TITABAR

Regional Agricultural Research Station
Assam Agricultural University
Assam

Regional Agricultural Research Station, Titabar was established in 1969 by Assam agricultural university. It is one of the funded centres under AICRIP and has been nominating rice cultures for testing in coordinated trials in the country for different ecosystems particularly from nineties.

Crop Improvement

Varieties developed/ identified

- The station has so far developed 45 rice varieties and after testing in AICRIP trials, they have been recommended for cultivation for various seasons and ecosystems in the state. These varieties cover more than 70% areas of HYV in the state.
- The most popular rice varieties include Ranjit, Bahadur, Luit, Keteki, Aghoni and Jaymati.
- The variety Ranjit is also cultivated in neighbouring countries like Bangladesh, Nepal and as well as in different states of India like West Bengal and N. E states.
- Keteki, an aromatic short grained rice and Aghoni, a glutinous rice of long duration group are also becoming popular and were released in Orissa.
- A number of genotypes contributed from RARS, Titabar having high Fe content were Aghoni bora (47 ppm), Prafulla(35 ppm), Betguti (42 ppm), Gitesh (45 ppm). Besides, a few cultures were found to be high in both Fe(25-28 ppm) and Zn(32-40 ppm) content viz. Malbhog, Goalbhog, Aghonibora and Prafulla. These varieties were identified as potential donor for improved nutritional quality and for special purpose *through bio fortification*

- Jalashree, Jalkuwari developed at RARS, Titabar along with Swarna sub1, BR 11 Sub 1 and IR64 sub1 have been identified as potential rice cultivars to tolerate submergence stress up to 10-12 days at early growth stage.

Varieties developed at RARS, Titabar & released

Variety	Eco system	Season	Parentage	Remarks
Madhab	Irrigated	Ahu	IR8/CH63	Mid early variety
Rongdoi			Prasadbhog/IR8	
Lachit			CRM13-3241/Kalinga II	
Chilarai			IR24/CR44-118-1	
Gopinath			Pusa2-21/IR36	
Luit	Irrigated/ rainfed	Ahu and Sali	Heera/Annada	Very early, suitable for pre and post flood situation
Kapilee				
Disang			Lachit/Kalinga III	
Ranjit	Rainfed shallow low land	Sali	Pankaj/Mahsuri	Long duration variety
Aghoni			Gandhi bora/Kmj1-52-2	Glutinous rice variety
Rongilee			Ghew bora/Kmj 1-52-2	
Bhogali			Ghew bora/Kmj 1-52-2	
Keteki Joha			Sabitri/Badsah bhog	Short grained long duration aromatic rice
Bokul Joha			Sabitri/Badsah bhog	
Jalashree	Flash flood affected lowland	Sali	Pankaj/FR13A	Long duration submergence tolerant variety
Jalkuwari		Sali	Pankaj/FR13A	
Prafulla		Sali	Akisali/Kushal	Long duration variety suitable for staggered planting
Gitesh		Sali		
Manah	Semi deep water	Sali	Kmj1-17-2/ IET 10016	Long duration rice variety suitable for low land waterlogged areas
Diphalu				
Chakra Sali				
Dhansiri				
Saytaranjan			IET 9711/ IET11162	Medium duration variety suitable for double cropped areas
Basundhara			IET8711/IET11161	
Shrabani			APMS6B / Piolee	
Mulagabharu			Jaya/Mahsuri	

Variety	Eco system	Season	Parentage	Remarks
Jaymati	Irrigated	Boro	Jaya/Mahsuri	Modern boro rice variety
Kanaklata				
Bishnuprasad			K 343-29-1/Sweon 334	
Jyotiprasad				

Crop Production

Agronomy

Technologies generated and validated include:

- Use of low plastic tunnel for raising boro (summer rice) seedlings to increase seedling height and vigour was recommended
- Direct seeding of sprouted seed after 12-24 hours of puddling with 8-row drum seeder in post flood situation was recommended.

Agronomic management practices identified

- Standardization of suitable agro-techniques *viz,*. Sowing time, seed rate, spacing, age of seedling, manures and fertilizers, time of application of fertilizers for direct seeded and transplanted autumn rice, winter rice, late winter rice (transplanted) and boro/summer rice have been recommended. Depth of planting, no. of seedlings/hill for normal as well as late transplanting of short and long duration varieties recommended.
- Maximum grain yield (5.99 t/ha) of Bahadur (150-155 days) was recorded by applying 60-20-40 kg N, P_2O_5 and K_2O /ha which was based on soil test crop response studies (STCR) closely followed by application of 40-20-20 (5.8t/ha). Application of FYM in addition to 40-20-20 kg/ha had no positive response (4.92 t/ha). Application of Zn could not improve yield.
- *Management of direct seeded kharif rice:* Direct seeding (wet) using a 8-row drum seeder developed at DRR, Hyderabad, could produce a yield (3.64t/ha) as high as farmers' practices of transplanting provided weeds are properly managed in var. Lachit (120-125 days). Direct seeding of sprouted seeds in lines along with pre emergence butachlor application and hand weeding at 40 DAS could yield more than that of transplanting.
- Application of 100% RDN (60 kg N/ha) gave higher N response (kg grain/kg N) over 150% RDN.
- ICM as an alternative to SRI was found to be more flexible .While studying the response of early (Luit and Disang) medium (Satyaranjan and Basundhara). Late varieties (Ranjit and Bahadur) and hybrids (KRH 2 and NK 5251) to 1CM, the performance of late cultures were found promising.

- Weed Management: Hand weeding twice raised the yield of dry seeded autumn rice to the double than that of herbicide application due to interculture involved in hand weeding. Application of anilophos either alone or in combination with 2, 4-D (Na- salt) as pre and post emergence respectively, yielded better than butachlor and pendimethalin either alone or in combination with 2,4-D in direct seeded autumn rice. Combined application of Flucetosulfuron 10% WG @ 20 g and at 2-3 DAS and Bispyribacsodium 10% SC @ 25 g a.i/ha at 15-20 DAS produced at par yield compared to weed free treatment in short duration variety Luit.
- Study indicated that for adoption of SRI in boro season, age of seedling and number of seedlings/hill are the two critical components for achieving higher productivity in boro season.

Soil Science

- Application of neem coated urea (1:5) proved a better source for N >sulphur coated urea > urea super granules > prilled urea in *kharif* low land rice and highest N recovery was obtained in NCU (56.12%).
- The rice var. Rasi and IET 5914 showed better phosphorus utilization efficiency at low levels of P in acid soil (pH 5.5).
- Significant improvement of rice productivity was observed with supplementation of recommended fertilizer dose (40 kg N, 20 kg P_2O_5, 20 kg K_2O/ha)+ $ZnSO_4$ @20 kg/ha+ 5t FYM/ha once in a season and correspondingly improved soil fertility as well as soil biological properties.
- Omission of N, P, K, Zn and S and 50% reduction in nutrients brought in considerable yield reduction in rice-rice system.
- Linear trends of productivity in rice over 25 years improved growth rate of about 100 kg/ha/year with a supplementary dose of 5t FYM/ha along with recommended fertilizer dose of 40 kg N, 20 kg P_2O_5 and 20 kg K_2O/ha
- Varietal evaluation for high Fe and Zn content in rice grain were initiated from 2008. A number of genotypes having high Fe content were obtained viz. R 979-67-2(37 ppm), MTU1010(30ppm), ADT 45 (39ppm), BR-2655(54ppm), ADT 36(56 ppm), ADT 37(33 ppm), Aghoni bora (47 ppm), Prafulla(35 ppm), Betguti (42 ppm), Indobhog(40 ppm), IR 64 (30 ppm), Jawaphool (52 ppm), MTU 3626 (53 ppm), Gitesh (45 ppm). Besides, a few cultures were high in both Fe(25-28 ppm) and Zn(32-40 ppm) content viz. Bilsa ahu, Malbhog, Goalbhog, ADT-45, Aghonibora and Prafulla
- IET 19749, IET 20556, IET 10016, IET 21579, IET 20997 and WL 21 were found to be promising to counteract Fe toxicity through application of lime.

Plant Physiology

- IET 13116, IET 13119, Sabita, Utkalprova, and IET 10016 have been identified for seedling survival under waterlogged condition
- The cultivars Chakra sali, Manah, Dipholu and Dhansiri exhibited prominence for adaptability at waterlogged ecology wherein a water depth of more than 30 cm prevails in a stagnant water environment.
- Modern variety Govind and traditional variety Fapori exhibited inherent potential to grow under moisture stress conditions. Both the varieties recorded higher leaf proline, leaf water potential and relative leaf water content under stress.
- IET 18645 and IET 17509 have been identified as potential donors of upland rice for both drought tolerance and grain dormancy.
- For submergence tolerance and regeneration ability, seed rate of 25 g/m^2 (heavy seedling) was found to be better than recommended seed rate($50g/m^2$)
- Purnendu, Swarna sub1and IR64 sub1 have been identified to be potential rice cultivars to tolerate submergence stress at early growth stage. The desirable traits of maintenance of low profile of the pace of degradation of carbohydrate, chlorophyll content and dry matter accumulation with low tissue water potential during stress period reflected the inherent capabilities of those varieties.
- Seed priming with 3% KCl together with foliar feeding of 2% potassium at tillering and PI stages have been found to be a potential drought mitigation management practice for upland summer rice
- Harvest of ahu rice usually coincides with rainy weather. Discolouration as well as sprouting of seeds in the panicle itself or after harvest is due to high moisture content of the seeds. To overcome such problem spraying of diquat 0.05% or paraquat 0.1% or common salt (NaCl) 10% should be done on the ear head @ 1000 lit/ha in terms of chemical solution at 20-25 days after 50% flowering. These chemicals enhance the maturity by 5-7 days.
- Application of sodium molybdate @ 150ppm at three stages viz. flowering, ripening and physiological maturity significantly reduced both pre and post harvest sprouting in rice.
- Critical levels of cumulative degree days (1500 CDD) and cumulative nyctoperiod (1100 CNP) were estimated from the data of last few years of experimentation (2010 -2013) with medium duration genotypes. Advancement of sowing date by 15 days resulted in some cultivars Viz. KRH2, IET 20924 and IET 22218 to meet the required CDD and CNP. The entry IET 20924 performed consistently well for few consecutive years and may be used as breeding lines for developing climate resilient rice cultures.

- The results from 3 consecutive years (2006-2008) of experimentation on evaluation of panicle topological features for better N use efficiency suggest that the number of secondary branches per panicle is largely governed by environment, whereas the primary branches are determined by genetic background of the cultivars. This could be one of the simple selection criteria in developing HYV with better response to external inputs.
- The study on influence of boron on spikelet fertility in rice for 3 consecutive years (2009-2011) revealed that application of 0.4ppm boron at anthesis resulted in increase in grain number and reduced the number of unfilled spikelet to the tune of 18-20% in IET 20979 and IET 21014.

Crop Protection

Entomology

- A number of promising entries were identified after screening NSN entries for resistance against major pests of rice.
- **Insecticide Evaluation-**Insecticide evaluation trial was undertaken to evaluate the effectiveness of insecticides at lower dosages and new insecticides at higher dosages against major insect pests of rice taking eight treatments including untreated control in both *Ahu* and *Sali* rice in the year 1987-90. Chloropyriphos granules, a promising insecticide was tested at lower dosage (1kg a.i./ha) while Cartap and Ethoprop (new formulations) were tested at higher dosages (1.5 kg .i /ha) along with carbofuran granules (1kg/a.i./ha) as a standard check.
- During 2007 to 2011, the following combination of insecticides gave profound results in reduction of rice insect pests specially stem borer, leaf folder, gall midge, case worms etc. These include, Flubendiamide 36% + Fipronil 30% @ 33g a.i. /ha; Buprofezin 20% +Acephate 50% @ 800 ml/ha; Suthathion (Triazophos) 40% a.i. @ 750 ml/ha.
- During 2012-13, Rynaxypyr reduced the maximum population of stem borer and leaf folder followed by Monocrotophos and Triazophos at higher doses and showed superior performance over other treatments.
- During 2013-14, Rynaxypyr (Coragen 20 EC) at 30 g a.i. /ha was the best treatment followed by acephate 95 SG at par and dintefuran (Token 20SC) blended with EK boond, a new non ionic organo silicone wetting agent which was significantly different from rynaxypyr and acephate alone.
- **Pesticide Compatibility Studies-**Glamore 80% a.i. @ 0.25g/litre + contaf 5 % a.i. @ 2.0 g /litre was found effective against two insect pests /diseases and obtained highest yield compared to other insecticide and fungicide formulation in 2010. Acephate 35% a.i. @ 1.2 g/L + Bacon 75% a.i. @ 0.6 g /L was the best treatment against target pests as compared to other formulations.

Flubendiamide 35g + hexaconazol 50g/kg was effective on containing severity of sheath blight, damage by stem borer and leaf folder.

Plant Pathology

- Information on disease screening - Titabar centre has screened several cultures against major rice diseases of the state and identified a few promising lines.
- **Control measures developed-**Contaf 2ml/L has been proposed for recommendation for management of 'stem rot' disease of rice.
- The IRBB lines pyramided with BLB gene were found highly resistant and the lines are being utilised for developing BLB resistant variety by the breeders.
- Application of carbofuran 3G @ 3g /m^2 in the nursery 5 days before uprooting, application of carbofuran 3G at 10 DAT and spraying of chlorpyriphos (0.05%) at 10 DAT reduced the early insect pests of rice.
- **Evaluation of fungicides -** Biotos(2.5ml/L), Armure 30EC 1ml/L were found promising against Glume discolouration(GD); Thiafuzamide 24 SC, Biotos(2.5 ml/L, Bevistin 50WP 1 ml/L against GD; Contaf 5 SC(2ml/L), Taquat 75 UP(1.5/L) , Metominodtrobin (2ml/L) against Stem rot; Hexaconazole 5 SC(2ml/L), Propenconazole 25 EC(2ml/L) against Stem rot; Kresoxim methyl (1ml/l), Propiconazole 25 Ec (1ml/L) against False smut.