

CHINSURAH

Rice Research Station, Directorate of Agriculture West Bengal

This rice research station was established in the year 1965 under the Directorate of Agriculture, Government of West Bengal. The objective of this station is to identify varieties suitable for irrigated and rainfed ecosystems.



Significant Achievements

Crop Improvement

- A total of forty six high-yielding varieties (HYVs) for different ecosystems have been released by the scientists of Rice Research Station, Chinsurah which are as follows:

Ecosystem	Nos. of varieties	Name of the variety released
Rainfed upland	6	Panke, Bhupen, Jamini, Khanika, Kiron and Puspa
Irrigated upland / medium land	7	Shatabdi, Khitish, CNRH-3, Kunti, CNM-25, CNM-31 and Lakshmi (CNM-6) , CNRH 3 (Hybrid)
Rainfed shallow	8	Jogen, Bipasa, Sashi, Giri, Kaushalya , Kanak, Dhiren and Sujala
Rainfed semideep	17	Sabita, Purnendu, Amulya, Sudhir, Nalini, Biraj, Suresh, Mandira, Matangini, Golak, Saraswati, Bhagirathi, Bhudeb, Hanseshwari, Ambika, Mahananda and Sunil
Rainfed deep	6	Jaladhi-1, Jaladhi-2, Jalaprabha and Neeraja Jitendra, Dinesh
Hill region	2	Kalimpong - 1 and Munal

- Varieties in pipeline: Aromatic varieties viz. IET 21250, IET 21261 (long slender), IET 21845, IET 21850 and IET 21847; rice hybrids viz. CNRH 102 and CNRH 103.

Recently identified varieties in SVRC include:



IET 22066 (Ajit)

- Early maturing type
- Duration: 108 - 110 days
- Average yield: 5032 kg/ha
- Can also be cultivated in boro (average yield 5500 kg/ha)

IET 17713 (CN 1039-9: Rajdeep)

- Suitable for semi-deep situation (40-70 cm depth of water)
- Long duration: 155 days
- Average yield: 4500-5000 kg ha⁻¹
- Tolerant to sheath blight, sheath rot, stem borer and leaf folder.



IET 23403 Chinsurah Nona 1 (Gosaba 5)

- In Farmer's field at 6 EC, Gosaba 5 recorded 4200 kg/ha
- Good grain quality with 58% head rice recovery

- More than 1200 germplasm are regularly being maintained, characterized and evaluated for better utilization and documentation.
- Three hybrids (CNRH 103, 104 and 105) are in pipeline. Shatabdi A (a CMS line from Shatabdi) has been developed.
- Aromatic entries IET 21261, IET 21549, IET 21845 and IET 21847 lines have average yield potential of 4.5 - 5.5 t/ha with slender grain and showed yield advantages of 20-35% over Basmati entries. The iron-rich rice varieties, Jayasilet, Chapakhushi and Seetabhog, having 4-5 times higher Fe content (40-50 mg/kg of polished rice) than the popular HYVs have been identified.

- In collaboration with CSIR-NBRI, Lucknow, a few low grain arsenic accumulating rice varieties viz. CN 1646-2, CN 1646-5, CN 1643-3 and IET 19226, safe for human consumption have been identified.
- In collaboration with C-DAC, Kolkata, software dependent electronic vision (E-Vision) & electronic nose (E-Nose) system have been developed for quality assessment of aromatic rice in non-invasive & time-saving methods. The instrument is very useful for detecting adulteration in rice.

Crop Production achievements

Agronomy

- Recommendations were made for seedling raising, seedling age, time of transplanting, stand establishment, seedling uprooting, no. of seedlings, spacing for high yield varieties, aromatic rice, boro rice for *kharif* (Aman) season. For obtaining higher yields, application of 100% N through organic sources or 50% recommended fertilizer dose (RFD) + 50% N through FYM is effective.
- Split application of N and K₂O was found effective in improving nutrient use efficiency. Use of sulphur coated urea (SCU) or incubated mud ball was advocated as slow release N-fertilizers in low-lying areas. Studies on recommended fertilizer dose for HYVs, hybrid rice, aromatic rice, semi deep and deep water rice were conducted.
- *N-fertilizer substitution*: Basal application of FYM at 5 t ha⁻¹ in conjunction with two top dressings of green foliage of *Glyricidea maculata* at AT and PI stages at 2.5 t ha⁻¹ resulted in 1 t ha⁻¹ of more grain yield over control. On an average, 10 kg of organic matter (compost + green foliage) gave an extra yield of 1 kg grain.
- Zn nutrition: Besides adding recommended dose of NPK fertilizers, basal application of either ZnSO₄·7H₂O @ 25 kg ha⁻¹ or ZnSO₄·H₂O @ 15 kg ha⁻¹ has widely been accepted for state as well as national recommendations in Zn-deficient areas.
- Integrated nutrient management: Advocated to follow an INM practice involving green manuring / green leaf manuring + Azotobacter or vermicompost along with 75% RFD for economizing and sustaining rice farming. Green manuring with Dhaincha in rice can substitute 40 kg inorganic N ha⁻¹.

Weed management:

- In nursery, an optimum dose of Metamifop 10 EC (100.0 g ha⁻¹) as post-emergence (POE) application at 12-15 days after sowing (DAS) or 2-3 leaf stage

of grasses has been found to be safe and effective weed management tool.

- In direct seeded rice (DSR), POE application of Metamifop 10 EC (100 g ha⁻¹) at 12-15 DAS (or 2-3 leaf stage of grasses) or Cyhalofop butyl 10 EC (100 g ha⁻¹) at 15 DAS is recommended.
- In normal transplanted rice (NTR), Penoxsulam 24 SC at higher dosage of 0.025 kg ha⁻¹ as pre-emergence (PE) at 5 DAT / lower dosage of 0.020 kg ha⁻¹ as POE at 10 DAT or bispyribac sodium 10 SC at higher dose of 50 g ha⁻¹ as POE at 15 DAT is recommended.
- Application of Flucetosulfuron 10 WG at 0.025 kg ha⁻¹ at 2-3 DAT + bispyribac sodium 10 SC at 0.025 kg ha⁻¹ at 15-20 DAT is more effective for broad spectrum weed management in both direct seeded and normal transplanted rice.

Crop establishment methods:

- *Drum seeded rice*: Direct wet seeding using plastic drum seeder has been found to record about 21% higher yields over farmers' practice in *boro* season.
- System of Rice Intensification (SRI): Field investigations as well as frontline demonstrations (FLDs) clearly showed about 15-20% yield advantage in SRI, compared with input-intensive NTR in different parts of West Bengal.
- *Double transplanting*: In case of delayed planting in water-logged areas, double transplantation of rice seedlings reduces the seedling mortality and increases the yield levels in *kharif*.
- Conservation agriculture: Zero tillage (ZT) has recorded yield improvement up to 10-15%, even in drought season. ZT was found at par with minimum tillage (MT) and both of them recorded significantly lower yields than conventional tillage. Thus, reduced tillage systems (ZT and MT) are rice productivity inhibitive.

Soil science

- *Growth studies of Azolla*: Maximum rate of *Azolla* multiplication was found in August-September and it can be utilized as a partial substitute for N-fertilizers in rice cultivation during *kharif*.
- *Synchronization of potassium supply for rice hybrids*: Split application is advantageous for light textured soils whereas it has no advantage in heavy textured clayey soil having high available K status.
- Influence of soil and nutrient related parameters on aromatic rice: Integrated use of green manure (dhaincha) and 50% inorganic NPK or only use of 100% inorganic NPK along with spraying of cycocel (cc) at 500 ppm + surfactant (twice) would be an effective nutrient management practice with regard to achieving higher productivity as well as better nutrient uptake in aromatic rice varieties.

- Inclusion of biofertilizer: Use of biofertilizers like Azotobacter and phosphate solubilising bacteria can save up to 25% of N and P₂O₅ and also can increase the productivity as well as uptake of nutrients. The effect was more prominent in boro than that in kharif.
- *Germplasm screening for Zn & Fe*: Local germplasm like Jamainadu, Kaminibhog, Dudswar, Banskathi, Medi, Gopalbhog, Ghandheswari and Nadu and some of the HYVs like Khitish, IR 36, ADT 36, ADT 43, Pavizham, Prafulla, Vasumathi, Shalimar rice 1, NDR 6279, Aghoni bora and MTU 3626 have been found promising for their Fe and Zn content.
- *Soil-test based fertilizer recommendation & SSINM*: Based on soil test values, the recommended fertilizer doses for soils having medium fertility status in different rice growing seasons are given in Table below.

Season	RFD (N:P ₂ O ₅ :K ₂ O in kg ha ⁻¹)	Time of application
Aus (Pre- kharif)	70-35-35 (HYV)	Basal: ¼ N + Full P ₂ O ₅ + Full K ₂ O 1 st TD: ½ N (at AT) ; 2 nd TD: ¼ N (at PI)
Aman (Kharif)	80-40-40 (HYV)	Basal: ¼ N + Full P ₂ O ₅ + Full K ₂ O
	90-45-45 (Hybrid)	1 st TD: ½ N (at AT); 2 nd TD: ¼ N (at PI)
Boro	130-65-65 (HYV)	Basal: ¼ N + Full P ₂ O ₅ + ¾ K ₂ O
	150-75-75 (Hybrid)	1 st TD: ½ N (at AT); 2 nd TD: ¼ N + ¼ K ₂ O (at PI)

AT: Active tillering; HYV: High-yielding variety; PI: Panicle initiation; RFD: Recommended fertilizer dose; TD: Top dressing

Crop Protection Technologies

Entomology

- *Chinsurah Type Light Trap* has been developed by modifying Rothamsted light trap. This is a very popular and most widely used light trap.
- *Screening of promising entries*: Identification of resistant/ tolerant advanced rice lines has been done against different insect-pests



Chinsurah Type Light Trap


- *Nursery and early pest control: Granular application of cartap, fipronil and carbofuran in seed bed was found effective against insect pests of rice. Seedling treatment+ soil drenching was at par with granular application of different insecticides.*
- *Evaluation of new generation insecticides: Spinosad 45% SC, flubendiamide 20 WG, acephate 75% SP, fipronil 66% WG, rynaxypyr and their combination products were found effective against stem borer incidence throughout the crop growth stage. Dinotefuron 20 SG, buprofezin 25 SC and imidacloprid 40% were very effective against sucking pests.*
- *Trap crop: Stem borer damage in terms of dead heart and white heads was comparatively lower when the main crop, Swarna (MTU 7029) was grown along with Pusa Basmati 1 as trap crop during kharif season.*
- *Effect of cultivation techniques: SRI is most effective in reducing the pest population and conserving natural enemies as well as enhancing the yield. Low white head and high dead heart attack were recorded in direct seeded rice as compared to normal transplanted rice.*
- *Pesticide compatibility test: Rynaxypyr + hexaconazole, flubendiamide + isoprothiolane, spinosad + carpropamid and acephate + tricyclazole were effective in minimizing the population of stem borer.*

Plant pathology

- *Host plant resistance: Evaluation of rice cultivars against major diseases like leaf blast, bacterial leaf blight, sheath blight, sheath rot, brown spot and tungro has been done. Several rice cultivars identified include: a) Leaf blast: Jalaprabha, Jaldi dhan-13, Jamini Mahananda, Jitandra, Manasarovar, Swarnadhan, Tulsi, Neeraja, (Resistant) and Prakash, CNM-25, CNM-31, Golok, Kisan, Kunti, Lakshmi, Munal (Hill), Neeraja, PNR 519, Saraswati, Sashi, Parijat, Pratikshya, Pratap, Savitri, Triguna, Amulya, Anamika, Suresh. (Moderately resistant); b) Bacterial leaf blight: Bhudeb, Utpala, IET- 849, Sabita. (Resistant) and, Lakshmi, Kisan, CNM-31, Daya, Prakash, Neeraja, Manasarovar, Tulasi, Amulya, Anamika, Sashi, Khitish (Moderately resistant); c) Sheath blight: Bhudeb, Giri, Dinesh, Jalaprabha, Jamini, Swarnadhan, Khanika, PNR 519, Munal, Saraswati, Utpala, , Pratikshya, Amulya, Manasarovar (Moderately resistant); d) Sheath rot: Jalamagna, Rassi, Dinesh (Moderately resistant); e) Brown spot: Neeraja, Swarnadhan, Purnendu, Kunti, Lakshmi, PNR 519, Khanika (Moderately resistant); f) Rice tungro: Dinesh (Resistant) and Golok, Jamini, Manasarovar, Swarnadhan, Tulsi, Amulya, Lakshmi, Saraswati, Utpala, Rajdeep (CR 1039-9) (Moderately resistant).*
- *Disease Monitoring: a) Isolates (*X. oryzae* pv *oryzae*) collected from Chinsurah and Pandua block of Hooghly District were not virulent against-IRBB entries possessing resistant genes namely Xa5, Xa8, Xa13, Xa21, Xa4 +Xa21, Xa5+Xa13,*

Xa5+Xa21 or Xa4+ Xa5+Xa13+Xa21. These may be incorporated in the breeding programme, to combat the bacterial blight problem.

- *Management of rice diseases:* It includes development of rice varieties resistant/tolerant against major diseases, and evaluation of effective bio-pesticides, botanicals and chemical fungicides against major diseases.
 - ♦ Sheath blight: Three foliar applications of the following fungicide at 10-12 days interval immediately after appearance of the disease were found effective and recommended i) Hexaconazole 75WG @ 0.13g/l ii) Metominostrobin 20S @2.0ml/l iii) Trifloxistrobin25%+ Tebuconazole 50% @ 0.4g/l iv) Propiconazole25EC @1.0ml/l v) Validamycin 3L@ 2.0ml/l vi) Hexaconazole 5SC+ Captan70% @ 1.5g/l vii) Pencycuron 250EC @ 2ml/l viii) Tebuconazole 25EC @ 1.5 ml/l ix) Azoxystrobin 25SC @1.0ml/l
 - ♦ Sheath rot: The following fungicides at heading and milk to soft dough stage were found effective and hence recommended i) Metominostrobin 20S @ 2.0ml/l ii) Hexaconazole 75WG @ 0.13g/l iii) Hexaconazole 5SC @ 2.0ml/l iv) Propiconazole 25EC @ 1.0ml/l v) Kresoximmethyl 40% @ 1.0ml/l vi) Kresoxim methyl 40% + Hexaconazole 8%WG @ 1.0ml/l vii) Azoxystrobin 25SC @ 1.0ml/l
 - ♦ Glume discolouration disease: Two foliar applications of the following fungicides at heading and milk to soft dough stage were found effective and hence recommended i) Propiconazole 25EC @ 1.0ml/l ii) Flusilazole12%+ Carbendazim 25% @ 2.0 ml/l iii) Thiafuzamide 24SC @ 0.45ml/l iv) Hexaconazole 5SC@ 2.0ml/l
 - ♦ Rice tungro disease: Three foliar applications of the following insecticides at nursery bed, 30DAT & 45DAT were found effective and hence recommended i) Imidacloprid 200SL @ 0.25ml/l ii) Chlothianidin 50WDG @ 0.06g/l iii) Thiamethoxam 25WG @ 0.2g/l iv) Thiamethoxam 25WG + Lamda cyhalothrin 2.5EC @ 0.1g/l+ 0.5ml/l, respectively v) Buprofezin 25WP + Deltamethrin 100EC @ 0.25g/l+ 0.1ml/l, respectively.
 - ♦ Damping off and seedling mortality disease in nursery bed: For effective control of damping off and seedling mortality disease in nursery bed during cool weather, both wet seed treatment and seedbed treatment with Metalaxyl 8% + Mancozeb 64% @ 2.5g/l was found effective.
 - ♦ Control of Sheath blight disease, stem borers and leaf folder infestation: Effect of combined formulation Flubendamide 3.5%+ Hexaconazole 5% WG @ 1.0ml/l against sheath blight disease, stem borers and leaf folder infestation indicated that three foliar applications of the formulation at 10-12 days interval immediately after appearance of the disease/insect infestation were found effective and hence recommended.

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- ◆ Pesticides/Botanicals (Phytopesticide):- Effect of the following biopesticides/botanical (Phytopesticide) has been evaluated against sheath blight disease indicated that seed treatment, seedling dip followed by three foliar applications at 10-12 days interval immediately after appearance of the disease were found effective i) Spictuf 4.5ml/l ii) Elorezen-P 2.5g/l iii) Biotos 2.5g/l iv) Liquid formulation of *Pseudomonas fluorescens*.
 - ◆ Initiated adaptive research on botanicals, 300 ppm azadirachtin followed by 1500 ppm azadirachtin spray during afternoon hours 4pm @4.5 ml /l may be recommended to the farmers for ecofriendly management of sheath blight.