemical control were comparable at **Chatha, Chinsurah** mechanical weed control was superior. The mean Tiller no/m^2 at panicle initiation stage varied from 490 at **Varanasi** to 155 at **Pattambi.** At six locations viz., **Chiplima, Malan, Pusa, Pattambi, Puducherry and Titabar**, mechanical transplanting recorded higher number. At two locations viz., **Moncompu, Nawagam** three establishment methods were comparable. At **Pantnagar** and **Varanasi** Dry DSR was significantly superior. At eight locations viz., **Chiplima, Malan, Moncompu, Pattambi, Puducherry, ARI-Rajendranagar, Titabar, Varanasi** chemical weed control recorded significantly higher tiller/m^2. At **Nawagam, Pusa** and **Pantnagar** mechanical weed control and chemical weed control were comparable whereas at **Chatha** mechanical weed control resulted in higher tiller number.

Dry Matter Production

The crop total dry matter production at maximum tillering stage and panicle initiation stage was reported by 6 locations viz., **Chatha, Chiplima, Malan, Moncompu, Pusa, Pantnagar, Chatha, Malan, Moncompu, Pusa, Pantnagar,** and **ARI –Rajendranagar respectively.** At one location viz., **Malan** three establishment methods were statistically comparable. At **Chatha, Chiplima, Moncompu** and **Pusa** mechanized transplanting was significantly superior. At **Pantnagar** dry DSR was found to be superior. Chemical weed control recorded significantly higher drymatter production at **Chiplima, Malan, Moncompu** and **Pusa**. At **Chatha** mechanical weed control recorded higher dry matter production. At Panicle initiation stage, **Moncompu** recorded statistically on par performance of establishment methods. At three locations viz., **Malan, Pusa** and **ARI-Rajendranagar** mechanized

transplanting was superior. At **Pantnagar,** Dry DSR was superior and at **Chatha** mechanized transplanting and wet DSR were comparable. Among weed control practices chemical weed control recorded significantly higher drymatter production at **Malan, Moncompu, Pusa and ARI- Rajendranagar.** At **Chatha** and **Pantnagar** mechanical weed control was found superior with higher total drymatter production

Yield attributes

The data on yield attributes viz., panicle no/m^2 was reported by all the 17 locations whereas panicle weight (g) was reported by 13 locations viz., **Aduthurai, Chatha, Gangavathi, Ghaghraghat, Malan, Moncompu, Nagina, Nawagam, Pusa, Pantnagar, Puducherry, Titabar** and **Varanasi**. The data on test weight was reported by 15 locations viz., **Aduthurai, Chatha, Chiplima, Gangavathi, Ghaghraghat, Malan, Moncompu, Nagina, Nawagam, Pusa, Pantnagar, Pattambi, Puducherry, ARI-Rajendranagar** and **Varanasi.** The mean maximum panicle number/m^2 was at **Puducherry** (332) and minimum was at **Nawagam** (110) (Table 4.3.3). The different methods of establishment were comparable at **Ghaghraghat, Moncompu** and **Nawagam**. At seven locations viz., **Chinsurah, Chiplima, Malan, Pusa, Pattambi, Puducherry** and **Titabar** mechanical transplanting recorded significantly higher number of panicles/m^2. At three locations viz., **Aduthurai, Chatha** and **Varanasi** wet DSR has recorded significantly high panicle number. At two locations Viz., **Gangavathi** and **ARI- Rajendranagar** mechanical transplanting and wet DSR were comparable. At 10 locations viz., **Chiplima, Gangavathi, Ghaghraghat, Moncompu**, **Pantnagar, Pattambi, Puducherry, ARI-Rajendranagar, Titabar** and **Varanasi,** Chemical weed control was found superior. At six locations viz**., Aduthurai, Chinsurah**, **Malan, Nagina, Nawagam** and **Pusa** both mechanical weeding and chemical weed control were comparable. Only at **Chatha** mechanical weed control was found superior. The mean panicle weight (g) was 3.89 (g) at **Puducherry** to 1.63 (g) at **Chatha**. At two locations viz., **Ghaghraghat** and **Pusa** the establishment methods did not record significant difference. At eight locations viz., **Chatha, Gangavathi, Malan, Moncompu**, **Nawagam, Pantnagar, Puducherry** and **Pattambi** mechanical transplanting recorded significantly high panicle weight. At three locations viz., **Aduthurai, Varanasi** and **ARI-Rajendranagar** wet DSR was significantly superior. At **Nagina** and **Titabar** mechanical transplanting and wet DSR were comparable. The test weight was also significantly high with mechanical transplanting at **Chatha, Chiplima, Gangavathi, Nagina and Pantnagar**. At four locations viz., **Ghaghraghat, Malan, Moncompu, Nawagam** and **Pusa** establishment methods did not influence test weight. At four locations viz., **Chiplima, Malan**, **Moncompu**, and **Nagina** test weight was significantly high in chemical weed control whereas at five locations viz., **Aduthurai, Gangavathi, Nagina, Puducherry** and **Varanasi**. Chemical weed control recorded higher panicle weight. At five locations viz., **Ghaghraghat, Malan, Moncompu, Pusa** and **Pantnagar** both mechanical weed control and Chemical weed control were comparable. At two locations viz., **Chatha** and **Nawagam** the mechanical weed control was superior. At **Chatha** and **Gangavathi** the test weight was significantly high in mechanical weed control

Grain yield and Straw Yield

The result revealed that the mean grain yield across the locations varied from 2.37 t/ha at **Chatha** (Variety Basmati 370) to 6.38 t/ha at **Varanasi** with HUR 4-3. Majority of the locations recorded lower average yields of 3-5 t/ha. The crop establishment methods influenced the grain yield significantly at 14 locations. At three locations viz., **Chiplima, Malan and Pusa**, no significant difference was recorded in grain yields. At five locations viz. **Aduthurai, Moncoupu, Nawagam, Pusa, ARI-Rajendranagar,** Mechanized transplanting/Transplanting and puddled wet DSR were comparable. At nine locations viz., **Chatha, Chinsurah, Gangavathi, Ghaghraghat, Nagina, Pantnagar, Pattambi, Puducherry** and **Titabar** the mechanical transplanting recorded significantly high grain yields. At **Varanasi** both wet and dry DSR systems showed superiority over mechanized transplanting.

Among the weed control practices, mechanical weed control and chemical weed control were comparable at **Chinsurah, Nawagam and Pusa**. Mechanical weed control was significantly superior over chemical weed control at **Aduthurai, Chatha**, At 12 locations viz., **Chiplima, Gangavathi, Ghaghraghat, Malan, Moncompu, Nagina, Pantnagar, Pattambi, Puducherry, ARI- Rajendranagar, Titabar and Varanasi**, chemical weed control was found superior over mechanical weed control. The data on straw yield was reported by 14 locations viz**., Chatha, Chiplima, Gangavathi, Ghaghraghat, Malan, Moncompu, Nawagam, Pusa, Pantnagar, Pattambi, Puducherry, ARI-Rajendranagar, Titabar** and **Varanasi.** At 5 locations viz., **Moncompu, Nawagam, Pusa, Pattambi and Varanasi** the establishment methods tested were statistically on par. At 6 locations viz., **Chatha, Gangavathi, Ghaghraghat, Malan, Pantnagar and Puducherry** mechanized transplanting was significantly superior. At **Chiplima** the unpudulled Dry DSR recorded highest straw yield, At **ARI-Rajendranagar** and **Titabar**, mechanical transplanting and wet DSR systems were comparable. At Nine locations viz., **Gangavathi, Ghaghraghat, Malan, Moncompu, Pantnagar, Pattambi, Puducherry**, **ARI- Rajendranagar** and **Varanasi**, chemical weed control was found significantly superior. At three locations viz., **Chiplima, Nawagam,** and **Titabar**, mechanical weed control and chemical weed control were found to be equally effective. At two locations viz., **Chatha** and **Pusa** mechanical weed control was superior and promising over chemical control.

Economics

Economics of the experiment was worked out and reported by six locations viz., **Chatha, Gangavathi, Moncompu, Nawagam, Pantnagar** and **Pattambi**. The cost of cultivation was low at **Chatha** with Rs.31000/ha under unpuddled Dry DSR with weedy check and high at **Moncompu** Rs.92060/ha. At all the locations cost of cultivation was high under mechanical transplanting with mechanical weed control except **Pattambi,** where unpuddled Dry DSR with mechanical weed control recorded higher. The Benefit-Cost ratio of different

treatments reported was statistically analyzed and data is presented in Table 4.3.3. The Benefit-Cost ratio was statistically significant among establishment methods. At three locations viz., **Gangavathi**, **Pantnagar** and **Pattambi** mechanical transplanting recorded significantly high Benefit-Cost ratio, whereas at **Moncompu** and **Nawagam** wet DSR recorded high Benefit-Cost ratio. Only at **Chatha**, the unpuddled dry DSR recorded significantly high Benefit-Cost ratio than other establishment methods.

***Rabi* Season 2021-22**

The trial was conducted at **Karaikal,** in replicated split plot design with 3 main plot treatments and four sub plot treatments with variety ADT46. The results revealed that the grain yield loss due to weeds was 36.05%. The mean gain yield was 4.99 t/ha. The establishment method of mechanical transplanting was superior over puddled or un-puddled direct seeding. Dry DSR system was superior over Wet DSR system in terms of grain yield, panicle number and total crop dry matter production at panicle initiation stage. The order of weed Group dominance was Grasses>Sedges>BLW. At Active vegetative stage, the weed species reported were *Echinochloa colonum* (Grass)*, Cyperus rotundus* (Sedge), *Bergia spp, Hydrolea zeylonica* (BLW). At heading stage, additionally *Leptochloa spp*. (Grass) infestation was reported. The un-puddled dry direct seeding recorded highest groups wise and total weed population. Maximum weed dry biomass was recorded by Grasses followed by Sedges at active vegetative stage and Grasses followed by BLW at heading stage. Among the weed control treatments, chemical weed control recorded lower population of Grasses, Sedges at active vegetative stage and Sedges, BLW at heading stage. Dry weed biomass at both stages was comparable under mechanical weed control and chemical weed control.

In summary, the 3rd year study was conducted at 17 locations viz., **Aduthurai, Chatha, Chinsurah, Chiplima, Gangavathi, Ghaghraghat, Malan, Moncompu, Nagina, Nawagam, Pantnagar, Pattambi, Pusa, Puducherry, ARI-Rajendranagar, Titabar and Varanasi** during ***Kharif*** season, and at **Karaikal** during **Rabi** season in split plot design. The Genus and Species wise weed population reported by eight locations showed dominance of Grasses i.e., *Echinochloa colonum/ crusgalli* at five locations, *Paspalum spp, Isachnea spp, Oplismaanus spp* at **Gangavathi**, **Moncompu** and **Pattambi** respectively. At four locations *Cyperus iria* was reported dominant and at three locations other species of *Cyperus* were dominant. Among BLW, no commonality in dominating Genus and Species. In Un-puddled Dry DSR system, six locations reported dominance of Sedges and four locations reported dominance of Grasses. At majority of the test locations, the direct seeding system recorded higher weed population (group wise and total) compared to mechanical transplanting; dry direct seeding system recorded higher weed population (group wise and total) compared to wet direct seeded system. The dry weed biomass (group wise and total) indicated that mechanical transplanting has lowest weed biomass and un-puddled direct seeding has highest weed biomass. The dry weed biomass was significantly low with chemical weed control treatments.

The 3rdyear results are clearly showing the shift in weed group from Grasses to Sedges (*Cyperus iria, Cyperus rotundus* and *Fimbristylis miliaceae*) with change in system of

establishment to DSR and increase in the quantum of population and biomass; In transplanted Wet and Dry and DSR systems, *Cyperus difformis* the common sedge weed occurrence was not reported by the test locations. In all establishment methods, among the grasses, *Echinochloa colonum* is reported dominant rather than usual *Echinochloa crusgalli*.

The mean grain yield across the locations varied from 2.37 t/ha at **Chatha** (Variety Basmati370) to 6.38 t/ha at Varanasi with HUR 4-3. The results of the crop growth parameters, yield attributes and straw yield showed that at nine locations, mechanical transplanting recorded significantly high grain yields. At five locations**,** Mechanized transplanting/Transplanting and puddled wet DSR were comparable. At 12 locations, chemical weed control was found superior over mechanical weed control and at three locations, mechanical weed control was superior.

Table 4.3.3: Yield parameters and grain yield of Long term trial on weed dynamics in rice based Cropping systems under different establishment methods, *Kharif* 2022.

Main plot Treatments	Sub plot Treatments	Grain Yield t/ha						
		Aduthurai	Chatha	Chinsurah	Chiplima	Gangavathi	Ghaghraghat	Malan
M1	S1	3.88	1.25	3.74	4.18	4.11	2.90	2.90
	S2	5.79	3.35	4.77	4.87	5.39	4.90	3.58
	S3	5.23	3.14	4.87	5.19	5.36	5.51	4.43
M2	S1	4.13	1.04	2.72	4.29	1.35	2.33	2.58
	S2	5.26	3.03	3.58	5.07	3.15	4.17	3.17
	S3	5.26	2.86	3.98	4.93	3.63	5.00	4.34
M3	S1	3.02	0.94	-	4.23	1.03	1.80	2.50
	S2	3.39	2.95	-	4.73	1.18	3.74	3.54
	S3	3.13	2.75	-	4.93	3.38	4.61	4.26
Mean of Factor-1								
M1		4.97	2.58	4.46	4.75	4.95	4.44	3.64
M2		4.88	2.31	3.43	4.76	2.71	3.83	3.36
M3		3.18	2.21	-	4.63	1.86	3.38	3.43
CD(0.05)		**0.16**	**0.03**	**1.01**	**NS**	**0.18**	**0.04**	**NS**
Mean of Factor-2								
S1		3.68	1.08	3.23	4.24	2.17	2.34	2.66
S2		4.81	3.11	4.17	4.89	3.24	4.27	3.43
S3		4.54	2.92	4.42	5.02	4.12	5.04	4.34
CD(0.05)		**0.15**	**0.03**	**0.42**	**0.08**	**0.21**	**0.20**	**0.19**
Interaction								
M and T		0.25	0.05	NS	0.13	0.37	NS	NS
T and M		0.23	0.05	NS	0.13	0.32	NS	NS
Experimental Mean		**4.34**	**2.37**	**3.94**	**4.71**	**3.17**	**3.88**	**3.48**
Applied N:P:K:Zn Kg/ha			30 : 20 : 10 kg /ha			150:75:75:20	120:60:40:25	90,40,40
Avail N:P:K (kg/ha)			245.15,14.34,146.31				200:24:234	297,54.5,241
Name of the variety			basmati 370	Manisha	MTU1156	GNV-10-89	NDR 359	HPR 1068
Soil type			Sandy clay loam				Sandy loam	
pH			8.03			8.2	7.4	5.9
EC (dsm-1)			0.21					
Organic carbon			0.57			0.51	0.3	8.4

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 Treatments	Sub plot Treatments	Grain yield t/ha				
		Moncompu	Nagina	Nawagam	Pusa	Pantnagar
M1	S1	1.14	2.15	5.43	3.23	3.83
	S2	2.79	4.77	6.58	3.67	5.06
	S3	4.33	4.87	5.99	3.90	5.1
M2	S1	1.36	1.98	5.19	3.23	2.89
	S2	1.89	4.35	6.48	3.75	3.94
	S3	4.84	4.56	6.4	4.07	4.58
M3	S1	0.79	1.89	5.02	2.75	2.39
	S2	1.85	4.33	5.13	3.67	4.33
	S3	3.08	4.44	5.18	3.58	4.53
Mean of Factor-1						
M1		2.76	3.93	6.00	3.60	4.66
M2		2.7	3.63	6.02	3.68	3.81
M3		1.91	3.55	5.11	3.33	3.75
CD(0.05)		**0.37**	**0.06**	**0.36**	**NS**	**0.28**
Mean of Factor-2						
S1		1.10	2.00	5.21	3.07	3.04
S2		2.18	4.48	6.06	3.69	4.44
S3		4.08	4.62	5.86	3.85	4.74
CD(0.05)		**0.35**	**0.10**	**0.36**	**0.26**	**0.22**
Interaction						
M and T		0.6	NS	NS	NS	0.39
T and M		0.53	NS	NS	NS	0.36
Experimental Mean		**2.45**	**3.70**	**5.71**	**3.54**	**4.07**
Applied N:P:K:Zn Kg/ha		90:45:45	120:60:40:25			120-60-40-10
Avail N:P:K (kg/ha)		350:55:250	18:33.3		225:12:125	230-21. 1-220
Name of the variety		MO16 (Uma)	Pusa basmati 1509	GAR 14	Rajenra Bhagwati	PD-24
Soil type		Clay loam			Sandy laom	Silt Loam
pH		5.5	7.7		8.2	7.7
EC (dsm-1)			0.18			
Organic carbon		2.5			0.39	0.73

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 Treatments	Sub plot Treatments	Grain Yield t/ha				
		Pattambi	Puducherry	ARI-Rajendranagar	Titabar	Varanasi
M1	S1	2.03	5.50	3.89	2.07	6.10
	S2	4.23	6.34	5.37	3.80	6.07
	S3	5.64	6.55	6.60	4.37	6.40
M2	S1	1.69	4.94	3.24	1.87	6.37
	S2	4.00	5.69	6.13	3.30	6.30
	S3	4.92	6.07	6.72	3.87	6.60
M3	S1	1.60	-	2.85	1.37	6.37
	S2	4.00	-	3.11	2.30	6.33
	S3	5.06	-	4.21	2.57	6.87
Mean of Factor-1						
M1		3.97	6.13	5.29	3.41	6.19
M2		3.54	5.57	5.36	3.01	6.42
M3		3.55	-	3.39	2.08	6.52
CD(0.05)		**0.20**	**0.05**	**0.36**	**0.26**	**0.11**
Mean of Factor-2						
S1		1.77	5.22	3.33	1.77	6.28
S2		4.08	6.01	4.87	3.13	6.23
S3		5.21	6.31	5.84	3.60	6.62
CD(0.05)		**0.26**	**0.22**	**0.39**	**0.30**	**0.15**
Interaction						
M and T		NS	NS	0.67	NS	NS
T and M		NS	NS	0.58	NS	NS
Experimental Mean		**3.69**	**5.85**	**4.68**	**2.83**	**6.38**
Applied N:P:K:Zn Kg/ha		90:45:45	120:40:40		60:20:40	
Avail N:P:K (kg/ha)			21.3,128	188-84-61		174-24-203
Name of the variety		Aiswarya	ADT 54	RNR28361	Numali	HUR 4-3
Soil type			Clay loam	clay loam		
pH		4.9	6.07	7.6	5.8	7.68
EC (dsm-1)			0.17			
Organic carbon					0.58	0.41

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 Treatments	Sub plot Treatments	Straw yield t/ha								
		Chatha	Chiplima	Gangavathi	Ghaghraghat	Malan	Moncompu	Nawagam	Pusa	Pantnagar
M1	S1	2.23	4.7	4.73	3.89	3.13	1.41	6.03	4.83	3.99
	S2	6.61	5.43	6.2	6.57	3.67	3.45	7.28	6.33	5.27
	S3	6.24	5.76	6.16	7.37	4.85	4.95	6.68	6.50	5.17
M2	S1	2.07	4.83	1.55	3.1	2.83	1.75	5.83	5.00	3.53
	S2	6.02	5.62	3.62	5.58	3.55	2.39	7.23	7.33	4.16
	S3	5.73	5.47	4.17	6.7	4.45	5.57	7.18	7.17	5.04
M3	S1	1.89	4.62	1.19	2.41	3.07	1.29	6.93	4.83	2.41
	S2	5.82	5.25	1.36	5.00	4.02	2.42	7.19	7.17	4.69
	S3	5.49	5.47	3.88	6.16	4.35	4.41	7.17	5.33	5.04
Mean of Factor-1										
M1		5.03	5.3	5.7	5.94	3.88	3.27	6.66	5.89	4.81
M2		4.60	5.3	3.11	5.13	3.61	3.24	6.75	6.50	4.24
M3		4.40	5.11	2.14	4.53	3.81	2.71	7.09	5.78	4.05
CD(0.05)		**0.04**	**0.05**	**0.21**	**0.06**	**0.07**	**NS**	**NS**	**NS**	**0.30**
Mean of Factor-2										
S1		2.06	4.72	2.49	3.13	3.01	1.48	6.26	4.89	3.31
S2		6.15	5.43	3.72	5.72	3.75	2.75	7.23	6.94	4.71
S3		5.82	5.57	4.74	6.74	4.55	4.98	7.01	6.33	5.08
CD(0.05)		**0.05**	**0.14**	**0.24**	**0.27**	**0.36**	**0.67**	**0.42**	**0.43**	**0.28**
Interaction										
M and T		0.08	NS	0.42	NS	NS	NS	NS	0.74	0.49
T and M		0.07	NS	0.36	NS	NS	NS	NS	0.69	0.43
Experimental Mean		**4.68**	**5.24**	**3.65**	**5.2**	**3.77**	**3.07**	**6.84**	**6.06**	**4.37**

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	Straw yield t/ha				
		Pattambi	Puducherry	ARI-Rajendranagar	Titabar	Varanasi
M1	S1	3.04	9.05	4.61	3.80	6.93
	S2	7.46	10.37	6.56	5.07	6.57
	S3	9.35	10.81	7.35	5.13	7.10
M2	S1	2.88	8.18	4.28	3.07	6.97
	S2	7.01	9.40	7.20	5.10	6.80
	S3	8.14	10.06	7.58	5.07	7.30
M3	S1	2.76	-	3.63	2.90	6.80
	S2	7.05	-	4.45	3.13	6.63
	S3	8.29	-	5.78	3.93	7.23
Mean of Factor-1						
1		6.62	10.08	6.17	4.67	6.87
2		6.01	9.21	6.35	4.41	7.02
3		6.04	-	4.62	3.32	6.89
CD(0.05)		**NS**	**0.34**	**0.38**	**0.51**	**NS**
Mean of Factor-2						
S1		2.89	8.62	4.17	3.26	6.90
S2		7.17	9.88	6.07	4.43	6.67
S3		8.59	10.44	6.91	4.71	7.21
CD(0.05)		**0.53**	**0.36**	**0.40**	**0.44**	**0.12**
Interaction						
M and T		NS	NS	0.70	0.76	NS
T and M		NS	NS	0.61	0.69	NS
Experimental Mean		**6.22**	**9.65**	**5.72**	**4.13**	**6.93**

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 Treatments	Sub plot Treatments	No of Panicles/m^2										
		Aduthurai	Chatha	Chinsurah	Chiplima	Gangavathi	Ghaghraghat	Malan	Moncompu	Nagina	Nawaagam	Pusa
M1	S1	209	99	239	188	252	173	157	162	211	105	230
	S2	266	237	332	224	221	216	212	186	299	115	275
	S3	251	205	333	253	293	235	221	223	311	115	282
M2	S1	237	135	267	183	194	164	137	148	206	101	202
	S2	278	225	266	209	284	201	206	169	305	110	275
	S3	270	211	225	236	246	214	215	202	312	105	290
M3	S1	170	135	-	176	47	157	136	148	217	104	194
	S2	206	215	-	204	114	193	202	169	275	119	275
	S3	218	206	-	214	248	210	190	182	271	117	262
Mean of Factor-1												
M1		242	180	301	221	255	208	197	190	274	112	262
M2		262	190	252	209	241	193	186	173	275	106	256
M3		198	186	-	198	136	187	176	166	254	113	244
CD(0.05)		**7**	**2**	**13**	**4**	**13**	**NS**	**3**	**NS**	**10**	**NS**	**4**
Mean of Factor-2												
S1		205	123	253	182	164	165	143	153	211	103	209
S2		250	226	299	212	206	203	207	175	293	115	275
S3		246	207	279	234	262	220	209	202	298	112	278
CD(0.05)		**6**	**3**	**27**	**3**	**14**	**16**	**4**	**17**	**12**	**9**	**9**
Interaction												
M and T		10.24	5.24	38.85	5.66	24.59	NS	7.18	NS	20.68	NS	15.30
T and M		9.23	4.42	33.37	5.25	21.44	NS	6.17	NS	17.78	NS	12.69
Experimental Mean		**234**	**185**	**277**	**210**	**211**	**196**	**186**	**176**	**268**	**110**	**254**

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 Treatments	Sub plot Treatments	No of Panicles/m^2					
		Pantnagar	Pattambi	Puducherry	ARI-Rajendranagar	Titabar	Varanasi
M1	S1	173	152	316	205	213	78
	S2	218	221	343	267	240	88
	S3	220	257	361	278	289	134
M2	S1	213	133	301	181	210	99
	S2	240	186	325	271	219	99
	S3	274	216	343	323	242	209
M3	S1	264	111	-	132	150	128
	S2	284	180	-	172	167	105
	S3	293	231	-	212	177	125
Mean of Factor-1							
M1		204	210	340	250	248	100
M2		242	179	323	258	224	136
M3		280	174	-	172	164	119
CD(0.05)		**10**	**11**	**6**	**12**	**4**	**7**
Mean of Factor-2							
S1		217	132	308	173	191	102
S2		248	196	334	237	208	97
S3		262	235	352	271	236	156
CD(0.05)		**5**	**21**	**5**	**15**	**4**	**16**
Interaction							
M and T		8.58	NS	NS	26.24	6.39	27.41
T and M		9.39	NS	NS	22.48	5.87	22.67
Experimental Mean		**242**	**188**	**332**	**227**	**212**	**118**

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 Treatments	Sub plot Treatments	Panicle weight (g)												
		Aduthurai	Chatha	Gangavathi	Ghaghraghat	Malan	Moncompu	Nagina	Nawagam	Pusa	Pantnagar	Puducherry	Titabar	Varanasi
	S1	2.48	0.85	2.59	2.21	2.89	2.93	2.84	4.01	2.32	2.57	3.73	3.47	2.20
	S2	3.18	2.16	3.45	3.08	4.36	3.58	2.85	4.04	2.83	2.65	4.00	4.17	2.50
M1	S3	3.14	2.06	3.90	3.14	4.48	3.30	2.86	3.52	3.07	2.65	4.26	4.20	2.60
	S1	2.53	0.78	2.59	2.12	2.30	2.71	2.81	3.20	2.30	1.88	3.54	3.43	2.50
	S2	3.30	2.10	2.85	3.02	4.34	2.92	2.84	3.59	3.07	1.96	3.78	4.27	2.67
M2	S3	3.27	1.97	3.65	3.11	4.51	2.98	2.86	3.05	3.00	2.00	4.02	4.30	2.77
	S1	2.13	0.75	1.20	2.06	2.24	2.45	2.80	3.15	2.00	1.21	-	3.10	2.70
	S2	2.28	2.04	3.17	2.89	4.22	2.90	2.84	3.20	2.98	1.84	-	3.23	2.27
M3	S3	2.64	1.96	3.91	3.08	4.39	2.92	2.85	3.06	2.93	1.85	-	3.50	2.73
Mean of Factor-1														
M1		2.93	1.69	3.31	2.81	3.91	3.27	2.85	3.85	2.74	2.62	4.00	3.94	2.43
M2		3.04	1.62	3.03	2.75	3.72	2.87	2.84	3.28	2.79	1.95	3.78	4.00	2.64
M3		2.35	1.58	2.76	2.68	3.62	2.76	2.83	3.13	2.64	1.63	-	3.28	2.57
CD(0.05)		**0.03**	**0.03**	**0.16**	**ns**	**0.13**	**0.25**	**0.01**	**0.22**	**ns**	**0.06**	**0.18**	**0.18**	**0.04**
Mean of Factor-2														
S1		2.38	0.79	2.13	2.13	2.48	2.70	2.82	3.45	2.21	1.88	3.64	3.33	2.47
S2		2.92	2.10	3.16	3.00	4.31	3.13	2.84	3.61	2.96	2.15	3.89	3.89	2.48
S3		3.02	2.00	3.82	3.11	4.46	3.07	2.86	3.21	3.00	2.17	4.14	4.00	2.70
CD(0.05)		**0.04**	**0.03**	**0.22**	**0.26**	**0.17**	**0.30**	**0.01**	**0.21**	**0.22**	**0.07**	**0.11**	**0.22**	**0.15**
Interaction														
M and T		0.07	ns	0.39	ns	0.29	ns	ns	ns	ns	0.12	ns	ns	0.25
T and M		0.06	ns	0.33	ns	0.25	ns	ns	ns	ns	0.10	ns	ns	0.21
Experimental Mean		**2.77**	**1.63**	**3.03**	**2.75**	**3.75**	**2.97**	**2.84**	**3.42**	**2.72**	**2.07**	**3.89**	**3.74**	**2.55**

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 Treatments	Sub plot Treatments	Test weight(g)										
		Aduthurai	Chatha	Chiplima	Gangavathi	Ghaghraghat	Malan	Moncompu	Nagina	Nawagam	Pusa	Pantnagar
M1	S1	17.27	19.10	20.65	19.02	24.78	24.60	25.27	23.20	18.5	21.00	28.75
	S2	18.33	21.20	21.39	18.31	25.15	27.83	25.8	23.46	18.67	21.00	29.45
	S3	18.17	20.83	22.03	18.74	25.55	26.84	26.43	23.51	19	21.67	29.3
M2	S1	18.33	18.90	20.48	18.15	24.58	24.11	24.87	23.17	18.17	20.33	26.83
	S2	18.17	20.80	21.16	17.83	24.98	27.14	24.9	23.45	18.13	21.00	28.62
	S3	18.33	20.47	21.56	17.73	25.17	28.32	27.27	23.49	17.93	21.33	27.08
M3	S1	16.5	19.07	20.75	8.9	24.23	25.01	24.5	23.19	18.1	19.67	26.37
	S2	17.57	20.47	21.12	18.19	24.62	25.91	25.17	23.46	18.67	21.00	28.35
	S3	17.5	20.20	21.59	17.04	24.68	28.11	26.93	23.52	18.7	21.50	27.18
Mean of Factor-1												
M1		17.92	20.38	21.36	18.69	25.16	26.42	25.83	23.39	18.72	21.22	29.17
M2		18.28	20.06	21.07	17.9	24.91	26.52	25.68	23.37	18.08	20.89	27.51
M3		17.19	19.91	21.16	14.71	24.51	26.34	25.53	23.39	18.49	20.72	27.3
CD(0.05)		**0.42**	**0.06**	**0.14**	**0.68**	**NS**	**NS**	**NS**	**0.01**	**NS**	**NS**	**0.85**
Mean of Factor-2												
S1		17.37	19.02	20.63	15.35	24.53	24.57	24.88	23.19	18.26	20.33	27.32
S2		18.02	20.82	21.22	18.11	24.92	26.96	25.29	23.46	18.49	21.00	28.81
S3		18	20.50	21.73	17.84	25.13	27.75	26.88	23.51	18.54	21.50	27.86
CD(0.05)		**0.21**	**0.09**	**0.16**	**0.66**	**NS**	**0.49**	**0.88**	**0.02**	**NS**	**0.75**	**1.17**
Interaction												
M and T		0.36	0.16	NS	1.14	NS	0.86	NS	NS	NS	NS	NS
T and M		0.4	0.14	NS	1.01	NS	0.73	NS	NS	NS	NS	NS
Experimental Mean		**17.8**	**20.11**	**21.19**	**17.1**	**24.86**	**26.43**	**25.68**	**23.39**	**18.43**	**20.94**	**27.99**

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 Treatments	Sub plot Treatments	Test weight(g)			
		Pattambi	Puducherry	ARI-Rajendranagar	Varanasi
M1	S1	22.20	18.51	24.43	22.50
	S2	27.07	18.83	24.13	21.03
	S3	29.73	19.45	25.00	19.50
M2	S1	21.43	18.46	24.67	18.77
	S2	26.57	18.83	24.73	18.57
	S3	28.07	19.10	24.87	18.77
M3	S1	21.17	-	23.77	19.47
	S2	26.53	-	23.77	20.13
	S3	28.67	-	24.53	20.37
Mean of Factor-1					
M1		26.33	18.93	24.52	21.01
M2		25.36	18.80	24.76	18.70
M3		25.46	-	24.02	19.99
CD(0.05)		**0.48**	**NS**	**0.28**	**NS**
Mean of Factor-2					
S1		21.60	18.49	24.29	20.24
S2		26.72	18.83	24.21	19.91
S3		28.82	19.27	24.80	19.54
CD(0.05)		**0.59**	**0.44**	**0.32**	**NS**
Interaction					
M and T		NS	NS	NS	NS
T and M		NS	NS	NS	NS
Experimental Mean		**25.72**	**18.86**	**24.43**	**19.90**

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 Treatments	Sub plot Treatments	No of Tillers /m² at Maximum Tillering stage										
		Chatha	Chinsurah	Chiplima	Gangavathi	Ghaghraghat	Malan	Moncompu	Nagina	Nawaagam	Pusa	Pantnagar
M1	S1	146	398	205	277	177	160	203	217	145	278	125
	S2	233	368	230	340	227	222	192	317	159	316	150
	S3	206	335	262	350	233	231	256	321	164	315	151
M2	S1	206	325	195	350	170	151	195	215	141	233	116
	S2	276	393	215	367	217	214	184	305	156	299	141
	S3	248	386	245	323	231	211	232	315	148	310	145
M3	S1	201	-	192	110	166	144	171	205	142	225	125
	S2	272	-	209	209	195	209	192	244	169	287	123
	S3	247	-	218	330	217	219	213	306	162	295	126
Mean of Factor-1												
M1		195	367	232	322	212	204	217	285	156	303	142
M2		244	368	218	347	206	192	204	278	148	281	134
M3		240	-	206	216	192	191	192	252	158	269	125
CD(0.05)		**6**	**NS**	**7**	**11**	**NS**	**2**	**NS**	**8**	**NS**	**13**	**2**
Mean of Factor-2												
S1		185	362	197	246	171	152	189	213	143	246	122
S2		261	381	218	305	213	215	189	289	161	300	138
S3		234	360	242	334	227	220	234	314	158	307	141
CD(0.05)		**6**	**NS**	**7**	**14**	**19**	**3**	**26**	**10**	**12**	**14**	**2**
Interaction												
M and T		NS	41.00	12.07	24.08	NS	4.65	NS	17.98	NS	NS	4.29
T and M		NS	38.79	10.72	20.49	NS	3.98	NS	15.38	NS	NS	3.7
Experimental Mean		**226**	**367**	**219**	**295**	**204**	**196**	**204**	**272**	**154**	**284**	**134**

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 Treatments	Sub plot Treatments	No of Tillers /m² at Maximum Tillering stage				
		Pattambi	Puducherry	ARI-Rajendranagar	Titabar	Varanasi
M1	S1	100	335	294	247	370
	S2	150	347	326	260	362
	S3	173	362	332	295	382
M2	S1	103	316	314	212	222
	S2	131	323	338	220	225
	S3	151	343	385	250	237
M3	S1	85	-	228	152	237
	S2	136	-	243	171	215
	S3	153	-	276	181	242
Mean of Factor-1						
M1		141	348	317	268	371
M2		128	327	346	227	228
M3		125	-	249	168	231
CD(0.05)		**NS**	**2**	**13**	**20**	**13**
Mean of Factor-2						
S1		96	325	278	204	277
S2		139	335	303	217	267
S3		159	352	331	242	287
CD(0.05)		**15**	**14**	**22**	**22**	**11**
Interaction						
M and T		NS	NS	NS	NS	NS
T and M		NS	NS	NS	NS	NS
Experimental Mean		**131**	**337**	**304**	**221**	**277**

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 Treatments	Sub plot Treatments	No of Tillers /m^2 at Panicle Initiation stage											
		Chatha	Chiplima	Malan	Moncompu	Nawaagam	Pusa	Pantnagar	Pattambi	Puducherry	ARI-Rajendranagar	Titabar	Varanasi
M1	S1	152	207	148	172	217	240	186	120	350	244	215	434
	S2	249	230	214	195	227	282	225	188	364	293	258	469
	S3	224	261	231	231	235	293	229	223	375	304	291	471
M2	S1	221	197	146	160	201	217	223	111	330	243	218	483
	S2	294	216	211	179	212	282	272	143	341	299	221	485
	S3	284	242	215	210	207	297	280	181	359	354	249	529
M3	S1	219	189	143	158	185	200	298	101	-	187	167	509
	S2	291	214	208	178	234	286	293	156	-	200	151	482
	S3	277	218	213	192	243	277	298	171	-	247	177	550
Mean of Factor-1													
M1		208	232	198	199	226	272	213	177	363	280	255	458
M2		266	218	190	183	206	265	258	145	343	299	229	499
M3		262	207	188	176	221	254	296	143	-	211	165	513
CD(0.05)		**5**	**1**	**3**	**NS**	**NS**	**6**	**3**	**15**	**12**	**18**	**7**	**6**
Mean of Factor-2													
S1		197	197	146	163	201	219	235	111	340	224	200	475
S2		278	220	211	184	224	283	263	162	353	264	210	479
S3		262	240	220	211	228	289	269	192	367	302	239	517
CD(0.05)		**3**	**3**	**4**	**17**	**16**	**13**	**8**	**17**	**11**	**18**	**12**	**17**
Interaction													
M and T		5.95	6.05	7.23	NS	NS	NS	13.33	NS	NS	30.43	21.08	29.44
T and M		5.64	4.98	6.13	NS	NS	NS	11.02	NS	NS	26.89	17.52	24.19
Experimental Mean		**246**	**219**	**192**	**186**	**218**	**264**	**256**	**155**	**353**	**263**	**216**	**490**

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 Treatments	Sub plot Treatments	Total dry matter g/m² at Maximum Tillering stage						Total dry matter g/m² at at Panicle Initiation stage					
		Chatha	Chiplima	Malan	Moncompu	Pusa	Pantnagar	Chatha	Malan	Moncompu	Pusa	Pantnagar	ARI-Rajendranagar
M1	S1	134.83	231.23	52.67	461.20	113.33	200.51	164.00	278.8	596.87	338.33	175.24	346.67
	S2	218.77	254.07	63.37	785.33	145.00	216.33	452.00	345.33	1066.88	496.58	223.08	383.33
	S3	203.40	281.2	71.07	1219.04	155.00	171.73	426.67	354.23	1301.88	510.00	197.08	410.00
M2	S1	135.60	223.83	48.57	331.60	93.33	176.63	159.63	260.43	428.47	306.77	198.12	310.00
	S2	212.43	240.57	62.90	451.73	136.67	192.07	453.30	349.13	726.24	463.30	253.24	393.33
	S3	200.13	262.7	65.80	1539.07	135.00	199.77	428.57	343.47	1697.29	461.67	225.16	430.00
M3	S1	135.13	208.67	49.93	117.33	90.00	281.23	156.90	242.4	334.6	289.83	353.08	296.67
	S2	203.30	239.43	62.20	420.63	116.67	239.4	447.53	323.7	527.08	403.33	269.88	280.00
	S3	187.77	243.57	66.97	1010.27	128.33	252.63	424.37	329.3	1271.59	420.00	268.32	353.33
Mean of Factor-1													
M1		185.67	255.5	62.37	821.86	137.78	196.19	347.56	326.12	988.54	448.30	198.47	380.00
M2		182.72	242.37	59.09	774.13	121.67	189.49	347.17	317.68	950.67	410.58	225.51	377.78
M3		175.40	230.56	59.70	516.08	111.67	257.76	342.93	298.47	711.09	371.06	297.09	310.00
CD(0.05)		**0.44**	**8.18**	**NS**	**141.94**	**5.00**	**4.97**	**1.26**	**0.94**	**NS**	**10.10**	**10.07**	**24.46**
Mean of Factor-2													
S1		135.19	221.24	50.39	303.38	98.89	219.46	160.18	260.54	453.31	311.64	242.15	317.78
S2		211.50	244.69	62.82	552.56	132.78	215.93	450.94	339.39	773.4	454.40	248.73	352.22
S3		197.10	262.49	67.94	1256.12	139.44	208.04	426.53	342.33	1423.59	463.89	230.19	397.78
CD(0.05)		**0.80**	**8.41**	**1.28**	**135.82**	**6.25**	**5.65**	**3.37**	**3.34**	**275.45**	**20.32**	**9.58**	**32.09**
Interaction													
M and T		1.38	NS	NS	235.24	NS	9.78	NS	5.79	NS	NS	16.6	NS
T and M		1.15	NS	NS	209.12	NS	8.46	NS	4.75	NS	NS	14.77	NS
Experimental Mean		**181.26**	**242.81**	**60.39**	**704.02**	**123.70**	**214.48**	**345.89**	**314.09**	**883.43**	**409.98**	**240.36**	**355.93**

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: Cost of cultivation and Benefit-Cost Ratio of long term trial on weed dynamics in rice based cropping systems under different establishment methods, *Kharif* 2022.

Main plot Treatments	Sub plot Treatments	Cost of cultivation (Rs./ha)					
		Chatha	Gangavathi	Moncompu	Nawagam	Pantnagar	Pattambi
M1	S1	42000	55588	64060	43276	41828	61030
	S2	50000	71077	92060	44317	45428	73030
	S3	46000	60052	72060	44571	45415	64008
M2	S1	36000	46774	56560	40037	36680	63030
	S2	44000	62465	84560	41078	40280	75030
	S3	40000	52031	64560	41349	40267	66008
M3	S1	31000	47252	56370	40889	36230	69030
	S2	39000	62309	84370	41896	39830	81030
	S3	35000	53366	64370	42167	39817	72008

Main plot Treatments	Sub plot Treatments	Benefit -Cost Ratio					
		Chatha	Gangavathi	Moncompu	Nawagam	Pantnagar	Pattambi
M1	S1	0.72	1.57	0.51	2.16	1.96	1.09
	S2	3.00	1.6	0.86	2.55	2.39	1.93
	S3	3.09	1.89	1.71	2.32	2.4	2.92
M2	S1	0.73	0.61	0.68	2.24	1.7	0.89
	S2	3.13	1.06	0.64	2.72	2.1	1.78
	S3	3.30	1.47	2.14	2.67	2.45	2.47
M3	S1	0.83	0.46	0.4	2.18	1.41	0.78
	S2	3.52	0.4	0.62	2.18	2.34	1.65
	S3	3.71	1.34	1.36	2.18	2.45	2.32
Mean of Factor-1							
M1		2.27	1.69	1.03	2.34	2.25	1.98
M2		2.38	1.05	1.15	2.54	2.08	1.72
M3		2.68	0.73	0.8	2.18	2.07	1.58
CD(0.05)		**0.03**	**0.08**	**0.16**	**0.15**	**ns**	**0.10**
Mean of Factor-2							
S1		0.76	0.88	0.53	2.19	1.69	0.92
S2		3.22	1.02	0.71	2.48	2.27	1.79
S3		3.36	1.57	1.74	2.39	2.43	2.57
CD(0.05)		**0.04**	**0.08**	**0.14**	**0.15**	**0.12**	**0.13**
Interaction							
M and T		0.07	0.14	0.24	ns	0.21	ns
T and M		0.06	0.12	0.21	ns	0.2	ns
Experimental Mean		**2.45**	**1.16**	**0.99**	**2.35**	**2.13**	**1.76**

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

Table 4.3.3: Weed population no/m² of Long term trial on weed dynamics in rice based cropping systems under different establishment methods, *Kharif* 2022.

Main plot Treatments	Sub plot Treatments	Aduthurai				Chatha							
		Weed population no/m² at Active tillering 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	23.07(4.85)	18.47(4.36)	13.10(3.69)	54.63(7.43)	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	18.20(4.32)	10.20(3.27)	10.07(3.25)	38.47(6.24)	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	15.10(3.95)	12.27(3.57)	8.47(2.99)	35.83(6.03)	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	23.47(4.90)	20.10(4.54)	15.10(3.95)	58.67(7.69)	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	18.23(4.33)	11.57(3.47)	9.33(3.14)	39.13(6.30)	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	14.10(3.82)	12.30(3.58)	11.10(3.41)	37.50(6.16)	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	33.53(5.83)	20.10(4.54)	25.33(5.08)	78.97(8.91)	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	19.30(4.45)	12.30(3.58)	13.30(3.71)	44.90(6.74)	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	12.03(3.54)	9.87(3.22)	8.47(2.99)	30.37(5.56)	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		18.79(4.38)	13.64(3.73)	10.54(3.31)	42.98(6.57)	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		18.60(4.35)	14.66(3.86)	11.84(3.50)	45.10(6.72)	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		21.62(4.61)	14.09(3.78)	15.70(3.93)	51.41(7.07)	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)		**0.01**	**0.01**	**0.01**	**0.01**	**NS**	**0.03**	**0.13**	**0.22**	**0.15**	**0.26**	**0.12**	**0.20**
Mean of Factor-2													
S1		26.69(5.19)	19.56(4.48)	17.84(4.24)	64.09(8.01)	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		18.58(4.37)	11.36(3.44)	10.90(3.37)	40.83(6.43)	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		13.74(3.77)	11.48(3.46)	9.34(3.13)	34.57(5.92)	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)		**0.01**	**0.03**	**0.03**	**0.01**	**0.24**	**0.2**	**0.33**	**0.2**	**0.23**	**0.15**	**0.19**	**0.17**
Interaction													
M and T		0.03	0.04	0.05	0.03	NS	0.35	NS	0.35	NS	NS	0.32	0.3
T and M		0.02	0.04	0.04	0.02	NS	0.28	NS	0.32	NS	NS	0.27	0.27
Experimental Mean		**4.44**	**3.79**	**3.58**	**6.78**	**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 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 Treatments	Sub plot Treatments	Chiplima			Chinsurah							
		Weed population no/m^2			Weed population no/m^2 at Active tillering stage				Weed population no/m^2 at Panicle initiation stage			
		Active vegetative stage	Panicle initiation stage	Heading stage	Grasses	Sedges	BLW	Total weed population	Grasses	Sedges	BLW	Total weed population
M1	S1	43.33(6.62)	66.00(8.15)	108.00(10.40)	5.33(2.41)	8.33(2.95)	5.33(2.25)	19.00(4.41)	19.00(4.41)	13.67(3.72)	10.00(3.21)	43.00(6.59)
	S2	18.67(4.37)	33.67(5.83)	48.00(6.95)	5.33(2.40)	3.33(1.85)	6.33(2.60)	15.00(3.92)	15.00(3.92)	2.67(1.76)	1.00(1.17)	5.33(2.40)
	S3	13.00(3.67)	22.33(4.74)	28.92(5.41)	2.00(1.56)	1.67(1.46)	3.00(1.81)	6.67(2.67)	6.67(2.67)	3.00(1.87)	0.67(1.05)	5.33(2.41)
M2	S1	88.33(9.38)	163.00(12.78)	186.00(13.65)	14.33(3.85)	6.33(2.60)	8.33(2.95)	29.00(5.43)	29.00(5.43)	22.00(4.61)	11.67(3.47)	68.00(8.28)
	S2	53.67(7.34)	78.33(8.85)	89.67(9.43)	11.67(3.45)	5.33(2.41)	3.33(1.85)	20.33(4.50)	20.33(4.50)	9.33(3.13)	3.67(2.04)	22.67(4.81)
	S3	21.00(4.61)	40.00(6.32)	49.67(7.06)	6.67(2.68)	4.33(2.18)	3.00(1.87)	14.00(3.80)	14.00(3.80)	8.67(3.02)	7.00(2.71)	22.00(4.72)
M3	S1	107.00(10.34)	182.00(13.50)	215.67(14.69)	-	-	-	-	-	-	-	-
	S2	65.67(8.11)	92.00(9.59)	107.00(10.36)	-	-	-	-	-	-	-	-
	S3	28.67(5.36)	49.00(7.01)	60.00(7.74)	-	-	-	-	-	-	-	-
Mean of Factor-1												
M1		25.00(4.89)	40.67(6.24)	61.64(7.59)	4.22(2.12)	4.44(2.09)	4.89(2.22)	13.56(3.67)	13.56(3.67)	6.44(2.45)	3.89(1.81)	17.89(3.80)
M2		54.33(7.11)	93.78(9.32)	108.44(10.04)	10.89(3.32)	5.33(2.40)	4.89(2.22)	21.11(4.58)	21.11(4.58)	13.33(3.59)	7.44(2.74)	37.56(5.94)
M3		67.11(7.94)	107.67(10.03)	127.56(10.93)	-	-	-	-	-	-	-	-
CD(0.05)		**0.45**	**0.43**	**0.78**	**0.55**	**NS**	**NS**	**0.54**	**0.54**	**NS**	**0.89**	**1.22**
Mean of Factor-2												
S1		79.56(8.78)	137.00(11.48)	169.89(12.91)	9.83(3.13)	7.33(2.78)	6.83(2.60)	24.00(4.92)	24.00(4.92)	17.83(4.17)	10.83(3.34)	55.50(7.43)
S2		46.00(6.61)	68.00(8.09)	81.56(8.91)	8.50(2.92)	4.33(2.13)	4.83(2.23)	17.67(4.21)	17.67(4.21)	6.00(2.45)	2.33(1.60)	14.00(3.61)
S3		20.89(4.55)	37.11(6.02)	46.19(6.74)	4.33(2.12)	3.00(1.82)	3.00(1.84)	10.33(3.23)	10.33(3.23)	5.83(2.45)	3.83(1.88)	13.67(3.57)
CD(0.05)		**0.7**	**0.51**	**0.69**	**0.47**	**0.46**	**NS**	**0.55**	**0.55**	**0.84**	**0.36**	**0.34**
Interaction												
M and T		NS	0.88	NS	NS	NS	NS	NS	NS	NS	0.5	NS
T and M		NS	0.76	NS	NS	NS	NS	NS	NS	NS	0.8	NS
Experimental Mean		**6.65**	**8.53**	**9.52**	**2.72**	**2.24**	**2.22**	**4.12**	**4.12**	**3.02**	**2.27**	**4.87**

***(Values in parentheses are transformed values)**

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 Treatments	Sub plot Treatments	Gangavathi							
		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	0.93(1.08)	274.29(15.63)	1.85(1.29)	277.07(15.73)	12.97(3.58)	218.69(14.75)	11.12(2.96)	242.79(15.53)
	S2	0.00(0.71)	57.45(7.57)	7.41(2.44)	64.87(8.03)	7.41(2.49)	82.47(9.10)	1.85(1.29)	91.74(9.59)
	S3	4.63(1.98)	41.70(6.41)	0.00(0.71)	46.33(6.73)	0.93(1.08)	50.04(6.66)	11.12(2.41)	62.09(7.39)
M2	S1	116.76(10.82)	624.57(24.77)	10.19(2.88)	751.53(27.25)	34.29(5.82)	276.15(16.52)	0.00(0.71)	310.43(17.56)
	S2	46.33(6.27)	270.59(16.28)	0.93(1.08)	317.85(17.76)	35.21(5.10)	349.35(18.66)	0.00(0.71)	384.57(19.58)
	S3	26.87(5.23)	107.49(10.37)	0.00(0.71)	134.37(11.59)	18.53(4.30)	114.91(9.88)	0.00(0.71)	133.44(10.97)
M3	S1	89.89(9.36)	113.05(10.27)	360.47(18.52)	563.41(23.57)	87.11(9.32)	21.31(4.03)	176.07(12.91)	284.49(16.63)
	S2	95.45(9.66)	281.71(16.49)	116.76(10.66)	493.91(22.10)	58.38(7.66)	180.70(13.21)	48.19(6.91)	287.27(16.77)
	S3	16.68(3.60)	89.89(9.44)	2.78(1.66)	109.35(10.38)	47.26(6.54)	390.13(19.70)	19.46(3.03)	456.85(21.29)
Mean of Factor-1									
M1		1.85(1.25)	124.48(9.87)	3.09(1.48)	129.42(10.16)	7.10(2.38)	117.07(10.17)	8.03(2.22)	132.20(10.84)
M2		63.32(7.44)	334.22(17.14)	3.71(1.55)	401.25(18.86)	29.34(5.07)	246.80(15.02)	0.00(0.71)	276.15(16.04)
M3		67.34(7.54)	161.55(12.07)	160.00(10.28)	388.89(18.68)	64.25(7.84)	197.38(12.31)	81.24(7.62)	342.87(18.23)
CD(0.05)		**2.01**	**0.88**	**2.32**	**2.77**	**1.98**	**NS**	**2.00**	**2.71**
Mean of Factor-2									
S1		69.19(7.09)	337.31(16.89)	124.17(7.56)	530.67(22.18)	44.79(6.24)	172.05(11.76)	62.40(5.53)	279.24(16.57)
S2		47.26(5.55)	203.25(13.45)	41.70(4.72)	292.21(15.96)	33.67(5.08)	204.18(13.66)	16.68(2.97)	254.52(15.31)
S3		16.06(3.60)	79.69(8.74)	0.93(1.02)	96.68(9.56)	22.24(3.97)	185.02(12.08)	10.19(2.05)	217.46(13.22)
CD(0.05)		**1.34**	**3.24**	**2.11**	**3.14**	**1.66**	**NS**	**2.25**	**NS**
Interaction									
M and T		2.33	5.62	3.66	NS	NS	4.55	3.89	4.84
T and M		2.28	4.61	3.29	NS	NS	4.07	3.37	4.24
Experimental Mean		**5.41**	**13.02**	**4.44**	**15.9**	**5.1**	**12.5**	**3.52**	**15.03**

***(Values in parentheses are transformed values)**

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 Treatments	Sub plot Treatments	Ghaghraghat		Malan							
		Weed population no/m²		Weed population no/m² at Active tillering stage				Weed population no/m² at Panicle initiation stage			
		Active vegetative stage	Panicle initiation stage	Grasses	Sedges	BLW	Total weed population	Grasses	Sedges	BLW	Total weed population
M1	S1	19.00(4.39)	21.38(4.65)	23.00(4.83)	10.67(3.34)	11.00(3.38)	44.67(6.72)	30.00(5.52)	14.33(3.84)	17.33(4.22)	61.67(7.88)
	S2	14.67(3.88)	17.39(4.14)	14.67(3.89)	7.67(2.83)	8.67(3.02)	31.00(5.60)	22.00(4.73)	7.67(2.85)	15.00(3.92)	44.67(6.71)
	S3	13.37(3.70)	13.33(3.64)	6.33(2.59)	6.00(2.54)	6.00(2.54)	18.33(4.32)	6.67(2.66)	5.33(2.40)	5.67(2.45)	17.67(4.24)
M2	S1	25.00(5.03)	27.73(5.30)	39.00(6.27)	29.67(5.47)	39.33(6.31)	108.00(10.41)	35.00(5.95)	21.33(4.66)	24.67(5.00)	81.00(9.02)
	S2	18.00(4.25)	21.40(4.65)	20.00(4.53)	17.67(4.26)	18.00(4.28)	55.67(7.49)	20.67(4.59)	18.33(4.32)	17.67(4.24)	56.67(7.55)
	S3	16.00(3.98)	19.00(4.40)	6.33(2.58)	7.00(2.71)	6.00(2.52)	19.33(4.42)	7.67(2.85)	6.00(2.54)	6.67(2.67)	20.33(4.56)
M3	S1	31.40(5.63)	32.67(5.72)	45.67(6.79)	54.67(7.43)	47.00(6.87)	147.33(12.15)	44.33(6.69)	46.67(6.80)	53.00(7.31)	144.00(12.01)
	S2	23.67(4.91)	25.33(5.02)	27.67(5.30)	28.00(5.34)	23.00(4.82)	78.67(8.90)	31.00(5.60)	25.00(5.05)	21.00(4.63)	77.00(8.80)
	S3	19.43(4.45)	19.33(4.39)	9.00(3.08)	9.33(3.12)	5.33(2.41)	23.67(4.92)	8.67(2.99)	5.00(2.34)	11.00(3.39)	24.67(5.02)
Mean of Factor-1											
M1		15.68(3.99)	17.37(4.14)	14.67(3.77)	8.11(2.90)	8.56(2.98)	31.33(5.55)	19.56(4.30)	9.11(3.03)	12.67(3.53)	41.33(6.28)
M2		19.67(4.42)	22.71(4.78)	21.78(4.46)	18.11(4.15)	21.11(4.37)	61.00(7.44)	21.11(4.46)	15.22(3.84)	16.33(3.97)	52.67(7.04)
M3		24.83(5.00)	25.78(5.04)	27.44(5.06)	30.67(5.30)	25.11(4.70)	83.22(8.65)	28.00(5.09)	25.56(4.73)	28.33(5.11)	81.89(8.61)
CD(0.05)		**NS**	**NS**	**0.27**	**0.23**	**0.24**	**0.15**	**NS**	**0.46**	**0.15**	**0.41**
Mean of Factor-2											
S1		25.13(5.02)	27.26(5.23)	35.89(5.96)	31.67(5.41)	32.44(5.52)	100.00(9.76)	36.44(6.05)	27.44(5.10)	31.67(5.51)	95.56(9.64)
S2		18.78(4.35)	21.37(4.60)	20.78(4.57)	17.78(4.14)	16.56(4.04)	55.11(7.33)	24.56(4.97)	17.00(4.07)	17.89(4.27)	59.44(7.69)
S3		16.27(4.04)	17.22(4.14)	7.22(2.75)	7.44(2.79)	5.78(2.49)	20.44(4.55)	7.67(2.83)	5.44(2.43)	7.78(2.84)	20.89(4.61)
CD(0.05)		**0.63**	**0.85**	**0.38**	**0.39**	**0.47**	**0.53**	**0.4**	**0.53**	**0.43**	**0.45**
Interaction											
M and T		NS	NS	0.66	0.68	0.81	0.91	NS	0.91	0.74	0.78
T and M		NS	NS	0.56	0.57	0.67	0.75	NS	0.79	0.61	0.68
Experimental Mean		**4.47**	**4.66**	**4.43**	**4.12**	**4.02**	**7.21**	**4.62**	**3.87**	**4.2**	**7.31**

***(Values in parentheses are transformed values)**

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 Treatments	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
M1	S1	80.00(8.66)	96.00(9.23)	18.67(4.27)	194.67(13.51)	298.67(17.26)	36.00(6.02)	4.00(1.65)	338.67(18.40)
	S2	38.67(6.09)	102.67(9.63)	13.33(3.24)	154.67(12.33)	49.33(7.02)	10.67(3.30)	1.33(1.18)	61.33(7.85)
	S3	50.67(6.76)	2.67(1.44)	1.33(1.18)	54.67(7.01)	30.67(5.55)	0.00(0.71)	0.00(0.71)	30.67(5.55)
M2	S1	40.00(6.36)	108.00(9.82)	20.00(4.11)	168.00(12.79)	122.67(10.44)	40.00(6.36)	5.33(2.39)	168.00(12.58)
	S2	53.33(7.21)	82.67(8.89)	12.00(3.10)	148.00(12.10)	258.67(16.10)	18.67(4.36)	6.67(2.39)	284.00(16.87)
	S3	34.67(5.72)	24.00(4.81)	0.00(0.71)	58.67(7.45)	244.00(15.64)	8.00(2.86)	0.00(0.71)	252.00(15.89)
M3	S1	154.67(12.45)	21.33(4.34)	54.67(7.31)	230.67(15.20)	273.33(16.51)	0.00(0.71)	18.67(4.34)	292.00(17.08)
	S2	113.33(10.60)	21.33(4.21)	13.33(3.25)	148.00(12.17)	249.33(15.81)	16.00(4.06)	9.33(2.72)	274.67(16.59)
	S3	58.67(7.34)	5.33(2.12)	0.00(0.71)	64.00(7.83)	116.00(9.88)	0.00(0.71)	0.00(0.71)	116.00(9.88)
Mean of Factor-1									
M1		56.44(7.17)	67.11(6.77)	11.11(2.90)	134.67(10.95)	126.22(9.94)	15.56(3.34)	1.78(1.18)	143.56(10.60)
M2		42.67(6.43)	71.56(7.84)	10.67(2.64)	124.89(10.78)	208.44(14.06)	22.22(4.53)	4.00(1.83)	234.67(15.11)
M3		108.89(10.13)	16.00(3.56)	22.67(3.76)	147.56(11.74)	212.89(14.06)	5.33(1.83)	9.33(2.59)	227.56(14.51)
CD(0.05)		**1.26**	**NS**	**NS**	**NS**	**2.09**	**0.31**	**NS**	**1.73**
Mean of Factor-2									
S1		91.56(9.16)	75.11(7.80)	31.11(5.23)	197.78(13.84)	231.56(14.74)	25.33(4.37)	9.33(2.79)	266.22(16.02)
S2		68.44(7.97)	68.89(7.58)	12.89(3.20)	150.22(12.20)	185.78(12.98)	15.11(3.91)	5.78(2.09)	206.67(13.77)
S3		48.00(6.60)	10.67(2.79)	0.44(0.86)	59.11(7.43)	130.22(10.35)	2.67(1.42)	0.00(0.71)	132.89(10.44)
CD(0.05)		**1.92**	**2.92**	**1.77**	**2.59**	**2.36**	**0.42**	**1.03**	**2.25**
Interaction									
M and T		NS	NS	NS	NS	4.09	0.72	NS	3.89
T and M		NS	NS	NS	NS	3.54	0.61	NS	3.31
Experimental Mean		**7.91**	**6.05**	**3.1**	**11.16**	**12.69**	**3.23**	**1.86**	**13.41**

***(Values in parentheses are transformed values)**

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 Treatments	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	5.52(2.45)	3.96(2.08)	3.18(1.92)	12.67(3.63)	3.54(2.01)	4.15(2.15)	3.44(1.97)	11.12(3.41)
	S2	4.04(2.13)	2.41(1.70)	2.17(1.63)	8.63(3.02)	3.85(2.08)	4.25(2.18)	3.04(1.88)	11.14(3.41)
	S3	3.23(1.93)	1.76(1.49)	3.05(1.88)	8.04(2.92)	2.82(1.81)	3.43(1.98)	3.14(1.90)	9.40(3.14)
M2	S1	6.01(2.55)	4.88(2.31)	3.33(1.95)	14.22(3.84)	3.29(1.95)	4.45(2.22)	4.06(2.11)	11.80(3.50)
	S2	3.06(1.89)	2.95(1.86)	2.59(1.75)	8.59(3.01)	3.01(1.87)	3.92(2.10)	3.17(1.91)	10.10(3.25)
	S3	2.20(1.64)	2.37(1.69)	2.79(1.81)	7.36(2.80)	1.89(1.55)	2.21(1.65)	2.73(1.79)	6.83(2.70)
M3	S1	6.02(2.55)	6.32(2.61)	4.94(2.33)	17.28(4.21)	5.41(2.42)	7.86(2.89)	4.31(2.19)	17.59(4.25)
	S2	4.10(2.11)	4.48(2.20)	3.68(2.04)	12.26(3.57)	4.03(2.12)	6.12(2.56)	4.04(2.13)	14.18(3.82)
	S3	1.82(1.52)	2.80(1.81)	3.54(2.00)	8.15(2.94)	3.11(1.88)	3.11(1.90)	3.15(1.91)	9.37(3.14)
Mean of Factor-1									
M1		4.26(2.17)	2.71(1.76)	2.80(1.81)	9.78(3.19)	3.40(1.97)	3.94(2.10)	3.21(1.92)	10.55(3.32)
M2		3.76(2.03)	3.40(1.95)	2.90(1.83)	10.06(3.22)	2.73(1.79)	3.52(1.99)	3.32(1.94)	9.58(3.15)
M3		3.98(2.06)	4.53(2.21)	4.05(2.12)	12.56(3.57)	4.18(2.14)	5.70(2.45)	3.83(2.08)	13.71(3.74)
CD(0.05)		**NS**	**0.10**	**0.05**	**0.11**	**NS**	**0.13**	**NS**	**0.19**
Mean of Factor-2									
S1		5.85(2.52)	5.05(2.33)	3.82(2.07)	14.72(3.89)	4.08(2.13)	5.49(2.42)	3.94(2.09)	13.50(3.72)
S2		3.73(2.04)	3.28(1.92)	2.81(1.81)	9.83(3.20)	3.63(2.02)	4.76(2.28)	3.42(1.97)	11.81(3.50)
S3		2.41(1.70)	2.31(1.67)	3.13(1.90)	7.85(2.89)	2.61(1.75)	2.92(1.84)	3.01(1.87)	8.53(2.99)
CD(0.05)		**0.2**	**0.23**	**0.19**	**0.19**	**0.19**	**0.19**	**NS**	**0.19**
Interaction									
M and T		NS	NS	NS	NS	NS	0.33	NS	0.33
T and M		NS	NS	NS	NS	NS	0.28	NS	0.29
Experimental Mean		**2.08**	**1.97**	**1.92**	**3.33**	**1.97**	**2.18**	**1.98**	**3.4**

***(Values in parentheses are transformed values)**

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 Treatments	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	308.33(17.54)	300.67(17.35)	126.00(11.21)	735.00(27.12)	645.00(25.27)	426.67(20.66)	227.67(15.05)	1299.33(35.96)
	S2	135.00(11.64)	233.67(15.30)	63.33(7.95)	432.00(20.78)	320.67(17.91)	328.00(18.10)	119.33(10.89)	768.00(27.72)
	S3	93.67(9.65)	175.00(13.10)	44.33(6.65)	313.00(17.66)	241.67(15.44)	251.00(15.72)	94.67(9.68)	587.33(24.24)
M2	S1	323.00(17.91)	281.00(16.75)	113.67(10.64)	717.67(26.76)	595.33(24.40)	401.67(20.02)	209.33(14.44)	1206.33(34.73)
	S2	131.00(11.42)	210.67(14.51)	67.33(8.23)	409.00(20.22)	305.00(17.46)	298.67(17.27)	114.33(10.71)	718.00(26.79)
	S3	110.00(10.44)	190.67(13.75)	49.33(7.05)	350.00(18.66)	255.33(15.86)	255.00(15.90)	91.00(9.55)	601.33(24.44)
M3	S1	395.67(19.80)	265.00(16.29)	118.67(10.92)	779.33(27.88)	762.33(27.61)	370.00(19.24)	213.33(14.62)	1345.67(36.68)
	S2	150.33(12.25)	237.33(15.42)	62.00(7.90)	449.67(21.21)	352.67(18.76)	321.00(17.93)	122.00(11.02)	795.67(28.21)
	S3	114.67(10.71)	187.00(13.65)	58.67(7.67)	360.33(18.96)	249.33(15.79)	260.00(16.08)	102.33(10.13)	611.67(24.72)
Mean of Factor-1									
M1		179.00(12.94)	236.44(15.25)	77.89(8.61)	493.33(21.86)	402.44(19.54)	335.22(18.16)	147.22(11.87)	884.89(29.30)
M2		188.00(13.26)	227.44(15.01)	76.78(8.64)	492.22(21.88)	385.22(19.24)	318.44(17.73)	138.22(11.56)	841.89(28.65)
M3		220.22(14.26)	229.78(15.12)	79.78(8.83)	529.78(22.68)	454.78(20.72)	317.00(17.75)	145.89(11.93)	917.67(29.87)
CD(0.05)		**0.62**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
Mean of Factor-2									
S1		342.33(18.42)	282.22(16.80)	119.44(10.92)	744.00(27.25)	667.56(25.76)	399.44(19.97)	216.78(14.70)	1283.78(35.79)
S2		138.78(11.77)	227.22(15.08)	64.22(8.03)	430.22(20.74)	326.11(18.04)	315.89(17.77)	118.56(10.87)	760.56(27.57)
S3		106.11(10.27)	184.22(13.50)	50.78(7.12)	341.11(18.43)	248.78(15.70)	255.33(15.90)	96.00(9.79)	600.11(24.46)
CD(0.05)		**1.71**	**1.17**	**0.71**	**1.39**	**1.48**	**1.31**	**1.00**	**1.52**
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		**13.48**	**15.13**	**8.69**	**22.14**	**19.83**	**17.88**	**11.79**	**29.27**

*(Values in parentheses are transformed values)

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 Treatments	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	36.00(6.02)	25.33(5.07)	7.28(2.79)	68.61(8.30)	54.67(7.43)	25.33(5.08)	32.00(5.69)	112.00(10.61)
	S2	5.33(2.39)	5.33(2.39)	4.16(2.15)	14.83(3.90)	12.00(3.54)	5.33(2.39)	5.33(2.39)	22.67(4.80)
	S3	5.33(2.39)	2.67(1.65)	2.08(1.59)	10.08(3.25)	6.67(2.65)	5.33(2.39)	6.67(2.65)	18.67(4.36)
M2	S1	49.33(7.03)	34.67(5.90)	16.67(4.14)	100.67(10.04)	93.33(9.68)	44.00(6.67)	45.33(6.76)	182.67(13.53)
	S2	9.33(3.11)	5.33(2.39)	2.67(1.76)	17.33(4.22)	16.00(4.04)	8.00(2.86)	5.33(2.39)	29.33(5.42)
	S3	5.33(2.31)	5.33(2.39)	2.00(1.47)	12.67(3.51)	8.00(2.86)	5.33(2.39)	4.00(1.91)	17.33(4.13)
M3	S1	49.83(7.09)	24.00(4.94)	16.67(4.13)	90.50(9.54)	78.67(8.88)	44.00(6.65)	40.00(6.36)	162.67(12.76)
	S2	8.67(3.01)	5.33(2.39)	6.67(2.67)	20.67(4.59)	10.67(3.33)	5.33(2.39)	5.33(2.39)	21.33(4.67)
	S3	3.00(1.69)	4.00(1.91)	5.00(2.30)	12.00(3.45)	10.67(3.33)	5.33(2.39)	2.67(1.65)	18.67(4.34)
Mean of Factor-1									
M1		15.56(3.60)	11.11(3.03)	4.51(2.18)	31.17(5.15)	24.44(4.54)	12.00(3.28)	14.67(3.58)	51.11(6.59)
M2		21.33(4.15)	15.11(3.56)	7.11(2.46)	43.56(5.92)	39.11(5.53)	19.11(3.97)	18.22(3.69)	76.44(7.69)
M3		20.50(3.93)	11.11(3.08)	9.44(3.03)	41.06(5.86)	33.33(5.18)	18.22(3.81)	16.00(3.46)	67.56(7.26)
CD(0.05)		**NS**	**NS**	**0.41**	**NS**	**0.44**	**0.19**	**NS**	**NS**
Mean of Factor-2									
S1		45.06(6.72)	28.00(5.30)	13.54(3.69)	86.59(9.29)	75.56(8.66)	37.78(6.13)	39.11(6.27)	152.44(12.30)
S2		7.78(2.84)	5.33(2.39)	4.50(2.19)	17.61(4.24)	12.89(3.64)	6.22(2.54)	5.33(2.39)	24.44(4.96)
S3		4.56(2.13)	4.00(1.98)	3.03(1.79)	11.58(3.40)	8.44(2.95)	5.33(2.39)	4.44(2.07)	18.22(4.28)
CD(0.05)		**0.6**	**0.66**	**0.34**	**0.66**	**0.45**	**0.56**	**0.65**	**0.68**
Interaction									
M and T		NS	NS	0.59	NS	0.78	NS	NS	1.17
T and M		NS	NS	0.54	NS	0.68	NS	NS	1
Experimental Mean		**3.9**	**3.22**	**2.56**	**5.64**	**5.08**	**3.69**	**3.58**	**7.18**

***(Values in parentheses are transformed values)**

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 Treatments	Sub plot Treatments	Pattambi								
		Weed population no/m² at Active tillering stage				Weed population no/m² at panicle initiation stage				
		Grasses	Sedges	Aquatic weed	Total weed population	Grasses	Sedges	BLW	Aquatic weed	Total weed population
M1	S1	21.67(4.69)	10.67(2.94)	3.00(1.68)	35.33(5.87)	8.67(3.02)	4.33(2.18)	9.67(3.18)	0.33(0.88)	23.00(4.85)
	S2	12.00(3.52)	2.33(1.38)	4.00(1.94)	18.33(4.30)	7.33(2.74)	3.67(2.02)	2.00(1.56)	1.00(1.17)	14.00(3.79)
	S3	8.33(2.94)	1.33(1.18)	1.33(1.18)	11.00(3.36)	5.00(2.34)	0.67(1.00)	1.00(1.17)	1.00(1.10)	7.67(2.85)
M2	S1	14.00(3.79)	15.33(3.96)	5.33(2.18)	34.67(5.93)	13.00(3.65)	2.00(1.47)	4.67(2.27)	0.00(0.71)	19.67(4.48)
	S2	8.00(2.88)	1.33(1.18)	2.33(1.54)	11.67(3.49)	9.33(3.06)	0.33(0.88)	7.33(2.74)	0.00(0.71)	17.00(4.18)
	S3	6.67(2.65)	0.00(0.71)	0.00(0.71)	6.67(2.65)	5.33(2.41)	0.00(0.71)	3.67(1.86)	5.67(2.41)	14.67(3.89)
M3	S1	17.33(4.22)	12.67(3.60)	3.33(1.73)	33.33(5.81)	5.00(2.34)	5.67(2.22)	11.67(3.41)	3.33(1.77)	25.67(5.11)
	S2	6.67(2.65)	7.67(2.85)	2.00(1.47)	16.33(4.10)	4.67(2.21)	3.67(2.02)	5.33(2.31)	1.00(1.10)	14.67(3.86)
	S3	6.33(2.58)	0.00(0.71)	0.00(0.71)	6.33(2.58)	2.67(1.72)	0.00(0.71)	2.00(1.43)	0.67(1.00)	5.33(2.35)
Mean of Factor-1										
M1		14.00(3.72)	4.78(1.84)	2.78(1.60)	21.56(4.51)	7.00(2.70)	2.89(1.73)	4.22(1.97)	0.78(1.05)	14.89(3.83)
M2		9.56(3.11)	5.56(1.95)	2.56(1.48)	17.67(4.02)	9.22(3.04)	0.78(1.02)	5.22(2.29)	1.89(1.28)	17.11(4.18)
M3		10.11(3.15)	6.78(2.39)	1.78(1.30)	18.67(4.17)	4.11(2.09)	3.11(1.65)	6.33(2.38)	1.67(1.29)	15.22(3.77)
CD(0.05)		**0.27**	**NS**	**NS**	**NS**	**0.44**	**NS**	**NS**	**NS**	**0.21**
Mean of Factor-2										
S1		17.67(4.23)	12.89(3.50)	3.89(1.86)	34.44(5.87)	8.89(3.00)	4.00(1.96)	8.67(2.95)	1.22(1.12)	22.78(4.81)
S2		8.89(3.02)	3.78(1.80)	2.78(1.65)	15.44(3.96)	7.11(2.67)	2.56(1.64)	4.89(2.21)	0.67(0.99)	15.22(3.94)
S3		7.11(2.73)	0.44(0.86)	0.44(0.86)	8.00(2.87)	4.33(2.16)	0.22(0.80)	2.22(1.48)	2.44(1.50)	9.22(3.03)
CD(0.05)		**0.38**	**0.97**	**0.8**	**0.58**	**0.46**	**0.65**	**0.67**	**NS**	**0.41**
Interaction										
M and T		NS	NS	NS	NS	NS	NS	NS	0.98	0.71
T and M		NS	NS	NS	NS	NS	NS	NS	0.86	0.59
Experimental Mean		**3.32**	**2.06**	**1.46**	**4.23**	**2.61**	**1.47**	**2.21**	**1.2**	**3.93**

***(Values in parentheses are transformed values)**

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 Treatments	Sub plot Treatments	Puducherry											
		Weed population no/m² at Active vegetative stage				Weed population no/m² at Panicle initiation stage				Weed population no/m² at heading stage			
		Grasses	Sedges	BLW	Total weed population	Grasses	Sedges	BLW	Total weed population	Grasses	Sedges	BLW	Total weed population
M1	S1	63.42(7.99)	30.69(5.58)	30.10(5.53)	124.21(11.17)	60.00(7.78)	35.36(5.99)	31.99(5.70)	127.35(11.31)	42.82(6.58)	31.49(5.65)	35.08(5.96)	109.39(10.48)
	S2	41.55(6.48)	24.62(5.01)	24.85(5.03)	91.02(9.57)	32.83(5.77)	20.47(4.58)	20.64(4.60)	73.93(8.63)	19.80(4.50)	13.98(3.81)	17.20(4.21)	50.98(7.17)
	S3	28.19(5.36)	20.23(4.55)	19.49(4.47)	67.91(8.27)	20.12(4.54)	15.00(3.94)	15.99(4.06)	51.11(7.18)	11.22(3.42)	10.97(3.39)	10.86(3.37)	33.06(5.79)
M2	S1	71.95(8.51)	42.97(6.59)	40.66(6.41)	155.57(12.49)	62.32(7.92)	40.74(6.42)	44.56(6.71)	147.61(12.17)	51.20(7.19)	39.01(6.28)	47.28(6.91)	137.49(11.75)
	S2	56.37(7.54)	35.84(6.03)	31.01(5.61)	123.22(11.12)	42.74(6.57)	27.99(5.34)	25.13(5.06)	95.86(9.82)	27.23(5.27)	20.54(4.59)	21.53(4.69)	69.30(8.35)
	S3	44.59(6.71)	27.87(5.32)	23.51(4.90)	95.96(9.82)	33.63(5.84)	19.66(4.49)	19.20(4.44)	72.49(8.54)	23.56(4.91)	16.82(4.16)	15.24(3.97)	55.63(7.49)
M3	S1	-	-	-	-	-	-	-	-	-	-	-	-
	S2	-	-	-	-	-	-	-	-	-	-	-	-
	S3	-	-	-	-	-	-	-	-	-	-	-	-
Mean of Factor-1													
M1		44.38(6.61)	25.18(5.05)	24.81(5.01)	94.38(9.67)	37.65(6.03)	23.61(4.83)	22.87(4.78)	84.13(9.04)	24.61(4.84)	18.82(4.28)	21.05(4.51)	64.48(7.82)
M2		57.64(7.59)	35.56(5.98)	31.72(5.64)	124.92(11.14)	46.23(6.78)	29.46(5.42)	29.63(5.40)	105.32(10.18)	34.00(5.79)	25.46(5.01)	28.02(5.19)	87.47(9.20)
M3		-	-	-	-	-	-	-	-	-	-	-	-
CD(0.05)		**0.14**	**0.15**	**0.06**	**0.18**	**0.12**	**0.15**	**0.07**	**0.19**	**0.05**	**0.15**	**0.03**	**0.13**
Mean of Factor-2													
S1		67.68(8.25)	36.83(6.09)	35.38(5.97)	139.89(11.83)	61.16(7.85)	38.05(6.20)	38.27(6.21)	137.48(11.74)	47.01(6.89)	35.25(5.97)	41.18(6.44)	123.44(11.11)
S2		48.96(7.01)	30.23(5.52)	27.93(5.32)	107.12(10.34)	37.78(6.17)	24.23(4.96)	22.88(4.83)	84.89(9.22)	23.51(4.89)	17.26(4.20)	19.36(4.45)	60.14(7.76)
S3		36.39(6.03)	24.05(4.94)	21.50(4.68)	81.94(9.05)	26.87(5.19)	17.33(4.21)	17.60(4.25)	61.80(7.86)	17.39(4.16)	13.90(3.77)	13.05(3.67)	44.34(6.64)
CD(0.05)		**0.11**	**0.11**	**0.06**	**0.16**	**0.11**	**0.11**	**0.05**	**0.14**	**0.07**	**0.1**	**0.07**	**0.11**
Interaction													
M and T		0.16	0.15	0.09	NS	0.15	0.15	0.08	0.2	0.1	NS	0.1	0.15
T and M		0.17	0.17	0.08	NS	0.16	0.17	0.09	0.22	0.09	NS	0.08	0.16
Experimental Mean		**7.1**	**5.52**	**5.33**	**10.41**	**6.4**	**5.12**	**5.09**	**9.61**	**5.31**	**4.65**	**4.85**	**8.51**

***(Values in parentheses are transformed values)**

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 Treatments	Sub plot Treatments	Pusa							
		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	46.67(6.86)	16.00(4.04)	21.67(4.62)	84.33(9.20)	22.67(4.78)	14.67(3.84)	24.00(4.86)	61.33(7.84)
	S2	16.67(4.13)	5.33(2.39)	7.33(2.79)	29.33(5.46)	13.33(3.68)	5.33(2.39)	8.00(2.92)	26.67(5.19)
	S3	15.33(3.87)	6.67(2.39)	8.00(2.92)	30.00(5.40)	13.33(3.66)	9.33(2.77)	9.33(3.06)	32.00(5.51)
M2	S1	42.67(6.54)	13.33(3.57)	24.67(5.01)	80.67(9.00)	25.33(5.07)	13.33(3.57)	24.67(5.01)	63.33(7.97)
	S2	18.67(4.36)	6.67(2.39)	9.33(3.06)	34.67(5.91)	18.67(4.36)	6.67(2.39)	9.33(3.06)	34.67(5.91)
	S3	13.33(3.71)	4.00(1.91)	13.33(3.59)	30.67(5.53)	12.00(3.50)	4.00(1.91)	18.67(4.26)	34.67(5.90)
M3	S1	73.33(8.57)	26.67(5.19)	30.67(5.58)	130.67(11.43)	45.33(6.75)	24.00(4.90)	29.33(5.45)	98.67(9.95)
	S2	24.67(5.02)	13.33(3.66)	8.00(2.77)	46.00(6.80)	17.33(4.22)	13.33(3.68)	9.33(3.03)	40.00(6.33)
	S3	18.67(4.37)	8.00(2.86)	12.00(3.50)	38.67(6.25)	18.67(4.37)	8.00(2.86)	12.00(3.50)	38.67(6.25)
Mean of Factor-1									
M1		26.22(4.95)	9.33(2.94)	12.33(3.44)	47.89(6.69)	16.44(4.04)	9.78(3.00)	13.78(3.61)	40.00(6.18)
M2		24.89(4.87)	8.00(2.62)	15.78(3.89)	48.67(6.82)	18.67(4.31)	8.00(2.62)	17.56(4.11)	44.22(6.60)
M3		38.89(5.99)	16.00(3.90)	16.89(3.95)	71.78(8.16)	27.11(5.11)	15.11(3.81)	16.89(4.00)	59.11(7.51)
CD(0.05)		**0.28**	**NS**	**NS**	**0.62**	**0.36**	**NS**	**NS**	**NS**
Mean of Factor-2									
S1		54.22(7.32)	18.67(4.27)	25.67(5.07)	98.56(9.88)	31.11(5.53)	17.33(4.10)	26.00(5.11)	74.44(8.59)
S2		20.00(4.50)	8.44(2.81)	8.22(2.88)	36.67(6.06)	16.44(4.09)	8.44(2.82)	8.89(3.00)	33.78(5.81)
S3		15.78(3.98)	6.22(2.39)	11.11(3.34)	33.11(5.73)	14.67(3.85)	7.11(2.51)	13.33(3.61)	35.11(5.89)
CD(0.05)		**0.67**	**0.9**	**0.76**	**0.75**	**0.61**	**1.11**	**0.81**	**0.83**
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		**5.27**	**3.15**	**3.76**	**7.22**	**4.49**	**3.14**	**3.91**	**6.76**

***(Values in parentheses are transformed values)**

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 Treatments	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	163.00(12.77)	61.00(7.84)	81.67(9.05)	305.67(17.48)	10.67(3.34)	21.67(4.70)	34.33(5.90)	66.67(8.19)
	S2	111.33(10.57)	57.00(7.57)	6.67(2.66)	175.00(13.25)	24.67(5.01)	28.33(5.37)	3.67(2.03)	56.67(7.55)
	S3	6.00(2.53)	76.33(8.76)	21.33(4.66)	103.67(10.20)	5.33(2.41)	35.33(5.98)	12.00(3.53)	52.67(7.29)
M2	S1	201.00(14.19)	27.00(5.23)	81.33(9.04)	309.33(17.60)	12.33(3.57)	41.33(6.45)	13.33(3.71)	67.00(8.21)
	S2	40.00(6.36)	75.00(8.69)	42.00(6.50)	157.00(12.55)	14.67(3.88)	18.67(4.37)	22.67(4.81)	56.00(7.52)
	S3	9.33(3.13)	22.00(4.73)	38.67(6.23)	70.00(8.39)	6.33(2.60)	39.67(6.33)	4.67(2.26)	50.67(7.15)
M3	S1	105.67(10.30)	323.67(18.00)	7.67(2.85)	437.00(20.91)	3.67(2.02)	58.33(7.67)	3.33(1.94)	65.33(8.11)
	S2	87.67(9.38)	302.33(17.40)	26.00(5.13)	416.00(20.40)	6.33(2.59)	60.67(7.82)	3.33(1.95)	70.33(8.41)
	S3	23.33(4.85)	161.33(12.72)	68.00(8.28)	252.67(15.91)	15.33(3.98)	30.67(5.58)	13.67(3.75)	59.67(7.75)
Mean of Factor-1									
M1		93.44(8.62)	64.78(8.05)	36.56(5.46)	194.78(13.64)	13.56(3.59)	28.44(5.35)	16.67(3.82)	58.67(7.68)
M2		83.44(7.89)	41.33(6.22)	54.00(7.26)	178.78(12.84)	11.11(3.35)	33.22(5.72)	13.56(3.60)	57.89(7.63)
M3		72.22(8.18)	262.44(16.04)	33.89(5.42)	368.56(19.07)	8.44(2.86)	49.89(7.02)	6.78(2.55)	65.11(8.09)
CD(0.05)		**NS**	**0.10**	**0.21**	**0.40**	**0.16**	**0.12**	**0.17**	**0.10**
Mean of Factor-2									
S1		156.56(12.42)	137.22(10.35)	56.89(6.98)	350.67(18.66)	8.89(2.97)	40.44(6.27)	17.00(3.85)	66.33(8.17)
S2		79.67(8.77)	144.78(11.22)	24.89(4.76)	249.33(15.40)	15.22(3.83)	35.89(5.85)	9.89(2.93)	61.00(7.83)
S3		12.89(3.50)	86.56(8.74)	42.67(6.39)	142.11(11.50)	9.00(3.00)	35.22(5.97)	10.11(3.18)	54.33(7.40)
CD(0.05)		**0.29**	**0.57**	**0.54**	**0.57**	**0.39**	**0.29**	**0.29**	**0.25**
Interaction									
M and T		0.51	0.98	0.94	0.99	0.68	0.49	0.5	0.43
T and M		0.56	0.8	0.78	0.84	0.56	0.41	0.42	0.36
Experimental Mean		**8.23**	**10.10**	**6.04**	**15.19**	**3.27**	**6.03**	**3.32**	**7.8**

***(Values in parentheses are transformed values)**

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 Treatments	Sub plot Treatments	Titabar							
		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	30.33(5.53)	12.33(3.57)	8.67(3.02)	51.33(7.19)	34.00(5.87)	14.67(3.86)	10.67(3.34)	59.33(7.73)
	S2	25.00(5.04)	5.67(2.48)	7.00(2.73)	37.67(6.17)	33.33(5.76)	9.33(3.13)	8.33(2.94)	51.00(7.12)
	S3	16.67(4.14)	4.67(2.27)	4.00(2.11)	25.33(5.08)	22.67(4.81)	8.00(2.91)	6.00(2.54)	36.67(6.10)
M2	S1	32.33(5.72)	11.33(3.43)	13.67(3.76)	57.33(7.60)	37.00(6.11)	14.33(3.83)	16.00(4.04)	67.33(8.24)
	S2	26.00(5.15)	7.00(2.73)	11.33(3.44)	44.33(6.70)	29.33(5.46)	10.33(3.27)	14.00(3.79)	53.67(7.35)
	S3	19.67(4.49)	5.67(2.48)	7.33(2.79)	32.67(5.76)	26.33(5.17)	10.33(3.29)	9.33(3.12)	46.00(6.81)
M3	S1	43.33(6.61)	13.33(3.69)	14.33(3.84)	71.00(8.45)	48.33(6.99)	16.33(4.06)	16.00(4.05)	80.67(9.00)
	S2	29.33(5.46)	3.67(2.04)	11.33(3.44)	44.33(6.69)	37.00(6.12)	6.00(2.54)	16.67(4.14)	59.67(7.76)
	S3	22.67(4.81)	4.33(2.20)	8.33(2.97)	35.33(5.99)	31.00(5.61)	6.00(2.54)	11.67(3.48)	48.67(7.01)
Mean of Factor-1									
M1		24.00(4.90)	7.56(2.77)	6.56(2.62)	38.11(6.14)	30.00(5.48)	10.67(3.30)	8.33(2.94)	49.00(6.98)
M2		26.00(5.12)	8.00(2.88)	10.78(3.33)	44.78(6.69)	30.89(5.58)	11.67(3.46)	13.11(3.65)	55.67(7.46)
M3		31.78(5.63)	7.11(2.64)	11.33(3.42)	50.22(7.04)	38.78(6.24)	9.44(3.05)	14.78(3.89)	63.00(7.92)
CD(0.05)		**0.33**	**NS**	**0.14**	**0.23**	**0.35**	**NS**	**0.23**	**0.3**
Mean of Factor-2									
S1		35.33(5.95)	12.33(3.56)	12.22(3.54)	59.89(7.75)	39.78(6.32)	15.11(3.92)	14.22(3.81)	69.11(8.32)
S2		26.78(5.21)	5.44(2.42)	9.89(3.20)	42.11(6.52)	33.22(5.78)	8.56(2.98)	13.00(3.62)	54.78(7.41)
S3		19.67(4.48)	4.89(2.32)	6.56(2.62)	31.11(5.61)	26.67(5.19)	8.11(2.91)	9.00(3.05)	43.78(6.64)
CD(0.05)		**0.36**	**0.29**	**0.27**	**0.3**	**0.42**	**0.41**	**0.32**	**0.41**
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**	**2.77**	**3.12**	**6.62**	**5.77**	**3.27**	**3.49**	**7.46**

***(Values in parentheses are transformed values)**

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 Treatments	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	46.33(6.66)	282.33(16.82)	11.00(3.38)	339.67(18.44)	33.33(5.78)	311.33(17.62)	14.33(3.85)	359.00(18.94)
	S2	41.67(6.36)	289.33(17.02)	11.67(3.48)	342.67(18.52)	40.67(6.33)	303.33(17.35)	12.67(3.63)	356.67(18.83)
	S3	34.33(5.74)	284.00(16.86)	10.33(3.29)	328.67(18.13)	28.00(5.32)	253.00(15.85)	10.00(3.20)	291.00(17.01)
M2	S1	35.67(6.01)	59.00(7.71)	31.00(5.54)	125.67(11.23)	75.33(8.71)	467.33(21.53)	14.00(3.74)	556.67(23.54)
	S2	30.33(5.55)	80.33(8.93)	10.33(3.28)	121.00(10.99)	52.33(7.26)	544.33(23.34)	15.33(3.98)	612.00(24.75)
	S3	23.00(4.82)	57.00(7.50)	23.33(4.88)	103.33(10.17)	51.67(7.22)	304.00(17.45)	17.00(4.17)	372.67(19.31)
M3	S1	31.67(5.67)	63.33(7.97)	16.67(4.13)	111.67(10.58)	63.33(7.99)	510.00(22.59)	18.33(4.31)	591.67(24.33)
	S2	31.33(5.59)	67.33(8.20)	20.33(4.50)	119.00(10.87)	55.33(7.47)	465.33(21.58)	20.00(4.51)	540.67(23.26)
	S3	25.33(5.08)	80.33(8.89)	35.33(5.78)	141.00(11.76)	66.67(8.19)	237.33(15.42)	14.00(3.78)	318.00(17.85)
Mean of Factor-1									
M1		40.78(6.25)	285.22(16.90)	11.00(3.38)	337.00(18.36)	34.00(5.81)	289.22(16.94)	12.33(3.56)	335.56(18.26)
M2		29.67(5.46)	65.44(8.05)	21.56(4.57)	116.67(10.80)	59.78(7.73)	438.56(20.77)	15.44(3.96)	513.78(22.53)
M3		29.44(5.45)	70.33(8.35)	24.11(4.80)	123.89(11.07)	61.78(7.88)	404.22(19.86)	17.44(4.20)	483.44(21.81)
CD(0.05)		**NS**	**0.84**	**NS**	**1.01**	**0.23**	**1.35**	**NS**	**1.28**
Mean of Factor-2									
S1		37.89(6.11)	134.89(10.83)	19.56(4.35)	192.33(13.41)	57.33(7.49)	429.56(20.58)	15.56(3.96)	502.44(22.27)
S2		34.44(5.83)	145.67(11.38)	14.11(3.75)	194.22(13.46)	49.44(7.02)	437.67(20.76)	16.00(4.04)	503.11(22.28)
S3		27.56(5.21)	140.44(11.09)	23.00(4.65)	191.00(13.35)	48.78(6.91)	264.78(16.24)	13.67(3.72)	327.22(18.06)
CD(0.05)		**0.4**	**NS**	**NS**	**NS**	**NS**	**1.21**	**NS**	**1.08**
Interaction									
M and T		NS	NS	1.26	NS	NS	2.1	NS	1.87
T and M		NS	NS	1.18	NS	NS	1.89	NS	1.71
Experimental Mean		**5.72**	**11.10**	**4.25**	**13.41**	**7.14**	**19.19**	**3.91**	**20.87**

*(Values in parentheses are transformed values)

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: Species wise Weed population no/m² of Long term trial on weed dynamics in rice based cropping systems under different establishment methods, *Kharif* 2022.

Main plot Treatments	Sub plot Treatments	Chatha							
		Weed population no/m² 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)	66.67(8.19)	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)	5.00(2.35)	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)	7.67(2.86)	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)	75.33(8.71)	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)	7.67(2.85)	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)	11.00(3.39)	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)	80.67(9.01)	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)	9.33(3.13)	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)	10.67(3.33)	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)	26.44(4.47)	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)	31.33(4.98)	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)	33.56(5.16)	1.78(1.49)	1.78(1.50)	55.11(6.96)
CD(0.05)		**NS**	**0.05**	**NS**	**NS**	**0.26**	**0.09**	**0.12**	**0.22**
Mean of Factor-2									
S1		10.44(3.30)	13.78(3.77)	23.22(4.87)	1.67(1.44)	74.22(8.64)	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)	7.33(2.78)	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)	9.78(3.19)	0.67(1.05)	0.89(1.11)	42.89(6.57)
CD(0.05)		**0.3**	**0.14**	**0.29**	**0.22**	**0.15**	**0.25**	**NS**	**0.2**
Interaction									
M and T		NS	NS	NS	NS	NS	NS	NS	0.35
T and M		NS	NS	NS	NS	NS	NS	NS	0.32
Experimental Mean		**2.04**	**2.3**	**2.78**	**1.21**	**4.87**	**1.26**	**1.24**	**6.59**

***(Values in parentheses are transformed values)**

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 Treatments	Sub plot Treatments	Chatha							
		Weed population no/m² 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)	35.33(5.99)	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)	1.33(1.34)	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)	29.33(5.46)	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)	46.00(6.82)	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)	2.33(1.68)	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)	35.00(5.96)	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)	45.33(6.77)	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)	1.33(1.34)	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)	40.33(6.39)	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)	22.00(4.26)	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)	27.78(4.82)	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)	29.00(4.83)	3.67(1.93)	3.22(1.85)	97.44(9.09)
CD(0.05)		**0.05**	**0.15**	**0.16**	**0.24**	**0.03**	**0.12**	**0.19**	**0.2**
Mean of Factor-2									
S1		20.11(4.53)	32.44(5.73)	45.44(6.75)	6.00(2.50)	42.22(6.52)	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)	1.67(1.45)	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)	34.89(5.93)	1.00(1.19)	1.22(1.29)	32.00(5.67)
CD(0.05)		**0.19**	**0.23**	**0.22**	**0.22**	**0.2**	**0.21**	**0.19**	**0.17**
Interaction									
M and T		0.33	NS	0.38	0.38	0.35	0.36	NS	0.3
T and M		0.27	NS	0.32	0.34	0.28	0.3	NS	0.27
Experimental Mean		**3.36**	**3.77**	**3.93**	**1.73**	**4.64**	**1.67**	**1.69**	**8.43**

*(Values in parentheses are transformed values)

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 Treatments	Sub plot Treatments	Gangavathi								
		Weed population no/m² at Active tillering stage								
		Grasses				Sedges	BLW			Total weed population
		Dinebra retroflexa	*Panicum repense*	*Paspalum scrobiculatum*	*Echinochloa colona*	*Cyperus iria*	*Ammania baccifera*	*Astercantha longifolia*	*Cynotis cristata*	
M1	S1	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.93(1.08)	274.29(15.63)	0.93(1.08)	0.00(0.71)	0.93(1.08)	277.07(15.73)
	S2	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	57.45(7.57)	3.71(1.83)	0.00(0.71)	3.71(1.83)	64.87(8.03)
	S3	0.00(0.71)	0.93(1.08)	0.00(0.71)	3.71(1.61)	41.70(6.41)	0.00(0.71)	0.00(0.71)	0.00(0.71)	46.33(6.73)
M2	S1	0.00(0.71)	6.49(2.36)	90.81(9.54)	19.46(4.28)	624.57(24.77)	5.56(1.85)	0.93(1.08)	3.71(1.61)	751.53(27.25)
	S2	0.00(0.71)	0.00(0.71)	25.95(4.32)	20.39(3.55)	270.59(16.28)	0.00(0.71)	0.00(0.71)	0.93(1.08)	317.85(17.76)
	S3	0.00(0.71)	16.68(3.60)	0.00(0.71)	10.19(2.33)	107.49(10.37)	0.00(0.71)	0.00(0.71)	0.00(0.71)	134.37(11.59)
M3	S1	12.05(3.51)	0.00(0.71)	47.26(5.65)	30.58(4.64)	113.05(10.27)	0.00(0.71)	277.07(16.19)	83.40(8.95)	563.41(23.57)
	S2	4.63(1.74)	15.75(2.78)	39.85(4.12)	35.21(5.10)	281.71(16.49)	0.00(0.71)	80.62(8.76)	36.14(5.71)	493.91(22.10)
	S3	0.00(0.71)	5.56(2.19)	0.00(0.71)	11.12(2.99)	89.89(9.44)	2.78(1.66)	0.00(0.71)	0.00(0.71)	109.35(10.38)
Mean of Factor-1										
M1		0.00(0.71)	0.31(0.83)	0.00(0.71)	1.54(1.13)	124.48(9.87)	1.54(1.20)	0.00(0.71)	1.54(1.20)	129.42(10.16)
M2		0.00(0.71)	7.72(2.22)	38.92(4.85)	16.68(3.39)	334.22(17.14)	1.85(1.09)	0.31(0.83)	1.54(1.13)	401.25(18.86)
M3		5.56(1.98)	7.10(1.89)	29.04(3.49)	25.64(4.24)	161.55(12.07)	0.93(1.02)	119.23(8.55)	39.85(5.12)	388.89(18.68)
CD(0.05)		**0.65**	**NS**	**1.03**	**NS**	**0.88**	**NS**	**2.08**	**1.22**	**2.77**
Mean of Factor-2										
S1		4.02(1.64)	2.16(1.26)	46.02(5.30)	16.99(3.33)	337.31(16.89)	2.16(1.21)	92.67(5.99)	29.34(3.88)	530.67(22.18)
S2		1.54(1.05)	5.25(1.40)	21.93(3.05)	18.53(3.12)	203.25(13.45)	1.24(1.08)	26.87(3.39)	13.59(2.87)	292.21(15.96)
S3		0.00(0.71)	7.72(2.29)	0.00(0.71)	8.34(2.31)	79.69(8.74)	0.93(1.02)	0.00(0.71)	0.00(0.71)	96.68(9.56)
CD(0.05)		**0.55**	**NS**	**3.32**	**NS**	**3.24**	**NS**	**1.48**	**1.34**	**3.14**
Interaction										
M and T		0.95	NS	NS	NS	5.62	NS	2.57	2.33	NS
T and M		0.87	NS	NS	NS	4.61	NS	2.46	2.02	NS
Experimental Mean		**1.13**	**1.65**	**3.02**	**2.92**	**13.02**	**1.11**	**3.36**	**2.49**	**15.9**

*(Values in parentheses are transformed values)

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 Treatments	Sub plot Treatments	Gangavathi										
		Weed population no/m² at panicle initiation stage										
		Grasses					Sedges		BLW			Total weed population
		Dinebra retroflexa	*Digitaria marginata*	*Panicum repense*	*Paspalum scrobiculatum*	*Echinochloa colona*	*Cyperus difformis*	*Cyperus iria*	*Ammania baccifera*	*Astercantha longifolia*	*Cynotis cristata*	
M1	S1	0.00(0.71)	0.00(0.71)	0.00(0.71)	5.56(1.85)	7.41(2.44)	0.93(1.08)	217.77(14.72)	11.12(2.96)	0.00(0.71)	0.00(0.71)	242.79(15.53)
	S2	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	7.41(2.49)	6.49(1.96)	75.99(8.71)	1.85(1.29)	0.00(0.71)	0.00(0.71)	91.74(9.59)
	S3	0.00(0.71)	0.00(0.71)	0.93(1.08)	0.00(0.71)	0.00(0.71)	4.63(1.74)	45.41(6.40)	11.12(2.41)	0.00(0.71)	0.00(0.71)	62.09(7.39)
M2	S1	0.00(0.71)	0.00(0.71)	0.00(0.71)	33.36(5.75)	0.93(1.08)	0.00(0.71)	276.15(16.52)	0.00(0.71)	0.00(0.71)	0.00(0.71)	310.43(17.56)
	S2	0.00(0.71)	0.00(0.71)	0.00(0.71)	35.21(5.10)	0.00(0.71)	0.00(0.71)	349.35(18.66)	0.00(0.71)	0.00(0.71)	0.00(0.71)	384.57(19.58)
	S3	0.00(0.71)	0.00(0.71)	10.19(2.88)	0.00(0.71)	8.34(2.64)	0.00(0.71)	114.91(9.88)	0.00(0.71)	0.00(0.71)	0.00(0.71)	133.44(10.97)
M3	S1	6.49(2.36)	7.41(2.33)	0.93(1.08)	50.04(6.67)	22.24(4.29)	0.00(0.71)	21.31(4.03)	0.00(0.71)	117.69(9.69)	58.38(7.34)	284.49(16.63)
	S2	12.05(2.49)	4.63(2.24)	0.00(0.71)	25.95(5.04)	15.75(3.22)	0.00(0.71)	180.70(13.21)	4.63(2.05)	24.09(4.90)	19.46(3.87)	287.27(16.77)
	S3	11.12(2.83)	5.56(1.85)	7.41(2.44)	13.90(2.64)	9.27(2.24)	0.00(0.71)	390.13(19.70)	19.46(3.03)	0.00(0.71)	0.00(0.71)	456.85(21.29)
Mean of Factor-1												
M1		0.00(0.71)	0.00(0.71)	0.31(0.83)	1.85(1.09)	4.94(1.88)	4.02(1.59)	113.05(9.94)	8.03(2.22)	0.00(0.71)	0.00(0.71)	132.20(10.84)
M2		0.00(0.71)	0.00(0.71)	3.40(1.43)	22.86(3.85)	3.09(1.47)	0.00(0.71)	246.80(15.02)	0.00(0.71)	0.00(0.71)	0.00(0.71)	276.15(16.04)
M3		9.88(2.56)	5.87(2.14)	2.78(1.41)	29.96(4.78)	15.75(3.25)	0.00(0.71)	197.38(12.31)	8.03(1.93)	47.26(5.10)	25.95(3.97)	342.87(18.23)
CD(0.05)		**NS**	**0.65**	**NS**	**NS**	**0.7**	**NS**	**NS**	**NS**	**1.91**	**1.27**	**2.71**
Mean of Factor-2												
S1		2.16(1.26)	2.47(1.25)	0.31(0.83)	29.65(4.76)	10.19(2.60)	0.31(0.83)	171.74(11.76)	3.71(1.46)	39.23(3.70)	19.46(2.92)	279.24(16.57)
S2		4.02(1.30)	1.54(1.22)	0.00(0.71)	20.39(3.61)	7.72(2.14)	2.16(1.12)	202.01(13.53)	2.16(1.35)	8.03(2.10)	6.49(1.76)	254.52(15.31)
S3		3.71(1.41)	1.85(1.09)	6.18(2.13)	4.63(1.35)	5.87(1.86)	1.54(1.05)	183.48(12.00)	10.19(2.05)	0.00(0.71)	0.00(0.71)	217.46(13.22)
CD(0.05)		**NS**	**NS**	**0.93**	**1.94**	**NS**	**NS**	**NS**	**NS**	**1.96**	**1.19**	**NS**
Interaction												
M and T		NS	NS	NS	NS	NS	NS	4.52	NS	3.4	2.06	4.84
T and M		NS	NS	NS	NS	NS	NS	4.04	NS	2.98	1.84	4.24
Experimental Mean		**1.32**	**1.19**	**1.22**	**3.24**	**2.2**	**1**	**12.43**	**1.62**	**2.17**	**1.8**	**15.03**

*(Values in parentheses are transformed values)

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:

		Weed population no/m² at Active tillering stage									
		Grasses			Sedges			BLW			Total weed population
	Sub plot Treatments	*Echinochloa colonum*	*Echinochloa crusgalli*	*Panicum spp*	*Cyperus difformis*	*Cyperus iria*	*Cyperus rotundus*	*Alternanthera spp*	*Eclipta alba*	*Monochoria vaginalis*	
M1	S1	14.00(3.79)	4.67(2.27)	4.33(2.18)	3.67(2.02)	2.67(1.77)	4.33(2.20)	4.00(2.11)	3.00(1.84)	4.00(2.11)	44.67(6.72)
	S2	8.67(3.02)	3.33(1.93)	2.67(1.74)	2.33(1.66)	2.33(1.64)	3.00(1.86)	3.67(2.02)	2.33(1.66)	2.67(1.77)	31.00(5.60)
	S3	3.00(1.86)	1.33(1.34)	2.00(1.56)	2.00(1.56)	2.33(1.68)	1.67(1.46)	2.00(1.58)	2.67(1.77)	1.33(1.34)	18.33(4.32)
M2	S1	18.67(4.37)	10.67(3.34)	9.67(3.17)	11.00(3.38)	10.33(3.26)	8.33(2.96)	13.33(3.71)	6.67(2.66)	19.33(4.45)	108.00(10.41)
	S2	13.33(3.71)	3.67(2.02)	3.00(1.86)	5.00(2.32)	6.67(2.65)	6.00(2.52)	6.33(2.60)	6.33(2.60)	5.33(2.40)	55.67(7.49)
	S3	2.33(1.64)	2.33(1.68)	1.67(1.46)	2.33(1.64)	2.33(1.68)	2.33(1.68)	2.00(1.56)	2.00(1.56)	2.00(1.56)	19.33(4.42)
M3	S1	22.33(4.77)	12.00(3.52)	11.33(3.43)	19.00(4.41)	18.67(4.37)	17.00(4.16)	16.00(4.05)	10.00(3.20)	21.00(4.63)	147.33(12.15)
	S2	13.67(3.75)	7.33(2.79)	6.67(2.66)	11.67(3.48)	7.67(2.84)	8.67(3.02)	12.00(3.52)	4.67(2.22)	6.33(2.60)	78.67(8.90)
	S3	4.00(2.11)	2.33(1.68)	2.67(1.74)	3.00(1.86)	3.00(1.86)	3.33(1.93)	2.00(1.56)	1.67(1.46)	1.67(1.46)	23.67(4.92)
Mean of Factor-1											
M1		8.56(2.89)	3.11(1.85)	3.00(1.83)	2.67(1.74)	2.44(1.70)	3.00(1.84)	3.22(1.90)	2.67(1.76)	2.67(1.74)	31.33(5.55)
M2		11.44(3.24)	5.56(2.34)	4.78(2.16)	6.11(2.45)	6.44(2.53)	5.56(2.38)	7.22(2.62)	5.00(2.27)	8.89(2.80)	61.00(7.44)
M3		13.33(3.54)	7.22(2.66)	6.89(2.61)	11.22(3.25)	9.78(3.02)	9.67(3.04)	10.00(3.04)	5.44(2.29)	9.67(2.90)	83.22(8.65)
CD(0.05)		**0.27**	**0.25**	**0.17**	**0.31**	**0.29**	**0.14**	**0.18**	**0.25**	**0.16**	**0.15**
Mean of Factor-2											
S1		18.33(4.31)	9.11(3.04)	8.44(2.92)	11.22(3.27)	10.56(3.14)	9.89(3.11)	11.11(3.29)	6.56(2.56)	14.78(3.73)	100.00(9.76)
S2		11.89(3.49)	4.78(2.25)	4.11(2.09)	6.33(2.48)	5.56(2.38)	5.89(2.46)	7.33(2.71)	4.44(2.16)	4.78(2.26)	55.11(7.33)
S3		3.11(1.87)	2.00(1.57)	2.11(1.59)	2.44(1.69)	2.56(1.74)	2.44(1.69)	2.00(1.57)	2.11(1.60)	1.67(1.45)	20.44(4.55)
CD(0.05)		**0.38**	**0.27**	**0.45**	**0.39**	**0.34**	**0.4**	**0.34**	**0.48**	**0.25**	**0.53**
Interaction											
M and T		NS	0.47	NS	0.67	0.59	NS	0.59	NS	0.44	0.91
T and M		NS	0.41	NS	0.57	0.51	NS	0.49	NS	0.37	0.75
Experimental Mean		**3.22**	**2.29**	**2.2**	**2.48**	**2.42**	**2.42**	**2.52**	**2.11**	**2.48**	**7.21**

*(Values in parentheses are transformed values)

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 Treatments	Sub plot Treatments	Malan									
		Weed population no/m² at Panicle initiation stage									
		Grasses			Sedges			BLW			Total weed population
		Echinochloa colonum	*Echinochloa crusgalli*	*Panicum spp*	*Cyperus difformis*	*Cyperus iria*	*Cyperus rotundus*	*Alternanthera spp*	*Eclipta alba*	*Monochoria vaginalis*	
M1	S1	18.67(4.37)	5.67(2.48)	5.67(2.46)	5.33(2.41)	4.00(2.11)	5.00(2.33)	7.67(2.84)	5.33(2.40)	4.33(2.20)	61.67(7.88)
	S2	11.33(3.43)	4.00(2.10)	6.67(2.66)	2.67(1.74)	3.00(1.86)	2.00(1.56)	5.67(2.47)	5.00(2.34)	4.33(2.18)	44.67(6.71)
	S3	3.00(1.86)	2.33(1.68)	1.33(1.34)	2.00(1.56)	1.67(1.46)	1.67(1.46)	2.00(1.56)	2.00(1.56)	1.67(1.46)	17.67(4.24)
M2	S1	20.67(4.60)	6.67(2.67)	7.67(2.85)	7.00(2.71)	6.67(2.66)	7.67(2.84)	9.00(3.06)	7.67(2.85)	8.00(2.91)	81.00(9.02)
	S2	12.67(3.62)	4.67(2.26)	3.33(1.94)	6.33(2.59)	5.67(2.47)	6.33(2.61)	5.67(2.46)	6.33(2.59)	5.67(2.48)	56.67(7.55)
	S3	4.67(2.26)	1.67(1.46)	1.33(1.34)	2.00(1.56)	2.00(1.56)	2.00(1.58)	2.67(1.77)	1.67(1.46)	2.33(1.68)	20.33(4.56)
M3	S1	24.67(5.01)	11.33(3.44)	8.33(2.96)	20.33(4.51)	11.67(3.20)	14.67(3.88)	19.33(4.45)	12.67(3.62)	21.00(4.63)	144.00(12.01)
	S2	17.67(4.26)	7.00(2.72)	6.33(2.60)	9.67(3.19)	6.00(2.54)	9.33(3.12)	8.00(2.91)	6.67(2.66)	6.33(2.60)	77.00(8.80)
	S3	5.33(2.38)	2.00(1.56)	1.33(1.34)	2.00(1.56)	1.33(1.34)	1.67(1.46)	3.67(2.04)	4.00(2.09)	3.33(1.95)	24.67(5.02)
Mean of Factor-1											
M1		11.00(3.22)	4.00(2.09)	4.56(2.15)	3.33(1.90)	2.89(1.81)	2.89(1.78)	5.11(2.29)	4.11(2.10)	3.44(1.95)	41.33(6.28)
M2		12.67(3.49)	4.33(2.13)	4.11(2.04)	5.11(2.29)	4.78(2.23)	5.33(2.35)	5.78(2.43)	5.22(2.30)	5.33(2.36)	52.67(7.04)
M3		15.89(3.88)	6.78(2.57)	5.33(2.30)	10.67(3.08)	6.33(2.36)	8.56(2.82)	10.33(3.13)	7.78(2.79)	10.22(3.06)	81.89(8.61)
CD(0.05)		**0.26**	**0.19**	**NS**	**0.46**	**NS**	**0.3**	**0.18**	**0.11**	**0.15**	**0.41**
Mean of Factor-2											
S1		21.33(4.66)	7.89(2.86)	7.22(2.76)	10.89(3.21)	7.44(2.66)	9.11(3.02)	12.00(3.45)	8.56(2.96)	11.11(3.25)	95.56(9.64)
S2		13.89(3.77)	5.22(2.36)	5.44(2.40)	6.22(2.51)	4.89(2.29)	5.89(2.43)	6.44(2.61)	6.00(2.53)	5.44(2.42)	59.44(7.69)
S3		4.33(2.16)	2.00(1.57)	1.33(1.34)	2.00(1.56)	1.67(1.45)	1.78(1.50)	2.78(1.79)	2.56(1.70)	2.44(1.70)	20.89(4.61)
CD(0.05)		**0.31**	**0.32**	**0.17**	**0.46**	**0.64**	**0.29**	**0.33**	**0.34**	**0.25**	**0.45**
Interaction											
M and T		NS	NS	0.3	0.79	NS	0.5	0.56	NS	0.44	0.78
T and M		NS	NS	0.4	0.7	NS	0.45	0.47	NS	0.37	0.68
Experimental Mean		**3.53**	**2.26**	**2.17**	**2.42**	**2.13**	**2.32**	**2.62**	**2.4**	**2.46**	**7.31**

*(Values in parentheses are transformed values)

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 Treatments	Sub plot Treatments	Moncompu									
		Weed population no/m^2 at Active tillering stage									
		Grasses				sedges			BLW		Total weed population
		Echinochloa crusgalli	*Isachnae miliaceae*	*Leptochloa chinensis*	*Weedy rice o.s.fsp spontanea*	*Cyperus difformis*	*Cyperus haspens*	*Fimbristylis miliaceae*	*Ludwigia hyssopifolia*	*Monochoria vaginalis*	
M1	S1	6.67(2.65)	73.33(8.19)	0.00(0.71)	0.00(0.71)	2.67(1.44)	0.00(0.71)	93.33(9.12)	10.67(3.30)	8.00(2.56)	194.67(13.51)
	S2	4.00(1.65)	32.00(5.60)	2.67(1.44)	0.00(0.71)	0.00(0.71)	0.00(0.71)	102.67(9.63)	9.33(2.72)	4.00(1.91)	154.67(12.33)
	S3	0.00(0.71)	44.00(6.36)	0.00(0.71)	6.67(1.98)	0.00(0.71)	0.00(0.71)	2.67(1.44)	1.33(1.18)	0.00(0.71)	54.67(7.01)
M2	S1	9.33(2.77)	30.67(5.53)	0.00(0.71)	0.00(0.71)	13.33(3.11)	1.33(1.18)	93.33(8.96)	12.00(3.39)	8.00(2.12)	168.00(12.79)
	S2	13.33(3.19)	40.00(6.01)	0.00(0.71)	0.00(0.71)	2.67(1.44)	0.00(0.71)	80.00(8.77)	9.33(2.77)	2.67(1.44)	148.00(12.10)
	S3	0.00(0.71)	24.00(4.81)	0.00(0.71)	10.67(2.37)	4.00(1.65)	0.00(0.71)	20.00(4.27)	0.00(0.71)	0.00(0.71)	58.67(7.45)
M3	S1	8.00(2.86)	146.67(12.13)	0.00(0.71)	0.00(0.71)	0.00(0.71)	1.33(1.18)	20.00(3.87)	33.33(5.72)	21.33(3.71)	230.67(15.20)
	S2	0.00(0.71)	113.33(10.60)	0.00(0.71)	0.00(0.71)	0.00(0.71)	2.67(1.44)	18.67(4.01)	5.33(2.12)	8.00(2.56)	148.00(12.17)
	S3	0.00(0.71)	58.67(7.34)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	5.33(2.12)	0.00(0.71)	0.00(0.71)	64.00(7.83)
Mean of Factor-1											
M1		3.56(1.67)	49.78(6.72)	0.89(0.95)	2.22(1.13)	0.89(0.95)	0.00(0.71)	66.22(6.73)	7.11(2.40)	4.00(1.73)	134.67(10.95)
M2		7.56(2.22)	31.56(5.45)	0.00(0.71)	3.56(1.26)	6.67(2.07)	0.44(0.86)	64.44(7.34)	7.11(2.29)	3.56(1.42)	124.89(10.78)
M3		2.67(1.42)	106.22(10.02)	0.00(0.71)	0.00(0.71)	0.00(0.71)	1.33(1.11)	14.67(3.33)	12.89(2.85)	9.78(2.33)	147.56(11.74)
CD(0.05)		**NS**	**1.46**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
Mean of Factor-2											
S1		8.00(2.76)	83.56(8.62)	0.00(0.71)	0.00(0.71)	5.33(1.75)	0.89(1.02)	68.89(7.32)	18.67(4.14)	12.44(2.80)	197.78(13.84)
S2		5.78(1.85)	61.78(7.40)	0.89(0.95)	0.00(0.71)	0.89(0.95)	0.89(0.95)	67.11(7.47)	8.00(2.54)	4.89(1.97)	150.22(12.20)
S3		0.00(0.71)	42.22(6.17)	0.00(0.71)	5.78(1.69)	1.33(1.02)	0.00(0.71)	9.33(2.61)	0.44(0.86)	0.00(0.71)	59.11(7.43)
CD(0.05)		**1.28**	**NS**	**NS**	**NS**	**NS**	**NS**	**2.93**	**1.33**	**NS**	**2.59**
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		**1.77**	**7.4**	**0.79**	**1.03**	**1.24**	**0.89**	**5.8**	**2.51**	**1.83**	**11.16**

***(Values in parentheses are transformed values)**

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 Treatments	Sub plot Treatments	Moncompu								
		Weed population no/m2 at Panicle initiation stage								
		Grasses				Sedges		BLW		Total weed population
		Echinochloa crusgalli	*Isachnae miliaceae*	*Leptochloa chinensis*	*Weedy rice o.s.fsp spontanea*	*Cyperus difformis*	*Fimbristylis miliaceae*	*Ludwigia hyssopifolia*	*Monochoria vaginalis*	
M1	S1	5.33(2.39)	293.33(17.10)	0.00(0.71)	0.00(0.71)	4.00(1.65)	32.00(5.70)	4.00(1.65)	0.00(0.71)	338.67(18.40)
	S2	14.67(3.89)	33.33(5.75)	1.33(1.18)	0.00(0.71)	2.67(1.44)	8.00(2.90)	1.33(1.18)	0.00(0.71)	61.33(7.85)
	S3	0.00(0.71)	29.33(5.42)	0.00(0.71)	1.33(1.18)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	30.67(5.55)
M2	S1	8.00(2.92)	112.00(9.81)	2.67(1.44)	0.00(0.71)	0.00(0.71)	40.00(6.35)	2.67(1.44)	2.67(1.65)	168.00(12.58)
	S2	18.67(4.37)	240.00(15.51)	0.00(0.71)	0.00(0.71)	2.67(1.44)	16.00(4.06)	5.33(2.18)	1.33(1.18)	284.00(16.87)
	S3	2.67(1.65)	240.00(15.51)	0.00(0.71)	1.33(1.18)	8.00(2.86)	0.00(0.71)	0.00(0.71)	0.00(0.71)	252.00(15.89)
M3	S1	4.00(2.12)	266.67(16.31)	2.67(1.44)	0.00(0.71)	0.00(0.71)	0.00(0.71)	13.33(3.57)	5.33(2.18)	292.00(17.08)
	S2	8.00(2.59)	240.00(15.51)	0.00(0.71)	1.33(1.18)	0.00(0.71)	16.00(4.06)	6.67(2.39)	2.67(1.44)	274.67(16.59)
	S3	8.00(2.59)	106.67(9.41)	1.33(1.18)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	116.00(9.88)
Mean of Factor-1										
M1		6.67(2.33)	118.67(9.43)	0.44(0.86)	0.44(0.86)	2.22(1.27)	13.33(3.10)	1.78(1.18)	0.00(0.71)	143.56(10.60)
M2		9.78(2.98)	197.33(13.61)	0.89(0.95)	0.44(0.86)	3.56(1.67)	18.67(3.71)	2.67(1.44)	1.33(1.18)	234.67(15.11)
M3		6.67(2.44)	204.44(13.74)	1.33(1.11)	0.44(0.86)	0.00(0.71)	5.33(1.82)	6.67(2.22)	2.67(1.44)	227.56(14.51)
CD(0.05)		**NS**	**2.11**	**NS**	**NS**	**NS**	**0.14**	**NS**	**0**	**1.73**
Mean of Factor-2										
S1		5.78(2.47)	224.00(14.41)	1.78(1.20)	0.00(0.71)	1.33(1.02)	24.00(4.25)	6.67(2.22)	2.67(1.51)	266.22(16.02)
S2		13.78(3.62)	171.11(12.26)	0.44(0.86)	0.44(0.86)	1.78(1.20)	13.33(3.67)	4.44(1.91)	1.33(1.11)	206.67(13.77)
S3		3.56(1.65)	125.33(10.11)	0.44(0.86)	0.89(1.02)	2.67(1.42)	0.00(0.71)	0.00(0.71)	0.00(0.71)	132.89(10.44)
CD(0.05)		**0.65**	**2.45**	**NS**	**NS**	**NS**	**0.18**	**0.99**	**NS**	**2.25**
Interaction										
M and T		1.13	4.24	NS	NS	1.35	0.31	NS	NS	3.89
T and M		1.05	3.65	NS	NS	1.21	0.27	NS	NS	3.31
Experimental Mean		**2.58**	**12.26**	**0.98**	**0.86**	**1.21**	**2.88**	**1.61**	**1.11**	**13.41**

***(Values in parentheses are transformed values)**

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 Treatments	Sub plot Treatments	Pusa										
		Weed population no/m² at Active tillering stage										
		Grasses				sedges		BLW				Total weed population
		Echinochloa colona	*Echinochloa crusgalli*	*Leptoclhoa chinensis*	*Paspalum*	*Cyperus difformis*	*Cyperus iria*	*Ammania baccifera*	*Caesulia axillaris*	*Eclipta alba*	*Ludwigia pariflora*	
M1	S1	20.00(4.51)	9.33(3.12)	14.67(3.89)	2.67(1.65)	9.33(3.12)	6.67(2.65)	3.00(1.72)	8.00(2.86)	4.00(1.91)	6.67(2.65)	84.33(9.20)
	S2	6.67(2.65)	2.00(1.47)	6.67(2.65)	1.33(1.18)	2.67(1.65)	2.67(1.65)	0.67(1.00)	2.67(1.65)	2.67(1.65)	1.33(1.18)	29.33(5.46)
	S3	6.67(2.65)	2.00(1.47)	4.00(1.91)	2.67(1.65)	2.67(1.65)	4.00(1.91)	1.33(1.18)	2.67(1.65)	1.33(1.18)	2.67(1.65)	30.00(5.40)
M2	S1	22.67(4.73)	9.33(3.12)	8.00(2.86)	2.67(1.65)	6.67(2.65)	6.67(2.39)	4.67(2.21)	5.33(2.39)	8.00(2.86)	6.67(2.39)	80.67(9.00)
	S2	6.67(2.65)	5.33(2.39)	4.00(1.91)	2.67(1.65)	4.00(1.91)	2.67(1.44)	1.33(1.18)	4.00(1.91)	1.33(1.18)	2.67(1.65)	34.67(5.91)
	S3	2.67(1.65)	6.67(2.65)	2.67(1.65)	1.33(1.18)	2.67(1.65)	1.33(1.18)	2.67(1.65)	5.33(2.39)	2.67(1.65)	2.67(1.44)	30.67(5.53)
M3	S1	34.67(5.87)	10.67(3.30)	25.33(5.06)	2.67(1.65)	12.00(3.50)	14.67(3.89)	6.67(2.65)	12.00(3.50)	8.00(2.92)	4.00(1.91)	130.67(11.43)
	S2	9.33(3.12)	4.00(1.91)	10.00(3.21)	1.33(1.18)	8.00(2.86)	5.33(2.39)	1.33(1.18)	2.67(1.65)	1.33(1.18)	2.67(1.44)	46.00(6.80)
	S3	9.33(3.12)	2.67(1.65)	5.33(2.39)	1.33(1.18)	4.00(1.91)	4.00(1.91)	4.00(2.12)	2.67(1.65)	2.67(1.65)	2.67(1.65)	38.67(6.25)
Mean of Factor-1												
M1		11.11(3.27)	4.44(2.02)	8.44(2.82)	2.22(1.49)	4.89(2.14)	4.44(2.07)	1.67(1.30)	4.44(2.05)	2.67(1.58)	3.56(1.83)	47.89(6.69)
M2		10.67(3.01)	7.11(2.72)	4.89(2.14)	2.22(1.49)	4.44(2.07)	3.56(1.67)	2.89(1.68)	4.89(2.23)	4.00(1.90)	4.00(1.83)	48.67(6.82)
M3		17.78(4.04)	5.78(2.29)	13.56(3.55)	1.78(1.34)	8.00(2.76)	8.00(2.73)	4.00(1.98)	5.78(2.27)	4.00(1.91)	3.11(1.67)	71.78(8.16)
CD(0.05)		**0.22**	**0.22**	**0.56**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**0.62**
Mean of Factor-2												
S1		25.78(5.04)	9.78(3.18)	16.00(3.93)	2.67(1.65)	9.33(3.09)	9.33(2.97)	4.78(2.19)	8.44(2.92)	6.67(2.56)	5.78(2.32)	98.56(9.88)
S2		7.56(2.81)	3.78(1.92)	6.89(2.59)	1.78(1.34)	4.89(2.14)	3.56(1.83)	1.11(1.12)	3.11(1.74)	1.78(1.34)	2.22(1.42)	36.67(6.06)
S3		6.22(2.47)	3.78(1.92)	4.00(1.98)	1.78(1.34)	3.11(1.74)	3.11(1.67)	2.67(1.65)	3.56(1.90)	2.22(1.49)	2.67(1.58)	33.11(5.73)
CD(0.05)		**0.81**	**0.76**	**0.75**	**NS**	**0.87**	**0.59**	**0.6**	**0.73**	**0.95**	**NS**	**0.75**
Interaction												
M and T		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
Experimental Mean		**3.44**	**2.34**	**2.84**	**1.44**	**2.32**	**2.16**	**1.65**	**2.18**	**1.8**	**1.77**	**7.22**

***(Values in parentheses are transformed values)**

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 Treatments	Sub plot Treatments	Pusa										
		Weed population no/m² at panicle initiation stage										
		Grasses				sedges		BLW				Total weed population
		Echinochloa colona	*Echinochloa crusgalli*	*Leptoclhoa chinensis*	*Paspalum*	*Cyperus difformis*	*Cyperus iria*	*Ammania baccifera*	*Caesulia axillaris*	*Eclipta alba*	*Ludwigia pariflora*	
M1	S1	5.33(2.39)	6.67(2.65)	8.00(2.86)	2.67(1.65)	8.00(2.86)	6.67(2.59)	4.00(1.91)	9.33(3.12)	4.00(1.91)	6.67(2.65)	61.33(7.84)
	S2	5.33(2.39)	2.67(1.65)	4.00(1.91)	1.33(1.18)	2.67(1.65)	2.67(1.65)	1.33(1.18)	2.67(1.65)	2.67(1.65)	1.33(1.18)	26.67(5.19)
	S3	5.33(2.39)	2.67(1.65)	2.67(1.65)	2.67(1.65)	4.00(1.91)	5.33(2.18)	2.67(1.65)	2.67(1.65)	1.33(1.18)	2.67(1.65)	32.00(5.51)
M2	S1	10.67(3.33)	4.00(1.91)	8.00(2.86)	2.67(1.65)	6.67(2.65)	6.67(2.39)	4.67(2.21)	5.33(2.39)	8.00(2.86)	6.67(2.39)	63.33(7.97)
	S2	6.67(2.65)	5.33(2.39)	4.00(1.91)	2.67(1.65)	4.00(1.91)	2.67(1.44)	1.33(1.18)	4.00(1.91)	1.33(1.18)	2.67(1.65)	34.67(5.91)
	S3	2.67(1.65)	5.33(2.39)	2.67(1.65)	1.33(1.18)	2.67(1.65)	1.33(1.18)	4.00(1.91)	5.33(2.39)	4.00(1.91)	5.33(2.18)	34.67(5.90)
M3	S1	20.00(4.51)	6.67(2.39)	14.67(3.89)	4.00(1.91)	12.00(3.50)	12.00(3.50)	6.67(2.59)	10.67(3.33)	8.00(2.92)	4.00(1.91)	98.67(9.95)
	S2	6.67(2.65)	2.67(1.65)	6.67(2.65)	1.33(1.18)	6.67(2.65)	6.67(2.65)	1.33(1.18)	2.67(1.65)	2.67(1.44)	2.67(1.44)	40.00(6.33)
	S3	9.33(3.12)	4.00(1.91)	4.00(1.91)	1.33(1.18)	4.00(1.91)	4.00(1.91)	4.00(2.12)	2.67(1.65)	2.67(1.65)	2.67(1.65)	38.67(6.25)
Mean of Factor-1												
M1		5.33(2.39)	4.00(1.98)	4.89(2.14)	2.22(1.49)	4.89(2.14)	4.89(2.14)	2.67(1.58)	4.89(2.14)	2.67(1.58)	3.56(1.83)	40.00(6.18)
M2		6.67(2.54)	4.89(2.23)	4.89(2.14)	2.22(1.49)	4.44(2.07)	3.56(1.67)	3.33(1.77)	4.89(2.23)	4.44(1.98)	4.89(2.07)	44.22(6.60)
M3		12.00(3.43)	4.44(1.98)	8.44(2.82)	2.22(1.42)	7.56(2.69)	7.56(2.69)	4.00(1.96)	5.33(2.21)	4.44(2.00)	3.11(1.67)	59.11(7.51)
CD(0.05)		**0.43**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
Mean of Factor-2												
S1		12.00(3.41)	5.78(2.32)	10.22(3.20)	3.11(1.74)	8.89(3.00)	8.44(2.83)	5.11(2.24)	8.44(2.95)	6.67(2.56)	5.78(2.32)	74.44(8.59)
S2		6.22(2.56)	3.56(1.90)	4.89(2.16)	1.78(1.34)	4.44(2.07)	4.00(1.91)	1.33(1.18)	3.11(1.74)	2.22(1.42)	2.22(1.42)	33.78(5.81)
S3		5.78(2.39)	4.00(1.98)	3.11(1.74)	1.78(1.34)	3.56(1.83)	3.56(1.76)	3.56(1.90)	3.56(1.90)	2.67(1.58)	3.56(1.83)	35.11(5.89)
CD(0.05)		**0.53**	**NS**	**0.88**	**NS**	**0.93**	**0.87**	**0.71**	**0.64**	**NS**	**NS**	**0.83**
Interaction												
M and T		0.92	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
T and M		0.79	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Experimental Mean		**2.79**	**2.07**	**2.37**	**1.47**	**2.3**	**2.17**	**1.77**	**2.19**	**1.86**	**1.86**	**6.76**

***(Values in parentheses are transformed values)**

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 Treatments	Sub plot Treatments	Pattambi										
		Weed population no/m² at Active tillering stage				Weed population no/m² at Panicle initiation stage						
		Grasses	Sedges	Auatic weed	Total weed population weed population	Grasses	Sedges		BLW		Aquatic weed	Total weed population
		Oplismenus burmannii	*Fimbristylis miliacea*	*Vallisneria americana*		*Oplismenus burmannii*	*Cyperus iria*	*Cyperus rotundus*	*Monochoria vaginalis*	*Centella asiatica*	*Blyxa japonica*	
M1	S1	21.67(4.69)	10.67(2.94)	3.00(1.68)	35.33(5.87)	8.67(3.02)	4.33(2.18)	0.00(0.71)	7.00(2.56)	2.67(1.44)	0.33(0.88)	23.00(4.85)
	S2	12.00(3.52)	2.33(1.38)	4.00(1.94)	18.33(4.30)	7.33(2.74)	3.67(2.02)	0.00(0.71)	1.33(1.34)	0.67(1.00)	1.00(1.17)	14.00(3.79)
	S3	8.33(2.94)	1.33(1.18)	1.33(1.18)	11.00(3.36)	5.00(2.34)	0.67(1.00)	0.00(0.71)	1.00(1.17)	0.00(0.71)	1.00(1.10)	7.67(2.85)
M2	S1	14.00(3.79)	15.33(3.96)	5.33(2.18)	34.67(5.93)	13.00(3.65)	2.00(1.47)	0.00(0.71)	3.33(1.90)	1.33(1.18)	0.00(0.71)	19.67(4.48)
	S2	8.00(2.88)	1.33(1.18)	2.33(1.54)	11.67(3.49)	9.33(3.06)	0.33(0.88)	0.00(0.71)	7.33(2.74)	0.00(0.71)	0.00(0.71)	17.00(4.18)
	S3	6.67(2.65)	0.00(0.71)	0.00(0.71)	6.67(2.65)	5.33(2.41)	0.00(0.71)	0.00(0.71)	3.33(1.79)	0.33(0.88)	5.67(2.41)	14.67(3.89)
M3	S1	17.33(4.22)	12.67(3.60)	3.33(1.73)	33.33(5.81)	5.00(2.34)	3.33(1.79)	2.33(1.38)	7.67(2.72)	4.00(1.65)	3.33(1.77)	25.67(5.11)
	S2	6.67(2.65)	7.67(2.85)	2.00(1.47)	16.33(4.10)	4.67(2.21)	3.00(1.84)	0.67(1.00)	5.33(2.31)	0.00(0.71)	1.00(1.10)	14.67(3.86)
	S3	6.33(2.58)	0.00(0.71)	0.00(0.71)	6.33(2.58)	2.67(1.72)	0.00(0.71)	0.00(0.71)	1.67(1.35)	0.33(0.88)	0.67(1.00)	5.33(2.35)
Mean of Factor-1												
M1		14.00(3.72)	4.78(1.84)	2.78(1.60)	21.56(4.51)	7.00(2.70)	2.89(1.73)	0.00(0.71)	3.11(1.69)	1.11(1.05)	0.78(1.05)	14.89(3.83)
M2		9.56(3.11)	5.56(1.95)	2.56(1.48)	17.67(4.02)	9.22(3.04)	0.78(1.02)	0.00(0.71)	4.67(2.14)	0.56(0.92)	1.89(1.28)	17.11(4.18)
M3		10.11(3.15)	6.78(2.39)	1.78(1.30)	18.67(4.17)	4.11(2.09)	2.11(1.45)	1.00(1.03)	4.89(2.13)	1.44(1.08)	1.67(1.29)	15.22(3.77)
CD(0.05)		**0.27**	**NS**	**NS**	**NS**	**0.44**	**NS**	**NS**	**NS**	**NS**	**NS**	**0.21**
Mean of Factor-2												
S1		17.67(4.23)	12.89(3.50)	3.89(1.86)	34.44(5.87)	8.89(3.00)	3.22(1.81)	0.78(0.93)	6.00(2.39)	2.67(1.42)	1.22(1.12)	22.78(4.81)
S2		8.89(3.02)	3.78(1.80)	2.78(1.65)	15.44(3.96)	7.11(2.67)	2.33(1.58)	0.22(0.80)	4.67(2.13)	0.22(0.80)	0.67(0.99)	15.22(3.94)
S3		7.11(2.73)	0.44(0.86)	0.44(0.86)	8.00(2.87)	4.33(2.16)	0.22(0.80)	0.00(0.71)	2.00(1.44)	0.22(0.82)	2.44(1.50)	9.22(3.03)
CD(0.05)		**0.38**	**0.97**	**0.8**	**0.58**	**0.46**	**0.57**	**NS**	**NS**	**NS**	**NS**	**0.41**
Interaction												
M and T		NS	NS	NS	NS	NS	NS	NS	NS	NS	0.98	0.71
T and M		NS	NS	NS	NS	NS	NS	NS	NS	NS	0.86	0.59
Experimental Mean		**3.32**	**2.06**	**1.46**	**4.23**	**2.61**	**1.4**	**0.81**	**1.99**	**1.02**	**1.2**	**3.93**

*(Values in parentheses are transformed values)

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	Titabar									
		Weed population no/m² at Active tillering stage					Weed population no/m² at Panicle initiation stage				
		Grasses		Sedges	BLW	Total weed population weed population	Grasses		Sedges	BLW	Total weed population
		Echinochloa crugalli	*Leersia hexandra*	*Cyperus iria*	*Alternanthera sp.*		*Echinochloa crugalli*	*Leersia hexandra*	*Cyperus iria*	*Alternanthera sp.*	
M1	S1	15.67(4.00)	14.67(3.87)	12.33(3.57)	8.67(3.02)	51.33(7.19)	19.00(4.41)	15.00(3.91)	14.67(3.86)	10.67(3.34)	59.33(7.73)
	S2	14.33(3.84)	10.67(3.34)	5.67(2.48)	7.00(2.73)	37.67(6.17)	17.67(4.21)	15.67(4.00)	9.33(3.13)	8.33(2.94)	51.00(7.12)
	S3	9.00(3.08)	7.67(2.86)	4.67(2.27)	4.00(2.11)	25.33(5.08)	11.00(3.36)	11.67(3.47)	8.00(2.91)	6.00(2.54)	36.67(6.10)
M2	S1	20.67(4.60)	11.67(3.47)	11.33(3.43)	13.67(3.76)	57.33(7.60)	21.67(4.69)	15.33(3.97)	14.33(3.83)	16.00(4.04)	67.33(8.24)
	S2	15.67(4.02)	10.33(3.29)	7.00(2.73)	11.33(3.44)	44.33(6.70)	17.67(4.26)	11.67(3.48)	10.33(3.27)	14.00(3.79)	53.67(7.35)
	S3	10.67(3.34)	9.00(3.08)	5.67(2.48)	7.33(2.79)	32.67(5.76)	15.00(3.93)	11.33(3.41)	10.33(3.29)	9.33(3.12)	46.00(6.81)
M3	S1	20.67(4.60)	22.67(4.81)	13.33(3.69)	14.33(3.84)	71.00(8.45)	23.00(4.84)	25.33(5.08)	16.33(4.06)	16.00(4.05)	80.67(9.00)
	S2	17.00(4.16)	12.33(3.58)	3.67(2.04)	11.33(3.44)	44.33(6.69)	19.00(4.40)	18.00(4.29)	6.00(2.54)	16.67(4.14)	59.67(7.76)
	S3	13.00(3.67)	9.67(3.19)	4.33(2.20)	8.33(2.97)	35.33(5.99)	16.00(4.06)	15.00(3.94)	6.00(2.54)	11.67(3.48)	48.67(7.01)
Mean of Factor-1											
M1		13.00(3.64)	11.00(3.35)	7.56(2.77)	6.56(2.62)	38.11(6.14)	15.89(3.99)	14.11(3.79)	10.67(3.30)	8.33(2.94)	49.00(6.98)
M2		15.67(3.98)	10.33(3.28)	8.00(2.88)	10.78(3.33)	44.78(6.69)	18.11(4.29)	12.78(3.62)	11.67(3.46)	13.11(3.65)	55.67(7.46)
M3		16.89(4.14)	14.89(3.86)	7.11(2.64)	11.33(3.42)	50.22(7.04)	19.33(4.43)	19.44(4.44)	9.44(3.05)	14.78(3.89)	63.00(7.92)
CD(0.05)		**NS**	**0.27**	**NS**	**0.14**	**0.23**	**NS**	**0.3**	**NS**	**0.23**	**0.3**
Mean of Factor-2											
S1		19.00(4.40)	16.33(4.05)	12.33(3.56)	12.22(3.54)	59.89(7.75)	21.22(4.65)	18.56(4.32)	15.11(3.92)	14.22(3.81)	69.11(8.32)
S2		15.67(4.00)	11.11(3.40)	5.44(2.42)	9.89(3.20)	42.11(6.52)	18.11(4.29)	15.11(3.92)	8.56(2.98)	13.00(3.62)	54.78(7.41)
S3		10.89(3.36)	8.78(3.04)	4.89(2.32)	6.56(2.62)	31.11(5.61)	14.00(3.78)	12.67(3.61)	8.11(2.91)	9.00(3.05)	43.78(6.64)
CD(0.05)		**0.32**	**0.31**	**0.29**	**0.27**	**0.3**	**0.47**	**0.33**	**0.41**	**0.32**	**0.41**
Interaction											
M and T		NS	0.54	NS	NS	NS	NS	NS	NS	NS	NS
T and M		NS	0.47	NS	NS	NS	NS	NS	NS	NS	NS
Experimental Mean		**3.92**	**3.5**	**2.77**	**3.12**	**6.62**	**4.24**	**3.95**	**3.27**	**3.49**	**7.46**

***(Values in parentheses are transformed values)**

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 Treatments	Sub plot Treatments	Varanasi								
		Weed population no/m² at Active tillering stage								
		Grasses		Sedges		BLW				Total weed population
		Echinocloa colona	*Cynodon dactylon*	*Cyperus iria*	*Cyperus rotundus*	*Eclipta prostrata*	*Parthenium hysterophorous*	*Phyllantus niruri*	*Solanum nigrum*	
M1	S1	3.33(1.93)	43.00(6.39)	0.00(0.71)	282.33(16.82)	1.33(1.29)	1.33(1.34)	4.33(2.19)	4.00(2.11)	339.67(18.44)
	S2	5.33(2.35)	36.33(5.87)	0.00(0.71)	289.33(17.02)	2.00(1.48)	2.33(1.68)	5.00(2.34)	2.33(1.68)	342.67(18.52)
	S3	3.33(1.94)	31.00(5.40)	0.00(0.71)	284.00(16.86)	1.67(1.46)	2.33(1.68)	5.00(2.32)	1.33(1.34)	328.67(18.13)
M2	S1	15.33(3.98)	20.33(4.56)	10.67(3.31)	48.33(6.99)	0.00(0.71)	4.67(2.27)	20.67(4.55)	5.67(2.39)	125.67(11.23)
	S2	17.67(4.24)	12.67(3.59)	21.33(3.96)	59.00(7.71)	0.00(0.71)	3.00(1.50)	7.00(2.68)	0.33(0.88)	121.00(10.99)
	S3	9.67(3.19)	13.33(3.67)	14.33(3.73)	42.67(6.53)	0.67(1.05)	2.33(1.60)	20.33(4.54)	0.00(0.71)	103.33(10.17)
M3	S1	16.00(4.06)	15.67(4.01)	15.67(4.02)	47.67(6.91)	0.33(0.88)	4.00(2.11)	11.67(3.46)	0.67(1.00)	111.67(10.58)
	S2	15.00(3.87)	16.33(4.08)	15.00(3.87)	52.33(7.24)	1.00(1.17)	4.67(2.26)	13.67(3.61)	1.00(1.17)	119.00(10.87)
	S3	15.67(3.93)	9.67(3.10)	36.67(5.79)	43.67(6.59)	0.67(1.05)	7.33(2.77)	27.33(4.91)	0.00(0.71)	141.00(11.76)
Mean of Factor-1										
M1		4.00(2.08)	36.78(5.89)	0.00(0.71)	285.22(16.90)	1.67(1.41)	2.00(1.57)	4.78(2.28)	2.56(1.71)	337.00(18.36)
M2		14.22(3.80)	15.44(3.94)	15.44(3.66)	50.00(7.08)	0.22(0.82)	3.33(1.79)	16.00(3.92)	2.00(1.33)	116.67(10.80)
M3		15.56(3.96)	13.89(3.73)	22.44(4.56)	47.89(6.91)	0.67(1.03)	5.33(2.38)	17.56(3.99)	0.56(0.96)	123.89(11.07)
CD(0.05)		**0.51**	**NS**	**0.84**	**0.86**	**NS**	**NS**	**NS**	**0.21**	**1.01**
Mean of Factor-2										
S1		11.56(3.32)	26.33(4.99)	8.78(2.68)	126.11(10.24)	0.56(0.96)	3.33(1.91)	12.22(3.40)	3.44(1.83)	192.33(13.41)
S2		12.67(3.49)	21.78(4.51)	12.11(2.85)	133.56(10.66)	1.00(1.12)	3.33(1.81)	8.56(2.88)	1.22(1.24)	194.22(13.46)
S3		9.56(3.02)	18.00(4.06)	17.00(3.41)	123.44(10.00)	1.00(1.19)	4.00(2.02)	17.56(3.92)	0.44(0.92)	191.00(13.35)
CD(0.05)		**NS**	**0.53**	**NS**	**0.41**	**NS**	**NS**	**0.8**	**0.45**	**NS**
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		**3.28**	**4.52**	**2.98**	**10.3**	**1.09**	**1.91**	**3.4**	**1.33**	**13.41**

*(Values in parentheses are transformed values)

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 Treatments	Sub plot Treatments	Varanasi							
		Weed population no/m² at panicle initiation stage							
		Grasses		Sedges	BLW				Total weed population
		Echinocloa colona	*Cynodon dactylon*	*Cyperus iria*	*Eclipta prostrata*	*Parthenium hysterophorous*	*Phyllantus niruri*	*Solanum nigrum*	
M1	S1	3.00(1.81)	30.33(5.51)	311.33(17.62)	1.33(1.34)	7.33(2.79)	2.33(1.64)	3.33(1.95)	359.00(18.94)
	S2	3.33(1.93)	37.33(6.07)	303.33(17.35)	2.00(1.48)	5.33(2.29)	2.33(1.64)	3.00(1.86)	356.67(18.83)
	S3	2.00(1.52)	26.00(5.12)	253.00(15.85)	2.00(1.56)	2.67(1.77)	2.67(1.72)	2.67(1.67)	291.00(17.01)
M2	S1	8.33(2.64)	67.00(8.21)	467.33(21.53)	1.67(1.44)	6.00(2.54)	3.67(1.97)	2.67(1.74)	556.67(23.54)
	S2	6.00(2.54)	46.33(6.84)	544.33(23.34)	3.00(1.81)	3.00(1.84)	4.67(2.26)	4.67(2.26)	612.00(24.75)
	S3	5.00(2.34)	46.67(6.87)	304.00(17.45)	1.33(1.29)	4.33(2.16)	5.00(2.30)	6.33(2.55)	372.67(19.31)
M3	S1	4.00(2.09)	59.33(7.73)	510.00(22.59)	1.67(1.39)	3.67(2.03)	8.67(2.95)	4.33(2.16)	591.67(24.33)
	S2	4.67(2.26)	50.67(7.15)	465.33(21.58)	3.00(1.84)	5.00(2.35)	6.67(2.68)	5.33(2.25)	540.67(23.26)
	S3	5.33(2.40)	61.33(7.85)	237.33(15.42)	2.00(1.56)	4.00(2.09)	4.33(2.18)	3.67(1.91)	318.00(17.85)
Mean of Factor-1									
M1		2.78(1.76)	31.22(5.57)	289.22(16.94)	1.78(1.46)	5.11(2.29)	2.44(1.67)	3.00(1.83)	335.56(18.26)
M2		6.44(2.50)	53.33(7.30)	438.56(20.77)	2.00(1.51)	4.44(2.18)	4.44(2.17)	4.56(2.18)	513.78(22.53)
M3		4.67(2.25)	57.11(7.58)	404.22(19.86)	2.22(1.59)	4.22(2.15)	6.56(2.60)	4.44(2.10)	483.44(21.81)
CD(0.05)		**NS**	**0.37**	**1.35**	**NS**	**NS**	**NS**	**NS**	**1.28**
Mean of Factor-2									
S1		5.11(2.18)	52.22(7.15)	429.56(20.58)	1.56(1.39)	5.67(2.45)	4.89(2.19)	3.44(1.95)	502.44(22.27)
S2		4.67(2.24)	44.78(6.69)	437.67(20.76)	2.67(1.71)	4.44(2.16)	4.56(2.19)	4.33(2.12)	503.11(22.28)
S3		4.11(2.09)	44.67(6.61)	264.78(16.24)	1.78(1.47)	3.67(2.01)	4.00(2.07)	4.22(2.04)	327.22(18.06)
CD(0.05)		**NS**	**NS**	**1.21**	**NS**	**NS**	**NS**	**NS**	**1.08**
Interaction									
M and T		NS	NS	2.1	NS	NS	NS	NS	1.87
T and M		NS	NS	1.89	NS	NS	NS	NS	1.71
Experimental Mean		**2.17**	**6.82**	**19.19**	**1.52**	**2.21**	**2.15**	**2.04**	**20.87**

*(Values in parentheses are transformed values)

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: Relative Weed Density at active tillering stage of long term trial on weed dynamics in rice based cropping systems under different establishment methods, *Kharif* 2022.

Main plot Treatments	Sub plot Treatments	Relative Weed Density											
		Active tillering stage											
		Chatha			Gangavathi			Malan			Moncompu		
		Grasses	Sedges	BLW	Grasses	Sedges	BLW	Grasses	Sedges	BLW	Grasses	Sedges	BLW
M1	S1	54.83	43.14	2.03	0.17	98.20	1.63	51.29	24.06	24.65	40.58	44.11	15.31
	S2	70.58	14.23	15.19	0.00	89.41	10.59	47.61	24.41	27.98	29.50	59.86	10.64
	S3	15.10	83.19	1.71	8.67	91.33	0.00	33.89	33.02	33.10	94.44	3.70	1.85
M2	S1	50.23	47.05	2.72	16.37	82.35	1.29	35.94	27.28	36.77	26.97	57.81	15.21
	S2	58.61	19.89	21.50	16.25	83.51	0.24	36.11	31.85	32.04	37.29	55.38	7.32
	S3	15.64	81.96	2.40	20.19	79.81	0.00	33.26	36.15	30.59	57.73	42.27	0.00
M3	S1	51.81	44.29	3.90	15.90	23.25	60.86	31.05	37.22	31.73	67.09	9.57	23.34
	S2	59.05	10.97	29.98	21.88	55.07	23.05	35.34	35.63	29.03	76.78	14.65	8.57
	S3	14.48	79.60	5.92	14.03	83.57	2.40	38.10	39.31	22.58	84.13	15.87	0.00

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 Treatments	Sub plot Treatments	Relative Weed Density														
		Active tillering stage														
		Nawagam			Pantnagar			Pattambi			Pusa			Titabar		
		Grasses	Sedges	BLW	Grasses	Sedges	BLW	Grasses	Sedges	Aquatic weed	Grasses	Sedges	BLW	Grasses	Sedges	BLW
M1	S1	41.87	40.94	17.19	52.32	36.84	10.84	69.00	24.62	6.38	56.00	18.90	25.09	58.68	23.90	17.42
	S2	31.32	54.16	14.52	35.97	35.97	28.06	70.00	8.97	21.03	56.83	18.10	25.08	66.16	15.24	18.60
	S3	31.16	54.83	14.01	53.83	25.94	20.23	80.95	9.52	9.52	49.47	17.41	33.12	65.80	18.38	15.82
M2	S1	44.67	39.15	16.18	48.92	34.36	16.73	40.12	43.78	16.10	52.96	16.11	30.93	56.29	19.80	23.92
	S2	31.81	51.60	16.59	54.17	30.56	15.28	68.18	11.11	20.71	56.72	17.41	25.87	58.67	15.80	25.53
	S3	31.52	54.15	14.33	39.60	47.68	12.73	100.00	0.00	0.00	46.67	11.67	41.67	60.13	17.36	22.51
M3	S1	50.25	34.30	15.44	55.08	26.50	18.42	51.92	37.59	10.48	55.97	20.23	23.80	61.10	18.70	20.20
	S2	33.27	52.93	13.80	42.23	25.13	32.64	41.05	47.19	11.76	54.94	28.70	16.36	66.15	8.27	25.59
	S3	31.94	51.83	16.23	30.65	25.81	43.55	100.00	0.00	0.00	49.32	19.92	30.76	64.16	12.25	23.58

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: Relative Weed Density at panicle initiation stage of long term trial on weed dynamics in rice based cropping systems under different establishment methods, *Kharif* 2022.

Main plot Treatments	Sub plot Treatments	Relative Weed Density											
		Panicle initiation stage											
		Chatha			Gangavathi			Malan			Moncompu		
		Grasses	Sedges	BLW	Grasses	Sedges	BLW	Grasses	Sedges	BLW	Grasses	Sedges	BLW
M1	S1	53.76	42.63	3.62	5.18	90.42	4.40	48.70	23.07	28.23	90.22	9.78	1.30
	S2	69.29	19.29	11.42	7.54	90.56	1.90	49.30	17.18	33.52	69.57	30.43	1.01
	S3	62.75	32.95	4.29	1.08	86.02	12.90	38.44	30.47	31.08	100.00	0.00	0.00
M2	S1	55.59	38.31	6.11	11.90	88.10	0.00	43.42	26.21	30.37	84.40	14.37	2.24
	S2	69.56	21.23	9.22	8.97	91.03	0.00	36.64	32.45	30.91	83.12	14.25	3.44
	S3	62.28	31.17	6.55	22.44	77.56	0.00	37.86	29.44	32.70	83.71	16.29	0.00
M3	S1	55.56	37.87	6.57	32.69	7.45	59.86	30.83	32.03	37.14	99.60	0.40	6.50
	S2	69.83	22.19	7.98	21.55	61.29	17.16	40.05	32.46	27.49	94.49	4.04	4.14
	S3	62.67	28.42	8.91	10.39	86.23	3.38	34.63	20.49	44.88	95.54	4.46	0.00

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 Treatments	Sub plot Treatments	Relative Weed Density															
		Panicle initiation stage															
		Nawagam			Pantnagar			Pattambi				Pusa			Titabar		
		Grasses	Sedges	BLW	Grasses	Sedges	BLW	Grasses	Sedges	BLW	Aquatic weed	Grasses	Sedges	BLW	Grasses	Sedges	BLW
M1	S1	49.19	33.32	17.49	48.81	22.64	28.55	38.12	18.61	50.85	1.52	36.60	25.65	37.75	57.35	24.63	18.02
	S2	41.94	42.61	15.44	54.29	22.86	22.86	49.73	26.29	64.06	8.62	49.05	19.76	31.19	64.86	19.04	16.10
	S3	41.64	42.41	15.96	36.11	27.78	36.11	65.28	8.33	60.19	11.11	47.22	22.22	30.56	61.67	21.87	16.46
M2	S1	49.35	33.22	17.43	51.16	24.10	24.74	65.07	11.18	58.50	0.00	40.44	20.35	39.21	54.95	21.24	23.81
	S2	42.43	41.50	16.06	55.56	26.67	17.78	54.63	1.96	30.63	0.00	56.72	17.41	25.87	55.12	18.98	25.90
	S3	42.16	42.37	15.46	46.67	34.44	18.89	36.57	0.00	22.22	39.54	35.28	11.36	53.35	57.18	22.48	20.34
M3	S1	56.61	27.49	15.90	48.38	26.98	24.64	19.59	12.35	30.81	12.99	45.71	24.31	29.98	60.38	19.88	19.74
	S2	44.23	40.41	15.37	50.00	25.56	24.44	29.65	23.61	46.60	7.69	44.30	33.40	22.29	62.07	10.02	27.92
	S3	40.97	42.23	16.80	58.89	28.89	12.22	65.28	0.00	50.00	8.33	49.32	19.92	30.76	63.82	12.31	23.86

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: Weed dry biomass g/m² of Long term trial on weed dynamics in rice based cropping systems under different establishment methods, *Kharif* 2022.

Main plot Treatments	Sub plot Treatments	Aduthurai				Chatha							
		Weed dry biomass g/m² at Active tillering stage				Weed dry biomass g/m² at Active tillering stage				Weed dry biomass g/m² at Pagcle 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	1.76	1.73	1.42	4.91	16.54	3.94	1.74	22.22	55.45	11.82	17.72	84.98
	S2	1.63	1.43	1.52	4.58	4.05	1.41	1.73	7.20	15.66	4.22	9.54	29.43
	S3	1.55	1.46	1.35	4.36	2.98	1.25	0.43	4.66	10.44	3.76	3.45	17.65
M2	S1	2.04	1.85	1.65	5.55	19.00	4.27	1.72	24.98	71.98	12.82	36.58	121.38
	S2	1.93	1.56	1.53	5.02	7.18	1.51	2.17	10.86	24.83	4.48	9.42	38.73
	S3	1.65	1.43	1.51	4.59	6.45	1.37	0.68	8.51	21.49	4.12	8.72	34.33
M3	S1	2.21	6.93	4.55	13.69	20.25	4.46	3.53	28.24	76.79	13.36	40.38	130.53
	S2	1.77	1.52	1.37	4.66	7.79	1.63	3.17	12.59	29.59	4.89	12.27	46.76
	S3	1.55	1.43	1.33	4.31	7.90	1.32	2.35	11.56	24.72	3.97	8.56	37.24
Mean of Factor-1													
M1		1.64	1.54	1.43	4.62	7.86	2.20	1.30	11.36	27.18	6.60	10.24	44.02
M2		1.88	1.61	1.56	5.05	10.88	2.38	1.52	14.78	39.43	7.14	18.24	64.81
M3		1.84	3.29	2.42	7.55	11.98	2.47	3.01	17.46	43.70	7.41	20.40	71.51
CD(0.05)		**0.01**	**0.01**	**0.01**	**0.01**	**0.47**	**0.03**	**0.40**	**0.53**	**2.16**	**0.11**	**1.34**	**3.18**
Mean of Factor-2													
S1		2.00	3.50	2.54	8.05	18.60	4.22	2.33	25.15	68.07	12.67	31.56	112.30
S2		1.78	1.51	1.47	4.76	6.34	1.52	2.36	10.22	23.36	4.53	10.41	38.31
S3		1.58	1.44	1.40	4.42	5.78	1.31	1.16	8.24	18.88	3.95	6.91	29.74
CD(0.05)		**0.02**	**0.02**	**0.02**	**0.03**	**0.52**	**0.08**	**0.71**	**0.71**	**2.62**	**0.23**	**2.42**	**2.32**
Interaction													
M and T		0.03	0.03	0.03	0.06	NS	0.14	NS	NS	NS	0.40	4.18	4.02
T and M		0.03	0.03	0.02	0.05	NS	0.11	NS	NS	NS	0.33	3.48	3.82
Experimental Mean		**1.79**	**2.15**	**1.80**	**5.74**	**10.24**	**2.35**	**1.95**	**14.54**	**36.77**	**7.05**	**16.29**	**60.11**

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 Treatments	Sub plot Treatments	Chiplima			Chinsurah							
		Weed dry biomass g/m²			Weed dry biomass g/m² at Active tillering stage				Weed dry biomass g/m² at Panicle initiation stage			
		Active vegetative stage	Panicle initiation stage	Heading stage	Grasses	Sedges	BLW	Total weed dry biomass	Grasses	Sedges	BLW	Total weed dry biomass
M1	S1	16.67	36.33	96.63	0.40	7.39	1.06	8.85	1.45	5.23	2.18	8.86
	S2	8.17	17.63	42.63	0.18	1.91	0.48	2.58	0.15	2.17	0.45	2.77
	S3	5.17	11.73	24.50	0.10	0.63	0.48	1.21	0.23	2.42	0.65	3.30
M2	S1	29.83	100.00	166.77	0.72	2.04	1.33	4.08	3.10	9.43	2.20	14.73
	S2	20.97	50.23	78.13	0.27	1.27	1.01	2.55	0.63	3.65	0.60	4.87
	S3	8.10	25.17	45.17	0.28	2.37	0.07	2.73	0.40	3.31	0.75	4.46
M3	S1	40.80	110.93	179.00	-	-	-	-	-	-	-	-
	S2	27.63	55.00	95.17	-	-	-	-	-	-	-	-
	S3	12.63	28.47	50.60	-	-	-	-	-	-	-	-
Mean of Factor-1												
M1		10.00	21.90	54.59	0.23	3.31	0.67	4.21	0.61	3.27	1.09	4.98
M2		19.63	58.47	96.69	0.42	1.89	0.80	3.12	1.38	5.46	1.18	8.02
M3		27.02	64.80	108.26	-	-	-	-	-	-	-	-
CD(0.05)		**2.57**	**4.60**	**12.19**	**0.10**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
Mean of Factor-2												
S1		29.10	82.42	147.47	0.56	4.72	1.19	6.47	2.28	7.33	2.19	11.80
S2		18.92	40.96	71.98	0.22	1.59	0.75	2.56	0.39	2.91	0.52	3.82
S3		8.63	21.79	40.09	0.19	1.50	0.28	1.97	0.31	2.87	0.70	3.88
CD(0.05)		**4.05**	**5.07**	**12.30**	**0.08**	**1.09**	**0.33**	**1.06**	**0.49**	**2.43**	**0.35**	**2.18**
Interaction												
M and T		7.02	8.79	21.31	0.12	1.54	0.47	1.50	0.69	NS	NS	NS
T and M		5.89	7.63	18.76	0.13	2.16	0.47	2.17	0.86	NS	NS	NS
Experimental Mean		**18.89**	**48.39**	**86.51**	**0.33**	**2.60**	**0.74**	**3.67**	**0.99**	**4.37**	**1.14**	**6.50**

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 Treatments	Sub plot Treatments	Gangavathi							
		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	1.20	201.09	0.28	202.57	21.31	117.96	1.11	140.39
	S2	0.00	59.12	1.30	60.42	16.77	42.63	0.37	59.77
	S3	3.24	11.21	0.00	14.46	1.20	18.53	1.95	21.68
M2	S1	41.89	285.51	3.89	331.28	144.93	152.71	0.00	297.65
	S2	26.78	122.32	1.02	150.12	123.06	193.02	0.00	316.09
	S3	6.86	38.09	0.00	44.94	41.33	53.93	0.00	95.26
M3	S1	63.48	44.48	169.58	277.54	167.26	21.31	143.54	332.12
	S2	54.58	151.14	66.35	272.07	92.57	92.76	58.10	243.44
	S3	11.86	18.35	1.58	31.78	127.69	166.80	1.58	296.07
Mean of Factor-1									
M1		1.48	90.47	0.53	92.48	13.10	59.71	1.14	73.95
M2		25.17	148.64	1.64	175.45	103.11	133.22	0.00	236.33
M3		43.31	71.32	79.17	193.80	129.18	93.62	67.74	290.54
CD(0.05)		**18.50**	**36.13**	**30.47**	**NS**	**NS**	**NS**	**6.32**	**82.59**
Mean of Factor-2									
S1		35.52	177.02	57.92	270.46	111.17	97.33	48.22	256.72
S2		27.12	110.86	22.89	160.87	77.47	109.47	19.49	206.43
S3		7.32	22.55	0.53	30.39	56.74	79.76	1.17	137.67
CD(0.05)		**19.52**	**82.50**	**19.17**	**85.24**	**NS**	**NS**	**23.29**	**76.06**
Interaction									
M and T		NS	NS	33.20	NS	NS	71.02	40.35	NS
T and M		NS	NS	33.27	NS	NS	64.78	33.07	NS
Experimental Mean		**23.32**	**103.48**	**27.11**	**153.91**	**81.79**	**95.52**	**22.96**	**200.27**

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 Treatments	Sub plot Treatments	Ghaghraghat		Malan							
		Weeddry biomass g/m²		Weeddry biomass g/m² at Active tillering stage				Weed dry biomass g/m² at Panicle initiation stage			
		Active vegetative stage	Panicle iniation stage	Grasses	Sedges	BLW	Total weed dry biomass	Grasses	Sedges	BLW	Total weed dry biomass
M1	S1	2.66	2.96	33.17	13.90	15.37	62.43	28.10	11.93	13.63	53.67
	S2	2.17	2.68	13.17	5.30	12.93	31.40	23.37	7.83	12.70	43.90
	S3	2.16	2.49	2.23	1.63	2.43	6.30	3.83	3.53	3.20	10.57
M2	S1	3.25	3.49	33.67	28.10	47.23	109.00	43.24	23.93	26.77	93.94
	S2	2.58	2.96	21.97	16.34	21.87	60.17	18.43	7.80	16.27	42.50
	S3	2.27	2.88	2.12	5.33	11.20	18.65	2.73	2.53	3.67	8.93
M3	S1	3.64	4.12	44.23	63.47	53.23	160.93	39.67	43.07	51.73	134.47
	S2	2.52	3.25	25.97	28.20	24.93	79.10	26.90	24.57	24.30	75.77
	S3	2.33	3.05	4.13	3.03	9.33	16.50	4.37	2.80	4.20	11.37
Mean of Factor-1											
M1		2.33	2.71	16.19	6.94	10.24	33.38	18.43	7.77	9.84	36.04
M2		2.70	3.11	19.25	16.59	26.77	62.61	21.47	11.42	15.57	48.46
M3		2.83	3.47	24.78	31.57	29.17	85.51	23.64	23.48	26.74	73.87
CD(0.05)		**NS**	**NS**	**1.30**	**2.65**	**1.66**	**2.40**	**NS**	**1.74**	**2.14**	**5.26**
Mean of Factor-2											
S1		3.18	3.52	37.02	35.16	38.61	110.79	37.00	26.31	30.71	94.02
S2		2.43	2.97	20.37	16.61	19.91	56.89	22.90	13.40	17.76	54.06
S3		2.25	2.81	2.83	3.33	7.66	13.82	3.64	2.96	3.69	10.29
CD(0.05)		**0.18**	**0.50**	**1.51**	**2.88**	**2.93**	**3.72**	**3.32**	**3.38**	**2.84**	**3.40**
Interaction											
M and T		0.31	NS	2.61	4.98	5.07	6.44	5.74	5.85	4.92	5.90
T and M		0.31	NS	2.25	4.34	4.23	5.40	5.19	4.85	4.18	5.84
Experimental Mean		**2.62**	**3.10**	**20.07**	**18.37**	**22.06**	**60.50**	**21.18**	**14.22**	**17.39**	**52.79**

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 Treatments	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	39.19	39.41	10.36	88.96	177.95	17.93	2.49	198.37
	S2	14.20	59.19	11.08	84.47	63.87	27.65	1.23	92.75
	S3	27.75	0.72	0.20	28.67	27.84	0.00	0.00	27.84
M2	S1	19.47	46.93	14.87	81.27	96.28	5.56	31.97	133.81
	S2	28.36	33.21	7.71	69.28	84.23	20.88	2.83	107.93
	S3	29.08	9.81	0.00	38.89	83.19	27.97	0.00	111.16
M3	S1	60.21	6.67	39.52	106.40	233.91	1.41	19.60	254.92
	S2	42.69	20.37	9.11	72.17	87.31	5.67	4.48	97.45
	S3	23.36	2.11	0.00	25.47	103.28	11.45	0.00	114.73
Mean of Factor-1									
M1		27.04	33.11	7.21	67.36	89.88	15.20	1.24	106.32
M2		25.64	29.99	7.52	63.15	87.90	18.14	11.60	117.64
M3		42.09	9.72	16.21	68.01	141.50	6.18	8.03	155.70
CD(0.05)		**8.27**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
Mean of Factor-2									
S1		39.62	31.00	21.58	92.21	169.38	8.30	18.02	195.70
S2		28.42	37.59	9.30	75.31	78.47	18.07	2.84	99.38
S3		26.73	4.21	0.07	31.01	71.44	13.14	0.00	84.58
CD(0.05)		**NS**	**NS**	**9.55**	**32.73**	**41.01**	**NS**	**NS**	**51.90**
Interaction									
M and T		NS	NS	NS	NS	71.03	NS	NS	NS
T and M		NS	NS	NS	NS	64.64	NS	NS	NS
Experimental Mean		**31.59**	**24.27**	**10.32**	**66.17**	**106.43**	**13.17**	**6.96**	**126.55**

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 Treatments	Sub plot Treatments	Nagina							
		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	3.11	3.22	3.36	9.69	4.58	3.70	4.12	12.40
	S2	1.30	1.18	1.39	3.87	1.33	1.41	1.33	4.08
	S3	1.10	1.00	1.07	3.17	1.29	1.16	1.20	3.65
M2	S1	3.60	3.77	4.05	11.41	4.47	3.76	4.23	12.45
	S2	1.68	2.01	1.26	4.94	1.43	1.57	1.34	4.34
	S3	1.27	1.23	1.46	3.96	1.30	1.23	1.31	3.84
M3	S1	3.58	3.65	3.51	10.74	4.60	4.16	3.83	12.59
	S2	1.92	1.85	1.61	5.39	1.50	1.47	1.47	4.44
	S3	1.35	1.26	1.51	4.12	1.30	1.40	1.42	4.12
Mean of Factor-1									
M1		1.84	1.80	1.94	5.58	2.40	2.09	2.22	6.71
M2		2.18	2.33	2.26	6.77	2.40	2.19	2.29	6.88
M3		2.29	2.25	2.21	6.75	2.47	2.34	2.24	7.05
CD(0.05)		**0.13**	**NS**	**NS**	**0.60**	**NS**	**NS**	**NS**	**NS**
Mean of Factor-2									
S1		3.43	3.54	3.64	10.62	4.55	3.87	4.06	12.48
S2		1.64	1.68	1.42	4.73	1.42	1.48	1.38	4.28
S3		1.24	1.16	1.35	3.75	1.30	1.26	1.31	3.87
CD(0.05)		**0.35**	**0.46**	**0.13**	**0.34**	**0.16**	**0.14**	**0.24**	**0.22**
Interaction									
M and T		NS	NS	0.23	NS	NS	NS	NS	NS
T and M		NS	NS	0.30	NS	NS	NS	NS	NS
Experimental Mean		**2.10**	**2.13**	**2.14**	**6.37**	**2.42**	**2.21**	**2.25**	**6.88**

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 Treatments	Sub plot Treatments	Nawagam							
		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	94.89	99.22	72.46	266.57	256.97	125.61	105.39	487.97
	S2	50.63	77.11	36.23	163.97	139.97	68.70	54.22	262.88
	S3	35.13	57.75	25.79	118.67	107.01	51.88	44.19	203.08
M2	S1	96.88	92.73	65.28	254.90	274.35	129.91	104.63	508.89
	S2	49.13	69.52	38.84	157.49	138.43	65.50	57.89	261.82
	S3	41.25	62.92	28.39	132.57	116.30	54.59	44.62	215.50
M3	S1	127.26	87.45	68.22	282.92	350.91	166.22	112.1	629.23
	S2	56.38	78.32	35.58	170.28	159.14	74.95	62.12	296.21
	S3	43.01	61.71	33.94	138.66	121.99	57.78	54.13	233.90
Mean of Factor-1									
M1		60.22	78.03	44.83	183.07	167.98	82.06	67.93	317.98
M2		62.42	75.06	44.17	181.65	176.36	83.33	69.05	328.74
M3		75.55	75.83	45.91	197.29	210.68	99.65	76.12	386.45
CD(0.05)		**7.55**	**NS**	**NS**	**NS**	**15.69**	**8.42**	**NS**	**27.36**
Mean of Factor-2									
S1		106.34	93.13	68.65	268.13	294.08	140.58	107.38	542.03
S2		52.05	74.98	36.88	163.91	145.85	69.72	58.08	273.64
S3		39.80	60.79	29.37	129.97	115.10	54.75	47.65	217.50
CD(0.05)		**12.34**	**10.54**	**7.96**	**19.96**	**22.19**	**10.61**	13.63	**29.02**
Interaction									
M and T		NS	NS	NS	NS	38.43	18.38	NS	50.26
T and M		NS	NS	NS	NS	32.48	15.70	NS	43.90
Experimental Mean		**66.06**	**76.30**	**44.97**	**187.34**	**185.01**	**88.35**	71.03	**344.39**

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 Treatments	Sub plot Treatments	Pantnagar				Pattambi								
		Weed dry biomass g/m² at Active tillering 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	Aquatic weed	Total weed dry biomass	Grasses	Sedges	BLW	Aquatic weed	Total weed dry biomass
M1	S1	40.32	25.86	26.48	92.66	5.55	2.44	0.68	8.67	9.01	8.16	17.03	0.64	34.83
	S2	6.37	34.44	47.62	88.44	3.14	0.34	0.99	4.47	11.77	6.46	3.88	1.90	24.00
	S3	8.23	19.44	31.67	59.34	2.54	0.10	0.36	3.00	6.00	0.68	1.54	1.78	10.00
M2	S1	62.67	24.22	32.89	119.77	2.88	2.91	1.21	7.00	34.50	5.36	18.14	0.00	58.00
	S2	8.00	34.52	22.86	65.38	2.78	0.58	0.97	4.33	15.43	0.44	11.66	0.00	27.53
	S3	5.33	41.11	15.87	62.32	2.00	0.00	0.00	2.00	9.07	0.00	7.32	3.95	20.33
M3	S1	62.50	21.65	31.21	115.36	4.84	3.48	1.01	9.33	11.82	7.47	19.71	2.32	41.33
	S2	8.67	30.00	42.50	81.17	1.72	1.95	0.66	4.33	5.90	2.93	14.05	2.25	25.14
	S3	5.17	24.44	39.29	68.90	2.00	0.00	0.00	2.00	9.67	0.00	2.72	0.61	13.00
Mean of Factor-1														
M1		18.31	26.58	35.26	80.15	3.74	0.96	0.68	5.38	8.92	5.10	7.48	1.44	22.94
M2		25.33	33.28	23.87	82.49	2.55	1.17	0.72	4.44	19.67	1.93	12.37	1.32	35.29
M3		25.44	25.37	37.67	88.48	2.86	1.81	0.56	5.22	9.13	3.47	12.16	1.73	26.49
CD(0.05)		**1.71**	**NS**	**NS**	**NS**	**0.26**	**NS**	**NS**	**NS**	NS	NS	**1.84**	**NS**	**4.80**
Mean of Factor-2														
S1		55.16	23.91	30.19	109.26	4.43	2.94	0.97	8.33	18.44	7.00	18.29	0.99	44.72
S2		7.68	32.99	37.66	78.33	2.55	0.96	0.87	4.38	11.03	3.28	9.86	1.38	25.56
S3		6.24	28.33	28.94	63.52	2.18	0.03	0.12	2.33	8.24	0.23	3.86	2.11	14.44
CD(0.05)		**4.34**	**NS**	**NS**	**19.29**	**1.13**	**0.89**	**0.71**	**1.19**	6.77	3.32	**5.24**	**NS**	**6.55**
Interaction														
M and T		7.51	NS	NS	NS	NS	NS	NS	NS	11.72	NS	NS	NS	NS
T and M		6.19	NS	NS	NS	NS	NS	NS	NS	10.60	NS	NS	NS	NS
Experimental Mean		**23.03**	**28.41**	**32.26**	**83.70**	**3.05**	**1.31**	**0.65**	**5.01**	12.57	3.50	**10.67**	**1.49**	**28.24**

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 Treatments	Sub plot Treatments	Puducherry											
		Weed dry biomass g/m² at Active vegetative stage				Weed dry biomass g/m² at Panicle initiation stage				Weed dry biomass g/m² at heading stage			
		Grasses	Sedges	BLW	Total weed dry biomass	Grasses	Sedges	BLW	Total weed dry biomass	Grasses	Sedges	BLW	Total weed dry biomass
M1	S1	40.03	27.89	18.34	86.27	43.91	24.39	21.40	89.69	29.60	20.26	19.21	69.07
	S2	23.43	16.67	15.65	55.75	22.75	14.12	13.76	50.62	10.94	9.00	9.11	29.05
	S3	16.66	14.65	11.88	43.18	13.52	10.34	10.70	34.56	6.48	7.06	5.95	19.49
M2	S1	48.99	34.09	25.61	108.69	51.10	28.09	29.81	109.00	40.53	25.10	25.05	90.68
	S2	33.81	26.99	18.90	79.70	29.21	19.30	16.81	65.32	16.25	13.21	11.79	41.25
	S3	27.37	22.04	14.81	64.22	21.83	13.56	12.84	48.23	10.13	10.82	8.08	29.03
M3	S1	-	-	-	-	-	-	-	-	-	-	-	-
	S2	-	-	-	-	-	-	-	-	-	-	-	-
	S3	-	-	-	-	-	-	-	-	-	-	-	-
Mean of Factor-1													
M1		26.71	19.74	15.29	61.73	26.72	16.28	15.28	58.29	15.67	12.10	11.43	39.20
M2		36.72	27.71	19.77	84.20	34.05	20.32	19.82	74.18	22.30	16.38	14.97	53.65
M3		-	-	-	-	-	-	-	-	-	-	-	-
CD(0.05)		**1.66**	**0.36**	**0.11**	**1.30**	**0.42**	**1.21**	**0.62**	**1.35**	**1.14**	**0.69**	**0.63**	**0.64**
Mean of Factor-2													
S1		44.51	30.99	21.97	97.48	47.50	26.24	25.60	99.35	35.07	22.68	22.13	79.88
S2		28.62	21.83	17.27	67.73	25.98	16.71	15.28	57.97	13.59	11.10	10.45	35.15
S3		22.01	18.35	13.34	53.70	17.67	11.95	11.77	41.39	8.31	8.94	7.01	24.26
CD(0.05)		**1.17**	**0.68**	**0.44**	**1.74**	**0.99**	**0.92**	**0.59**	**1.61**	**1.04**	**0.64**	**0.76**	**1.61**
Interaction													
M and T		NS	0.96	0.62	NS	NS	NS	0.84	2.27	1.47	NS	1.07	2.28
T and M		NS	0.84	0.52	NS	NS	NS	0.84	2.14	1.50	NS	1.01	1.93
Experimental Mean		**31.71**	**23.72**	**17.53**	**72.97**	**30.38**	**18.30**	**17.55**	**66.24**	**18.99**	**14.24**	**13.20**	**46.43**

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 Treatments	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	20.00	6.33	10.00	36.33	21.00	13.33	25.50	59.83
	S2	8.67	2.50	4.67	15.83	12.83	5.17	10.00	28.00
	S3	6.83	2.83	4.33	14.00	12.50	6.67	10.83	30.00
M2	S1	15.67	5.00	12.33	33.00	21.83	13.67	28.00	63.50
	S2	9.33	2.67	4.00	16.00	16.33	6.67	11.83	34.83
	S3	7.00	1.50	6.00	14.50	9.83	4.00	21.50	35.33
M3	S1	27.33	10.67	14.00	52.00	37.50	23.33	34.00	94.83
	S2	8.70	5.17	4.00	17.87	17.67	12.67	11.00	41.33
	S3	7.50	3.17	5.67	16.33	15.33	8.50	13.83	37.67
Mean of Factor-1									
M1		11.83	3.89	6.33	22.06	15.44	8.39	15.44	39.28
M2		10.67	3.06	7.44	21.17	16.00	8.11	20.44	44.56
M3		14.51	6.33	7.89	28.73	23.50	14.83	19.61	57.94
CD(0.05)		**NS**	**NS**	**NS**	**2.80**	**3.65**	**NS**	**NS**	**7.88**
Mean of Factor-2									
S1		21.00	7.33	12.11	40.44	26.78	16.78	29.17	72.72
S2		8.90	3.44	4.22	16.57	15.61	8.17	10.94	34.72
S3		7.11	2.50	5.33	14.94	12.56	6.39	15.39	34.33
CD(0.05)		**3.12**	**2.06**	**2.80**	**4.11**	**4.80**	**5.39**	**6.71**	**9.04**
Interaction									
M and T		5.40	NS	NS	7.11	NS	NS	NS	NS
T and M		4.72	NS	NS	5.99	NS	NS	NS	NS
Experimental Mean		**12.34**	**4.43**	**7.22**	**23.99**	**18.31**	**10.44**	**18.50**	**47.26**

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 Treatments	Sub plot Treatments	ARI-Rajendranagar							
		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	46.33	77.33	2.33	126.00	55.00	6.33	13.33	74.67
	S2	21.67	36.33	16.00	74.00	20.00	9.33	42.33	71.67
	S3	4.33	30.00	13.67	48.00	21.67	33.00	3.67	58.33
M2	S1	92.00	106.00	1.33	199.33	43.33	4.00	52.67	100.00
	S2	24.67	25.00	3.00	52.67	31.33	23.67	16.00	71.00
	S3	13.33	6.33	5.00	24.67	22.67	16.67	12.67	52.00
M3	S1	177.33	22.67	38.67	238.67	45.33	55.00	33.00	133.33
	S2	152.33	9.00	42.67	204.00	72.67	23.00	12.00	107.67
	S3	15.33	84.67	16.33	116.33	35.00	14.67	23.00	72.67
Mean of Factor-1									
M1		24.11	47.89	10.67	82.67	32.22	16.22	19.78	68.22
M2		43.33	45.78	3.11	92.22	32.44	14.78	27.11	74.33
M3		115.00	38.78	32.56	186.33	51.00	30.89	22.67	104.56
CD(0.05)		**5.05**	**NS**	**1.85**	**8.87**	**3.01**	**0.88**	**1.40**	**3.84**
Mean of Factor-2									
S1		105.22	68.67	14.11	188.00	47.89	21.78	33.00	102.67
S2		66.22	23.44	20.56	110.22	41.33	18.67	23.44	83.44
S3		11.00	40.33	11.67	63.00	26.44	21.44	13.11	61.00
CD(0.05)		**7.54**	**3.77**	**1.96**	**8.46**	**3.75**	**NS**	**3.18**	**5.98**
Interaction									
M and T		13.06	6.52	3.39	14.66	6.49	5.42	5.51	10.36
T and M		10.99	6.30	2.96	13.04	5.55	4.44	4.55	8.69
Experimental Mean		**60.81**	**44.15**	**15.44**	**120.41**	**38.56**	**20.63**	**23.19**	**82.37**

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 Treatments	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 dry biomass	Grasses	Sedges	BLW	Total weed dry biomass
M1	S1	8.57	1.20	4.07	13.83	10.30	1.57	4.53	16.40
	S2	7.83	0.83	3.53	12.20	9.26	1.03	4.03	14.33
	S3	4.67	0.50	1.60	6.77	5.67	0.62	2.03	8.32
M2	S1	9.30	1.20	5.53	16.03	10.93	1.53	6.30	18.77
	S2	8.17	1.00	5.27	14.43	9.57	1.33	6.07	16.97
	S3	5.83	0.83	2.80	9.47	7.10	0.97	3.67	11.73
M3	S1	12.43	1.50	8.00	21.93	15.53	1.80	10.90	28.23
	S2	9.67	0.50	4.93	15.10	10.70	0.60	6.07	17.37
	S3	7.03	0.47	3.43	10.93	8.03	0.61	4.23	12.88
Mean of Factor-1									
M1		7.02	0.84	3.07	10.93	8.41	1.07	3.53	13.02
M2		7.77	1.01	4.53	13.31	9.20	1.28	5.34	15.82
M3		9.71	0.82	5.46	15.99	11.42	1.00	7.07	19.49
CD(0.05)		**0.72**	**NS**	**0.68**	**0.83**	**1.16**	**0.11**	**0.41**	**1.26**
Mean of Factor-2									
S1		10.10	1.30	5.87	17.27	12.26	1.63	7.24	21.13
S2		8.56	0.78	4.58	13.91	9.84	0.99	5.39	16.22
S3		5.84	0.60	2.61	9.06	6.94	0.73	3.31	10.98
CD(0.05)		**0.74**	**0.18**	**0.63**	**1.11**	**0.96**	**0.19**	**0.92**	**1.32**
Interaction									
M and T		NS	0.31	1.09	1.92	1.66	0.32	1.60	2.28
T and M		NS	0.26	0.97	1.63	1.52	0.27	1.32	2.00
Experimental Mean		**8.17**	**0.89**	**4.35**	**13.41**	**9.68**	**1.12**	**5.31**	**16.11**

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 Treatments	Sub plot Treatments	Varanasi							
		Weed dry biomass g/m² at Active tillering stage				Weed dry biomass g/m² panicle initiation stage			
		Grasses	Sedges	BLW	Total weed dry biomass	Grasses	Sedges	BLW	Total weed dry biomass
M1	S1	4.98	70.93	1.66	77.57	42.71	240.68	7.04	290.43
	S2	5.13	73.32	0.97	79.41	31.66	194.80	7.95	234.41
	S3	5.35	70.80	1.06	77.21	30.80	183.67	6.90	221.36
M2	S1	5.47	14.69	3.42	23.58	117.09	287.33	7.11	411.53
	S2	6.21	16.36	1.72	24.29	73.30	244.67	5.69	323.66
	S3	4.08	14.59	3.19	21.86	62.61	231.00	6.10	299.71
M3	S1	5.67	12.77	1.72	20.15	65.77	274.33	8.26	348.36
	S2	5.61	14.04	2.19	21.85	76.64	310.33	8.45	395.42
	S3	4.86	13.65	4.14	22.66	73.27	181.67	8.46	263.40
Mean of Factor-1									
M1		5.15	71.68	1.23	78.06	35.06	206.38	7.30	248.73
M2		5.25	15.21	2.78	23.24	84.33	254.33	6.30	344.97
M3		5.38	13.49	2.69	21.55	71.89	255.44	8.39	335.72
CD(0.05)		**NS**	**4.72**	**NS**	**5.39**	**13.07**	**NS**	**NS**	**NS**
Mean of Factor-2									
S1		5.37	32.80	2.27	40.43	75.19	267.45	7.47	350.11
S2		5.65	34.57	1.63	41.85	60.53	249.93	7.36	317.83
S3		4.76	33.01	2.80	40.58	55.56	198.78	7.15	261.49
CD(0.05)		**NS**	**NS**	**NS**	**NS**	**11.20**	**52.10**	**NS**	**52.36**
Interaction									
M and T		NS	NS	NS	NS	19.40	NS	NS	NS
T and M		NS	NS	NS	NS	17.66	NS	NS	NS
Experimental Mean		**5.26**	**33.46**	**2.23**	**40.95**	**63.76**	**238.72**	**7.33**	**309.81**

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: Species wise Weed dry biomass g/m² of long term trial on weed dynamics in rice based cropping systems under different establishment methods, *Kharif* 2022.

Main plot Treatments	Sub plot Treatments	Chatha							
		Weed dry biomass g/m² at Active tillering stage							
		Grasses				Sedges	BLW		Total weed biomass
		Cynodon dactylon	*Dactylactenium aegyptium*	*Echinochloa spp*	*Eleusine indica*	*Cyperus spp*	*Physalis minima*	*Solanum nigrum*	
M1	S1	3.95	4.54	6.82	1.23	3.94	1.15	0.59	22.22
	S2	1.02	1.05	1.57	0.42	1.41	0.57	1.17	7.2
	S3	0.81	0.94	1.04	0.19	1.25	0.25	0.18	4.66
M2	S1	4.25	5.42	7.19	2.13	4.27	0.83	0.88	24.98
	S2	1.37	2.42	2.82	0.57	1.51	1.16	1.02	10.86
	S3	1.14	2.2	2.57	0.54	1.37	0.47	0.22	8.51
M3	S1	4.41	5.67	7.72	2.45	4.46	2.03	1.49	28.24
	S2	1.5	2.49	3.41	0.4	1.63	1.76	1.41	12.59
	S3	1.25	2.27	3.13	1.24	1.32	0.87	1.48	11.56
Mean of Factor-1									
M1		1.93	2.18	3.14	0.61	2.2	0.66	0.64	11.36
M2		2.25	3.35	4.19	1.08	2.38	0.82	0.71	14.78
M3		2.39	3.48	4.75	1.36	2.47	1.55	1.46	17.46
CD(0.05)		**0.1**	**0.06**	**0.03**	**NS**	**0.03**	**0.28**	**0.22**	**0.53**
Mean of Factor-2									
S1		4.2	5.21	7.25	1.94	4.22	1.34	0.99	25.15
S2		1.29	1.99	2.6	0.46	1.52	1.16	1.2	10.22
S3		1.07	1.8	2.25	0.66	1.31	0.53	0.63	8.24
CD(0.05)		**0.05**	**0.03**	**0.1**	**0.51**	**0.08**	**0.44**	**NS**	**0.71**
Interaction									
M and T		NS	0.05	0.18	NS	0.14	NS	NS	NS
T and M		NS	0.05	0.15	NS	0.11	NS	NS	NS
Experimental Mean		**2.19**	**3**	**4.03**	**1.02**	**2.35**	**1.01**	**0.94**	**14.54**

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 Treatments	Sub plot Treatments	Chatha							
		Weed dry biomass g/m² at panicle initiation stage							
		Grasses				Sedges	BLW		Total weed biomass
		Cynodon dactylon	*Dactylactenium aegyptium*	*Echinochloa spp*	*Eleusine indica*	*Cyperus spp*	*Physalis minima*	Solanum nigrum	
M1	S1	11.85	13.63	20.47	9.5	11.82	7.65	10.07	84.98
	S2	3.14	3.18	4.71	4.63	4.22	4.57	4.98	29.43
	S3	2.43	2.81	3.16	2.03	3.76	1.25	2.2	17.65
M2	S1	12.75	16.29	21.6	21.33	12.82	19.96	16.62	121.38
	S2	4.1	7.27	8.45	5	4.48	4.04	5.38	38.73
	S3	3.42	6.6	7.7	3.77	4.12	4.94	3.78	34.33
M3	S1	13.22	17.02	23.15	23.4	13.36	21.45	18.93	130.53
	S2	4.51	7.46	10.19	7.43	4.89	5.77	6.5	46.76
	S3	3.75	6.83	9.39	4.75	3.97	3.2	5.36	37.24
Mean of Factor-1									
M1		5.81	6.54	9.45	5.39	6.6	4.49	5.75	44.02
M2		6.76	10.06	12.59	10.03	7.14	9.65	8.59	64.81
M3		7.16	10.44	14.24	11.86	7.41	10.14	10.26	71.51
CD(0.05)		**0.27**	**0.18**	**0.07**	**2.15**	**0.11**	**1.35**	**1.98**	**3.18**
Mean of Factor-2									
S1		12.61	15.65	21.74	18.08	12.67	16.35	15.21	112.3
S2		3.92	5.97	7.78	5.69	4.53	4.79	5.62	38.31
S3		3.2	5.41	6.75	3.52	3.95	3.13	3.78	29.74
CD(0.05)		**0.17**	**0.08**	**0.32**	**2.44**	**0.23**	**1.94**	**1.79**	**2.32**
Interaction									
M and T		NS	0.13	0.55	4.22	0.4	3.35	3.11	4.02
T and M		NS	0.16	0.45	3.65	0.33	2.83	2.79	3.82
Experimental Mean		**6.57**	**9.01**	**12.09**	**9.09**	**7.05**	**8.09**	**8.2**	**60.11**

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 Treatments	Sub plot Treatments	Gangavathi								
		Weed dry biomass g/m² at Active tillering stage								
		Grasses				Sedges	BLW			Total weed biomass
		Dinebra retroflexa	*Panicum repense*	*Paspalum scrobiculatum*	*Echinochloa colona*	*Cyperus iria*	*Ammania baccifera*	*Astercantha longifolia*	*Cynotis cristata*	
M1	S1	0.00	0.00	0.00	1.20	201.09	0.28	0.00	0.00	202.57
	S2	0.00	0.00	0.00	0.00	59.12	1.30	0.00	0.00	60.42
	S3	0.00	1.20	0.00	2.04	11.21	0.00	0.00	0.00	14.46
M2	S1	0.00	5.00	36.88	0.00	285.51	0.19	1.02	2.69	331.28
	S2	0.00	0.00	25.67	1.11	122.32	0.00	0.00	1.02	150.12
	S3	0.00	6.86	0.00	0.00	38.09	0.00	0.00	0.00	44.94
M3	S1	5.47	0.00	39.94	18.07	44.48	0.00	129.92	39.66	277.54
	S2	2.87	7.32	27.89	16.49	151.14	0.00	51.34	15.01	272.07
	S3	0.00	5.19	0.00	6.67	18.35	1.58	0.00	0.00	31.78
Mean of Factor-1										
M1		0.00	0.40	0.00	1.08	90.47	0.53	0.00	0.00	92.48
M2		0.00	3.95	20.85	0.37	148.64	0.06	0.34	1.24	175.45
M3		2.78	4.17	22.61	13.75	71.32	0.53	60.42	18.22	193.80
CD(0.05)		**1.45**	**NS**	**NS**	**4.04**	**36.13**	**NS**	**NS**	**6.46**	**NS**
Mean of Factor-2										
S1		1.82	1.67	25.61	6.42	177.02	0.15	43.65	14.12	270.46
S2		0.96	2.44	17.85	5.87	110.86	0.43	17.11	5.34	160.87
S3		0.00	4.42	0.00	2.90	22.55	0.53	0.00	0.00	30.39
CD(0.05)		**NS**	**NS**	**NS**	**NS**	**82.50**	**NS**	**21.00**	**6.85**	**85.24**
Interaction										
M and T		NS	NS	NS	NS	NS	1.20	36.37	11.86	NS
T and M		NS	NS	NS	NS	NS	1.02	36.68	10.36	NS
Experimental Mean		**0.93**	**2.84**	**14.49**	**5.07**	**103.48**	**0.37**	**20.25**	**6.49**	**153.91**

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:

Gangavathi										
Weed dry biomass g/m^2 at panicle initiation stage										
Main plot Treatments	Sub plot Treatments	Grasses			Sedges		BLW			Total weed biomass
		Panicum repense	*Paspalum scrobiculatum*	*Echinochloa colona*	*Cyperus difformis*	*Cyperus iria*	*Ammania baccifera*	*Astercantha longifolia*	*Cynotis cristata*	
M1	S1	0.00	8.25	13.07	1.95	116.02	1.11	0.00	0.00	140.39
	S2	0.00	0.00	16.77	4.73	37.90	0.37	0.00	0.00	59.77
	S3	1.20	0.00	0.00	3.71	14.83	1.95	0.00	0.00	21.68
M2	S1	0.00	144.65	0.28	0.00	152.71	0.00	0.00	0.00	297.65
	S2	0.00	123.06	0.00	0.00	193.02	0.00	0.00	0.00	316.09
	S3	30.95	0.00	10.38	0.00	53.93	0.00	0.00	0.00	95.26
M3	S1	1.76	128.71	22.15	0.00	21.31	0.00	67.65	75.89	332.12
	S2	0.00	58.38	23.35	0.00	92.76	3.52	28.45	26.13	243.44
	S3	42.07	73.67	7.41	0.00	166.80	1.58	0.00	0.00	296.07
Mean of Factor-1										
M1		0.40	2.75	9.95	3.46	56.25	1.14	0.00	0.00	73.95
M2		10.32	89.24	3.55	0.00	133.22	0.00	0.00	0.00	236.33
M3		14.61	86.92	17.64	0.00	93.62	1.70	32.03	34.01	290.54
CD(0.05)		**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**14.95**	**13.03**	**82.59**
Mean of Factor-2										
S1		0.59	93.87	11.83	0.65	96.68	0.37	22.55	25.30	256.72
S2		0.00	60.48	13.37	1.58	107.89	1.30	9.48	8.71	206.43
S3		24.74	24.56	5.93	1.24	78.52	1.17	0.00	0.00	137.67
CD(0.05)		**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**12.24**	**76.06**
Interaction										
M and T		NS	NS	NS	NS	69.02	NS	NS	21.20	NS
T and M		NS	NS	NS	NS	63.61	NS	NS	18.92	NS
Experimental Mean		**8.44**	**59.64**	**10.38**	**1.15**	**94.37**	**0.95**	**10.68**	**11.34**	**200.27**

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 Treatments	Sub plot Treatments	Malan									
		Weed dry biomass g/m² at Active tillering stage									
		Grasses			Sedges			BLW			Total weed dry biomass
		Echinochloa colonum	*Echinochloa crusgalli*	*Panicum spp*	*Cyperus difformis*	*Cyperus iria*	*Cyperus rotundus*	*Alternanthera spp*	*Eclipta alba*	*Monochoria vaginalis*	
M1	S1	18.83	7.30	7.03	4.57	5.10	4.23	5.40	4.67	5.30	62.43
	S2	7.67	2.67	2.83	1.23	2.00	2.07	4.33	3.80	4.80	31.40
	S3	1.47	0.47	0.30	0.37	0.60	0.67	0.83	1.00	0.60	6.30
M2	S1	19.00	6.47	8.20	6.10	11.70	10.30	14.83	15.17	17.23	109.00
	S2	12.23	4.90	4.83	5.37	5.93	5.04	6.37	7.23	8.27	60.17
	S3	1.25	0.47	0.40	1.90	1.97	1.47	1.03	8.07	2.10	18.65
M3	S1	24.10	9.77	10.37	19.50	21.50	22.47	18.43	18.37	16.43	160.93
	S2	13.63	5.97	6.37	8.80	10.00	9.40	8.43	7.43	9.07	79.10
	S3	3.03	0.67	0.43	0.90	1.10	1.03	2.23	3.30	3.80	16.50
Mean of Factor-1											
M1		9.32	3.48	3.39	2.06	2.57	2.32	3.52	3.16	3.57	33.38
M2		10.83	3.94	4.48	4.46	6.53	5.60	7.41	10.16	9.20	62.61
M3		13.59	5.47	5.72	9.73	10.87	10.97	9.70	9.70	9.77	85.51
CD(0.05)		**0.63**	**0.69**	**0.27**	**1.59**	**0.70**	**1.76**	**0.58**	**1.71**	**0.94**	**2.40**
Mean of Factor-2											
S1		20.64	7.84	8.53	10.06	12.77	12.33	12.89	12.73	12.99	110.79
S2		11.18	4.51	4.68	5.13	5.98	5.50	6.38	6.16	7.38	56.89
S3		1.92	0.53	0.38	1.06	1.22	1.06	1.37	4.12	2.17	13.82
CD(0.05)		**0.96**	**1.01**	**0.62**	**2.00**	**0.50**	**2.19**	**0.73**	**1.94**	**2.24**	**3.72**
Interaction											
M and T		1.66	1.74	1.07	3.47	0.86	3.80	1.27	3.37	3.89	6.44
T and M		1.39	1.47	0.88	2.96	0.82	3.25	1.09	2.91	3.20	5.40
Experimental Mean		**11.25**	**4.30**	**4.53**	**5.41**	**6.66**	**6.30**	**6.88**	**7.67**	**7.51**	**60.50**

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)

Trial 4.3.3: Contd:

Main plot	Sub plot treatments	Malan									
		Weed dry biomass g/m² panicle initiation stage									
		Grasses			Sedges			BLW			Total weed dry biomass
		Echinochloa colonum	*Echinochloa crusgalli*	*Panicum spp*	*Cyperus difformis*	*Cyperus iria*	*Cyperus rotundus*	*Alternanthera spp*	*Eclipta alba*	*Monochoria vaginalis*	
M1	S1	15.43	6.40	6.27	3.97	4.47	3.50	4.4	4.43	4.8	53.67
	S2	13.00	5.53	4.83	2.97	2.20	2.67	4.83	3.47	4.4	43.9
	S3	1.87	1.23	0.73	0.97	1.70	0.87	0.87	1.2	1.13	10.57
M2	S1	22.20	11.43	9.60	8.10	6.53	9.30	8.57	8.87	9.33	93.94
	S2	9.10	4.67	4.67	0.63	3.77	3.40	7.3	4.67	4.3	42.5
	S3	1.03	0.73	0.97	0.93	0.73	0.87	1.8	0.53	1.33	8.93
M3	S1	17.60	12.37	9.70	13.93	16.00	13.13	15.97	15.03	20.73	134.47
	S2	9.77	8.80	8.33	7.23	8.07	9.27	7.37	6.37	10.57	75.77
	S3	2.27	1.40	0.70	0.87	1.47	0.47	0.97	0.9	2.33	11.37
Mean of Factor-1											
M1		10.10	4.39	3.94	2.63	2.79	2.34	3.37	3.03	3.44	36.04
M2		10.78	5.61	5.08	3.22	3.68	4.52	5.89	4.69	4.99	48.46
M3		9.88	7.52	6.24	7.34	8.51	7.62	8.1	7.43	11.21	73.87
CD(0.05)		**NS**	**1.33**	**NS**	**0.52**	**0.86**	**1.53**	**1.49**	**0.98**	**0.86**	**5.26**
Mean of Factor-2											
S1		18.41	10.07	8.52	8.67	9.00	8.64	9.64	9.44	11.62	94.02
S2		10.62	6.33	5.94	3.61	4.68	5.11	6.5	4.83	6.42	54.06
S3		1.72	1.12	0.80	0.92	1.30	0.73	1.21	0.88	1.6	10.29
CD(0.05)		**1.51**	**2.05**	**1.46**	**1.13**	**2.82**	**1.60**	**1.33**	**2.03**	**0.95**	**3.4**
Interaction											
M and T		2.62	NS	NS	1.95	4.89	2.77	2.3	3.52	1.64	5.9
T and M		2.71	NS	NS	1.62	4.01	2.43	2.07	2.91	1.43	5.84
Experimental Mean		**10.25**	**5.84**	**5.09**	**4.40**	**4.99**	**4.83**	**5.79**	**5.05**	**6.55**	**52.79**

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)

Trial 4.3.3: Contd:

Main plot Treatments	Sub plot Treatments	Moncompu									
		Weed dry biomass g/m² at Active tillering stage									
		Grasses				sedges			BLW		Total weed dry biomass
		Echinochloa crusgalli	*Isachnae miliaceae*	*Leptochloa chinensis*	*Weedy rice o.s.fsp spontanea*	*Cyperus difformis*	*Cyperus haspens*	*Fimbristylis miliaceae*	*Ludwigia hyssopifolia*	*Monochoria vaginalis*	
M1	S1	4.01	35.17	0.00	0.00	1.91	0.00	37.51	6.24	4.12	88.96
	S2	1.32	10.43	2.45	0.00	0.00	0.00	59.19	4.05	7.03	84.47
	S3	0.00	21.53	0.00	6.21	0.00	0.00	0.72	0.20	0.00	28.67
M2	S1	5.04	14.43	0.00	0.00	3.65	0.51	42.77	11.73	3.13	81.27
	S2	9.83	18.53	0.00	0.00	1.77	0.00	31.44	7.25	0.45	69.28
	S3	0.00	14.44	0.00	14.64	2.36	0.00	7.45	0.00	0.00	38.89
M3	S1	6.61	53.60	0.00	0.00	0.00	1.91	4.76	36.59	2.93	106.40
	S2	0.00	42.69	0.00	0.00	0.00	2.32	18.05	3.48	5.63	72.17
	S3	0.00	23.36	0.00	0.00	0.00	0.00	2.11	0.00	0.00	25.47
Mean of Factor-1											
M1		1.78	22.38	0.82	2.07	0.64	0.00	32.47	3.50	3.72	67.36
M2		4.96	15.80	0.00	4.88	2.60	0.17	27.22	6.33	1.20	63.15
M3		2.20	39.88	0.00	0.00	0.00	1.41	8.31	13.36	2.85	68.01
CD(0.05)		**NS**	**10.37**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
Mean of Factor-2											
S1		5.22	34.40	0.00	0.00	1.85	0.80	28.35	18.19	3.40	92.21
S2		3.72	23.88	0.82	0.00	0.59	0.77	36.23	4.93	4.37	75.31
S3		0.00	19.78	0.00	6.95	0.79	0.00	3.43	0.07	0.00	31.01
CD(0.05)		**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**9.54**	**NS**	**32.73**
Interaction											
M and T		NS	NS	NS	NS	NS	NS	NS	16.52	NS	NS
T and M		NS	NS	NS	NS	NS	NS	NS	14.73	NS	NS
Experimental Mean		**2.98**	**26.02**	**0.27**	**2.32**	**1.08**	**0.53**	**22.67**	**7.73**	**2.59**	**66.17**

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 Treatments	Sub plot Treatments	Moncompu								
		Weed dry biomass g/m² at Panicle initiation stage								
		Grasses				Sedges		BLW		Total weed dry biomass
		Echinochloa crusgalli	*Isachnae miliaceae*	*Leptochloa chinensis*	*Weedy rice o.s.fsp spontanea*	*Cyperus difformis*	*Fimbristylis miliaceae*	*Ludwigia hyssopifolia*	*Monochoria vaginalis*	
M1	S1	32.56	145.39	0.00	0.00	1.20	16.73	2.49	0.00	198.37
	S2	23.09	38.85	1.92	0.00	0.93	26.72	1.23	0.00	92.75
	S3	0.00	26.99	0.00	0.85	0.00	0	0.00	0.00	27.84
M2	S1	5.92	87.28	3.08	0.00	0.00	5.56	30.31	1.67	133.81
	S2	20.04	64.19	0.00	0.00	0.88	20	2.83	0.00	107.93
	S3	3.91	76.01	0.00	3.27	1.37	26.6	0.00	0.00	111.16
M3	S1	5.35	224.28	4.28	0.00	0.00	1.41	15.92	3.68	254.92
	S2	4.07	80.24	0.00	3.00	0.00	5.67	3.68	0.80	97.45
	S3	6.87	95.29	1.12	0.00	0.00	11.45	0.00	0.00	114.73
Mean of Factor-1										
M1		18.55	70.41	0.64	0.28	0.71	14.48	1.24	0.00	106.32
M2		9.96	75.83	1.03	1.09	0.75	17.39	11.04	0.56	117.64
M3		5.43	133.27	1.80	1.00	0.00	6.18	6.53	1.49	155.70
CD(0.05)		**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
Mean of Factor-2										
S1		14.61	152.32	2.45	0.00	0.40	7.9	16.24	1.78	195.70
S2		15.73	61.09	0.64	1.00	0.60	17.46	2.58	0.27	99.38
S3		3.59	66.10	0.37	1.37	0.46	12.68	0.00	0.00	84.58
CD(0.05)		**9.26**	**42.25**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**51.90**
Interaction										
M and T		16.04	NS	NS	NS	NS	NS	NS	NS	NS
T and M		14.07	NS	NS	NS	NS	NS	NS	NS	NS
Experimental Mean		**11.31**	**93.17**	**1.16**	**0.79**	**0.49**	**12.68**	**6.27**	**0.68**	**126.55**

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 I 4.3.3: Contd:

Main plot Treatments	Sub plot Treatments	Pattambi									
		Weed dry biomass g/m² at Active tillering stage				Weed dry biomass g/m² at Panicle initiation stage					
		Grasses	Sedges	Aquatic	Total weed biomass	Grasses	Sedges	BLW		Aquatic weed	Total weed dry biomass
		Oplismenus burmannii	*Fimbristylis miliacea*	*Vallisneria americana*		*Oplismenus burmannii*	*Cyperus iria*	*Monochoria vaginalis*	*Centella asiatica*	*Blyxa japonica*	
M1	S1	5.55	2.44	0.68	8.67	9.01	8.16	16.49	0.54	0.64	34.83
	S2	3.14	0.34	0.99	4.47	11.77	6.46	2.61	1.27	1.90	24.00
	S3	2.54	0.10	0.36	3.00	6.00	0.68	1.54	0.00	1.78	10.00
M2	S1	2.88	2.91	1.21	7.00	34.50	5.36	16.17	1.97	0.00	58.00
	S2	2.78	0.58	0.97	4.33	15.43	0.44	11.13	0.53	0.00	27.53
	S3	2.00	0.00	0.00	2.00	9.07	0.00	6.80	0.52	3.95	20.33
M3	S1	4.84	3.48	1.01	9.33	11.82	7.47	19.71	0.00	2.32	41.33
	S2	1.72	1.95	0.66	4.33	5.90	2.93	8.72	5.33	2.25	25.14
	S3	2.00	0.00	0.00	2.00	9.67	0.00	2.32	0.40	0.61	13.00
Mean of Factor-1											
M1		3.74	0.96	0.68	5.38	8.92	5.10	6.88	0.60	1.44	22.94
M2		2.55	1.17	0.72	4.44	19.67	1.93	11.37	1.01	1.32	35.29
M3		2.86	1.81	0.56	5.22	9.13	3.47	10.25	1.91	1.73	26.49
CD(0.05)		**0.26**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**4.80**
Mean of Factor-2											
S1		4.43	2.94	0.97	8.33	18.44	7.00	17.46	0.84	0.99	44.72
S2		2.55	0.96	0.87	4.38	11.03	3.28	7.49	2.38	1.38	25.56
S3		2.18	0.03	0.12	2.33	8.24	0.23	3.55	0.31	2.11	14.44
CD(0.05)		**1.13**	**0.89**	**0.71**	**1.19**	**6.77**	**3.32**	**5.19**	**NS**	**NS**	**6.55**
Interaction											
M and T		NS	NS	NS	NS	11.72	NS	NS	NS	NS	NS
T and M		NS	NS	NS	NS	10.60	NS	NS	NS	NS	NS
Experimental Mean		**3.05**	**1.31**	**0.65**	**5.01**	**12.57**	**3.50**	**9.50**	**1.17**	**1.49**	**28.24**

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 Treatments	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 dry biomass	Grasses		Sedges	BLW	Total weed dry biomass
		Echinochloa crugalli	*Leersia hexandra*	*Cyperus iria*	*Alternanthera spp.*		*Echinochloa crugalli*	*Leersia hexandra*	*Cyperus iria*	*Alternanthera spp.*	
M1	S1	4.27	4.3	1.2	4.07	13.83	5.4	4.9	1.57	4.53	16.4
	S2	4.33	3.5	0.83	3.53	12.2	5.36	3.9	1.03	4.03	14.33
	S3	2.6	2.07	0.5	1.6	6.77	3.11	2.57	0.62	2.03	8.32
M2	S1	5.7	3.6	1.2	5.53	16.03	6.77	4.17	1.53	6.3	18.77
	S2	5	3.17	1	5.27	14.43	5.9	3.67	1.33	6.07	16.97
	S3	3.23	2.6	0.83	2.8	9.47	3.97	3.13	0.97	3.67	11.73
M3	S1	6.1	6.33	1.5	8	21.93	8	7.53	1.8	10.9	28.23
	S2	5.73	3.93	0.5	4.93	15.1	6.2	4.5	0.6	6.07	17.37
	S3	4.2	2.83	0.47	3.43	10.93	4.8	3.23	0.61	4.23	12.88
Mean of Factor-1											
M1		3.73	3.29	0.84	3.07	10.93	4.62	3.79	1.07	3.53	13.02
M2		4.64	3.12	1.01	4.53	13.31	5.54	3.66	1.28	5.34	15.82
M3		5.34	4.37	0.82	5.46	15.99	6.33	5.09	1	7.07	19.49
CD(0.05)		**0.49**	**0.41**	**NS**	**0.68**	**0.83**	**NS**	**0.48**	**0.11**	**0.41**	**1.26**
Mean of Factor-2											
S1		5.36	4.74	1.3	5.87	17.27	6.72	5.53	1.63	7.24	21.13
S2		5.02	3.53	0.78	4.58	13.91	5.82	4.02	0.99	5.39	16.22
S3		3.34	2.5	0.6	2.61	9.06	3.96	2.98	0.73	3.31	10.98
CD(0.05)		**0.67**	**0.39**	**0.18**	**0.63**	**1.11**	**0.88**	**0.41**	**0.19**	**0.92**	**1.32**
Interaction											
M and T		NS	0.67	0.31	1.09	1.92	NS	0.71	0.32	1.6	2.28
T and M		NS	0.6	0.26	0.97	1.63	NS	0.65	0.27	1.32	2
Experimental Mean		**4.57**	**3.59**	**0.89**	**4.35**	**13.41**	**5.5**	**4.18**	**1.12**	**5.31**	**16.11**

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 Treatments	Sub plot Treatments	Varanasi								
		Weed dry biomass g/m² at Active tillering stage								
		Grasses		Sedges		BLW				Total weed dry biomass
		Echinocloa colona	*Cynodon dactylon*	*Cyperus iria*	*Cyperus rotundus*	*Eclipta prostrata*	*Parthenium hysterophorous*	*Phyllantus niruri*	*Solanum nigrum*	
M1	S1	1.11	3.86	0.00	70.93	0.25	0.55	0.45	0.41	77.57
	S2	1.19	3.93	0.00	73.32	0.08	0.15	0.50	0.24	79.41
	S3	1.27	4.08	0.00	70.80	0.23	0.13	0.47	0.23	77.21
M2	S1	3.94	1.53	1.23	13.45	0.00	0.71	2.09	0.63	23.58
	S2	4.79	1.42	1.73	14.62	0.00	0.51	1.17	0.04	24.29
	S3	2.69	1.38	1.83	12.76	0.50	0.63	2.06	0.00	21.86
M3	S1	4.29	1.38	1.70	11.07	0.27	0.31	1.07	0.07	20.15
	S2	4.23	1.38	1.57	12.48	0.24	0.18	1.30	0.48	21.85
	S3	3.96	0.90	3.00	10.65	0.08	0.41	3.66	0.00	22.66
Mean of Factor-1										
M1		1.19	3.96	0.00	71.68	0.18	0.28	0.47	0.29	78.06
M2		3.81	1.44	1.60	13.61	0.17	0.62	1.77	0.22	23.24
M3		4.16	1.22	2.09	11.40	0.19	0.30	2.01	0.18	21.55
CD(0.05)		**1.03**	**0.29**	**0.70**	**4.91**	**NS**	**0.14**	**NS**	**NS**	**5.39**
Mean of Factor-2										
S1		3.12	2.26	0.98	31.82	0.17	0.52	1.20	0.37	40.43
S2		3.41	2.24	1.10	33.47	0.10	0.28	0.99	0.25	41.85
S3		2.64	2.12	1.61	31.40	0.27	0.39	2.06	0.08	40.58
CD(0.05)		**0.53**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
Interaction										
M and T		0.92	NS	NS	NS	NS	NS	NS	NS	NS
T and M		1.01	NS	NS	NS	NS	NS	NS	NS	NS
Experimental Mean		**3.05**	**2.21**	**1.23**	**32.23**	**0.18**	**0.40**	**1.42**	**0.23**	**40.95**

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 Treatments	Sub plot Treatments	Varanasi							
		Weed dry biomass g/m² at panicle initiation stage							
		Grasses		Sedges	BLW				Total weed dry biomass
		Echinocloa colona	*Cynodon dactylon*	*Cyperus rotundus*	*Eclipta prostrata*	*Parthenium hysterophorous*	*Phyllantus niruri*	*Solanum nigrum*	
M1	S1	20.17	22.54	240.68	1.08	2.51	1.94	1.52	290.43
	S2	14.53	17.13	194.8	0.89	3.05	3.14	0.87	234.41
	S3	12.33	18.47	183.67	1.37	1.57	3.1	0.85	221.36
M2	S1	63.92	53.17	287.33	1.03	2.2	2.08	1.8	411.53
	S2	40.17	33.13	244.67	1.2	1.25	2.01	1.24	323.66
	S3	32.83	29.77	231	1.02	1.25	2.23	1.6	299.71
M3	S1	20	45.77	274.33	1.42	1.66	3.31	1.87	348.36
	S2	31.77	44.87	310.33	1.2	2.25	3.23	1.77	395.42
	S3	27	46.27	181.67	1.88	2.69	2.03	1.87	263.4
Mean of Factor-1									
M1		15.68	19.38	206.38	1.11	2.38	2.73	1.08	248.73
M2		45.64	38.69	254.33	1.08	1.56	2.11	1.55	344.97
M3		26.26	45.63	255.44	1.5	2.2	2.86	1.84	335.72
CD(0.05)		**9.85**	**6.52**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
Mean of Factor-2									
S1		34.7	40.49	267.45	1.18	2.12	2.44	1.73	350.11
S2		28.82	31.71	249.93	1.09	2.18	2.79	1.29	317.83
S3		24.06	31.5	198.78	1.43	1.84	2.45	1.44	261.49
CD(0.05)		**NS**	**6.74**	**52.1**	**NS**	**NS**	**NS**	**NS**	**52.36**
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		**29.19**	**34.57**	**238.72**	**1.23**	**2.05**	**2.56**	**1.49**	**309.81**

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: Weed control efficiency % of long term trial on weed dynamics in rice based cropping systems under different establishment methods, *Kharif* 2022.

Main plot Treatments	Sub plot Treatments	Weed control efficiency %										
		Active tillering stage										
		Aduthurai	Chatha	Gangavathi	Malan	Moncompu	Nagina	Nawagam	pantnagar	Pattambi	Pusa	Titabar
M1	S1	-	-	-	-	-	-	-	-	-	-	-
	S2	7.27	87.47	51.27	49.61	7.31	60.98	41.15	91.99	41.58	61.33	11.99
	S3	11.17	56.88	91.36	89.83	63.19	67.23	57.27	92.81	63.81	75.67	50.96
M2	S1	-	-	-	-	-	-	-	-	-	-	-
	S2	9.43	87.44	50.63	44.58	7.75	56.63	42.81	93.12	38.48	49.33	9.90
	S3	17.23	56.32	85.18	82.81	50.24	65.31	50.51	95.92	71.03	63.33	40.65
M3	S1	-	-	-	-	-	-	-	-	-	-	-
	S2	65.90	87.95	6.81	50.85	41.97	50.00	41.57	95.46	53.33	61.00	31.12
	S3	68.53	50.47	88.50	89.75	75.30	61.77	53.44	97.89	78.15	69.67	50.05

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: Weed control efficiency % of long term trial on weed dynamics in rice based cropping systems under different establishment methods, *Kharif* 2022.

Main plot Treatments	Sub plot Treatments	Weed control efficiency %									
		Panicle initiation stage									
		Chatha	Gangavathi	Malan	Moncompu	Nagina	Nawagam	pantnagar	Pattambi	Pusa	Titabar
M1	S1	-	-	-	-	-	-	-	-	-	-
	S2	83.37	56.97	18.15	50.43	67.10	39.73	89.25	32.29	61.33	12.97
	S3	85.09	81.50	80.36	84.20	70.56	53.77	90.57	71.59	75.67	48.75
M2	S1	-	-	-	-	-	-	-	0.00	-	-
	S2	81.69	-7.57	54.91	0.64	65.14	40.54	96.08	50.99	49.33	9.53
	S3	82.03	68.41	90.55	15.49	69.16	50.18	97.75	71.78	63.33	37.35
M3	S1	-	-	-	-	-	-	-	-	-	-
	S2	80.28	26.49	43.62	58.30	64.69	40.91	97.19	33.94	61.00	38.49
	S3	82.47	9.09	91.54	56.62	67.31	54.54	97.74	68.56	69.67	54.37

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(R): Yield parameters and grain yield of Long term trial on weed dynamics in mono or double cropped rice system under different establishment methods, *Rabi* 2021-22

Main plot Treatments	Sub plot Treatments	Karaikal						
		No of tillers/m² at panicle initiation stage	Total dry matter/m² at Panicle initiation stage	No of panicles/m²	Panicle weight(g)	Test weight(g)	Grain yield t/ha	Straw yield t/ha
M1	T1	461	1102.80	420	4.19	25.98	5.92	9.41
	T2	417	809.27	368	3.80	25.61	4.86	8.93
	T3	477	1195.47	445	3.87	25.60	5.21	9.10
	T4	433	1176.87	407	4.54	25.86	5.59	10.52
M2	T1	460	1014.67	410	4.19	24.78	5.00	10.07
	T2	299	614.53	277	3.80	25.88	1.65	7.19
	T3	442	1058.13	398	3.87	26.27	6.43	12.03
	T4	415	1086.67	374	4.54	25.14	5.38	11.59
M3	T1	372	968.53	330	4.30	25.71	5.22	9.77
	T2	291	582.40	222	3.28	26.43	3.82	3.18
	T3	386	928.00	330	3.70	25.04	5.51	10.31
	T4	395	958.40	363	4.12	25.69	5.33	10.21
Mean of Factor-1								
M1		447	1071.10	410	4.10	25.76	5.39	9.49
M2		404	943.50	365	4.10	25.52	4.62	10.22
M3		361	859.33	311	3.85	25.72	4.97	8.37
CD(0.05)		**NS**	**40**	**26**	**NS**	**NS**	**0.29**	**NS**
Mean of Factor-2								
T1		431	1028.67	387	4.23	25.49	5.38	9.75
T2		336	668.73	289	3.63	25.97	3.44	6.44
T3		435	1060.53	391	3.81	25.64	5.72	10.48
T4		414	1073.98	381	4.40	25.56	5.43	10.77
CD(0.05)		**68**	**62**	**53**	**0.43**	**NS**	**0.44**	**1.16**
Interaction								
M and T		NS	NS	NS	NS	NS	0.77	2.01
T and M		NS	NS	NS	NS	NS	0.68	1.81
Experimental Mean		**404**	**957.98**	**362**	**4.02**	**25.67**	**4.99**	**9.36**

Grain yield loss %	**36.05**	**M1- Mechanised transplanting/Transplanting (if transplanters not available)**
Applied N:P:K:Zn Kg/ha		**M2-Puddled direct seeding (preferably line sowing by drumseeder)**
Avail N:P:K (kg/ha)	250:30:358	**M3-Un-puddled dry direct seeding (line sowing)**
Name of the variety	ADT 46	
Soil type	Sandy clay loam	**T1-Weed free**
pH		**T2-Weedy check**
EC (dsm-1)		**T3-Mechanical weeding using weeder**
Organic carbon		**T4-Chemical weed control* (pre & post emergence herbicide application)**

Table 4.3.3(R): Weed population no/m^2 of Long term trial on weed dynamics in mono or double cropped rice system under different establishment methods, *Rabi* 2021-22

Main plot Treatments	Sub plot Treatments	Weed population no/m^2 at Active vegetative stage				Weed population no/m^2 at Heading stage			
		Grasses	Sedges	BLW	Total	Grasses	Sedges	BLW	Total
M1	T1	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)
	T2	4.67(2.13)	3.00(1.79)	7.67(2.76)	15.33(3.89)	34.67(5.83)	5.00(2.34)	19.00(4.37)	58.67(7.63)
	T3	8.33(2.83)	2.00(1.48)	2.00(1.56)	12.33(3.45)	5.33(2.39)	1.33(1.34)	17.00(3.91)	23.67(4.84)
	T4	3.33(1.80)	5.33(2.31)	3.00(1.81)	11.67(3.43)	8.67(3.03)	0.00(0.71)	5.67(2.48)	14.33(3.85)
M2	T1	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)
	T2	99.00(9.96)	21.67(4.69)	3.00(1.84)	123.67(11.12)	78.00(8.84)	6.67(2.67)	8.00(2.91)	92.67(9.63)
	T3	135.33(11.65)	13.00(3.55)	0.67(1.00)	149.00(12.22)	4.00(1.91)	0.33(0.88)	22.67(4.75)	27.00(5.15)
	T4	48.67(7.01)	5.33(2.09)	0.33(0.88)	54.33(7.39)	4.00(2.11)	0.00(0.71)	8.67(3.03)	12.67(3.63)
M3	T1	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)
	T2	153.00(12.35)	31.00(5.56)	9.67(3.07)	193.67(13.92)	138.67(11.79)	7.33(2.79)	49.00(7.00)	195.00(13.97)
	T3	143.00(11.96)	7.33(2.71)	2.00(1.47)	152.33(12.35)	5.33(2.39)	1.33(1.34)	17.33(4.22)	24.00(4.95)
	T4	31.00(5.54)	4.67(2.24)	3.00(1.68)	38.67(6.16)	16.00(4.06)	0.00(0.71)	8.00(2.88)	24.00(4.94)
Mean of Factor-1									
M1		4.08(1.87)	2.58(1.57)	3.17(1.71)	9.83(2.87)	12.17(2.99)	1.58(1.27)	10.42(2.87)	24.17(4.26)
M2		70.75(7.33)	10.00(2.76)	1.00(1.11)	81.75(7.86)	21.50(3.39)	1.75(1.24)	9.83(2.85)	33.08(4.78)
M3		81.75(7.64)	10.75(2.81)	3.67(1.73)	96.17(8.29)	40.00(4.74)	2.17(1.39)	18.58(3.70)	60.75(6.14)
CD(0.05)		**0.66**	**0.31**	**NS**	**0.56**	**0.42**	**NS**	**NS**	**0.69**
Mean of Factor-2									
T1		0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)
T2		85.56(8.15)	18.56(4.01)	6.78(2.55)	110.89(9.65)	83.78(8.82)	6.33(2.60)	25.33(4.76)	115.44(10.41)
T3		95.56(8.81)	7.44(2.58)	1.56(1.34)	104.56(9.34)	4.89(2.23)	1.00(1.19)	19.00(4.29)	24.89(4.98)
T4		27.67(4.78)	5.11(2.21)	2.11(1.46)	34.89(5.66)	9.56(3.07)	0.00(0.71)	7.44(2.80)	17.00(4.14)
CD(0.05)		**0.77**	**0.81**	**0.56**	**0.74**	**0.63**	**0.16**	**0.70**	**0.59**
Interaction									
M and T		1.33	1.4	**NS**	1.29	1.09	0.28	1.21	1.03
T and M		1.22	1.23	**NS**	1.16	0.98	0.25	1.11	0.99
Experimental Mean		**5.61**	**2.38**	**1.51**	**6.34**	**3.71**	**1.3**	**3.14**	**5.06**

***(Values in parentheses are transformed values)**

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)

T1-Weed free

T2-Weedy check

T3-Mechanical weeding using weeder

T4-Chemical weed control* (pre & post emergence herbicide application)

Table 4.3.3(R): Species wise weed population no/m² of Long term trial on weed dynamics in mono or double cropped rice system under different establishment methods, *Rabi* 2021-22

Main plot Treatments	Sub plot Treatments	Weed population no/m² at Active vegetative stage					Weed population no/m² at Heading stage					
		Grasses	Sedges	BLW		Total weed population	Grasses		Sedges	BLW		Total weed population
		Echinochloa colonum	Cyperus rotundus	Bergia ammoinnoides	Hydrolea zeylanica		Echinocloa colonum	Letochloa chinensis	Cyperus rotundus	Bergia ammannoides	Hydrolea zeylanica	
M1	T1	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)
	T2	4.67(2.13)	3.00(1.79)	1.00(1.17)	6.67(2.58)	15.33(3.89)	32.00(5.59)	2.67(1.77)	5.00(2.34)	1.33(1.34)	17.67(4.21)	58.67(7.63)
	T3	8.33(2.83)	2.00(1.48)	1.67(1.44)	0.33(0.88)	12.33(3.45)	5.33(2.39)	0.00(0.71)	1.33(1.34)	1.00(1.22)	16.00(3.75)	23.67(4.84)
	T4	3.33(1.80)	5.33(2.31)	1.00(1.10)	2.00(1.43)	11.67(3.43)	8.67(3.03)	0.00(0.71)	0.00(0.71)	0.00(0.71)	5.67(2.48)	14.33(3.85)
M2	T1	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)
	T2	99.00(9.96)	21.67(4.69)	3.00(1.84)	0.00(0.71)	123.67(11.12)	70.67(8.42)	7.33(2.76)	6.67(2.67)	3.00(1.86)	5.00(2.30)	92.67(9.63)
	T3	135.33(11.65)	13.00(3.55)	0.67(1.00)	0.00(0.71)	149.00(12.22)	4.00(1.91)	0.00(0.71)	0.33(0.88)	0.33(0.88)	22.33(4.71)	27.00(5.15)
	T4	48.67(7.01)	5.33(2.09)	0.33(0.88)	0.00(0.71)	54.33(7.39)	0.00(0.71)	4.00(2.11)	0.00(0.71)	0.00(0.71)	8.67(3.03)	12.67(3.63)
M3	T1	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)
	T2	153.00(12.35)	31.00(5.56)	9.33(3.03)	0.33(0.88)	193.67(13.92)	122.67(11.09)	16.00(4.04)	7.33(2.79)	14.00(3.80)	35.00(5.91)	195.00(13.97)
	T3	143.00(11.96)	7.33(2.71)	1.00(1.17)	1.00(1.10)	152.33(12.35)	5.33(2.39)	0.00(0.71)	1.33(1.34)	0.00(0.71)	17.33(4.22)	24.00(4.95)
	T4	31.00(5.54)	4.67(2.24)	3.00(1.68)	0.00(0.71)	38.67(6.16)	9.33(3.13)	6.67(2.65)	0.00(0.71)	4.67(2.23)	3.33(1.93)	24.00(4.94)
Mean of Factor-1												
M1		4.08(1.87)	2.58(1.57)	0.92(1.10)	2.25(1.40)	9.83(2.87)	11.50(2.93)	0.67(0.97)	1.58(1.27)	0.58(1.00)	9.83(2.78)	24.17(4.26)
M2		70.75(7.33)	10.00(2.76)	1.00(1.11)	0.00(0.71)	81.75(7.86)	18.67(2.94)	2.83(1.57)	1.75(1.24)	0.83(1.04)	9.00(2.69)	33.08(4.78)
M3		81.75(7.64)	10.75(2.81)	3.33(1.64)	0.33(0.85)	96.17(8.29)	34.33(4.33)	5.67(2.03)	2.17(1.39)	4.67(1.86)	13.92(3.19)	60.75(6.14)
CD(0.05)		**0.66**	**0.31**	**NS**	**0.32**	**0.56**	**0.43**	**0.2**	**NS**	**0.16**	**NS**	**0.69**
Mean of Factor-2												
T1		0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)	0.00(0.71)
T2		85.56(8.15)	18.56(4.01)	4.44(2.01)	2.33(1.39)	110.89(9.65)	75.11(8.37)	8.67(2.86)	6.33(2.60)	6.11(2.33)	19.22(4.14)	115.44(10.41)
T3		95.56(8.81)	7.44(2.58)	1.11(1.20)	0.44(0.89)	104.56(9.34)	4.89(2.23)	0.00(0.71)	1.00(1.19)	0.44(0.94)	18.56(4.22)	24.89(4.98)
T4		27.67(4.78)	5.11(2.21)	1.44(1.22)	0.67(0.95)	34.89(5.66)	6.00(2.29)	3.56(1.82)	0.00(0.71)	1.56(1.21)	5.89(2.48)	17.00(4.14)
CD(0.05)		**0.77**	**0.81**	**0.43**	**0.4**	**0.74**	**0.61**	**0.28**	**0.16**	**0.22**	**0.75**	**0.59**
Interaction												
M and T		1.33	1.4	0.74	0.7	1.29	1.05	0.48	0.28	0.38	1.3	1.03
T and M		1.22	1.23	0.7	0.63	1.16	0.95	0.43	0.25	0.34	1.18	0.99
Experimental Mean		5.61	2.38	1.28	0.98	6.34	3.4	1.52	1.3	1.3	2.89	5.06

***(Values in parentheses are transformed values)**

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)

T1-Weed free
T2-Weedy check
T3-Mechanical weeding using weeder
T4-Chemical weed control* (pre & post emergence herbicide application)

Table 4.3.3(R): Weed dry biomass g/m2 of Long term trial on weed dynamics in mono or double cropped rice system under different establishment methods, Rabi 2021-22

Main plot	Sub plot Treatments	Weed dry biomass g/m^2 at Active vegetative stage				Weed dry biomass g/m^2 at Heading stage			
		Grasses	Sedges	BLW	Total weed dry biomass	Grasses	Sedges	BLW	Total weed dry biomass
M1	T1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	T2	3.52	1.63	1.58	6.73	13.27	2.20	9.25	24.72
	T3	9.15	4.07	2.18	15.40	4.17	2.52	2.52	9.21
	T4	2.96	7.47	1.43	11.85	1.03	0.00	3.40	4.43
M2	T1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	T2	19.16	36.37	0.52	56.05	69.80	4.72	8.64	83.16
	T3	21.88	1.23	0.05	23.16	8.05	0.31	10.79	19.15
	T4	12.89	2.04	0.04	14.97	3.13	0.00	0.00	3.13
M3	T1	0.00	0.00	0.00	0.00	2.00	0.00	3.09	5.09
	T2	43.40	7.97	0.47	51.84	116.71	16.49	52.45	185.65
	T3	36.21	1.08	1.03	38.33	2.99	2.20	18.09	23.28
	T4	9.71	2.44	0.47	12.61	40.56	0.00	11.03	51.59
Mean of Factor-1									
M1		3.91	3.29	1.30	8.50	4.62	1.18	3.79	9.59
M2		13.48	9.91	0.15	23.55	20.25	1.26	4.86	26.36
M3		22.33	2.87	0.49	25.69	40.56	4.67	21.17	66.40
CD(0.05)		7.86	2.21	ns	ns	7.23	0.79	3.54	9.23
Mean of Factor-2									
T1		0.00	0.00	0.00	0.00	0.67	0.00	1.03	1.70
T2		22.03	15.32	0.86	38.21	66.59	7.80	23.45	97.84
T3		22.41	2.12	1.09	25.63	5.07	1.68	10.47	17.21
T4		8.52	3.98	0.64	13.15	14.91	0.00	4.81	19.72
CD(0.05)		10.88	2.06	NS	12.33	8.47	1.14	5.42	7.94
Interaction									
M and T		NS	3.57	NS	NS	14.67	1.97	9.39	13.76
T and M		NS	3.37	NS	NS	13.39	1.76	8.37	13.20
Experimental Mean		13.24	5.36	0.65	19.25	21.81	2.37	9.94	34.12

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)

T1-Weed free

T2-Weedy check

T3-Mechanical weeding using weeder

T4-Chemical weed control* (pre & post emergence herbicide application)

Table 4.3.3(R): Species wise weed dry biomass g/m2 of Long term trial on weed dynamics in mono or double cropped rice system under different establishment methods, *Rabi* 2021-22

Main plot	Sub plot Treatments	Weed dry biomass g/m2 at Active vegetative stage					Weed dry biomass g/m2 at Heading stage					
		Grasses	Sedges	BLW		Total weed dry biomass	Grasses		Sedges	BLW		Total weed dry biomass
		Echinochloa colonum	Cyperus rotundus	Bergia ammoinnoides	Hydrolea zeylanica		Echinocloa colonum	Letochloa chinensis	Cyperus rotundus	Bergia ammannoides	Hydrolea zeylanica	
M1	T1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	T2	3.52	1.63	0.79	0.80	6.73	10.08	3.19	2.20	2.87	6.39	24.72
	T3	9.15	4.07	2.13	0.05	15.40	4.17	0.00	2.52	0.97	1.55	9.21
	T4	2.96	7.47	1.15	0.28	11.85	1.03	0.00	0.00	0.00	3.40	4.43
M2	T1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	T2	19.16	36.37	0.52	0.00	56.05	66.27	3.53	4.72	3.13	5.51	83.16
	T3	21.88	1.23	0.05	0.00	23.16	8.05	0.00	0.31	0.88	9.91	19.15
	T4	12.89	2.04	0.04	0.00	14.97	0.00	3.13	0.00	0.00	0.00	3.13
M3	T1	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	0.00	3.09	5.09
	T2	43.40	7.97	0.40	0.07	51.84	71.36	45.35	16.49	25.24	27.21	185.65
	T3	36.21	1.08	1.03	0.01	38.33	2.99	0.00	2.20	0.00	18.09	23.28
	T4	9.71	2.44	0.47	0.00	12.61	15.25	25.31	0.00	4.13	6.91	51.59
Mean of Factor-1												
M1		3.91	3.29	1.02	0.28	8.50	3.82	0.80	1.18	0.96	2.83	9.59
M2		13.48	9.91	0.15	0.00	23.55	18.58	1.67	1.26	1.00	3.85	26.36
M3		22.33	2.87	0.47	0.02	25.69	22.40	18.16	4.67	7.34	13.83	66.40
CD(0.05)		**7.86**	**2.21**	**NS**	**NS**	**NS**	**6.13**	**2.01**	**0.79**	**0.45**	**3.73**	**9.23**
Mean of Factor-2												
T1		0.00	0.00	0.00	0.00	0.00	0.00	0.67	0.00	0.00	1.03	1.70
T2		22.03	15.32	0.57	0.29	38.21	49.24	17.36	7.80	10.41	13.04	97.84
T3		22.41	2.12	1.07	0.02	25.63	5.07	0.00	1.68	0.62	9.85	17.21
T4		8.52	3.98	0.55	0.09	13.15	5.43	9.48	0.00	1.38	3.44	19.72
CD(0.05)		**10.88**	**2.06**	**ns**	**0.19**	**12.33**	**8.95**	**2.12**	**1.14**	**1.52**	**5.82**	**7.94**
Interaction												
M and T		NS	3.57	NS	NS	NS	15.50	3.67	1.97	2.64	NS	13.76
T and M		NS	3.37	NS	NS	NS	13.86	3.40	1.76	2.30	NS	13.20
Experimental Mean		13.24	5.36	0.55	0.10	19.25	14.93	6.88	2.37	3.10	6.84	34.12

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)

T1-Weed free
T2-Weedy check
T3-Mechanical weeding using weeder
T4-Chemical weed control* (pre & post emergence herbicide application)

4.3.4 Analysis of long term meteorology data (temperatures and rainfall) for identifying the reasons for yield reduction

The Dataset consists of rice yield data and meteorological data of 10 locations like Navasari, Rajendranagar, Mandya, Coimbatore, Gangavathi, Kaul, Khudwani, Ludhiana, Pattambi and Chinsurah for the years 2005 to 2022. This data includes yield of rice crop (t/ha), rainfall of the crop season(mm) and mean weekly minimum temperature and maximum temperature of the crop season(^{0}C).

Yield prediction models were developed using six machine learning algorithms namely Gaussian Process Regressor with Rational Quadratic kernel, Random Forest, K Neighbors Regressor, Kernel Ridge with three different kernels i.e. Linear, RBF and Poly. R program was used for Random forest algorithm and Python program was used for other five models. The dataset was divided into two parts for the purpose of training (80%) and testing (20%). The relation between rice yield and weather parameters was also analyzed.

The KNeighbors Regressor and Random forest algorithms performed well (R^2=0.82) compared to other four machine learning models in predicting the yield of the rice crop (Figs. 1&2). These models will be further used for predicting yield and suggesting best sowing week for rice crop. From the meteorological analysis, it is clear that weather conditions like min. temp>20^{0}C, max. temp >30^{0}C and crop season rainfall between 300-1000 mm are favorable for rice crop in producing higher yield (>6 t/ha) as well as weather conditions like min. temp>16^{0}C, max. temp>28^{0}C and crop season rainfall 50-1000 mm are favorable in producing yield ranging from 3-6 t/ha and low yields (< 3 t/ha) are influenced by rainfall>1000 mm or min. temp<18^{0}C or max. temp<30^{0}C (Fig. 3). There is scope for improvement of these learning models by training with larger samples of datasets.

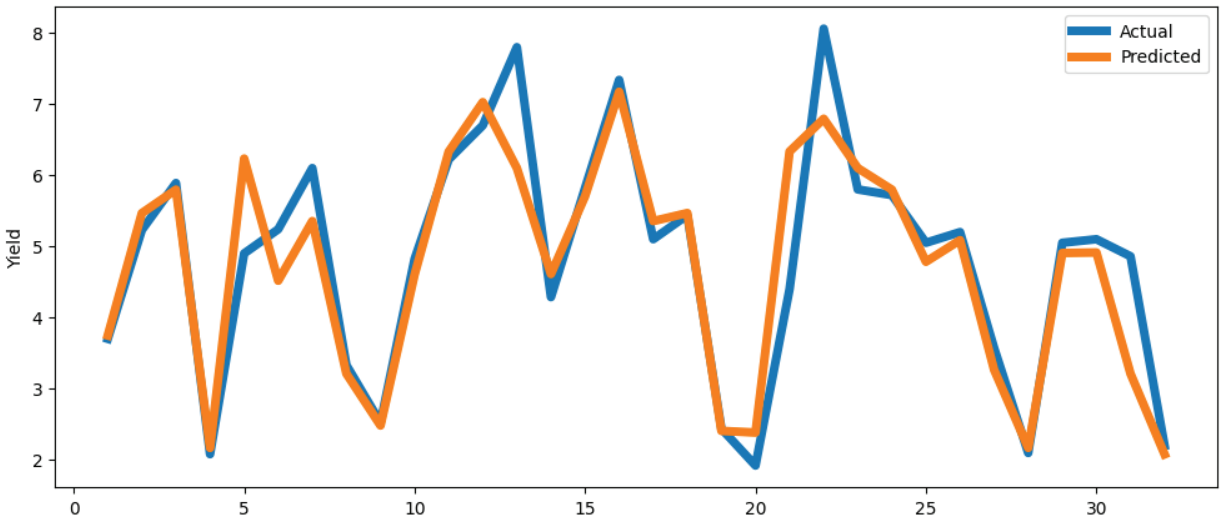
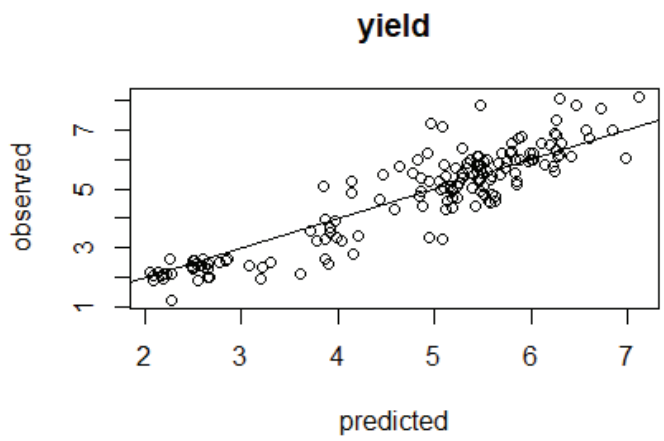


Fig 1: Predicted Vs Actual yield of Rice crop-KNN Algorithm



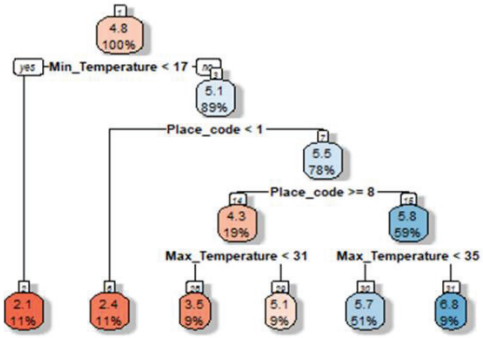


Fig 2: Predicted Vs Actual yield of Rice Crop-Random Forest Algorithm

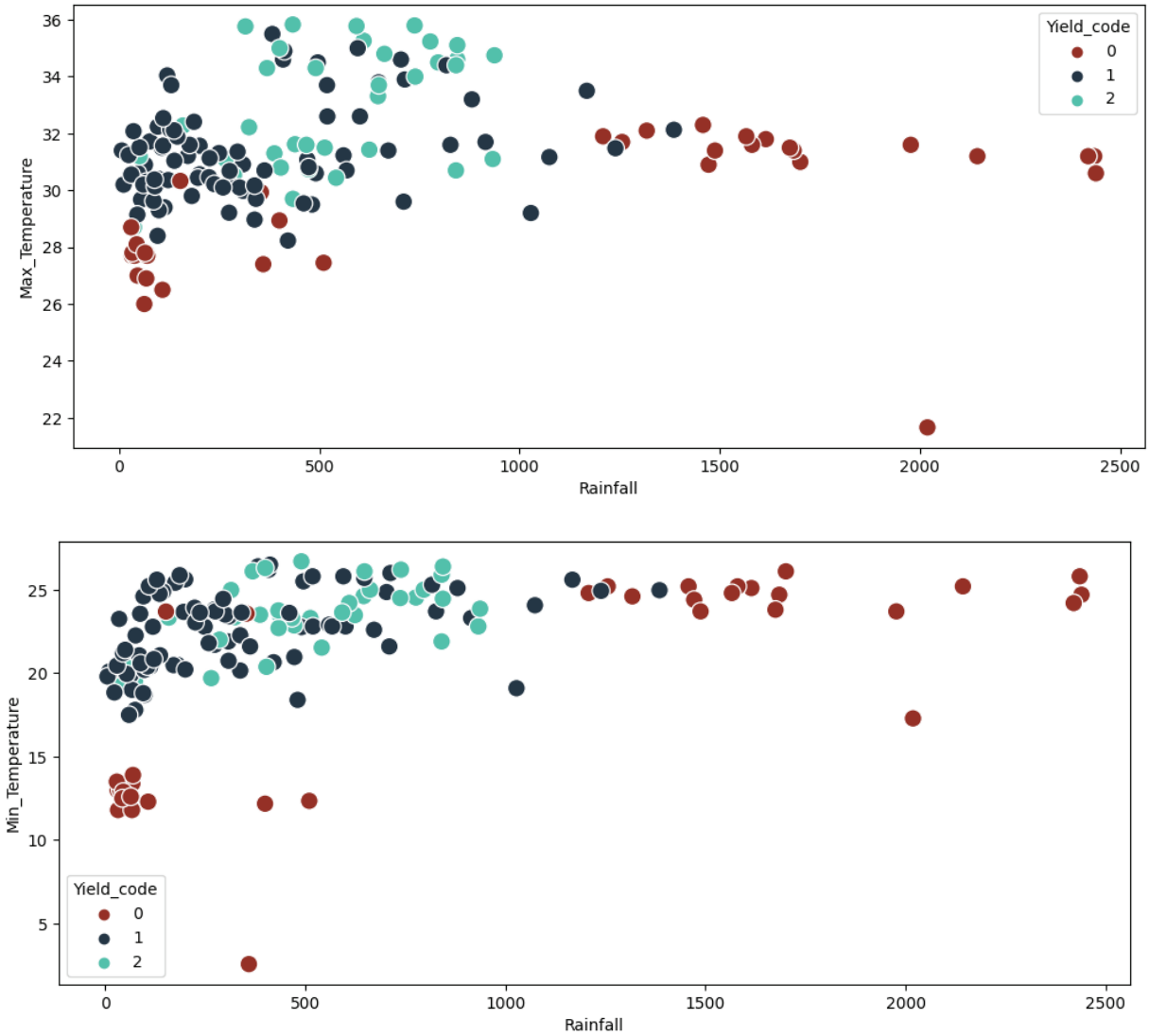


Fig 3: Three yield scenarios with maximum and minimum temperatures and rainfall in the rice crop season (where x- axis represents rainfall in the season and y-axis represents Mean Weekly Maximum Temperature in the season. Yield code 0 represents the scenarios where the yield < 3, Yield code 1 represents the scenarios where yield > = 3 and yield < 6, Yield code 2 represents yield >= 6)

INTER DISCIPLINARY TRIALS

4.4 INTER DISCIPLINARY TRIALS

4.4.1 Yield maximization of rice in different zones

4.4.1(a)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); 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 16 locations (**Gangavathi, Maruteru, Raipur, Kota, Bankura, Chinsurah, Faizabad, Kanpur, Kaul, Khudwani, Mandya, Moncompu, Pantnagar, Pusa, Titabar, Puducherry, Karaikal).** The results were summarized and presented in **Table 4.4.1(a)** and the salient findings are as followed.

In **Gangavathi**, 125% RDF + FYM @ 5 t/ha treatment resulted in the highest grain yield (6.29 t/ha), however, at par with 125% RDF (6.06 t/ha). Filled grains/panicle were also recorded the highest (171) under 125% RDF + FYM @ 5 t/ha applied plots. In vertisols of **Raipur**, 125% RDF + FYM @ 5 t/ha treatment resulted in the highest grain yield (6.04 t/ha), followed by 125% RDF (5.83 t/ha).

In sandy loam soils of **Bankura**, RDF + sampoorna (KAU) @ 10g/L (250 L/ha) resulted in the highest grain yield (6.41 t/ha) followed by 125% RDF of T_1 + FYM @ 5 t/ha (6.16 t/ha). The highest total K uptake was recorded under same treatment. However, the highest total P uptake (34.0 kg/ha) was recorded under plots received RDF + FYM @ 5 t/ha.

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).

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

The Coefficient of Variation of the trial conducted in sandy loam soils of **Karaikal** was very high (60.7). This data has to be rechecked. All the treatments resulted in similar grain yield (ranged from 5.11 to 6.07 t/ha). ADT 46 variety applied with RDF + FYM @ 10 t/ha resulted in the highest grain yield (6.07 t/ha).

Table 4.4.1: Yield maximization of rice in different Zones, Kharif 2022.

Treatment	BANKURA										
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Tillers/m^2 (No.)	Panicle/m^2 (No.)	Test wt (g)	Filled grains/panicle	Total uptake (kg/ha) in plant		Nutrient use efficiency in grain kg/ha	
								P	K	P	K
T1	5.62	7	7.05	171	157	30.45	171	24.00	80.00	245.67	70.67
T2	5.88	4	6.31	226	213	30.53	193	34.00	84.00	175.00	70.33
T3	6.41	1	7.63	209	188	31.98	170	32.00	89.33	206.33	71.67
T4	5.77	5	7.12	228	212	30.54	161	25.67	80.33	224.33	72.00
T5	6.16	2	6.65	212	197	30.25	146	22.33	58.00	284.67	196.67
T6	5.64	6	6.07	234	221	30.79	196	20.00	52.33	312.67	227.00
T7	-		-	-	-	-	-	-	-	-	-
T8	5.95	3	7.33	241	225	30.46	168	24.00	67.67	256.67	200.33
Exp. mean	**5.92**		**6.88**	**217**	**202**	**30.71**	**172**	**26.00**	**73.10**	**243.62**	**129.81**
CD(0.05)	0.12		0.09	10.3	9.9	NS	NS	8.7	NS	NS	NS
CV	1.1		0.7	2.7	2.8	2.6	16.9	18.8	31.1	22.5	97.4
Soil type	Sandyloam										
pH	-										
EC	-										
Variety	MTU 1153										
Applied NPK kg/ha	80;40:40										
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 (i.e.Boron at AI +PI stage @ 1.5gm/litre of water)

T_7 : -

T_8: Optional (According to location) - T_1+ Vermicompost @ 2.5 t/ha

Table 4.4.1: Contd.

Treatment	CHINSURAH												
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Tillers/m^2 (No.)	Panicle/m^2 (No.)	Test wt (g)	Soil pH	Soil EC (dS/m)	Soil OC (%)	Soil available kg/ha			Soil Zn (ppm)
										N	P	K	
T1	4.25	8	5.78	321	307	19.70	7.02	0.22	1.17	429.50	88.50	282.65	17.60
T2	5.53	5	5.20	384	339	19.83	6.99	0.26	1.17	445.00	90.38	292.60	17.63
T3	5.53	5	4.48	392	320	19.55	7.06	0.21	1.14	480.25	97.00	292.00	17.18
T4	6.83	1	5.13	395	335	19.65	7.13	0.21	1.17	460.50	96.50	295.53	17.43
T5	5.53	5	5.50	400	300	19.28	7.11	0.21	1.16	478.75	97.50	286.05	17.58
T6	6.35	2	6.05	352	303	19.73	7.06	0.20	1.15	476.00	100.90	295.67	17.55
T7	5.78	4	2.60	373	311	19.80	7.06	0.22	1.10	473.75	99.00	295.45	17.25
T8	6.30	3	3.10	267	240	19.43	7.04	0.22	1.19	409.75	93.00	281.38	17.50
Exp. mean	**5.76**		**4.73**	**360**	**307**	**19.62**	**7.06**	**0.22**	**1.15**	**456.69**	**95.35**	**290.17**	**17.46**
CD(0.05)	0.3		0.2	14.9	34.0	NS	0.07	NS	NS	35.92	6.69	NS	NS
CV	4.03		2.29	2.81	7.53	1.81	0.66	18.64	5.87	5.4	4.8	3.11	1.8
Soil type	Clay loam												
pH	7.50												
EC	0.40												
Variety	Muktashree												
Applied NPK kg/ha	130:70:70												
Available NPK kg/ha	164:82.4:518.1												

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 (Spray of Zn-EDTA at PI and Booting Stage)

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

T_8: Optional (According to location) - Farmers practice

Table 4.4.1: Contd.

Treatment	FAIZABAD						
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Tillers/m^2 (No.)	Panicle/m^2 (No.)	Test wt (g)	Filled grains/panicle
T1	3.78	6	5.61	212	207	15.88	218
T2	4.45	4	6.59	233	231	15.50	230
T3	4.57	3	6.79	247	244	15.88	234
T4	4.01	5	5.96	219	216	15.88	223
T5	5.36	1	7.97	313	308	16.15	260
T6	4.88	2	7.24	276	273	16.08	243
T7	-		-	-	-	-	-
T8	-		-	-	-	-	-
Exp. mean	**4.51**		**6.69**	**250**	**246**	**15.89**	**234.5**
CD(0.05)	0.17		0.24	10.4	10.3	NS	7.5
CV	2.45		2.45	2.75	2.76	1.77	2.11
Soil type	Sandy loam						
pH	7.60						
EC	1.02						
Variety	Sambha Mahsuri Sub-1						
Applied NPK kg/ha	120:60:60						
Available NPK kg/ha	215:25:235						

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+ T1+ Application of micro nutrient (deficient to that location)

T_7 : -

T_8: -

Table 4.4.1: Contd.

Treatment	GANGAVATHI						
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Tillers/m^2 (No.)	Panicle/m^2 (No.)	Test wt (g)	Filled grains/panicle
T1	5.21	7	6.00	393	318	15.85	156
T2	5.55	4	6.38	330	341	15.64	159
T3	5.35	6	6.16	330	308	15.73	140
T4	6.06	2	6.96	330	352	15.59	156
T5	6.29	1	7.23	360	361	16.00	171
T6	5.52	5	6.34	357	324	16.01	158
T7	5.15	8	5.93	293	310	16.10	155
T8	5.73	3	6.59	303	351	15.40	159
Exp. mean	**5.61**		**6.45**	**337**	**333**	**15.79**	**157**
CD(0.05)	0.4		0.46	43.99	23.05	0.82	13.53
CV	4.05		4.05	7.45	3.95	2.98	4.93
Soil type	-						
pH	-						
EC	-						
Variety	-						
Applied NPK kg/ha	150:75:75						
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+ T1+ 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) - T1+FYM@10t/ha+Azospirillum+PSB@3.5kg/ha

Table 4.4.1: Contd.

Treatment	KANPUR															
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Tillers/m² (No.)	Panicle/m² (No.)	Test wt (g)	Total uptake (kg/ha) in plant			Nutrient use efficiency in grain kg/ha			Soil available kg/ha			Soil Zn (ppm)
							N	P	K	N	P	K	N	P	K	
T1	5.56	8	7.61	482	385	24.42	113.67	34.00	115.33	48.90	162.87	48.13	224.00	22.10	209.00	0.55
T2	6.10	3	8.39	487	396	24.49	128.00	39.00	131.00	47.53	157.00	46.50	215.00	22.28	218.00	0.57
T3	5.94	5	8.15	466	381	24.46	123.00	37.33	124.67	48.27	159.13	47.63	208.00	21.78	205.00	0.53
T4	6.36	2	8.76	499	400	24.67	136.00	43.33	140.00	46.80	147.20	45.50	228.00	23.20	216.00	0.56
T5	6.68	1	9.25	509	405	24.72	145.33	46.67	149.33	46.07	142.60	44.87	232.00	23.80	221.00	0.58
T6	5.87	6	8.04	486	383	24.46	123.33	37.33	124.67	47.53	159.00	47.10	210.00	22.15	207.00	0.59
T7	6.04	4	8.29	467	373	24.46	127.33	39.67	127.67	47.43	153.53	47.27	214.00	22.42	213.00	0.58
T8	5.73	7	7.84	487	389	24.43	119.00	35.67	119.33	48.13	160.90	47.97	218.00	22.10	210.00	0.56
Exp. mean	**6.04**		**8.29**	**485**	**389**	**24.52**	**126.96**	**39.13**	**129.00**	**47.58**	**155.28**	**46.87**	**218.62**	**22.48**	**212.37**	**0.57**
CD(0.05)	NS		NS	16.4	15.0	0.0	16.6	5.1	17.3	NS	12.45	1.49	NS	NS	NS	NS
CV	7.6		7.7	1.9	2.2	0.1	7.47	7.38	7.64	2.02	4.58	1.82	5.79	6.15	4.92	6.79
Soil type	Sandy loam															
pH	7.60															
EC	0.61															
Variety	Sarjoo-52															
Applied NPK kg/ha	150:60:60															
Available NPK kg/ha	221:22:215															

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	KAUL																
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Panicle/m^2 (No.)	Test wt (g)	Total uptake (kg/ha) in plant			Nutrient use efficiency in grain kg/ha			Soil pH	Soil EC (dS/m)	Soil OC (%)	Soil available kg/ha		
						N	P	K	N	P	K				N	P	K
T1	5.97	6	6.60	367	27.33	109.33	28.33	107.67	54.33	210.67	55.33	8.27	0.16	0.49	170.33	28.00	406.00
T2	6.33	3	6.87	372	28.03	122.33	33.00	119.00	51.67	193.33	53.33	8.16	0.18	0.53	177.67	29.00	413.00
T3	6.07	5	6.50	369	27.43	112.33	28.33	109.33	54.33	216.67	55.67	8.22	0.15	0.48	173.33	28.33	405.67
T4	6.37	2	7.33	373	28.77	127.00	36.00	127.67	50.00	176.67	49.67	8.25	0.17	0.48	179.67	31.33	417.33
T5	6.50	1	7.50	379	28.97	133.33	39.00	134.33	49.00	166.67	48.67	8.19	0.16	0.51	187.67	32.00	425.67
T6	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T7	6.13	4	6.50	370	27.47	115.33	29.33	110.33	53.33	207.67	55.67	8.24	0.15	0.50	171.67	29.00	407.67
T8	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exp. mean	**6.23**		**6.88**	**371.7**	**28.00**	**119.94**	**32.33**	**118.06**	**52.11**	**195.28**	**53.06**	**8.22**	**0.16**	**0.50**	**176.70**	**29.11**	**412.56**
CD(0.05)	0.3		0.7	7.5	NS	7	4	11	2	21	3	NS	NS	NS	0.23	NS	NS
CV	2.7		5.9	1.1	2.6	3	8	5	2	6	3	1.53	14.23	7.63	3.44	5.4	2.29
Soil type	Clay loam																
pH	8.40																
EC	0.40																
Variety	HKR 127																
Applied NPK kg/ha	150:60:60:25																
Available NPK kg/ha	175:25:395																

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_7: T1+ Geoxol.com @ 40 kg/ha during basal fertilizer application

T_8: -

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	Total uptake (kg/ha) in plant			Nutrient use efficiency in grain kg/ha			Soil pH	Soil EC (dS/m)	Soil OC (%)	Soil available kg/ha		
								N	P	K	N	P	K				N	P	K
T1	7.20	7	7.83	351	296	26.90	107	118.33	22.00	106.33	60.67	325.67	67.67	6.73	0.22	0.71	352.33	17.57	219.00
T2	7.60	5	8.20	365	310	27.10	109	122.67	24.33	112.67	61.67	309.67	67.33	6.60	0.23	0.71	385.33	17.90	222.33
T3	7.73	3	8.53	368	301	27.30	114	127.33	26.00	116.00	60.33	302.00	67.00	6.70	0.23	0.72	345.67	18.40	225.67
T4	7.33	6	7.83	358	302	26.40	106	124.67	22.67	108.67	58.33	321.33	67.33	6.63	0.23	0.71	364.33	18.60	217.33
T5	7.63	4	8.30	383	308	26.90	111	131.00	25.00	113.67	58.33	311.67	67.33	6.50	0.22	0.72	401.00	17.53	231.00
T6	7.87	2	8.63	391	312	27.53	119	129.00	25.33	119.33	61.00	315.67	65.67	6.60	0.23	0.70	354.67	18.50	214.00
T7	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T8	7.93	1	9.07	398	314	27.63	121	137.67	25.33	122.67	57.33	317.67	64.67	6.87	0.22	0.72	430.00	17.80	238.33
Exp. mean	**7.61**		**8.34**	**373**	**306**	**27.11**	**113**	**127.24**	**24.38**	**114.19**	**59.67**	**314.81**	**66.71**	**6.66**	**0.23**	**0.71**	**376.19**	**18.04**	**223.95**
CD(0.05)	NS		0.79	26.83	NS	NS	NS	10.654	NS	NS	NS	NS	NS	NS	NS	NS	28.3	NS	NS
CV	5.0		5.3	4.0	3.5	3.5	6.4	4.7	10.6	5.2	3.6	12.1	7.9	5.33	11.70	6.46	4.2	7.6	4.2
Soil type	Silty clay loam																		
pH	6.30																		
EC	0.31																		
Variety	Shalimar Rice-4																		
Applied NPK kg/ha	120:60:30																		
Available NPK kg/ha	358:35:267																		

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 - ($ZnSO_4.7H_2O$ @ 20 Kg/ha)

T_7 : -

T_8: Optional (According to location)

Table 4.4.1: Contd.

Treatment	MANDYA																			
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Tillers/m^2 (No.)	Panicle/m^2 (No.)	Test wt (g)	Filled grains/ panicle	Total uptake (kg/ha) in plant			Nutrient use efficiency in grain kg/ha			Soil pH	Soil EC (dS/m)	Soil OC (%)	Soil available kg/ha			Soil Zn (ppm)
								N	P	K	N	P	K				N	P	K	
T1	5.16	8	6.63	308	284	12.87	256	79.67	9.67	88.00	65.00	550.33	58.67	7.57	0.14	0.54	246.67	53.88	149.13	1.05
T2	5.45	6	7.15	324	298	13.00	259	105.00	11.00	108.00	52.67	508.00	50.33	7.63	0.14	0.58	255.40	60.02	158.10	1.14
T3	5.46	5	7.06	315	297	12.97	257	105.00	10.67	109.00	52.00	524.67	50.67	7.54	0.14	0.58	256.73	65.95	157.57	1.34
T4	5.91	2	7.45	337	318	12.83	257	110.33	11.00	113.33	53.67	542.00	52.67	7.99	0.17	0.56	249.97	66.69	155.23	1.52
T5	6.01	1	7.32	366	324	13.57	262	119.00	11.33	121.33	50.33	534.67	49.33	7.76	0.16	0.60	264.67	69.87	165.47	1.34
T6	5.71	4	7.26	324	297	13.27	266	106.00	10.33	107.33	54.33	557.00	53.67	7.79	0.15	0.59	249.33	62.60	154.73	1.62
T7	5.45	6	7.32	328	299	13.53	256	100.67	8.33	107.00	54.33	663.00	51.33	7.82	0.15	0.54	243.80	54.66	151.60	1.08
T8	5.86	3	7.51	323	302	12.33	258	103.67	8.00	107.33	57.00	952.00	54.67	7.95	0.15	0.54	240.03	52.91	150.83	0.89
Exp. mean	**5.63**		**7.21**	**328.3**	**302.1**	**13.05**	**258.9**	**103.67**	**10.04**	**107.67**	**54.92**	**603.96**	**52.67**	**7.76**	**0.15**	**0.57**	**250.83**	**60.82**	**155.33**	**1.25**
CD(0.05)	0.5		NS	23.8	NS	NS	NS	16.2	NS	15.8	NS	NS	NS	NS	NS	0.04	14.8	NS	8.8	0.33
CV	4.9		4.7	4.1	4.5	6.1	11.7	8.9	21.0	8.4	8.6	36.2	8.8	4.12	10.57	3.73	3.4	9.2	3.2	15.13
Soil type	Red sandy loam																			
pH	7.80																			
EC	0.27																			
Variety	IET 26241 (93-R)																			
Applied NPK kg/ha	100:50:50:20																			
Available NPK kg/ha	264:69:252																			

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	MONCOMPU																		
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Tillers/m^2 (No.)	Panicle/m^2 (No.)	Test wt (g)	Filled grains/panicle	Total uptake (kg/ha) in plant			Nutrient use efficiency in grain kg/ha			Soil pH	Soil EC (dS/m)	Soil OC (%)	Soil available kg/ha		
								N	P	K	N	P	K				N	P	K
T1	4.23	7	7.01	170	135	27.60	111	79.00	32.93	92.17	53.77	133.23	46.00	4.60	0.07	2.77	302.33	46.03	221.57
T2	4.40	6	7.82	172	144	28.03	108	96.47	41.70	111.90	45.60	108.13	39.47	4.99	0.08	2.87	300.53	46.97	229.67
T3	5.11	2	7.96	178	149	29.10	117	116.47	49.93	126.17	44.07	103.67	40.57	4.83	0.07	2.75	316.77	51.00	223.70
T4	4.56	5	7.49	166	136	27.43	103	92.30	39.10	104.00	49.53	117.10	43.90	4.73	0.07	2.79	299.87	46.67	225.53
T5	5.32	1	8.99	187	154	27.57	111	120.60	56.83	136.53	44.17	93.83	39.07	4.94	0.06	2.91	320.43	48.27	235.83
T6	4.69	4	7.54	167	134	27.07	114	89.63	41.33	103.00	52.27	113.47	45.57	4.67	0.05	2.79	299.73	45.83	223.47
T7	4.88	3	8.19	179	142	28.77	111	108.37	54.17	123.43	45.00	90.57	39.60	4.97	0.07	2.81	309.47	51.10	225.87
T8	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exp. mean	**4.74**		**7.86**	**174**	**14**	**27.94**	**111**	**100.40**	**45.14**	**113.89**	**47.77**	**108.57**	**42.04**	**4.82**	**0.01**	**2.82**	**307.02**	**47.98**	**226.52**
CD(0.05)	0.5		0.6	NS	NS	NS	NS	10.6	9.4	14.7	5.7	NS	5.0	0.2	NS	NS	12.8	NS	NS
CV	5.8		4.4	4.63	5.95	3.1	8.20	6.0	11.7	7.3	6.7	13.7	6.6	2.6	35.9	2.7	2.4	10.0	2.4
Soil type	Red sandy loam																		
pH	4.90																		
EC	0.09																		
Variety	Uma																		
Applied NPK kg/ha	90:45:45																		
Available NPK kg/ha	305:47:210																		

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: -

Table 4.4.1: Contd.

Treatment	PANTNAGAR																		
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Tillers/m^2 (No.)	Panicle/m^2 (No.)	Test wt (g)	Filled grains/panicle	Total uptake (kg/ha) in plant			Nutrient use efficiency in grain kg/ha			Soil pH	Soil EC (dS/m)	Soil OC (%)	Soil available kg/ha		
								N	P	K	N	P	K				N	P	K
T1	5.53	8	5.85	234	230	27.30	93	100.33	28.33	88.33	55.33	197.00	63.00	7.23	0.29	0.42	176.25	9.60	187.50
T2	5.91	1	6.16	225	250	27.63	78	106.00	33.33	101.67	56.00	176.33	58.33	7.25	0.35	0.52	187.50	10.10	196.25
T3	5.64	5	5.90	225	236	27.30	87	98.33	32.00	99.00	57.67	177.00	57.67	7.15	0.38	0.45	177.50	10.65	195.00
T4	5.73	2	6.13	242	240	28.83	78	98.33	34.67	99.00	58.00	163.67	57.67	7.23	0.33	0.51	188.75	11.43	211.25
T5	5.71	3	5.94	223	238	27.80	79	98.00	32.00	93.67	58.00	177.33	61.00	7.23	0.38	0.57	195.00	10.78	202.50
T6	5.62	7	5.77	230	236	27.57	86	97.33	29.00	89.00	57.67	196.00	63.33	7.25	0.36	0.44	188.75	11.60	198.75
T7	5.65	4	5.81	228	233	27.20	78	96.67	30.33	89.33	58.33	187.00	63.67	7.23	0.37	0.46	181.50	12.00	193.75
T8	5.62	6	5.93	234	236	27.33	79	94.67	28.67	90.33	59.33	195.00	62.67	7.23	0.37	0.54	180.00	11.15	192.50
Exp. mean	**5.68**		**5.94**	**230**	**237**	**27.62**	**82**	**98.71**	**31.04**	**93.79**	**57.54**	**183.67**	**60.92**	**7.22**	**0.36**	**0.49**	**184.41**	**10.91**	**197.19**
CD(0.05)	0.12		NS	10.59	9.16	0.28	4.16	4.52	2.69	4.84	NS	14.17	3.53	NS	NS	0.08	6.71	0.74	10.10
CV	1.2		3.2	2.6	2.2	0.6	2.9	2.6	5.0	3.0	3.1	4.4	3.3	1.64	18.21	11.05	2.5	4.6	3.5
Soil type	Silt loam																		
pH	7.50																		
EC	1.20																		
Variety	PD 24																		
Applied NPK kg/ha	135;42:46																		
Available NPK kg/ha	231;22:222																		

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: -

Table 4.4.1: Contd.

Treatment	PUSA																	
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Tillers/m^2 (No.)	Panicle/m^2 (No.)	Test wt (g)	Total uptake (kg/ha) in plant			Nutrient use efficiency in grain kg/ha			Soil pH	Soil EC (dS/m)	Soil OC (%)	Soil available kg/ha		
							N	P	K	N	P	K				N	P	K
T1	4.25	7	5.38	266	247	25.90	69.00	16.97	91.57	61.67	250.00	46.33	8.75	0.49	0.54	209.07	25.50	158.20
T2	4.47	5	5.65	270	250	26.50	75.40	17.97	96.97	59.33	249.00	46.33	8.65	0.47	0.56	224.00	27.13	165.07
T3	4.43	6	5.63	275	251	26.20	73.20	17.57	93.17	60.33	252.67	47.67	8.75	0.49	0.50	210.80	24.97	158.03
T4	4.87	2	6.18	305	285	27.27	86.73	20.50	109.07	56.00	238.00	44.67	8.72	0.49	0.54	231.47	28.47	174.97
T5	5.03	1	6.42	316	294	27.40	90.73	22.17	118.90	55.67	227.00	42.33	8.64	0.46	0.57	242.67	30.70	178.77
T6	4.57	3	5.84	271	252	26.23	74.03	17.73	97.00	61.67	258.00	47.00	8.74	0.50	0.50	203.47	25.23	159.50
T7	4.56	4	5.80	281	258	26.77	77.80	18.47	100.00	58.67	247.33	45.33	8.68	0.49	0.55	227.73	27.83	161.77
T8	3.23	8	4.16	213	193	25.60	48.57	11.83	66.67	66.33	272.67	48.67	8.79	0.51	0.48	197.87	22.37	151.40
Exp. mean	**4.43**		**5.63**	**275**	**254**	**26.48**	**74.43**	**17.90**	**96.67**	**59.96**	**249.30**	**46.04**	**8.72**	**0.49**	**0.53**	**218.38**	**26.53**	**163.46**
CD(0.05)	0.6		0.7	24.04	18.91	0.8	10.7	2.6	14.9	3.7	18.8	NS	NS	NS	NS	27.4	3.1	NS
CV	7.9		7.4	5.0	4.3	1.7	8.2	8.4	8.8	3.5	4.3	4.6	1.45	11.32	8.62	7.2	6.7	5.9
Soil type	Sandy loam																	
pH	8.80																	
EC	0.25																	
Variety	Rajendra Bhagwati																	
Applied NPK kg/ha	120;60:40:25																	
Available NPK kg/ha	197:22:150																	

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) - (5 kg/ha Zn)

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

T_8: -Optional - Absolute Control

Table 4.4.1: Contd.

Treatment	RAIPUR								
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant height (cm)	Panicle/m^2 (No.)	Panicle wt (g)	Test wt (g)	Filled grains/panicle	Un-filled grains/panicle
T1	5.24	7	6.78	104.33	245	3.81	32.50	106	27
T2	5.77	3	7.33	109.45	293	4.27	32.70	116	29
T3	5.63	5	7.21	105.53	274	4.22	32.50	113	25
T4	5.83	2	7.38	110.08	311	4.31	33.15	119	28
T5	6.04	1	7.59	111.58	315	4.40	33.33	122	26
T6	5.46	6	6.98	105.58	258	3.92	33.20	111	29
T7	-		-	-	-	-	-	-	-
T8	5.73	4	7.29	105.33	276	4.25	32.78	114	23
Exp. mean	5.67		7.22	107.41	282	4.17	32.88	114	27
CD(0.05)	0.25		0.32	3.68	24.08	0.24	0.95	8.39	3.58
CV	3.02		3.02	2.3	5.75	3.96	1.95	4.93	9.05
Soil type	Vertisols								
pH	-								
EC	-								
Variety	-								
Applied NPK kg/ha	100:60:40								
Available NPK kg/ha	212;19.4:293.6								

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 (deficient to that location)

T_7 : -

T_8: Optional (According to location)

Table 4.4.1: Contd.

Treatment	TITABAR																			Over all Mean	Rank
	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			Nutrient use efficiency in grain kg/ha			Soil pH	Soil OC (%)	Soil available kg/ha			Soil Zn (ppm)		
								N	P	K	N	P	K			N	P	K			
T1	3.20	7	5.33	179	179	19.63	181	140.00	25.25	141.25	23.00	126.75	22.75	5.23	0.58	259.43	16.93	122.25	0.60	5.02	8
T2	3.80	6	5.38	225	212	21.05	237	140.00	19.50	141.25	27.00	195.50	27.00	5.30	0.61	272.27	19.10	127.66	0.69	5.48	6
T3	3.95	5	7.10	238	222	21.80	255	142.00	21.50	144.50	27.50	185.50	27.25	5.28	0.60	260.92	18.18	131.05	0.67	5.52	5
T4	4.73	4	6.05	265	237	23.00	289	142.25	22.25	144.75	33.25	213.00	33.00	5.25	0.62	274.36	17.05	128.32	0.70	5.72	3
T5	4.88	2	7.38	269	259	23.03	263	144.00	24.00	146.00	34.00	204.50	33.50	5.25	0.68	283.42	20.15	131.64	0.76	5.93	1
T6	4.98	1	6.20	256	258	22.63	274	143.25	25.50	146.00	34.75	196.50	34.00	5.35	0.64	274.38	18.88	131.05	0.78	5.60	4
T7	4.78	3	7.93	257	251	22.43	271	144.00	74.50	145.00	33.00	152.75	33.00	5.40	0.65	272.27	18.18	128.32	0.75	5.38	7
T8	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.79	2
Exp. mean	**4.33**		**6.48**	**241**	**231**	**21.94**	**253**	**142.21**	**30.36**	**144.11**	**30.36**	**182.07**	**30.07**	**5.29**	**0.63**	**271.01**	**18.35**	**128.61**	**0.71**	**5.55**	
CD(0.05)	0.4		1.0	9.7	34.7	1.8	12.5	1.9	NS	NS	2.8	NS	2.8	NS	NS	10.54	0.99	NS	0.11		
CV	6.6		10.8	2.7	10.1	5.7	3.3	0.9	124.2	1.7	6.3	21.7	6.2	2.77	6.36	2.6	3.6	4.6	10.5		
Soil type	Sandy loam																				
pH	5.30																				
EC	0.11																				
Variety	Numoli																				
Applied NPK kg/ha	60:20:40																				
Available NPK kg/ha	251;18:208																				

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: -

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
T1	5.39	8	6.57	311	291	23.39	142	20
T2	5.94	3	7.15	325	309	23.96	159	19
T3	5.81	7	6.91	314	301	23.27	149	18
T4	6.06	2	7.23	330	318	24.15	163	21
T5	6.34	1	7.43	339	324	24.28	169	20
T6	5.88	5	6.93	320	305	23.98	156	19
T7	5.84	6	6.98	323	304	24.08	149	20
T8	5.93	4	6.78	315	307	24.03	160	17
Exp. mean	**5.90**		**7.00**	**322**	**307**	**23.89**	**156**	**19**
CD(0.05)	0.36		0.38	16.55	16.25	0.55	14.57	2.69
CV	3.51		3.14	2.94	3.02	1.3	5.34	7.97
Soil type	Clay							
pH	7.50							
EC	-							
Variety	-							
Applied NPK kg/ha	120:60:40							
Available NPK kg/ha	206.98:38.14:543.2							

T1: Recommended dose of fertilizer (RDF NPK @ 120-60-40 kg/ha))

T2: T1 + FYM@ 5t/ha

T3: T1 + Sampoorna (KAU) @10 g per litre of water twice in the cropping season (250 litre/hectare/application)

T4: 125% RDF of T1

T5: 125% RDF of T1 + FYM@5 t/ha

T6: T1+ Application of micro nutrient (Soil application of ZnSO4 @ 25 kg/ha))

T7: T1+ Sulphur @ 40 kg/ha during basal fertilizer application

T8: T1 + Two foliar sprays of NPK 19:19:19 at maximum tillering and PI stage

Table 4.4.1: Contd.

Treatment	MARUTERU										
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant height (cm)	Tillers/m^2 (No.)	Panicle/m^2 (No.)	Total uptake (kg/ha) in plant	Nutrient use efficiency in grain kg/ha	Soil pH	Soil EC (dS/m)	Soil OC (%)
							N	N			
T1	6.73	5	8.20	137.17	298	257	57.33	121.67	5.81	1.16	0.78
T2	6.87	4	7.73	132.43	295	257	51.67	134.33	5.72	0.98	0.90
T3	7.43	1	8.23	133.03	308	265	70.33	108.67	5.62	1.13	1.06
T4	7.27	3	8.80	129.17	313	269	62.33	116.67	5.75	1.21	0.95
T5	7.37	2	9.33	136.90	296	254	72.00	107.67	5.63	0.96	0.89
T6	-		-	-	-	-	-	-	-	-	-
T7	6.67	6	8.03	136.30	289	249	62.67	107.33	5.74	1.06	1.03
T8	5.73	7	9.47	135.97	285	245	61.33	94.33	5.67	0.98	0.83
T9	3.90	8	4.43	117.27	284	236	33.33	123.00	5.66	1.01	0.95
Exp. mean	**6.50**		**8.03**	**132.28**	**296**	**254**	**58.88**	**114.21**	**5.69**	**1.06**	**0.92**
CD(0.05)	0.92		1.03	NS	17.31	16.70	18.76	NS	NS	NS	0.16
CV	8.1		7.4	6.89	3.34	3.75	18.19	14.89	3.49	29.20	9.71
Soil type	Clay loam										
pH	6.30										
EC	0.62										
Variety	MTU-1064										
Applied NPK kg/ha	90:50:50:60										
Available NPK kg/ha	162:42:338										

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_7 : T1+ Geoxol.com @ 40 kg/ha during basal fertilizer application
T_8: Optional (According to location) - Farmers application dose(101:50:20)
T_9: Control

Table 4.4.1: Contd.

Treatment	PUDUCHERRY																
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Tillers/m^2 (No.)	Panicle/m^2 (No.)	Total uptake (kg/ha) in plant			Nutrient use efficiency in grain kg/ha			Soil pH	Soil EC (dS/m)	Soil OC (%)	Soil available kg/ha		
						N	P	K	N	P	K				N	P	K
T1	5.40	8	8.60	456	408	95.67	29.00	125.00	56.33	188.67	43.33	6.50	0.23	0.24	134.40	32.33	125.33
T2	6.10	3	9.57	492	435	127.33	39.00	150.00	47.67	159.00	41.00	6.71	0.20	0.31	156.80	41.33	154.00
T3	5.97	4	9.13	498	476	120.33	33.00	140.00	49.67	182.00	42.67	6.52	0.24	0.28	138.13	35.33	130.33
T4	5.57	7	8.70	517	454	116.33	32.33	135.33	47.67	171.00	41.33	6.37	0.20	0.26	138.13	34.00	142.33
T5	6.13	2	9.73	522	431	132.00	42.33	155.33	46.67	145.67	39.67	6.50	0.24	0.30	149.33	37.00	162.33
T6	5.83	5	9.03	468	426	117.00	33.67	136.00	50.00	174.33	42.67	6.38	0.18	0.26	134.40	30.00	125.67
T7	5.83	5	9.63	479	441	114.00	34.67	145.33	51.00	169.00	40.00	6.65	0.20	0.28	138.13	36.67	132.33
T8	6.40	1	10.07	545	485	133.33	38.67	157.00	48.33	168.67	40.67	6.40	0.18	0.29	141.87	35.67	155.33
Exp. mean	**5.90**		**9.31**	**497**	**444**	**119.50**	**35.33**	**143.00**	**49.67**	**169.79**	**41.42**	**6.50**	**0.21**	**0.28**	**141.40**	**35.29**	**140.96**
CD(0.05)	0.56		0.93	52.88	44.66	14.46	6.87	14.27	4.56	NS	NS	NS	NS	NS	NS	NS	16.2
CV	5.45		5.71	6.1	5.7	6.91	11.1	5.7	5.2	12.0	7.3	3.53	15.27	17.02	9.5	15.5	6.6
Soil type	Clay loam																
pH	6.70																
EC	0.24																
Variety	ADT 54																
Applied NPK kg/ha	150;50:50																
Available NPK kg/ha	156:36:158																

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) - (B as foliar spray @ 2%)
T_7 : T1+ Geoxol.com @ 40 kg/ha during basal fertilizer application
T_8: Optional (According to location) - (T1 + FYM @ 5 t ha-1 + MN soil application @ 5 kg ha-1)

Table 4.4.1(R): Yield maximization of rice in different Zones, Rabi 2021-22.

Treatment	KARAIKAL																			
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Tillers/m^2 (No.)	Panicle/m^2 (No.)	Test wt (g)	Filled grains/ panicle	Total uptake (kg/ha) in plant			Nutrient use efficiency in grain kg/ha			Soil pH	Soil EC (dS/m)	Soil OC (%)	Soil available kg/ha			Soil Zn (ppm)
								N	P	K	N	P	K				N	P	K	
T1	5.11	8	8.00	419	389	26.81	138	80.67	7.67	169.33	63.33	714.67	32.00	5.33	0.07	0.48	149.50	29.30	145.23	7.50
T2	6.07	1	9.71	427	377	26.72	143	110.33	11.00	283.67	56.00	692.67	22.33	5.48	0.06	0.43	142.13	25.11	129.57	6.11
T3	5.45	6	7.50	491	442	26.72	146	85.33	8.67	225.67	64.33	644.00	24.67	5.34	0.07	0.67	150.53	27.41	172.77	7.50
T4	5.97	2	9.93	590	528	25.97	153	94.67	9.33	319.00	63.33	672.67	20.00	5.33	0.06	0.45	165.17	25.70	137.40	7.50
T5	5.34	7	7.43	414	384	26.65	132	71.67	7.33	214.67	76.33	765.00	26.00	5.59	0.06	0.58	169.37	22.76	153.13	15.36
T6	5.66	5	7.00	434	366	27.16	149	74.67	6.67	178.00	77.33	921.67	33.33	5.31	0.06	0.66	146.37	24.33	157.03	5.61
T7	5.74	4	8.63	407	343	27.05	128	80.67	8.33	267.33	71.67	690.67	22.33	5.53	0.06	0.61	171.47	22.00	157.03	6.41
T8	5.87	3	8.27	411	358	27.00	164	86.67	8.33	224.33	69.67	722.67	26.33	5.68	0.06	0.64	161.00	25.65	160.97	6.19
Exp. mean	**5.65**		**8.31**	**449**	**398**	**26.76**	**144**	**85.58**	**8.42**	**235.25**	**67.75**	**728.00**	**25.79**	**5.45**	**0.06**	**0.56**	**156.94**	**25.28**	**151.64**	**7.77**
CD(0.05)	NS		NS	108.5	107.8	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
CV	60.7		15.3	13.8	15.4	1.9	12.2	15.1	37.7	25.1	14.0	28.9	24.5	2.72	13.60	28.52	7.5	18.7	20.1	57.3
Soil type	Sandy loam																			
pH	6.90																			
EC	0.08																			
Variety	ADT 46																			
Applied NPK kg/ha	150:60:60																			
Available NPK kg/ha	138:35:134																			

T_1: Location specific recommended dose of fertilizer (RDF)

T_2: T_1 + FYM@ 10t/ha

T_3: 125% RDF of T_1

T_4: 150% RDF of T_1

T_5: T_1 + Sampoorna (KAU) @10 g per litre of water twice in the cropping season (250 litre/hectare/application)

T_6: T_1+ Panchakavya spray (deficient to that location)

T_7: Farmers dose

T_8: 100% NP +150% K

Table 4.4.1(R): Contd.

Treatment	MARUTERU (Rabi)																	
	Grain yield (t/ha)	Rank	Straw yield (t/ha)	Plant height (cm)	Tillers/m^2 (No.)	Panicle/m^2 (No.)	Nutrient use efficiency in grain kg/ha			Nutrient use efficiency in straw kg/ha			Soil pH	Soil EC (dS/m)	Soil OC (%)	Soil available kg/ha		
							N	P	K	N	P	K				N	P	K
T1	6.80	8	8.05	96.72	414	369	0.82	0.16	0.19	0.47	0.08	0.98	6.32	0.62	1.37	161.88	41.93	337.60
T2	7.02	7	9.40	93.55	423	379	0.83	0.15	0.19	0.50	0.09	1.51	6.35	0.67	1.37	129.50	51.70	376.99
T3	8.00	3	9.69	93.97	443	396	0.91	0.20	0.24	0.47	0.08	1.20	6.49	0.52	1.24	161.88	53.15	339.05
T4	9.01	1	10.34	98.09	447	399	0.96	0.17	0.19	0.42	0.10	1.06	6.20	0.47	1.39	126.88	54.66	360.25
T5	7.63	6	9.90	95.96	424	379	0.92	0.14	0.19	0.49	0.07	0.96	5.98	0.37	1.30	151.38	47.48	356.16
T6	7.76	4	9.78	93.99	422	376	0.96	0.16	0.19	0.45	0.10	1.00	6.07	0.42	1.34	133.88	52.40	347.09
T7	8.30	2	9.94	90.89	438	390	0.88	0.14	0.20	0.46	0.08	1.09	6.25	0.38	1.35	151.38	45.87	330.51
T8	7.73	5	9.04	95.30	445	380	1.09	0.17	0.22	0.50	0.10	1.15	6.24	0.35	1.34	119.88	49.90	346.58
Exp. mean	**7.78**		**9.52**	**94.81**	**432**	**384**	**0.92**	**0.16**	**0.20**	**0.47**	**0.09**	**1.12**	**6.24**	**0.47**	**1.34**	**142.08**	**49.64**	**349.28**
CD(0.05)	1.19		1.31	4.84	33.34	30.55	0.24	0.07	0.05	0.09	0.01	0.5	0.4	0.25	0.15	45.85	10.99	67.53
CV	10.36		9.37	3.47	5.25	5.42	17.99	29.75	17.29	13.38	8.53	30.13	4.37	36.38	7.85	21.94	15.05	13.15
Soil type	-																	
pH	-																	
EC	-																	
Variety	-																	
Applied NPK kg/ha	-																	
Available NPK kg/ha	-																	

T_1: Location specific recommended dose of fertilizer (RDF) 180:90:60
T_2: T_1 + FYM@ 10t/ha
T_3: 125% RDF of T_1
T_4: 150% RDF of T_1
T_5: T_1 + Sampoorna (KAU) @10 g per litre of water twice in the cropping season (250 litre/hectare/application) (55-60 DAT)
T_6: T_1+ Eco Agra spray 3 times @ 1lt in 300 lt of water (25,40 and 55 DAP) (deficient to that location)
T_7: Fertilizers as per Nutriexpert (141-39-72)
T_8: Farmers application dose (205-84-64)

4.4.1(b) Assessment of yield gap analysis- Interdisciplinary with Economics (Yield Gaps in Rice in different Zones)

A well-structured interview schedule was constructed and data were collected from the respondents through the personal interview method. The data on research station yield and progressive farmers' yield were collected. The index of yield gaps was worked out using the following formula:

Yield Gap (%) = $\frac{Yp-Ya}{Yp} * 100$

Where,

Yp is the Research station yield

Ya is the Average farmers' yield

Table. Yield gap in different states

Sl.No.	State	Potential yield	Farmers' field yield	Yield Gap (%)
1	Kerala	7.4	6.9	7
2	Assam	6	5.75	4.2
3	Karnataka	6.5	5.6	14
4	Tamil Nadu	6.5	6	8
5	Gujarat	6.5	4.8	26
	Average	**6.6**	**5.8**	**12**

The results of the data collected from various districts of five states of India revealed that the yield gaps ranged from 4 percent to 26 percent. The average yield gap was found to be 12 percent.

4.4.2. 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 an 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. There were mainly nine treatments during rabi 2021-22-viz.,1) Absolute control (No: NPK), 2) 100% RDN, 3) 100% N (FYM), 4) 150% N (FYM), 5) 50% N (FYM)+ 50% N (Green manure/Green Leaf Manure, 6) 50% N (FYM)+ 50% N (Vermicompost), 7) 50% N (FYM)+ 50 % N (Neem / Castor/ any cake), 8) Optional 1: 75% RDN: 50% each through FYM + Vermicompost, 9) Optional 2: Best sate organic practice and during kharif 2022 the trial was modified with five treatments viz 1) Control, 2) Complete NF, 3) AI-NPOF package, 4) Integrated Crop Management and 5) Integrated Crop Management (Pest management). The results were summarized and presented in Table 4.4.2 and the salient findings are as followed.

In sandy loam soils of **Ghaghraghat**, Integrated Crop Management resulted in the highest grain yield (4.88 t/ha) followed by Integrated Crop Management (Pest management) (4.57 t/ha). Similarly, in **Raipur**, Integrated Crop Management (Pest management) treatment resulted in the highest grain yield (4.34 t/ha) followed by Integrated Crop Management (4.12 t/ha). It was noticed that natural farming treatment resulted in lower grain yield (2.89 t/ha). Other locations / centres results were presented in Soil Science Section.

Rabi:

Enhancing productivity of organic rice cultivation (rabi 2021-22)

In Karaikal also 150% N (FYM) resulted in the highest grain yield (4.36 t/ha). Similarly, the highest gross return also recorded under same treatment (Rs.1,00,285/-). In clay loam soils of Puducherry, ADT-54 variety, State best organic management practices resulted in the highest grain yield (6.52 t/ha). Other locations / centres results were presented in Soil Science Section.

Table 4.4.2: Enhancing productivity of Organic Rice cultivation – permanent trial for 5 years and system-based approach, Kharif-2022.

Treatment	GANGAVATHI										GHAGHRAGHAT								
	Grain yield (t/ha)	Grain yield (Kg/20 m²)	Straw yield (t/ha)	Straw yield (Kg/20 m²)	Tillers /m² (No.)	Panicle/ m² (No.)	Test wt (g)	Filled grains/ panicle	Cost of cultivation Rs/ha	Gross return Rs/ha	Grain yield (t/ha)	Grain yield (Kg/20 m²)	Straw yield (t/ha)	Straw yield (Kg/20 m²)	Tillers/ m² (No.)	Panicle/ m² (No.)	Test wt (g)	Filled grains/ panicle	Unfilled grains/ panicle
T1	1.01	2.02	1.16	2.33	195	165	18.57	73	27625	21391	3.78	7.57	5.61	9.32	212	207	15.88	218	26
T2	1.06	2.13	1.22	2.45	203	174	18.72	69	45000	22509	4.45	8.91	6.59	10.84	233	231	15.50	229	19
T3	1.55	3.10	1.78	3.56	204	184	17.90	121	63575	32740	4.01	8.02	5.96	9.74	219	216	15.88	223	22
T4	2.86	5.72	3.29	6.57	297	384	17.84	142	39909	60460	4.88	9.76	7.24	11.77	276	273	16.08	243	15
T5	2.63	5.26	3.02	6.05	268	360	19.04	143	41921	55598	4.57	9.14	6.79	11.06	247	244	15.88	234	18
Exp. mean	**1.82**	**3.64**	**2.10**	**4.19**	**233**	**253**	**18.42**	**110**			**4.34**	**8.68**	**6.44**	**10.55**	**237**	**234**	**15.84**	**229**	**20**
CD(0.05)	0.21	0.41	0.24	0.48	60.56	14.46	1.28	25.49			0.17	0.33	0.24	0.4	11.28	11.09	0.42	7.28	1.96
CV	7.37	7.37	7.37	7.37	16.84	3.71	4.51	15.09			2.48	2.48	2.44	2.49	3.09	3.08	1.72	2.06	6.35
Soil type	Black clay										Sandy loam								
Variety	-										-								
Applied NPK kg/ha	150:75:75										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 4.4.2: Contd.

Treatment	KARAIKAL(Rabi-22)										RAIPUR							Over all Mean	Rank
	Grain yield (t/ha)	Grain yield (Kg/20 m²)	Straw yield (t/ha)	Straw yield (Kg/20 m²)	Tillers/ m² (No.)	Panicle/ m² (No.)	Test wt (g)	Filled grains/ panicle	Unfilled grains/ panicle	Gross return Rs/ha	Grain yield (t/ha)	Straw yield (t/ha)	Panicle/ m² (No.)	Panicle wt (g)	Test wt (g)	Filled grains/ panicle	Unfilled grains/ panicle		
T1	3.27	6.54	5.9	11.8	380.5	352.5	26.49	98.75	7.45	92264	2.32	3.13	229	2.02	18.73	88	39	3.12	5
T2	4.81	9.62	8.36	16.73	467.5	437.5	25.55	107.55	9.8	134507	2.89	3.86	240	2.17	19.03	97	38	4.05	4
T3	4.48	8.97	7.74	15.48	447.5	420	26.74	119.7	13.85	125132	3.68	4.87	274	2.53	19.20	136	51	4.06	3
T4	4.58	9.16	7.96	15.91	482.5	455	25.73	118.35	10.55	128029	4.12	5.29	279	2.81	19.13	148	53	4.53	2
T5	5.17	10.35	9.1	18.2	533.88	495	26.09	138.5	14.8	145024	4.34	5.48	281	2.94	19.73	155	51	4.69	1
Exp. mean	**4.46**	**8.93**	**7.81**	**15.62**	**462.38**	**432**	**26.12**	**116.57**	**11.29**	**124991**	**3.47**	**4.53**	**261**	**2.49**	**19.16**	**125**	**46**	**4.09**	
CD(0.05)	0.7	1.39	1.52	3.04	64.55	63.76	1	17.8	4.11		0.29	0.4	20.07	0.24	0.91	11.95	8.14		
CV	10.13	10.13	12.63	12.63	9.06	9.58	2.48	9.91	23.61		5.42	5.71	5	6.15	3.09	6.22	11.42		
Soil type	-										-								
Variety	-										CG Devbhog								
Applied NPK kg/ha	-										80;50:30								
Available NPK kg/ha	-										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 4.4.2(R): Enhancing productivity of Organic Rice cultivation – permanent trial for 5 years and system-based approach, Rabi 2021-22.

Treatment	CHINSURAH					KARAIKAL									
	Grain yield (t/ha)	Straw yield (t/ha)	Tillers/m^2 (No.)	Panicle/ m^2 (No.)	Test wt (g)	Grain yield (t/ha)	Grain yield (Kg/20 m^2)	Straw yield (t/ha)	Straw yield (Kg/20 m^2)	Tillers/ m^2 (No.)	Panicle/ m^2 (No.)	Test wt (g)	Filled grains/ panicle	Unfilled grains/ panicle	Gross return Rs/ha
T1	2.33	2.75	258	222.75	20.18	3.04	6.08	5.58	11.15	350	329	14.87	147	30	71985
T2	5.47	6.48	364	319.25	21.75	3.88	7.75	7.35	14.71	478	433	14.78	192	25	92226
T3	2.72	3.23	249.25	215.75	19.63	4.13	8.27	6.15	12.30	482	411	14.79	202	29	94963
T4	2.57	3.06	250	217.5	20.23	4.36	8.71	6.59	13.18	559	482	14.99	206	17	100285
T5	3.44	4.21	257.75	214.5	19.65	3.89	7.77	6.67	13.34	510	438	14.82	192	19	91075
T6	3.69	4.56	289.5	262.5	20.23	4.16	8.31	6.69	13.38	487	425	14.66	184	29	96518
T7	2.76	3.28	259.25	225.25	19.65	4.27	8.54	6.54	13.08	487	433	14.87	183	16	98508
T8	2.67	3.18	263.75	227.25	19.8	4.06	8.11	6.24	12.49	463	403	14.76	170	25	93586
T9	2.72	3.23	247.25	214.25	20.95	4.21	8.42	6.91	13.83	416	356	14.27	195	19	97995
Exp. mean	**3.15**	**3.78**	**270.97**	**235.44**	**20.23**	**4.00**	**8.00**	**6.53**	**13.05**	**470**	**412**	**14.76**	**186**	**23**	**93016**
CD(0.05)	0.23	0.31	33.31	33.94	0.71	0.64	1.28	1.09	2.17	102.29	68.59	0.35	31.16	8.59	
CV	4.92	5.68	8.42	9.88	2.4	9.27	9.27	9.63	9.63	12.57	9.61	1.37	9.69	21.4	
Soil type	Clay Loam					-									
pH	-					-									
EC	-					-									
Variety	Sukumar 120-125 days					TKM 13, 135 days									
Applied NPK kg/ha	80:40:40					150:50:50									
Available NPK kg/ha	-					-									

T_1: Absolute Control (No NPK)
T_2: 100% RDN
T_3: 100 % N (FYM)
T_4: 150 % N (FYM)
T_5: 50 % N (FYM) + 50 % N (Green Leaf Manure)
T_6: 50 % N (FYM) + 50 % N (Vermi compost)
T_7: 50 % N (FYM) + 50 % N (Neem / Castor/ any cake)
Optional treatments:
T8: Optional 1- 75% RDN 50% each through FYM + Vermicompost; FYM as basal and VC 20days after transplanting + Panchgavya + Jeevamrit + Ghanjeevamrit.
T9: Optional 2 – Best State Organic practice (mention the treatment)

Table 4.4.2(R): Contd.

Treatment	PUDUCHERRY												Over all Mean	Rank
	Grain yield (t/ha)	Grain yield (Kg/25 m²)	Straw yield (t/ha)	Straw yield (Kg/25 m²)	Tillers/ m² (No.)	Panicle/ m² (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		
T1	4.48	11.20	7.51	18.77	287	255	18.63	169	26	87.00	26.33	99.33	3.28	9
T2	6.29	15.72	10.94	27.36	367	344	19.62	227	14	125.33	40.00	161.00	5.21	1
T3	5.60	14.00	9.75	24.37	298	315	18.90	194	21	104.67	32.33	141.00	4.15	7
T4	5.77	14.42	10.66	26.66	343	329	19.14	207	18	112.00	37.67	150.67	4.23	6
T5	5.91	14.78	10.11	25.27	351	335	19.36	213	16	114.67	36.33	151.33	4.41	4
T6	6.05	15.12	10.46	26.15	367	341	19.36	219	15	123.00	37.67	160.67	4.63	2
T7	5.71	14.26	9.99	24.96	335	322	19.02	200	19	104.33	33.67	134.33	4.25	5
T8	-	-	-	-	-	-	-	-	-	-	-	-	3.37	8
T9	6.52	16.29	11.21	28.02	399	357	19.48	232	11	135.33	45.33	166.33	4.48	3
Exp. mean	**5.79**	**14.47**	**10.08**	**25.19**	**343**	**325**	**19.19**	**208**	**17**	**113.29**	**36.17**	**145.58**	**4.31**	
CD(0.05)	0.17	0.42	1.09	2.72	8.36	6.84	0.47	4.31	0.75	5.26	4.2	10.1		
CV	1.63	1.65	6.17	6.17	1.39	1.2	1.4	1.19	2.47	2.65	6.63	3.96		
Soil type	Clay loam													
pH	6.77													
EC	0.10													
Variety	ADT 54, 135 days													
Applied NPK kg/ha	120;40:40													
Available NPK kg/ha	123;11.4:105													

T_1: Absolute Control (No NPK)
T_2: 100% RDN
T_3: 100 % N (FYM)
T_4: 150 % N (FYM)
T_5: 50 % N (FYM) + 50 % N (Green Leaf Manure)
T_6: 50 % N (FYM) + 50 % N (Vermi compost)
T_7: 50 % N (FYM) + 50 % N (Neem / Castor/ any cake)
Optional treatments:
T8: Optional 1 -
T9: Optional 2 – Best State Organic practice (mention the treatment) Green Manure (Daincha 6.25 tons/ha + FYM 6 tons/ha + Neem Cake as basal 100 kg/ha + Panchgavya and Fish extract (Foliar spray at every 10 days intervel) 25 days after transplanting .

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

For detailed report refer Soil Science Progress Report 2022, Volume 3.

4.4. Integrated Pest Management– on farm management of insects, diseases and weeds IPMs (Entomology, Pathology and Agronomy) Special interdisciplinary trial, *Kharif 2022.*

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* 2022, the trial was conducted Zone-wise at 13 locations viz., **Coimbatore, Chinsurah, Gangavathi, Karjat, Mandya, Malan, Navasari, Nawagam, Pusa, Puducherry, Raipur, Titabar and Vadagaon.** The data on weed population and weed dry biomass in critical period of crop weed competition (30 DAT & 60 DAT) and grain yields were reported and the results after statistical analyses are summarized and presented in **Tables 4.4.4.**

Species wise weed data reported by 7 locations **Coimbatore, Gangavathi, Mandya, Malan, Navasari, Titabar and Vadagaon.**

The weed flora reported in the test locations included **GRASSES:** *Cynodon dactylon, Dactylactenium aegyptium, Echinochloa colona, Echinochloa crusgalli, Hymenachne spp, Leptochloa chinensis, Panicum repens and Panicum tripheron.* **SEDGES:** *Cyperus difformis, Cyperus iria, Cyperus rotundus, Cyperus procerus, Eleocharis spp, Scirpus spp and Fimbristylis miliacea.* **BLW:** *Ammania baccifera, Spilanthes acmella, Alternanthera spp, Alternanthera philxeroides, Bergia capensis, Eclipta alba, Eclipta prostrata, Ludwigia parviflora, Monochoria vaginalis, Glinus oppositifolius, Monochoria spp, Rotala densiflora, Sphenoclea zeylanica and Marsilea quadrifolia.*

<u>Zone I – Hilly Regions</u>

Himachal Pradesh, Malan: IPMs 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 30 DAT and 60 DAT stage in IPM plots was lower than farmers practice by 30.60 and 27.56% respectively. The dry weed biomass was

lower in IPM implemented fields by 49.70 and 18.20 % respectively. The mean grain yield advantage was 51.05 in IPM adopted plots.

Zone III – Eastern areas

The variety Swarna was cultivated in both Farmers practice and IPM adopted fields.

At **Chinsurah**, the trial was conducted in the village Bele, Pandua Block, Hooghly District, West Bengal State. The data on weed population and weed biomass were recorded at 30 DAT & 60 DAT. Significant decrease in weed population by 43.47 and 33.63% and weed dry biomass by 44.58 and 36.76% respectively in IPM implemented fields, resulted in higher growth, yield attributes and grain yield advantage increase by 25.1% of the variety Swarna.

At **Pusa,** the field trial was conducted in the village Ladaura of Samastipur District & Kuchauli Village, Darbhanga District using the variety Rajendra Mahsuri. The weed population at 30 DAT & 60 DAT in IPM plots was lower than farmers practice by 18.08 and 16.65 % respectively. The dry weed biomass also was lower in IPM implemented fields by 18.02 and 13.16 respectively. The mean grain yield advantage was 24.95% in IPM adopted plots.

In the Eastern Zone, yield advantage of 25.02% was recorded in IPM implemented fields. The weed population was reduced by 38.83% at 30 DATand 31.10% at 60 DAT respectively in IPM fields. The reduction in weed biomass was 26.84% at 30 DAT and 22.67% at 60 DAT.

Zone IV – North-Eastern areas

Assam – Titabar: In Zone IV, 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. In this Zone Weed population and biomass were reported for 30 DAT only. Significant reduction in weed population (44.31%) and dry weed biomass (39.98%) at 30 DAT in IPM fields with variety Ranjit Sub1. Significant improvement in grain yield advantage was noticed with 21.39 % higher in IPM adopted fields.

Zone V – Central areas

In this Zone, IPMs trial was conducted by one location **Raipur**.

The weed population & Weed biomass was recorded at 30 DAT & 60 DAT. In this Zone, in IPM plots the weed population was lower than farmers practice by 22.52 & 22.70% respectively. The dry weed biomass also was lower in IPM implemented fields by 15.65 and 18.16 respectively. The mean grain yield advantage was 10.97% in IPM adopted plots.

Zone VI – Western areas

IPMs trial was conducted by **Karjat, Navasari, Nawagam, Vadagoan** four locations in this Zone. The IPM practices adopted in this Zone are detailed below.

At **Karjat,** the field trial was conducted in the villages of Vadap, Gourkamat, Salokh with varieties Karjat 7. The weed population at 30 DAT in IPM plots was lower than farmers practice by 18.75. The dry weed biomass also was lower in IPM implemented fields by 100 respectively. The mean grain yield advantage was 17.07 % in IPM adopted plots.

At **Navsari**, the trial was conducted in the Research Farm, Main Rice Research Centre. Significant reduction in weed population (51.47 and 39.53%) and dry weed biomass (48.30 and 35.39%) at 30 DAT & 60 DAT in IPM implemented fields was experienced with variety GNR3. Significant improvement in grain yield advantage was noticed with 5.23% higher in IPM adopted fields.

At **Nawagam**, the trial was conducted in the villages Khathwada, Nawagam significant reduction in weed population (62.36 and 54.83%) and dry weed biomass (68.73 and 59.62%) at 30 DAT & 60 DAT in IPM implemented fields was experienced with variety Gurjari. Significant improvement in grain yield advantage was noticed with 16.8% higher in IPM adopted fields.

At **Vadgaon**, the trial was conducted in the Village Chandkhed. **Vadgaon,** significant reduction in weed population (73.93 and 68.59%) and dry weed biomass (74.30 and 68.88%) at 30 DAT & 60 DAT in IPM implemented fields was experienced with variety Phule Samrudhi. Significant improvement in grain yield advantage was noticed with 44.95% higher in IPM adopted fields.

In this Western Zone, adoption of IPM package resulted in yield advantage of 21.01% over the farmers practice. The weed population in IPM implemented fields was lower by 63.32 at 30 DAT and 56.13% at 60 DAT. The reduction in weed dry biomass was 69.69% at 30 DAT and 60.04 at 60 DAT respectively.

Zone VII – Southern areas

IPMs trial was conducted by four locations in two farmers' fields in this Zone. The IPM practices adopted are given below:

At **Coimbatore**, **Tamil Nadu State** the field trial was conducted in the village Bhavani, Erode District using the variety CO 52. The weed population at 30 DAT & 60 DAT in IPM plots was lower than farmers practice by 60.00 and 55.03% respectively. The weed dry biomass at 30 DAT & 60 DAT in IPM plots was lower than farmers practice by 58.40and 48.71% respectively and contributed to the mean grain yield advantage of 18.19 % in IPM adopted plots.

At **Gangavathi**, the field trial was conducted in the Research Farm of Agriculture Research Station, Gangavathi in Karnataka using the varietyBPT-5204. The weed population at 30 DAT & 60 DAT in IPM plots was lower than farmers practice by 86.96 and 62.70% respectively. The weed dry biomass at 30 DAT & 60 DAT in IPM plots was lower than farmers practice by 74.18and 55.44% respectively and contributed to the mean grain yield advantage of 6.19 % in IPM adopted plots.

At **Mandya,** the field trial was conducted in the villages Ganadalu and Mallanayakanakatte of Mandya District, Karnataka state using variety Jyothi. The weed population at 30 DAT & 60 DAT in IPM plots was lower than farmers practice by 65.70 and 64.10% respectively. The weed dry biomass at 30 DAT & 60 DAT in IPM plots was lower than farmers practice by 83.44and 73.77% respectively and contributed to the mean grain yield advantage of 14.46 % in IPM adopted plots.

At **Puducherry,** the field trial was conducted in the villages of Panaiyadikuppam, Karaiyamputhurr using the variety ADT 54. The weed population at 30 DAT & 60 DAT in IPM plots was lower than farmers practice by 24.89and 27.73% respectively with lower weed biomass in IPM implemented fields by 24.09 and 39.12% respectively. The mean grain yield advantage was 4.89% in IPM adopted plots.

In the Southern Zone, the yield advantage of 11.03% was recorded in IPM implemented fields. The weed population reduction in IPM fields was 66.68% at 30 DAT and 48.09% at 60DAT. The reduction in weed biomass in IPM implemented fields was 67.64% at 30 DAT and 54.09% at 60 DAT.

Rabi 2021-2022

At **Aduthurai,** the field trial was conducted in the villages Melamaruthuvakudi, Thiruneelakudi, Aduthurai, of Thanjavur District, Tamilnadu state using varieties CR1009, ADT 51, ADT 54. The weed population at 30 DAT & 60 DAT in IPM plots was lower than farmers practice by 74.83 and 73.6% respectively. The weed dry biomass at 30 DAT & 60 DAT in IPM plots was lower than farmers practice by 46.30 and 66.64% respectively and contributed to the mean grain yield advantage of 17.67 % in IPM adopted plots.

In summary, the Integrated Pest Management special (IPMs) trial was conducted at 13 locations during ***Kharif*** 2022 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 51.05 %, 25.02%, 21.39 %, 10.97%, 44.95% and 11.03% respectively in Zone-I, III, IV, V, VI and VII over the farmer practices and 17.67% during ***Rabi*** season-2021-22 at **Aduthurai** (Zone-VII). In IPM adopted fields, the mean weed population reduction over the Zones ranged from 22.52 % in Zone-V (Central areas) to 66.68 % in Zone-VII at 30 DAT; and at 60 DAT, its range is from 27.56 % in Zone-I (Hilly areas) to 56.13 % in Zone-I and during *Rabi* season-2021-22 at Aduthurai (Zone-VII) 74.83%, 73.6% at 30 and 60 DAT respectively. The dry weed biomass reported by 13 locations showed that, both 30 & 60 DAT were significantly reduced by 15.65 % in Zone-V (Central areas) to 69.69% in Zone-VI (Western areas); 18.16 % in Zone-V (Central areas) to 54.09% in Zone-VI (Western areas) where as in case of Rabi at Aduthurai (Zone-VII) 46.3 %, 66.64 % at 30 & 60 DAT respectively.

Table 4.4.4: 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* 2022.

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	
							30 DAT	60 DAT	30 DAT	60 DAT
Coimbatore	IPM	336	3.13	6.32	18.19	8.38	6.40(2.61)	13.40(3.72)	4.62	9.6
	Farmers Practice	232	2.6	5.17		7.25	16.00(4.04)	29.80(5.50)	11.11	18.72
	Exp. mean	284	2.86	5.75		7.82	3.33	4.61	7.87	14.16
	CD(0.05)	**8.26**	**0.13**	**0.18**		**0.2**	**0.28**	**0.23**	**1.40**	**1.1**
	Variety	CO 52, 135 days								
Chinsurah	IPM	332	3.25	4.98	25.1		34.35(5.87)	56.00(7.51)	4.35	7.38
	Farmers Practice	294	3.21	3.73			60.77(7.81)	84.38(9.18)	7.85	11.67
	Exp. mean	313	3.23	4.35			6.84	8.34	6.1	9.53
	CD(0.05)	**16.76**	**0.02**	**0.17**			**0.93**	**1.01**	**1.30**	**1.93**
	Variety	Swarna								
Gangavathi	IPM	465	2.79	5.49	6.19	6.32	19.54(4.33)	12.23(3.50)	62.29	40.92
	Farmers Practice	463	2.53	5.15		5.92	149.93(12.22)	32.80(5.68)	241.28	91.85
	Exp. mean	464	2.66	5.32		6.12	8.28	4.59	151.79	66.39
	CD(0.05)	**9.03**	**0.09**	**0.14**		**0.25**	**1.23**	**0.98**	**67.97**	**15.37**
	Variety	BPT-5204, 145 days								
Karjat	IPM			3.25	17.07		2.60(1.73)		0.00	
	Farmers Practice			2.67			3.20(1.90)		3.14	
	Exp. mean			2.96			1.82		1.57	
	CD(0.05)			**0.07**			**0.13**		**0.69**	
	Variety	Karjat 7								

Table 4.4.4: 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	
							30 DAT	60 DAT	30 DAT	60 DAT
Mandya	IPM	372	3.24	6.29	14.46	7.13	4.80(2.30)	11.20(3.34)	1.01	7.84
	Farmers Practice	345	3.04	5.38		6.43	14.00(3.69)	31.20(5.61)	6.1	29.9
	Exp. mean	358	3.14	5.84		6.78	2.99	4.48	3.55	18.87
	CD(0.05)	**17.19**	**0.16**	**1.36**		**1.17**	**0.89**	**0.86**	**2.26**	**5.25**
	Variety	Jyothi, 135 to 140 days								
Malan	IPM	224	2.16	3.31	51.05	3.9	31.00(5.60)	44.67(6.71)	31.4	43.9
	Farmers Practice	186	1.42	1.62		2.03	44.67(6.72)	61.67(7.88)	62.43	53.67
	Exp. mean	205	1.79	2.47		2.97	6.16	7.29	46.92	48.78
	CD(0.05)	**6.77**	**0.35**	**0.15**		**0.33**	**0.95**	**0.82**	**8.48**	**6.95**
	Variety									
Navasari	IPM	214	3.9	5.35	5.23	7.64	6.60(2.64)	15.60(4.00)	9.16	20.48
	Farmers Practice	201	3.62	5.07		7.45	13.60(3.74)	25.80(5.12)	17.72	31.7
	Exp. mean	208	3.76	5.21		7.54	3.19	4.56	13.44	26.09
	CD(0.05)	**7.77**	**0.09**	**0.13**		**0.24**	**0.54**	**0.25**	**4.41**	**2.79**
	Variety	GNR-3, 120-125 days								
Nawagam	IPM			5.00	16.8		102.17(9.95)	79.64(8.84)	48.89	39.92
	Farmers Practice			4.16			271.50(16.17)	176.34(13.08)	156.35	98.87
	Exp. mean			4.58			13.06	10.96	102.62	69.4
	CD(0.05)			**0.44**			**2.16**	**1.4**	**33.52**	**15.67**
	Variety	Gurjari								
Puducherry	IPM	375	4.07	6.74		9.74	52.47(7.28)	42.05(6.52)	27.37	24.99
	Farmers Practice	331	3.62	6.41	4.89	9.23	69.86(8.39)	58.19(7.66)	36.06	41.05
	Exp. mean	353	3.84	6.58		9.49	7.83	7.09	31.72	33.02
	CD(0.05)	**6.72**	**0.07**	**0.11**		**0.22**	**0.07**	**0.07**	**0.63**	**0.65**
	Variety	ADT 54 (135 Days)								
Pusa	IPM			5.89			11.14(3.41)	12.26(3.57)	12.92	14.91
	Farmers Practice			4.42	24.95		13.60(3.75)	14.71(3.89)	15.76	17.17
	Exp. mean			5.15			3.58	3.73	14.34	16.04
	CD(0.05)			**0.4**			**0.18**	**0.16**	**1.34**	**1.17**
	Variety	Rajendra Mahsuri								

Table 4.4.4: 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	
							30 DAT	60 DAT	30 DAT	60 DAT
Raipur	IPM	403	3.96	7.11	10.97	8.73	13.28(3.69)	23.90(4.93)	8.78	35.99
	Farmers Practice	394	3.75	6.33		7.83	17.14(4.16)	30.92(5.59)	10.41	43.98
	Exp. mean	398	3.86	6.72		8.28	3.93	5.26	9.59	39.99
	CD(0.05)	**6.56**	**0.14**	**0.58**		**0.81**	**0.24**	**0.29**	**0.51**	**3.27**
	Variety	Swarna, 145 days								
Titabar	IPM	229	5.66	4.3	21.39	10	38.20(6.22)	-	17.86	-
	Farmers Practice	194	4.36	3.38		7.62	68.60(8.28)	-	29.76	-
	Exp. mean	211	5.01	3.84		8.81	7.25	-	23.81	-
	CD(0.05)	**8.69**	**0.62**	**0.24**		**0.99**	**0.79**	**-**	**9.02**	**-**
	Variety	Ranjit Sub-1, 150 days								
Vadagoan	IPM	244	5.3	5.85	44.95	6.16	13.84(3.77)	19.97(4.52)	24.3	34.02
	Farmers Practice	174	2.99	3.22		4.04	53.10(7.32)	63.58(8.00)	94.56	109.34
	Exp. mean	209	4.14	4.54		5.1	5.55	6.26	59.43	71.68
	CD(0.05)	**8.8**	**0.19**	**0.10**		**0.19**	**0.35**	**0.19**	**6.65**	**4.76**
	Variety	Phule Samruddhi-125 to 130 days								
Rabi 2021-22										
Aduthurai	IPM			6.28	17.67		5.00(2.32)	8.87(3.04)	5.47	5.13
	Farmers Practice			5.17			19.87(4.44)	33.60(5.68)	10.19	15.38
	Exp. mean			5.73			3.38	4.36	7.83	10.26
	CD(0.05)			**0.22**			**0.51**	**0.83**	**3.3**	**4.09**
	Variety	CR1009,ADT 51,ADT54								

Table 4.4.4: 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* 2022.

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	
							30 DAT	60 DAT	30 DAT	60 DAT
Zone I – Hilly areas										
Malan	IPM	224	2.16	3.31	51.05	3.90	31.00	44.67	31.40	43.9
	Farmers Practice	186	1.42	1.62		2.03	44.67	61.67	62.43	53.67
Zone III – Eastern areas										
Chinsurah, Pusa	IPM	332	3.25	5.43	25.04		22.745	34.13	8.64	11.15
	Farmers Practice	294	3.21	4.07			37.185	49.54	11.81	14.42
Zone IV – North-Eastern areas										
Titabar	IPM	229	5.66	4.30	21.39	10.00	38.2		17.86	
	Farmers Practice	194	4.36	3.38		7.62	68.60		29.76	
Zone V – Central areas										
Raipur	IPM	403	3.96	7.11	13.09	8.73	13.28	23.90	8.78	35.99
	Farmers Practice	394	3.75	6.33		7.83	17.14	30.92	10.41	43.98
Zone VI – Western areas										
Karjat, Nawagam, Navsari, Vadgoan	IPM	229	4.60	4.86	22.22	6.90	31.30	29.40	20.59	24.19
	Farmers Practice	187	3.31	3.78		5.75	85.35	67.03	67.94	60.55
Zone VII – Southern areas										
Coimbatore, Gangavathi, Mandya, Puducherry	IPM	387	3.31	6.21	11.11	7.89	20.80	19.72	23.82	20.83
	Farmers Practice	343	2.95	5.52		7.21	62.44	37.99	73.63	45.38
Rabi 2021-22										
Aduthurai	IPM			6.28	17.67		5.00	8.87	5.47	5.13
	Farmers Practice			5.17			19.87	33.60	10.19	15.38

Table 4.4.4: Reduction % in weed parameters in Integrated Pest Management - on farm management of insects, diseases and weeds IPMs (Entomology, Pathology and Agronomy)-Special Interdisciplinary trial, *Kharif* 2022.

Centers	Weed Population (% reduction in IPM)		Weed dry biomass (% reduction in IPM)	
	30 DAT	60 DAT	30 DAT	60 DAT
Coimbatore	60.00	55.03	58.40	48.71
Chinsurah	43.47	33.63	44.58	36.76
Gangavathi	86.96	62.70	74.18	55.44
Karjat	18.75	-	100.00	-
Mandya	65.70	64.10	83.44	73.77
Malan	30.60	27.56	49.70	18.20
Navasari	51.47	39.53	48.30	35.39
Nawagam	62.36	54.83	68.73	59.62
Puducherry	24.89	27.73	24.09	39.12
Pusa	18.08	16.65	18.02	13.16
Raipur	22.52	22.70	15.65	18.16
Titabar	44.31	-	39.98	-
Vadagoan	73.93	68.59	74.30	68.88
Rabi 2021-22				
Aduthurai	74.83	73.6	46.31	66.64

ANNEXURES

Annexure - I

Major weeds observed during *Kharif* - 2022

Grasses	Sedges	BLW
Cynodon dactylon	*Cyperus difformis*	*Ammania baccifera*
Dactylactenium aegyptium	*Cyperus hapens*	*Astercantha longifolia*
Digitaria marginata	*Cyperus iria*	*Alternanthera philxeroides*
Dinebra retroflexa	*Cyperus procerus*	*Alternanthera spp*
Echinochloa colona	*Cyperus rotundus*	*Bergia capensis*
Echinochloa crusgalli	*Fimbristylis miliacea*	*Centella asiatica*
Eleusine indica	*Scirpus spp*	*Cynotis cristata*
Hymenachne spp		*Eclipta alba*
Isachne miliacea		*Eclipta prostrata*
Leptochloa chinensis		*Glinus oppositifolius*
Leersia hexandra		*Ludwigia parviflora*
Panicum repens		*Ludwigia hyssopifolia*
Panicum tripheron		*Marsilea quadrifolia*
Paspalum scrobiculatum		*Monochoria vaginalis*
Oplismenus burmannii		*Physalis minima*
Weedy rice (Oryaza sativa f. spontanea)		*Phyllanthus niruri*
		Parthenium hysterophorous
		Rotala densiflora
		Solanum nigrum
		Spilanthes acmella
		Sphenoclea zeylanica

WEATHER DATA – KHARIF 2022

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	7	13	10	9	6	53
Total Rainfall (mm)	66.0	55.5	138.2	86.5	104.5	180.5	631.2
Avg. Max. Temp. ('^{0}C)	30.1	33.1	30.4	31.3	29.3	25.9	25.9-33.1
Avg. Mini. Temp. ('^{0}C)	17.3	17.8	21.0	19.9	18.2	11.1	11.1-21.0
Avg. Sunshine hours	5.84	7.52	5.27	6.42	4.88	6.85	6.13

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
	MONTH1	**MONTH2**	**MONTH3**	**MONTH4**	**MONTH5**	**MONTH6**		**Total / Range**
No. of rainy days	12	18	15	6	0	0	-	51
Total rainfall (mm)	44.9	98.7	135.5	54	0	0	-	333.1
Avg. Max Temp. (°C)	32.15	33.23	34.32	32.06	30.16	29.18	-	29.18-34.3
Avg. Min.Temp. (°C)	28.27	27.19	27.77	25.35	19.32	14.27	-	14.27-28.3
* Avg. Sunshine hours	13h & 25 min	12h &55 min	12 h &17 min	11 h & 37 min	11 h &2 min	10 h & 44 min	-	-
* Avg. wind velocity	1.4	1.3	0.9	0.8	0.8	0.6	-	0.97

CHINSURAH							
Latitude:	22^0 52' N		Longitude:	88^0 24' E		Elevation (m) :	8.62
Soil type:	Clay Loam		Soil pH :	7.3		Soil texture :	Gangetic Alluvial
	June	**July**	**Aug**	**Sep**	**Oct**	**Nov**	**Total / Range**
No. of Rainy days	17	22	18	11	6	-	74
Total Rainfall (mm)	194.00	200.10	255.80	235.90	67.10	-	952.9
Avg. Max. Temp. ('^{0}C)	35.10	34.71	33.92	33.78	32.30	29.52	29.52-35.10
Avg. Mini. Temp. ('^{0}C)	24.58	24.48	24.15	23.6	21.22	13.70	13.70-24.58

CHIPLIMA							
Latitude :	20^{0}21'N		Longitude	80^0 55'E		Elevation :	178.8
Soil type:	Mixed Red, Black &Lateritic		Soil pH :			Soil texture :	
	June	**July**	**Aug**	**Sep**	**Oct**	**Nov**	**Total/Range**
No. of Rainy days	6	15	17	8	6	-	52
Total Rainfall (mm)	56.6	444.4	347.4	257.6	68.4	-	1174.4
Avg. Max. Temp. ('0C)	31.8	32.0	32.1	32.2	31.8	31.1	31.1-32.2
Avg. Mini. Temp. ('0C)	25.8	25.2	24.8	24.6	21.1	14.8	14.8-25.8

CANNING TOWN							
Latitude :	27.2046 N		Longitude:	77.4977 E		Elevation (m) :	6
Soil type:	Salitu Clay		Soil pH :	6.5-7.0		Soil texture	Heavy texture
	June	**July**	**Aug.**	**Sep.**	**Oct.**	**Nov**	**Total / Range**
No. of Rainy days	10	16	18	13	8	0	65
Total Rainfall (mm)	112.8	159.4	491.8	362.4	113.6	0	1240
Avg. Max. Temp. ('^{0}C)	34.2	33.4	32.8	32.9	32	29.8	29.8-34.2
Avg. Mini. Temp. ('^{0}C)	26.7	26.7	26.7	26.9	24.3	18.7	18.7-26.9
Avg. Sunshine hours	2.8	5.4	4.3	5.5	6.7	8.1	5.47
Avg. wind velocity	9.7	7.7	7.1	5.8	3.7	2.2	6.033

CHATHA							
Latitude	**32^0 40'N**	Longitude	**74^0 48'E**			Elevation (m)	293
Soil type		Soil pH	7.0			Soil texture	Clay loam
	June	**July**	**Aug.**	**Sep.**	**Oct.**	**Nov.**	**Total / Range**
No. of Rainy days	4.0	15	8	9	2	3	41
Total Rainfall (mm)	91.8	460.4	339	137.6	48.2	24.8	1101.8
Avg. Max. Temp. ('^{0}C)	38.9	33.5	34.1	33.4	31.2	25.8	25.8-38.9
Avg. Mini. Temp. ('^{0}C)	24.3	24.3	26	23.6	17.3	10	9.0-34.2
Avg. Sunshine hours	6.7	3.2	6.5	6.1	7.4	5.7	5.43

NRRI – CUTTACK							
Latitude :	20.5^o N		Longitude:	86.0^0 N		Elevation(m) :	23.48
Soil type:	Clay loam		Soil pH :	-		Soil Texture:	
	June	**July**	**Aug**	**Sep**	**Oct**	**Nov**	**Total / Range**
No. of Rainy days	07	21	20	10	7	0	65
Total Rainfall (mm)	105mm	415.7mm	297.5mm	175.8mm	177.1mm	0.0mm	1171.1
Avg. Max. Temp. ('^{0}C)	35.5°C	31.7°C	32.0°C	32.2°C	31.0°C	30.4°C	30.4-35.5
Avg. Mini. Temp. ('^{0}C)	27.6°C	26.5°C	26.4°C	26.5°C	24.6°C	19.9	19.9-27.6
Avg. Sunshine hours	3.4	2.8	3.8	3.9	5.6	7.0	4.416
Avg. wind velocity							

GANGAVATI							
Latitude :	15^0 15' N			Longitude:	76^0 31' E	Elevation (m) :	419
Soil type:	Medium Black			Soil pH/EC	6.5-7.5	Soil texture :	Fine
	July	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Total / Range**
No. of Rainy days	10	11	10	8	1	3	43
Total Rainfall (mm)	84.5	146.0	122.0	109.5	5.5	40.0	507.0
Avg. Max. Temp. ('^{0}C)	30.93	30.75	30.77	31.09	30.31	30.43	30.31-31.09
Avg. Mini. Temp. ('^{0}C)	23.69	23.45	22.86	21.22	18.27	18.21	18.21-23.45

JAGDALPUR							
Latitude :	19.05^{0}N		Longitude:	82.02^0		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	7	25	20	14	7	0	73
Total Rainfall (mm)	144.8	582.4	679.9	452.4	88.8	0	1948.3
Avg. Max. Temp. ('^{0}C)	33.5	28.1	29.3	29.9	28.6	28.9	28.1-33.5
Avg. Mini. Temp. ('^{0}C)	23.2	22.0	21.8	21.7	18.7	12.9	12.9-23.2
Avg. Sunshine hours	3.1	1.7	3.2	4.5	6.5	7.7	4.45
Avg. wind velocity (km/h)	3.8	2.7	3.0	2.8	1.9	1.5	2.616

KARJAT							
Latitude :	18^0 55' N		Longitude:	73^0 18' E		Elevation (m) :	51
Soil type:	Medium black		Soil pH :	6.2		Soil texture :	Clay loam
	June	**July**	**Aug**	**Sep**	**Oct**	**Nov**	**Total / Range**
No. of Rainy days	13	28	24	23	10	0.0	98
Total Rainfall (mm)	191.4	2023.6	713.4	660.2	165.6	0.0	3754.2
Avg. Max. Temp ('^{0}C)	33.83	29.04	30.15	30.47	31.81	34.28	29.04-34.28
Avg. Mini Temp ('^{0}C)	23.88	22.34	22.84	22.33	20.72	17.02	17.02-23.88
Avg. Sunshine hours	1.87	1.40	2.49	3.23	6.88	6.05	3.653
Avg. wind velocity	3.31	3.80	2.11	2.78	1.02	1.00	2.33

KAUL							
Latitude :	29^0 51' N		Longitude	76^0 39' E		Elevation (m) :	230.7
Soil type:	Clay loam		Soil pH :	7.8		Soil texture :	Clay
	June	**July**	**Aug.**	**Sep.**	**Oct.**	**Nov.**	**Total / Range**
No. of Rainy days	3	8	1	6	2	0	20
Total Rainfall (mm)	27.9	287.8	31.7	243.1	8.9	0	599.4

Avg. Max. Temp. ('^{0}C)	39.3	33.3	33.4	32.5	31.3	27.5	27.5-39.3
Avg. Mini .Temp. ('^{0}C)	24.9	26.5	25.9	24.0	17.3	10.8	10.8-26.5
Avg. Sunshine hours	-	-	-	-	-	-	-
Avg. wind velocity (Km/h)	20.9	4.4	3.5	2.6	2.1	2.0	5.916

KHUDWANI								
Latitude :	34 ^{0} N		Longitude:	73 ^{0} E		Elevation(m) :		1560
Soil type:	Clay loam		Soil pH :	Neutral		Soil texture		Silty Clay loam
	April	**May**	**June**	**July**	**Aug**	**Sep**	**Oct**	**Total / Range**
No. of Rainy days	3	7	2	8	4	3	2	29
Total Rainfall (mm)	37.8	65.8	117.6	177.8	82	20	40	541
Avg. Max. Temp. ('0C)	23.7	25.6	27.3	28.8	29.0	28.7	22.6	22.6-29.0
Avg. Mini. Temp. ('0C)	7.32	10.5	13.3	18.8	17.4	13.2	5.2	5.2-18.8
* Avg. Sunshine hours	-	-	-	-	-	-	-	-
* Avg. wind velocity	1.95	3.63	3.51	1.61	2.06	2.06	2.37	2.117

LUCKNOW							
Latitude :	27.47		Longitude :	80.21		Elevation (m):	126
Soil type: -Typic Natrustalfs	Alkali		Soil pH :	9.6±0.18, 0.96 dSm^{-1}		Soil texture :	Loam (sandy to clayey)
	June	**July**	**Aug**	**sep**	**Oct**	**Nov**	**Total / Range**
No. of Rainy days	2	8	12	8	5	0	35
Total Rainfall (mm)	33.2	253	152.8	367.2	192.2	0	998.4
Avg. Max. Temp. ('^{0}C)	41	36	34	34	32	29	29-41
Avg. Mini .Temp. ('^{0}C)	28	28	27	26	20	13	13-28
* Avg. Sunshine hours	7.7	6.6	6.2	5.8	6.7	7.0	6.666
* Avg. wind velocity	4.8	2.6	3.3	2.9	1.6	1.7	2.816

LUDHIANA									
Latitude :	30^{0}54' N		Longitude:	75^0 48' E		Elevation(m) :			247
Soil type:	Loamy Sand		Soil pH :	7.7		Soil texture			
	May	**June**	**July**	**Aug**	**Sep**	**Oct.**	**Nov.**	**Dec**	**Total / Range**
No. of Rainy Days	2	4	12	5	4	2	-	-	29
Total rainfall (mm)	25.60	70.60	323.80	59.20	190.10	5.40	-	-	674.7
Avg. Max. Temp. ('^{0}C)	39.29	38.79	33.55	33.95	33.03	31.35	-	-	31.35-39.29
Avg. Mini Temp. ('^{0}C)	26.11	27.01	27.34	27.35	25.17	18.84	-	-	18.84-25.17
Avg. Sunshine hours	7.47	7.96	4.79	7.42	6.83	7.69	-	-	7.02
* Avg. wind velocity	5.74	5.12	4.61	3.37	2.21	2.15			3.866

MALAN							
Latitude :	32^0 1' N		Longitude:	76^0 20' E		Elevation (m) :	950
Soil type:	Alfisol		Soil pH :	5.6- 5.8		Soil texture :	Silty clay loam
	June	**July**	**Aug**	**Sep**	**Oct**	**Nov**	**Total / Range**
No. of Rainy days	6	12	9	14	1	0	42
Total Rainfall (mm)	230.8	486.1	260.6	179.6	8.4	0	1165.5
Avg. Max. Temp. ('0C)	32.44	28.6	30.44	27.4	25.21	26.6	25.21-32.44
Avg. Mini .Temp. ('0C)	18.03	21.4	21.36	20.67	14.9	13.87	13.87-21.4

MANDYA							
Latitude	12.45^0- 13.57^0 N		Longitude	76.48^0- 78.24^0 E		Elevation (m):	695
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	10	13	6	12	4	3	48
Total Rainfall (mm)	149	447.1	102.4	371.4	23	30.4	1123.3
Avg. Max. Temp. ('^{0}C)	28.50	29.00	29.90	29.70	28.00	29.20	28.00-29.90
Avg. Mini. Temp.('^{0}C)	18.20	19.60	19.70	19.40	18.70	16.80	16.80-19.70
Avg. Sunshine hours	2.3	4.3	5.8	5.5	5.6	6.3	4.96
Avg. wind velocity (Km/h)	1.9	2.9	3.5	2.0	1.8	2.3	2.4

MARUTERU							
Latitude	16.38° N		Longitude:	81.44° E		Elevation (m)	13
Soil type	Black alluvial clay		Soil pH:	6.5- 7.5		Soil Texture:	Delta alluvial
	June	**July**	**Aug.**	**Sep.**	**Oct.**	**Nov.**	**Total / Range**
No. of Rainy days	10	14	11	14	12	4	65
Total Rainfall (mm)	163.5	226.6	158.8	205.4	224.2	34.6	1013.1
Avg. Max. Temp. ('^{0}C)	34.95	30.40	31.65	31.40	31.26	29.83	29.83-34.95
Avg. Mini. Temp. ('^{0}C)	27.65	26.90	27.02	26.57	26.29	22.93	22.93-27.65
Avg. wind velocity (Km/h)	-	-	-	-	-	-	-

MONCOMPU							
Latitude :	90-25'N		Longitude:	76027'E		Elevation (m) :	1-2.5
Soil type:	Alluvial clay		Soil pH :	4.5 to 6.5		Soil texture :	Silty Clay Loam
	Jun	**July**	**Aug.**	**Sep.**	**Oct.**	**Nov.**	**Total / Range**
No. of Rainy days	17	18	17	16	19	11	98
Total Rainfall (mm)	430.2	237.5	510.8	137.6	210.3	275.6	1802
Avg. Max. Temp. ('^{0}C)	31.88	30.39	30.19	31.35	31.99	32.06	30.19-32.06
Avg. Mini. Temp. ('^{0}C)	24.44	24.23	23.99	24.81	23.56	24.18	23.56-24.81

NAGINA							
Latitude :	290 28'N		Longitude:	780 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	06	09	05	10	04	00	34
Total Rainfall (mm)	116.2	127.0	79.0	284.8	294.2	0.0	901.2
Avg. Max. Temp. ('^{0}C)	36.0	33.1	32.5	31.9	29.9	26.4	26.4-36.0
Avg. Mini. Temp. ('^{0}C)	24.5	25.6	25.6	23.7	17.0	9.7	9.7-25.6
* Avg. Sunshine hours	6.7	4.6	4.9	3.9	7.1	5.6	5.466
* Avg. wind velocity	4.4	4.2	5.4	3.0	23	1.7	6.95

NAVASARI								
Latitude :	20° 29'		Longitude:	73° 29'		Elevation (m) :		105
Soil type:	Clayey		Soil pH :	7.5		Soil texture :		Loamy
	June	**July**	**Aug.**	**Sep.**	**Oct.**	**Nov.**	**Dec**	**Total / Range**
No. of Rainy days	11	20	16	15	3	0	0	65
Total Rainfall (mm)	164.00	995.00	527.00	660.00	74.00	0.00	0.00	2420
Avg. Max. Temp. ('^{0}C)	33.25	29.39	30.75	31.42	33.62	33.72	29.25	29.25-33.62
Avg. Mini .Temp . ('^{0}C)	25.54	24.34	24.05	23.72	21.35	16.86	15.59	15.59-25.54
Avg. Sunshine hours	6.38	1.73	3.49	3.88	7.70	8.94	6.27	5.484
Avg. wind velocity (Km/h)	6.18	5.31	5.47	2.16	2.34	2.37	2.22	3.721

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	26	12	03	02	45
Total Rainfall (mm)	-	48.0	677.6	207.0	65.4	35.7	1033.7
Avg. Max. Temp. ('^{0}C)	42.1	39.5	32.2	31.8	33.3	34.0	31.8-42.1
Avg. Mini .Temp . ('^{0}C)	25.8	26.5	25.7	25.0	25.0	20.8	20.8-26.5
Avg. Sunshine hours	10.1	8.7	5.1	10.1	10.1	9.3	8.9
Avg. wind velocity (Km/h)	7.5	7.0	4.4	1.4	1.4	1.3	3.833

PATTAMBI						
Latitude :	10.770388	Longitude :	76.37706		Elevation (m) :	63
Soil type:	Clay loam	Soil pH :	5.8		Soil texture :	fine

	July	August	Sep	Oct	Nov	Dec	Total / Range
No. of Rainy days	4	21	17	20	15	3	80
Total Rainfall (mm)	515.1	410.2	324.2	726.2	261.3	21.5	2258.5
Avg. Max. Temp. ('^{0}C)	32.5	30.7	31.1	30.1	30.6	31.7	30.1-32.5
Avg. Mini. Temp. ('^{0}C)	23.2	23.1	23.4	23.5	23	21.5	21.5-23.5
Avg. Sunshine hours/day	2.5	3.1	3.5	3.8	3.0	10.7	4.433
Avg. Wind velocity	4.1	3.3	2.1	2.4	2.7	10.7	4.216

Panvel							
Latitude :	18^0 59'		Longitude:	73^0 16'		Elevation(m) :	858
Soil type:	Coastal saline soil		Soil pH :	7.8		Soil texture	Clay loam
	Month 1	**Month 2**	**Month 3**	**Month 4**	**Month 5**	**Month 6**	**Total / Range**
No. of Rainy days	12	25	27	18	8	0	90
Total Rainfall (mm)	147	1576.4	557.2	673.8	325.4	0	3279.8
Avg. Max. Temp. ('^{0}C)	33.21	28.07	30.37	30.25	33.20	36.11	28.07-36.11

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	19	9	12	10	0	0	50
Total Rainfall (mm)	368.8	92.4	228.0	171.8	0.0	3.6	864.6
Avg. Max. Temp. ('^{0}C)	28.7	30.0	30.0	29.6	29.4	29.2	28.7-30.0
Avg. Mini. Temp. ('^{0}C)	22.5	22.9	22.5	19.8	15.9	15.9	15.9-22.5
* Avg. Sunshine hours	2.9	4.9	4.8	6.6	7.1	6.4	5.45
* Avg. wind velocity	9.5	7.8	5.7	3.1	2.8	2.7	5.266

RAIPUR							
Latitude :	21.2514° N		Longitude:	81.6296° E		Elevation (m):	298
Soil type:	Red-yellow soil		Soil pH :	7.2-7.4		Soil texture :	Loamy clay
	June	**July**	**Aug.**	**Sep.**	**Oct.**	**Nov.**	**Total / Range**
No. of Rainy days	06	18	15	11	06	00	66
Total Rainfall (mm)	68.8	349.0	432.6	173.6	59.2	0.00	1083.2
Avg. Max. Temp. ('^{0}C)	39.3	31.6	31.4	31.5	31.2	29.9	29.9-39.3
Avg. Mini. Temp. ('^{0}C)	26.8	25.3	25.0	24.7	21.5	13.8	13.8-26.8
Avg. Sunshine hours	5.6	2.7	4.1	4.1	7.2	7.5	5.2
Avg. wind velocity	3.0	2.1	3.3	3.4	1.4	0.8	2.33

Ranchi							
Latitude :	27017' N		Longitude:	850 19' E		Elevation (m):	625
Soil type:	SANDY LOAM		Soil pH :			Soil texture :	
	June	**July**	**Aug.**	**Sep.**	**Oct.**	**Nov.**	**Total / Range**
No. of Rainy days	6.0	16.0	19..0	17.0	4.0	0.0	43
Total Rainfall (mm)	99.0	280.8	790.8	528.8	83.0	0.0	1782.4
Avg. Max. Temp. ('^{0}C)	36.7	33.0	32.7	33.3	30.6	26.9	26.9-36.7
Avg. Mini. Temp. ('^{0}C)	25.9	24.0	24.1	24.7	20.9	9.2	9.2-25.9
Avg. Sunshine hours	228.5	127.5	128.4	165.7	201.5	260.9	185
Avg. wind velocity	2.4	2.1	2.5	2.3	2.4	2.4	2.35

Rewa							
Latitude :			Longitude:			Elevation(m) :	
Soil type:			Soil pH :			Soil texture	
	June	**July**	**Aug**	**sep**	**Oct**	**Nov**	**Total / Range**
No. of Rainy days	8	14	18	9	4	0.00	53
Total Rainfall (mm)	69.4	216.6	339.8	86.8	122.40	0.00	835
Avg. Max. Temp. ('^{0}C)	39.42	34.56	32.20	32.47	31.83	29.50	29.50-39.42
Avg. Mini. Temp. ('^{0}C)	26.61	25.65	24.87	24.33	18.88	12.62	12.62-26.61

TITABAR							
Latitude :			Longitude:			Elevation :	
Soil type:			Soil pH :			Soil texture :	
	June	**July**	**Aug.**	**Sep.**	**Oct.**	**Nov**	**Total / Range**
No. of Rainy days	19	16	11	10	12	0.0	68
Total Rainfall (mm)	235.8	334.4	207.2	142.4	217.2	0.0	1137
Avg. Max. Temp. ('^{0}C)	28.37	34.21	34.01	33.27	31.18	29.1	28.37-34.21
Avg. Mini. Temp. ('^{0}C)	24.82	23.63	23.85	22.58	19.56	12.15	12.15-24.82

VARANASI							
Latitude	25^0 20' N		Longitude	23^0 03'E		Elevation (m)	75.7
Soil type	Medium		Soil pH	7.2		Soil texture	Sandy loam
	Jun	**July**	**Aug.**	**Sep.**	**Oct.**	**Nov.**	**Total / Range**
No. of Rainy days	6	11	17	15	7	0	56
Total Rainfall (mm)	201.8	212.6	239.8	223.2	27.4	0	904.8
Avg. Max. Temp. ('^{0}C)	39.7	34.5	34.1	32.9	32.1	28.8	28.8-39.7
Avg. Mini. Temp. ('^{0}C)	25.3	24.3	22.8	22.2	17.8	11.1	11.1-25.3
RH (%)	58.6	72.4	81.0	85.6	73.9	69.7	73.5
Avg. Sunshine hours	6.7	7.3	5.1	4.7	6.5	7.4	3.47
* Avg. wind velocity	4.7	5.9	4.8	3.2	1.8	1.3	5.27

VADAGAON									
Latitude :	187-45		Longitude:	73 – 41 East		Elevation(m) :			677.9 m
Soil type:	Medium		Soil pH :	6.5-7.5		Soil texture			Clay loam
	May	**June**	**July**	**Aug**	**Sep**	**Oct.**	**Nov.**	**Dec**	**Total / Range**
No. of Rainy Days	1	5	26	22	11	5	0	0	70
Total rainfall (mm)	7.8	63.4	840.2	325.4	284.4	90.8	0.0	0.0	1612
Avg. Max. Temp. ('^{0}C)	--	34.1	29.7	29.7	29.4	30.1	30.7	32.1	28.4-34.1
Avg. Mini Temp. ('^{0}C)	--	21.0	21.4	22.0	21.3	14.9	15.9	13.1	13.1-22.0

WANGBAL							
Latitude :	24.8^o 'N		Longitude:	94^0 E		Elevation(m) :	781
Soil type:	Clay Loam		Soil pH :	5.5		Soil texture	fine
	June	**July**	**Aug.**	**Sep.**	**Oct.**	**Nov.**	**Total / Range**
No. of Rainy days	18	13	8	9	8	5	61
Total Rainfall (mm)	286.2	148.4	94.8	98.6	81	27.4	736.4
Avg. Max. Temp. ('^{0}C)	35	35	33	31	30	26	26-35
Avg. Mini. Temp. ('^{0}C)	26	29	25	21	17	14	14-29

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
MLN	Malan	**WBL**	Wangbal (Imphal)

Annexure – V

ADDRESSES OF COOPERATORS - AGRONOMY
2022-23

FUNDED CENTRES:

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Soil Science

Progress Report of Soil Science Coordinated Program
(*Rabi* and *Kharif* - 2022)

SOIL SCIENCE

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5. SOIL SCIENCE

Summary

The coordinated multi-location evaluation program in Soil Science addresses the issues related to sustaining productivity of soil and crop systems on long term basis; soil quality and productivity assessment for bridging the gap in farmers' fields; management of sodic soils using nano Zn formulation; management of acid soils; residue management in rice based cropping systems; nano-fertilizers for increasing nutrient use efficiency, yield and economic returns in transplanted rice; yield maximization in different rice growing zones and evaluation of organic fertilizers and Natural farming practices for enhancing the crop productivity and soil health. A total of eight trials were conducted during *Rabi*-2021-22 and *Kharif*-2022 in 16 locations (funded as well as voluntary centers) representing typical soil and crop systems and important rice growing regions.

5.1. Long-term soil fertility management in rice-based cropping system

In the 34th year of study on long term soil fertility management in RBCS, the treatment RDF + FYM resulted in maximum grain yield at all 3 locations and the treatment with FYM alone was on par to RDF during *Kharif* at MTU and in both seasons at TTB. 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 centers in both seasons. Over a period of 34 years, supplementary dose of FYM along with RDF recorded positive growth rate in productivity with 63, 75 and 58 kg/ha/year at MTU, TTB and MND, respectively, compared to RDF where growth rate varied from less than 1 kg/ha/year at MND to 42 kg/ha/year at TTB.

Supplementary dose of FYM along with RDF resulted in maximum grain yield at all locations and nutrient omission and reduction of NPK to 50% resulted in significant yield reduction at all centers. FYM along with RDF recorded a higher positive growth rate in productivity compared to RDF.

5.2. Soil quality and productivity assessment for bridging the yield gaps in farmers' fields

This trial was conducted in farmers' fields in few selected centres, viz., - Chinsurah, Titabar, Pantnagar, Kanpur, Kaul and Karaikal 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. Sharp variations in mean grain yields recorded varied from 2.38 t /ha among low yielders to 4.73 t/ha

among high yielders at Chinsurah, from 2.48 t /ha among low yielders to 3.43 t /ha among high yielders at Titabar , varied from 4.76 t /ha among low yielders to 6.59t /ha among high yielders at Kanpur, varied from 4.83 t /ha among low yielders to 5.84 t /ha among high yielders at Pantnagar, from 3.83 t /ha among low yielders to 4.36 t/ha among high yielders at Karaikal and from 1.44 t /ha among low yielders to 8.8 t /ha among high yielders at Kaul. Fertilizer prescriptions were worked out for all the farm sites. The soil quality index was much superior at Pantnagar and was at par for all other centers.

- **Out of many factors that contribute to the yield gap, soil quality vis a vis rice yield was studied across several dominant rice ecologies of India and sharp variations in yield and soil quality indices were noted across rice ecologies and farming communities.**
- **Closing the yield gap requires a multi-faceted approach that addresses the underlying causes of low yields and hence, fertilizer prescriptions were worked out for all the farm sites to bridge the yield gap.**

5.3. Management of sodic soils using nano Zn formulation

In a study on "Management of Sodic soils using nano zinc formulation", 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 and Pusa, soil application of $ZnSO_4$ @ 50 kg/ha registered higher grain (4.36 t/ha, 3.41 t/ha) and straw (6.25 t/ha, 5.15 t/ha) yields where as at Mandya and Faizabad foliar application of nano Zn @ 50 ppm recorded significantly higher grain (6.24 t/ha, 3.99 t/ha) and straw yields (6.86 t/ha, 5.37 t/ha). In case of Varieties, DRR Dhan 48 found superior at Mandya and Faizabad and CSR23 performed better at Kanpur. 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 Mandya, Pusa and Faizabad and CSR 23 recorded significantly higher nutrient uptake at Kanpur.

- **Foliar application of nano Zn@ 50 ppm has performed better across the locations except Kanpur.**
- **The variety DRR Dhan 48 exhibited superior performance in all the locations except Kanpur.**
- **Significantly superior performance of Zn application (Soil/foliar/nano formulations) was observed in sodic soils across the locations.**

5.4. Management of acid soils

The second year study of the trial on "Management of acid soils" indicate that application of RDF + dolomite + Silixol recorded the highest yields at all locations (except Ranchi) where RDF + Dolomite + RHA application recorded the highest grain yield. Between two varieties, Uma yielded the highest at majority locations while Vasundhara performed better at Moncompu. Ameliorative effect of application of RDF + dolomite + RHA was observed as the pH increased to 4.39 and 6.25 was observed in acid soils of Moncompu and Titabar respectively when compared to RDF alone (4.21 and 5.22, respectively) at these locations.

Application of RDF + dolomite (250 kg/ha) + Silixol spray (at vegetative, booting and grain filling stage) improved yields over sole RDF by 12-35% in irrigated rice and by 14% under upland rice.

5.5. Residue management in rice based cropping systems

The disposal of huge quantity 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 the appreciable amount of plant essential nutrients besides being deleterious to soil microbes. The trial was conducted this year at nine 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.

Supplementation of nitrogen (50%) through crop residues either alone or in combination with GM (50%) and 50% RDF with or without Pusa Decomposer, gave on par yields with 100% RDF at majority of the centres.

5.6. Nano-fertilizers for increasing nutrient use efficiency, yield and economic returns in transplanted rice *(collaborative trial with Agronomy)*

The trial on "Nano-fertilizers for increasing nutrient use efficiency, yield and economic returns in transplanted rice" was continued in the second year at 23 locations with six 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, Faizabad, Chata, ARI, Mandya, Pantnagar, Moncompu, Sabour, Kanpur and Warangal. Whereas, 75% RDN + two sprays of nano urea registered the highest growth parameters, yield and N uptake

at Karaikal, Kanpur, Coimbatore, Mandya, Bankura, Khudwani, Pattambu, and Puducherry. 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 rest of the locations.

Additional input of nano urea (two sprays) along with either 75% RDN or 100% RDN was found better for yield, N uptake and nutrient use efficiency at majority of the locations but did not fetch much benefit in economic returns over RDN.

5.7 Yield maximization of rice in different zones *(collaborative trial with Agronomy)*

Overall, across all 14 locations 125% RDF of the location+ FYM @ 5 t/ha treatment resulted in the highest mean grain yield (5.89 t/ha) followed by location specific management practices (5.80 t/ha), 125% RDF of the location (5.68 t/ha).

Location specific 125% RDF + FYM @ 5 t/ha treatment resulted in the highest mean grain yield followed by location specific management practices, 125% RDF of the location.

5.8 Evaluation of Organic fertilizers and Natural farming practices for enhancing the productivity and soil health (*collaborative trial with Agronomy*)

The third year of study on "Enhancing productivity of Organic Rice cultivation", revealed that organic treatment with 100% FYM improved the majority of the soil characteristics compared to other treatments at KRK and CHN, and the organic treatments, 50% N (FYM)+ 50% N (Vermicompost) manure recorded higher yield and yield parameters at CHN.

In the modified trial on "Evaluation of Organic fertilizers and Natural farming practices for enhancing the productivity and soil health", the first year results indicated better performance of integrated Crop Management (with need based pesticides for pest management) than other treatments at MND, KHD, PNT, PUSA, PUD, and TTB in terms of grain yield and yield parameters and majority of the soil parameters at CHN, MND, PNT, and PUSA were improved with integrated crop management treatment (with organic methods of pest management).

Integrated Crop Management, ICM (with need based pest management) performed significantly better in terms of grain yield and yield parameters and majority of the soil parameters improved with NPOF package/ ICM (with organic methods of pest management).

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 centres only. Hence, the results of 34th year of cropping *i.e., Rabi* 2021-22 and *Kharif*-2022 are presented in Tables 5.1.1 to 5.1.11.

Crop productivity and soil fertility during *Rabi* 2021-22

Grain and straw yields of rice at MTU and TTB are presented in Table 5.1.2. At MTU, grain yield ranged from 2.83 (control) to 6.97 t/ha (RDF+FYM) with a mean of 5.02 t/ha. RDF, RDF + FYM and 50% NPK substituted with FYM treatments were at par. The omission of N, P, K, Zn and S resulted in yield reduction by 0.82 t/ha in -S to 2.25 t/ha in -P plots over RDF. FYM alone treatment was on par to 50% NPK+ 50% FYM-N and 50% NPK + 25% GM-N+ 25% FYM-N and this treatment was superior to all nutrient (NPK) omission plots. At Titabar, grain yield ranged from 1.33 t/ha in control to 4.63 t/ha in RDF+FYM which was on par to RDF (4.43 t/ha). Here also, the omission of nutrients resulted in grain yield reduction by 0.45 t/ha in -Zn to 0.85 t/ha in - N plots over RDF. Here, at TTB also, FYM alone treatment was on par to RDF and significantly superior to all nutrient (NPK) omission plots. Fifty per cent (50%) reduction in RDF resulted in 68% yield reduction in silty clay soil of TTB compared to 35% reduction in clay loam soil of MTU over RDF. Fifty per cent (50%) reduction in NPK resulted in more loss at TTB compared to other two centers since 100% RDF itself was much lower than other centres Compared to previous year, the yield difference between RDF and RDF+FYM is more by 10% at MTU and by 5% at TTB showing the beneficial effect of organics over a period of time. Straw yields followed the similar trend as that of grain yield at both locations. At MND, cowpea yield ranged from 219 kg/ha to 409 kg/ha with a mean of 353 kg/ha.

Total nutrient (NPK) uptake followed 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 when 50% RDF was substituted with FYM/GM+FYM compared to RDF and FYM alone treatment recorded maximum values (1.57%) which was 45% higher than RDF alone. No definite trend was recorded in case of other soil parameters though there was an improvement with addition of organics (Table 5.1.4). In nutrient omission plots of P and K, there was a significant reduction in available P and K compared to plots with RDF and RDF+FYM.

FYM along with RDF resulted in maximum grain yield while nutrient omission/50% reduction of NPK resulted in reduction of yield as well as soil available NPK at all centers.

Crop productivity and soil fertility status during *Kharif*-2022

At MTU, the treatments receiving organics and biofertiliser recorded grain yield (5.03-5.90 t/ha) that was on par to RDF (5.47 t/ha) [Table 5.1.5]. Omission of major nutrients N and P resulted in significant yield loss (1.04 and 1.30 t/ha, respectively) compared to RDF. At TTB also, RDF+FYM (5.55 t/ha) recorded maximum yield which was on par to RDF (5.38 t/ha) and treatments that received organics. Here also, yield loss due to omission of major and micro nutrients was observed. At MND, RDF+FYM recorded maximum yield (5.77 t/ha) which was significantly superior to RDF (4.89 t/ha) and on par when 50% NPK was replaced by 25% GM-N+ 25% FYM-N (5.54 t/ha). Here also, all nutrient omission plots recorded significantly lower yields than RDF. With regard to FYM alone treatment, it recorded slightly higher yield that RDF at MTU; on par to RDF at TTB and lower than RDF at MND. But, this treatment was significantly superior to all the nutrient omission plots at all 3 locations. 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*-2022 (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 significant reduction in NPK values compared to RDF at MND and TTB and only in K values at MTU. 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.

Nutrient omission plots recorded significantly lower yields than RDF and the treatment with FYM alone was significantly superior to all the nutrient omission plots at all 3 locations. Improvement in most of the soil properties with addition of organics was observed with significantly higher organic carbon values in FYM alone and RDF+FYM treatments.

Long term changes in crop productivity and soil fertility over a period of 34 years

The trends in mean grain yields over 34 years (1989-2022) 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 (Tables 5.1.9 and 5.1.10)

During *Kharif* 2022, the treatment, RDF+5t FYM/ha recorded maximum mean yield at all 3 locations (MND- 5.29; MTU-5.24 and TTB- 5.04 t/ha) with an average increase of 12, 3.4 and 13.3%, respectively, at MND, MTU and TTB by this treatment over RDF. Linear trends of productivity over the years with current RDF indicated slightly positive growth in the sandy loam of MND and delta soils of MTU (0.5 and 11 kg grain/ha/year, respectively) and more positive growth in the acid alluvial soils of TTB (42 kg/ha/year). An additional dose of FYM @ 5t/ha along with RDF improved the growth rate substantially with 63, 75 and 58 kg/ha/year at MTU, TTB and MND, respectively. FYM alone treatment recorded a more positive growth rate compared to RDF at all 3 locations.

During *Rabi* also, RDF+5t FYM recorded maximum mean grain yield both at MTU (6.31 t/ha) and TTB (4.38 t/ha) and this treatment recorded growth rate of 14 and 45 kg/ha/year at MTU and TTB, respectively (Table 5.1.10).

Changes in soil fertility compared to initial values (Table 5.1.11)

The organic carbon (OC) content increased in the treatments with organics at MTU compared to initial values. At MND, maximum positive change was observed in INM treatment with a decrease in control. At TTB also, OC decreased in control but increased in treatments with addition of organics. Maximum increase in OC was in FYM alone treatment at MTU; RDF+FYM at TTB and in 50% NPK+25% GM+ 25% FYM treatment 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 three locations except in control at TTB where the % change was –ve. In case of available K, at MTU, there was a decrease and –ve change in all treatments compared to initial value. At MND and TTB, there was a –ve change in control and +ve change in other treatments where the increase was to a greater extent at MND and to a lesser extent at TTB.

Summary

From the results of 34th year of study on long term soil fertility management in RBCS, superior performance of RDF+FYM was noticed over other treatments but this treatment was on par to RDF (except at MND). FYM alone treatment was on par to RDF but significantly superior to all nutrient omission plots at all 3 locations. 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 positive growth rate at all three locations. Compared to initial values, changes in soil fertility showed +ve values in INM and organics alone treatments.

Superior performance of RDF+FYM was noticed but this treatment was on par to RDF at most of the locations.

- **Omission of major and micro nutrients resulted in yield reduction at all locations.**
- **INM and organics alone treatments improved soil fertility parameters and OC was significantly higher when FYM was added either alone or as supplementary dose.**
- **Over a period of 34 years, FYM along with RDF recorded a higher positive growth rate in productivity compared to RDF.**

Table 5.1.1: Long-term soil fertility management in RBCS, 2022
Soil and crop characteristics

Cropping system	Maruteru		Titabar	Mandya
	Rice-Rice		Rice-Rice	Rice-Rice
Variety				
Kharif	MTU 1064		Gitesh	KMP 175
Rabi	MTU 1121		Disang	Cowpea
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	83.6:63.9:53.6		9.8:7.68:98.56	70.9:36.1:20.5
Rabi	124.5:87.4: 59.9		12.56:0: 103	-
Crop growth: *Kharif*	-		Good	-
Rabi	-		Good	-
% 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)	5.45 (Rabi)	6.63 (Kharif)	5.4	5.87
Organic carbon (%)	1.05	1.07	1.1	0.30
CEC (cmol (p^+)/kg)	48.6	48.9	12.5	-
EC (dS/m)	0.64	0.69	0.03	0.28
Avail. N (kg/ha)	218	184	495	208
Avail. P_2O_5 (kg/ha)	-	33.9	22.4	19.7
Avail. K_2O (kg/ha)	368	397	112	117.6

Table 5.1.2: Long-term soil fertility management in RBCS, *Rabi*-2022
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	2.83	1.31	219.5	4.79	1.59
100% PK	4.37	3.58	249.5	6.98	4.32
100% NK	3.97	3.68	242.9	8.14	4.45
STCR recommendation	5.05	4.10	268.8	8.49	4.98
100% NP	4.08	3.87	258.1	8.30	4.64
100% NPKZnS	6.22	4.43	286.0	9.40	5.36
100% NPKZnS + FYM/PM @ 5t/ha	6.97	4.63	382.5	9.82	5.61
100% NPK –Zn	5.09	3.98	277.4	9.08	4.82
100% NPK – S	5.40	3.60	281.0	9.07	4.33
100%NPK-S+1t lime/ha	-	4.19	-	-	5.08
100% N+50% PK	4.86	3.42	245.0	7.36	4.14
50 % NPK	4.60	2.63	260.6	8.09	3.19
50 % NPK + Biofertiliser	5.61	3.22	258.8	8.40	3.88
50%NPK+ 50% GM-N	4.99	3.78	345.5	7.78	4.59
50% NPK + 50% FYM-N	5.52	4.15	380.3	8.48	5.04
50% NPK + 25% GM-N+25% FYM-N	5.13	4.18	408.8	8.96	5.06
FYM @ 10 t/ha	4.96	4.43	367.7	6.53	5.38
FYM @ 10 t/ha + Split application	5.74	-	390.6	8.23	-
Expt. Mean	**5.02**	**3.72**	**301.4**	**8.11**	**4.49**
CD (0.05)	**1.61**	**0.32**	**42.4**	**1.26**	**0.46**
CV (%)	**19.4**	**5.17**	**6.64**	**9.46**	**6.24**

Table 5.1.3: Long-term soil fertility management in RBCS, *Rabi* 2022- Total Nutrient uptake (kg/ha)

Treatments	Maruteru			Titabar		
	N	P	K	N	P	K
Control	26.8	11.8	59.8	19.7	4.01	27.9
100% PK	45.1	18.5	124.0	54.3	11.9	83.5
100% NK	40.4	11.5	104.3	57.4	10.9	86.1
STCR recommendation	55.3	25.5	149.3	64.9	13.9	97.4
100% NP	48.1	23.9	96.7	60.5	12.9	82.5
100% NPKZnS	56.3	26.6	123.3	72.3	16.6	112.3
100% NPKZnS + FYM/PM @ 5t/ha	60.2	28.4	161.0	76.5	18.3	125.4
100% NPK – Zn	52.0	21.6	127.4	63.9	14.5	101.6
100% NPK – S	45.7	21.5	130.1	59.9	11.9	90.5
100%NPK-S+1t lime/ha	-	-	-	77.3	13.6	107.6
100% N+50% PK	50.4	20.9	121.8	54.1	10.6	88.1
50 % NPK	53.4	25.3	119.2	40.2	8.09	56.3
50% NPK + Biofertiliser	53.9	23.5	142.9	53.3	12.3	83.7
50% NPK+ 50% GM-N	51.0	23.9	144.0	60.6	13.2	97.3
50% NPK + 50% FYM-N	57.2	24.8	133.6	67.3	15.8	106.8
50% NPK + 25% GM-N+ 25% FYM-N	50.2	26.3	158.5	68.5	15.4	105.8
FYM @ 10 t/ha	54.1	29.8	124.5	42.0	7.09	-
FYM @ 10 t/ha + Split Vermi	57.1	19.7	169.5	-	-	-
Expt. Mean	**50.4**	**22.6**	**128.8**	**58.4**	**12.4**	**90.8**
CD (0.05)	**15.1**	**7.3**	**37.6**	**6.81**	**2.28**	**11.3**
CV (%)	**18.2**	**19.8**	**17.7**	**7.07**	**11.1**	**7.5**

Table 5.1.4: Long-term soil fertility management in RBCS, *Rabi*-2022 Soil fertility status at harvest

Treatments	Maruteru					
	pH	EC (dS/m)	Org C (%)	Avail. N (kg/ha)	Avail. P_2O_5 (kg/ha)	Avail. K_2O (kg/ha)
Control	6.63	0.70	1.07	184.0	33.9	397.3
100% PK	6.17	0.32	1.06	268.3	42.8	361.3
100% NK	6.28	0.65	1.46	236.3	27.8	462.0
STCR recommendation	6.19	0.33	1.14	207.0	45.1	407.0
100% NP	6.44	0.43	1.34	245.3	48.6	341.3
100% NPKZnS	6.53	0.28	1.08	233.3	52.9	463.3
100% NPKZnS + FYM/PM @ 5t/ha	6.18	0.30	1.26	262.7	51.8	369.7
100% NPK – Zn	6.60	0.53	1.01	210.0	36.7	424.7
100% NPK – S	6.39	0.83	1.38	233.3	45.1	468.7
100%NPK-S+1t lime/ha	-	-	-	-	-	-
100% N+50% PK	6.52	0.51	1.23	221.6	42.1	364.3
50 % NPK	6.48	0.60	1.06	225.0	37.5	340.0
50% NPK + Biofertilizer	6.09	0.43	1.29	201.3	38.9	385.7
50% NPK+ 50% GM-N	6.12	0.81	1.43	277.0	45.1	466.7
50% NPK + 50% FYM-N	6.24	0.47	1.58	216.0	72.4	389.7
50% NPK + 25% GM-N+ 25% FYM-N	6.18	0.54	1.36	233.3	52.5	521.3
FYM @ 10 t/ha	5.84	0.87	1.57	329.6	54.0	462.7
FYM@10 t/ha + 3.0 t/ha Vermicompost +200 kg/ha oil cakes	6.27	0.60	1.33	213.0	72.3	588.7
Expt. Mean	6.30	0.54	1.27	235.1	47.0	424.4
CD (0.05)	**0.6**	**0.46**	**0.45**	**66.8**	**23.9**	**162.6**
CV (%)	**5.7**	**51.7**	**21.5**	**17.2**	**30.8**	**23.23**

Table 5.1.5: Long-term soil fertility management in RBCS, *Kharif* -2022 Yield and yield parameters of rice

Treatments	Grain yield (t/ha)			Straw yield (t/ha)		
	MTU	TTB	MND	MTU	TTB	MND
Control	3.02	1.57	2.07	4.57	2.32	2.72
100% PK	4.17	4.08	2.32	7.05	5.94	2.97
100% NK	4.43	4.22	2.61	6.80	6.26	3.32
STCR recommendation	4.62	4.77	3.79	8.24	7.08	4.42
100% NP	5.25	4.18	2.70	6.04	6.19	3.52
100% NPKZnS	5.47	5.38	4.89	8.02	7.98	5.38
100% NPKZnS + FYM/PM @ 5 t/ha	5.67	5.55	5.77	9.15	8.25	6.49
100% NPK –Zn	5.10	4.52	3.94	8.43	6.69	4.62
100% NPK – S	5.00	4.41	3.92	7.75	6.54	4.68
100%NPK-S+ 1t limelime/ha	-	3.05	-	-	6.69	-
100% N+50% PK	5.27	3.96	4.42	8.04	5.47	5.26
50 % NPK	4.82	2.64	3.37	9.05	3.92	4.28
50 % NPK + Bio fertilizer	5.46	4.18	3.68	8.57	6.20	4.30
50% NPK+ 50% GM-N	5.90	4.81	4.68	8.99	7.14	5.48
50% NPK + 50% FYM-N	5.03	4.86	4.75	8.86	7.20	5.61
50% NPK + 25% GM-N+25% FYM-N	5.52	5.02	5.54	9.12	7.43	6.58
FYM @ 10 t/ha	5.49	4.90	4.50	8.63	7.27	5.25
FYM@10 t/ha + 3.0 t/ha Vermicompost +200 kg/ha oil cakes	5.18	-	4.50	9.08	-	5.35
Expt. Mean	5.14	**4.22**	3.96	8.02	**6.38**	4.72
CD (0.05)	**0.82**	**1.07**	**0.26**	**1.04**	**0.29**	**0.33**
CV (%)	**9.6**	**15.4**	**3.2**	**7.88**	**2.81**	**3.36**

Table 5.1.6: Long-term soil fertility management in RBCS, *Kharif-2022*
Total Nutrient uptake (kg/ha) in total dry matter

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	53.7	23.6	119.6	19.7	4.22	31.4	24.7	5.64	34.3
100% PK	90.3	37.0	248.2	56.1	12.5	88.5	32.9	6.62	39.4
100% NK	80.8	23.0	208.6	55.3	11.6	92.9	36.4	7.43	45.6
STCR recommendation	110.7	51.0	298.6	68.1	14.0	106.6	56.4	12.5	62.5
100% NP	96.3	47.9	193.5	60.1	10.9	83.7	44.5	10.4	52.3
100% NPK + Zn + S	112.5	53.1	246.5	81.6	17.5	128.3	81.7	17.5	83.5
100% NPK + Zn + S + FYM/PM @ 5 t/ha	120.4	56.9	322.0	84.7	17.4	141.1	107.8	22.9	105.5
100% NPK –Zn	104.0	43.2	254.7	67.7	14.8	108.3	63.1	13.9	71.9
100% NPK – S	91.5	42.7	260.3	71.0	12.0	104.5	66.1	18.2	71.9
100%NPK-S+ 1t limelime/ha	-	-	-	64.6	10.1	98.6	-	-	-
100% N+50% PK	100.7	41.7	243.6	54.1	9.9	89.4	75.3	15.5	76.9
50 % NPK	106.8	50.5	238.3	38.3	7.4	53.2	58.6	11.4	58.5
50 % NPK + Biofertilizer	107.7	47.1	285.8	64.7	13.2	102.5	61.7	13.1	63.7
50% NPK+ 50% GM-N	101.7	47.9	288.0	69.9	14.0	117.0	80.7	18.8	79.9
50% NPK+ 50% FYM-N	114.4	49.5	267.1	75.6	15.2	116.8	86.2	19.5	86.9
50% NPK +25% GM-N +25% FYM-N	100.5	52.9	317.1	75.8	15.4	119.5	104.5	23.8	102.3
FYM @ 10 t/ha	108.2	59.6	250.9	73.3	16.3	120.1	78.7	16.6	76.6
FYM@10t/ha +3.0 t/ha Vermi+200 kg/ha oil cakes	114.1	39.4	339.1	-	-	-	78.9	15.3	75.5
Expt. Mean	**100.8**	**45.1**	**257.7**	**63.6**	**12.7**	**100.2**	**66.9**	**14.7**	**69.8**
CD (0.05)	**15.2**	**7.4**	**37.6**	**9.06**	**2.4**	**10.6**	**19.3**	**4.5**	**16.4**
CV (%)	**18.4**	**19.8**	**17.8**	**11.5**	**15.6**	**8.6**	**40.7**	**43.9**	**33.2**

Table 5.1.7: Long-term soil fertility management in RBCS, *Kharif*-2022
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	Avail. P_2O_5 (kg/ha)	Avail. K_2O (kg/ha)
Control	1.17	219.7	62.3	368.0	0.54	141.6	10.9	66.5
100% PK	1.33	196.3	74.3	393.3	0.93	257.7	18.5	76.7
100% NK	1.32	241.0	62.5	351.0	1.14	178.3	21.2	91.7
STCR recommendation	1.33	279.3	69.5	341.6	1.17	288.3	27.8	98.3
100%NP	1.16	260.3	70.2	295.0	0.98	179.0	29.0	89.3
100% NPKZnS	1.14	202.7	69.0	376.3	1.51	351.7	36.8	153.3
100% NPKZnS + FYM/PM @ 5t/ha	1.36	237.0	81.1	353.7	1.70	391.0	37.8	181.3
100% NPK –Zn	1.25	273.0	65.2	347.0	1.01	288.3	26.8	156.0
100% NPK – S	1.34	202.7	73.8	351.3	1.09	358.3	32.3	147.0
100%NPK-S+ 1t limelime/ha	-	-	-	-	1.13	366.6	30.8	150.7
100% N+50% PK	1.23	220.0	68.3	364.7	0.98	281.0	26.2	84.8
50 % NPK	1.28	173.0	64.9	341.7	0.77	221.0	26.3	85.0
50 % NPK + Biofertiliser	1.26	254.0	71.9	348.0	1.22	353.3	33.8	156.0
373.750% NPK+ 50% GM-N	1.24	230.3	65.8	348.0	1.57	389.3	31.7	140.7
50% NPK + 50% FYM-N	1.29	256.0	78.2	339.0	1.53	351.3	32.3	157.7
50% NPK + 25%GM-N+25%FYM-N	1.39	234.3	69.5	401.0	1.54	373.7	32.7	158.3
FYM @ 10 t/ha	1.43	215.7	78.2	383.7	1.72	396.0	38.2	173.3
FYM@10 t/ha +3.0 t/ha Vermicompost +200 kg/ha oil cakes	1.41	211.3	82.4	369.3	-	-	-	-
Expt. Mean	**1.29**	**229.8**	**71.0**	**357.2**	**1.20**	**303.9**	**29.1**	**127.4**
CD (0.05)	**0.22**	**95.8**	**12.0**	**36.4**	**0.14**	**52.5**	**6.2**	**15.6**
CV (%)	**10.5**	**25.3**	**10.3**	**6.2**	**7.21**	**10.5**	**12.9**	**7.4**

Table 5.1.8: Long-term soil fertility management in RBCS, *Kharif* 2022
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	0.25	222.8	38.8	97.0
100% PK	0.33	228.5	46.0	129.0
100% NK	0.35	242.8	41.6	138.9
STCR recommendation	0.39	257.3	47.3	143.7
100%NP	0.44	255.3	47.1	125.9
100% NPKZnS	0.58	280.8	51.0	214.5
100% NPKZnS + FYM/PM @ 5t/ha	0.69	281.4	62.0	253.9
100% NPK –Zn	0.35	277.3	53.6	222.7
100% NPK – S	0.35	282.0	53.7	235.6
100%NPK-S+ 1t limelime/ha	-	-	-	-
100% N+50% PK	0.43	274.5	49.5	237.7
50 % NPK	0.52	243.4	47.8	243.4
50 % NPK + Biofertilizer	0.54	288.3	53.1	228.4
373.750% NPK+ 50% GM-N	0.61	300.3	54.4	233.0
50% NPK + 50% FYM-N	0.70	299.9	64.5	245.1
50% NPK + 25%GM-N+25%FYM-N	0.74	316.2	61.3	253.9
FYM @ 10 t/ha	0.63	310.5	51.9	243.2
FYM@10 t/ha +3.0 t/ha Vermicompost +200 kg/ha oil cakes	0.61	315.5	54.7	233.2
Expt. Mean	**0.50**	**275.1**	**51.1**	**204.7**
CD (0.05)	**0.04**	**8.3**	**2.7**	**9.6**
CV (%)	**3.55**	**1.4**	**2.5**	**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 2022

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	2.85	9	2.63	1.97	-52	2.90	2.20	-55	3.13
100% PK	3.52	37	2.86	3.26	43	2.51	2.72	-37	3.35
100% NK	4.08	-3	4.13	3.58	26	3.13	3.38	-76	4.66
100% NP	4.48	-12	4.68	3.78	22	3.39	3.79	-83	5.19
100% NPK + Zn + S	5.07	11	4.87	4.45	42	3.72	4.72	0.27	5.18
100% NPKZnS + FYM	5.24	63	3.78	5.04	75	3.32	5.29	58	3.96
100% NPK – Zn	4.81	-7	4.81	4.18	22	3.79	4.49	-52	5.36
100% NPK – S	4.70	3	4.70	4.15	7	4.03	4.39	-49	5.22
100% N + 50% PK	4.46	2	4.42	3.68	-0	3.61	4.03	-63	5.10
50% NPK	4.32	3	4.26	3.18	-31	3.73	3.73	-43	4.47
50% NPK + 50% GM-N	4.53	15	4.26	3.87	30	3.34	4.75	7	4.87
50% NPK + 50% FYM-N	4.78	15	4.51	4.01	36	3.37	4.83	4	4.76
50% NPK + 25% GM-N + 25%FYM-N	4.58	16	4.30	4.07	36	3.45	5.39	9	5.23
FYM @ 10 t/ha	4.47	13	4.24	4.13	54	3.18	4.16	19	3.83

Table 5.1.10: Long-term soil fertility management in RBCS
Linear trends of changes in *Rabi* rice yields (t/ha) from 1989 to 2022

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	2.30	41	1.42	1.68	-33	2.20
100% PK	3.04	71	1.77	3.00	55	2.15
100% NK	4.10	27	3.61	3.29	29	2.82
100% NP	4.95	4	4.87	3.42	15	3.19
100% NPK + Zn + S	5.73	39	5.02	3.92	34	3.37
100% NPKZnS + FYM/PM	6.31	14	6.40	4.38	45	3.46
100% NPK – Zn	5.21	23	4.80	3.69	21	3.36
100% NPK – S	5.32	27	4.85	3.58	19	3.28
100% N + 50% PK	5.15	15	4.88	3.39	12	3.19
50% NPK	4.28	18	3.95	2.81	-4	2.88
50% NPK + 50% GM-N	4.93	7	4.80	3.39	25	2.99
50% NPK + 50% FYM-N	5.19	34	4.58	3.49	35	2.93
50% NPK + 25% GM-N + 25% FYM-N	5.00	10	4.82	3.50	33	2.97
FYM @ 10 t/ha	4.18	44	3.40	3.53	40	2.89

Table: 5.1.11: Long-term soil fertility management in RBCS
Changes (%) in soil fertility parameters over 1989 to 2022

Treatments	Maruteru				Titabar			Mandya			
	OC	N	P	K	OC	P	K	O.C.	N	P	K
Control	31.5	-26.3	205	-9.4	-43.2	-17.4	-54.5	-28.6	-53.4	97.0	-17.1
100% NPK + Zn + S	28.1	-32.0	238	-7.4	58.9	178.8	5.0	65.7	2.9	158.9	82.9
100% NPK + Zn + S + 5 t/ha FYM	52.8	-20.5	298	-13.1	78.9	186.4	24.2	97.1	22.1	214.7	117.0
50% NPK + 25% GM-N + 25% FYM-N	56.2	-21.5	241	-1.2	61.1	144.7	8.0	111.4	22.1	211.2	117.0
FYM @ 10 t/ha	60.7	-27.6	283	-5.4	62.1	147.7	18.7	80.0	16.9	177.7	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 amid strong competition for limited resources and steep and sometimes skewed variations in yield are a major impending problem in India. Ecology wise and region-wide yield gap analysis is a useful method to examine how large the ranges are between potential, desirable rice yields and those actually 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 46 farmers), Titabar (pool of 30 farmers), Pantnagar (pool of 50 farmers), Kanpur (pool of 20 farmers), Kaul (pool of 24 farmers) and Karaikal (pool of 22 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 validation of fertilizer recommendations for targeted yields. The *kharif* 2022 and in *Rabi* 2022 (Karaikal alone) data were received representing the irrigated and shallow lowland rice ecosystems are presented in Tables 5.2.1 to 5.2.4. The test varieties were Swarna, Khitish, Shatabdi at Chinsurah, Ranjeet, Ranjeet Sub 1, Bahadur, Swarna at Titabar, Pioneer 3727, Pioneer 2761, Arize 6444, Sudha, Kaveri 9090 at Kanpur, PR114, CSR-30, PR-1509,27P-31, PR-114, PR-114, PR-1121 at Kaul, Sarbati, Pusa 150, PR121, Indrasan, PR1509, PR126, Hybrid, PD10, PD 12, HR 47, Pusa 154, 2967, PD 18, Sarju 52, HR 47, Saket 4, Basmati, Pusa Basmati, HR 147, local at Pantnagar and CR 1009, BPT 5204, ADT 46 at Karaikal. The methodology involved as conduction of a survey in nearby villages during *Kharif*-2022 and *Rabi*-2022 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 analyzed for their nutrient contents, and soil quality indexes were calculated. For next season crop, site specific recommendations to the farmers have been generated and is being given for higher productivity and soil health improvement. The details of crop, soil and weather parameters of the experimental sites,

presented in the 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 2.38 t/ha among low yielders to 4.73 t/ha among high yielders at Chinsurah, from 3.1 t/ha among low yielders to 4.75 t/ha among high yielders at Titabar , varied from 4.76 t/ha among low yielders to 6.59 t/ha among high yielders at Kanpur, varied from 4.83 t/ha among low yielders to 5.84 t/ha among high yielders at Pantnagar, from 3.83 t/ha among low yielders to 4.36 t/ha among high yielders at Karaikal and from 1.44 t/ha among low yielders to 8.8 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 Titabar due to considerable variation among the farm sites and soil test values. The soil quality index was much superior at Kaul, Pantnagar and others were at par for all other centers. Large variations were seen for nutrient uptake between low yielders and high yields across the centers. Soil nutrient uptake for major nutrients varied widely among the sites. At all these locations wide variations in grain yields and nutrient uptake were recorded (Table 5.2.3), while soil test values did not match the yields recorded with rice yield and nutrient uptake at both the locations, suggesting perhaps less suitability of current soil testing methods for flooded soils. However, some centers reported soil quality index at par with their resulting grain yield and nutrient uptake patterns. Table 5.2.3 recorded the nutrient requirement per ton grain yield variations obtained at all the centers. Nutrient requirement calculations were useful to know how the responses were for fertilizers applied per ton of the grain yield.

Fertilizer prescriptions were worked out for all the farm sites (being the highest yield recorded at the test sites rounded to the next big numeral) and specific fertilizer recommendations were suggested for target yield: **Chinsurah - 5** t/ha **Titabar - 5** t/ha**, Pantnagar - 6.5** t/ha**, Kaul - 10** t/ha**, Kanpur - 6.5** t/h and **5.10** t/ha Karaikal at these locations 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 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. While the yields were having considerable variation with the farmers' fertilizer practices, respectively with corresponding variation in soil test values and uptake pattern followed. Wide variations in yields were recorded under recommended fertilizer practices and with all the nutrients under farmers practice indicating mismatch of the fertilizer doses.

Yield Gap analysis

Yield gap analysis was done for all farm fields. The need was assessed to ascertain the gaps of technology and compared the yield variations among low yielders and high yielders vis a *vis* uptake, 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 prevalent across the region. The results have been enlisted in the table no.5.2.4. The highest level of yield gap (83.6 %) was recorded at Kaul, followed by 49.6 % at Chinsurah, 27.7 % at Titabar, 17.3% at Pantnagar, 17.3% at Karaikal and 27.8% at Kanpur. 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 46 farmers), Titabar (pool of 30 farmers), Pantnagar (pool of 50 farmers), Kanpur (pool of 20 farmers), Kaul (pool of 24 farmers) and Karaikal pool of 22 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. Sharp variations in mean grain yields recorded varied from 2.38 t/ha among low yielders to 4.73 t/ha among high yielders at Chinsurah, from 2.48 t/ha among low yielders to 3.43 t/ha among high yielders at Titabar , varied from 4.76 t/ha among low yielders to 6.59 t/ha among high yielders at Kanpur, varied from 4.83 t/ha among low yielders to 5.84 t /ha among high yielders at Pantnagar, from 3.83 t /ha among low yielders to 4.36 t/ha among high yielders at Karaikal and from 1.44 t/ha among low yielders to 9.9 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- 5 t/ha Titabar-5 t/ha, Pantnagar -6.5 t/ha, Kaul-10 t/ha, Kanpur-6.5 t/ha at these locations (target yield is decided 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 soil quality index was much superior at Pantnagar and were at par for all other centers. The highest level of yield gap (83.6 %) was recorded at Kaul, followed 49.67% at Chinsurah, 27.7% at titabar, 17.3% at Pantnagar, 17.3% at Karaikal and 27.8% at Kanpur. This shows a wide gap of grain harvest existed. However, ample scope existed at these centers to increase yields.

- **Sharp variations in mean grain yields with wide yield gaps recorded among farmers and rice ecologies indicate mismatch of the fertilizer doses and establishing the probable cause of such gaps**

- **Soil quality index generated showed variations in the quality and health of the soil across different farmer's categories with the poorest soil quality index from Titabar and superior from Karaikal and Pantnagar.**

Table 5.2.1. Rice productivity in relation to internal supply capacity of nutrients in farmers' fields, *kharif* 2022 (Soil, crop and weather data)

Parameter	Chinsurah	Titabar	Kanpur	Kaul	Karaikal	Pantnagar
Variety	Swarna , Khitish, Shatabdi	Ranjeet, Ranjeet Sub 1, Bahadur, Swarna	Pioneer 3727, Pioneer 2761, Arize 6444, Sudha, Kaveri 9090	PR114, CSR-30, PR-1509, 27P-31, PR-114, PR-114, PR-1121	CR 1009, BPT 5204, ADT 46	Sarbati, Pusa 150, PR121, Indrasan, PR1509, PR126, Hybrid, PD10, PD 12, HR 47, Pusa 154, 2967, PD 18, Sarju 52 HR 47, Saket 4, Basmati, Pusa Basmati, HR 147, local
Crop growth	Good	Good	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 – 20-15-20,20-15-10,30-15-25,40-20-25,25-25-30,20-15-30,40-20-30,30-20-15,35-20-15,30-15-30	Varying 120-40-0,100-40-0,150-60-40,120-60-0,120-60-20,120-60-30,120-60-40	-	168:58:45, 100: 58: 60, 114:58:45, 80:58:37, 162:58:60, 80:58:37, 80: 58: 60,120:58:45 , 120:58:60, 80: 58: 60	180,60,40, 150,60,50, 120,60,40, 120,60,50, 200,60,40, 150,60,40, 150,50,50, 150,50,40, 120,50,40, 120,60,40, 160,60,50, 160,60,50,
% Clay	-	32-44	-	-		
% Silt	-	25.5-30.8	-	-		
% Sand	-	22-28	-	-		
Soil Texture	-	Sandy loam to silty clay	-	-		
pH	6.49-7.20	5.2-5.6	7.78-8.54	7.5-9.2	7.5-8.36	7.0-7.9
EC (mmhos/cm)	0.18-0.44	0.01-0.11	0.15-0.68	0.15-0.74	0.15-0.95	0.26-0.56
Org. carbon (%)	0.85-1.28	0.5-0.8	0.43-0.78	0.39-0.68	0.03-0.87	0.25-0.74
Avail. N (kg/ha)	378-507	220-310	147-204	135-198	113-204	125-215
Avail. P_2O_5 (kg/ha)	85-103	8.5-14.5	32-57	29.31	15-66	5.5-16.3
Avail. K_2O (kg/ha)	265-303	105-140	150-375	223-392	138-502	110-220

Table 5.2.2. Rice productivity in relation to internal supply capacity of nutrients in farmers' fields, *kharif 2022* - Soil nutrient supply potential vis a vis nutrient uptake assessed among different farmers' categories

Categories/ Nutrient	**Chinsurah** (Total of 46 sites, 12 low yielders and 21 high yielder sites)			**Titabar** (Total of 30 sites, 21 low yielders and 9 high yielder sites)		
	Minimum	**Maximum**	**Mean***	**Minimum**	**Maximum**	**Mean****
Grain yield (t/ha)						
Low Yielders	1.76	3.06	2.38	2.00	2.85	2.48
High Yielders	4.27	4.99	4.73	3.10	4.75	3.43
Nutrient uptake (kg/ha)						
	Low Yielders					
N	-	-	-	-	-	-
P	-	-	-	-	-	-
K	-	-	-	-	-	-
	High Yielders					
N	-	-	-	-	-	-
P	-	-	-	-	-	-
K	-	-	-	-	-	-
Soil Quality Index						
Low yielders(0.7) High Yielders 0.9 (Very High)				**Low Yielders 0.3 (very poor), High Yielders (0.4) Average**		
Categories/ Nutrient	**Kanpur** (Out of 20,5 low yielders, 15 high yielders)			**Pantnagar** (Out of 50,9 low yielders,51 high yielders)		
	Minimum	**Maximum**	**Mean***	**Minimum**	**Maximum**	**Mean****
Grain yield (t/ha)						
Low Yielders	4.59	4.98	4.76	4.0	4.5	4.83
High Yielders	5.31	7.18	6.59	5.1	7.4	5.84
Nutrient uptake (kg/ha)						
	Low Yielders					
N	74.88	80.38	77.57	31.2	48.02	40.17
P	26.82	29.42	28.13	2.7	7.0	4.73
K	8.92	9.72	9.30	21.6	40.0	29.81
	High Yielders					
N	83.11	131.45	113.93	28.08	72.52	47.8
P	32.21	54.43	44.59	4.56	13.32	8.58
K	11.24	19.02	14.93	18.2	44.4	28.69
Soil Quality Index						
Low yielders(0.7) High Yielders 0.67(good)				**Low yielders(0.6-good) High Yielders** (0.8) very good		
Categories/ Nutrient	**Kaul** (Out of 24, 14 low yielders, 10 high yielders)			**Karaikal** (Out of 22,16 low yielders, 6 high yielders)		
	Minimum	**Maximum**	**Mean***	**Minimum**	**Maximum**	**Mean****
Grain yield (t/ha)						
Low Yielders	1.3	1.7	1.44	3.56	3.92	3.83
High Yielders	7.5	9.9	8.8	4.03	4.65	4.36
Nutrient uptake (kg/ha)						
	Low Yielders					
N	24.3	38.4	30.4	23.96	30.77	26.83
P	8.3	16.1	11.3	9.16	21.49	15.12
K	27.8	44.8	35.4	17.20	49.23	30.12
	High Yielders					
N	96	128	114.5	22.57	54.68	33.83
P	37.87	53.1	42.09	3.84	26.65	16.68
K	40.5	54.9	45.63	19.44	53.84	31.37
Soil Quality Index						
0.67(good)				NA		

Table 5.2.3. Rice productivity in relation to internal supply capacity of nutrients in farmers' fields, *kharif* 2022 - - Nutrient Requirement per ton grain yield

Farmers categories	Chinsurah			Titabar		
	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	-	-	2.48	-	-
N		-	-		-	-
P		-	-		-	-
K		-	-		-	-
High Yielders (34 sites)	4.73	-	-	3.43	-	-
N		-	-		-	-
P		-	-		-	-
K		-	-		-	-

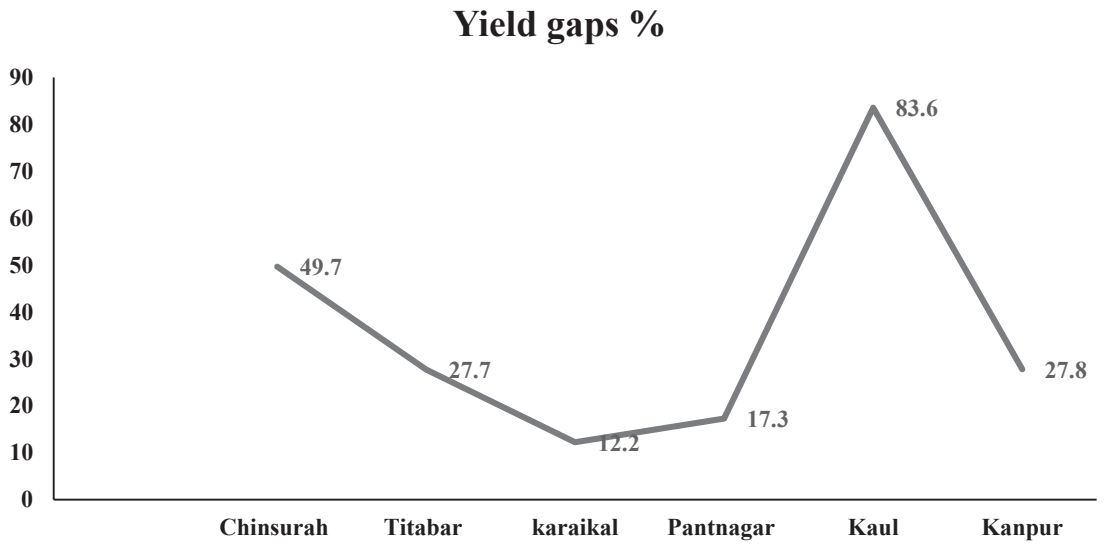
Farmers categories	Kanpur			Pantnagar		
	Mean yield (t/ha)	Mean uptake (kg/ha)	Nutrient Requirement (kg/t grain)	Mean yield (t/ha)	Mean uptake (kg/ha)	Nutrient Requirement (kg/t grain)
Low yielders	4.76			4.83		
N		77.57	16.29		40.17	8.31
P		28.13	5.90		4.93	1.02
K		9.30	1.95		29.81	5.96
High yielders	6.59			5.84		
N		113.93	17.28		**47.8**	8.18
P		44.59	6.76		**8.58**	1.46
K		14.93	2.26		**28.69**	4.92

Farmers categories	Kaul			Karaikal			
	Mean yield (t/ha)	Mean uptake (kg/ha)	Nutrient Requirement (kg/t grain)	Farmers categories	Mean yield (t/ha)	Mean uptake (kg/ha)	Nutrient Requirement (kg/t grain)
Low yielders	1.44				3.83		
N		30.4	21.11			26.83	7.01
P		11.3	7.84			15.12	3.94
K		35.4	24.5			30.12	7.84
High yielders	8.8				4.36		
N		114.5	13.01			33.83	7.75
P		42.09	4.78			16.68	3.82
K		45.63	5.18			31.37	7.19

Table 5.2.4 Rice productivity in relation to internal supply capacity of nutrients in farmers' fields, *kharif* 2022 (Site-specific fertilizer recommendation (kg/ha) for a target yield)

Site /centers.	Current mean yield from low yielders group (t/ha)	Current mean yield from high Yielders group (t/ha)	Percent increase in yield over low yielders groups	Fertilizer recommendation for the target yield (t/ha) Chinsurah- 5 Titabar-5 Karaikal -4.5 Kaul-10, Kanpur-7, Pantnagar-6		
				N (Urea)	P_2O_5 (SSP)	K_2O (Potash)
Chinsurah	2.38	4.73	49.7	90	25	50
Titabar	2.48	3.43	27.7	85	23	47
Karaikal	3.83	4.36	12.2	32	18	36
Pantnagar	4.83	5.84	17.3	62	8	44
Kaul	1.44	8.8	83.6	114	42	45
Kanpur	4.76	6.59	27.8	119	42	16

Figure 1. Yield Gaps among all centers



5.3. Management of Sodic Soils Using Nano Zinc Formulation

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 on 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). 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 produced highest tiller number at Kanpur (337) and Pusa (240) whereas foliar application of nano Zn @ 50 ppm has produced highest tiller number at Mandya (425) and Faizabad (308). In case of Varieties, DRR Dhan 48 registered higher tiller number at all the locations except Kanpur 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 (286) and Faizabad (303) whereas soil application of $ZnSO_4$ @ 50 kg/ha has recorded higher panicle number at Kanpur (249) and Pusa (217). With respect to varieties, CSR 23 produced higher panicles at Kanpur (233) and Mandya (253) where as DRR Dhan 48 produced higher panicle number at Pusa (208) and Faizabad (287).

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 (4.36 t/ha) and straw (6.25 t/ha) yields whereas foliar application of nano Zn @ 50 ppm recorded on par grain (4.08 t/ha) and straw yields (5.70 t/ha). Between the varieties, CSR23 has recorded significantly higher grain (4.43 t/ha) and straw (5.78 t/ha) yields compared to DRR Dhan 48.

In case of Mandya, foliar application of nano Zn @ 50 ppm recorded significantly higher grain (6.24 t/ha) and straw yields (6.86 t/ha) compared to all other treatments. With respect to varieties, DRR Dhan 48 produced significantly higher grain (5.43 t/ha) and straw yields (6.01 t/ha) than CSR23.

At Pusa, Soil application of $ZnSO_4$ @ 50 kg/ha registered higher grain yield (3.41 t/ha) followed by application of silicic acid @ 40 ppm (3.20 t/ha). In case of straw yield, soil application of $ZnSO_4$ @ 50 kg/ha registered higher straw yield (5.15 t/ha) followed by silicic acid @ 40 ppm (4.84 t/ha) and Nano Zn @ 50 ppm (4.69 t/ha). However, there is no significant difference among the varieties.

In Faizabad, foliar application of nano Zn @ 50 ppm recorded significantly higher grain (3.99 t/ha) and straw yields (5.37 t/ha) compared to all other treatments. Between the varieties, DRR Dhan 48 was superior to CSR 23. Interaction between treatments and genotypes was found to be non-significant in most of the cases.

Soil application of $ZnSO_4$ @ 50 kg/ha registered higher thousand grain weight at Kanpur (21.0 g) and Pusa (22.0 g) while foliar application of nano Zn @ 50 ppm recorded higher thousand grain weight at Mandya (23.2 g). In case of varieties, CSR 23 recorded higher thousand grain weight at Kanpur (26.7 g) and Pusa (25.2 g) whereas DRR Dhan 48 recorded significantly higher thousand grain weight at Mandya (22.3 g) (Table 5.3.6).

Nutrient uptake

Significant differences in nutrient uptake of NPK and Zn were observed at all the locations (Table 5.3.7 and 5.3.10). At Kanpur and Pusa, soil application of $ZnSO_4$ @ 50 kg/ha has recorded higher NPKZn uptake whereas at Mandya and Faizabad, Nano Zn @ 50 ppm foliar spray recorded higher NPKZn uptake. In case of varieties, DRR Dhan 48 has accumulated higher amount of NPKZn at Mandya, Pusa and Faizabad and CSR 23 recorded significantly higher nutrient uptake at Kanpur.

Partioning of Zn in Grain and straw: Zinc accumulation in grain and straw significantly differed among the treatments at all the locations but varietal difference was observed only at Kanpur (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. Application of $ZnSO_4$ @ 50 kg/ha has registered higher grain and straw Zn uptake at Kanpur and Pusa while at Mandya Nano Zn @ 50 ppm foliar spray accumulated more amount of Zn in grain and straw.

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 (2.38 mg/kg) compared to rest of the treatments. In Kanpur, except control and silicic acid applied plots, all other treatments were on par with each other with respect to post harvest soil Zn status.

Summary:

Significant genotypic and location-specific differences in yield parameters and yield were observed at all four locations. At Kanpur and Pusa, soil application of $ZnSO_4$ @ 50 kg/ha registered higher grain (4.36 t/ha, 3.41 t/ha) and straw (6.25 t/ha, 5.15 t/ha) yields whereas at Mandya and Faizabad foliar application of nano Zn @ 50 ppm recorded significantly higher grain (6.24 t/ha, 3.99 t/ha) and straw yields (6.86 t/ha, 5.37 t/ha). In case of Varieties, DRR Dhan 48 found superior at Mandya and Faizabad and CSR23 performed better at Kanpur. 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 Mandya, Pusa and Faizabad and CSR 23 recorded significantly higher nutrient uptake at Kanpur.

- **Foliar application of nano Zn@ 50 ppm has performed better across the locations except Kanpur.**
- **The variety DRR Dhan 48 exhibited superior performance in all the locations except Kanpur.**
- **Significantly superior performance of Zn application (Soil/foliar/nano formulations) was observed in sodic soils across the locations.**

Table 5.3.1: Management of Sodic soil using nano zinc formulations (Crop and soil characteristics)

Parameters	Kanpur	Mandya	Pusa	Faizabad
Season	***Kharif* -2022**	***Kharif* -2022**	***Kharif* -2022**	***Kharif* -2022**
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	125:62.5:62.5	120:60:40:50	120:60:60:25
Soil pH	9.90	9.02	9.61	9.6
Soil EC (dS/m)	0.23	0.34	0.61	2.85
Available N (kg/ha)	147	281	172	210
Available P (kg/ha)	12.4	30.2	19	25
Available K (kg/ha)	208	350	102	235
Texture	Sandy Clay loam	Sandy loam	Sandy loam	Sandy loam
OC (%)	0.21	0.65	0.42	0.39
DTPA-Zn (mg/kg)	0.48	0.86	0.42	-

Table 5.3.2: Management of Sodic soils using nano Zn formulation, 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	284	276	280	317	328	322	216	221	218	251	264	258
$ZnSO_4$ @ 0.5 % foliar spray	318	289	304	359	356	358	219	223	221	269	272	270
Nano Zn @ 20 ppm foliar spray	326	294	310	392	401	396	226	228	227	284	290	287
Nano Zn @ 50 ppm foliar spray	343	304	323	420	429	425	231	224	228	298	318	308
Soil application of $ZnSO_4$ @ 50 kg/ha	353	320	337	404	409	406	234	246	240	294	308	301
Silicic acid @ 40 ppm	292	286	289	391	394	393	221	234	227	292	302	297
Mean	319	295	307	380	386	383	225	229	226	281	292	287
CD (0.05) M	14.4			20.9			NS			4.37		
CD (0.05) S	6.41			5.28			NS			2.55		
M X S	15.7			NS			NS			6.23		
S XM	15.1			NS			NS			5.40		
CV (%) M	3.65			4.24			4.89			1.43		
CV (%) S	2.87			1.90			6.04			1.46		

Table 5.3.3: Management of Sodic soils using nano Zn formulation, 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	203	197	200	217	218	218	194	198	196	246	259	252
ZnSO4 @ 0.5 % foliar spray	222	213	217	244	241	242	197	202	200	263	268	265
Nano Zn @ 20 ppm foliar spray	237	215	226	260	256	258	204	206	205	280	285	283
Nano Zn @ 50 ppm foliar spray	251	217	234	283	288	286	210	202	206	294	313	303
Soil application of $ZnSO_4$ @ 50 kg/ha	262	236	249	274	267	271	210	223	217	288	302	295
Silicic acid @ 40 ppm	222	204	213	239	239	239	201	214	207	287	297	292
Mean	233	214	223	253	252	252	203	208	205	276	287	282
CD (0.05) M	13.9			15.3			NS			4.71		
CD (0.05) S	6.37			NS			NS			2.44		
M X S	NS			NS			NS			5.97		
S XM	NS			NS			NS			5.39		
CV (%) M	4.84			4.72			5.04			1.57		
CV (%) S	3.93			2.81			6.29			1.43		

Table 5.3.4: Management of Sodic soils using nano Zn formulation, 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	3.44	1.83	2.64	4.24	4.31	4.27	2.54	2.78	2.66	2.53	3.16	2.84
$ZnSO_4$ @ 0.5 % foliar spray	4.17	2.45	3.31	5.34	5.47	5.40	2.68	2.74	2.71	2.90	3.82	3.36
Nano Zn @ 20 ppm foliar spray	4.67	2.86	3.77	5.53	5.57	5.55	2.87	2.93	2.90	3.13	4.11	3.62
Nano Zn @ 50 ppm foliar spray	5.02	3.13	4.08	6.20	6.27	6.24	3.04	3.11	3.07	3.52	4.46	3.99
Soil application of $ZnSO_4$ @ 50 kg/ha	5.27	3.44	4.36	5.34	5.50	5.42	3.29	3.53	3.41	3.32	4.30	3.81
Silicic acid @ 40 ppm	4.02	2.24	3.13	5.39	5.48	5.44	3.13	3.26	3.20	3.22	4.25	3.73
Mean	4.43	2.65	3.54	5.34	5.43	5.39	2.93	3.06	2.99	3.10	4.02	3.56
CD (0.05) M	0.38			0.18			0.30			0.09		
CD (0.05) S	0.23			0.03			NS			0.05		
M X S	NS			NS			NS			0.13		
S XM	NS			NS			NS			0.11		
CV (%) M	8.37			2.62			7.75			2.38		
CV (%) S	9.03			0.70			8.82			4.48		

Table 5.3.5: Management of Sodic soils using nano Zn formulation, Straw yield (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	4.40	2.65	3.53	4.69	4.91	4.80	3.86	3.89	3.88	3.55	3.16	3.83
ZnSO4 @ 0.5 % foliar spray	5.38	3.68	4.53	5.77	5.95	5.86	4.11	4.14	4.13	4.05	3.82	4.51
Nano Zn @ 20 ppm foliar spray	6.05	4.38	5.21	6.14	6.29	6.22	4.39	4.42	4.40	4.32	4.11	4.82
Nano Zn @ 50 ppm foliar spray	6.55	4.85	5.70	6.80	6.91	6.86	4.63	4.74	4.69	4.91	4.46	5.37
Soil application of $ZnSO_4$ @ 50 kg/ha	7.10	5.40	6.25	5.82	5.95	5.88	4.96	5.33	5.15	4.63	4.30	5.11
Silicic acid @ 40 ppm	5.17	3.40	4.29	5.98	6.06	6.02	4.79	4.89	4.84	4.44	4.25	4.96
Mean	5.78	4.06	4.92	5.87	6.01	5.94	4.46	4.57	4.51	4.32	5.22	4.77
CD (0.05) M	0.60			0.23			0.56			0.13		
CD (0.05) S	0.28			0.02			NS			0.07		
M X S	NS			0.05			NS			0.16		
S XM	NS			0.17			NS			0.15		
CV (%) M	9.47			3.06			9.63			2.61		
CV (%) S	7.77			0.51			10.7			2.29		

Table 5.3.6: Management of Sodic soils using nano Zn formulation, Thousand grain weight (g) of rice at different locations

Treatments/ Varieties	Kanpur			Mandya			Pusa		
	CSR 23	DRR Dhan 48	Mean	CSR 23	DRR Dhan 48	Mean	CSR 23	DRR Dhan 48	Mean
Control	26.2	13.9	20.1	20.2	20.7	20.4	24.7	17.9	21.3
$ZnSO_4$ @ 0.5 % foliar spray	26.7	14.2	20.4	21.6	21.7	21.6	24.9	17.8	21.3
Nano Zn @ 20 ppm foliar spray	26.8	14.4	20.6	22.1	22.5	22.3	25.2	18.0	21.6
Nano Zn @ 50 ppm foliar spray	26.9	14.8	20.9	23.0	23.4	23.2	25.2	18.3	21.8
Soil application of $ZnSO_4$ @ 50 kg/ha	27.0	14.9	21.0	22.6	22.9	22.7	25.8	18.2	22.0
Silicic acid @ 40 ppm	26.6	14.4	20.5	22.8	22.9	22.9	25.7	18.2	22.0
Mean	26.7	14.4	20.6	22.0	22.3	22.1	25.2	18.0	21.6
CD (0.05) M	0.21			0.89			NS		
CD (0.05) S	0.11			0.19			0.37		
M X S	NS			NS			NS		
S XM	NS			NS			NS		
CV (%) M	0.79			3.12			2.19		
CV (%) S	0.71			1.16			2.33		

Table 5.3.7: Management of Sodic soils using nano Zn formulation, 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	45.7	25.2	35.4	14.6	9.01	11.8	55.7	33.3	44.5	1337	797	1067
$ZnSO_4$ @ 0.5 % foliar spray	62.4	38.5	50.4	20.3	13.7	17.0	72.1	49.4	60.7	2500	1684	2092
Nano Zn @ 20 ppm foliar spray	73.8	46.9	60.3	22.8	16.69	19.7	82.6	59.5	71.0	2955	2074	2515
Nano Zn @ 50 ppm foliar spray	81.9	54.4	68.1	27.0	19.36	23.2	90.7	67.1	78.9	3365	2389	2877
Soil application of $ZnSO_4$ @ 50 kg/ha	89.8	61.5	75.6	29.9	22.26	26.1	101.2	76.7	88.9	3721	2752	3237
Silicic acid @ 40 ppm	59.1	34.7	46.9	20.0	12.72	16.4	69.5	46.4	58.0	2346	1522	1934
Mean	68.7	43.5	56.1	22.4	15.6	19.0	78.6	55.4	67.0	2704	1870	0.19
CD (0.05) M	7.04			2.60			6.92			325		
CD (0.05) S	3.04			1.30			4.06			189		
M X S	NS			NS			NS			NS		
S XM	NS			NS			NS			NS		
CV (%) M	9.74			10.7			8.03			11.0		
CV (%) S	7.47			9.40			8.35			11.3		

Table 5.3.8: Management of Sodic soils using nano Zn formulation, 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	68.3	69.0	68.7	11.2	11.9	11.6	53.9	56.8	55.3	993	1108	1050
$ZnSO_4$ @ 0.5 % foliar spray	92.3	95.0	93.7	15.9	16.9	16.4	72.1	74.8	73.4	1741	1746	1744
Nano Zn @ 20 ppm foliar spray	99.8	103.7	101.8	18.4	19.0	18.7	82.8	84.1	83.4	1962	1989	1976
Nano Zn @ 50 ppm foliar spray	124.7	124.5	124.6	23.3	20.7	22.0	101.4	103.6	102.5	2428	2500	2464
Soil application of $ZnSO_4$ @ 50 kg/ha	95.6	98.7	97.1	17.4	18.1	17.7	75.5	78.3	76.9	1832	1918	1875
Silicic acid @ 40 ppm	94.2	94.2	94.2	15.8	17.5	16.6	77.9	78.0	77.9	1714	1724	1719
Mean	95.8	97.5	96.6	17.0	17.3	17.2	77.3	79.3	78.3	1778	1830	1804
CD (0.05) M	6.31			1.93			5.94			52.1		
CD (0.05) S	1.51			NS			1.30			44.82		
M X S	NS			NS			NS			NS		
S XM	NS			NS			NS			NS		
CV (%) M	5.07			8.75			5.90			2.25		
CV (%) S	2.16			7.45			2.20			3.42		

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	47.1	49.0	48.1	11.1	11.6	11.3	63.5	65.0	64.3	1520	1605	1562
$ZnSO_4$ @ 0.5 % foliar spray	49.7	50.4	50.1	11.3	11.4	11.4	67.9	69.5	68.7	1723	1770	1747
Nano Zn @ 20 ppm foliar spray	53.0	53.8	53.4	12.0	12.2	12.1	73.2	74.3	73.7	1898	1969	1934
Nano Zn @ 50 ppm foliar spray	55.5	57.7	56.6	12.8	13.1	13.0	77.7	80.3	79.0	2069	2134	2101
Soil application of $ZnSO_4$ @ 50 kg/ha	60.6	65.0	62.8	13.8	14.9	14.3	89.5	94.2	91.9	2293	2449	2371
Silicic acid @ 40 ppm	57.1	59.6	58.3	13.4	13.7	13.6	81.5	84.4	83.0	2000	2068	2034
Mean	53.8	55.9	54.8	12.4	12.8	12.6	75.5	77.9	76.7	1917	1999	1958
CD (0.05) M	6.35			1.22			9.92			205		
CD (0.05) S	NS			NS			NS			NS		
M X S	NS			NS			NS			NS		
S XM	NS			NS			NS			NS		
CV (%) M	8.39			7.51			10.0			8.13		
CV (%) S	10.2			11.1			12.0			10.9		

Table 5.3.10: Management of Sodic soils using nano Zn formulation, Total nutrient uptake (kg/ha) of rice at Faizabad

Treatments/ Varieties	N uptake			P uptake			K uptake		
	CSR 23	DRR Dhan 48	Mean	CSR 23	DRR Dhan 48	Mean	CSR 23	DRR Dhan 48	Mean
Control	52.5	70.4	61.5	28.7	39.0	33.8	40.1	50.9	45.5
$ZnSO_4$ @ 0.5 % foliar spray	64.9	94.6	79.8	36.4	52.5	44.5	50.2	67.0	58.6
Nano Zn @ 20 ppm foliar spray	74.5	102.7	88.6	42.7	62.1	52.4	56.6	78.3	67.5
Nano Zn @ 50 ppm foliar spray	87.9	120.7	104.3	53.1	70.3	61.7	69.1	87.7	78.4
Soil application of $ZnSO_4$ @ 50 kg/ha	79.7	105.5	92.6	45.1	61.8	53.5	60.2	78.0	69.1
Silicic acid @ 40 ppm	78.0	107.8	92.9	46.2	67.0	56.6	60.5	82.0	71.3
Mean	72.9	100	86.6	42.0	58.7	50.4	56.1	73.9	65.0
CD (0.05) M	4.42			2.93			3.19		
CD (0.05) S	2.24			1.43			1.53		
M X S	5.49			3.50			3.75		
S XM	5.00			3.23			3.49		
CV (%) M	4.79			5.45			4.61		
CV (%) S	4.27			4.67			3.88		

Table 5.3.11: Management of Sodic soils using nano Zn formulation, Zn uptake (g/ha) in grain and straw of rice at Kanpur

Treatments/ Varieties	Grain uptake			Straw uptake		
	CSR 23	DRR Dhan 48	Mean	CSR 23	DRR Dhan 48	Mean
Control	313	171	242	1024	627	825
$ZnSO_4$ @ 0.5 % foliar spray	863	527	695	1637	1158	1397
Nano Zn @ 20 ppm foliar spray	1040	645	842	1915	1429	1672
Nano Zn @ 50 ppm foliar spray	1224	773	998	2142	1617	1879
Soil application of $ZnSO_4$ @ 50 kg/ha	1353	903	1128	2368	1849	2109
Silicic acid @ 40 ppm	810	463	637	1536	1059	1297
Mean	934	580	757	1770	1289	1530
CD M	126			225		
CD S	69.5			123		
M X S	NS			3.5		
S XM	NS			3.23		
CV (%) M	13			11.4		
CV (%) S	12.6			11		

Table 5.3.12: Management of Sodic soils using nano Zn formulation, Zn uptake (g/ha) in grain and straw of rice at Mandya

Treatments/ Varieties	Grain uptake			Straw uptake		
	CSR 23	DRR Dhan 48	Mean	CSR 23	DRR Dhan 48	Mean
Control	370	372	371	623	735	679
$ZnSO_4$ @ 0.5 % foliar spray	627	612	619	1114	1134	1124
Nano Zn @ 20 ppm foliar spray	676	719	697	1287	1269	1278
Nano Zn @ 50 ppm foliar spray	908	927	918	1520	1573	1547
Soil application of $ZnSO_4$ @ 50 kg/ha	657	695	676	1175	1223	1199
Silicic acid @ 40 ppm	570	539	554	1143	1185	1164
Mean	634	644	639	1143	1186	1165
CD M	34.9			36		
CD S	NS			38.5		
M X S	NS			NS		
S XM	NS			NS		
CV (%) M	4.25			2.40		
CV (%) S	4.11			4.55		

Table 5.3.13: Management of Sodic soils using nano Zn formulations, Zn uptake (g/ha) in grain and straw of rice at Pusa

Treatments/ Varieties	Grain uptake			Straw uptake		
	CSR 23	DRR Dhan 48	Mean	CSR 23	DRR Dhan 48	Mean
Control	639	717	678	880	888	884
$ZnSO_4$ @ 0.5 % foliar spray	716	746	731	1006	1024	1015
Nano Zn @ 20 ppm foliar spray	769	815	792	1130	1154	1142
Nano Zn @ 50 ppm foliar spray	828	879	854	1241	1255	1248
Soil application of $ZnSO_4$ @ 50 kg/ha	926	996	961	1367	1453	1410
Silicic acid @ 40 ppm	798	845	821	1202	1224	1213
Mean	779	832	806	1138	1166	1151
CD M	88.4			138		
CD S	NS			NS		
M X S	NS			NS		
S XM	NS			NS		
CV (%) M	8.53			9.36		
CV (%) S	11			11.8		

Table 5.3.14: Management of Sodic soils using nano Zn formulations, Post-harvest soil zinc (mg/kg) status

Treatments/ Varieties	Kanpur			Mandya		
	CSR 23	DRR Dhan 48	Mean	CSR 23	DRR Dhan 48	Mean
Control	0.38	0.37	0.38	0.84	0.87	0.86
ZnSO4 @ 0.5 % foliar spray	0.52	0.51	0.52	0.97	1.01	0.99
Nano Zn @ 20 ppm foliar spray	0.53	0.54	0.54	1.06	1.07	1.06
Nano Zn @ 50 ppm foliar spray	0.56	0.57	0.56	1.12	1.15	1.14
Soil application of $ZnSO_4$ @ 50 kg/ha	0.59	0.59	0.59	2.31	2.45	2.38
Silicic acid @ 40 ppm	0.44	0.45	0.44	0.99	0.99	0.99
Mean	0.50	0.50	0.50	1.22	1.26	1.24
CD M	0.07			0.14		
CD S	NS			NS		
M X S	NS			NS		
S XM	NS			NS		
CV (%) M	10.2			8.85		
CV (%) S	10.7			6.30		

5. 4 Management of Acid soils

Acid soils are wide spread 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, deficiency of B, Mo and Si. The soils also fix large quantities of soluble P, which lead 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 four centers viz., Moncompu-MCP (Kuttanad, Kerala, soil pH 4.66), Ranchi-RCI (Jharkhand, soil pH 5.22) and Titabar-TTB (Assam, soil pH 5.2) under irrigated conditions and at Mizoram (ICAR RC NEH Region, Mizoram Centre, Kolasib, soil pH 5.12-5.42) under rainfed upland conditions during *kharif* 2022. The genotypes Uma and Vasundhara (Moncompu, Ranchi, Titabar) and Uma and RC Maniphou-6 (Mizoram) were evaluated under seven sets of nutrient management treatments *viz*., i) NPK (RD), ii) NPK (RD)+ Silixol spray (at vegetative, booting and grain filling stage), iii) NPK (RD) + Rice husk ash, 250 kg/ha during land preparation, iv) NPK (RD) + Dolomite 250 kg/ha 30 days after transplanting, v) NPK (RD) + Silixol spray (at vegetative, booting and grain filling stage) + Dolomite 250 kg/ha, 30 days after transplanting, vi) NPK (RD)+ Rice husk ash, 250 kg/ha during land preparation + Dolomite 250 kg/ha, 30 days after transplanting and viii) Potassium Silicate Solution- Four sprays at 15 days interval 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 – 5.4.8 and briefly discussed.

Yield and yield parameters

At Moncompu (MCP), application of dolomite + Silixol spray in combination with RDF (4.12 t/ha) yielded significantly higher than other treatments (Table 5.4.3). The yields obtained with RDF + Dolomite + RHA (3.83 t/ha), RDF+ K-Silicate (3.68 t/ha), RDF + Silixol spray (3.55 t/ha) application were on par, while the treatment with that received only recommended dose of fertilizer (RDF) recorded the lowest yield of 3.05 t/ha. Among varieties, the yield of Vasundhara (3.64 t/ha) was significantly higher than Uma (3.42 t/ha) at MCP. Straw yields recorded with RDF + dolomite + Silixol spray (5.81 t/ha) and RDF +

dolomite + RHA (5.62 t/ha) were on par and significantly higher than other treatments. Similar to grain yield, the application of RDF + dolomite + Silixol spray (Table 5.4.2), resulted in the highest number of tillers/m^2(191), panicles/m^2 (160) and filled grain/ panicle (119). Application of RDF+ K-Silicate and RDF + dolomite + Silixol spray recorded significantly higher 1000 grain weight of 26.30 g and 25.86 g, respectively.

At Titabar (TTB), significant differences were observed in nutrient management treatments (Table 5.4.3), with the highest yield recorded with RDF + dolomite + Silixol spray (4.70 t/ha). The other treatments recorded comparable on-par yields ranging from 4.36 t/ha to 4.05 t/ha, while the lowest yield was observed in the treatment with sole RDF application (3.78 t/ha). Between the varieties, the genotype Uma, recorded significantly superior yields (4.36 t/ha) compared to Vasundhara (4.07 t/ha). Straw yields followed similar trends as grain yields at Titabar for both nutrient management and varieties. The highest number of tillers/m^2(387), panicles/m^2(341) and filled grain/ panicle (119) were observed following the application of RDF + dolomite + Silixol spray (Table 5.4.2).

In acid soils of Ranchi, application of RDF + Dolomite + RHA (5.76 t/ha) recorded the highest grain yield, while among the varieties, Uma recorded a significantly higher yield (5.49 t/ha) than Vasundhara (5.26 t/ha).

Grain yield, straw yield, plant height, and yield parameters like tillers/hill and filled grains/panicle of the variety Vasundhara was not significantly influenced by nutrient management practices at Mizoram (Table 5.4.4). Treatment differences in the grain yield of variety Mahipou 6 were observed, with the RDF + dolomite + Silixol spray (4.01 t/ha) recording significantly higher yields than other treatments. No significant effect of the treatments was observed for straw yield and other parameters like plant height, and yield parameters like tillers/hill and filled grains/panicle.

Total nutrient uptake

Different treatments and varieties significantly influenced total nutrient uptake at Moncompu (Table 5.4.5). Among the treatments, RDF + dolomite + Silixol spray recorded significantly higher nitrogen uptake (91.14 kg/ha), phosphorus uptake (44.54 kg/ha), and potassium uptake (92.42 kg/ha) compared to the rest of the treatments. Between the two varieties, Vasundhara recorded the highest nitrogen uptake (77.65 kg/ha) and phosphorus uptake (34.98 kg/ha) and potassium uptake (82.87 kg/ha).

RDF + dolomite + Silixol spray recorded significantly higher nitrogen, phosphorus and potassium uptake (79.86 kg/ha, 15.46 kg/ha and 106.56 kg/ha, respectively) at Titabar (Table 5.4.5) compared to other treatments, while the variety Uma recorded high NPK uptake (79.86 kg/ha, 15.46 kg/ha and 106.56 kg/ha respectively) than Vasundhara.

No significant differences in N and P uptake were observed at Mizoram for the variety Vasundhara (Table 5.4.6). Treatment differences were observed for K uptake as significantly higher and comparable potassium uptake was observed with RDF + dolomite + RHA (269.99 kg/ha), RDF + potassium silicate (257.05 kg/ha), RDF + dolomite + Silixol spray (245.99 kg/ha) and RDF + RHA application (235.75 kg/ha) compared to other treatments. A significant effect of treatments was observed for nitrogen and phosphorus uptake by Mahipou 6 variety (Table 5.4.6), while no effect was observed for potassium uptake. Application of RDF + dolomite + Silixol spray resulted in the highest N (40.05 kg/ha) and P (23.21 kg/ha) uptake by Mahipou 6.

Post-harvest soil properties

A significant effect of treatments was observed for post-harvest soil characteristics in Moncompu and Titabar soils (Table 5.4.7). At Moncompu, RDF + dolomite + RHA caused an increase in pH (4.39) compared to the control (4.21). The highest improvement in OC% was observed in the RDF + RHA (3.06%), RDF + dolomite + RHA (3.02%) and RDF + dolomite + Silixol spray (3.00 %) treatments. The available N in soil was highest under treatments with RDF + dolomite + Silixol spray (358.84 kg/ha) and RDF + dolomite + RHA (352.50 kg/ha). While no treatment differences were observed for soil phosphorus, significantly higher potassium and zinc availability were observed due to the application of RDF + RHA (240.56 kg/ha and 1.98 ppm, respectively) and RDF + dolomite + RHA (238.18 kg/ha and 1.96 ppm respectively). No significant differences between varieties were observed for soil properties except for available K.

At Titabar, application of RDF + dolomite + RHA (6.25), RDF + dolomite + Silixol spray (6.22) and RDF + dolomite (6.15) significantly increased the soil pH. Significantly higher accumulation of organic carbon was observed in the treatments with RDF + RHA (0.90%) and RDF + dolomite + RHA (0.90%). The available nitrogen status in soil showed a significant increase due to RDF + dolomite + Silixol spray (323.00 kg/ha) and RDF + dolomite + RHA (319.80 kg/ha) compared to other treatments. All treatments except RDF and RDF + Silixol spray significantly increased soil available phosphorus (22.00-23.66 kg/ha). No significant differences were observed for soil available K.

The post-harvest soil characteristics of Mizoram after harvest of Mahipou 6 variety is presented in Table 5.4.8. No significant effect of treatments was observed for soil pH, soil SOC and available NPK.

Summary

The results indicate that application of RDF + dolomite (250 kg/ha) + Silixol spray (at vegetative, booting and grain filling stage) recorded the highest yields at three locations, viz., Moncompu (4.12 t/ha), Titabar (4.70 t/ha) and Mizoram (Mahipou 6 - 4.01 t/ha) while in acid soils of Dhumka, RDF + Dolomite + RHA (5.76 t/ha) application recorded the highest grain yield. Between two varieties, while Vasundhara (3.64 t/ha) performed better at Moncompu, the genotype Uma yielded the highest at Titabar (4.36 t/ha) and Dhumka (5.49 t/ha). Ameliorative effect of application of RDF + dolomite (250 kg/ha) + RHA (250 kg/ha) was observed as the pH increased to 4.39 and 6.25 was observed in acid soils of Moncompu and Titabar respectively when compared to RDF alone (4.21 and 5.22 respectively) at these locations.

- **Application of RDF + dolomite + Silixol spray improved yields over sole RDF by 12-35% in irrigated rice and by 14% under upland rice.**
- **Application of RDF + dolomite + rice husk ash resulted in an increase in soil pH over RDF and RDF + dolomite, indicating the improved ameliorative potential of combined application of dolomite + RHA.**

Table 5.4.1: Management of acid soils (*Kharif*-2022)

Soil and crop characteristics

Parameter	Ranchi	Mizoram		Moncompu	Titabar
Cropping system		Mono-cropping upland rice		Rice - Rice	Rice -Fallow
Rice Variety	Vasundhara and Uma	RC Maniphou-6	Vasundhara	Vasundhara and Uma	Vasundhara and Uma
RDF (kg NPK/ha)	-	80:60:40		90:45:45	60:20:40
Crop growth	-	Good		Good	Good
Soil characteristics					
% Clay	-	30	30	-	34
% Silt	-	15	15	-	33
% Sand	-	55	55	-	28
Soil Texture	-	Sandy clay loam	Sandy clay loam	-	Silty Clay
pH (1:2.5)	5.22	5.42	5.12	4.21	5.3 (1:1)
Org. carbon (%)	-	1.97	1.2	2.98	0.86
CEC [c mol (p+)/kg]	-	-	-	-	11.1
EC (ds/m)	-	-	-	0.13	0.15
Avail.N (kg/ha)	-	232.96	112.45	347.8	312
Avail. P_2O_5 (kg/ha)	-	38.08	53.76	71.4	20.7
Avail. K_2O (kg/ha)	-	414.4	470.4	214.3	162
Avail S (mg/kg)	-	-	-	14.8	-
DTPA –Zn (mg/kg)	-	-	-	1.88	-
DTPA –Fe (mg/kg)	-	-	-	276	-
DTPA –Mn (mg/kg)	-	-	-	2.08	-
DTPA –Cu (mg/kg)	-	-	-	1.72	-

Table 5.4.2: Management of acid soils (*Kharif*-2022)

Yield parameters at Moncompu and Titabar

Treatments	Tillers m^{-2}		Panicles m^{-2}		Filled grains/panicle		1000 grain wt. (g)
	Moncompu	Titabar	Moncompu	Titabar	Moncompu	Titabar	Moncompu
Nutrient management							
RDF	166	270	139	219	90	92	24.78
RDF + Silixol	183	360	153	299	96	105	25.62
RDF + RHA*	175	302	152	261	96	100	25.19
RDF + Dolomite	171	310	145	264	91	99	25.06
RDF + Dolomite+ Silixol	191	387	160	341	119	119	25.86
RDF + Dolomite + RHA	182	329	156	284	114	113	26.09
RDF + K-Silicate	188	329	153	287	109	104	26.30
CD (0.05)	7.0	32	6.0	35	9.0	15.0	0.44
CV(%)	3.75	7.66	3.97	9.94	7.91	11.09	1.65
Varieties							
Vasundhara	184	320	154	271	103	101	25.63
Uma	175	333	148	288	101	108	25.49
Experimental Mean	179	327	151	279	102	104	25.56
CD (0.05)-varieties	4.0	NS	3.0	10	NS	6.0	NS
Interaction -M X S	NS	NS	NS	NS	NS	NS	0.65
Interaction -S X M	NS	NS	NS	NS	NS	NS	0.56
CV(%)	3.68	7.34	3.8	5.38	6.16	9.25	1.73

*Rice husk ash, M – Main plot (Nutrient management), S – Subplot (Varieties)

Table 5.4.3: Management of acid soils (*Kharif*-2022)

Grain and straw yields at Moncompu, Titabar and Ranchi

Treatments	Grain yield (t/ha)			Straw yield (t/ha)	
	Moncompu	Titabar	Ranchi	Moncompu	Titabar
Nutrient management					
RDF	3.05	3.78	4.97	4.61	4.12
RDF + Silixol	3.55	4.36	5.25	5.37	4.77
RDF + RHA*	3.36	4.05	5.32	5.16	4.42
RDF + Dolomite	3.13	4.14	5.48	4.92	4.53
RDF + Dolomite + Silixol	4.12	4.70	5.54	5.81	5.05
RDF + Dolomite + RHA	3.83	4.26	5.76	5.62	4.66
RDF + K-Silicate	3.68	4.22	5.33	5.40	4.60
CD (0.05)	0.36	0.31	NS	0.35	0.34
CV(%)	9.76	5.80	7.84	6.36	5.81
Varieties					
Vasundhara	3.64	4.07	5.26	5.56	4.44
Uma	3.42	4.36	5.49	4.98	4.74
Experimental Mean	3.53	4.21	5.38	5.27	4.59
CD (0.05)- varieties	0.19	0.17	1.62	0.16	0.19
Interaction -M X S	NS	NS	NS	NS	NS
Interaction -S X M	NS	NS	NS	NS	NS
CV%	9.57	6.03	4.56	5.5	6.32

*Rice husk ash, M – Main plot (Nutrient management), S – Subplot (Varieties)

Table 5.4.4: Management of acid soils (*Kharif*-2022)
Yield parameters and yield at Mizoram

Treatments	Plant height (cm)		Tillers/hill		Filled grains/panicle		100 grain wt (g)	Grain yield (t/ha)		Straw yield (t/ha)	
	V1	V2	V1	V2	V1	V2	V1	V1	V2	V1	V2
RDF	89.72	110.78	9	7	106	89	2.38	3.33	3.53	9.43	9.62
RDF + Silixol	90.89	112.56	10	9	110	93	2.49	3.65	3.53	9.12	9.49
RDF + RHA*	88.72	114.00	9	10	108	92	2.46	3.59	3.70	9.59	8.80
RDF + Dolomite	88.33	113.45	9	8	107	95	2.56	3.42	3.77	9.49	9.39
RDF + Dolomite + Silixol	92.66	116.22	10	12	112	101	2.54	3.73	4.01	9.72	10.12
RDF + Dolomite + RHA	88.78	118.45	9	8	107	104	2.61	3.44	3.65	9.77	10.12
RDF + K-Silicate	89.44	113.11	9	8	114	99	2.45	3.50	3.72	9.52	9.82
Experimental mean	89.79	114.08	9	9	109	96	2.50	3.52	3.70	9.52	9.62
CD (0.05)	NS	NS	NS	NS	NS	NS	0.18	NS	0.23	NS	NS
CV(%)	2.74	2.47	7.73	22	6.42	7.12	3.98	6.49	3.48	9.4	8.47

*Rice husk ash, V1= Vasundhara, V2= Mahipou 6

Table 5.4.5: Management of acid soils (*Kharif*-2022) Nutrient (NPK) uptake at Moncompu and Titabar

Treatments	N uptake (kg/ha)		P uptake (kg/ha)		K uptake (kg/ha)	
	Moncompu	Titabar	Moncompu	Titabar	Moncompu	Titabar
Nutrient management						
RDF	60.05	49.54	24.61	8.33	63.12	62.81
RDF + Silixol	75.09	70.04	32.58	12.62	79.16	89.48
RDF + RHA*	69.03	55.2	30.45	10.07	73.59	79.86
RDF + Dolomite	61.75	58.5	28.38	10.4	68.61	79.24
RDF + Dolomite + Silixol	91.14	79.86	44.54	15.46	92.42	106.56
RDF + Dolomite + RHA	86.34	63.52	39.34	10.70	85.82	85.51
RDF + K-Silicate	82.67	65.94	36.17	12.14	87.36	91.96
CD (0.05)	4.01	5.93	2.83	1.90	3.65	7.52
CV(%)	5.08	7.46	7.99	13.26	4.42	7.03
Varieties						
Vasundhara	77.65	59.98	34.98	10.58	82.87	79.68
Uma	72.65	66.48	32.47	12.2	74.29	90.44
Experimental Mean	75.15	63.23	33.73	11.39	78.58	85.06
CD (0.05)- varieties	3.12	2.47	2.23	1.30	2.66	5.01
Interaction -M X S	NS	NS	NS	NS	NS	NS
Interaction -S X M	NS	NS	NS	NS	NS	NS
CV(%)	7.47	5.9	11.88	17.19	6.08	8.9

*Rice husk ash, M – Main plot (Nutrient management), S – Subplot (Varieties)

Table 5.4.6: Management of acid soils (*Kharif*-2022)
Nutrient uptake (NPK) at Mizoram

Treatments	N uptake (kg/ha)		P uptake (kg/ha)		K uptake (kg/ha)	
	V1	V2	V1	V2	V1	V2
RDF	39.27	26.32	13.41	16.19	186.15	209.55
RDF + Silixol	42.21	28.19	13.97	15.57	209.16	234.53
RDF + RHA*	46.42	28.67	14.39	17.1	235.75	204.92
RDF + Dolomite	42.66	29.04	14.97	17.11	206.83	221.99
RDF + Dolomite + Silixol	43.34	40.05	15.13	23.21	245.99	239.73
RDF + Dolomite + RHA	41.11	34.42	14.55	17.65	269.99	192.52
RDF + K-Silicate	43.82	37.52	14.28	19.41	257.05	216.76
Experimental mean	42.69	32.03	14.39	18.03	230.13	217.14
CD (0.05)	NS	8.33	NS	3.74	52.99	NS
CV(%)	13.08	14.62	13.61	11.67	12.94	22.35

*Rice husk ash, V1= Vasundhara, V2= Mahipou 6

Table 5.4.7: Management of acid soils (*Kharif*-2022)

Post-harvest soil characteristics at Moncompu and Titabar

Treatments	Soil pH		Soil OC (%)		Soil EC (dS/m)	Available N (kg/ha)		Available P (kg/ha)		Available K (kg/ha)		Available Zn (ppm)
	MCP	TTB	MCP	TTB	MCP	MCP	TTB	MCP	TTB	MCP	TTB	MCP
Nutrient management												
RDF	4.21	5.22	2.92	0.84	0.14	344.02	314.34	71.75	20.84	218.64	160.66	1.82
RDF + Silixol	4.18	5.26	2.88	0.86	0.16	347.98	313.34	75.30	21.16	226.78	161.66	1.85
RDF + RHA*	4.26	5.20	3.06	0.90	0.12	345.00	315.66	75.00	22.66	240.56	163.84	1.98
RDF + Dolomite	4.32	6.15	2.79	0.86	0.12	344.82	318.17	71.26	22.50	223.54	161.66	1.83
RDF + Dolomite + Silixol	4.24	6.22	3.00	0.86	0.14	358.84	319.83	78.02	23.00	236.83	162.50	1.89
RDF + Dolomite + RHA	4.39	6.25	3.02	0.90	0.14	352.50	323.00	76.32	23.66	238.18	166.17	1.96
RDF + K-Silicate	4.16	5.35	2.90	0.86	0.14	349.66	314.84	73.16	22.00	232.39	163.00	1.84
CD (0.05)	0.05	0.18	0.1	0.02	NS	7.19	3.81	NS	1.75	3.44	NS	0.08
CV(%)	1.17	2.52	3.26	2.12	33.23	1.96	0.96	5.13	6.26	1.42	1.59	3.92
Varieties												
Vasundhara	4.25	5.65	2.94	0.87	0.14	349.32	317.19	74.07	22.76	232.29	163.10	1.88
Uma	4.25	5.68	2.94	0.86	0.14	348.63	316.86	74.73	21.76	229.69	162.48	1.88
Experimental Mean	4.25	5.66	2.94	0.87	0.14	348.97	317.02	74.4	0.88	230.99	162.79	1.88
CD (0.05)- varieties	NS	NS	NS	NS	NS	NS	NS	NS	22.26	1.23	NS	NS
Interaction -M X S	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Interaction -S X M	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
CV(%)	1.5	2.97	2.58	2.63	36.13	2.07	1.53	4.7	5.96	0.96	0.77	4.51

*Rice husk ash, M – Main plot (Nutrient management), S – Subplot (Varieties), MCP- Moncompu, TTB- Titabar

Table 5.4.8: Management of acid soils (*Kharif*-2022)

Post-harvest soil characteristics at Mizoram

Treatments	Soil pH	Soil SOC (mg/g)	Available N (kg/ha)	Available P (kg/ha)	Available K (kg/ha)
	V2	V2	V2	V2	V2
RDF	5.45	1.99	104.72	17.22	184.25
RDF + Silixol	5.52	1.99	102.85	18.84	188.50
RDF + RHA*	5.46	2.1	111.07	19.22	174.50
RDF + Dolomite	5.56	1.96	112.37	15.98	174.50
RDF + Dolomite + Silixol	5.53	2.09	119.84	17.53	188.25
RDF + Dolomite + RHA	5.47	1.98	111.07	22.10	179.75
RDF + K-Silicate	5.47	2.06	114.05	16.84	181.75
Experimental mean	5.49	2.02	110.85	18.25	181.57
CD (0.05)	NS	NS	NS	NS	NS
CV(%)	1.47	9.87	5.63	16.53	6.16

*Rice husk ash, V2= Mahipou 6

5.5: Residue management in rice based cropping systems

In India, huge quantities of crop residues (about 371 million tons) are produced annually of which paddy residues constitute 51–57%. The disposal of paddy residues has become a big problem, particularly in North-West Indian states, mainly due to the use of combine harvester and 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 environment by depleting air quality, emitting greenhouse gases (GHGs), but also causes smog in the environment, results in loss of appreciable amount 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 important 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*-2018, 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 nine centers *viz*., Faizabad (FZB), Kanpur (KPR), Karaikal (KRK), Kaul (KUL), Khudwani (KHD), Maruteru (MTU), Moncompu (MCU), Pantnagar (PNT) and Pusa (PSA).

The treatments in the current year were simplified to five combinations consisting of application of recommended dose of fertilizers (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 along with an absolute control (Table 5.5.1.). Pusa Decomposer is a microbial consortium, capable of producing hydrolytic enzymes responsible for the degradation of the polysaccharides in plant cell wall resulting in faster decomposition.

The test varieties were Samba Mahsuri Sub-1 at FZD, Sarjoo-52 at KPR, ADT 37 at KRK, Basmati CSR 30 at KUL, Shalimar Rice-4 at KHD, MTU-1064 at MTU, Uma at MCU, Pant Dhan-18 at PNT and Rajendra Nilam at PSA. The details of crop, soil and weather parameters of the experimental sites (Table 5.5.2) show variation in soil characteristics with

reference to pH, organic carbon content, soil texture and available nutrient status. The data from nine locations are presented in Tables 5.5.3 to 5.5.6.

Rice productivity

Data presented in Tables 5.5.3 shows that the rice productivity significantly varied with the source of nitrogen. Application of 100% RDF resulted in significantly highest grain yield at two centers *viz*., FZD (4484 kg/ha) and KHD (7550 kg/ha). Supplementation of 50% recommended N through residues along with microbial culture (Pusa Decomposer) gave yields on par with 100% RDF at more than half of the centers studied *viz*., KNP, KUL, MCU, PNT and PSA. At MTU and KRK the treatment differences were not significant. The results prove that the crop residues in combination with Pusa decomposer can be deployed to substitute half of the recommended nitrogen without yield penalty. Similar trend was also observed for straw yield as well.

Nutrient uptake and use efficiency

Data presented in Table 5.5.4 show significant effect of 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 (33-187 kg N/ha, 7-54 kg P/ha and 23-467 kg K/ha) which were at par with each other and significantly higher than absolute control, across the centers.

Data presented in Table 5.5.5 show lower nutrient use efficiencies in RDF as compared to crop residue treatments which were mostly at par with each other.

Post-harvest soil nutrient status:

The available nutrient status (N, P and K) of soils at are presented in Table 5.5.6. 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

The disposal of huge quantity 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 amount of plant essential nutrients besides being deleterious to soil microbes. The trial was conducted this year at nine centres. The results show that supplementation of nitrogen (50%) through crop residues either alone or in combination with GM (50%) and 50% RDF with or without Pusa Decomposer, gave on par yields with

100% RDF at majority of the centres. The different crop residue treatments resulted in nutrient uptake values of 33-187 kg N/ha, 7-54 kg P/ha and 2-467 kg K/ha which were at par with each other and significantly higher than absolute control, across the centres. Post-harvest soil nutrient status was not influenced much by various residue treatments which were at par with each other.

- **Crop residues along with Pusa decomposer can be deployed to substitute half of the recommended nitrogen without yield penalty.**
- **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	Treatment
1	Absolute control
2	100% RDF (Recommended Dose of Fertilizer)
3	50% Residue + 50% RDF
4	50% Residue + 50% RDF + Pusa decomposer
5	50% Residue + 50% GM/GLM

Table: 5.5.2 Residue management in RBCS Crop and soil characteristics

Parameter	**FZD [1]**	**KNP [2]**	**KRK [3]**	**KUL [4]**	**KHD [5]**	**MTU [6]**	**MCU [7]**	**PNT [8]**	**PSA [9]**
Cropping system	Rice-Wheat	Rice-Wheat	Rice-Wheat	Rice-Wheat	Rice-Wheat	Rice-Rice	Rice - Rice	Rice-Wheat	Rice-wheat
Variety									
Kharif	Samba Mahsuri Sub-	Sarjoo-52	ADT 37	Basmati CSR 30	Shalimar Rice-4	MTU-1064	Uma	Pant Dhan-18	Rajendra Nilam
Rabi	-	-	-	-	-	-	-	-	-
RFD (Kg NPK/ha)									
Kharif	120:60:60:25	120:60:60	150: 60: 60	-	120:60:30	90: 60: 60	90: 45: 45	120:60:30	120:60:40:25
Rabi	-	-	-	-	-	-	-	-	
Crop growth									
Kharif	Good	Good	Good	Good	Good	Good	Good	Good	Good
Rabi	-	-	-	-	-	-	-	-	-
Soil data									
% clay	23	17.83	17.4	-	37	38	-	25.9	15
% silt	21	22.77	2.0	-	45	28	-	61.4	29
% sand	56	59.40	82.76	-	18	34	-	12.9	56
Soil Texture	Sandy Loam	Sandy Loam	Sandy loam	Clay loam	Silty clay loam	Clay loam	Sandy loam	Silty clay loam	Sandy loam
pH (1:1)	7.6	7.8	5.91	8.1	6.4	6.12	5.09	7.4	8.3
Org. carbon (%)	0.4	0.49	0.21	0.5	0.67	1.36	3.18	0.58	0.52
CEC [c mol (p+)/kg]	13.5	-	10.2	-	-	48.6	-	23.5	-
EC (ds/m)	1.04	0.56	0.071	0.15	0.21	0.69	0.07	0.35	0.29
Avail.N (kg/ha)	215	219	325	171	302	132	369.8	164	254
Avail. P_2O_5 (kg/ha)	25	23.2	20.5	26.8	32.6	50.07	51.1	10.8	31.5
Avail. K_2O (kg/ha)	237	209	207.7	399	253	440	189.3	210	143.4

Table: 5.5.3 Residue management in RBCS
Grain and straw yields (*Kharif* 2022)

Treatment	Grain yield (kg/ha)									Straw yield (kg/ha)								
	FZD [1]	KNP [2]	KRK [3]	KUL [4]	KHD [5]	MTU [6]	MCU [7]	PNT [8]	PSA [9]	FZD [1]	KNP [2]	KRK [3]	KUL [4]	KHD [5]	MTU [6]	MCU [7]	PNT [8]	PSA [9]
Absolute control	2376	1883	3333	2058	5613	-	3550	2338	3525	3355	2560	12750	4598	6325	-	5863	2655	5325
100% RDF (Recommended Dose Fertilizer)	4484	4550	4375	3106	7550	5228	5213	4580	5413	6152	6288	12250	7162	8413	9054	8538	5325	8078
50% Residue + 50% RDF	3250	4025	4333	3098	6525	5258	4800	4093	4803	4429	5546	13584	7053	7350	8588	7700	4958	6908
50% Residue + 50% RDF + Pusa decomposer	3679	4283	4209	2959	6700	5250	4975	4653	5180	5006	5740	14042	7118	7663	8492	8050	5325	7343
50% Residue + 50% GM/GLM	2930	3706	4250	3051	6050	5370	5063	4050	4408	3973	5109	13250	7007	6575	8934	8163	4548	6288
Expt. Mean	3344	3690	4100	2854	6488	5276	4720	3943	4666	4583	5048	13175	6587	7265	8767	7663	4562	6788
CD (0.05)	152	399	NS	470	719	NS	722	118	696	224	618	NS	480	1433	NS	478	284	1046
CV (%)	3.0	7.0	13.1	10.7	7.2	9.3	9.9	1.9	9.7	3.2	8.0	17.4	4.7	12.8	6.6	4.1	4.0	10.0

Table: 5.5.4 Residue management in RBCS
Nutrient uptake (Kg/ha) in total dry matter (*Kharif* 2022)

Treatment	FZD [1]			KPR [2]			KRK [3]			KUL [4]			KHD [5]			MTU [6]			MCU [7]			PNT [8]			PSA [9]		
	N	P	K	N	P	K	N	P	K	N	P	K	N	P	K	N	P	K	N	P	K	N	P	K	N	P	K
Absolute control	40	14	23	33	8	35	143	7	343	48	18	66	91	16	84	-	-	-	64	27	79	41	7	32	57	14	82
100% RDF (Recommended Dose Fertilizer)	106	45	56	93	25	94	165	18	401	82	34	111	136	25	114	65	38	169	116	54	139	103	23	97	97	24	137
50% Residue + 50% RDF	62	25	39	85	22	85	170	9	467	79	32	108	114	21	102	71	31	146	89	44	110	89	17	83	82	20	113
50% Residue + 50% RDF + Pusa decomposer	77	32	47	94	24	89	187	13	464	78	33	108	116	21	101	60	22	203	100	45	122	99	22	95	89	21	122
50% Residue + 50% GM/GLM	52	18	27	80	20	79	160	10	464	77	30	105	102	19	86	53	27	147	106	50	129	83	16	77	74	17	100
Expt. Mean	67	27	38	77	20	76	165	11	428	73	29	100	112	20	97	62	30	166	95	44	116	83	17	77	80	19	111
CD (0.05)	5.4	3.0	12.5	8.2	2.8	9.9	NS	4.9	NS	8.5	3.7	8.5	12.4	2.5	16.7	10.8	3.3	26.3	13.4	5.8	7.6	3.3	2.4	4.9	NS	NS	NS
CV (%)	5.2	7.4	5.3	6.9	9.1	8.4	19.7	28.4	17.3	7.6	8.4	5.5	7.2	7.8	11.1	10.9	6.9	9.9	9.1	8.6	4.2	2.6	9.1	4.1	8.6	10.0	10.6

Table: 5.5.5 Residue management in RBCS
Nutrient use efficiency (kg grain/kg uptake) (*Kharif* 2022)

Treatment	FZD [1]			KPR [2]			KRK [3]			KUL [4]			KHD [5]			MTU [6]			MCU [7]			PNT [8]			PSA [9]		
	N	P	K	N	P	K	N	P	K	N	P	K	N	P	K	N	P	K	N	P	K	N	P	K	N	P	K
Absolute control	59.8	175.5	102.9	57.0	234.2	54.3	23.4	512.7	10.1	66.5	43.2	113.8	61.0	347.2	67.3	-	-	-	55.6	133.5	44.9	57.2	345.3	74.6	62	257	43
100% RDF (Recommended Dose Fertilizer)	42.2	100.1	69.7	48.9	181.8	48.4	26.7	254.8	11.4	111.3	38.0	91.2	55.6	305.0	66.3	81.4	137.3	31.0	44.7	98.0	37.9	44.5	200.9	47.6	55	230	40
50% Residue + 50% RDF	52.8	133.0	84.0	47.3	179.0	47.3	26.1	481.5	9.3	107.6	39.1	95.9	57.1	306.6	65.8	73.9	172.1	36.7	54.4	110.4	43.8	45.9	247.5	49.1	58	244	42
50% Residue + 50% RDF + Pusa decomposer	47.5	116.6	77.8	45.5	175.7	48.1	24.4	356.7	9.5	108.6	37.7	91.1	57.8	316.2	66.3	89.1	237.6	26.5	49.8	111.5	40.9	46.8	209.7	49.2	58	245	42
50% Residue + 50% GM/GLM	56.8	159.7	96.1	46.3	184.3	47.2	26.9	464.7	9.9	105.4	39.7	101.6	59.8	323.0	71.7	102.4	196.8	37.0	47.8	103.0	39.4	48.8	253.1	52.4	60	253	44
Expt. Mean	51.8	137.0	86.1	49.0	191.0	49.1	25.5	414.1	10.0	99.9	39.5	98.7	58.3	319.6	67.5	86.7	185.9	32.8	50.5	111.3	41.4	48.6	251.3	54.5	58.9	246	42.3
CD (0.05)	2.1	8.9	4.4	1.9	15.4	2.1	NS	184.1	NS	2.4	7.1	NS	NS	NS	NS	15.1	30.7	NS	5.2	NS	NS	1.5	25.4	5.2	NS	NS	NS
CV (%)	2.7	4.2	3.3	2.5	5.3	2.8	17.8	28.9	22.3	5.5	4.0	4.6	5.7	6.2	14.2	10.9	10.3	13.8	6.7	16.3	9.1	2.0	6.6	6.2	4.4	5.0	8.6

Table: 5.5.6 Residue management in RBCS
Post-harvest nutrient status of soil (kg/ha) (*Kharif* 2022)

Treatment	KAN			KRK			KUL			KHD			MTU			MCU			PNT			PSA		
	N	P	K	N	P	K	N	P	K	N	P	K	N	P	K	N	P	K	N	P	K	N	P	K
Absolute control	192.0	20.2	207.0	65.9	22.5	89.5	167.6	22.7	387.9	278.0	13.0	189.1	-	36.1	-	330.9	36.1	178.4	214.1	13.5	150.3	240.8	19.5	208.4
100% RDF (Recommended Dose Fertilizer)	212.0	22.8	210.0	94.9	16.7	65.1	182.3	33.7	416.9	283.3	15.8	222.7	204.3	43.1	212.0	345.9	43.1	198.7	247.4	20.2	184.4	268.8	27.4	233.9
50% Residue + 50% RDF	197.0	22.2	199.0	100.4	15.1	249.7	178.9	29.3	404.8	297.1	14.1	210.7	204.3	44.9	272.3	342.9	44.9	206.0	247.4	19.0	165.5	261.8	25.2	225.5
50% Residue + 50% RDF + Pusa decomposer	206.0	21.9	201.0	104.3	12.8	141.1	181.2	31.6	412.7	299.6	13.9	209.7	198.3	42.4	342.8	349.1	42.4	207.4	251.2	18.6	173.3	264.6	26.0	228.1
50% Residue + 50% GM/GLM	199.0	21.2	208.0	101.1	23.3	230.7	175.8	28.9	403.8	302.1	13.3	204.8	203.5	45.0	282.0	352.3	45.0	200.1	241.7	16.6	174.8	254.8	22.9	221.1
Expt. Mean	203.5	22.0	204.5	100.2	17.0	171.7	179.5	30.8	409.6	295.5	14.3	212.0	202.6	43.9	277.3	347.5	43.9	203.0	246.9	18.6	174.5	262.5	25.4	227.1
CD (0.05)	NS	NS	NS	17.55	7.57	99.17	9.31	3.35	13.83	NS	1.34	13.96	NS	5.19	37.24	12.40	5.19	7.97	4.20	1.65	7.53	13.80	2.59	13.16
CV (%)	6.05	7.17	7.35	12.21	27.19	41.47	3.41	7.45	2.21	5.33	6.21	4.37	13.37	7.97	8.4	2.34	7.97	2.61	1.14	6.11	2.88	3.47	6.93	3.82

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 in production, rise in photosynthesis, and significant expansion in the leaves' surface area. It would be very helpful if we use nano-fertilizer 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-fertilizer in increasing the growth and yield of rice crops and 2. To find out the nutrient use efficiency of nano-fertilizers in rice crops. A total of Six 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) **T6**: Control (no application of fertilizer) were taken in this trial. The trial was conducted in RBD and replicated thrice. The trial was conducted in collaboration with Agronomy in a total of 23 locations (Jagdalpur-JDP, Jagtial-JGL, Khudwani-KHD, Mandya-MND, Maruteru-MTU, Moncompu-MNC, Pantnagar-PNT, Pattambi-PTB, Puducherry-PDU, Pusa-PSA, Rajendranagar-RNR, Warangal-WGL, Nellore-NLR, Navsari-NVS, Bankura-BNK, Coimbatore-CBE, Kanpur-KNP, Karaikal-KRL, Ranchi-RCI, Sabour-SBR, Chatha-CHT and Faizabad-FZB). 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 followed.

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 (Table 5.6.2). 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 (330, 229), Jagdalpur (240, 240), Faizabad (281,278), Chata (248, 225), ARI (301, 273), Mandya (361, 329), Pantnagar (248, 241), Moncompu (309, 236), Warangal (350, 326), which was on par with the recommended dose of N treated plots. At a few centers, application of 75% RDN and two

sprays of nano urea recorded higher tiller and panicle numbers (per m^2) *i.e.*, Karaikal (498, 441), Khudwani (313, 299), Pattambi (238, 238), Coimbatore (386, 364), respectively. Whereas, the application of 50% RDN combined with two sprays (T3) and 75% RDN alone also improved the tiller numbers in all centers over absolute control but not to the level of T1 treatment. In general, the order of improvement was observed as T6<T4=T3<T5<T1=T2 across the locations. A similar trend was observed in panicle number also (Table 5.6.3).

Grain and straw yields at all the locations showed significant differences with the addition of nano urea treatments (Table 5.6.3). Application of 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., Kanpur (5.32 and 6.93 t/ha), Jagdalpur (5.50 and 7.50 t/ha), Faizabad (6.00 and 8.22 t/ha), Chatha (3.12 and 7.02 t/ha), Kaul (6.48 and 6.67 t/ha), Mandya (6.07 and 8.79 t/ha), Pantnagar (5.29 and 5.98 t/ha), Sabour (5.26 and 6.43 t/ha), Warangal (6.43 and 7.20 t/ha), Moncompu (5.11 and 6.01 t/ha), Jagtial (7.21 and 5.78 t/ha), respectively. At Bankura (5.87 and 7.55 t/ha), Karaikal (5.44 and 8.82 t/ha) Khudwani (7.70 and 7.75 t/ha), Coimbatore (6.72 and 8.87 t/ha), Pattambi (5.04 and 8.00 t/ha) and Puducherry (6.77 and 9.99 t/ha) exhibited highest grain and straw yields to the application of 75% RDN along with two sprays of nano urea followed by 100% RDN + two sprays of nano urea. While at Navsari and Pusa centers, RDN outperformed and registered higher grain yields i.e., 5.51 and 4.50 t/ha, respectively.

The N uptake of rice plants was documented and represented in table 5.6.4. Additional application of nano urea (two sprays) with RDN registered the highest N uptake in rice plants grown at Chatha (46.4 kg/ha), Jagadalpur (134.8 kg/ha), Jagtial (136.1 kg/ha), Kanpur (103.3 kg/ha), Pantnagar (88.9 kg/ha), Ranchi (91.6 kg/ha), Sabour (99.6 kg/ha) and Kaul (119.9 kg/ha), respectively followed by two sprays of nano urea in addition to 75 % RDN, which was on par with T1 (100% RDN). Whereas in Puducherry, the order of N uptake varies with the season *i.e.* during Kharif 100% RDN + two sprays (141.0 kg/ha) registered the highest N uptake, while during Rabi T3 registered the highest N uptake (152.3 kg/ha). A combination of 75% RDN + two sprays of nano urea effectively improved the N uptake at Coimbatore (120.4 kg/ha) and Khudwani (159.8 kg/ha). Whereas, RDN application recorded a high value of uptake at Pusa (80.8 kg/ha) and Navasari (100.8 kg/ha).

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 crop significantly improved the BC ratio (Economic returns) across the locations (Table 5.6.6). The highest benefit and returns were observed with T2 at Sabour (2.14), Pantnagar (1.43), Jagdalpur (1.89), Kanpur (1.99), Chatha (3.17) and Moncompu (2.22). Whereas, 75% RDN + two sprays of nano urea registered higher benefits at Pattambi (2.11) and Coimbatore (2.58), respectively. At Pusa and Khudwani centers, RDN recorded the highest returns (2.47 and 2.20, respectively) than nano urea-involved treatments. 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.

Application of nano urea has increased the NUE (Agronomic efficiency) across the locations as given in table 5.6.7. The highest use efficiency was observed with T2 (100% RDN + two sprays of nano urea) at Kaul (16.8), Warangal (9.2), Sabour (19.9), Ranchi (16.2), ARI (13.9), Pantnagar (25.9), Mandya (24.7), Kanpur (17.7) and Jagtial (22.7). Application of 75% RDN plus two sprays recorded higher AE at Bankur (12.1), Khudwani (17.8) and Karaikal (11.0), respectively. While at Pusa and Navasari, 100% RDN exhibited higher NUE than other treatments.

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 respect to the tiller, panicle numbers, yield and N uptake at Jagdalpur Faizabad, Chata, ARI, Mandya, Pantnagar, Moncompu, Sabour, Kanpur and Warangal. But, application of 75% + two sprays of nano urea was found better at Karaikal, Kanpur, Coimbatore, Mandya, Bankura, Khudwani, Pattambu, and Puducherry for the tiller, panicle numbers and grain yield parameter. At Bankura, Khudwani and Karaikal, the higher NUE was observed with with 75% RDN + two sprays of nano urea treatment while 100% RDN + two sprays of nano urea treatment registered a higher NUE at rest of the locations.

- **At the end of second year study, additional input of nano urea (two sprays) along with either 75% RDN or 100% RDN was found better for yield, B:C ratio, N uptake and nutrient use efficiency at 61% locations.**

Table 5.6.1: List of centers with trial details

S. No	Centre name	Variety	Soil Type	Soil values (Initial)	Fertilizer Dose
1.	Jagdalpur	-	-	-	100:60:30
2.	Jagtial	JGL 24423		195.3:54.7:442	120:50:40
3.	Khudwani		Silty clay	317:1736:232	120:60:30
4.	Mandya	93-R	Red Sandy Loam	270:61.4:226.8	100:50:50
5.	Maruteru	-	-	-	-
6.	Moncompu		Clay Loam	372:69.4:182.3	-
7.	Pantnagar	PD-24	Silty Loam	231:22.3:221	67.5:21:23
8.	Pattambi	-	-	-	94:45:45
9.	Puducherry	ADT 54	Clay Loam	123:11.4:105	120:40:40
10.	Pusa	Rajendra Sweta	Sandy Loam	224:12.5:135	120:60:40
11.	ARI, Rajendranagar	JGL 24423	Clay Loam		120:60:40
12.	Warangal		Clay Loam		120:60:40
13.	Nellore	NLR 3354		213:60:288	120:60:40
14.	Navsari		Clay	271:28:736	100:30:0:0
15.	Bankura	Ajit			
16.	Coimbatore		Clay Loam	227:18.2:411	150:50:50
17.	Kanpur		Sandy Loam	219:23.2:209	120:60:60
18.	Karaikal				150:50:50
19.	Ranchi	MTU 1010			120:60:40
20.	Sabour		Silty Loam		100:40:20
21.	Chatha	Basmati-370	Sandy clay loam	245:14.3:146.3	30:20:10
22.	Faizabad	NDR 2065	Sandy Loam	215:25:235	120:60:60
23.	Kaul	HKR 127	Clay loam		120:60:60:25

Table 5.6.2: Effect of nano urea application growth parameters of Rice (Tiller (T) and Panicle (P) Numbers per m^2)

Treat.	BNK		KRK		KNP		JDP		KHD		FZB		CHT	
	T	P	T	P	T	P	T	P	T	P	T	P	T	P
T1	155	148	471	400	290	271	208	206	314	296	256	251	224	201
T2	146	138	463	435	330	299	240	240	305	281	281	278	248	225
T3	186	179	432	394	265	261	175	174	303	287	247	243	196	174
T4	191	183	445	357	275	265	179	178	307	281	217	202	199	175
T5	158	151	498	441	310	285	200	197	313	299	265	259	215	193
T6	188	177	356	332	318	260	139	138	287	257	181	172	152	139
Mean	**170**	**162**	**444**	**393**	**297**	**273**	**190**	**188**	**304**	**283**	**241**	**234**	**205**	**184**
CD (0.05)	**10.2**	**10.4**	**60.9**	**63.4**	**30.9**	**27.5**	**30.7**	**31.2**	**30.2**	**26.9**	**15.6**	**12.6**	**6.3**	**4.7**
CV (%)	**3.3**	**3.5**	**7.5**	**8.9**	**5.7**	**5.5**	**8.8**	**9.0**	**5.4**	**5.2**	**3.5**	**2.9**	**1.8**	**1.4**

T= Tiller numbers per m^2, P = Panicle number per m^2

Cont… Table 5.6.2: Effect of nano urea application growth parameters of Rice (Tiller (T) and Panicle (P) Numbers per m^2)

Treat.	PTB		NLR		CBT		ARI, Rajendranagar		MND		NVS		PNR	
	T	P	T	P	T	P	T	P	T	P	T	P	T	P
T1	201	201	372	339	363	342	253	242	336	306	187	170	248	233
T2	207	207	326	290	376	354	301	273	361	329	181	162	248	241
T3	223	223	348	327	346	324	239	215	291	265	165	153	209	204
T4	207	207	429	416	358	336	226	222	304	258	169	151	217	213
T5	238	238	425	332	386	364	241	225	324	282	173	156	235	232
T6	195	195	262	248	222	210	202	199	276	213	161	136	158	146
Mean	**211**	**211**	**360**	**325**	**341**	**321**	**243**	**229**	**315**	**275**	**172**	**154**	**219**	**211**
CD (0.05)	**15.2**	**15.2**	**71**	**64.7**	**10.2**	**13.2**	**20.6**	**20.3**	**52.8**	**37.5**	**16.5**	**19.9**	**7.0**	**16.5**
CV (%)	**3.9**	**3.9**	**10.8**	**10.9**	**1.6**	**2.3**	**5.6**	**5.8**	**9.2**	**7.5**	**5.3**	**7.1**	**1.8**	**4.3**

T= Tiller numbers per m^2, P = Panicle number per m^2

Contd… Table 5.6.2: Effect of nano urea application growth parameters of Rice (Tiller (T) and Panicle (P) Numbers per m^2)

Treat.	PDU (K)		PDU (R)		MNC		SBR		PSA		WGL		RCI	KUL	JGL	MTU
	T	P	T	P	T	P	T	P	T	P	T	P	P	P	P	P
T1	320	300	342	316	266	226	288	212	336	231	349	323	246	366	427	272
T2	340	235	336	308	309	236	292	215	291	217	350	326	272	381	403	289
T3	311	291	374	351	260	205	223	164	317	192	342	304	211	336	324	246
T4	311	321	357	335	264	205	234	175	317	226	346	315	232	358	370	252
T5	362	350	368	344	277	194	244	180	328	230	348	320	246	364	395	250
T6	299	259	307	277	242	154	193	142	248	211	341	300	181	372	317	214
Mean	**327**	**292**	**347**	**321**	**269**	**203**	**246**	**181.8**	**306**	**217**	**346**	**315**	**231**	**363**	**372**	**253**
CD (0.05)	**7.6**	**8.2**	**7.8**	**4.0**	**38.3**	**12.0**	**31**	**30.2**	**18.3**	**23.8**	**6.3**	**11.6**	**38.0**	**11.1**	**75.0**	**21.5**
CV (%)	**1.3**	**1.5**	**1.3**	**0.7**	**7.8**	**3.3**	**6.9**	**9.14**	**3.3**	**5.9**	**1.0**	**2.0**	**11.1**	**2.0**	**11.0**	**4.6**

T= Tiller numbers per m^2, P = Panicle number per m^2

Table 5.6.3: Effect of nano urea application growth parameters of Rice (Grain (t/ha) and straw yield (t/ha))

Treatments	BNK		KRK		KNP		JDP		KHD	
	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw
T1	5.19	6.57	4.97	9.15	5.02	6.50	4.72	6.63	7.63	7.69
T2	5.49	6.52	4.51	7.99	5.32	6.93	5.50	7.50	7.40	7.50
T3	5.36	6.56	5.02	8.08	4.59	5.68	4.00	5.82	7.50	7.58
T4	5.67	7.09	4.84	8.99	4.86	5.87	4.05	5.67	7.40	7.49
T5	5.87	7.55	5.44	8.82	5.24	6.83	4.63	6.52	7.70	7.75
T6	4.90	5.54	3.79	5.72	3.20	3.41	3.12	4.50	5.57	5.61
Mean	**5.41**	**6.64**	**4.76**	**8.2**	**4.70**	**5.87**	**4.33**	**6.10**	**7.20**	**7.27**
CD (0.05)	**0.10**	**0.67**	**0.9**	**1.9**	**0.49**	**0.61**	**0.7**	**1.1**	**0.70**	**0.56**
CV (%)	**1.1**	**5.5**	**10.6**	**12.9**	**5.7**	**5.7**	**9.78**	**9.9**	**5.30**	**4.2**

Contd….Table 5.6.3: Effect of nano urea application growth parameters of Rice (Grain (t/ha) and straw yield (t/ha))

Treatments	FZB		CHT		CBT		KUL		MND	
	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw
T1	5.14	6.95	2.89	6.51	6.06	8.62	6.22	6.47	5.39	7.94
T2	6.00	8.22	3.12	7.02	6.21	8.76	6.48	6.67	6.07	8.79
T3	4.44	6.24	2.73	6.06	5.92	7.98	5.69	6.38	4.83	6.47
T4	3.80	5.22	2.78	6.26	5.98	8.12	5.99	6.24	4.97	6.86
T5	5.55	4.56	2.81	6.33	6.72	8.87	6.23	6.36	5.57	7.89
T6	2.12	3.08	2.19	4.39	2.05	3.77	4.00	4.27	3.61	5.10
Mean	**4.50**	**6.21**	**2.75**	**6.09**	**5.49**	**7.68**	**5.77**	**6.06**	**5.07**	**7.2**
CD (0.05)	**0.18**	**0.18**	**0.05**	**0.10**	**0.08**	**0.12**	**0.51**	**0.41**	**0.62**	**0.69**
CV (%)	**2.20**	**1.62**	**0.91**	**0.94**	**1.0**	**1.0**	**5.9**	**4.6**	**6.8**	**5.3**

Contd….Table 5.6.3: Effect of nano urea application growth parameters of Rice (Grain (t/ha) and straw yield (t/ha))

Treatments	PTB		NLR		NVS		PNR		PSA	
	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw
T1	4.07	5.78	5.34	7.20	5.51	7.22	4.86	5.55	4.50	8.06
T2	4.44	8.17	4.97	6.11	5.48	6.93	5.29	5.98	4.34	6.76
T3	4.42	6.91	5.30	6.56	4.66	6.37	3.57	4.13	3.63	7.46
T4	3.77	5.45	5.62	7.44	4.89	6.52	4.04	4.44	4.13	8.13
T5	5.04	8.0	4.81	7.83	4.42	6.66	4.82	5.08	4.40	6.76
T6	3.28	5.61	3.98	5.47	3.99	5.49	2.18	2.50	3.10	6.60
Mean	**4.17**	**6.82**	**5.00**	**6.76**	**4.83**	**6.53**	**4.13**	**4.62**	**4.01**	**7.29**
CD (0.05)	**0.60**	**2.12**	**0.39**	**0.41**	**0.70**	**1.02**	**0.36**	**0.63**	**0.48**	**NS**
CV (%)	**7.95**	**17.1**	**4.34**	**3.35**	**8.0**	**8.61**	**4.9**	**7.5**	**6.6**	**15.8**

Contd….Table 5.6.3: Effect of nano urea application growth parameters of Rice (Grain (t/ha) and straw yield (t/ha))

Treatments	PDU (K)		PDU (R)		SBR		WGL		MNC	
	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw
T1	6.24	9.24	6.45	9.51	4.88	5.98	6.27	7.13	4.76	5.75
T2	6.57	9.63	6.06	8.96	5.26	6.43	6.43	7.20	5.11	6.01
T3	6.17	9.07	7.01	10.4	4.04	4.95	5.93	6.70	3.59	4.63
T4	6.38	9.42	6.69	9.86	4.48	5.47	5.80	6.80	4.11	5.11
T5	6.77	9.99	6.81	10.6	4.83	5.91	6.13	7.00	4.18	5.28
T6	4.70	6.77	4.71	7.24	3.26	3.99	5.33	6.27	2.97	4.06
Mean	**6.14**	**9.02**	**6.28**	**9.42**	**4.45**	**5.45**	**5.98**	**6.85**	**4.13**	**5.14**
CD (0.05)	**0.26**	**0.31**	**0.22**	**0.10**	**0.37**	**0.43**	**0.97**	**0.86**	**0.63**	**1.04**
CV (%)	**2.3**	**1.8**	**1.91**	**0.64**	**4.5**	**4.35**	**8.9**	**6.91**	**8.5**	**11.2**

Contd….Table 5.6.3: Effect of nano urea application growth parameters of Rice (Grain (t/ha) and straw yield (t/ha))

Treatments	JGL		ARI, Rajendranagar	RCI	MTU		GNG	
	Grain	Straw	Grain	Grain	Grain	Straw	Grain	Straw
T1	6.52	5.16	6.60	4.55	5.32	6.21	5.13	5.89
T2	7.21	5.78	6.79	4.86	5.68	6.62	5.71	6.58
T3	5.55	4.28	6.01	3.86	4.54	5.38	6.19	6.19
T4	6.14	4.38	6.22	4.22	4.96	5.78	5.46	5.46
T5	6.46	4.67	6.58	4.44	4.99	5.88	6.16	6.16
T6	4.50	3.85	5.07	3.16	4.22	5.00	4.26	4.26
Mean	**6.12**	**4.68**	**6.21**	**4.18**	**4.90**	**5.81**	**5.01**	**5.76**
CD (0.05)	**0.59**	**0.65**	**0.56**	**0.61**	**0.86**	**0.99**	**0.33**	**0.38**
CV (%)	**5.3**	**7.6**	**6.01**	**9.72**	**9.52**	**9.35**	**3.67**	**3.67**

Table 5.6.4: Effect of nano urea application on total N uptake (kg/ha) in rice

Treats.	CHT	CBE	JDP	JGL	KNP	KHD	NVS	PNR	PDU (K)	PDU (R)	PSA	RCI	SBR	KUL
T1	45.7	112.3	114.6	116.5	87.9	157.5	100.8	80.1	135.7	138.0	80.8	84.3	94.7	112.0
T2	46.4	116.4	134.8	136.1	103.3	152.0	95.3	88.9	141.0	124.6	73.9	91.6	99.6	119.9
T3	39.6	104.7	98.5	84.7	66.9	154.6	84.1	62.0	125.0	152.3	67.5	72.6	81.9	105.3
T4	40.1	108.4	100.5	96.7	76.9	143.1	86.1	70.6	134.3	144.3	75.7	80.1	88.1	105.6
T5	42.2	120.4	115.8	105.7	98.6	159.8	81.5	86.6	142.7	145.3	74.3	84.7	93.8	114.4
T6	35.6	80.5	73.3	49.6	40.0	99.7	63.9	37.8	87.7	91.6	60.3	60.3	58.2	68.7
Mean	**41.6**	**107.1**	**106.2**	**98.2**	**78.9**	**144.4**	**85.3**	**71.0**	**127.7**	**132.7**	**72.0**	**78.9**	**86.1**	**104.3**
CD (0.05)	**0.30**	**1.8**	**19.2**	**7.1**	**11.6**	**13.2**	**12.7**	**7.4**	**8.0**	**7.6**	**9.4**	**8.2**	**5.5**	**8.7**
CV (%)	**0.40**	**0.9**	**9.9**	**3.9**	**7.8**	**5.0**	**8.2**	**5.7**	**3.4**	**3.2**	**7.2**	**6.9**	**3.5**	**5.6**

Table 5.6.5: Effect of nano urea application on available N (kg/ha) in soil

Treatments	SBR	KUL	PSA	PNT	NVS	KHD	JGL	CBE	CHT
T1	155.7	186.3	235	219	234.7	333	135.4	213	235
T2	156.2	189.5	235	216	235.7	332	122.8	217	239
T3	150.7	177.4	230	219	239.3	338	97.6	207	231
T4	156.8	181.5	235	220	243.0	329	110.2	210	226
T5	155.9	183.7	233	223	224.3	326	116.5	218	230
T6	144.8	172.6	216	212	236.7	307	94.5	197	223
Mean	**153.4**	**181.8**	**231**	**218**	**235.6**	**327**	**112.8**	**210**	**236**
CD (0.05)	**1.6**	**6.9**	**5.8**	**2.8**	**45.8**	**17.5**	**23.6**	**3.7**	**1.9**
CV (%)	**0.6**	**2.5**	**1.4**	**0.7**	**10.7**	**2.9**	**11.5**	**1.0**	**0.5**

Table 5.6.6: Effect of nano urea application on Benefit: Cost Ratio in rice

Treatments	SBR	PSA	PTB	PNT	NVS	CBE	JDP	KNP	KHD	CHT	MND	MNC	GNG
T1	1.97	2.47	1.72	1.25	1.81	2.46	1.61	1.91	2.20	2.87	1.88	2.19	1.61
T2	2.14	2.29	1.86	1.43	1.73	2.36	1.89	1.99	2.00	3.17	2.01	2.22	1.74
T3	1.66	1.93	1.86	0.80	1.54	2.29	1.42	1.71	2.07	2.35	1.65	1.68	1.66
T4	1.84	2.25	1.60	1.05	1.63	2.45	1.52	1.82	2.06	2.77	1.75	1.94	1.50
T5	2.02	2.33	2.11	1.41	1.48	2.58	1.55	1.97	2.10	2.81	1.86	1.89	1.64
T6	1.32	1.85	1.42	0.32	1.40	1.13	1.08	1.26	1.47	1.99	1.34	1.46	1.22
Mean	**1.82**	**2.19**	**1.72**	**1.04**	**1.59**	**2.22**	**1.52**	**1.77**	**2.20**	**2.66**	**1.75**	**1.90**	**1.56**
CD (0.05)	**0.22**	**0.27**	**0.25**	**0.19**	**0.20**	**0.05**	**0.25**	**0.07**	**0.23**	**0.06**	**0.19**	**0.30**	**0.10**
CV (%)	**6.7**	**6.9**	**7.86**	**10.0**	**6.8**	**1.12**	**8.95**	**8.20**	**6.4**	**1.33**	**5.89**	**8.7**	**3.67**

Table 5.6.7: Effect of nano urea application on Nutrient Use Efficiency (NUE) in rice

Treats.	BNK	KUL	WGL	SBR	RCI	ARI, RJNR	PSA	PDU (K)	PDU (R)	PNT	NLR	NVS	MND	KHD	KRK	KNP	JGL
T1	3.6	14.0	7.8	16.2	13.4	12.3	12.2	14.5	12.8	22.3	11.3	15.2	17.9	17.2	7.9	15.2	19.7
T2	7.4	16.8	9.2	19.9	16.2	13.9	10.7	11.3	15.6	25.9	8.2	14.9	24.7	15.3	4.8	17.7	22.7
T3	5.8	10.4	5.0	7.8	5.6	7.8	4.2	19.2	12.2	11.5	11.1	6.7	12.2	16.1	8.2	11.5	8.8
T4	9.6	12.8	3.9	12.1	9.7	8.7	8.5	16.5	14.0	15.5	13.7	9.0	13.6	15.3	7.0	13.9	13.7
T5	12.1	14.9	6.7	15.6	11.9	12.5	10.9	17.5	17.2	21.9	6.9	4.4	19.6	17.8	11.0	17.0	16.4

5.7 Yield maximization of rice in different zones

5.7.1 (a)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); 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 14 locations (**Bankura, Chinsurah, Faizabad, Kanpur, Kaul, Khudwani, Mandya, Moncompu, Pantnagar, Pusa, Titabar, Maruteru, Puducherry, Karaikal).** 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 (6.41 t/ha) followed by 125% RDF of T_1 + FYM @ 5 t/ha (6.16 t/ha). The highest total K uptake was recorded under same treatment. However, the highest total P uptake (34.0 kg/ha) was recorded under plots received RDF + FYM @ 5 t/ha.

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).

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

The Coefficient of Variation of the trial conducted in sandy loam soils of **Karaikal** was very high (60.7). This data has to be rechecked. All the treatments resulted in similar grain yield (ranged from 5.11 to 6.07 t/ha). ADT 46 variety applied with RDF + FYM @ 10 t/ha resulted in the highest grain yield (6.07 t/ha).

For tables, refer Agronomy report

Trial 5.8. Evaluation of Organic fertilizers and Natural farming practices for enhancing the Productivity and soil health

The trial was conducted during *rabi* 2021-22 and *kharif*-2022 in collaboration with Agronomy to "Evaluate the Organic fertilizers and Natural farming practices for enhancing the productivity and soil heath" 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 nine treatments during *rabi* 2021-22-viz.,1) Absolute control (No: NPK), 2) 100% RDN, 3) 100% N (FYM), 4) 150% N (FYM), 5) 50% N (FYM)+ 50% N (Green manure/Green Leaf Manure, 6) 50% N (FYM)+ 50% N (Vermicompost), 7) 50% N (FYM)+ 50 % N (Neem / Castor/ any cake), 8) Optional 1: 75% RDN: 50% each through FYM + Vermicompost, 9) Optional 2: Best sate organic practice and during *kharif* 2022 the trial was modified with five treatments *viz 1)* Control, 2) Complete 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 conducting experiment and after harvest and were analyzed for important soil properties. The trial was conducted at eight locations *viz*., [Chinsurah-CHN, Moncompu-MNC, Mandya-MND, Khudwani-KHD, Pantnagar-PNT, Pusa-PSA, Pudhuchery-PUD and Titabar-TTB] during *kharif*- 2022 and at CHN and Karaikal-KRK during *rabi* 2021-22. The results are presented in Tables 5.8.1 to 5.8.19.

Grain, straw yield and yield parameters

Among the eight locations, grain yield during *kharif*-2022 (Table 5.8.2) was significantly superior in (T5) Integrated Crop Management (need based pesticides) [3.01, 6.73, 2.09, 3.52, 5.82, 4.85 t/ha] treatment as compared to other treatments recording 93%, 15%, 42% ,11%, 16%, 50% higher yield over complete natural farming, at MND, KHD, PNT, PSA, PUD and TTB, respectively. Whereas at CHN (5.13 t/ha) and MNC (4.83 t/ha) complete natural farming recorded higher grain yield which was 2.4% and 26 % higher as compared integrated crop management (need based pesticides), respectively. Straw yield followed a similar trend as that of grain yield at most of the locations (Table 5.8.3) recording 76%, 14%, 27% 18%, 15% and 23% higher yield in integrated crop management (need based pesticides) over complete

natural farming at MND, KHD, PNT, PSA, PUD and TTB, respectively. 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 MND, KHD, PNT, PSA, PUD and TTB, but at MNC complete natural farming treatment recorded significantly higher as compared to other treatments (Table 5.8.4 to 5.8.11).

At CHN location, during *rabi* 2021-22 (Table 5.8.12) grain and straw yields were significantly superior in inorganic RDF as compared to other treatments and with 48% and 42% higher grain and straw yields over Organic POP recommendation. With regard to tillers/m^2, panicles/m^2, 1000-grain wt. (g), in inorganic RDF recorded significantly higher values. Among the organic treatments, 50% N (FYM) + 50% N (Vermicompost) manure recorded higher yield and highest number of tillers/m^2 (292) and panicles/m^2 (272) and 1000-grain weight (20.20 g) as compare other organic treatments. At KRK location, during *rabi* 2021-22 (Table 5.8.13) performed significantly superior in 100% N (FYM) as compared to other treatments.

In sandy loam soils of Ghaghraghat, Integrated Crop Management resulted in the highest grain yield (4.88 t/ha) followed by Integrated Crop Management (Pest management) (4.57 t/ha). Similarly, in Raipur, Integrated Crop Management (Pest management) treatment resulted in the highest grain yield (4.34 t/ha) followed by Integrated Crop Management (4.12 t/ha). It was noticed that natural farming treatment resulted in lower grain yield (2.89 t/ha). (Tables for these two centres are given in Agronomy report).

Soil properties after harvest

At CHN, MND, PNT and PSA most of the soil properties improved with Integrated Crop Management (with organic pest management practices) and at MNC, KHD, PUD improved with AI-NPOF package, as organic treatments compared to other treatments. The important soil properties from eight locations (CHN, MNC, MND, KHD, PNT, PSA, PUD and TTB) are presented in Table (5.8.4, 5.8.14 to 5.8.19). At CHN, MND, PNT and PSA most of the soil properties improved with Integrated Crop Management (with organic pest management practices) and are on par in all treatments (Table 5.8.4, 5.8.16, 5.8.17 and 5.8.18) respectively. At and MNC, KHD, PUD improved with AI-NPOF package, as treatments compared to other treatments (Table 5.8.16, 5.8.18 and 5.8.12) respectively. At KRK and CHN most of the soil properties improved with 100% N (FYM), organic treatments compared to other treatments (Table 5.8.12 and 5.8.13) respectively.

Summary

The third year of study on "Enhancing productivity of Organic Rice cultivation", revealed that among the organic treatments, 50% N (FYM)+ 50% N (Vermicompost) manure recorded higher yield and yield parameters at CHN. At KRK and CHN most of the soil properties improved with 100% N (FYM) and organic treatments compared to other treatments.

In the first year of study on "Evaluation of Organic fertilizers and Natural farming practices for enhancing the productivity and soil heath", out of five treatments, Integrated Crop Management (with need based pesticides) was significantly superior as compared to other treatments at MND, KHD, PNT, PSA, PUD and TTB in terms of grain yield and yield parameters. At CHN, MND, PNT and PUSA most of the soil properties improved with Integrated Crop Management (with organic pest management practices) while at MNC, KHD and PUD, soil properties improved with AI-NPOF package compared to other treatments.

- **In the first 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 (with organic pest management practices of NF) 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	PSA	PUD	TTB
Cropping system	**Rice**	**Rice - Rice**	**Rice**	**Rice-Wheat**	**Rice-Wheat**	**Rice-wheat**	**Rice – Rice**	**Rice -Fallow**
Variety – *Kharif*	Sukumar	Pournami	KMP-175	Shalimar Rice-4	Pant Dhan-18	Rajendra Nilam	ADT 54	Bokul Joha
RDF (kg NPK/ha)		90:45:45	100:50:50	120:60:30	120:60:30	120:60:40	150:50:50	-
Crop growth:	-	-	-	-		-	-	-
Soil characteristic								
% Clay	-	-	-	37	25.9	15	-	35
% Silt	-	-	-	45	61.4	29	-	34
% Sand	-	-	-	18	12.9	56	-	27
Texture	Clay loam	-	-	Silty clay loam	Silty clay loam	Sandy loam	Clay loam	Silty Clay
pH (1:2)	7.51	4.87	7.4	6.3	7.4	8.3	6.71	5.3
Organic carbon (%)	1.2	3.19	0.54	0.67	0.58	0.52	0.29	0.58
CEC (cmol (p^+)/kg)	-	-	-		23.5	-	-	10.1
EC (dS/m)	0.4	0.14	0.12	0.25	0.35	0.29	0.24	0.13
Avail. N (kg/ha)	521	374.6	235.6	321	164	254	156	284

Table 5.8.2 Evaluation of Organic fertilizers and Natural farming practices for enhancing the productivity and soil health- Grain yield of *kharif* (Locations: CHN, MNC, MND, KHD, PNT, PSA, PUD and TTB)

Treatment	Grain yield (t/ha)							
	CHN	MNC	MND	KHD	PNT	PSA	PUD	TTB
Control	3.22	3.39	1.27	5.13	1.00	2.8	3.6	2.58
Complete NF	5.13	4.83	1.56	5.84	1.47	3.14	5.01	3.23
AI-NPOF package	5.11	3.71	2.23	6.34	1.79	3.05	5.21	3.45
Integrated Crop Management	4.97	4.03	2.96	6.75	2.04	3.45	5.73	3.58
Integrated Crop Management (Pest management)	5.01	3.83	3.01	6.73	2.09	3.52	5.82	4.85
Exp. mean	4.69	3.96	2.21	6.12	1.68	3.19	5.07	3.54
CD (0.05)	0.04	0.57	0.31	0.63	0.11	0.38	0.7	0.72
CV (%)	0.57	9.41	9.26	6.69	4.18	7.77	7.37	13.29

Table 5.8.3 Evaluation of Organic fertilizers and Natural farming practices for enhancing the productivity and soil health- Straw yield of *kharif* ((Locations: CHN, MNC, MND, KHD, PNT, PSA, PUD and TTB)

Treatment	Straw yield (t/ha)							
	CHN	MNC	MND	KHD	PNT	PSA	PUD	TTB
Control	4.29	4.46	1.54	6.25	1.28	4.12	5.11	6.35
Complete NF	6.82	8.62	2.02	6.95	1.79	4.5	7.12	7.75
AI-NPOF package	6.35	6.38	2.63	7.43	2.02	4.45	7.7	7.48
Integrated Crop Management	5.55	6.68	3.55	7.94	2.24	5.07	8.35	7.70
Integrated Crop Management (Pest management)	5.21	5.24	3.55	7.89	2.28	5.33	8.17	9.55
Exp.mean	5.64	6.27	2.66	7.29	1.92	4.69	7.29	7.77
CD (0.05)	0.25	1.07	0.38	0.9	0.04	0.57	0.93	1.43
CV (%)	2.9	11.06	9.25	8.01	1.31	7.84	6.81	11.96

Table 5.8.4 Evaluation of Organic fertilizers and Natural farming practices for enhancing the productivity and soil health- Yield parameters and Soil properties after harvest of *kharif* (Locations: CHN)

Treatment Name	Tiller Number/m^2	Panicle number/m^2	1000 grain wt (g)	Soil pH	Soil EC (dS m^{-1})	Soil OC (%)	Soil N (kg/ha)	Soil P (kg/ha)	Soil K (kg/ha)	Soil Zn (mg/kg)
Control	258	219	20.18	7.02	0.22	1.17	429.50	88.50	282.65	17.60
Complete NF	249	216	19.63	7.02	0.22	1.22	459.50	91.00	290.10	17.28
AI-NPOF package	259	225	19.65	7.06	0.21	1.10	470.00	93.50	291.15	17.23
Integrated Crop Management	264	227	19.80	7.05	0.21	1.12	486.25	99.25	296.10	17.15
Integrated Crop Management (Pest management)	247	214	20.95	7.06	0.21	1.19	490.25	95.25	290.20	17.20
Exp. mean	255	220	20.04	7.04	0.21	1.16	467.10	NS	290.04	NS
CD (0.05)	NS	NS	NS	NS	NS	NS	24.14	8.93	7.54	0.48
CV (%)	9.60	7.55	3.23	0.36	8.76	6.01	3.35	6.20	1.69	1.81

Table 5.8.5 Evaluation of Organic fertilizers and Natural farming practices for enhancing the productivity and soil health- Yield parameters and nutrient concentration (%) *kharif* (Location: MNC)

Treatment Name	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	165	145	26.50	0.95	0.25	0.29	21.03	0.50	0.24	1.13	23.43
Complete NF	199	170	29.68	1.19	0.33	0.38	24.48	0.67	0.34	1.31	28.10
AI-NPOF package	171	152	29.50	1.01	0.27	0.32	25.55	0.54	0.27	1.18	28.40
Integrated Crop Management	190	160	28.23	1.10	0.36	0.34	24.33	0.65	0.37	1.28	26.98
Integrated Crop Management (Pest management)	178	156	27.93	1.05	0.32	0.31	24.15	0.61	0.30	1.22	25.83
Exp. mean	180.60	157	28.37	1.06	0.31	0.33	23.91	0.59	0.30	1.22	26.55
CD (0.05)	6.03	2.73	0.64	0.12	NS	NS	NS	0.11	0.07	0.09	NS
CV (%)	2.17	1.13	1.46	7.12	16.80	18.39	12.49	12.30	15.13	5.02	11.19

Table 5.8.6 Evaluation of Organic fertilizers and Natural farming practices for enhancing the productivity and soil health- Yield parameters and nutrient concentration, *kharif* (Location: MND)

Treatment Name	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	161.00	140.50	18.81	0.81	0.06	0.28	5.93	0.53	0.04	0.32	8.17
Complete NF	162.25	147.50	19.72	0.87	0.08	7.98	5.81	0.54	0.03	0.42	8.70
AI-NPOF package	162.00	150.00	19.90	0.90	0.08	0.33	6.02	0.56	0.05	0.43	9.00
Integrated Crop Management	185.00	158.50	19.99	0.98	0.11	0.37	6.53	0.61	0.09	0.52	11.78
Integrated Crop Management (Pest management)	190.75	168.00	20.79	1.01	0.12	0.40	6.89	0.62	0.09	0.54	13.07
Exp.mean	172.20	152.90	19.84	0.91	0.09	1.87	6.24	0.57	0.06	0.45	10.14
CD (0.05)	15.22	6.59	0.98	0.04	0.02	NS	0.54	0.04	0.02	0.03	0.81
CV (%)	5.74	2.80	3.20	2.71	10.97	366.86	5.64	4.82	16.32	5.06	5.17

Table 5. 8.7 Evaluation of Organic fertilizers and Natural farming practices for enhancing the productivity and soil health- Yield parameters and nutrient uptake, *kharif* (Location: KWD)

Treatment Name	Tiller Number/m^2	Panicle number/m^2	1000 grain wt (g)	Grain N Uptake (kg/ha)	Grain P Uptake (kg/ha)	Grain K Uptake (kg/ha)	Straw N Uptake (kg/ha)	Straw P Uptake (kg/ha)	Straw K Uptake (kg/ha)
Control	322.75	284.50	25.58	53.72	10.17	11.97	27.30	6.94	66.71
Complete NF	331.25	295.75	25.93	63.07	12.03	13.72	31.86	8.16	74.77
AI-NPOF package	350.50	304.50	26.05	68.88	13.66	15.50	35.04	9.31	81.87
Integrated Crop Management	364.50	309.75	26.03	76.52	13.95	17.97	39.07	10.15	89.87
Integrated Crop Management (Pest management)	366.75	310.75	26.43	74.93	14.48	18.64	39.53	10.47	88.83
Exp.mean	347.15	301.05	26.00	67.42	12.86	15.56	34.56	9.01	80.41
CD (0.05)	21.40	NS	NS	5.90	2.68	3.24	6.04	1.87	10.35
CV (%)	4.00	4.35	3.54	5.68	13.54	13.53	11.33	13.45	8.36

Table 5.8.8 Evaluation of Organic fertilizers and Natural farming practices for enhancing the productivity and soil health- Yield parameters and nutrient concentration, *kharif* (Location: PNT).

Treatment Name	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 (%)
Control	98	87	17.48	0.90	0.07	0.80	9.53	0.40	0.11
Complete NF	112	99	19.13	0.96	0.09	0.76	9.83	0.47	0.14
AI-NPOF package	118	112	19.85	1.03	0.14	0.87	10.55	0.58	0.25
Integrated Crop Management	127	116	20.05	1.04	0.15	0.95	11.03	0.65	0.22
Integrated Crop Management (Pest management)	128	117	20.43	1.04	0.15	0.97	10.90	0.78	0.24
Exp. mean	117	106	19.39	1.00	0.12	0.87	10.37	0.58	0.19
CD (0.05)	6.02	3.76	0.72	NS	0.03	0.08	0.84	0.15	0.03
CV (%)	3.34	2.30	2.39	2.47	13.71	5.88	5.27	16.79	8.86

Table 5.8.9 Evaluation of Organic fertilizers and Natural farming practices for enhancing the productivity and soil health- Yield parameters and nutrient concentration (%), *kharif* (Location: PSA)

Treatment Name	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	216.50	198.00	26.40	1.37	0.28	0.16	0.66	0.07	1.23
Complete NF	233.25	213.50	26.80	1.38	0.29	0.17	0.67	0.07	1.25
AI-NPOF package	230.00	209.00	26.73	1.38	0.30	0.17	0.68	0.08	1.26
Integrated Crop Management	246.50	223.75	27.20	1.40	0.33	0.19	0.75	0.08	1.30
Integrated Crop Management (Pest management)	253.25	238.50	27.03	1.42	0.33	0.19	0.75	0.08	1.31
Exp. mean	235.90	216.55	26.83	1.39	0.31	0.18	0.70	0.08	1.27
CD (0.05)	NS	23.26	NS	NS	NS	0.01	0.06	0.00	NS
CV (%)	7.00	6.97	2.10	5.50	9.17	5.51	5.35	4.16	3.01

Table 5.8.10 Evaluation of Organic fertilizers and Natural farming practices for enhancing the productivity and soil health- Yield parameters and nutrient concentration (%), of *kharif* (Locations: PUD)

Treatment Name	Tiller Number/m^2	Panicle number/m^2	Grain N	Grain P	Grain K	Straw N	Straw P	Straw K	Soil pH
Control	228.33	144.67	0.93	0.19	0.29	0.30	0.17	0.84	6.65
Complete NF	394.67	343.67	1.21	0.27	0.42	0.41	0.20	1.05	6.37
AI-NPOF package	429.67	365.00	1.23	0.27	0.43	0.44	0.22	1.16	6.40
Integrated Crop Management	457.33	410.67	1.27	0.29	0.44	0.44	0.24	1.11	6.42
Integrated Crop Management (Pest management)	457.33	419.33	1.29	0.28	0.43	0.45	0.23	1.15	6.57
Exp. mean	393.46	336.67	1.19	0.26	0.40	0.41	0.21	1.06	6.48
CD (0.05)	44.26	45.02	0.22	NS	NS	0.10	0.03	0.20	NS
CV (%)	5.97	7.1	9.91	18.09	14.81	12.48	7.8	9.97	3.36

Table 5.8.11 Evaluation of Organic fertilizers and Natural farming practices for enhancing the productivity and soil health- Yield and soil parameters and of *kharif* (Locations: TTB)

Treatment Name	Tiller Number/m^2	Panicle number/m^2	1000 grain wt (g)	Soil pH	Soil OC (%)	Soil N (kg/ha)	Soil P (kg/ha)	Soil K (kg/ha)	Soil Zn (mg/kg)
Control	238	213	11.60	5.25	0.59	232.43	16.95	104.50	0.62
Complete NF	255	246	11.48	5.73	0.60	247.36	18.88	109.91	0.74
AI-NPOF package	303	296	12.53	5.58	0.58	245.28	18.18	109.30	0.73
Integrated Crop Management	258	251	11.38	5.23	0.53	256.42	18.96	112.05	0.69
Integrated Crop Management (Pest management)	300	298	12.30	5.18	0.55	254.25	18.30	112.64	0.70
Exp.mean	271	261	11.86	5.39	0.57	247.15	18.25	109.68	0.70
CD (0.05)	24.54	45.48	0.77	0.20	0.03	5.17	NS	NS	NS
CV (%)	5.88	11.32	4.19	2.38	3.16	1.36	5.22	4.78	12.53

Table 5.8.12 Enhancing productivity of organic rice cultivation Yield parameters and post harvest soil status during *rabi*(Location:CHN)

Treats.	Grain yield (t/ha)	Straw yield (t/ha)	Tiller/m^2	Panicle /m^2	1000 grain wt	Soil OC (%)	Avail N (kg/ha)	Avail P_2O_5 (kg/ha)	Avail K_2O (kg/ha)	Avail S (mg/kg)	DTPA-Zn (mg/kg)	DTPA-Fe (mg/kg)	DTPA-Mn (mg/kg)	DTPA-Cu (mg/kg)
1	2.36	2.78	258	220	20.18	1.19	440.60	91.30	284.74	18.48	17.62	14.19	3.04	5.16
2	5.47	6.46	364	318	21.50	1.16	458.60	89.10	288.10	19.52	17.20	14.27	3.06	5.15
3	2.74	3.26	250	217	19.60	1.11	480.00	98.10	295.74	19.52	17.10	14.20	3.09	5.14
4	2.65	3.15	259	225	20.20	1.18	489.20	95.50	291.58	18.44	17.24	14.21	3.06	5.12
5	3.37	4.13	251	209	19.80	1.11	480.00	98.10	295.74	19.52	17.10	14.20	3.09	5.14
6	3.69	4.55	292	272	20.20	1.18	466.20	95.30	294.24	18.12	17.38	14.26	3.06	5.17
7	2.76	3.3	260	226	19.80	1.10	474.19	93.40	282.62	18.90	17.25	14.28	3.07	5.19
8	2.74	3.24	269	232	19.86	-	-	-	-	-	-	-	-	-
9	2.73	3.25	248	215	20.82	-	-	-	-	-	-	-	-	-
Exp. mean	3.17	3.8	272	237	20.22	1.15	469.83	94.40	290.39	18.93	17.27	14.23	3.07	5.15
CD (0.05)	0.2	0.28	28.05	28.7	0.65	NS	NS	5.54	7.72	NS	NS	NS	0.03	NS
CV (%)	5.02	5.75	8.06	9.47	2.51	6.64	5.35	4.5	2.04	4.56	1.55	0.69	0.8	1.31

1-Absolute control, 2-100% RDN, 3-100% N (FYM), 4-150% N (FYM), 5- 50% N (FYM) + 50% N (GM), 6- 50% N (FYM) + 50% N (Vermicompost), 7- 50% N (FYM) + 50% N (Neem/castor/any cake), 8- Optional 1: RDN 50% each through FYM + Vermicompost ; FYM as basal and VC 20., 9-Optional 2: Vermicompost @ 50% as basal, 25% at active tillering and 25% at PI

Table 5.8.13 Enhancing productivity of organic rice cultivation
Yield parameters, nutrient concentration and soil properties of *Rabi* (Location: 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 (dSm^{-1})	Soil OC (%)	Soil N (kg/ha)	Soil P (kg/ha)	Soil K (kg/ha)	Soil S (ppm)
1	3.04	5.58	1.37	0.17	1.31	0.51	0.09	1.99	5.25	0.07	1.07	118.13	36.77	212.00	14.79
2	3.88	7.35	1.74	0.16	1.66	0.5	0.07	2.56	5.05	0.06	0.94	133.8	50.33	274.83	22.65
3	4.13	6.15	1.77	0.2	1.31	0.39	0.09	2.09	5.03	0.06	1.35	164.13	75.37	227.73	22.65
4	4.36	6.59	1.59	0.18	1.21	0.37	0.1	2.52	5.78	0.09	0.75	155.77	63.6	455.47	12.45
5	3.89	6.67	1.46	0.21	1.16	0.36	0.09	2.36	4.97	0.07	1.05	159.97	51.1	164.9	19.56
6	4.16	6.69	1.62	0.22	1.46	0.43	0.08	2.12	5.66	0.30	0.71	175.6	56.8	278.73	14.71
7	4.27	6.54	1.59	0.29	1.11	0.48	0.13	2.36	5.36	0.24	0.72	168.3	65.4	196.27	14.46
8	4.06	6.24	1.43	0.27	0.96	0.37	0.17	2.42	5.44	0.65	0.81	152.63	61.07	200.23	11.28
9	4.21	6.91	1.46	0.29	1.01	0.41	0.07	2.13	4.77	0.29	0.49	156.8	37.1	180.6	11.95
Exp.mean	4.00	6.53	1.55	0.21	1.25	0.42	0.10	2.33	5.28	0.19	0.85	152.73	55.35	235.18	15.98
CD (0.05)	0.64	1.09	NS	NS	NS	NS	NS	NS	NS	0.32	NS	NS	NS	NS	7.70
CV (%)	9.27	9.63	12.32	43.65	19.13	18.02	52.52	26.78	8.66	99.26	41.34	23.76	29.14	51.96	28.09

1 Absolute control, 2. 100%RDN, 3. 100%N through FYM, 4. 150%N through FYM, 5. . 50%N through FYM+50%N through GLM, 6. 50%N through FYM+50%N through Vermicompost, 7. 50% N through FYM+50% N through Neemcake, 8. 75%RDN (50%N each through FYM and vermicompost), 9. Best state organic practiice (10 t/ha FYM+2.5 t/ha Vermicompost+3%Fish Amino acid spray)

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* (Location: MNC)

Treatment Name	Soil OC %	Soil N (kg/ha)	Soil K (kg/ha)	Soil P (kg/ha)	Soil Zn (mg/kg)	Total N uptake (kg/ha)	Total uptake P (kg/ha)	Total uptake K (kg/ha)
Control	3.00	368.38	168.10	38.37	1.18	55.04	19.17	60.14
Complete NF	3.02	376.95	202.38	48.02	1.19	115.41	44.70	131.08
AI-NPOF package	3.05	382.65	203.15	50.77	1.16	71.51	27.15	86.79
Integrated Crop Management	3.01	375.08	193.28	44.81	1.14	87.80	38.98	98.74
Integrated Crop Management (Pest management)	2.98	374.75	188.55	45.72	1.18	71.66	27.86	75.59
Exp.mean	3.01	375.56	191.09	45.54	1.17	80.28	31.57	90.47
CD (0.05)	NS	5.04	6.05	4.31	NS	14.87	5.03	15.13
CV (%)	2.73	0.87	2.05	6.14	4.95	12.02	10.33	10.85

Table 5.8.15 Evaluation of Organic fertilizers and Natural farming practices for enhancing the productivity and soil health- Nutrient uptake and Soil properties after harvest of *kharif* (Location: MND)

Treatment Name	Soil pH	Soil EC (dSm^{-1})	Soil OC %	Soil N (kg/ha)	Soil P (kg/ha)	Soil K (kg/ha)	Soil Zn (mg/kg)	Total N uptake (kg/ha)	Total uptake P (kg/ha)	Total uptake K (kg/ha)
Control	7.56	0.12	0.51	227.38	20.17	162.05	0.63	18.52	1.35	8.56
Complete NF	7.49	0.13	0.55	234.85	21.96	160.33	0.63	24.48	1.83	122.73
AI-NPOF package	7.48	0.13	0.55	240.05	20.63	156.28	0.92	34.65	3.09	18.58
Integrated Crop Management	7.34	0.13	0.54	256.08	24.79	180.40	1.14	50.32	6.12	29.30
Integrated Crop Management (Pest management)	7.42	0.13	0.53	257.40	25.17	180.08	1.17	52.46	6.82	30.92
Exp.mean	7.46	0.13	0.54	243.15	22.54	167.83	0.90	36.09	3.84	42.02
CD (0.05)	0.11	NS	0.03	7.35	2.19	8.16	0.11	5.46	0.64	NS
CV (%)	0.96	6.91	3.06	1.96	6.31	3.16	7.87	9.82	10.80	232.03

Table 5.8.16 Evaluation of Organic fertilizers and Natural farming practices for enhancing the productivity and soil health- and Soil properties after harvest of *kharif* (Location: KWD)

Treatment Name	Soil pH	Soil EC (dSm^{-1})	Soil OC (%)	Soil N (kg/ha)	Soil P (kg/ha)	Soil K (kg/ha)
Control	6.45	0.27	0.67	301.68	13.15	152.33
Complete NF	6.38	0.25	0.74	317.78	14.60	161.68
AI-NPOF package	6.20	0.26	0.81	341.45	14.85	169.18
Integrated Crop Management	6.25	0.25	0.75	324.68	16.40	172.03
Integrated Crop Management (Pest management)	6.20	0.26	0.78	319.40	15.78	176.48
Exp. mean	6.30	0.26	0.75	321.00	14.96	166.34
CD (0.05)	NS	NS	0.07	NS	1.67	14.95
CV (%)	2.92	8.54	6.10	5.56	7.26	5.83

Table 5.8.17 Evaluation of Organic fertilizers and Natural farming practices for enhancing the productivity and soil health- Nutrient uptake and Soil properties after harvest of *kharif* (Location: PNT)

Treatment Name	Soil pH	Soil EC (dSm^{-1})	Soil OC (%)	Soil N (kg/ha)	Soil P (kg/ha)	Soil K (kg/ha)	Soil Zn (mg/kg)	Total N uptake (kg/ha)	Total uptake P (kg/ha)	Total uptake K (kg/ha)
Control	7.13	0.22	0.30	132.75	9.28	114.00	8.85	9.00	0.73	8.04
Complete NF	7.15	0.26	0.45	148.50	10.40	137.50	10.45	14.0	1.28	11.09
AI-NPOF package	7.38	0.42	0.54	155.50	11.65	160.00	12.03	18.51	2.50	15.59
Integrated Crop Management	7.33	0.45	0.62	161.50	13.23	182.50	12.78	21.30	3.05	19.45
Integrated Crop Management (Pest management)	7.48	0.47	0.62	159.00	13.18	168.75	13.25	21.65	3.10	20.30
Exp. mean	7.29	0.36	0.51	151.45	11.55	152.55	11.47	16.9	2.13	14.89
CD (0.05)	0.22	0.06	0.06	5.59	0.60	4.09	0.65	NS	0.51	1.12
CV (%)	1.96	11.42	7.52	2.40	3.36	1.74	3.68	2.45	15.52	4.86

Table 5.8.18 Evaluation of Organic fertilizers and Natural farming practices for enhancing the productivity and soil health- Nutrient uptake and Soil properties after harvest of *kharif* (Location:PSA)

Treatment Name	Soil pH	Soil EC (dSm^{-1})	Soil OC (%)	Soil N (kg/ha)	Soil P (kg/ha)	Soil K (kg/ha)	Total N uptake (kg/ha)	Total uptake P (kg/ha)	Total uptake K (kg/ha)
Control	8.37	0.32	0.46	219.75	26.60	121.30	65.49	10.79	55.25
Complete NF	8.30	0.28	0.47	224.00	27.45	125.63	73.30	12.39	61.63
AI-NPOF package	8.29	0.25	0.52	232.50	27.93	127.33	72.14	12.42	61.12
Integrated Crop Management	8.34	0.30	0.50	250.50	30.38	141.45	86.26	15.46	72.43
Integrated Crop Management (Pest management)	8.31	0.29	0.52	253.50	31.30	143.48	90.05	16.02	76.43
Exp.mean	8.32	0.29	0.49	236.05	28.73	131.84	77.45	13.42	65.37
CD (0.05)	NS	0.04	NS	NS	NS	15.20	11.80	2.14	8.17
CV (%)	0.81	9.47	11.21	7.58	8.18	7.48	9.89	10.33	8.11

Table 5.8.19 Evaluation of Organic fertilizers and Natural farming practices for enhancing the productivity and soil health Nutrient uptake and Soil properties after harvest of *kharif* (Location: PUD)

Treatment Name	Soil EC (dSm^{-1})	Soil OC (%)	Soil N (kg/ha)	Soil P (kg/ha)	Soil K (kg/ha)	Total N uptake (kg/ha)	Total uptake P (kg/ha)	Total uptake K (kg/ha)
Control	0.22	0.27	112.00	35.67	134.33	36.88	11.69	40.42
Complete NF	0.25	0.31	138.13	48.00	159.33	67.42	20.69	72.03
AI-NPOF package	0.28	0.35	145.33	48.67	166.67	72.94	23.29	83.67
Integrated Crop Management	0.32	0.29	141.87	43.33	157.33	82.23	27.18	88.51
Integrated Crop Management (Pest management)	0.29	0.32	134.40	46.33	153.00	83.98	26.41	89.62
Exp. mean	0.27	0.31	134.35	44.40	154.13	68.69	21.85	74.85
CD (0.05)	0.06	NS	NS	NS	17.59	16.90	4.52	21.28
CV (%)	10.99	9.25	9.13	12.55	6.06	13.06	10.99	15.1

List of cooperating centers of Soil Science and allotment of trials: 2022

Appendix-I

Sl. No	Locations	Trial 1		Trial 2		Trial 3		Trial 4	Trial 5		Trial 6		Trial 7		Trial 8		Allotted	Conducted	Conducted (%)
		K	R	K	R	K	R	K	K	R	K	R	K	R	K	R			
1	Kanpur (F)			x		x			x				x				07	04	57
2	Karaikal (F)			x					x		x			x		x	05	05	100
3	Kaul (F)			x					x		x		x				04	04	100
4	Mandya (F)	x	x			x							x		x		05	05	100
5	Maruteru (F)	x	x						x	x	x		x	x			07	07	100
6	Moncompu (F)							x	x				x		x		07	04	57
7	Pantnagar (F)			x					x				x		x		06	04	67
8	Pusa (F)					x			x				x		x		06	04	67
9	Titabar (F)	x	x	x				x					x		x		06	06	100
10	Bankura												x				01	01	100
11	Chinsurah (V)			x											x	x	05	03	60
12	Faizabad (V)					x			x				x				03	03	100
13	Khudwani (V)								x		x		x		x		04	04	100
14	Mizoram (V)							x									01	01	100
15	Puducherry (V)												x		x		02	02	100
16	Ranchi (V)							x									01	01	100
Total trials allotted		**03**	**03**	**06**		**04**		**04**	**09**		**04**		**12**	**01**	**08**	**02**	**70**	**58**	**83**

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:** 06 (Kanpur, Karaikal, Kaul, Pantnagar, Titabar, Chinsurah)

Trial No.3: **Management of sodic soils using nano Zn formulation:** 04 (Kanpur, Mandya, Pusa, Faizabad)

Trial No.4: **Management of acid soils:** 04 (Moncompu, Titabar, Ranchi, Mizoram)

Trial No.5**: Residue management in rice-based cropping systems**: 09 (Kanpur, Karaikal, Kaul, Maruteru, Moncompu, Pantnagar, Pusa, Faizabad, Khudwani)

Trial No.6: **Nano-fertilizers for increasing nutrient use efficiency, yield and economic returns in transplanted rice**: 04 (Karaikal, Kaul, Maruteru, Khudwani)

Trial No.7: **Yield maximization of rice in different zones:** 13 (Kanpur, Karaikal, Kaul, Mandya, Maruteru, Moncompu, Pantnagar, Pusa, Titabar, Bankura, Faizabad, Khudwani, Puducherry)

Trial No.8: **Enhancing productivity of Organic Rice cultivation**: 09 (Karaikal, Mandya, Moncompu, Pantnagar, Pusa, Titabar, Chinsurah, Khudwani, Puducherry).

Scientists involved in Soil Science Co-ordinated Programme 2021-22 (Appendix II)

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Voluntary Centres							
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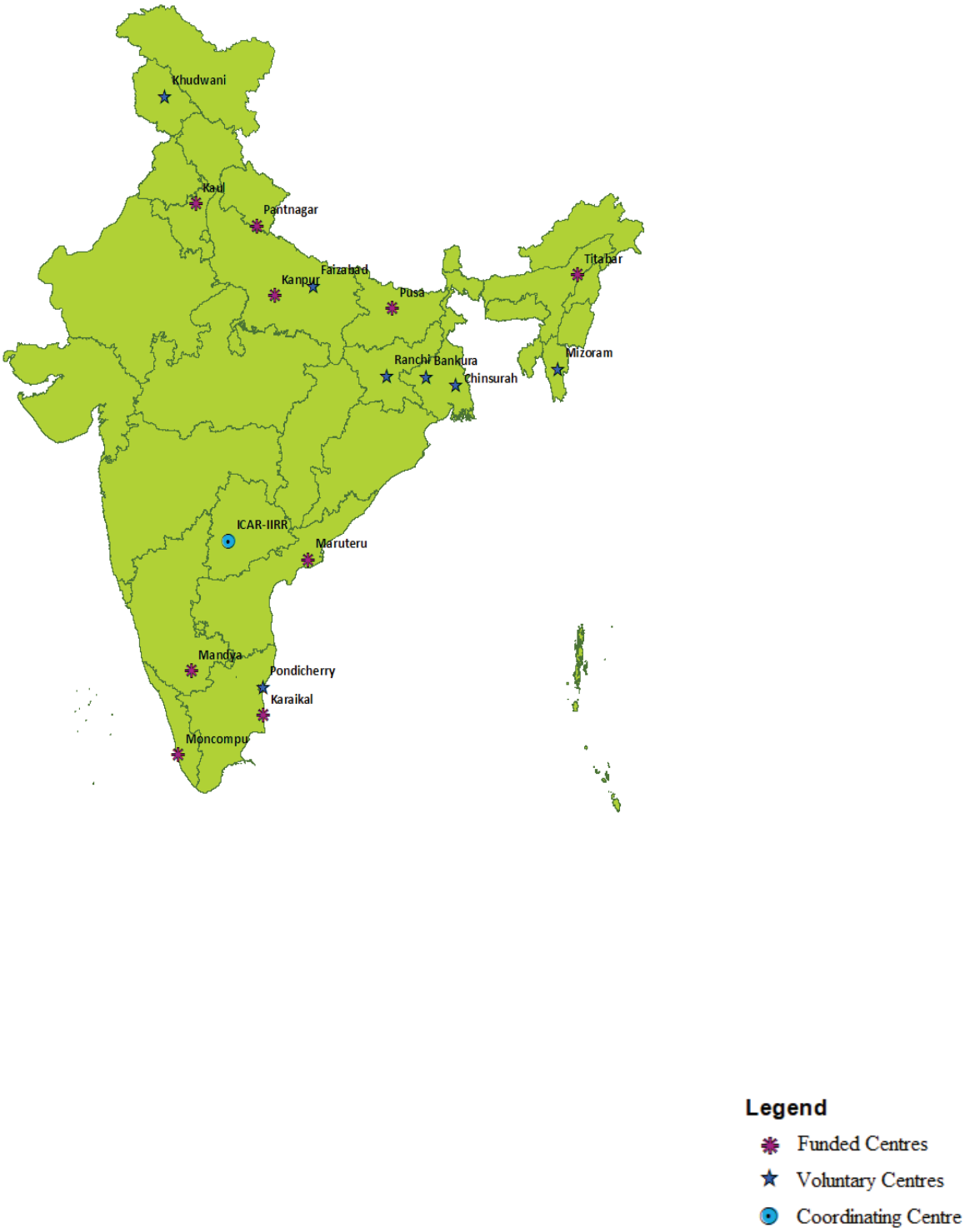
Map showing Soil Science AICRIP Funded and Voluntary centres (2022)



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PLANT PHYSIOLOGY

6. PLANT PHYSIOLOGY

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6. Plant Physiology

Summary

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

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

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

The salient findings of the experimental research are presented below:

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

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

6.2 Screening of elite rice cultures for drought tolerance

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

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

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

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

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

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

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

6.5. Screening for submergence tolerance in Rice

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

6.6 Screening of rice varieties for tolerance to low light stress

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

Detailed results

6.1 Role of Silicon in inducing abiotic stress tolerance in rice

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

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

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

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

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

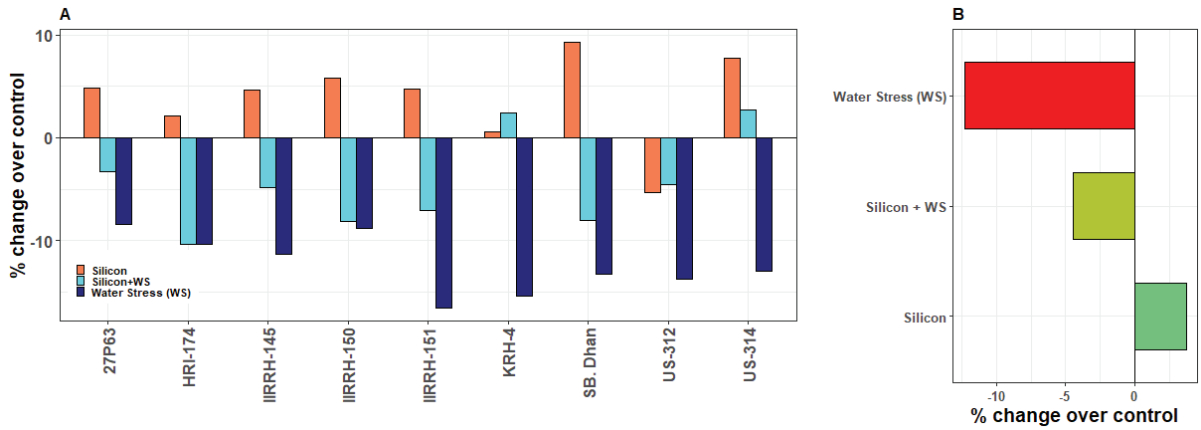


Fig 6.1.1: Percentage change in grain number per panicle with respect to control. (A) Mean of all varieties (B) Mean of all locations

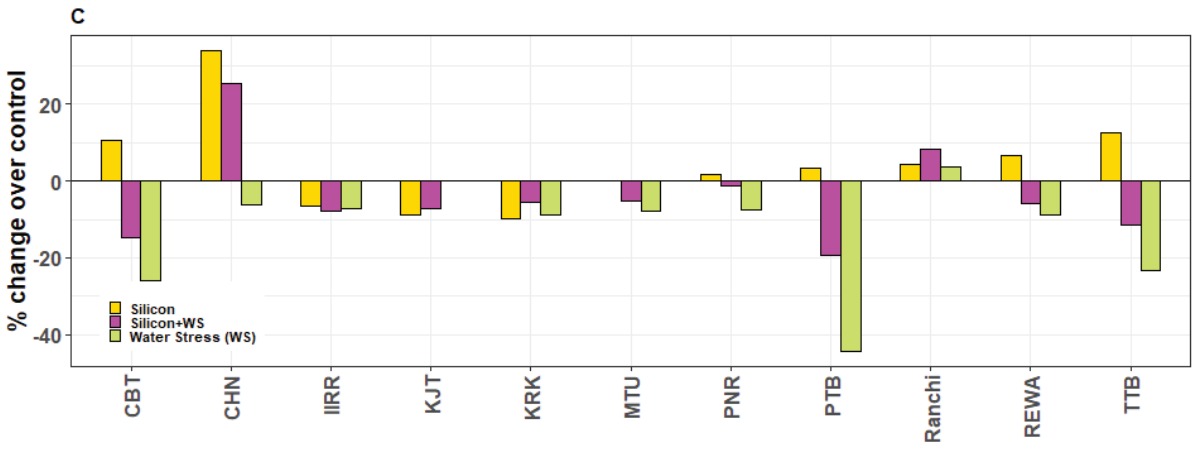


Fig 6.1.2: Percentage change in grain number per panicle with respect to control. Each value represent mean of all varieties.

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

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

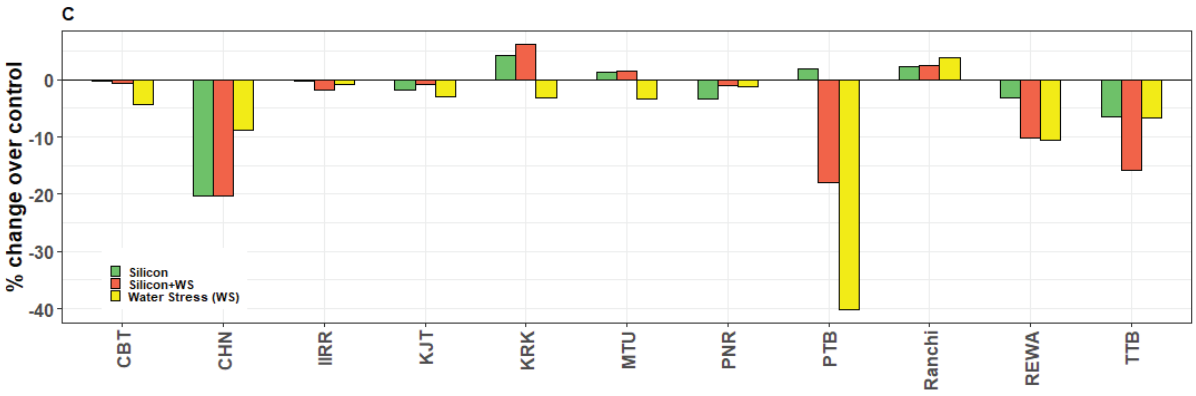


Fig 6.1.3: Percentage change in Harvest Index with respect to control. Each variety represent mean of all centres

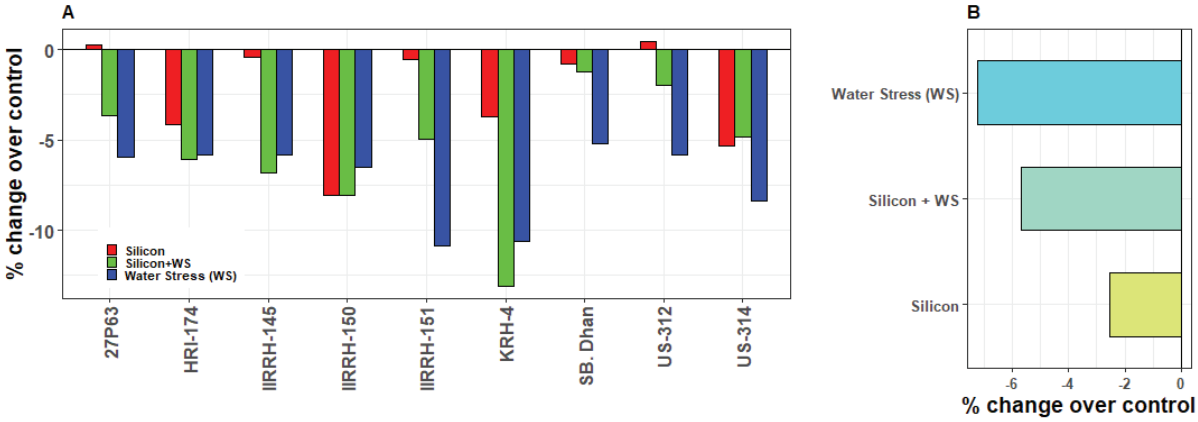


Fig 6.1.4 (A): Harvest Index mean of all varieties, (B) Mean of all locations.

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

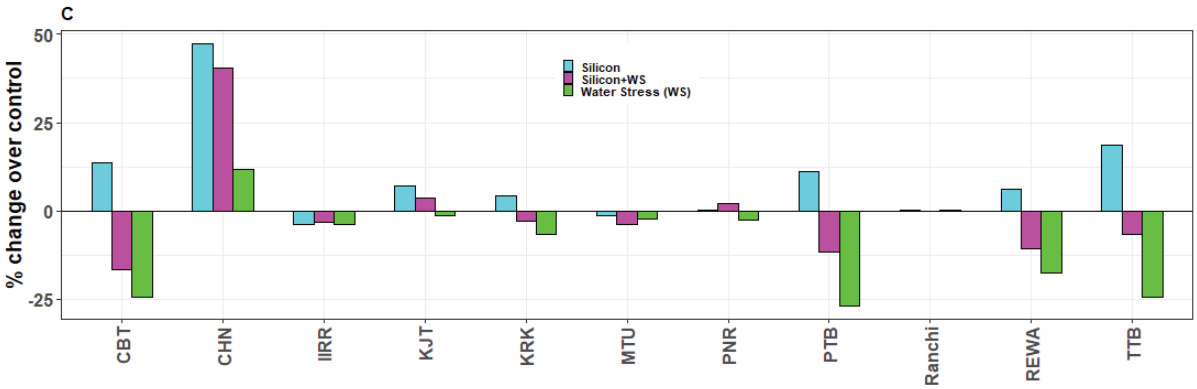


Fig 6.1.5: Percentage change in total dry matter (g/m2) with respect to control. Each value represent mean of all centres

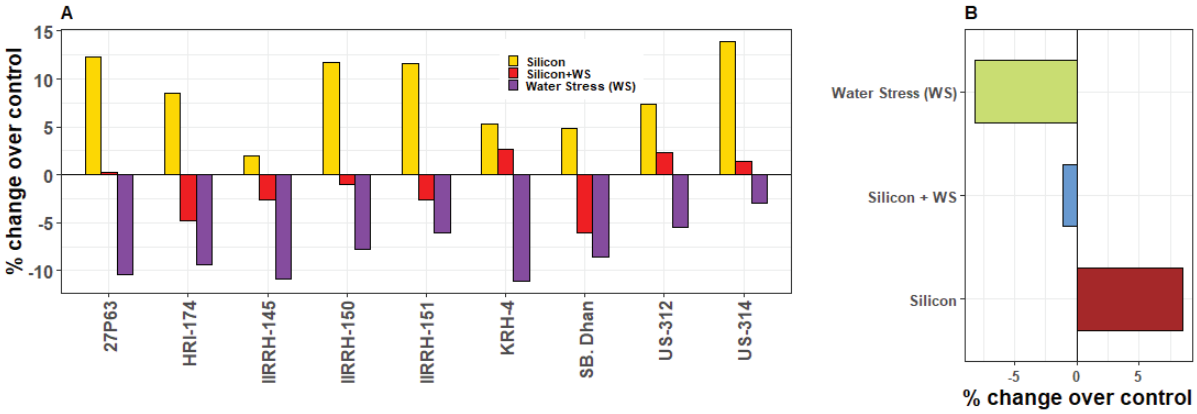


Fig 6.1.6: Percentage change in total dry matter (g/m2) with respect control. (A) Each value represent mean of all varieties. (B) Each value represents mean of all locations.

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

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

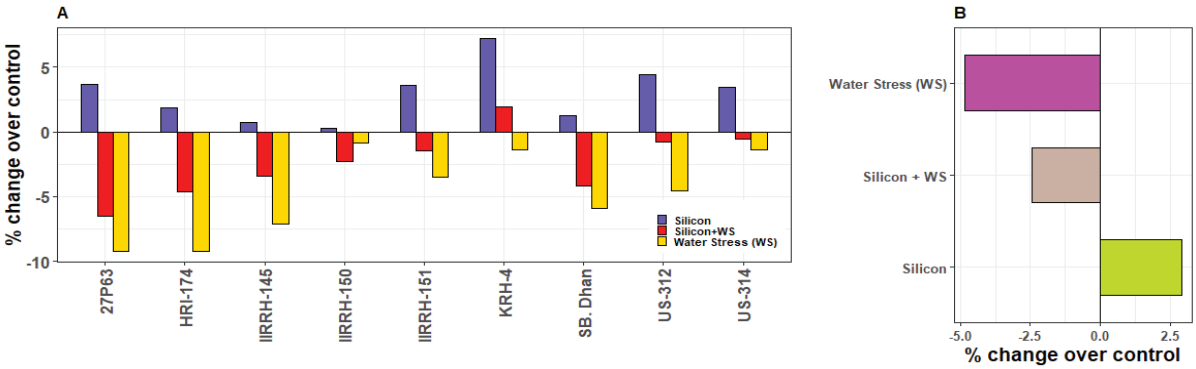


Fig 6.1.7: (A) 1000 grain weight mean of all locations, (B) 1000 grain weight mean of all varieties.

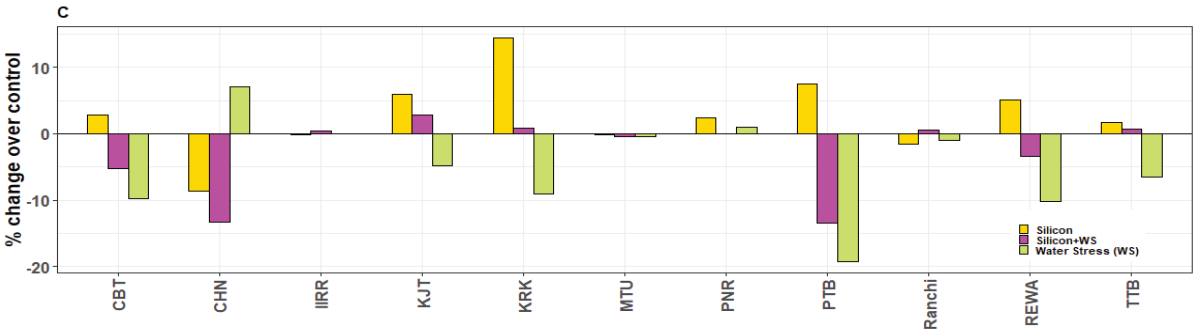


Fig 6.1.8: Percentage change in 1000 grain weight with respect to control. Each value represents mean of all locations.

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

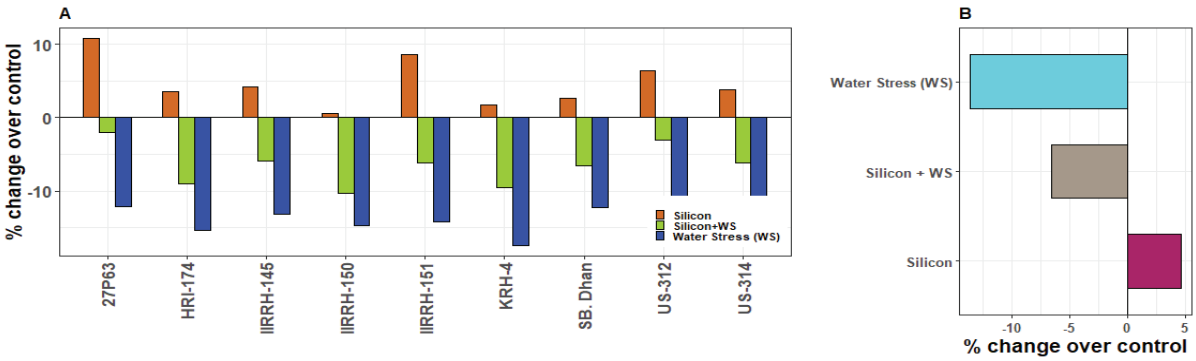


Fig 6.1.9: (A) Grain yield, mean of all Varieties, (B) Grain yield mean of all locations.

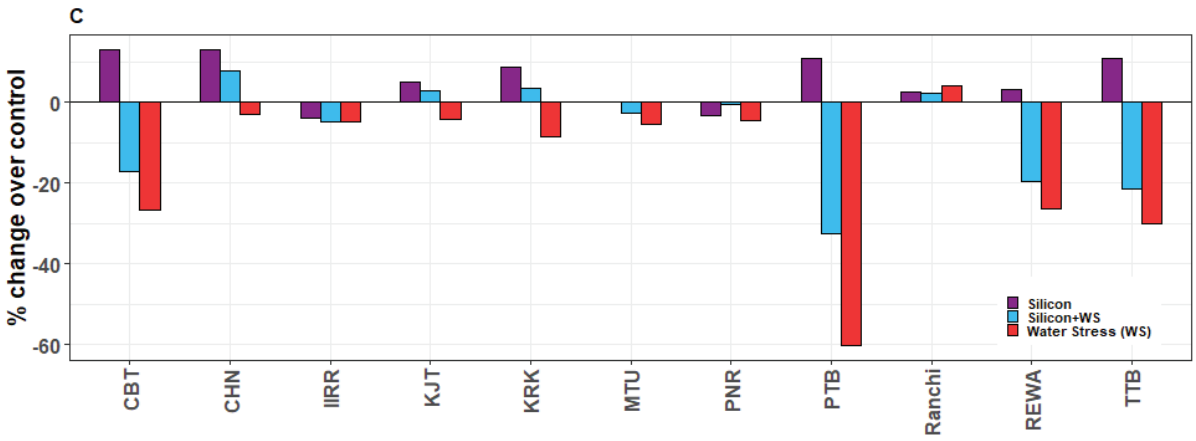


Fig 6.1.10: Percentage change in grain yield with respect to control. Each value represent mean of all locations.

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

Summary and conclusion:

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

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

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

LSD (Silicon)	ns	LSD (Silicon x Variety)		ns	
LSD (Location x Silicon)	2.26**	LSD (Location x Silicon x Variety)		6.27**	
LSD (Variety)	0.94**	CV(Silicon) %		3.29	
LSD (Location x Variety)	3.13**	CV(Residual) %		3.12	

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

6.2 Phenotyping of elite rice genotypes for Drought Tolerance

Locations: PTB, REWA, TTB, RPUR & RANCHI

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

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

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

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

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

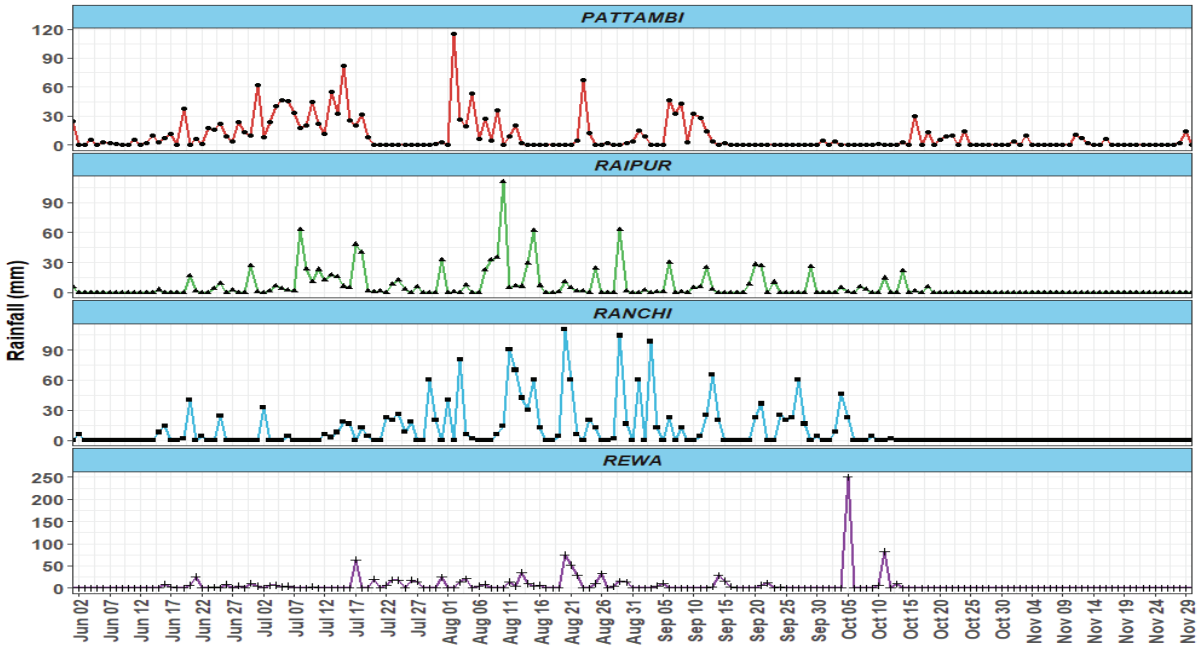


Fig 6.2.1A: Rainfall pattern under rainfed upland situation (drought) at different locations during Kharif 2022

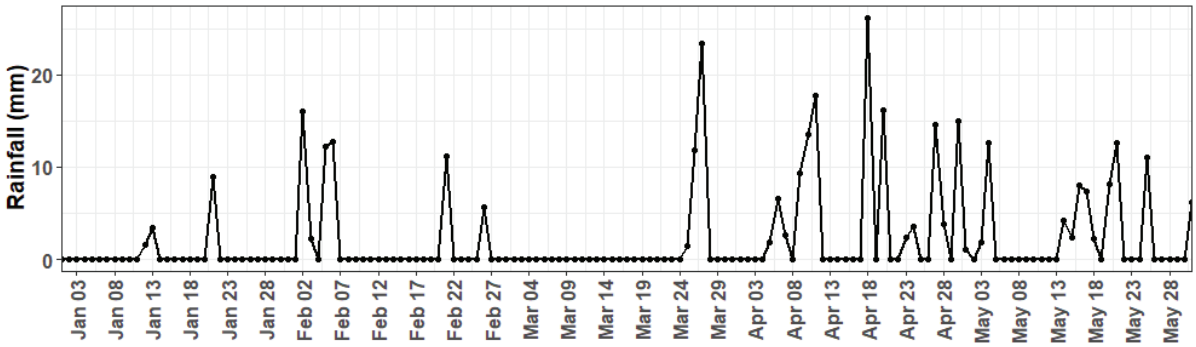


Fig 6.2.1B: Rainfall pattern under rainfed upland situation (drought) at Titabar during Rabi 2021-22

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

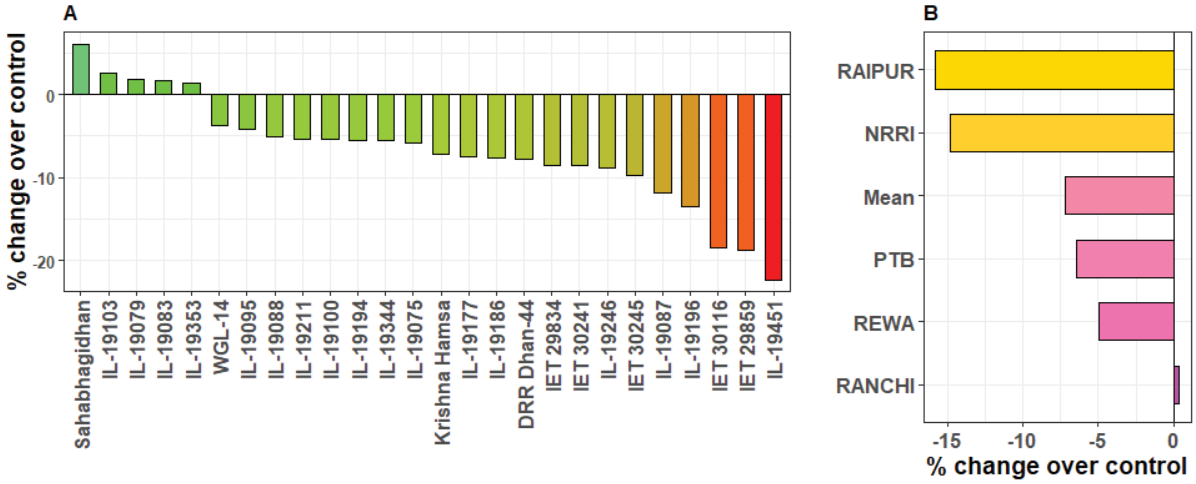


Fig 6.2.2: Influence of irrigation regimes on Tiller No/Plant recorded at flowering stage in different rice genotypes at different AICRIP centres during kharif-2022 season. [A] Mean of all locations [B] Mean of all genotypes. Each value represents % change under rainfed treatment in comparison with irrigated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

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

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

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

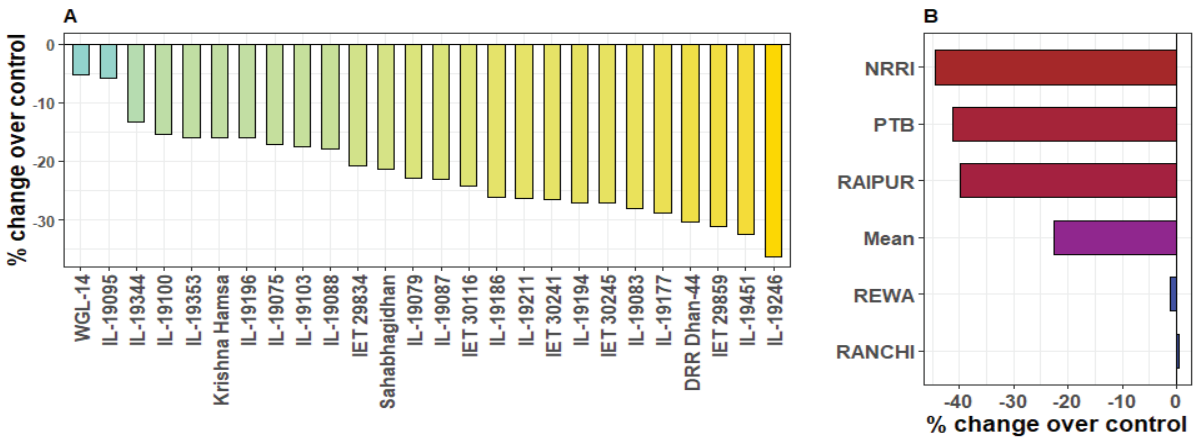


Fig. 6.2.3: Influence of irrigation regimes on panicle weight/m2 recorded at maturity stage in different rice genotypes at different AICRIP centres during kharif-2022 season. [A] Mean of all locations [B] Mean of all genotypes. Each value represents % change under rainfed treatment in comparison with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

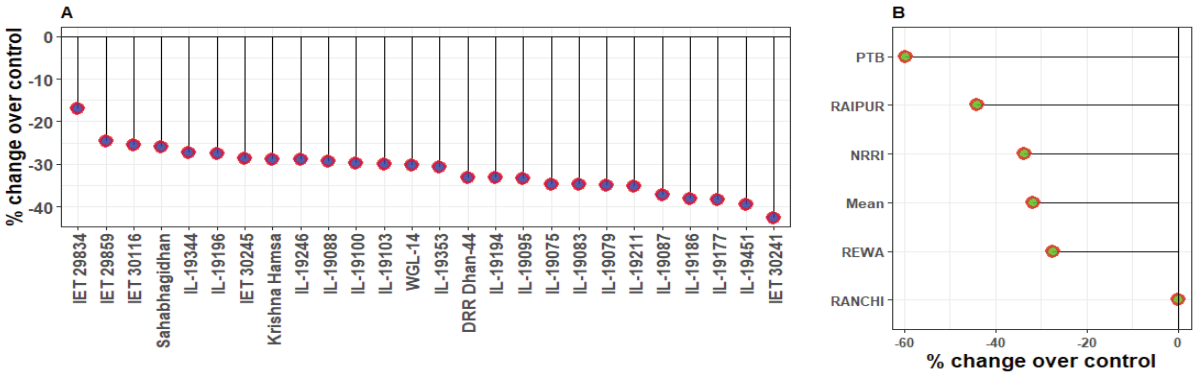


Fig. 6.2.4: Influence of irrigation regimes on No. Grains/Panicle in different rice genotypes at different AICRIP centres during kharif-2022 season. [A] Mean of all locations [B] Mean of all genotypes. Each value represents % change under rainfed treatment in comparison with irrigated control.

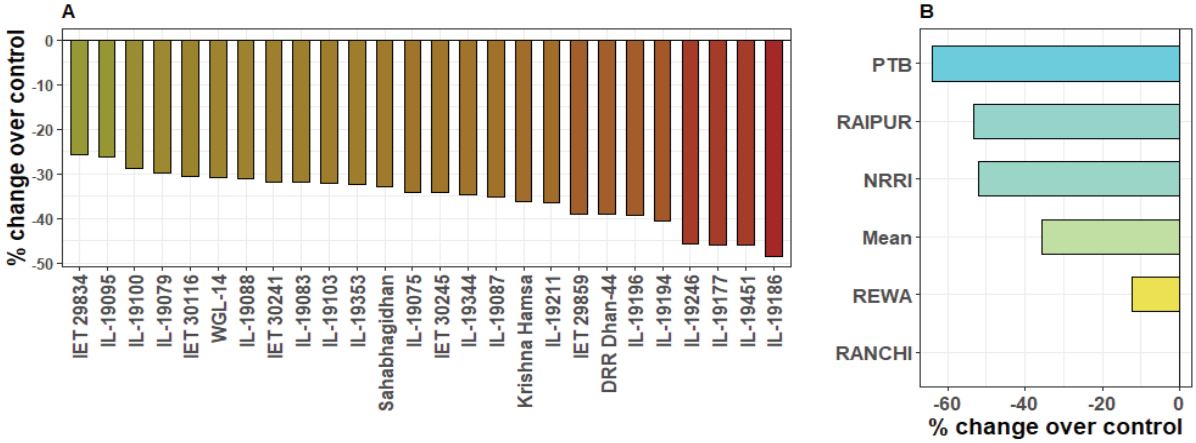


Fig 6.5: Influence of irrigation regimes on Grain Yield (g/m2) in different rice genotypes at different AICRIP centers during kharif-2022 season. [A] Mean of all locations [B] Mean of all genotypes. Each value represents % change under rainfed treatment in comparison with irrigated control.

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

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

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

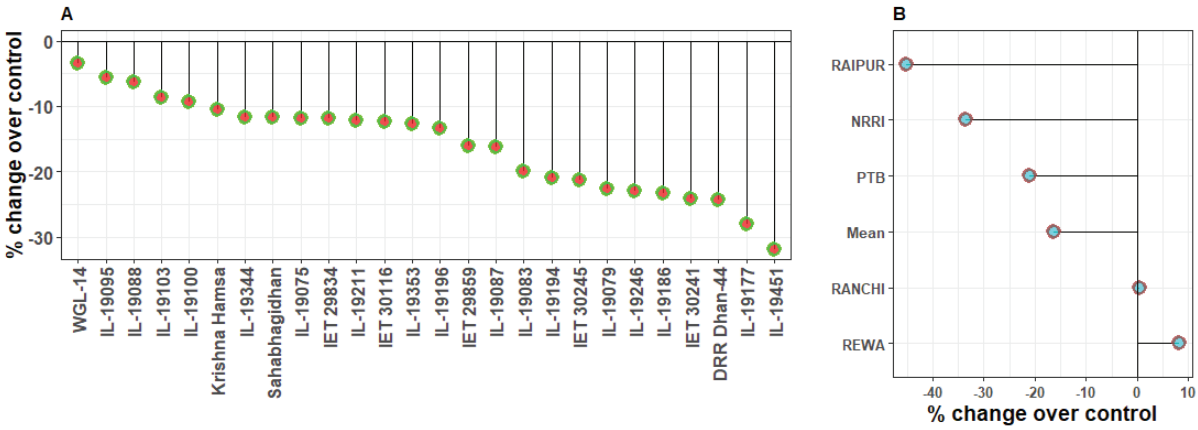


Fig 6.2.6: Influence of irrigation regimes on TDM (g/m2) in different rice genotypes at different AICRIP centres during kharif-2022 season. [A] Mean of all locations [B] Mean of all genotypes. Each value represents % change under rainfed treatment in comparison with irrigated control.

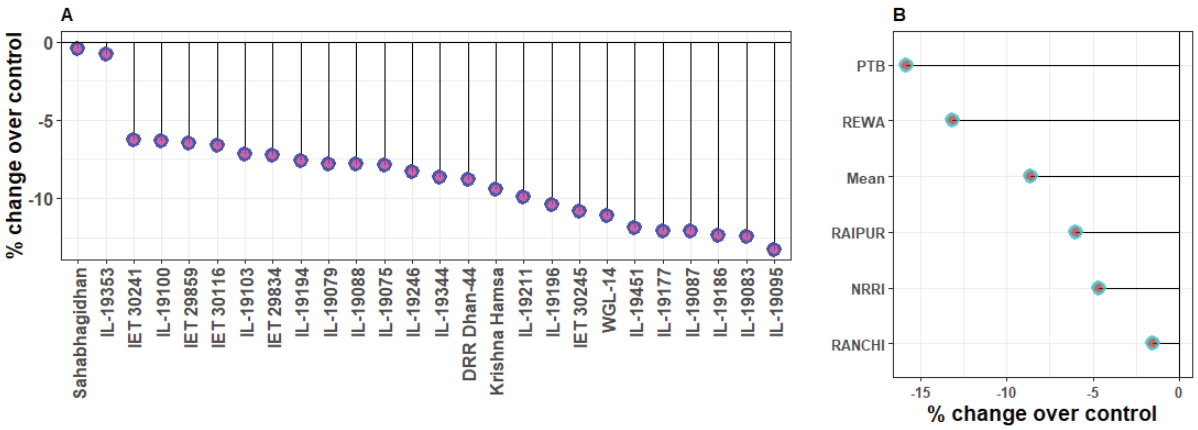


Fig 6.2.7: Influence of irrigation regimes on 1000 grain weight (g) in different rice genotypes at different AICRIP centres during kharif-2022 season. [A] Mean of all locations [B] Mean of all genotypes. Each value represents % change under rainfed treatment in comparison with irrigated control.

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

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

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

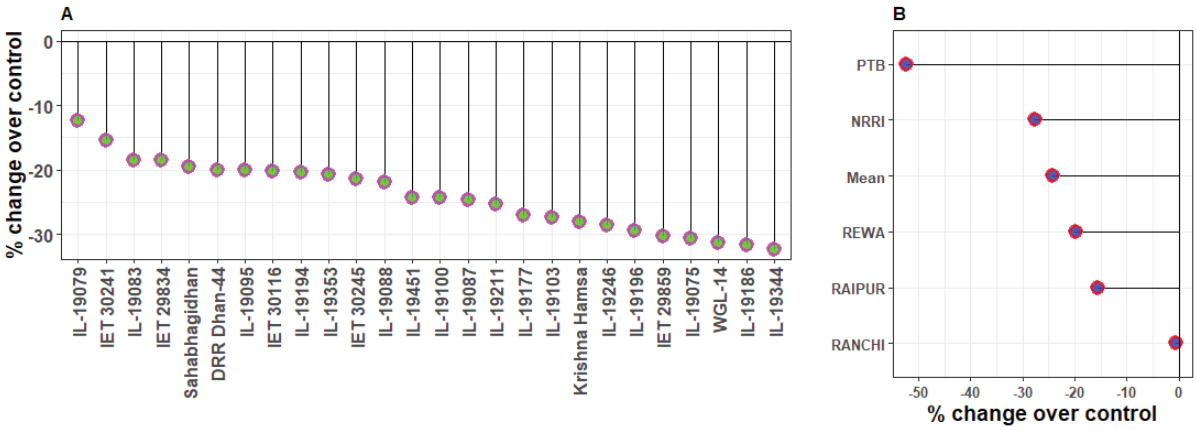


Fig. 6.2.8: Influence of irrigation regimes Harvest Index (%) in different rice genotypes at different AICRIP centres during kharif-2022 season. [A] Mean of all locations [B] Mean of all genotypes. Each value represents % change under rainfed treatment in comparison with irrigated control.

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

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

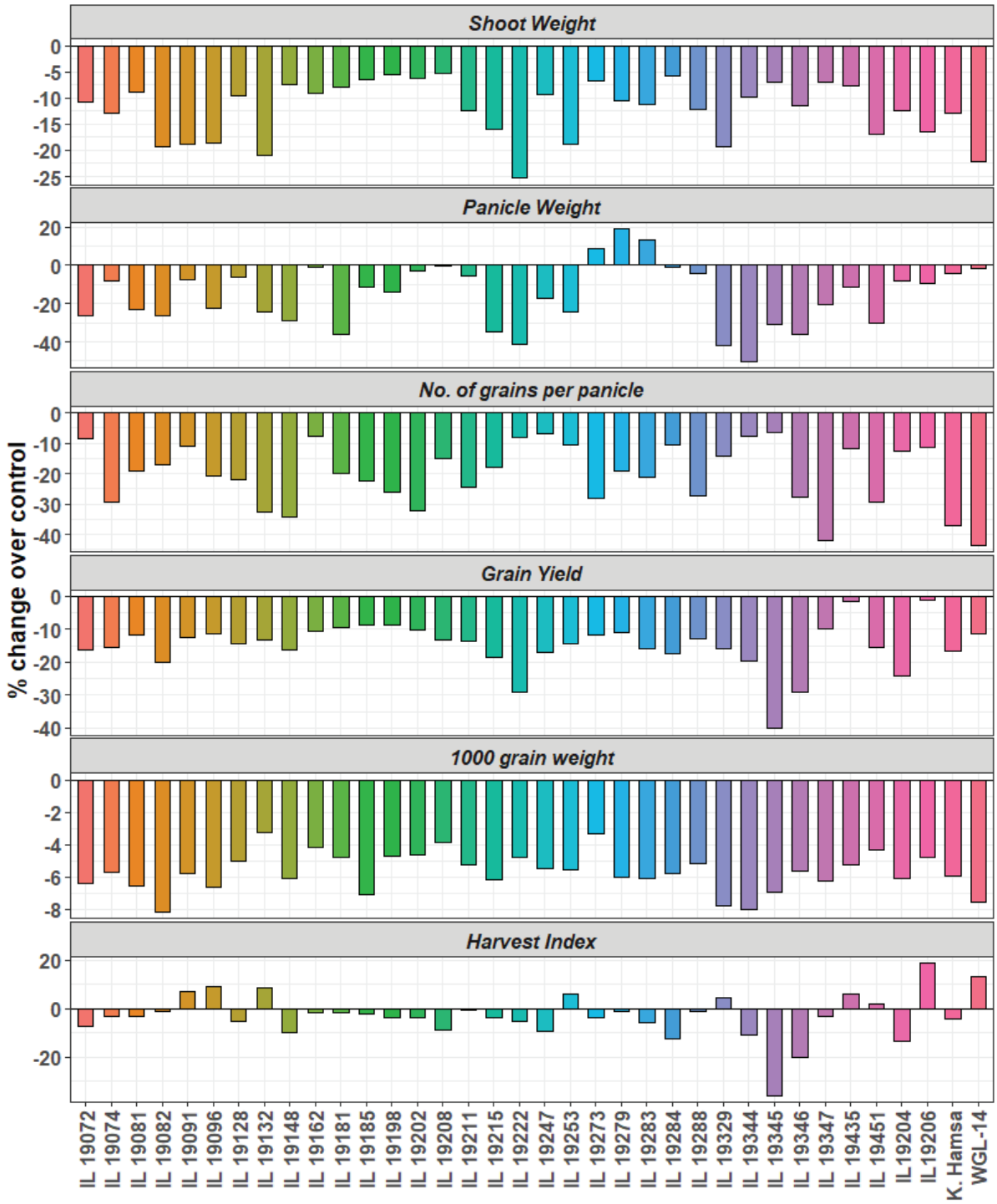


Fig 6.2.9: Influence of irrigation regimes on important physiological traits in selected rice genotypes at TTB centre during Rabi season. Each bar represents % change under rainfed condition in relation to irrigated control treatment.

Identification of Drought Tolerant genotypes using yield based drought Indices:

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

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

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

Selection for high yield and stability of performance under rainfed conditions

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

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

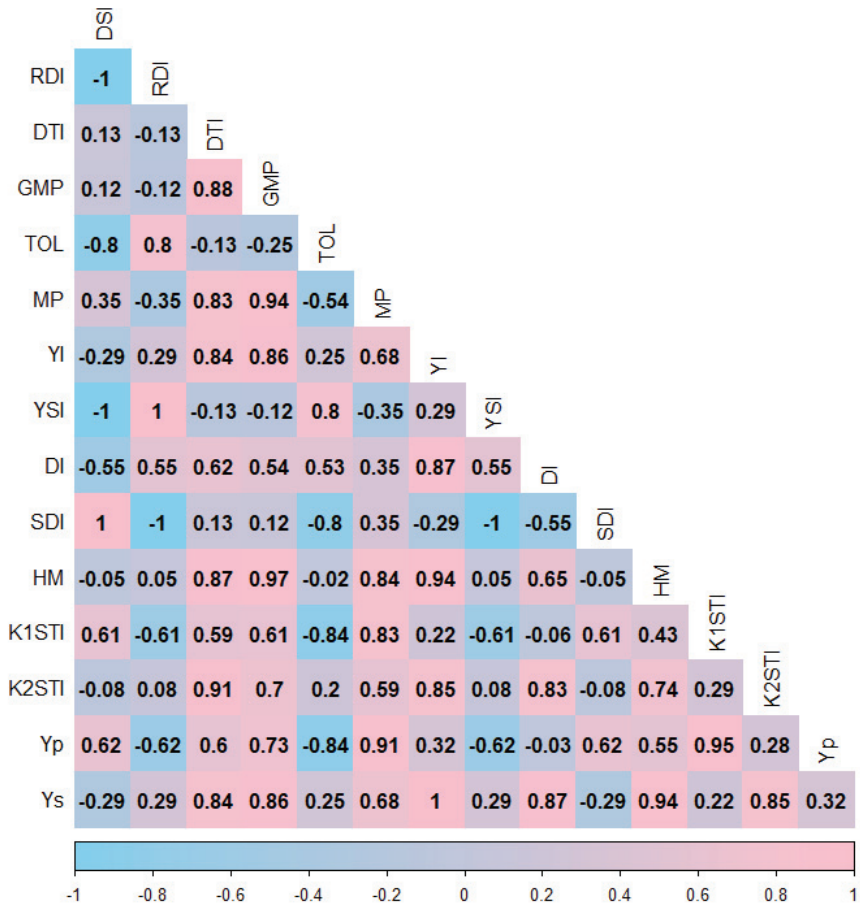


Fig. 6.2.10: Relationship between grain yield recorded under irrigated and rain fed condition and drought tolerant indices. For computing indices mean yield values for all the locations were used.

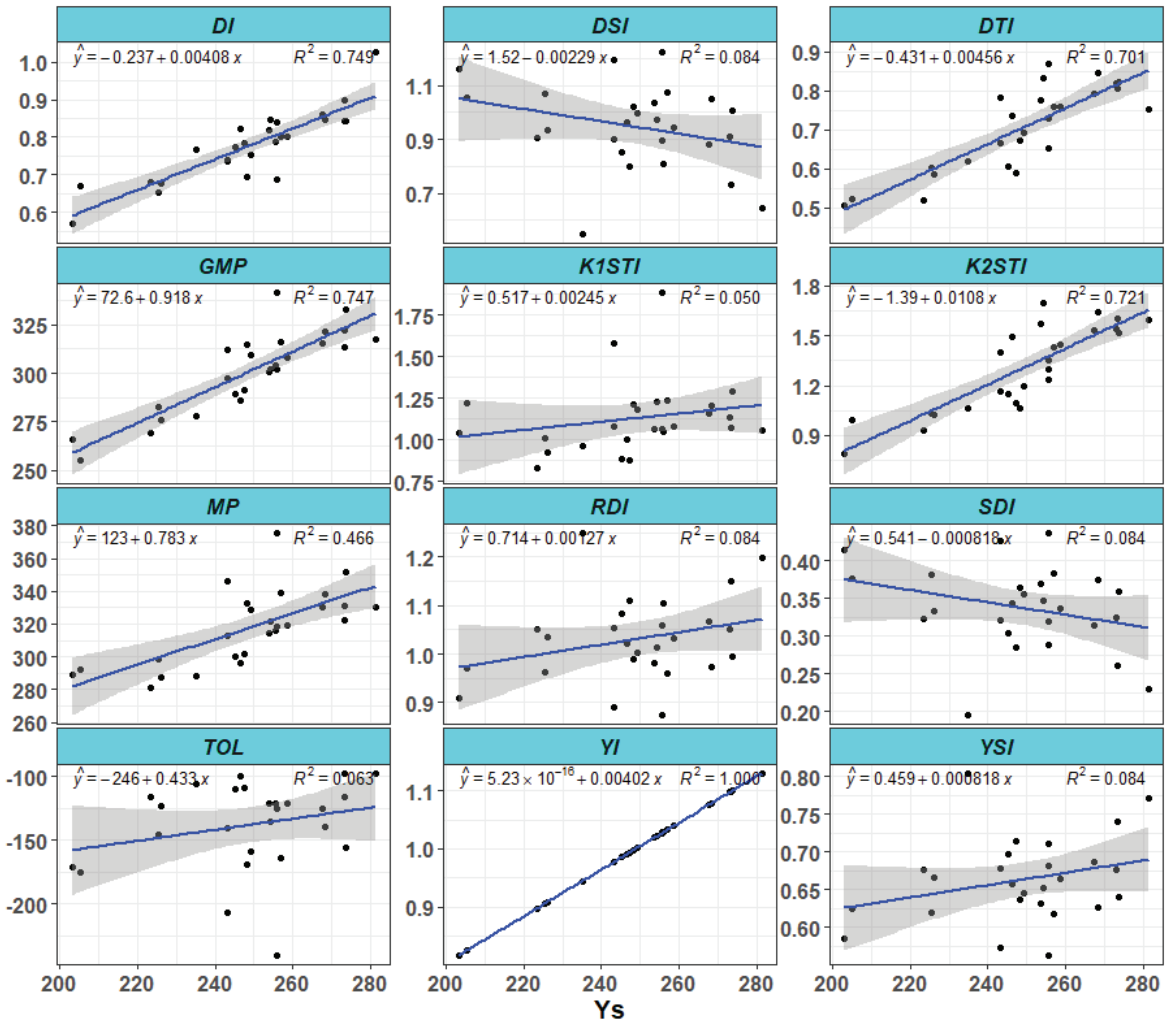


Fig 6.2.11: Relationship between grain yield recorded under rainfed condition (drought) and different drought tolerance indices computed from grain yield recorded under both rainfed and irrigated conditions.

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

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

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

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

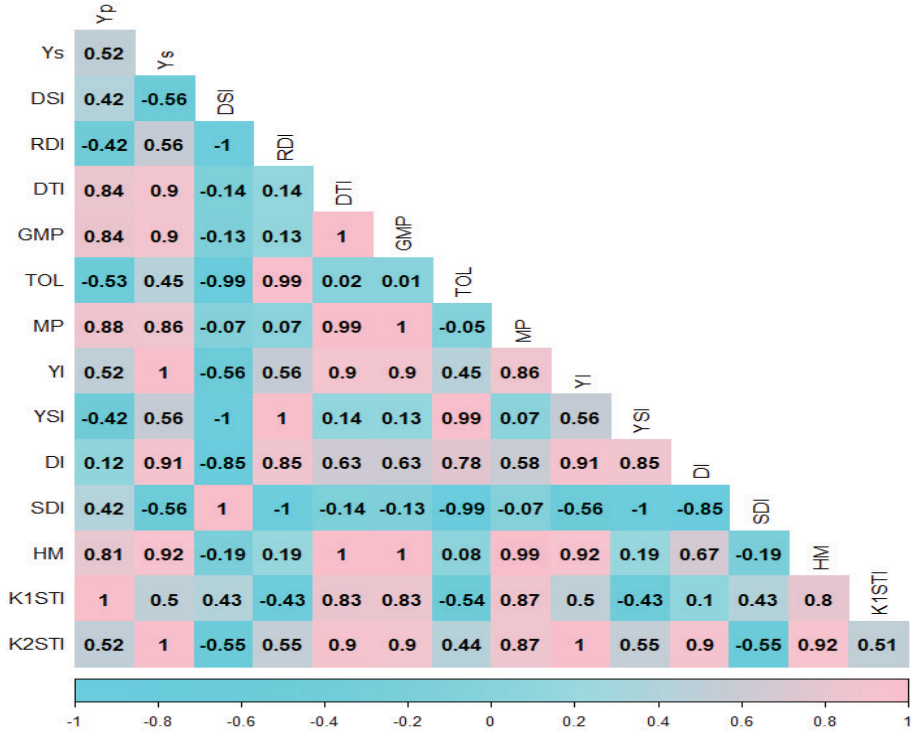


Fig. 6.2.12: Relationship between different drought tolerance indices and grain yield recorded under Rainfed (Ys) and Irrigated control (Yp) at TTB centre during Rabi season

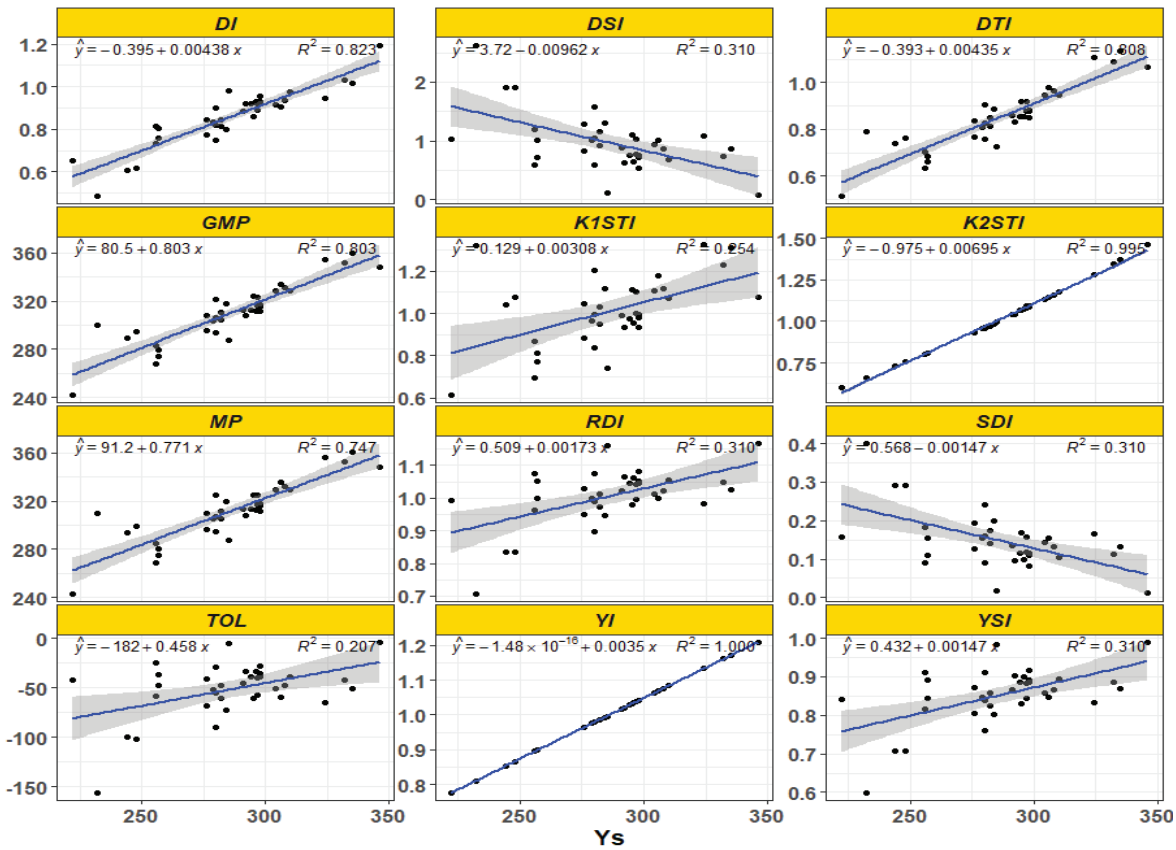


Fig 6.2.13: Relationship between grain yield recorded under rainfed condition (drought) and different drought tolerance indices computed from grain yield recorded under both rainfed and irrigated conditions at TTB centre during Rabi season

Summary & Conclusions

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

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

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

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

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

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

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

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

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

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

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

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

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

Table 6.2.7 Screening for elite rice culture for drought tolerance on grain number/m^2 maturity at different centers Kharif 2022

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

Table 6.2.8 Screening for elite rice culture for drought tolerance on spikelet number/m^2 maturity at different centers Kharif 2022

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

6.3 Screening for high temperature tolerance in rice genotypes

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

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

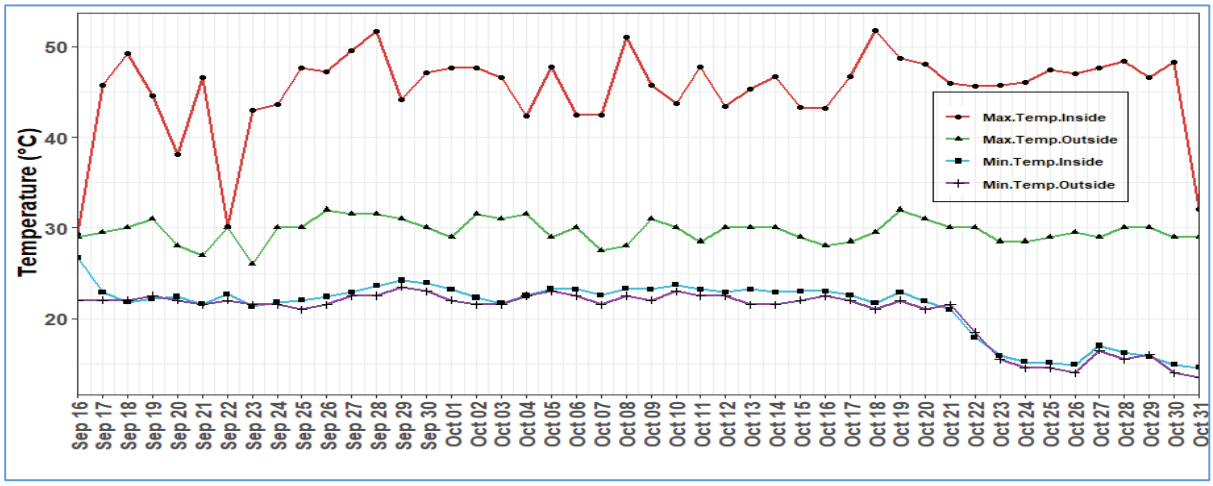


Fig 6.3.1: Maximum and minimum temperatures recorded between PI and maturity stages of rice crop inside and outside of the polythene tunnel at IIRR, Hyderabad during Kharif 2022.

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

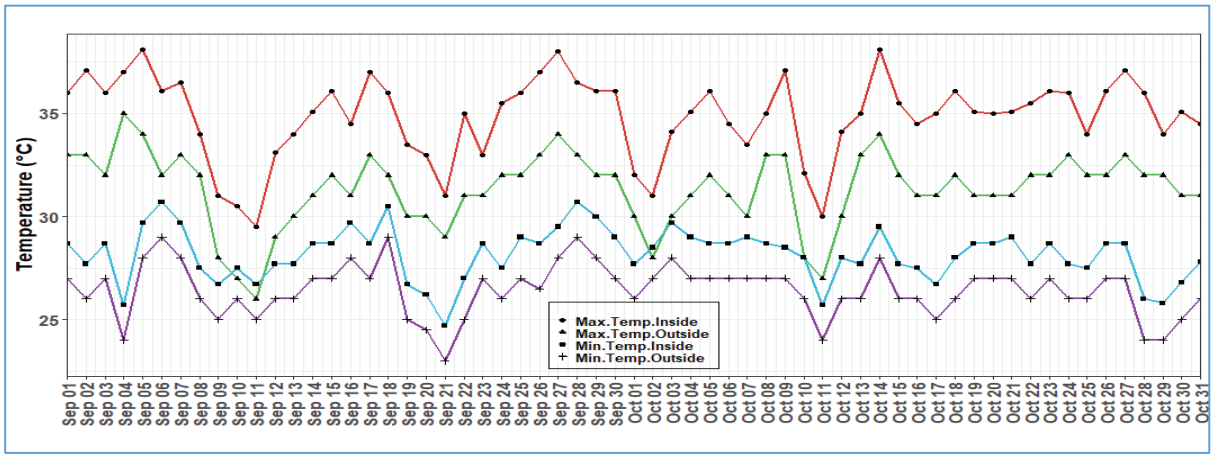


Fig 6.3.2: Maximum and minimum temperatures recorded between PI and maturity stages of rice crop inside and outside of the polythene tunnel at MTU, Maruteru during Kharif 2022

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

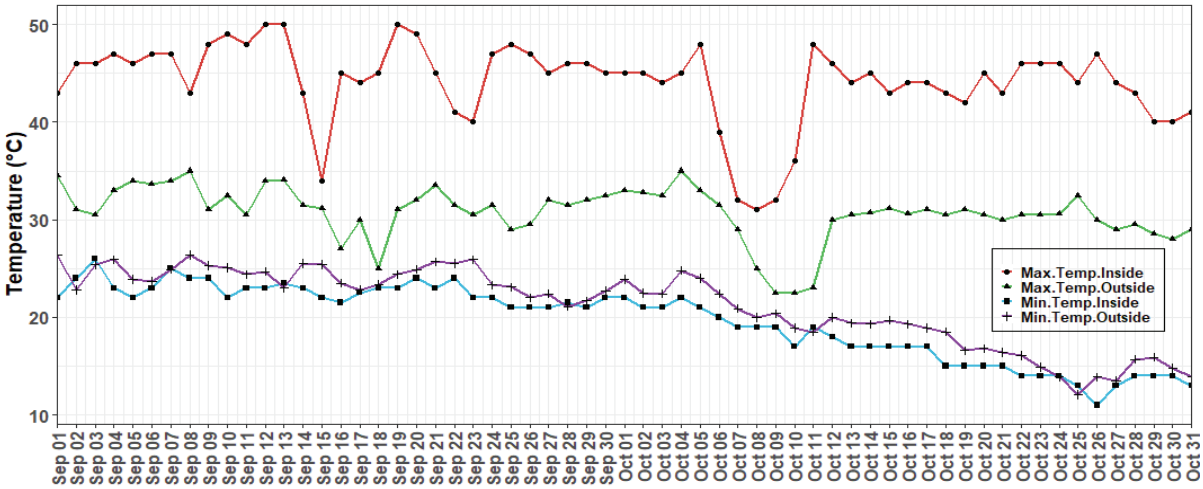


Fig 6.3.3: Maximum and minimum temperatures recorded between PI and maturity stages of rice crop inside and outside of the polythene tunnel at Pantnagar during Kh 2022

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

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

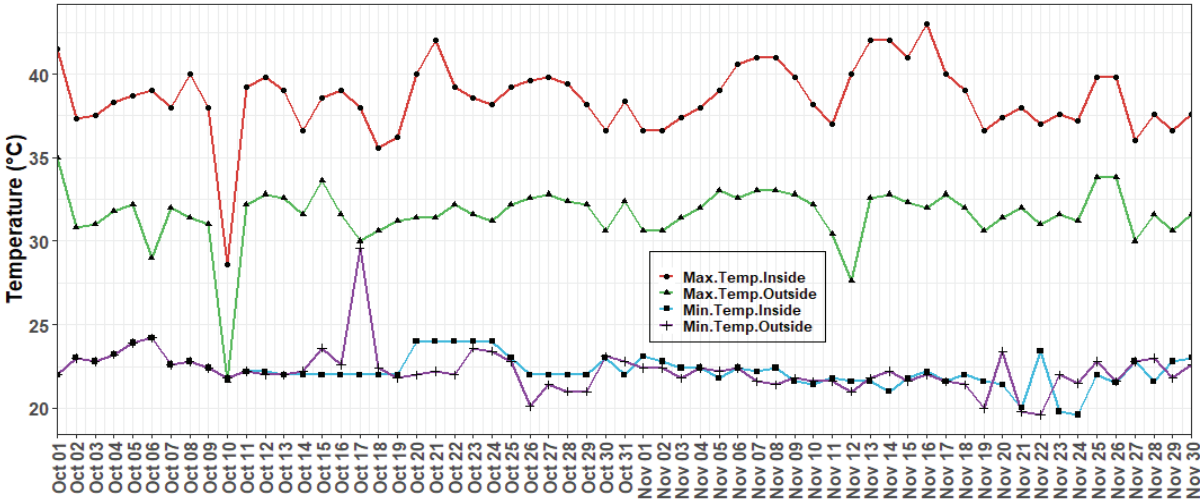


Fig 6.3.4: Maximum and minimum temperatures recorded between PI and maturity stages of rice crop inside and outside of the polythene tunnel at Pattambi, Kerala during Kh 2022

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

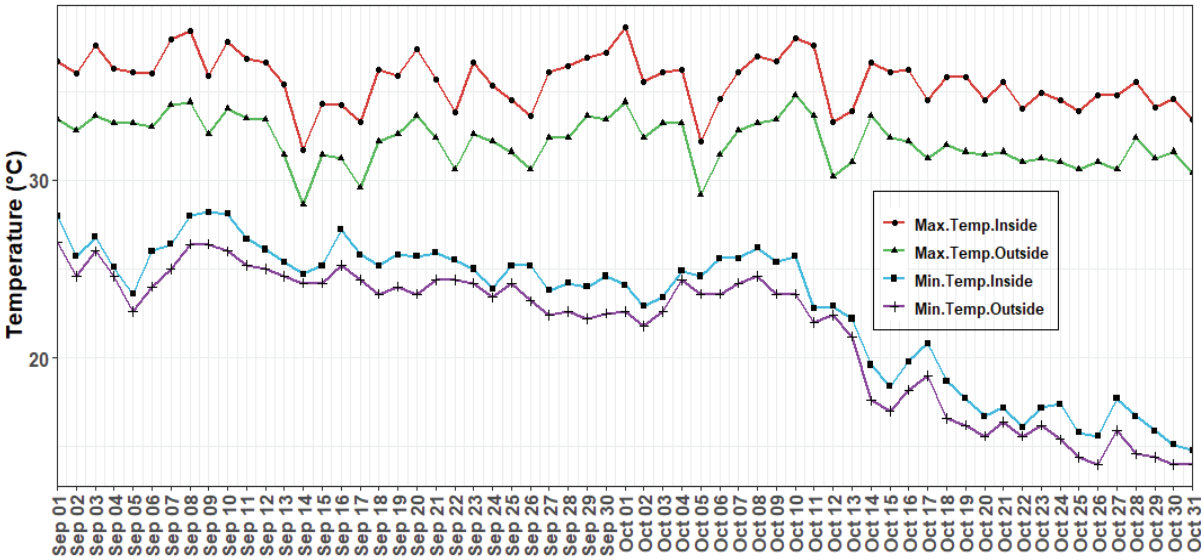


Fig 6.3.5: Maximum and minimum temperatures recorded between PI and maturity stages of rice crop inside and outside of the polythene tunnel at REWA during Kh 2022

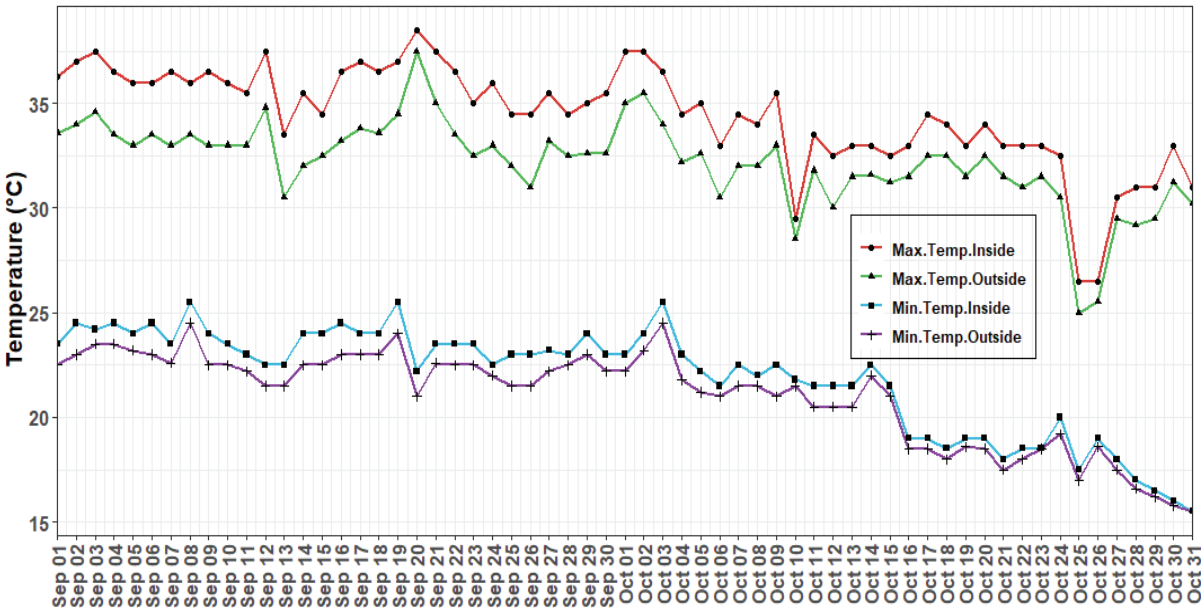


Fig 6.3.6: Maximum and minimum temperatures recorded between PI and maturity stages of rice crop inside and outside of the polythene tunnel at Titabar Assam during Kh 2022

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

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

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

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

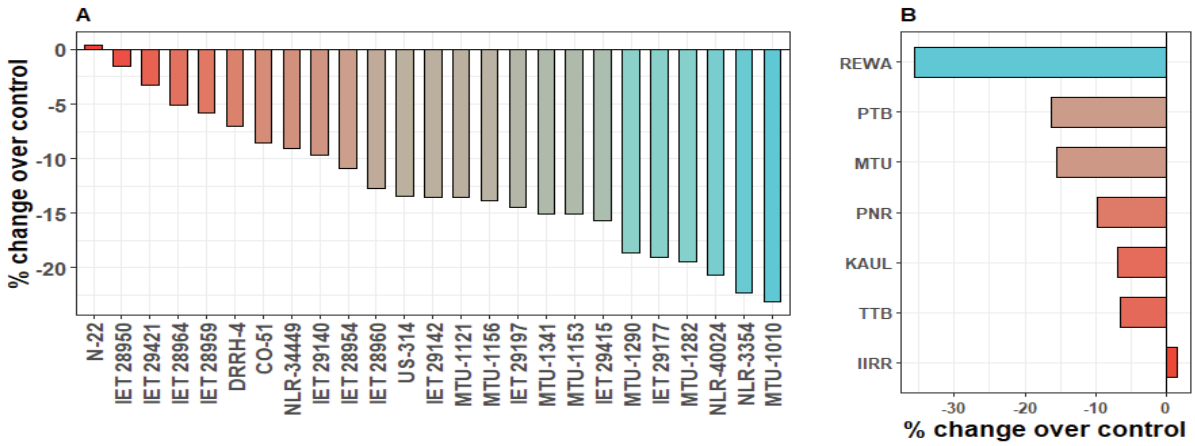


Fig 6.3.7. Influence of elevated temperature on total dry matter (g/m2) recorded at maturity each bar represents percent change in total dry matter under elevated temperature in comparison with control (A) mean of all varieties, (B) mean of all locations.

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

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

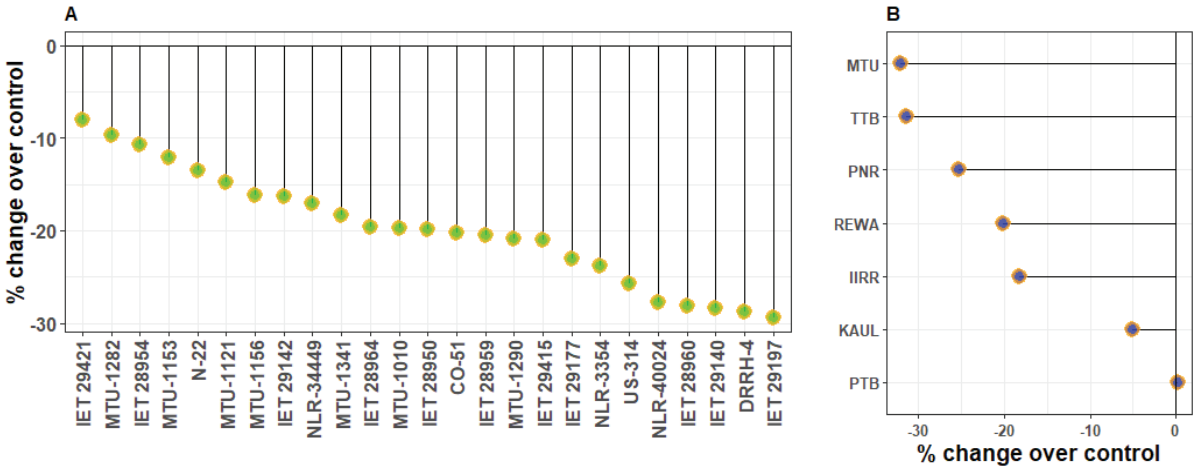


Fig 6.3.8. Influence of elevated temperature on number filled grains per/panicle recorded at maturity each bar represents percent change in grain number under elevated temperature in comparison with control (A) mean of all varieties, (B) mean of all locations.

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

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

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

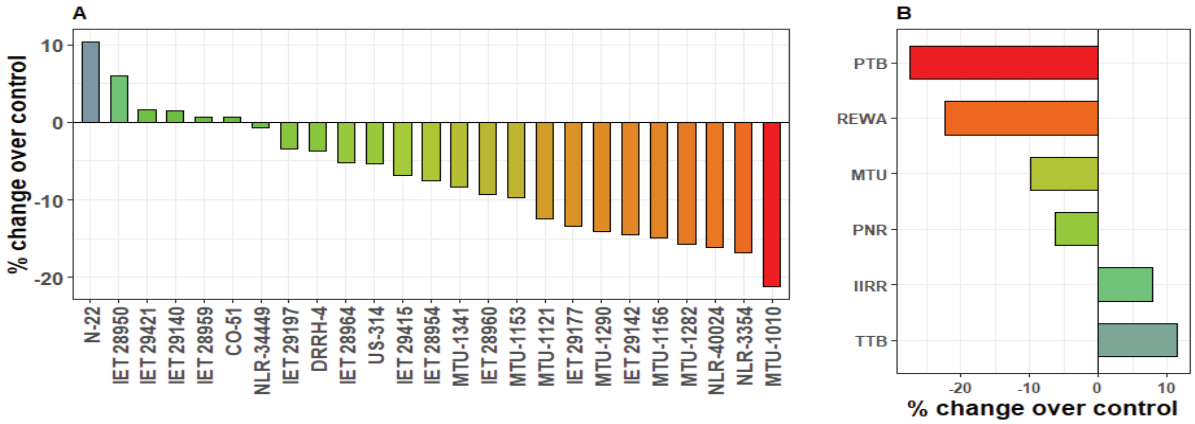


Fig 6.3.9. Influence of elevated temperature on shoot weight (g/m^2) recorded at maturity each bar represents percent change in shoot weight under elevated temperature in comparison with control (A) mean of all varieties, (B) mean of all locations.

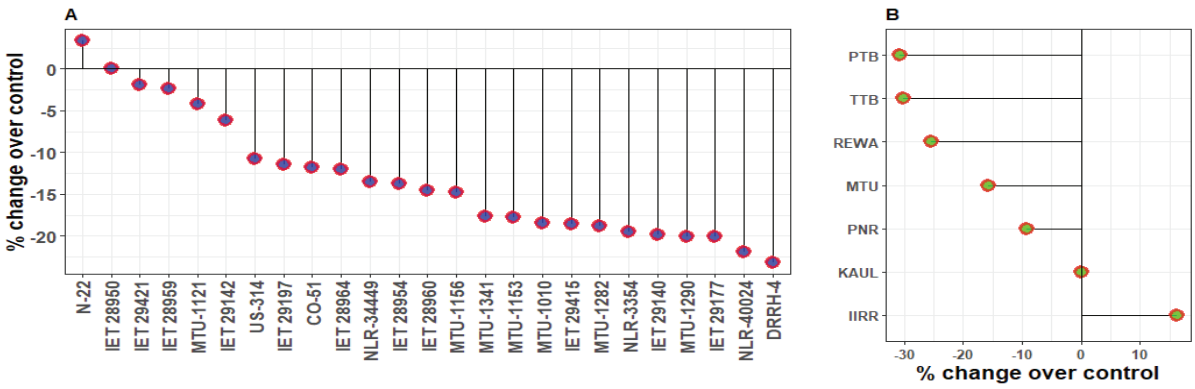


Fig 6.3.10. Influence of elevated temperature on panicle number/m2 recorded at maturity each bar represents percent change in panicle number under elevated temperature in comparison with control (A) mean of all varieties, (B) mean of all locations.

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

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

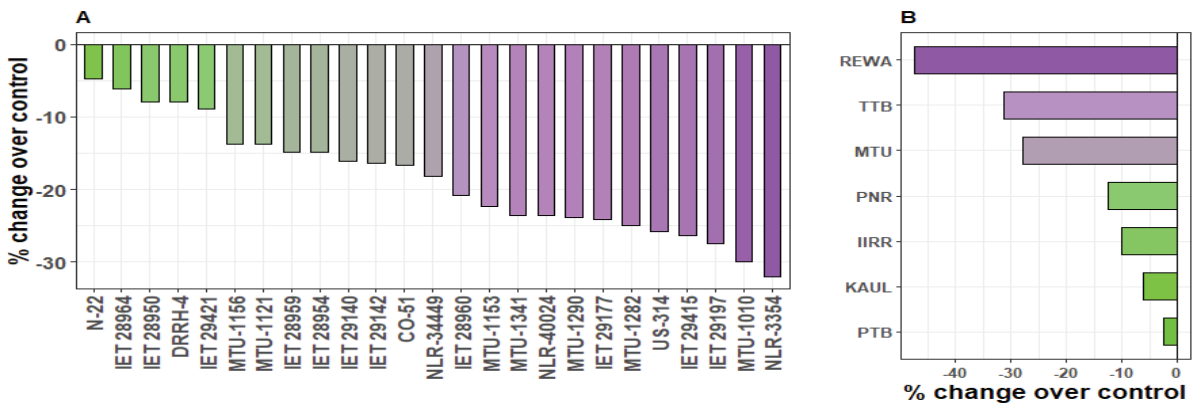


Fig 6.3.11. Influence of elevated temperature on grain yield (g/m^2) recorded at maturity each bar represents percent change in grain yield under elevated temperature in comparison with control (A) mean of all varieties, (B) mean of all locations.

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

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

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

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

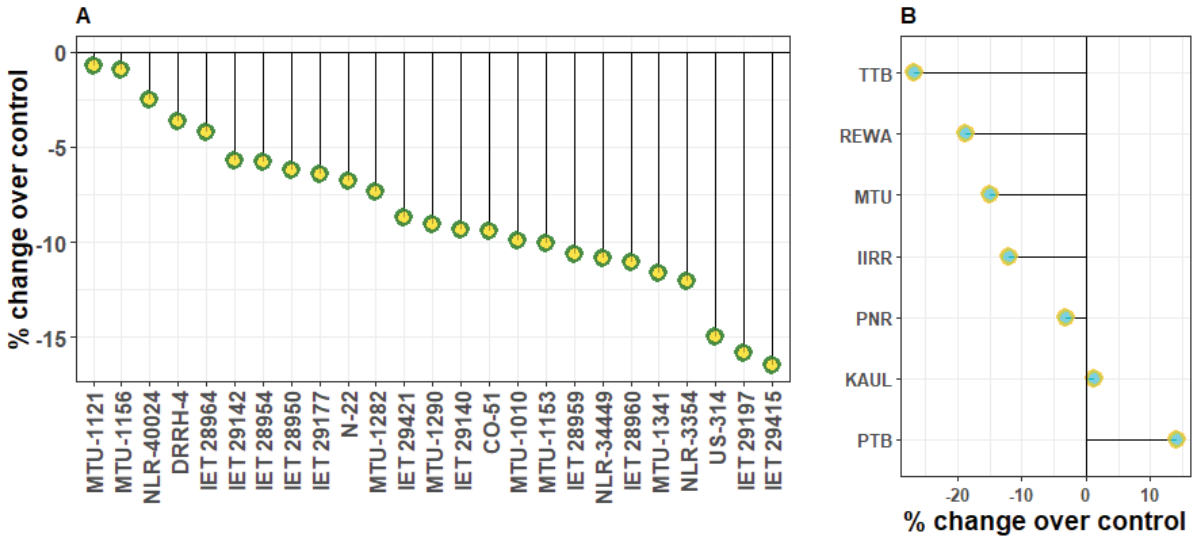


Fig 6.3.12. Influence of elevated temperature on harvest index (%) recorded at maturity each bar represents percent change in harvest index under elevated temperature in comparison with control (A) mean of all varieties, (B) mean of all locations.

Identification of high temperature tolerant genotypes using yield based indices

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

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

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

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

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

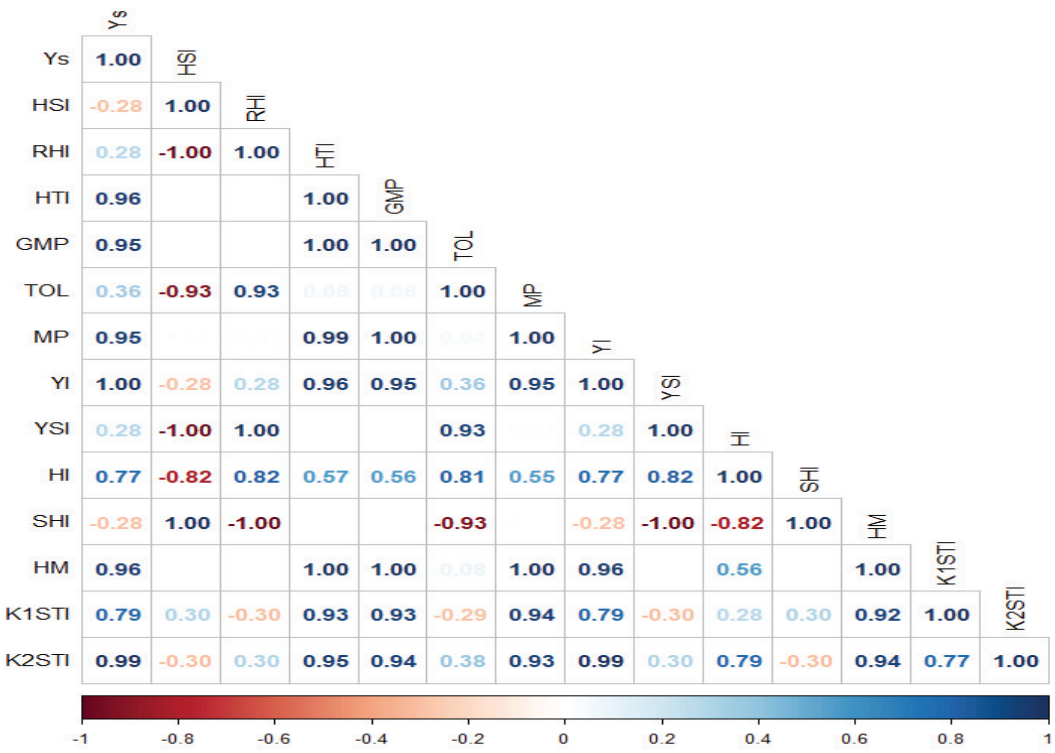


Fig 6.3.13. Correlation between yield recorded under elevated temperature condition and heat indices computed from yield recorded under both stressed and non-stressed condition. Mean yield data from all locations was used for computing the correlation coefficients. Statistically significant coefficients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

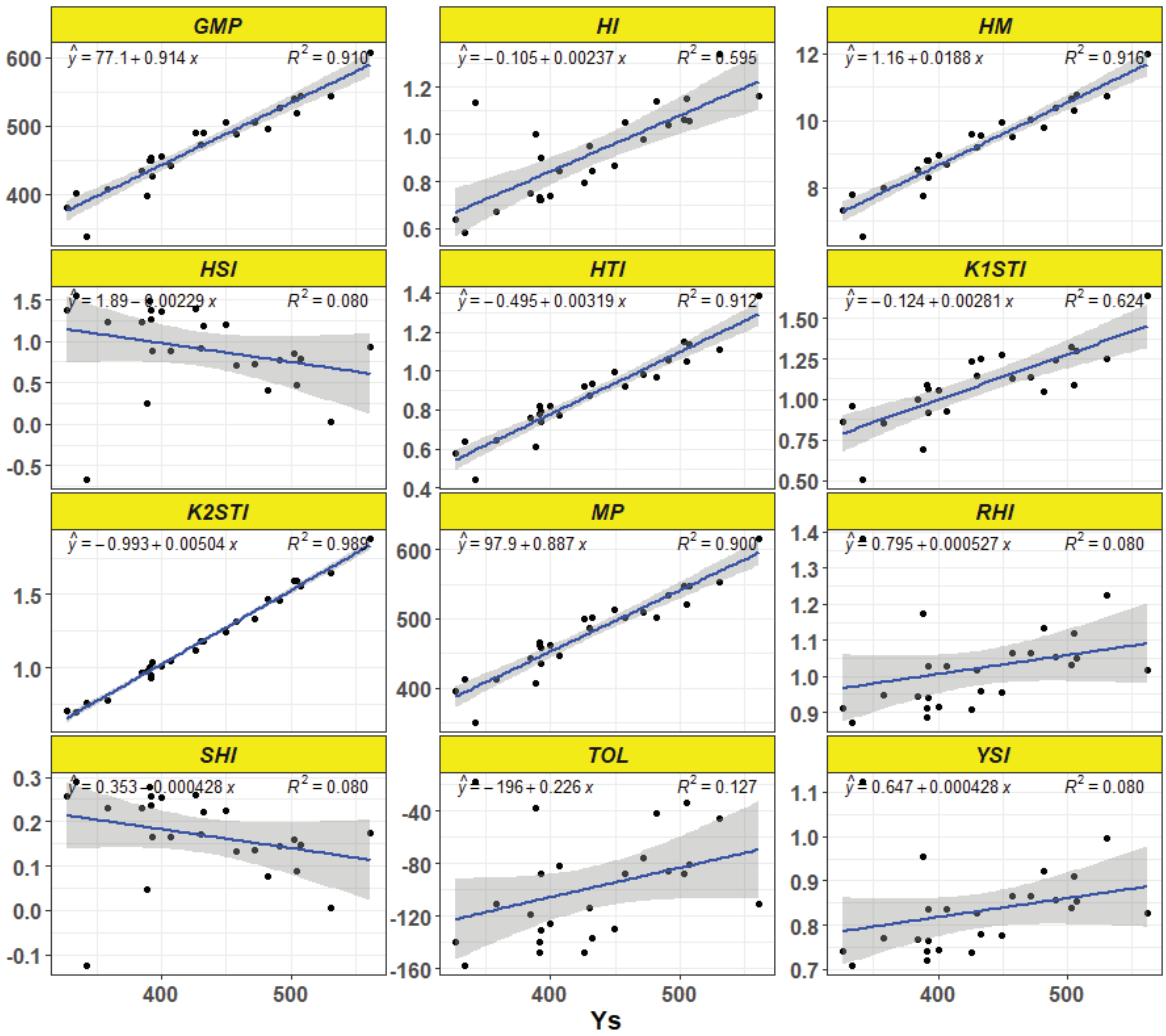


Fig 6.3.14. Relationship between heat stress indices and grain yield recorded under stressed condition (Ys). Mean of grain yield recorded at different locations was used for regression analysis.

Summary and Conclusions:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Anaerobic Germination:

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

70.6% (KRK) with an overall experimental CV of 18.02% **(Table 6.4.2)**. The tolerant check Vandana recorded an overall mean AGI of 65.7% across all locations. One entry IC-256608 recorded highest AGI of 73.5% based on multi-location mean, whereas four other entries, viz., Pantara (66.1%), AC847A (65.1%), FL478 (64.8%) and CR4423-17 (60.6%) also recorded an AGI of 60-70% and were at par with Vandana. All these entries can be considered as highly tolerant to anaerobic germination **(Fig. 6.4.1)**. There were six more accessions *viz*. CR4423-101 (54.6), AC1125A (54.1%), IC-256605 (53.3%), CR4423-8 (51.9%), CR 4111-B-1-10-S-1-Sub-B (51.0%) and CR 4111-B-1-4-S-1-Sub-B (50.8%), which showed an AGI of 50-55% and can be considered as tolerant to anaerobic germination. Rest of the genotypes showed less than 50% germination under anaerobic conditions including the susceptible checks Naveen and IR20 showing 16.9% and 22.2% AGI across locations.

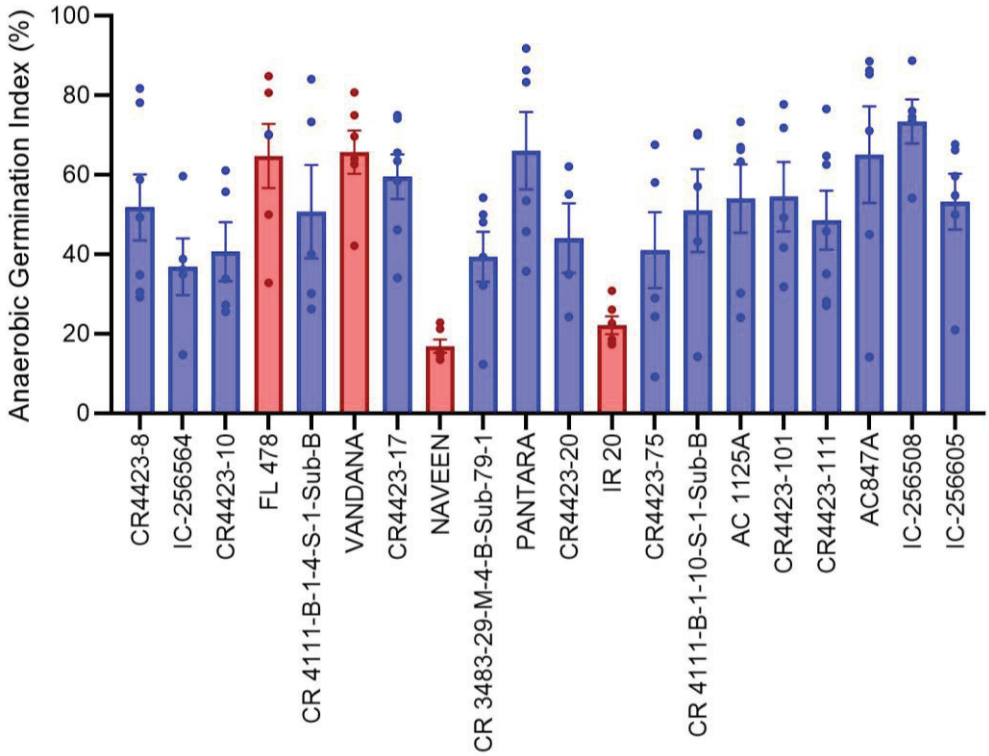


Fig. 6.4.1 *Mean AGI (%) of rice genotypes recorded after under 21 days of germination stage submergence stress tested at three different locations. Error bars representing SE (mean) of all locations and scattered dots are representing mean of individual location.*

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

across all locations **(Table 6.5.3)**. The mean epicotyl length was highest in AC874A (24.9 cm), followed by FL478 (22.3 cm), Vandana (21.3 cm), AC1125A (20.4 cm) and IC-256605 (20.0 cm) after 21 days of AG treatment **(Fig. 6.4.2)**. But the epicotyl length was found significantly low in some genotypes like CR4423-20 (9.6 cm), CR4423-10 (11.2 cm), CR 4111-B-1-4-S-1-Sub-B (12.0 cm). We found a significant correlation ($R^2 = 0.3991$) between AGI and length of epicotyl measured after 21 days of stress, which signifies greater the epicotyl elongation under AG condition, more is anaerobic germination potential of that particular genotypes **(Fig. 6.4.3)**. Interestingly, the genotype IC-256608, which showed highest AGI of 73.5% showed moderate epicotyl elongation of 16.9 cm based the mean data of different centres.

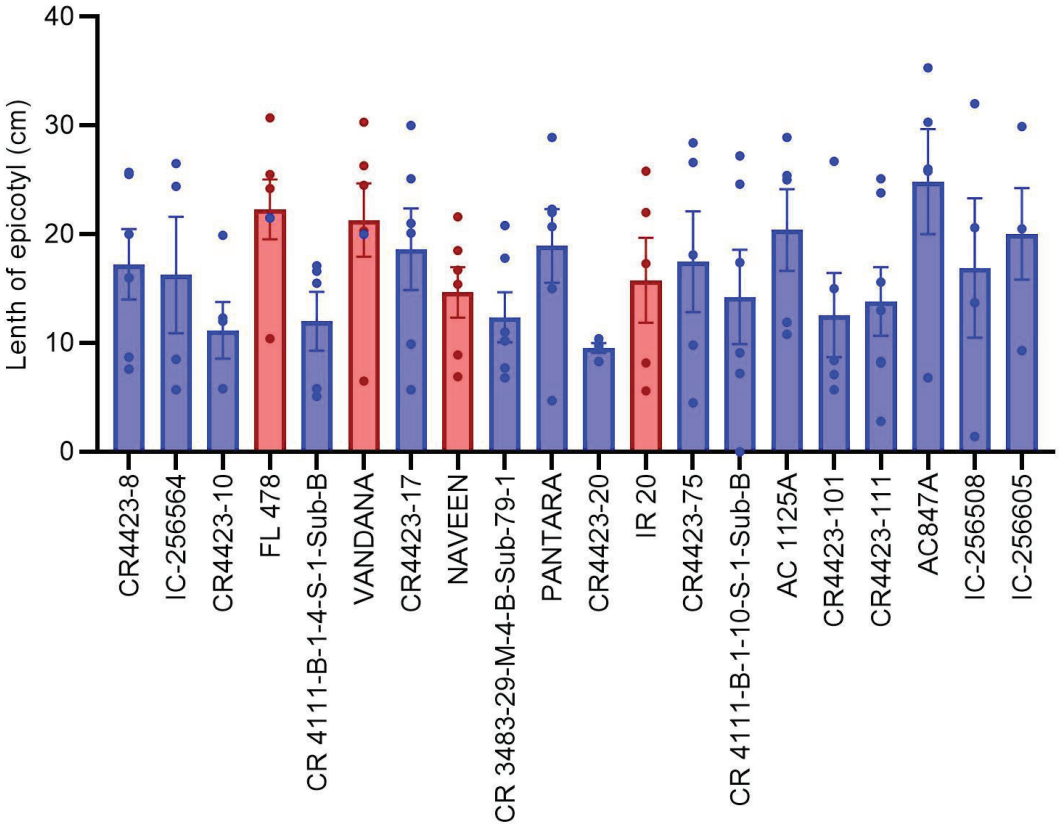


Fig. 6.4.2 *Mean length of epicotyl (cm) of rice genotypes recorded after under 21 days of germination stage submergence stress tested at three different locations. Error bars representing SE (mean) of all locations and scattered dots are representing mean of individual location.*

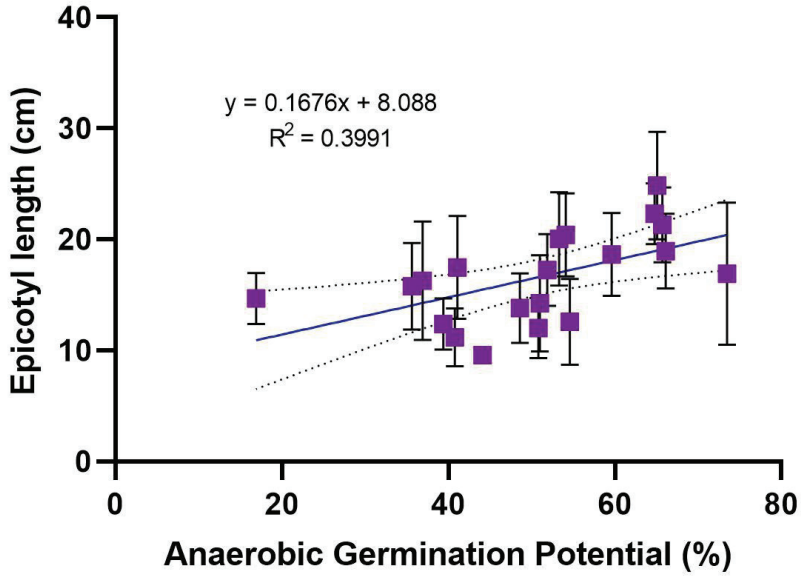


Fig. 6.4.3 *An XY-scatter plot showing simple linear regression between anaerobic germination potential and epicotyl length of rice genotypes under 14 days of complete submergence tested at three different locations. Error bars representing SE (mean) of all locations.*

Salinity Stress:

Screening for salinity tolerance was conducted at NRRI, KJT, PTB and MTU centres. Root and shoot dry biomass and visual salt injury score important physiological traits in rice for tolerance to salinity stress at seedling stage. Salinity stress significantly reduced the mean (average of all locations) root and shoot dry weight of all studied genotypes **(Fig. 6.4.4, Table 6.4.4 & 6.4.5)**. Mean root dry weight in control and salinity stress was 25.9 and 10.6 mg, respectively. The mean root dry weight showed ~60% reduction under stress as compared to the control for all genotypes across locations. The highest reduction was recorded in CR 4111-B-1-10-S-1-Sub-B (70%) followed by IR20 (65 %) over control, whereas CR4423-8 (21.8%) has recorded the lowest reduction followed by IC-256605 (39%) and CR4423-10 (41%). Mean shoot dry weight in control and salinity tolerance was 34.1 and 14.6 mg, respectively. All the genotypes had shown the mean reduction of >50% in shoot dry weight under stress as compared to the control. The highest reduction in shoot dry weight was observed in IC-256608 (60%), followed by CR 4111-B-1-4-S-1-Sub-B (53%), and CR4423-17 (51%) whereas the genotype, CR4423-8 showed the lowest reduction of 35.8% over control, followed by FL478 and CR4423-101 (38.5%).

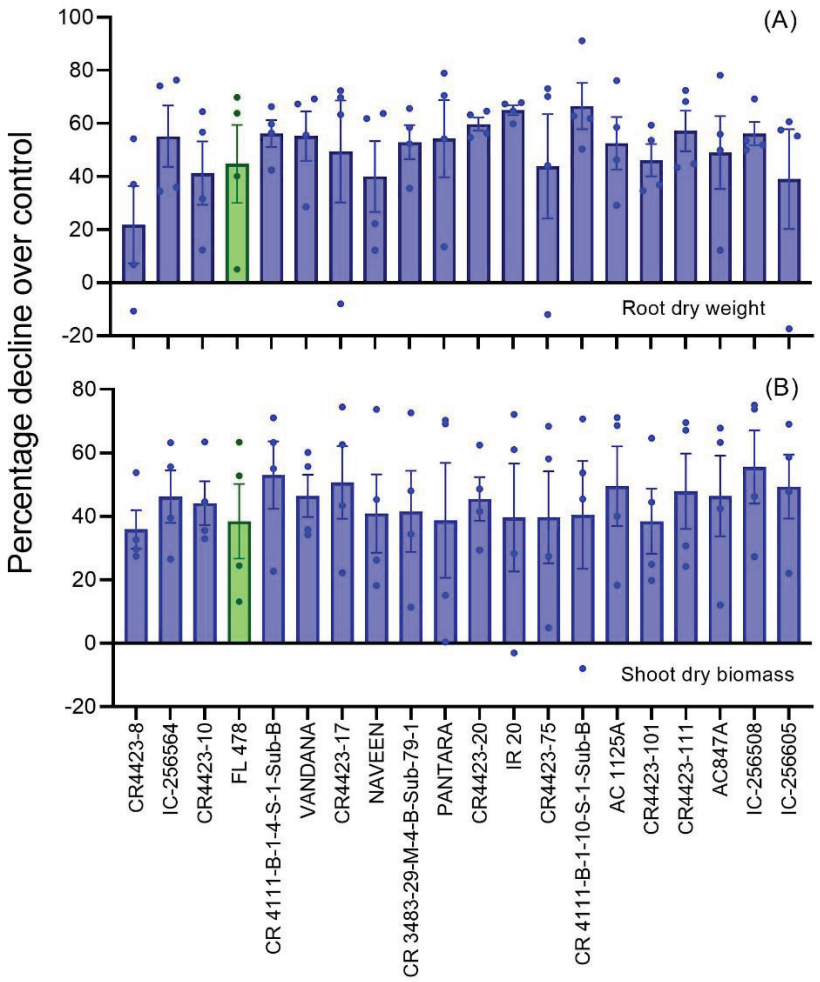


Fig. 6.4.4 *Changes in root dry weight (A) and shoot dry weight (B) of 20 rice entries (mean of all locations) in response to 12 dS m^{-1} salinity stress imposed at seedling stage tested at four different locations. Error bars representing SE (mean) of all locations and scattered dots are representing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

Salinity stress considerably reduced the total chlorophyll content of the leaves in all the genotypes across locations **(Fig. 6.4.5)**. Salt stress reduced the mean plant dry biomass by 32.12% (average of all the genotypes at all the locations). The mean (of all genotypes and all locations) chlorophyll content of the leaf was found to 1.7 mg g^{-1} leaf dry weight in control conditions, which reduced to 0.7 mg g^{-1} leaf dry weight under stress. The highest reduction over control was recorded in CR4423-10 (69%), followed by CR4423-101 (67%) and CR4423-20 (63%), while the least reduction was observed in IC-256608 (39%), followed by Pantara (44%), CR4423-75 (47%) and CR-4411-B-1-10-S-1-Sub-B (47%) **(Table 6.4.6)**.

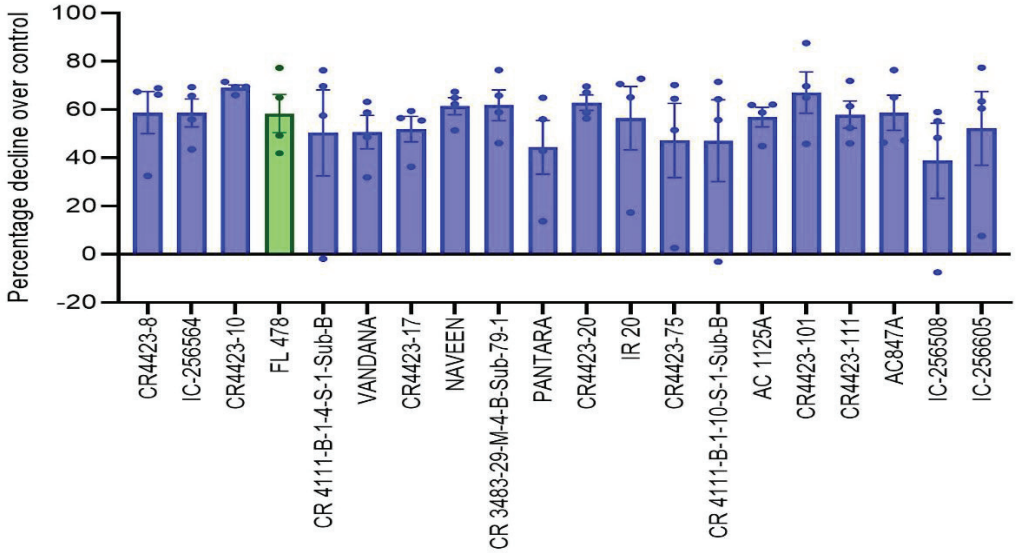


Fig. 6.4.5 *Changes in total chlorophyll content of the leaf of 20 rice entries (mean of all locations) in response to 12 dS m^{-1} salinity stress imposed at seedling stage tested at four different locations. Error bars representing SE (mean) of all locations and scattered dots are representing mean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

The visual salt injury score (SES score) taken at four studied locations suggested a wide variability of these genotypes towards salt stress. The highest SES score of '9' was recorded in susceptible check IR20 and CR4423-10, while it was least in tolerant check FL478 (3) **(Fig. 6.4.6)**. Besides FL478, an average score of '3' was received by two other genotypes, AC1125A and Vandana. Based on standard evaluation system these genotypes may be considered as tolerant to seedling stage salinity stress. Nine other genotypes *viz*. Pantara, AC847A, CR4423-8, CR4423-107, CR4423-101, CR4423-1111, IC-256608, IC-256605 and CR-4411-B-1-10-S-1-Sub-B.

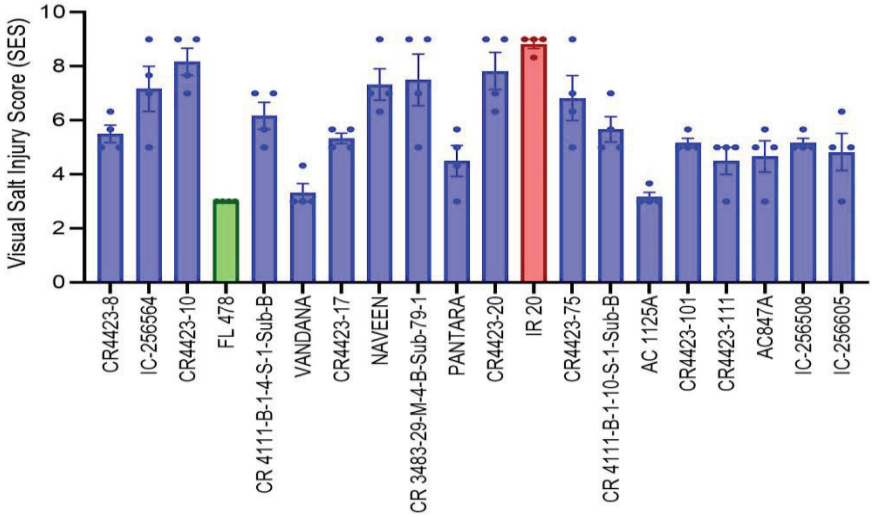


Fig. 6.4.7 *Visual salt injury (VSI) score (mean of all locations) in response to 12 dS m^{-1} salinity stress imposed at seedling stage tested at four different locations. Error bars representing SE (mean) of all biological replicates. Error bars representing SE (mean) of all locations and scattered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

The shoot Na^+/K^+ ratio under salt stress and visual salt injury (VSI) scores are two associated traits for salt tolerance in rice. The Na^+/K^+ ratio was fond to be highly correlated (0.6929**) with VSI for all genotypes across four studied locations **(Fig. 6.4.7, Table 6.4.7)**. The shoot Na^+/K^+ ratio was varied between 0.787 – 2.533 in the studied genotypes. Besides the tolerant check FL478 (0.787), the lowest shoot Na^+/K^+ ratio was observed in AC1125A (0.867). Few other genotypes like Vandana (1.000), CR4423-8 (1.333) and CR4423-101 (1.333) also showed relatively lower Na^+/K^+ ratio in the leaf tissue suggesting tolerance nature of these genotypes under seedling stage salt stress. After dissecting different adaptive traits, it was found that FL478, AC1125Ab and Vandana were good ion excluder and tolerant to seedling stage salt stress, while genotypes like Pantara, CR4423-8, CR4423-101, AC847A, CR4423-17, IC-256608 were moderately tolerant to salt stress with relatively higher mesophyll Na^+ load.

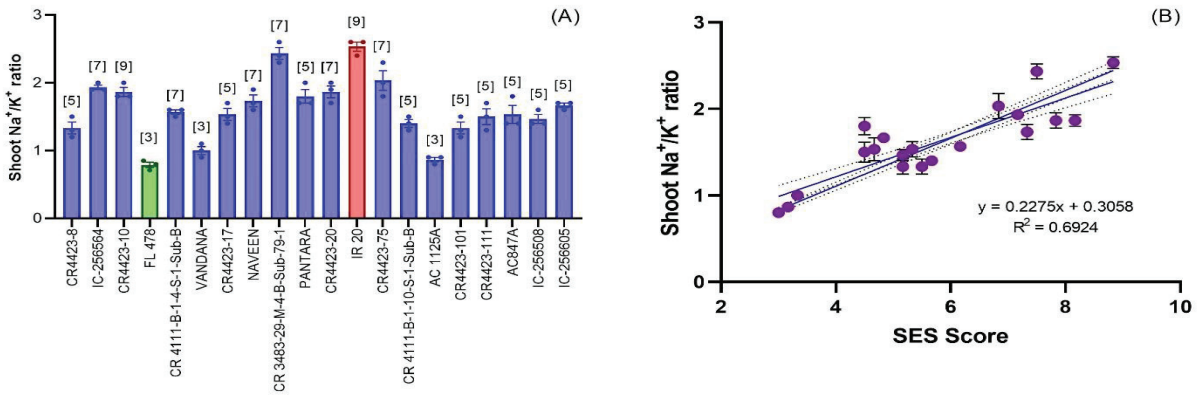


Fig. 6.4.7 *Changes in shoot Na^+/K^+ ratio and visual salt injury (VSI) score (A) and XY-scatter plot showing simple linear regression between shoot Na^+/K^+ ratio and visual salt injury (VSI) score (B) of 25 rice entries (mean of all locations) in response to 12 dS m^{-1} salinity stress imposed at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

Osmotic/dehydration Stress:

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

0.11752 g, 0.09225 g and 0.08162 g, respectively. Highest and least reduction in root dry weight was recorded in Naveen and IC-256605, respectively under both 1% and 2% mannitol treatment. Compared to mean root dry weight, mean shoot dry weight was less affected by osmotic stress by mannitol treatment (16.2% and 20.8% reduction was observed in 1% and 2% mannitol treatment, respectively). All the genotypes recorded significant reduction in shoot dry weight over control under 1% mannitol treatment except Vandana, Pantara, IC-256608 and IC-256605 **(Fig. 6.4.9)**.

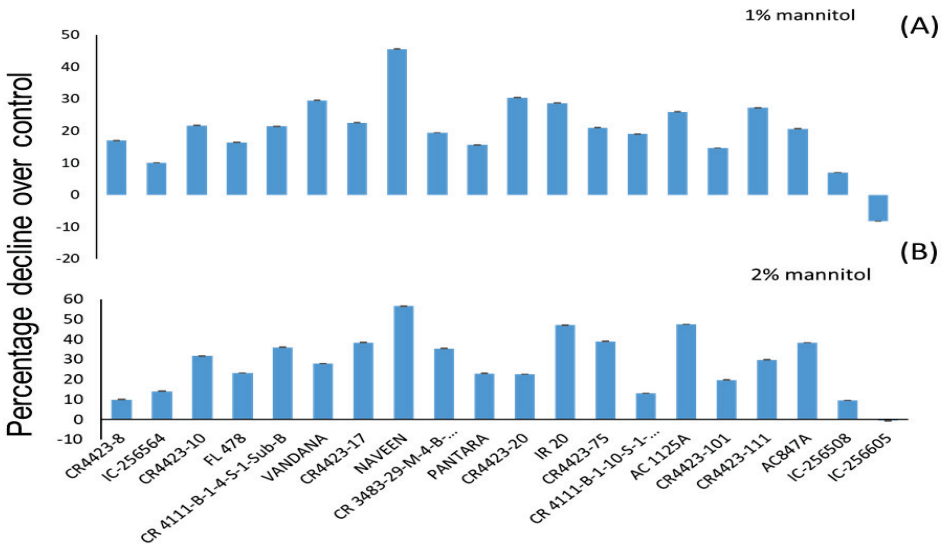


Fig. 6.4.8. *Changes in root dry weight of 20 rice entries (mean of all locations) in response to 1% (**A**) and 2% (**B**) mannitol induced osmotic stress imposed at seedling stage tested at seven different locations. Error bars representing SE (mean) of all locations.*

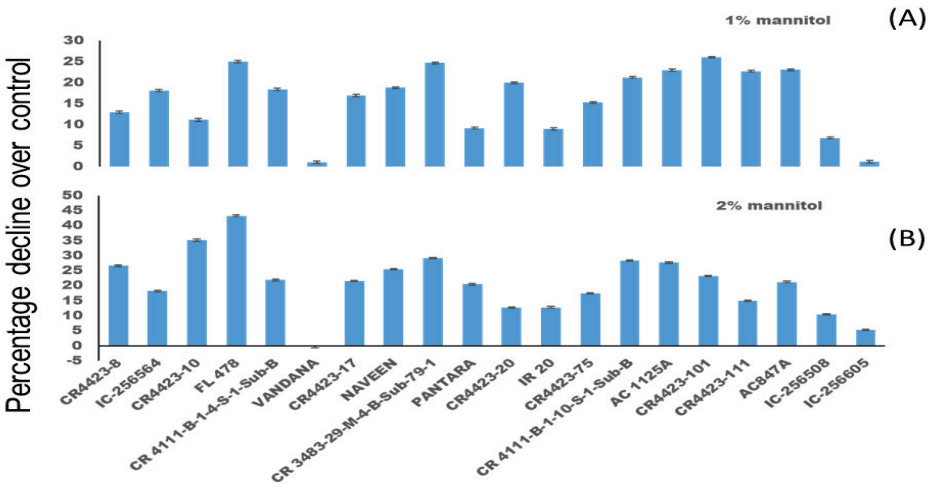


Fig. 6.4.9. *Changes in Shoot dry weight of 20 rice entries (mean of all locations) in response to 1%(**A**) and 2% (**B**) mannitol induced osmotic stress imposed at seedling stage tested at seven different locations. Error bars representing SE (mean) of all locations.*

The effect of stress levels (1% and 2% mannitol) on shoot length was found significant in the present study. In 1% mannitol treatment, shoot length was reduced by 10.3%, whereas in 2% mannitol it was reduced by 20.7% as compared to that of control **(Fig. 6.4.10, Table 6.4.8)**. Mean shoot length in control, 1% mannitol and 2% mannitol was 13.10, 11.72 and 10.36 cm, respectively. In 1% mannitol highest reduction in shoot length was observed in CR4423-111 (25.1%), whereas the least reduction was observed in Pantara (0.8%). In 2% mannitol the greatest reduction was exhibited by CR4423-10 (36.7) and least reduction by Pantara **(Fig. 6.4.10, Table 6.4.9)**. Root length was more affected by both the levels of water stress treatments than the shoot length. The genotypes, IC-256605, Pantara, IC-256608 and CR3483-29-M-4-B-Sub-79-1 were least affected by 1% mannitol treatments as compared to control plants **(Fig. 6.4.11)**. A similar kind of response was observed in total chlorophyll content, which reduced significantly under both 1% (23.7%) and 2% mannitol (38.6%) treatment as compared to control. The highest reduction was observed in CR4423-111 (44.1%), followed by IR-20 (32.8%) over control while the least reduction was shown by Vandana (9.3%), followed by CR4423-20 (12.4%) and IC-256605 (15%) over control **(Fig. 6.4.12, Table 6.4.10)**.

Screening of 20 rice accessions for multiple abiotic stress tolerance was conducted at 7 AICRIP centers for their osmotic/dehydration (1 and 2% mannitol) stress tolerance at seedling stage. All the genotypes including tolerant checks recorded reduction in key physiological traits viz. Root and shoot lengths, root and shoot dry weights and total chlorophyll content. Based on the data obtained from all the centres, we could able to conclude that, some of the genotypes performed better than the checks and some of the entries like IC-256605 found to be tolerant and IC-256608, Pantara, CR4423-101 and IC-256564 were moderately tolerant when percent reduction in Root Dry Weight trait at both 1% and 2% stress level is considered. When percent reduction in Shoot Dry Weight trait is considered, IC-256605 was tolerant and CR4423-75, IC-256608, CR4423-20 and Pantara were found to be moderately tolerant.

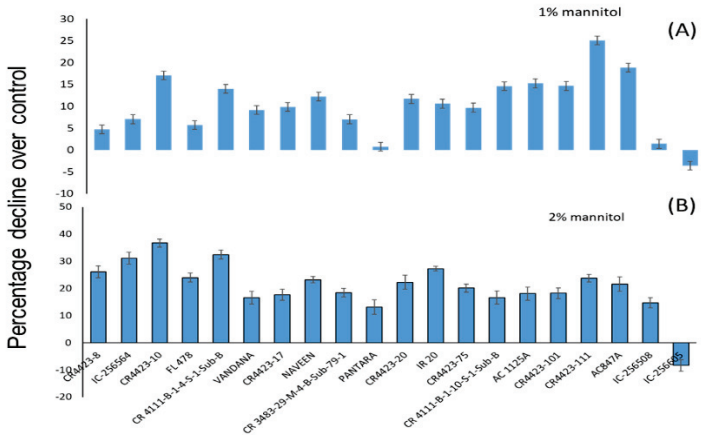


Fig. 6.4.10. *Changes in Shoot length(cm) of 20 rice entries (mean of all locations) in response to 1%(**A**) and 2% (**B**) mannitol induced osmotic stress imposed at seedling stage tested at seven different locations. Error bars representing SE (mean) of all locations.*

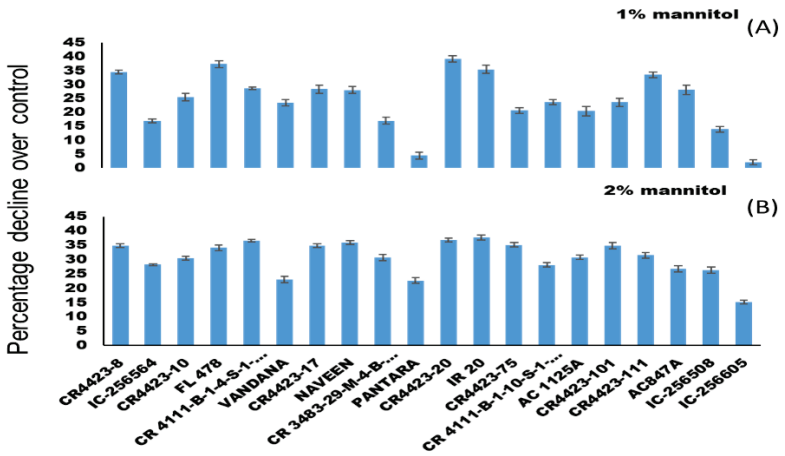


Fig. 6.4.11. *Changes in Root length(cm) of 20 rice entries (mean of all locations) in response to 1%(**A**) and 2% (**B**) mannitol induced osmotic stress imposed at seedling stage tested at seven different locations. Error bars representing SE (mean) of all locations.*

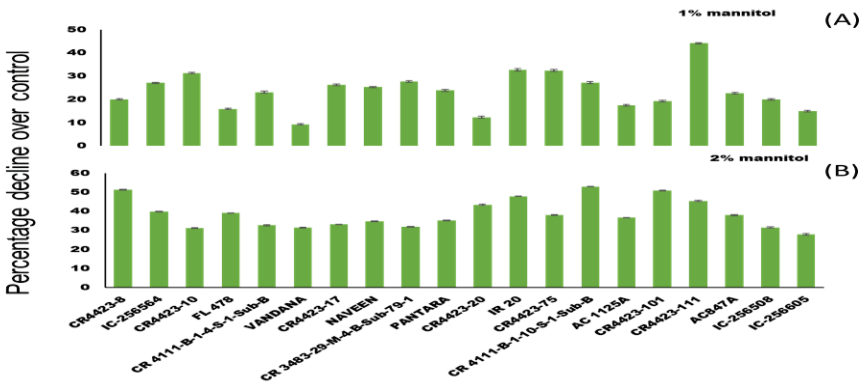


Fig. 6.4.12. *Changes in Chlorophyll content (mg/FW) of 20 rice entries (mean of all locations) in response to 1%(**A**) and 2% (**B**) mannitol induced osmotic stress imposed at seedling stage tested at seven different locations. Error bars representing SE (mean) of all locations.*

Summary and Conclusion:

- Screening of 20 rice accessions for multiple abiotic stress tolerance was conducted at 7 AICRIP centers for their anaerobic germination potential and tolerant against salinity (12 dS m^{-1}) and osmotic/dehydration (1 and 2% mannitol) stresses at seedling stage.
- All the genotypes including tolerant checks recorded reduction in key physiological traits *viz*. germination percentage, epicotyl length, shoot and root dry weight, shoot and root length, leaf chlorophyll content and shoot Na^+/K^+ ratio in response to different abiotic stresses.
- Based on the multi-locational performance under AG stress, IC-256608, Pantara, AC847A, FL478, Vandana and CR4423-17 were found tolerant.
- Similarly, genotypes *viz*., FL478, AC1125A, Vandana, Pantara, AC847A, CR4423-8, CR4423-107, CR4423-101, CR4423-1111, IC-256608, IC-256605 and CR-4411-B-1-10-S-1-Sub-B were found tolerant to seedling stage salinity stress.
- Similarly, genotypes *viz*., IC-256605, Pantara, IC-256608, CR3483-29-M-4-B-Sub-79-1, CR4423-17 and Vandana showed considerable osmotic stress tolerance.
- Three entries *viz*. Pantara, IC-256608, Vandana were tolerant to all the abiotic stresses (AG, salinity and osmotic), while another genotype CR4423-17 was found tolerant to both AG and osmotic stresses and two other genotypes (AC847A and FL478) were found tolerant to salinity and AG stresses.

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

S.No.	Nature of Stress	Tolerant genotypes identified
1	Anaerobic germination (AG)	IC-256608, Pantara, AC847A, FL478, Vandana, CR4423-17
2	Salinity stress (SS)	FL478, AC1125A, Vandana, Pantara, AC847A, CR4423-8, CR4423-107, CR4423-101, CR4423-1111, IC-256608, IC-256605, CR-4411-B-1-10-S-1-Sub-B.
3	Osmotic stress (OS)	IC-256605, Pantara, IC-256608, CR3483-29-M-4-B-Sub-79-1, CR4423-17, Vandana
4	AG + SS	IC-256608, Pantara, FL478, Vandana, AC847A
5	AG + OS	IC-256608, Pantara, CR4423-17, Vandana
6	SS + OS	Pantara, IC-256608, Vandana
7	AG + SS+ OS	Pantara, IC-256608, Vandana

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

S.No.	Genotypes	CTC	KJT	CBT	TTB	PTB	KAUL	KRK	Mean
1	CR4423-8	29.3	34.9	81.8	78.2	30.5	58.9	49.4	**51.9**
2	IC-256564	14.8	36.2	59.7	.	35.0	38.9	.	**36.9**
3	CR4423-10	33.9	27.3	61.1	.	55.8	25.6	.	**40.8**
4	FL 478	32.9	.	80.7	84.9	70.0	50.0	70.2	**64.8**
5	CR 4111-B-1-4-S-1-Sub-B	30.2	.	40.0	.	73.4	26.3	84.1	**50.8**
6	VANDANA	42.2	.	64.0	75.0	80.8	62.7	69.7	**65.7**
7	CR4423-17	38.1	46.2	75.0	63.5	65.6	58.5	74.2	**59.6**
8	NAVEEN	14.8	13.6	15.6	21.3	13.5	22.9	.	**16.9**
9	CR 3483-29-M-4-B-Sub-79-1	12.4	54.3	50.0	48.1	32.2	39.4	.	**39.4**
10	PANTARA	53.5	35.8	83.4	91.9	86.4	45.8	.	**66.1**
11	CR4423-20	35.0	.	62.1	.	55.1	24.3	.	**44.1**
12	IR 20	17.4	22.7	17.6	.	26.1	18.6	30.9	**22.2**
13	CR4423-75	24.4	.	58.1	29.0	58.2	9.2	67.6	**41.1**
14	CR 4111-B-1-10-S-1-Sub-B	43.3	.	57.1	.	70.0	14.3	70.5	**51.0**
15	AC 1125A	30.3	.	63.4	73.4	66.4	24.1	67.0	**54.1**
16	CR4423-101	49.3	31.9	71.9	.	77.8	41.8	.	**54.6**
17	CR4423-111	28.2	27.2	45.9	76.6	62.6	35.1	64.8	**48.6**
18	AC847A	45.0	.	86.3	85.4	71.1	14.2	88.6	**65.1**
19	IC-256608	76.1	.	73.7	.	88.8	54.2	74.6	**73.5**
20	IC-256605	50.0	.	59.7	67.7	54.9	21.0	66.3	**53.3**
	Mean	**34.9**	**33.0**	**62.3**	**66.2**	**58.7**	**34.3**	**70.6**	**50.8**
	LSD (Genotype)						**5.579**		
	LSD (Location × Genotype)						**14.761**		
	CV (Residual) %						**18.015**		

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

S.No.	Genotypes	CTC	KJT	CBT	TTB	PTB	KAUL	KRK	Mean
1	CR4423-8	8.7	7.6	25.7	20.0	25.5	16.0	--	**17.2**
2	IC-256564	5.7	8.5	26.5	--	24.4	--	--	**16.3**
3	CR4423-10	5.8	5.9	12.3	--	19.9	12.0		**11.2**
4	FL 478	10.4	--	30.7	21.5	24.2	21.5	25.5	**22.3**
5	CR 4111-B-1-4-S-1-Sub-B	5.8	--	15.5	--	16.6	5.1	17.1	**12.0**
6	VANDANA	6.5	--	30.3	20.3	24.5	20.0	26.3	**21.3**
7	CR4423-17	9.9	5.7	25.1	21.0	30.0	20.1	--	**18.6**
8	NAVEEN	6.9	8.9	21.6	16.7	18.5	15.4	--	**14.7**
9	CR 3483-29-M-4-B-Sub-79-1	7.7	6.8	20.8	11.0	17.8	10.2	--	**12.4**
10	PANTARA	22.3	4.7	28.9	22.0	20.7	15.0	--	**18.9**
11	CR4423-20	9.9	--	10.4	--	9.7	8.3	--	**9.6**
12	IR 20	8.2	5.6	22.0	--	17.3	--	25.8	**15.8**
13	CR4423-75	9.8	--	26.6	4.5	18.1	--	28.4	**17.5**
14	CR 4111-B-1-10-S-1-Sub-B	9.1	--	17.4	0.0	24.6	7.2	27.2	**14.3**
15	AC 1125A	11.9	--	28.9	10.8	25.0	--	25.4	**20.4**
16	CR4423-101	7.1	8.4	26.7	--	15.0	5.7	--	**12.6**
17	CR4423-111	8.3	8.2	23.8	13.0	15.6	2.8	25.1	**13.8**
18	AC847A	26.0	--	35.3	6.8	30.3	--	25.8	**24.9**
19	IC-256608	13.7	--	32.0	--	20.6	1.4	--	**16.9**
20	IC-256605	20.5	--	29.9	9.3	20.5	--	--	**20.0**
	Mean	**10.7**	**7.0**	**24.5**	**13.6**	**20.9**	**11.5**	**25.2**	**16.6**
	LSD (Genotype)						**1.178**		
	LSD (Location × Genotype)						**3.117**		
	CV (Residual) %						**18.429**		

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

S.No.	Genotypes	CTC	KJT	PTB	MTU	Mean	CTC	KJT	PTB	MTU	Mean
1	CR4423-8	31.9	28.6	3.6	34.3	**24.6**	8.7	8.0	3.6	32.0	**13.1**
2	IC-256564	28.3	27.5	3.9	41.7	**25.3**	6.7	7.1	2.5	27.3	**10.9**
3	CR4423-10	13.4	21.8	4.3	46.3	**21.5**	5.8	7.8	3.8	31.7	**12.3**
4	FL 478	32.3	30.2	5.9	50.7	**29.8**	9.8	10.9	5.6	30.3	**14.1**
5	CR 4111-B-1-4-S-1-Sub-B	13.6	26.4	2.5	52.7	**23.8**	5.9	8.9	2.4	30.3	**11.9**
6	VANDANA	23.7	34.3	5.8	81.7	**36.4**	10.5	10.5	4.2	26.7	**13.0**
7	CR4423-17	27.0	29.1	5.5	54.3	**29.0**	8.2	10.7	5.9	15.0	**9.9**
8	NAVEEN	16.5	32.6	6.0	51.0	**26.5**	6.3	11.8	5.3	39.7	**15.8**
9	CR 3483-29-M-4-B-Sub-79-1	12.2	22.8	4.6	40.3	**20.0**	4.2	9.5	2.2	26.0	**10.5**
10	PANTARA	20.7	39.3	7.1	49.3	**29.1**	4.3	11.6	3.2	42.7	**15.4**
11	CR4423-20	13.1	24.1	5.0	48.7	**22.7**	5.7	8.9	1.8	22.0	**9.6**
12	IR 20	12.8	25.2	9.1	62.3	**27.4**	4.5	10.1	2.9	20.3	**9.5**
13	CR4423-75	15.2	30.5	3.9	65.7	**28.8**	4.1	9.1	4.4	36.7	**13.6**
14	CR 4111-B-1-10-S-1-Sub-B	17.6	23.4	3.0	45.0	**22.2**	6.7	8.7	0.3	22.3	**9.5**
15	AC 1125A	19.7	36.4	5.0	46.0	**26.8**	8.1	8.7	3.6	24.7	**11.3**
16	CR4423-101	16.9	25.5	3.7	40.7	**21.7**	7.8	10.4	4.5	25.7	**12.1**
17	CR4423-111	15.6	26.8	5.1	59.3	**26.7**	8.8	8.5	2.8	16.3	**9.1**
18	AC847A	16.4	27.8	5.7	50.3	**25.1**	8.2	12.3	5.0	11.0	**9.1**
19	IC-256608	17.2	31.4	4.4	52.0	**26.2**	8.3	9.7	2.0	26.0	**11.5**
20	IC-256605	18.3	24.3	3.9	48.7	**23.8**	7.2	10.9	3.6	20.7	**10.6**
	Mean	**19.1**	**28.4**	**4.9**	**51.1**	**25.9**	**7.0**	**9.7**	**3.5**	**26.4**	**11.6**
	LSD (Treatment)	**0.87**		LSD (Location X Genotype)			**3.23**	CV (Treatment) %			**22.05**
	LSD (Location X Treatment)	**1.74**		LSD (Treatment X Genotype)			**2.29**	CV (Residual) %			**15.18**
	LSD (Genotype)	**1.62**		LSD (L X G X T)			**4.57**				

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

S.No.	Genotypes	CTC	KJT	PTB	MTU	Mean	CTC	KJT	PTB	MTU	Mean
1	CR4423-8	92.4	48.1	9.4	17.2	**41.8**	42.7	14.9	6.3	12.1	**19.0**
2	IC-256564	85.1	37.4	7.7	19.2	**37.3**	31.3	16.6	5.6	11.6	**16.3**
3	CR4423-10	48.6	34.8	8.2	19.5	**27.8**	26.9	12.7	5.3	13.1	**14.5**
4	FL 478	87.7	51.0	9.8	16.5	**41.3**	41.4	18.7	7.4	14.3	**20.4**
5	CR 4111-B-1-4-S-1-Sub-B	53.0	40.3	7.1	15.8	**29.1**	19.5	11.7	5.9	12.2	**12.3**
6	VANDANA	78.4	55.3	9.6	15.9	**39.8**	31.3	24.5	6.2	10.4	**18.1**
7	CR4423-17	65.3	48.0	8.0	16.2	**34.4**	16.7	18.0	6.2	9.2	**12.5**
8	NAVEEN	68.1	54.6	7.5	15.9	**36.5**	17.9	29.9	5.5	13.0	**16.6**
9	CR 3483-29-M-4-B-Sub-79-1	54.7	40.2	6.3	13.3	**28.6**	15.0	20.9	5.2	8.7	**12.4**
10	PANTARA	71.8	65.9	8.7	15.4	**40.5**	22.2	19.6	8.2	13.1	**15.8**
11	CR4423-20	51.4	40.3	10.1	15.6	**29.3**	19.3	20.7	7.1	9.1	**14.1**
12	IR 20	46.3	50.4	7.2	15.3	**29.8**	12.9	19.6	6.2	11.0	**12.4**
13	CR4423-75	55.1	40.5	5.7	14.2	**28.9**	17.4	17.0	5.1	10.3	**12.4**
14	CR 4111-B-1-10-S-1-Sub-B	57.2	38.6	5.3	16.1	**29.3**	16.8	17.9	5.1	8.8	**12.1**
15	AC 1125A	66.7	59.3	11.3	17.8	**38.8**	19.3	18.6	9.2	10.7	**14.5**
16	CR4423-101	54.5	47.8	9.2	10.6	**30.5**	19.3	26.6	6.9	8.5	**15.3**
17	CR4423-111	57.3	51.8	9.0	15.4	**33.4**	17.5	17.0	7.5	11.7	**13.4**
18	AC847A	58.3	54.0	10.0	15.5	**34.4**	18.8	19.8	8.8	8.9	**14.1**
19	IC-256608	66.1	60.6	7.6	15.6	**37.5**	17.3	15.2	7.7	8.4	**12.1**
20	IC-256605	57.9	50.4	10.0	16.5	**33.7**	17.9	20.8	7.8	8.6	**13.8**
	Mean	**63.8**	**48.5**	**8.4**	**15.9**	**34.1**	**22.1**	**19.0**	**6.7**	**10.7**	**14.6**
	LSD (Treatment)	**0.77**		LSD (Location X Genotype)			**3.31**	CV (Treatment) %			**14.95**
	LSD (Location X Treatment)	**1.53**		LSD (Treatment X Genotype)			**2.34**	CV (Residual) %			**11.97**
	LSD (Genotype)	**1.66**		LSD (L X G X T)			**4.69**				

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

S.No.	Genotypes	CTC	KJT	PTB	MTU	Mean	CTC	KJT	PTB	MTU	Mean
1	CR4423-8	3.9	1.5	0.5	1.8	**1.9**	1.3	0.4	0.3	0.6	**0.7**
2	IC-256564	2.7	1.3	0.5	2.1	**1.7**	1.2	0.4	0.3	0.7	**0.6**
3	CR4423-10	3.0	1.2	0.6	2.1	**1.7**	1.0	0.3	0.2	0.6	**0.5**
4	FL 478	3.0	1.6	1.0	1.8	**1.9**	1.7	0.6	0.2	0.9	**0.9**
5	CR 4111-B-1-4-S-1-Sub-B	3.2	1.2	0.2	2.1	**1.7**	1.4	0.4	0.2	0.5	**0.6**
6	VANDANA	2.5	1.6	0.7	2.2	**1.8**	1.7	0.6	0.4	0.9	**0.9**
7	CR4423-17	2.6	1.5	0.5	2.2	**1.7**	1.1	0.6	0.3	1.0	**0.8**
8	NAVEEN	2.8	1.6	0.5	1.9	**1.7**	0.9	0.6	0.2	0.9	**0.6**
9	CR 3483-29-M-4-B-Sub-79-1	2.8	1.3	0.5	2.0	**1.6**	0.6	0.5	0.3	0.8	**0.5**
10	PANTARA	2.9	1.7	0.9	2.0	**1.9**	1.3	0.6	0.8	1.1	**0.9**
11	CR4423-20	3.0	1.1	0.4	1.7	**1.6**	1.2	0.4	0.1	0.8	**0.6**
12	IR 20	2.9	1.5	0.3	2.2	**1.7**	0.8	0.4	0.2	0.8	**0.6**
13	CR4423-75	2.9	1.2	0.5	2.1	**1.7**	1.0	0.3	0.5	1.0	**0.7**
14	CR 4111-B-1-10-S-1-Sub-B	2.7	1.2	0.2	2.3	**1.6**	1.2	0.4	0.2	0.6	**0.6**
15	AC 1125A	2.9	1.7	0.6	2.0	**1.8**	1.6	0.6	0.3	0.8	**0.8**
16	CR4423-101	3.0	1.4	0.6	2.1	**1.8**	1.1	0.4	0.3	0.3	**0.5**
17	CR4423-111	2.4	1.5	0.4	1.8	**1.5**	1.3	0.4	0.2	0.7	**0.7**
18	AC847A	2.5	1.5	0.5	2.1	**1.6**	1.3	0.5	0.3	0.5	**0.6**
19	IC-256608	2.8	1.7	0.7	2.1	**1.8**	1.2	0.7	0.7	1.1	**0.9**
20	IC-256605	3.5	1.3	0.4	2.2	**1.8**	1.4	0.3	0.3	0.8	**0.7**
	Mean	**2.9**	**1.4**	**0.5**	**2.0**	**1.7**	**1.2**	**0.5**	**0.3**	**0.8**	**0.7**
	LSD (Treatment)	**0.06**		LSD (Location X Genotype)			**0.17**	CV (Treatment) %			**25.37**
	LSD (Location X Treatment)	**0.13**		LSD (Treatment X Genotype)			**0.12**	CV (Residual) %			**12.33**
	LSD (Genotype)	**0.08**		LSD (L X G X T)			**0.24**				

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

S.No.	Genotypes	Na^+ Content				K^+ Content			
		Shoot		Root		Shoot		Root	
		Control	Stress	Control	Stress	Control	Stress	Control	Stress
1	CR4423-8	11.3	90.7	29.3	123.3	81.3	68.0	76.0	50.0
2	IC-256564	22.7	117.3	28.7	112.0	70.7	60.0	70.0	36.0
3	CR4423-10	66.0	111.3	27.3	119.3	63.3	59.3	54.7	46.0
4	FL 478	32.0	63.3	27.3	125.3	95.3	78.7	72.7	64.0
5	CR 4111-B-1-4-S-1-Sub-B	26.0	102.7	28.0	116.7	84.7	66.0	65.3	56.0
6	VANDANA	28.0	70.0	34.0	116.7	98.0	70.7	70.0	62.7
7	CR4423-17	13.3	93.3	31.3	136.0	84.7	62.0	71.3	55.3
8	NAVEEN	24.0	106.0	37.3	130.7	91.3	62.0	76.0	54.0
9	CR 3483-29-M-4-B-Sub-79-1	26.7	126.0	29.3	144.7	78.7	51.3	64.7	36.0
10	PANTARA	30.0	107.3	29.3	133.3	83.3	60.0	50.0	41.3
11	CR4423-20	24.0	109.3	33.3	131.3	80.0	58.0	64.0	43.3
12	IR 20	25.3	126.0	42.0	92.7	84.0	50.0	74.7	36.0
13	CR4423-75	16.0	108.7	28.7	118.0	87.3	54.0	52.0	45.3
14	CR 4111-B-1-10-S-1-Sub-B	13.3	90.0	32.0	120.0	86.7	66.0	63.3	32.0
15	AC 1125A	20.0	62.7	30.0	122.0	84.7	71.3	66.0	57.3
16	CR4423-101	14.0	88.0	26.0	120.7	97.3	64.7	68.0	50.0
17	CR4423-111	11.3	100.7	28.0	127.3	76.0	67.3	72.7	59.3
18	AC847A	20.7	94.0	30.7	117.3	78.7	61.3	69.3	44.7
19	IC-256608	18.7	88.7	34.7	124.0	73.3	61.3	61.3	43.3
20	IC-256605	26.7	106.0	27.3	135.3	86.7	63.3	69.3	50.0
	Grand Mean	**23.5**	**98.1**	**30.7**	**123.3**	**83.3**	**62.8**	**66.6**	**48.1**
	LSD (Treatment)	16.60		5.10		1.17		1.12	
	LSD (Genotype)	18.49		4.61		4.77		6.44	
	LSD (Treatment X Genotype)	26.15		6.52		6.74		9.10	
	CV (Residual) %	26.45		5.20		5.68		9.76	

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

S.No.	Genotypes	Control						1% Mannitol						2% Mannitol					
		CTC	KJT	MTU	TTB	PTB	Mean	CTC	KJT	MTU	TTB	PTB	Mean	CTC	KJT	MTU	TTB	PTB	Mean
1	CR4423-8	5.02	3.87	7.36	6.00	9.57	**6.21**	6.78	2.81	7.13	7.67	9.83	**6.08**	3.08	2.60	4.84	4.50	6.46	**4.05**
2	IC-256564	4.88	3.93	4.50	7.17	8.42	**5.52**	6.02	3.26	4.38	8.33	7.73	**5.51**	3.06	2.56	4.28	.	5.22	**3.46**
3	CR4423-10	4.76	2.86	9.58	1.50	11.39	**5.62**	4.27	2.16	6.19	.	6.60	**4.19**	3.36	1.89	5.16	.	5.68	**3.91**
4	FL 478	5.77	4.80	7.73	5.67	13.11	**7.16**	4.59	3.07	7.39	6.33	8.41	**6.07**	3.91	2.48	7.34	5.17	9.10	**4.72**
5	CR 4111-B-1-4-S-1-Sub-B	6.51	4.20	5.71	6.00	6.44	**5.91**	5.12	2.62	5.10	3.33	4.38	**4.22**	4.86	2.26	5.25	2.00	2.90	**3.75**
6	VANDANA	5.54	5.53	6.90	10.50	13.98	**8.45**	6.94	4.72	5.76	5.67	9.34	**6.47**	3.42	3.45	5.20	6.17	11.68	**5.51**
7	CR4423-17	4.07	4.63	5.45	9.50	15.02	**7.33**	5.16	3.18	5.25	3.67	10.38	**5.25**	4.09	2.95	5.04	6.00	7.26	**4.78**
8	NAVEEN	4.26	5.17	6.74	4.67	12.64	**7.01**	4.02	2.43	5.81	5.33	7.66	**5.05**	3.24	2.21	5.70	5.67	5.73	**4.49**
9	CR 3483-29-M-4-B-Sub-79-1	3.79	3.62	6.75	13.00	10.33	**7.48**	4.54	3.60	5.14	5.50	6.11	**4.89**	2.81	2.26	4.65	9.00	9.44	**5.18**
10	PANTARA	5.64	6.24	8.95	8.17	14.79	**8.21**	7.09	4.49	8.69	11.50	12.23	**7.85**	3.41	3.10	7.85	7.00	9.18	**6.35**
11	CR4423-20	5.66	3.55	4.91	13.33	8.23	**6.92**	5.84	3.80	4.73	1.50	5.93	**4.21**	3.08	2.22	4.45	.	6.91	**4.37**
12	IR 20	4.52	4.01	7.20	6.67	13.90	**6.23**	4.54	2.51	6.86	6.17	7.43	**5.17**	1.87	2.06	6.06	6.25	7.64	**4.48**
13	CR4423-75	4.01	4.84	7.75	8.17	11.94	**6.77**	3.70	4.01	7.45	4.67	8.13	**5.37**	2.37	2.71	6.15	3.33	8.05	**4.39**
14	CR 4111-B-1-10-S-1-Sub-B	6.38	3.71	8.20	9.83	9.55	**6.76**	6.21	2.68	7.81	7.83	7.00	**5.16**	3.83	2.41	7.50	.	6.44	**4.21**
15	AC 1125A	6.59	6.02	6.18	9.00	17.47	**8.10**	4.32	3.69	5.59	5.50	12.81	**6.44**	3.70	3.28	5.39	4.00	9.47	**5.61**
16	CR4423-101	5.80	4.06	5.13	4.67	14.66	**6.75**	3.83	3.34	4.75	5.17	10.63	**5.81**	3.44	2.41	4.73	6.67	11.39	**5.20**
17	CR4423-111	6.73	4.26	6.49	10.67	9.40	**7.98**	4.10	3.82	6.11	1.83	8.64	**5.31**	3.24	3.39	5.94	.	10.64	**5.46**
18	AC847A	6.99	4.49	7.48	8.50	18.36	**8.70**	4.10	3.06	7.21	7.50	10.34	**6.25**	3.91	2.84	6.83	6.83	12.25	**6.37**
19	IC-256608	7.93	5.62	6.51	10.17	12.76	**8.02**	4.66	4.12	6.23	8.00	10.34	**6.66**	3.37	3.27	5.68	8.75	10.23	**5.91**
20	IC-256605	4.36	4.59	5.13	7.67	10.97	**6.63**	3.36	3.88	4.58	5.83	3.35	**4.76**	2.53	2.38	4.80	4.50	4.26	**4.28**
	Grand Mean	**5.46**	**4.50**	**6.73**	**8.04**	**12.15**	**7.09**	**4.96**	**3.36**	**6.11**	**5.86**	**8.36**	**5.55**	**3.33**	**2.64**	**5.64**	**5.72**	**8.00**	**4.84**
	LSD (Treatment)	0.19			LSD (Location X Genotype)			1.12			CV (Treatment) %			23.10					
	LSD (Location X Treatment)	0.50			LSD (Treatment X Genotype)			0.74			CV (Residual) %			20.79					
	LSD (Genotype)	0.42			LSD (L X G X T)			1.95											

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

S.No.	Genotypes	Control						1% Mannitol						2% Mannitol					
		CTC	KJT	MTU	TTB	PTB	Mean	CTC	KJT	MTU	TTB	PTB	Mean	CTC	KJT	MTU	TTB	PTB	Mean
1	CR4423-8	18.28	8.19	18.54	10.83	11.45	**13.88**	19.90	7.26	16.33	11.33	12.56	**13.23**	12.33	6.95	9.39	7.50	13.67	**10.25**
2	IC-256564	23.22	6.35	19.65	11.33	13.29	**14.80**	20.13	5.92	14.39	13.33	13.67	**13.75**	14.64	4.29	12.00	.	9.54	**10.18**
3	CR4423-10	16.10	5.92	16.71	7.50	9.33	**10.56**	15.87	5.18	12.71	.	6.05	**8.76**	11.07	3.09	10.89	.	8.87	**6.68**
4	FL 478	20.13	8.68	14.24	8.33	13.91	**13.23**	16.49	7.06	14.14	8.50	11.76	**12.47**	11.06	6.52	12.29	7.83	12.82	**10.05**
5	CR 4111-B-1-4-S-1-Sub-B	17.41	6.85	15.20	8.17	8.47	**12.28**	16.38	6.20	10.08	6.83	7.37	**10.56**	15.41	5.61	9.69	3.33	8.82	**8.29**
6	VANDANA	17.28	9.41	23.54	12.67	17.02	**15.61**	20.23	8.56	17.49	10.50	15.97	**14.17**	19.09	7.73	14.74	9.67	20.59	**13.03**
7	CR4423-17	11.50	8.17	14.38	13.17	10.70	**11.26**	16.26	7.34	11.00	8.17	14.26	**10.16**	11.46	6.79	9.99	3.00	11.13	**9.27**
8	NAVEEN	9.68	9.28	14.03	6.00	11.92	**10.25**	13.37	5.48	11.06	7.33	10.52	**10.10**	9.18	4.63	10.33	7.33	9.50	**8.38**
9	CR 3483-29-M-4-B-Sub-79-1	13.42	6.83	14.36	10.50	10.24	**11.20**	16.90	5.73	11.54	9.33	9.24	**10.42**	11.96	4.71	10.14	5.50	13.13	**9.13**
10	PANTARA	13.69	11.21	21.31	11.00	16.38	**15.14**	20.20	10.05	19.55	11.67	15.36	**15.02**	15.58	6.31	19.16	5.50	16.52	**13.15**
11	CR4423-20	15.51	6.85	11.64	9.83	8.77	**10.01**	16.66	6.18	10.44	3.83	10.25	**10.37**	11.99	5.37	10.11	.	10.28	**10.85**
12	IR 20	14.50	8.56	13.31	7.83	9.02	**10.05**	11.09	5.40	12.34	9.17	9.63	**8.98**	7.62	4.47	11.08	6.75	8.98	**7.30**
13	CR4423-75	18.29	6.89	13.79	8.17	9.99	**11.94**	11.82	6.64	13.16	9.50	9.33	**10.78**	9.58	6.40	12.69	6.00	12.26	**9.53**
14	CR 4111-B-1-10-S-1-Sub-B	20.14	6.57	13.61	9.67	9.62	**11.54**	13.00	5.33	12.41	10.17	7.97	**9.86**	14.30	3.12	12.24	.	9.71	**9.62**
15	AC 1125A	21.50	10.09	19.60	13.50	18.08	**15.99**	15.16	9.70	15.95	9.33	13.03	**13.55**	13.07	6.55	12.80	10.17	18.04	**13.09**
16	CR4423-101	17.26	8.13	17.63	8.50	13.98	**12.29**	11.40	5.51	11.98	8.33	14.33	**10.49**	10.47	4.88	11.60	6.67	14.90	**10.48**
17	CR4423-111	20.33	8.81	20.76	5.17	10.16	**12.27**	12.71	6.74	11.79	4.67	11.04	**9.19**	11.46	6.21	10.44	.	15.23	**9.35**
18	AC847A	23.69	9.19	24.53	13.17	20.50	**18.33**	18.57	6.27	17.65	11.50	17.34	**14.88**	17.98	5.33	16.40	10.00	16.84	**14.38**
19	IC-256608	22.19	10.31	21.00	12.50	18.18	**15.71**	20.46	6.21	15.81	10.00	14.45	**13.79**	15.17	3.34	13.63	11.00	16.12	**12.06**
20	IC-256605	20.42	8.56	23.93	13.83	12.63	**15.64**	19.81	6.04	12.36	11.83	15.53	**13.81**	12.28	5.61	12.18	9.00	18.10	**12.16**
	Grand Mean	**17.73**	**8.24**	**17.59**	**10.08**	**12.68**	**13.10**	**16.32**	**6.64**	**13.61**	**9.23**	**11.98**	**11.74**	**12.78**	**5.40**	**12.09**	**7.28**	**13.25**	**10.40**
	LSD (Treatment)	0.33			LSD (Location X Genotype)			2.08			CV (Treatment) %			19.97					
	LSD (Location X Treatment)	0.88			LSD (Treatment X Genotype)			1.36			CV (Residual) %			19.03					
	LSD (Genotype)	0.78			LSD (L X G X T)			3.60											

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

S.No.	Genotypes	Control						1% Mannitol						2% Mannitol					
		CTC	KJT	MTU	TTB	PTB	Mean	CTC	KJT	MTU	TTB	PTB	Mean	CTC	KJT	MTU	TTB	PTB	Mean
1	CR4423-8	2.501	1.460	1.750	2.575	0.346	**1.726**	1.953	0.825	1.407	2.160	0.554	**1.380**	0.692	0.590	1.297	1.395	0.220	**0.839**
2	IC-256564	2.399	1.277	2.103	2.535	0.306	**1.724**	1.600	0.705	1.703	1.850	0.423	**1.256**	1.605	0.519	1.457	-	0.574	**1.039**
3	CR4423-10	2.415	1.190	2.123	1.900	0.189	**1.563**	2.037	0.677	1.410	1.088	0.155	**1.073**	1.830	0.467	1.230	-	0.777	**1.076**
4	FL 478	2.491	1.580	1.807	2.525	0.233	**1.727**	1.875	0.870	1.573	2.170	0.769	**1.452**	1.080	0.691	1.380	1.400	0.708	**1.052**
5	CR 4111-B-1-4-S-1-Sub-B	2.530	1.207	2.113	2.760	0.239	**1.770**	2.570	0.671	1.150	2.125	0.287	**1.361**	2.307	0.543	1.173	1.550	0.493	**1.213**
6	VANDANA	2.744	1.623	2.220	2.125	0.378	**1.818**	1.458	0.959	1.450	1.840	0.404	**1.222**	1.086	0.708	1.237	1.325	0.382	**0.948**
7	CR4423-17	2.342	1.460	2.217	1.900	0.311	**1.646**	2.397	0.713	1.340	1.400	0.215	**1.213**	1.391	0.675	1.187	1.340	0.912	**1.101**
8	NAVEEN	2.461	1.590	1.900	2.760	0.170	**1.776**	2.027	1.083	1.340	1.850	0.333	**1.327**	1.915	0.697	1.197	1.490	0.504	**1.161**
9	CR 3483-29-M-4-B-Sub-79-1	2.561	1.330	1.997	1.920	0.254	**1.612**	2.211	0.692	1.283	1.535	0.112	**1.167**	1.883	0.581	1.143	1.425	0.461	**1.099**
10	PANTARA	2.072	1.713	1.970	2.730	0.791	**1.855**	2.709	0.959	1.583	2.250	0.387	**1.578**	1.529	0.724	1.390	2.160	0.878	**1.336**
11	CR4423-20	2.427	1.137	1.717	2.380	0.129	**1.558**	2.777	0.631	1.190	1.925	0.304	**1.365**	1.738	0.491	1.043	-	0.252	**0.881**
12	IR 20	2.015	1.523	2.207	2.340	0.218	**1.661**	3.282	0.768	1.263	1.850	0.371	**1.507**	1.507	0.737	1.180	1.660	0.609	**1.139**
13	CR4423-75	2.357	1.170	2.090	2.160	0.489	**1.653**	2.440	0.643	1.527	1.845	0.162	**1.323**	1.751	0.475	1.253	1.665	0.424	**1.114**
14	CR 4111-B-1-10-S-1-Sub-B	3.610	1.153	2.260	2.115	0.177	**1.863**	2.573	0.591	1.427	1.790	0.395	**1.355**	1.443	0.490	0.900	-	0.672	**0.877**
15	AC 1125A	2.943	1.650	2.037	2.560	0.253	**1.888**	2.505	0.994	1.393	2.270	0.634	**1.559**	1.386	0.838	1.137	1.530	1.090	**1.196**
16	CR4423-101	2.761	1.360	2.140	2.180	0.314	**1.751**	2.518	0.719	1.513	1.990	0.327	**1.414**	1.170	0.560	0.910	1.440	0.226	**0.861**
17	CR4423-111	2.997	1.463	1.840	2.130	0.195	**1.725**	1.226	0.785	1.110	1.505	0.192	**0.964**	1.935	0.779	0.963	-	0.091	**0.942**
18	AC847A	2.646	1.450	2.077	2.490	0.251	**1.783**	1.777	0.789	1.480	2.445	0.398	**1.378**	2.173	0.686	1.177	1.240	0.250	**1.105**
19	IC-256608	2.394	1.707	2.137	2.120	0.748	**1.821**	2.577	1.001	1.430	1.485	0.439	**1.386**	2.232	0.874	1.250	1.375	0.172	**1.180**
20	IC-256605	2.583	1.303	2.227	3.120	0.330	**1.913**	2.233	0.659	1.517	1.680	0.370	**1.292**	2.608	0.624	1.263	1.350	0.075	**1.184**
	Grand Mean	**2.562**	**1.417**	**2.047**	**2.366**	**0.316**	**1.742**	**2.237**	**0.787**	**1.405**	**1.853**	**0.362**	**1.329**	**1.663**	**0.638**	**1.188**	**1.490**	**0.488**	**1.073**
	LSD (Treatment)	0.205290			LSD (Location X Genotype)			0.295647			CV (Treatment) %			86.96					
	LSD (Location X Treatment)	0.459042			LSD (Treatment X Genotype)			0.229007			CV (Residual) %			23.03					
	LSD (Genotype)	0.132217			LSD (L X G X T)			0.512075											

6.5 Screening of Rice Genotypes for Submergence Tolerance

Locations: NRRI, TTB, PTB and CBT

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

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

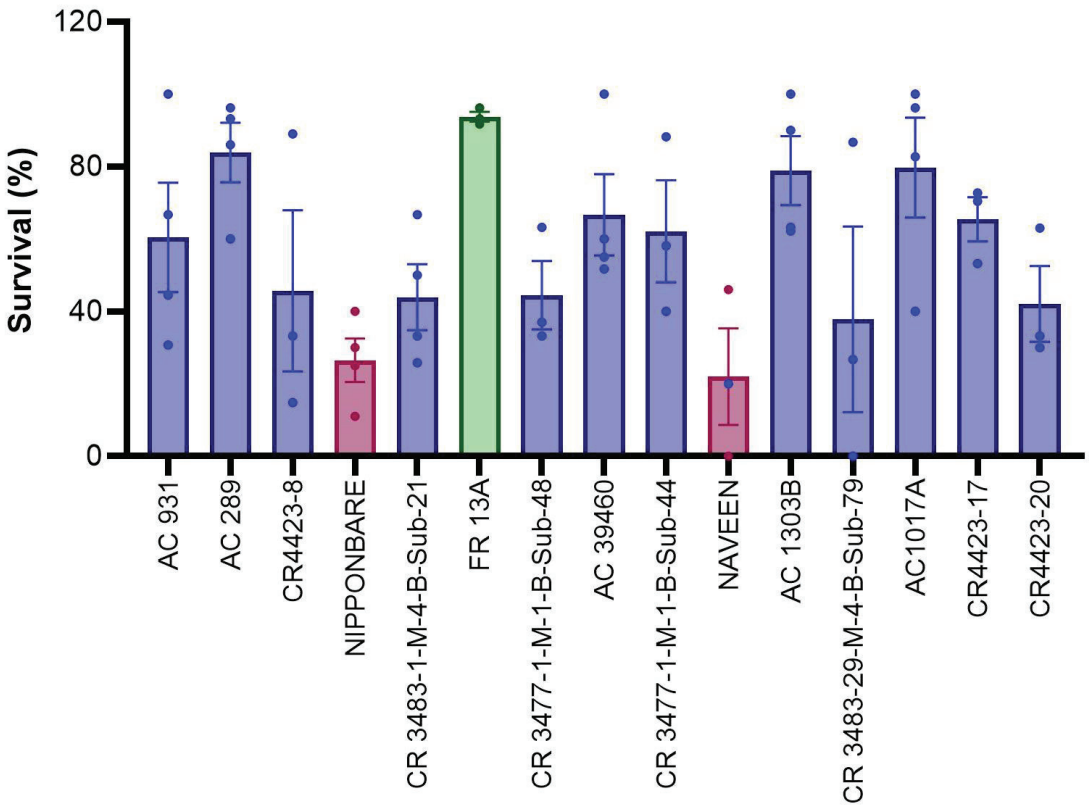


Fig. 6.5.1 *Mean survival rate (%) of rice genotypes under 14 days of complete submergence tested at three different locations. Error bars representing SE (mean) of all locations and scattered dots are representing mean of individual location.*

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

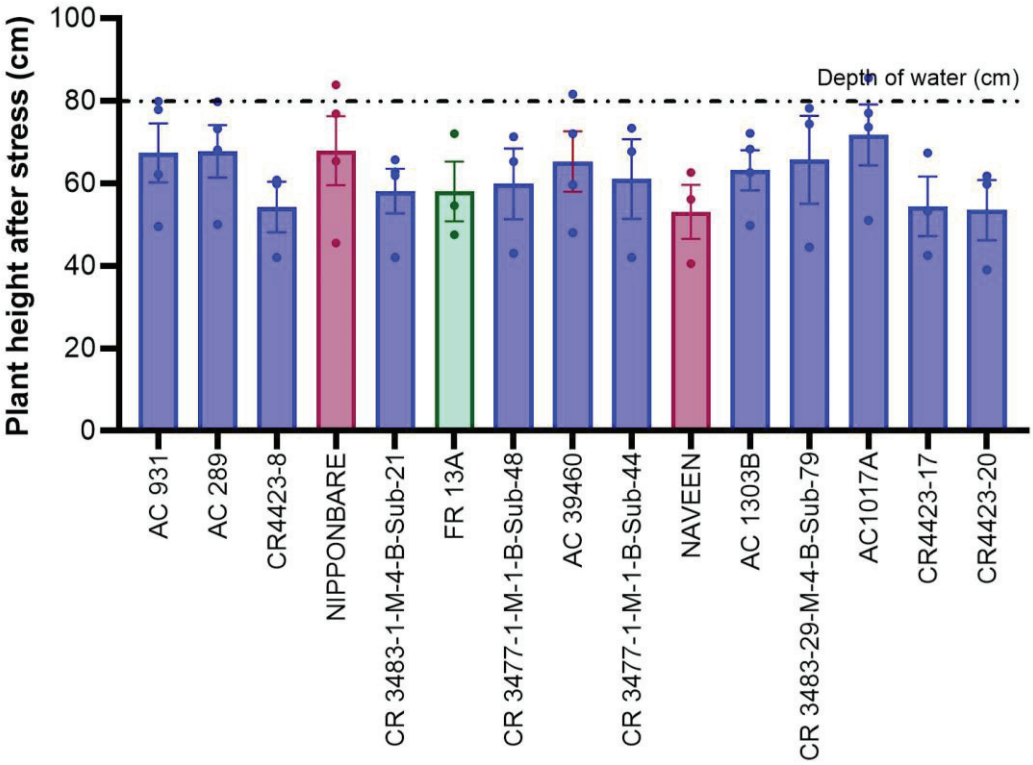


Fig. 6.5.2 *Mean plant height (cm) of rice genotypes under 14 days of complete submergence tested at three different locations. Error bars representing SE (mean) of all locations and scattered dots are representing mean of individual location.*

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

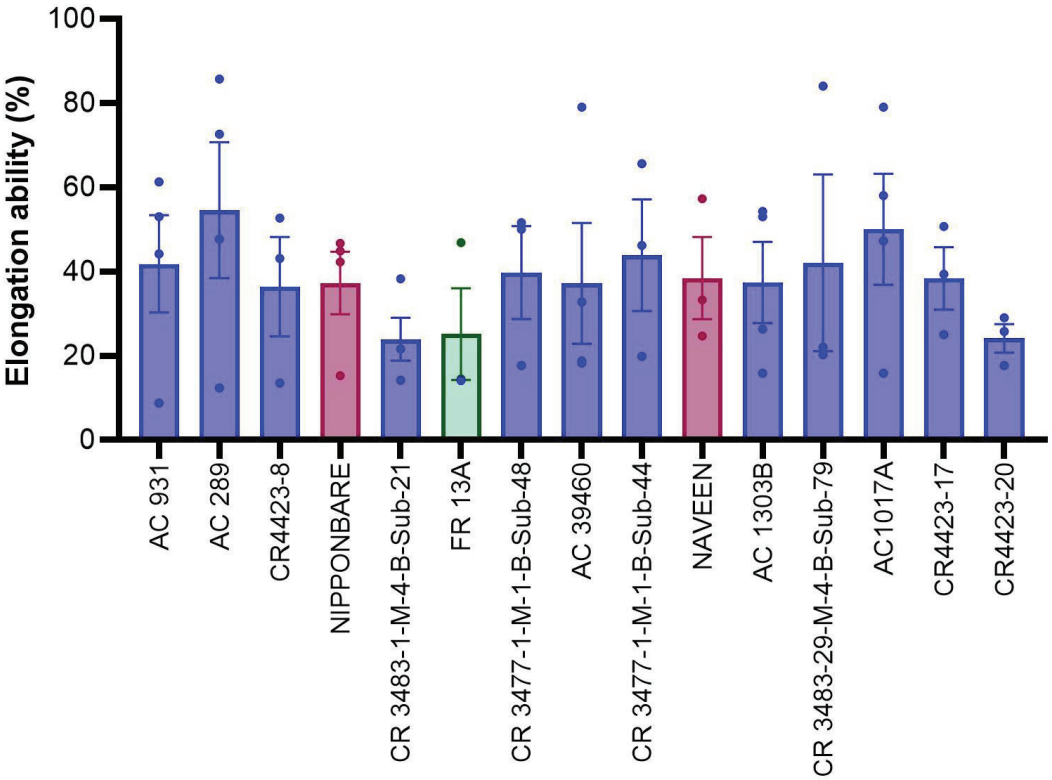


Fig. 6.5.3 *Mean elongation ability (%) of rice genotypes under 14 days of complete submergence tested at three different locations. Error bars representing SE (mean) of all locations and scattered dots are representing mean of individual location.*

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

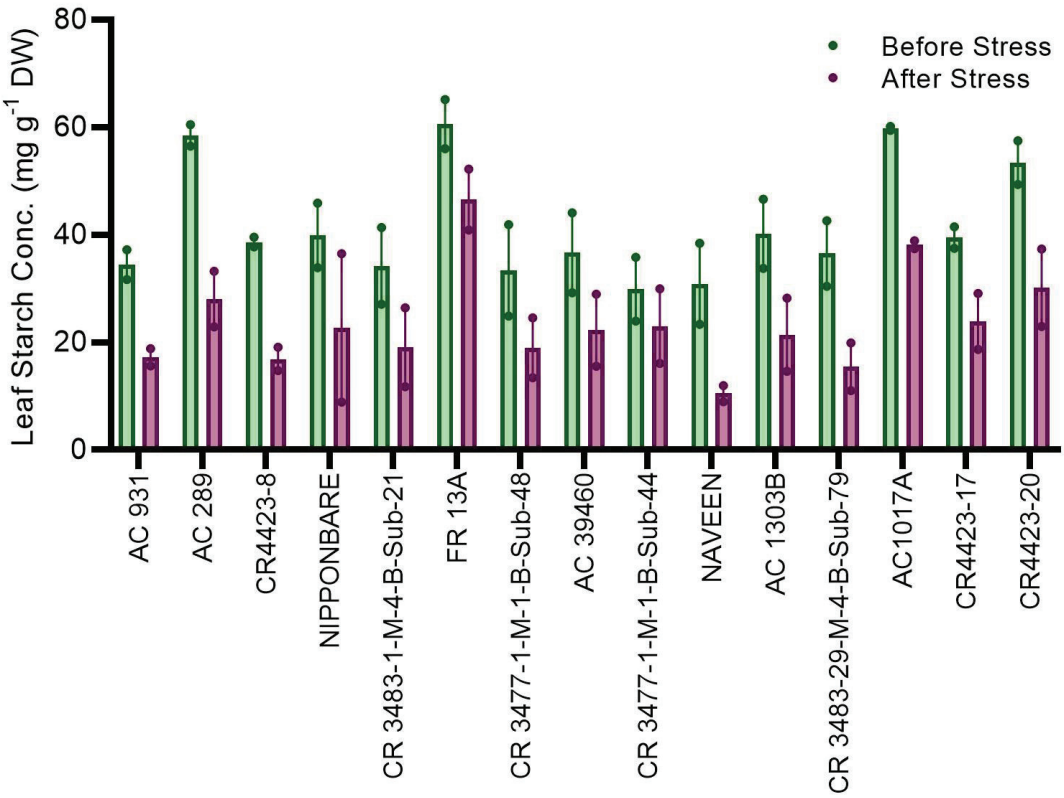


Fig. 6.5.3 *Mean elongation ability (%) of rice genotypes under 14 days of complete submergence tested at three different locations. Error bars representing SE (mean) of all locations and scattered dots are representing mean of individual location.*

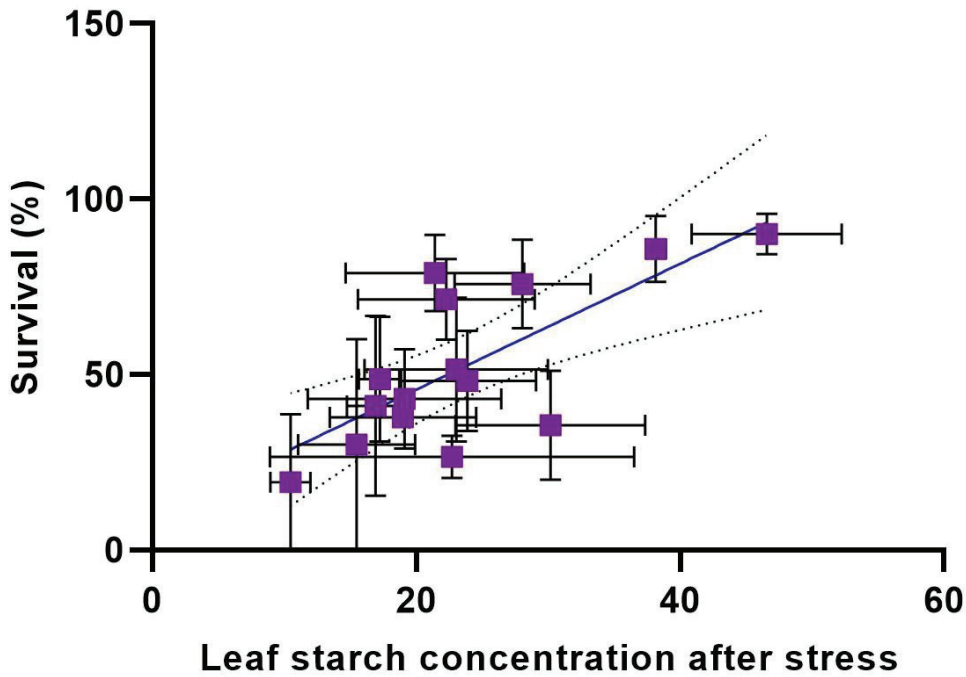


Fig. 6.5.5 *An XY-scatter plot showing simple linear regression between survival rate and elongation ability of rice genotypes under 14 days of complete submergence tested at three different locations. Error bars representing SE (mean) of all locations.*

Summary & Conclusion:

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

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

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

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

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

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

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

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

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

6.6 Screening of rice genotypes for tolerance to low light stress

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

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

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

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

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

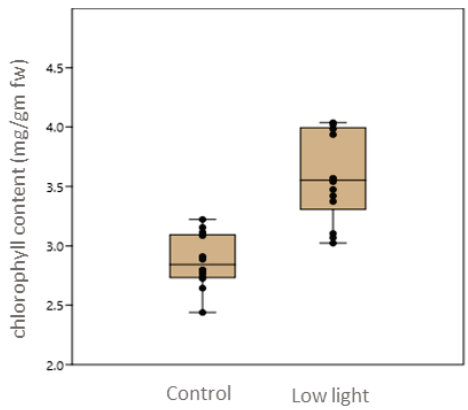


Figure 6.6.1a: Variation in mean chlorophyll content under control and low light stress conditions in the tested genotypes.

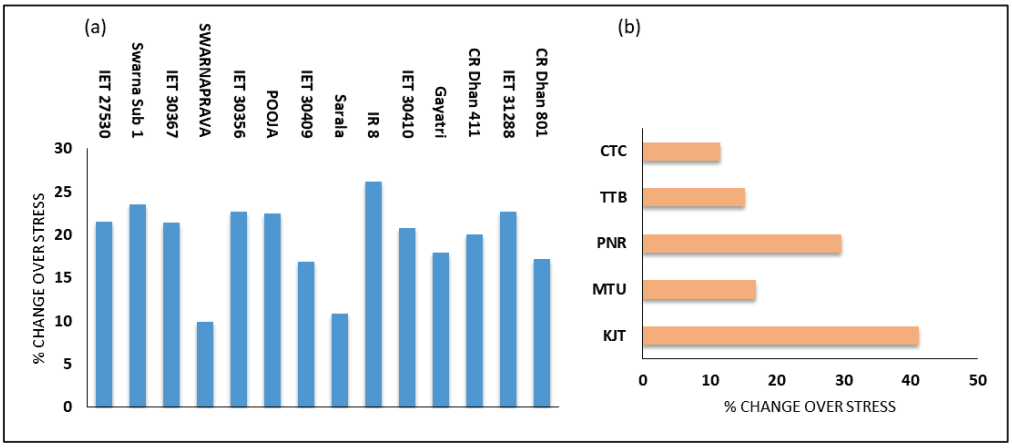


Figure 6.6.1b: Influence of Low-Light Stress on total chlorophyll content: a) mean of all the genotypes b) mean of all the locations.

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

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

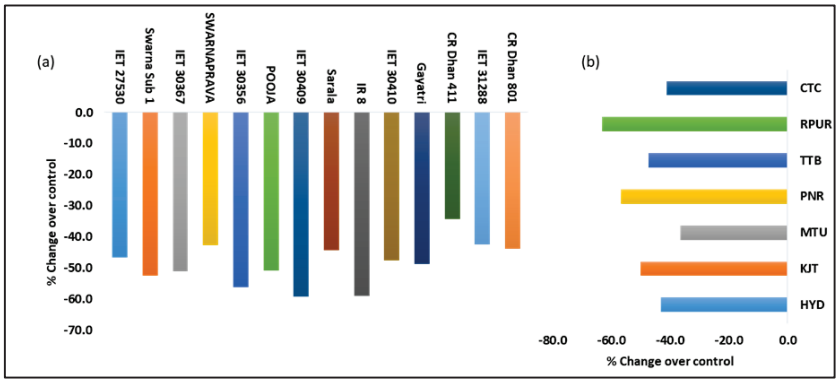


Figure 6.6.2: Influence of Low-Light Stress on grain yield g/m^2: a) mean of all the genotypes b) mean of all the locations.

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

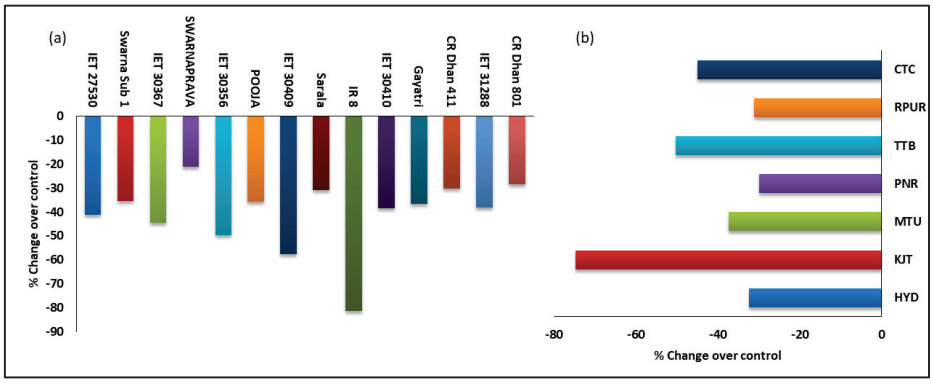


Figure 6.6.3: Influence of Low-Light Stress on total dry matter (g/m^2): a) mean of all the genotypes b) mean of all the locations.

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

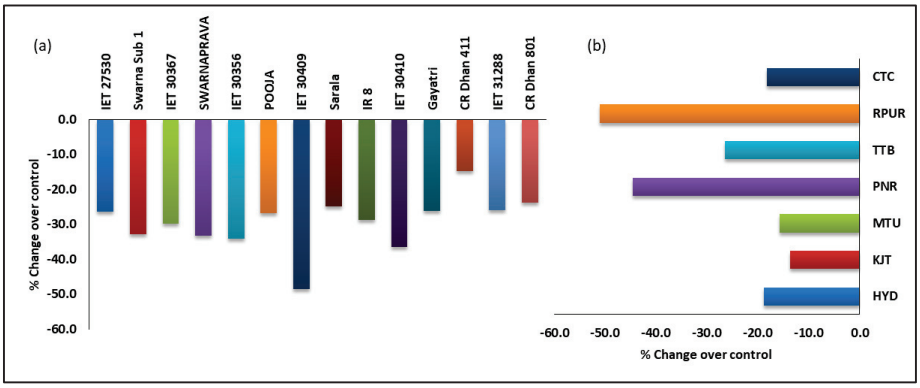


Figure 6.6.4: Influence of Low-Light Stress on harvest index: a) mean of all the genotypes b) mean of all the locations.

Summary and conclusions

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

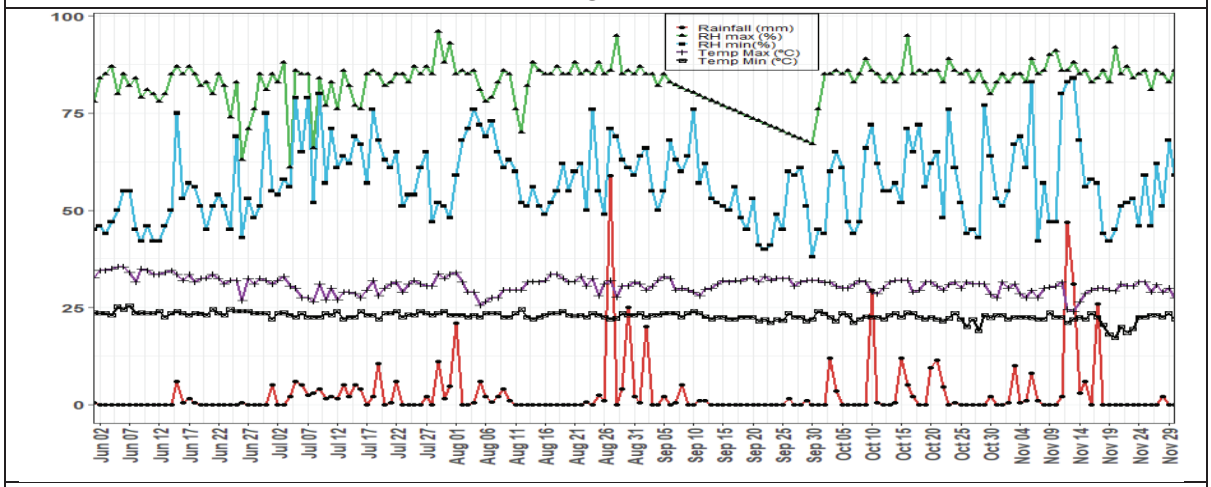
Table 6.6.15 Influence of Low-Light Stress on 1000 grain weight (g) in different rice varieties during Kharif 2022 at different centers

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

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

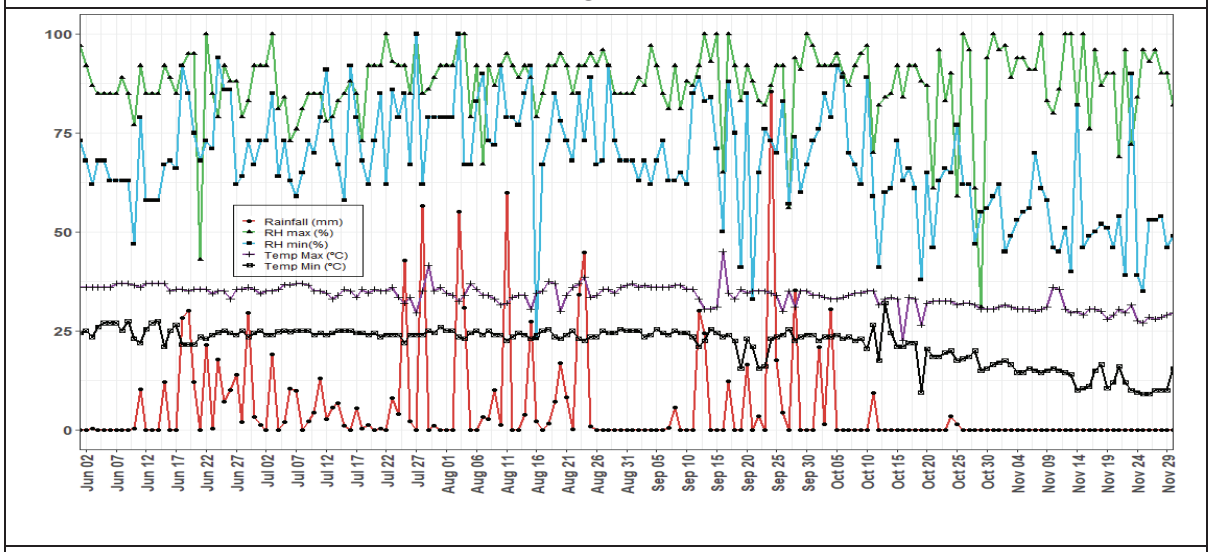
S.No.	Genotypes	Treated (Low light)							Grand Mean	Control							Grand Mean
		IIRR	KJT	MTU	PNR	TTB	RPUR	NRRI		IIRR	KJT	MTU	PNR	TTB	RPUR	NRRI	
1	IET 27530	38	41	42	30	25	16	40	33	43	47	47	45	29	40	43	42
2	Swarna Sub 1	37	42	36	10	24	13	34	28	46	47	41	34	32	23	42	38
3	IET 30367	37	36	37	18	21	6	37	28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

CBT



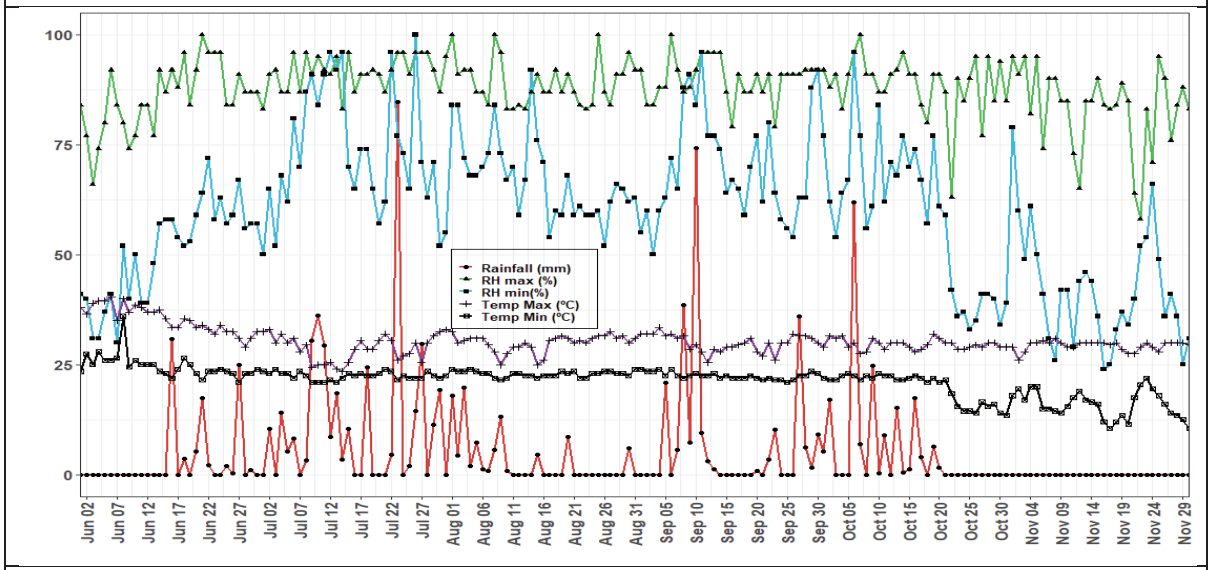
Temperature and Humidity and Rainfall recorded at Coimbatore (CBT) centre during 2022

CHN



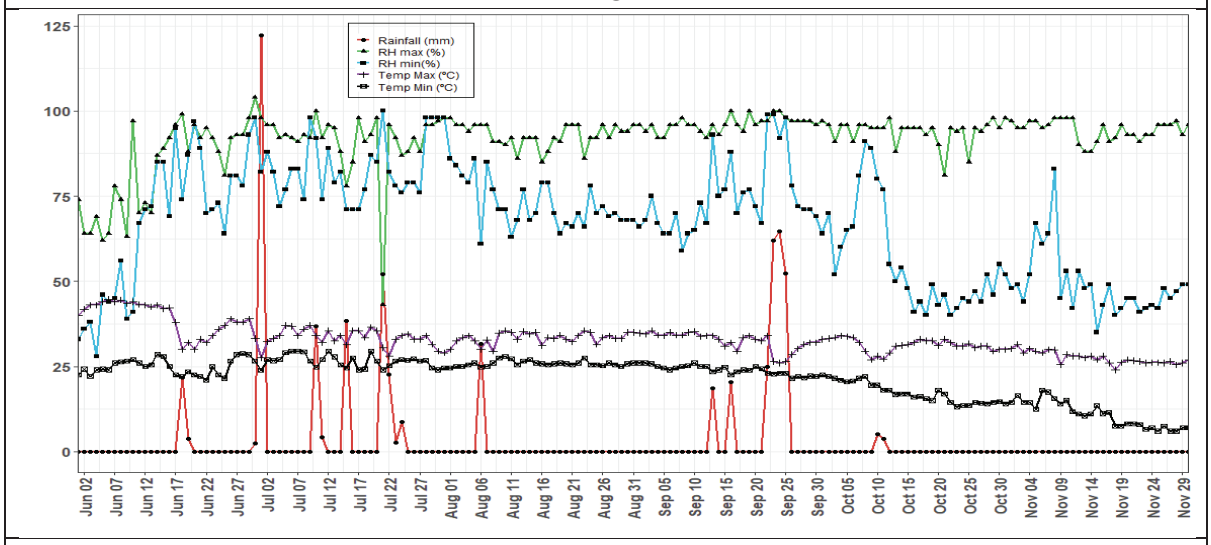
Temperature and Humidity and Rainfall recorded at Chinsura (CHN) centre during 2022

IIRR



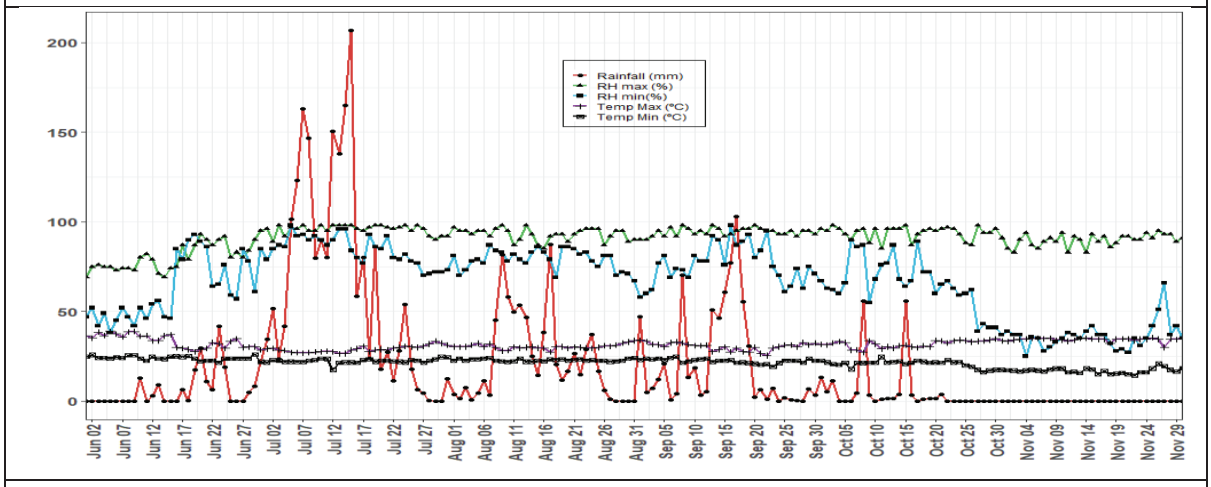
Temperature and Humidity and Rainfall recorded at IIRR, Hyderabad centre during 2022

KAUL



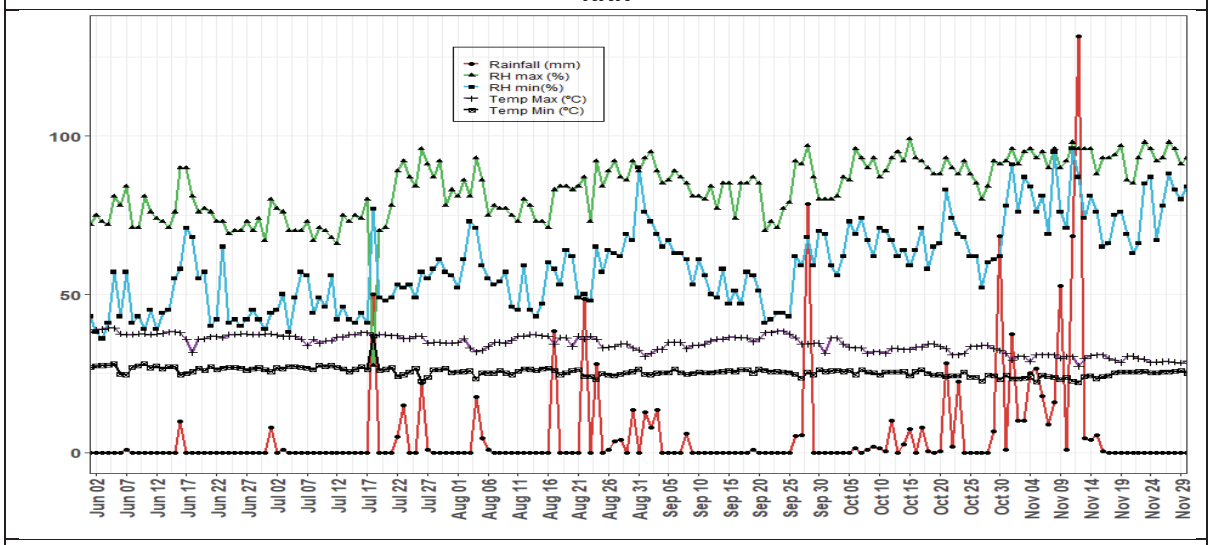
Temperature and Humidity and Rainfall recorded at KAUL centre during 2022

KJT



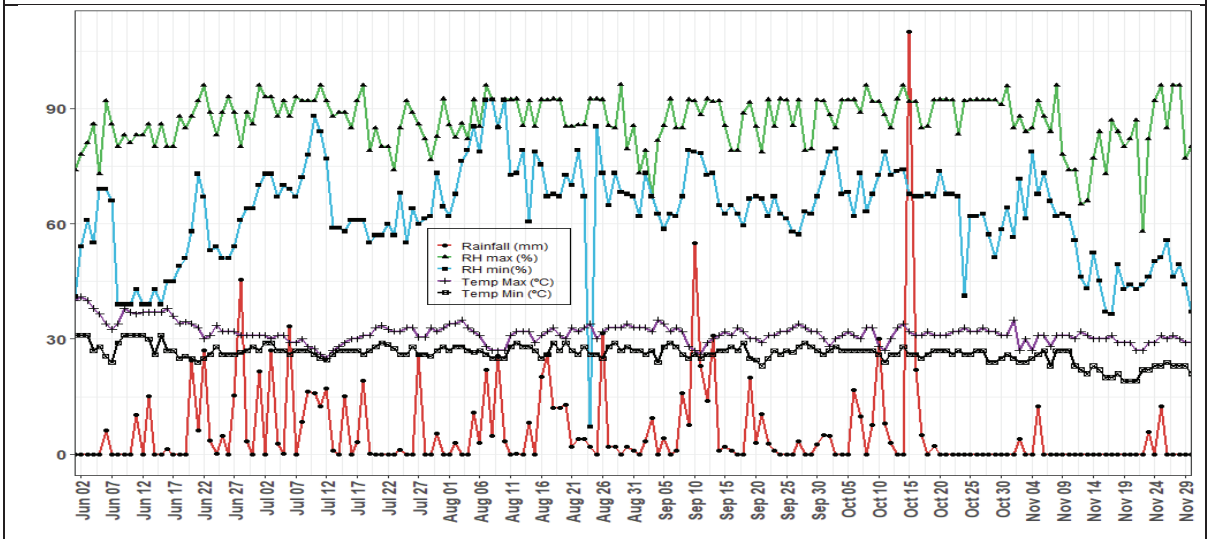
Temperature and Humidity and Rainfall recorded at Karjat (KJT) centre during 2022

KRK



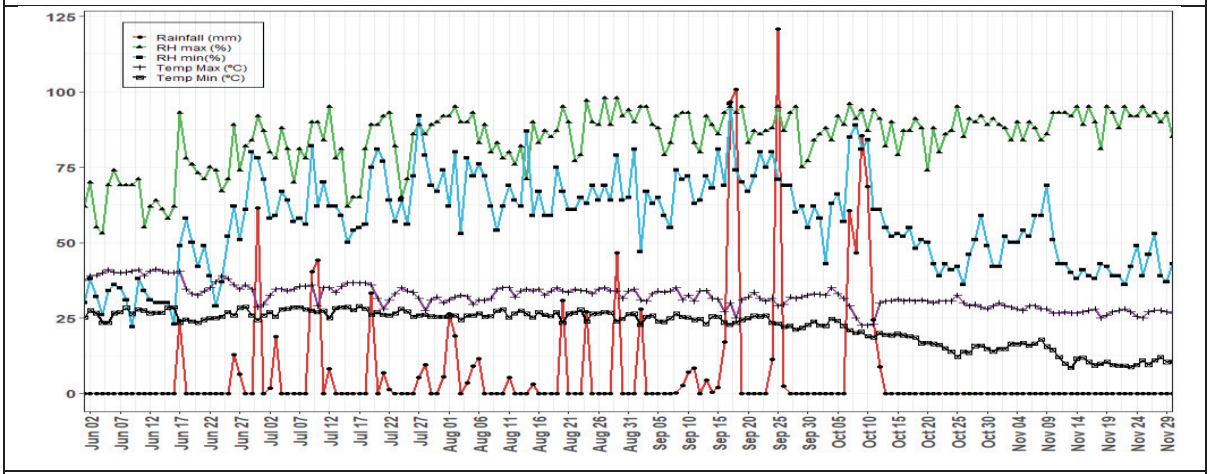
Temperature and Humidity and Rainfall recorded at Karaikal (KRK) centre during 2022

MTU



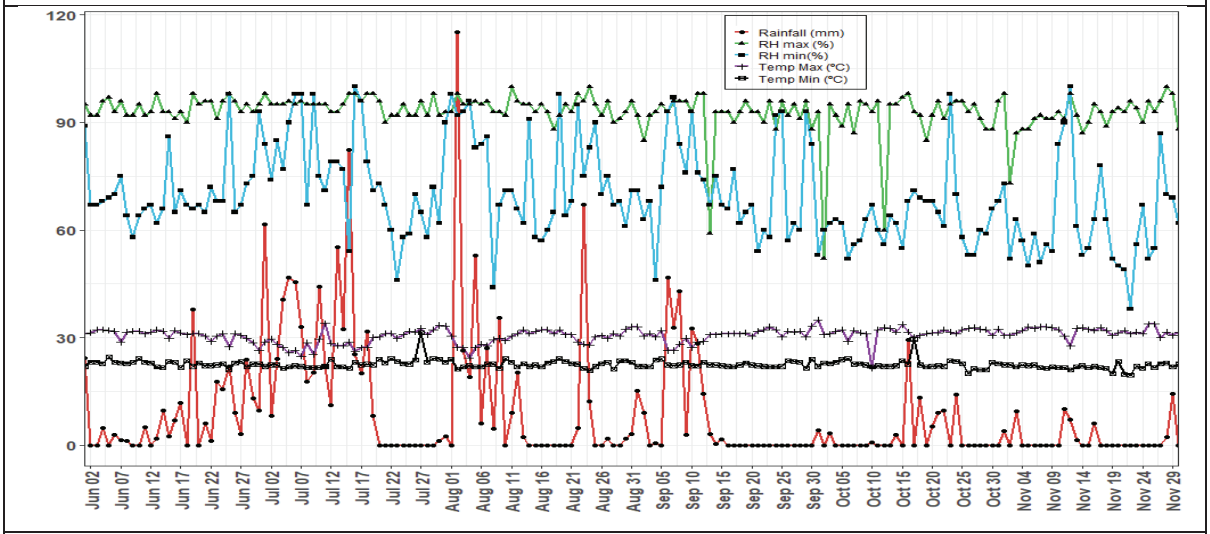
Temperature and Humidity and Rainfall recorded at Maruteru (MTU) centre during 2022

PNR



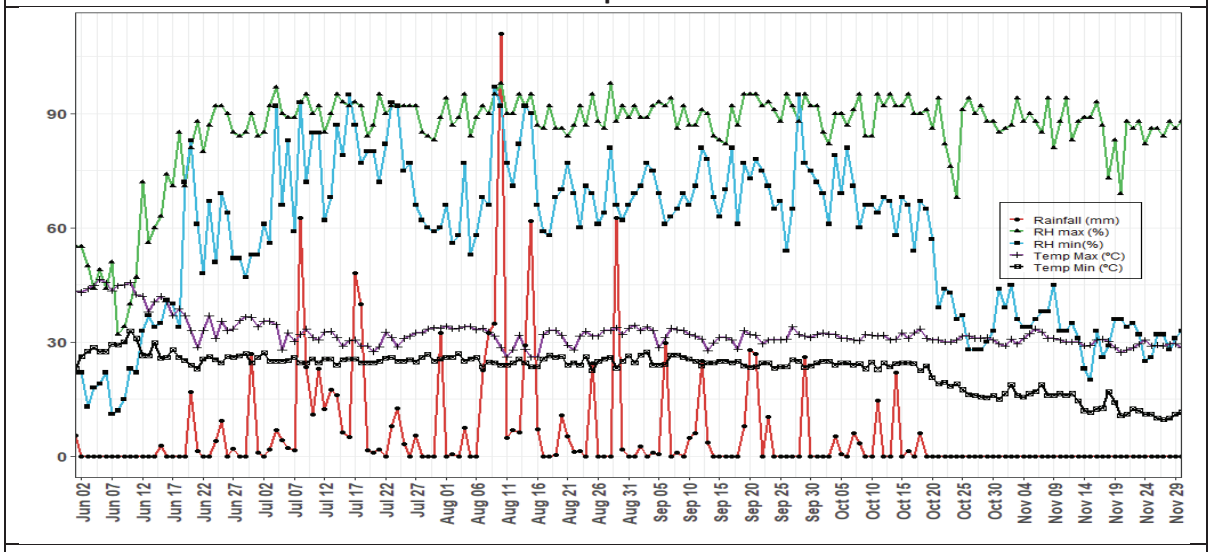
Temperature and Humidity and Rainfall recorded at Pantnagar (PNR) centre during 2022

PTB



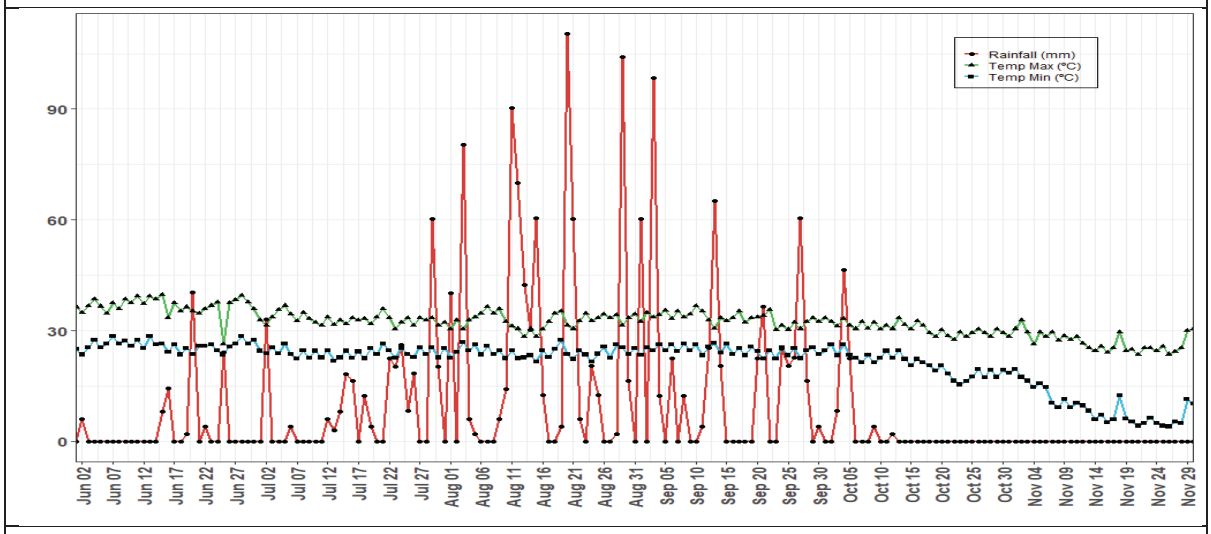
Temperature and Humidity and Rainfall recorded at Pattambi (PTB) centre during 2022

Raipur



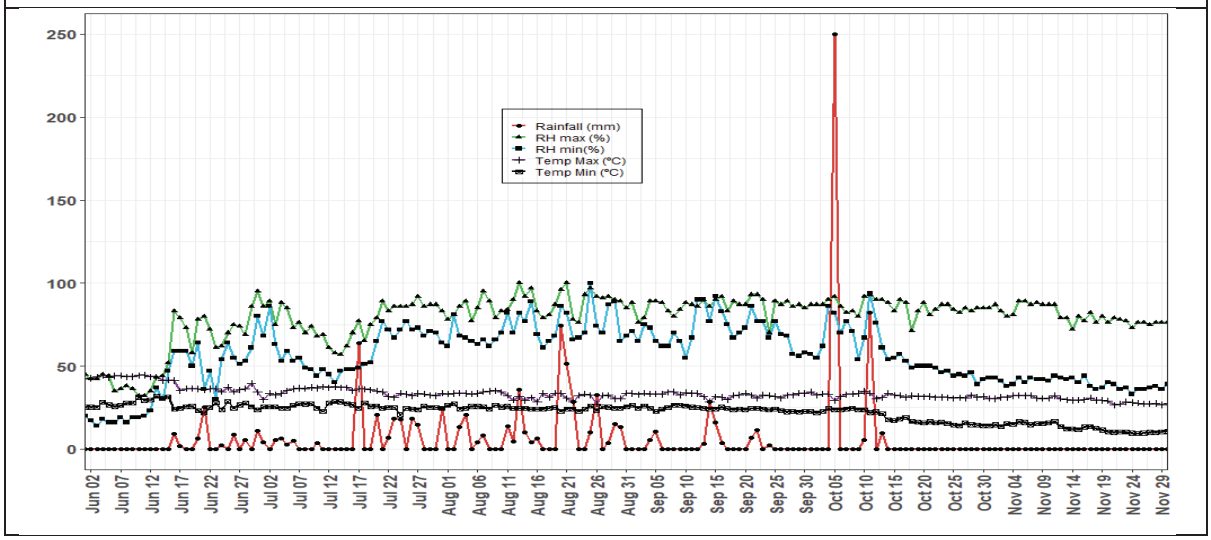
Temperature and Humidity and Rainfall recorded at IGKV, Raipur centre during 2022

Ranchi



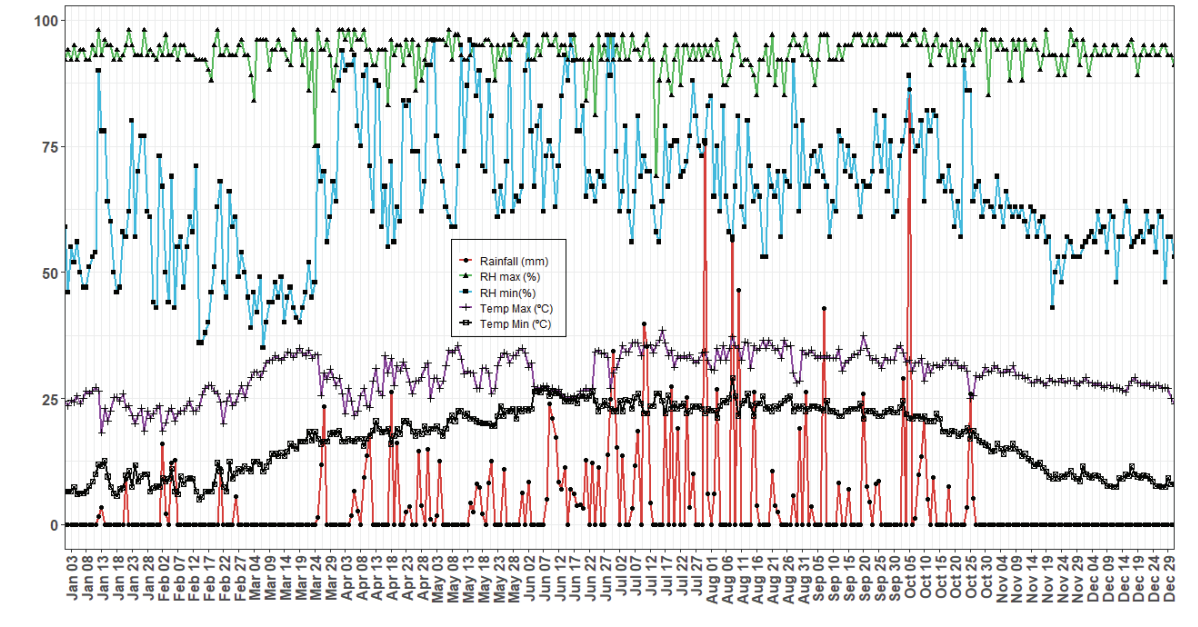
Temperature and Humidity and Rainfall recorded at BAU, Ranchi centre during 2022

REWA



Temperature and Humidity and Rainfall recorded at Rewa centre during 2022

TTB



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

APPENDIX - II
Rice cultures of Physiology

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

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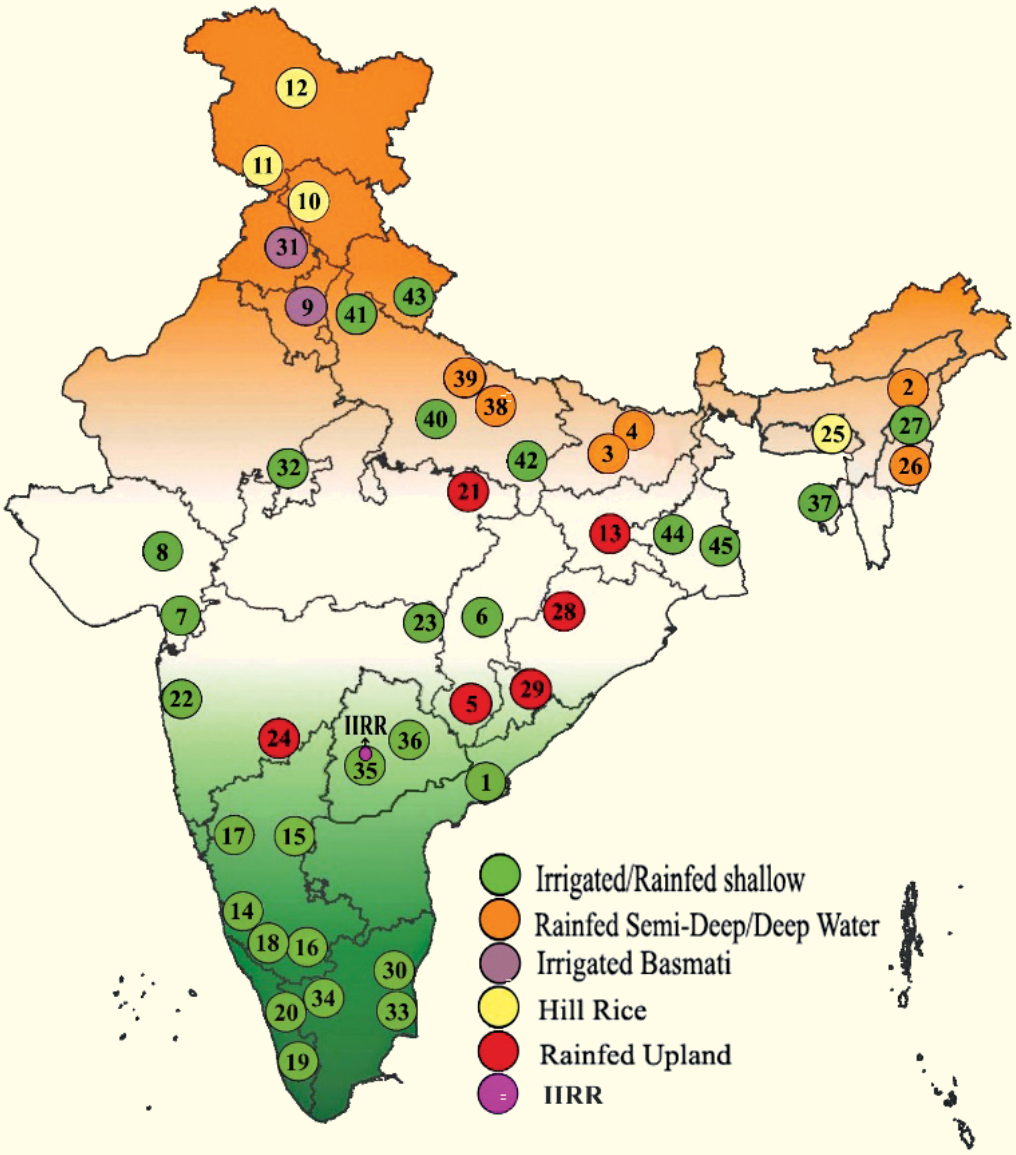

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