MARUTERU

Andhra Pradesh Rice Research Institute (APRRI) & Regional Agricultural Research Station (RARS), Acharya NG Ranga Agricultural University, Andhra Pradesh

APRRI & RARS, Maruteru was established in 1965 in the typical deltaic soils of West Godavari. Research programmes are being carried out at this Institute with multi-disciplinary approach involving Breeding, Plant Physiology, Agronomy, Soil Science, Entomology and Plant Pathology with the major objective of development of rice varieties/ hybrids suitable for different situations in Krishna Godavari zone.

Major contributions to AICRIP

Crop Improvement – *Plant Breeding*

- Released 48 varieties including 23 pure line selections, 7 improved varieties through crossing, 13 BPH resistant varieties, two rice hybrids (APHR 1 and APHR 2) and two rainfed rice varieties.
- The varieties developed at Andhra Pradesh Rice Research Institute, Maruteru are being extensively cultivated in 13 states in India and four neighboring countries and occupying an area of 12 million hectares
- The research station has the distinction of developing BPH resistant varieties viz., Vajram, Chaitanya, Krishnaveni, Prathiba, Nandi and Deepti in India.
- The centre has distinction of releasing medium duration fine grain CMS lines viz., APMS 6A, APMS 9A which are being currently used extensively to develop medium duration fine grain rice hybrids in India.

Popular varieties released from APRRI & RARS, Maruteru

- Three mega varieties released by this station viz., MTU7029 (Swarna), MTU1001 (Vijetha) and MTU1010 (Cottondora sannalu) occupy approximately 18-20% rice area in the country and contribute about 25 m.t. of rice to the national food pool and thereby benefiting the country to a tune of Rs. 1200 to 1500 crores additional income every year.

MTU 7029 (Swarna) – IET 5656
Parentage: Vasista/Mahsuri
Duration (Days): 150-155
Average yield: 55-60 q/ha
Grain type: short bold, brown husk
Special features: semi dwarf plant type with dark green foliage. It is profuse tillering variety. Resistant to BLB

Cottondora Sannalu (MTU-1010) IET 15644
Parentage: Krishnaveni /IR 64
Duration (Days): 120
Average yield: 40-45 q/ha
Grain type: long slender
Special features: Semi- dwarf (108 cm), resistant to blast & tolerant to BPH

MTU 1001(Vijetha) - IET-13967
Parentage: MTU 5249 x MTU 7014
Duration (Days): 120-125
Average yield: 97 q/ha
Grain type: Medium slender
Special features: semi dwarf (115 cm), tolerant to BPH & blast

MTU 1061 (Indra)
Parentage – PLA 1100/MTU 1010
Duration (Days) –Late
Average yield–48-65 q/ha
Grain type – Medium slender
Special features –Plant height 115 cm, semi- dwarf, tolerant to BPH, BLB and GM biotype 1.

MTU 1075 (IET 18482) (Pushyami)
Parentage – MTU 2716/MTU 1010
Duration (Days) – 135-140
Average yield– 60 q/ha
Grain type – long slender
Special features –Plant height 108 cm, semi-dwarf, tolerant to leaf blast, BLB , sheath blight, BPH, WBPH and leaf folder.

MTU 1064 (Amara)
Parentage – PLA 1100/MTU 1010
Duration (Days) – 115-120
Average yield– 65 q/ha
Grain type – medium slender
Special features –Plant height 115 cm, semi- dwarf, tolerant to BPH,BLB, GM biotype 4, low incidence of SB, flood and salinity tolerance.

Crop production

Agronomy

- Among different crop establishment methods with common date of sowing and transplanted on different dates, highest yield was obtained under SRI method (6039 kg/ha) followed by Integrated crop management (ICM) with 20x20 cm (5942 kg/ha) and was on par to standard method of transplanting with 20x10 cm spacing. On the other hand, Crop establishment methods with different dates of sowing and planted on the same day, ICM method recorded the highest grain yield (6018 kg/ha) followed by SRI method (5831kg/ha).
- Among different varieties tested under aerobic conditions in puddle transplanted situation, MTU-1075 performed well and resulted significantly

superior grain yield (5855 kg/ha) followed by MTU 1010 (5546 kg/ha) and MTU 1064 (5477 kg/ha) under aerobic conditions.

- Rice – Maize system was found more remunerative with 1:1.8 B:C ratio than Rice – Rice system (1:1.66) for Godavari delta.
- Organic package of green manuring-insitu with Dhaincha and FYM application @ 10 t/ha as basal and top dressing of neem cake @ 500 kg/ha in two splits at tillering and P.I stage was found to meet the nutrition requirement as that of inorganic fertilizer dose (60-40-40 kg NPK/ha) for Swarna variety during kharif season.
- In transplanted rice among different herbicides, application of penoxulam 24SC, @ 0.0250 kg a.i/ha at 0-5 DAT resulted in the highest grain yield (5597 kg/ha) and lowest dry weight of weeds at 45 DAT (9.5g/m2). In another trial, Penoxulam + Cyhalofop-butyl at two doses (120 & 135 g.a.i/ha) applied at 15-20 DAT are very much effective and recorded higher grain yields (5662 & 5581 kg /ha) and it was on par with two hand weedings (5959 kg/ ha) and Bispyribac- Sodium 35 g a.i/ha (5336 kg/ha).
- In direct seeded rice under puddle condition, Penoxulam @ 25 g a.i/ha at 15-20 DAS resulted in higher yields (5726 kg/ha) and it was on par with Pyrazosurfuron ethyl @ 20 g a.i/ha at 4-7 DAS (5645 kg/ha), two hand weedings (5806 kg/ha) and weed free (5871 kg/ha) treatments.
- Studies on weed dynamics in rice – rice system indicated that the application of Glyphosate @ 0.75 kg a.i. /ha at 15 days before crop establishment without standard method of farmer's field preparation coupled with Bensulfuron-methyl + Pretilachlor (6.6GR) @ 0.06 + 0.60 kg a.i/ha at 8-15 DAT (post - emergence) resulted in better control of weeds and recorded higher grain yield of 5714 & 5738 kg/ha during Kharif and Rabi, respectively. This treatment was as effective as two hand weedings. Residual effect of different herbicides was not conspicuous.

Soil Science

- Conjunctive use of organics and inorganics (substitution or 25 to 50% N through green manure and / or FYM) produced yields comparable to yield obtained with 100% N applied through urea only after seven seasons of continuous usage of organics.
- In situ incorporation of Sesbania sp., pillipesara / black gram and application of paddy straw, FYM etc., have contributed to the nutrient needs of Kharif rice in part as revealed by on par yields obtained with 50% and 100% NPK treatments. The contribution of crop residues to the succeeding Rabi rice was, however, marginal.

- Commonly used complex fertilizers like DAP, 28:28:0, 17:17:17 and APP and straight fertilizers like single super phosphate (SSP) were equally effective in respect of P uptake, buildup of soil P and rice yields. Continuous application of SSP has however, resulted in significantly higher buildup of Calcium and Sulphur suggesting the usage of SSP now and then to enrich the soils with these two secondary nutrients.
- Nitrogen dose of 60 kg/ha was observed to be optimum for rice during Kharif season but for varieties like Swarna 30 kg/ha is adequate.
- A dose of 40 kg P_2O_5 was found to be necessary for Kharif rice, while 60 kg/ha was optimum and economical for Rabi rice in Godavari alluvial soils analyzing for low to medium available phosphorus.
- Application of phosphorus bio-fertilizer at 2.5 kg/ha was found to be effective in solubilizing and making available, the phosphorus present in rock phosphate and also the native fixed P in the soil, which are otherwise not readily available to the rice crop.
- Potash application @ 40 to 45 kg/ha was found to be optimum for getting higher yields in Godavari alluvial soils irrespective of soil available K_2O content. Split application of potassium has no additional advantage over entire basal application in these heavy soils.

Crop protection

Entomology

- Eight brown planthopper resistant donors viz., PTB 33, Velluthacheera, Huru Honderwala, Rathu Heenati, PTB 12, Manoharsali, CRMR 1523 and ARC 6650 were identified. MTU IJ 206-7-4-1 (BM 71) havve been identified as new resistant donor having field resistance to planthoppers.

- Anjungbyeo, BR314-B-4-6 and Hamnam 15 were identified as resistant donors to yellow stem borer
- New insecticide molecules effective against insect pests were identified and included in the state level package. These include:
  - Planthoppers - Ethofenprox 10EC @ 2.0ml/L, fenobucarb 50 EC @ 2.0 ml/L, imidacloprid @ 0.2ml/L, thiamethoxam 25WG @ 0.2g/L, buprofezin @ 1.6 ml/L, ethiprole 40%+imidacloprid 40% @ 0.25 g/L, pymetrozine 50 WG @ 0.5 g/L and sulfoxaflor 24 SC @ 0.75 ml/L of water

- Planthoppers, leaf folder and stem borer - Acephate 75 SP @ 1.5 g/L water
- Stem borer and leaf folder - Cartap hydrochloride 4G @ 8 kg/ac, fipronil 0.3 G @ 5 Kg/ac, cartap hydrochloride 50WP @ 2g/L, fipronil 5 SC @ 2.0 ml/L, chlorantraniliprole 20 SC @ 0.4 g/L of water.
- Leaf folder and rice hispa - Profenophos @ 2.0 ml/L of water

- Use of pheromone traps @ 3traps/acre for monitoring and 8 traps/acre for mass trapping has been recommended for yellow stem borer management.
- The occurrence of rice panicle mite, Steneotarsonemus spinki was reported for the first time in the state and its management by spraying with profenophos @ 2 ml or dicofol @ 5 ml /L or diafenthiuron 50 WP @ 1.5 g/L of water, once at panicle initiation stage and another at 15 days later was recommended.
- Recommended the effective insecticide and fungicide combinations against insect pests and diseases *viz.*,ethofenprox + hexaconazole; acephate 75 SP + hexaconazole; imidacloprid + validamycin; imidacloprid + propiconazole; thiamethoxam + validamycin; thiamethoxam + propiconazole against planthoppers and sheath blight. While, cartap hydrochloride 50WP+ hexaconazole and acephate 75SP + hexaconazole against sheath blight, leaf folder and stem borer.
- Created awareness among the farming community about the IPM practices and developed two IPM modules for K.G. Zone i.e., cultivation of a BPH tolerant variety like Vijetha (Kharif) and Cotton dorasannalu (Rabi) with need based application of insecticides against other major pests and diseases or cultivation of BPH susceptible HYV with timely plant protection against planthoppers realized higher benefit cost ratios.

Plant Pathology

- Sheath blight, blast and bacterial blight forecasting techniques were developed using trap plot techniques.
- A yield loss regression equation to sheath blight disease was developed.
- Seed dressing with carbendazim 50 WP was found to control seed borne sheath blight and blast disease pathogens.
- Blast disease was found to be controlled up to 40 DAS in direct seeded upland rice by treating the seeds with fungorin @ 3g/kg of seed at least 24 hours before sowing.
- Tricyclazole 75% WP @ 0.6 g/litre and edifenphos 50EC @ 1 ml/l were found to control rice leaf and neck blast disease effectively.
- Propiconazole 25 EC @ 1 ml/litre, Hexaconazole 5 EC 2 ml/l. and Validamycin @ 2 ml/lwere found effective against sheath blight.

- Bacterial leaf blight tolerant varieties like MTU 7029, MTU 1061, MTU 1031, MTU 4870, MTU 9993, IR 36, IR 40, IR 42, Jaya, Satya and Mahsuri were identified.
- Rice tungro tolerant varieties: MTU 9992, Suraksha, Vikramarya, Bharani
- Several resistant / moderately resistant / tolerant rice cultures were identified against bacterial leaf blight, sheath blight, brown spot and blast.
- Hexaconazole 5 EC 2 ml/L, Propiconazole 25 EC @ 1 ml/L, and validamycin @ 2 ml/L, carbendazim @ 1.0g/L and benomyl @ 1.0g/L were found effective against stem rot of rice.
- Carbendazim 50 WP@ 1.0g/L or benomyl 50WP @ 1.0g/L was found effective against red stripe disease.
- Azoxystrobin 18.2% + Difenconazole 11.4% SC (Amistar top) @ 1.25 ml /l was found effective against sheath blight of rice.
- Tebuconazole 25.9% EC @ 2.0 ml/l was found effective against stem rot of rice.
- Isoprothiolane 40 EC @ 1.5 ml/litre was found to control both leaf and neck blast. Trifloxystrobin+ tebuconazole (Nativo) 75WG was found to be effective against sheath blight. This was also found effective against sheath rot, false smut and grain discolouration. Hence these were recommended in the University (ANGRAU) package of practices.
- Validamycin 3L @ 2.0 ml, hexaconazole 5 EC @ 2.0 ml, propiconazole 25 EC @ 1.0 ml, carbendazim 50WP @ 1.0 g, benomyl 50 WP @ 1.0g/litre and tebuconazole 25.9 EC @ 2.0 ml/l were found effective against stem rot disease in rice.
- Red stripe is a new disease problem in areas where rice- rice cropping system is prevailing. The disease occurs from panicle initiation to crop maturity when conditions like high temperatures and high humidity are prevailed. Recently its pathogenicity was proved and the causal agent has been identified as *Nigrospora oryzae*. It can be controlled by spraying with either carbendazim 50 WP or benomyl 50 WP @ 1.0g/l.