DRR Newsletter

Vol. 6 No: 1 www.drricar.org January - 2008

## CONTENTS



## New DDG (Crop Science) takes over

Dr. Prem Lal Gautam has taken over the charge as the Deputy Director General (Crop Science), ICAR on 12th October 2007. Dr. Gautam began his professional career in agricultural research from Govind Ballabh Pant University of Agriculture and Technology, Pantnagar in 1974. He holds a Doctorate degree in Genetics from the Indian Agricultural Research Institute, New Delhi. His previous assignments include Director, National Bureau of Plant Genetic Resources (NBPGR), National Director, National Agricultural Technology Project (NATP), Dean, Y.S. Parmar University of Horticulture & Forestry, Solan (H.P.) among others. He is a widely travelled person and has served as a member of different National and International committees on R&D and policy issues related to bioresource collection, conservation, exchange, quarantine, biosafety etc. He is associated with the release of 12 improved crop varieties and has several publications to his credit. He is a combination of a popular teacher, credible researcher, institutional builder and also an acknowledged person in social welfare activities. We look forward to his wise counsel and leadership in the coming years to forge ahead in making significant progress in all our endeavours. Dr. Gautam was serving as the Vice Chancellor of GBPUAT, Pantnagar before assuming this coveted position of DDG (CS), ICAR.

## Seminar on GM crops

Directorate of Rice Research organized a one day seminar on "Outlook on biotech/GM crops" on 29th October 2007 at the University Auditorium in the campus of Acharya N G Ranga Agricultural University, Rajendranagar, Hyderabad to appraise the scientific community and personnel from seed and other agro-industries on the latest developments in biotech/GM crops. The seminar was sponsored by the International Service for the Acquisition of Agri-biotech Application (ISAAA), a non profit organization.


The eminent speakers at the seminar were Dr. Clive James, Chair, ISAAA board of Directors, Dr. Zhen Zhu, Professor, Chinese Academy of Sciences, Beijing, China, Dr. Swapan Datta, Professor, University of Calcutta, Kolkata and Dr. T.V. Ramanaiah, Biotech Affairs Manager, PHI Seeds, Hyderabad. The seminar was chaired by the eminent Rice Scientist and former Deputy Director General (CS), Indian Council of Agricultural Research, Dr. E. A. Siddiq. The seminar was attended by over 250 researchers, scientists, professors and executives of Agro-Industries representing 28 Organizations mainly based in Hyderabad.

## Seminar on SRI

The second National Symposium on System of Rice Intensification was held at Agartala in Tripura from 3rd to 5th October, 2007 which was jointly organized by Department of Agriculture of Government of Tripura, DRR, Hyderabad, ANGRAU, Hyderabad, Central Rice Research Institute (CRRI), Cuttack, the Directorate of Rice Development (DRD), Patna, Acharya NG Ranga Agricultural University (ANGRAU), Hyderabad the National Bank for Agriculture and Rural Development (NABARD), Mumbai and WWF- ICRISAT dialogue project, ICRISAT, Patancheru. It provided an opportunity for discussing concerns about constraints, farm innovations, identification of research priorities and policy directions to enhance adoption and scaling up of SRI adoption in order to enhance rice production and improve the livelihoods of rural people and marginal farmers. Norman Uphoff of CIIFAD University and Dr. Biksham Gujja from WWF, ICRISAT took part in panel discussion.


## Training Programme on Hybrid Rice Seed Production

DRR organized a 5 day training program on "Hybrid Rice Seed Production Technology" during 25-29 October, 2007. 31 participants from 18 companies including three public sector undertakings - APSSDC, MSSC & NSC benefited from the training.

# RICE NEWS AROUND THE WORLD

## Hybrid Rice Research and Development Consortium established at IRRI

IRRI has established a Hybrid Rice Research and Development consortium (HRDC) in partnership with National Agricultural Research and Extension systems (NARES) and the private hybrid rice seed sector to support research, capacity building, provide information and create awareness about Hybrid rice.

HRDC will have a public-private sector advisory committee and will meet annually to provide information to its members on new plant genetic resources available or under development, review research on hybrid rice management, discuss new research priorities and make decisions on other consortium activities.

Rice farmers in Asia will benefit from the accelerated access to hybrid rice based technologies, such as more and better hybrids, good quality seeds, knowledge and services provided by the public and private sectors. For further information and obtaining detailed guidelines and joining the consortium please contact :

**Dr. Fanming Xie**,
*Senior Scientist, Hybrid Rice Breeding, Plant Breeding,*
Genetics and Biotechnology Division, International Rice Research Institute (IRRI), DAPO Box: 7777, Metro Manila, Phillipines,
email: f.xie@cgiar.org,
Phone # +63-2-580-5600, Extn. 2769, Fax: +63-2-580-5699.

## Indian Scientist honoured

Dr. D.S.Brar, Senior Scientist and Head, Plant Breeding,Genetics and Biotechnology Division, International Rice Research Institute(IRRI), Los Banos, Philippines won the 2007- CGIAR Science award-Outstanding scientist, Koshihikari International

Rice Prize and a medal awarded by the Ministry of Agriculture & Rural Development, Vietnam . These awards recognize the contribution of Dr. Brar in rice breeding and in broadening the gene pool of rice through introgression of genes from wild species. As the outstanding CGIAR scientist he gets a citation and a cash prize of 5000 US$. Koshihikari International Rice Prize is shared by Dr. Brar and Dr. Tantawi A. Badawi, president of the Agricultural Research Center, Cairo, Egypt. The awardee receives a plaque and 500,000 Japanese yen.

# PROFILES OF AICRIP CENTRES

## Zonal Agricultural Research Station - Mandya

AICRIP, Mandya centre was established in the year 1965 at Zonal Agricultural Research Station, Vishveswaraiah Canal (VC) Farm of the University of Agricultural Sciences, Bangalore (Karnataka). The station has an area of 243.49 ha and perennial irrigation facility from Krishnarajasagar Dam of Cauvery River. It is located between 12° 45′ to 13° 57′ N latitude and 76°45' to 78° 24' E longitude and is at an altitude of 695 m above MSL. The major soil type is red sandy loam. The average rainfall is around 765 mm with a maximum temperature of 34° C and a minimum of 14°C. The centre has the sanctioned with the posts of Breeder, Agronomist, Entomologist and a Pathologist besides a Junior Breeder. A Jeep with a Driver and four Field Assistants assist them. The centre has adequate field and laboratory facilities to meet the experimental requirements.

### Achievements

So far the centre has released 23 varieties and two rice hybrids for commercial cultivation. These varieties include tolerance to Blast (1), BPH (2), Gall Midge (5), Salinity (2) and Cold (2). The variety '**Thanu'**, released during 2004-05 is very popular in the region for its quality. It matures in 130 – 135 days and yields 26-28 q/acre. The other variety **BR-2655** released in 2002 is also popular for its high grain and straw yield besides tolerance to Blast.

ZARS, Mandya is one of the pioneers in Hybrid rice research in the country. The hybrid **KRH-2** released in 1996 has become a national hybrid and gained popularity in all the rice growing states of the country for its high yield potential and tolerance to pests, diseases, salinity and drought. This hybrid which matures in 125–130 days is also found suitable for SRI and Aerobic system of cultivation. The centre has identified a new rice hybrid KRH-3. It is a fine grain, non-aromatic, quality rice hybrid.

For development and release of KRH-2 and popularizing this by taking up seed production in large scale, Dr. B.Vidyachandra and his colleagues were honoured with Dr. B.R. Barawale National Award in the *"International Symposium on Rice: Green Revolution to Gene Revolution"* held at DRR, Hyderabad during 2004.

### A Field day on THANU Variety Organized at Mandya

A 'Field Day' for Frontline demonstration of the new rice variety ***'Thanu'*** organized on 23-11-2007 at Hosahalli near Mandya. It was inaugurated by Dr. B.C. Viraktamath, Project Director, DRR, Hyderabad. He stressed the need for adopting new varieties and production technology to meet the challenge of an additional production of 20 lakh tonnes of rice every year. The new variety 'Thanu' is a derivative of Sona mahsuri having the advantage of medium duration (130-135 days) and medium fine grain quality with yield potential of 6.5-7.0 t/ha.

Dr. T.K. Prabhakara setty, Director of Research, Dr. H. Eshwarappa, Director of Extension, Dr. T.A. Srirama Setty, Associate Director of Research, Dr. K.C. Narasimhaiah, Extension

Coordinator, Dr. B. Vidyachandra, Professor of Hybrid Rice and Dr. M.P. Rajanna Rice Breeder of UAS, Bangalore attended the function. The function was presided by Sri. M. Srinivas, MLA of Mandya Vidhana Sabha.

# Crop Research Station, Masodha, Faizabad

The Crop Research Station, Masodha, Faizabad formerly known as Rice Research Station, was established in the year 1951. This Station is a satellite centre of N.D. University of Agriculture & Technology, Faizabad. It is situated at 26°47´N latitude, 82°12´E Longitude and 113 m altitude above mean sea level on the Faizabad-Allahabad road. The soil of station is sandy loam with alkaline tendency, rich in potassium and moderate in organic matter. The Centre has well equipped laboratories, net house, glass house and field facilities to conduct rice research on different ecosystems *viz*., drought prone rainfed upland, rainfed lowland- shallow water and semi deep ecology, irrigated etc. Rice scientists deployed in different disciplines like Plant Breeding, Agronomy, Soil Science, Physiology, Pathology and Entomology are working at the station.

The Centre shoulders the responsibility of catering to the varietal needs of different prevailing eco-systems. Accordingly, altogether 18 varieties have been released for various ecologies and areas including NDRH 2, the first rice hybrid of the state. This centre also takes the credit of releasing the hybrid Narendra Usar Sankar Dhan 3 (NDURH-3) which is the first saline tolerant hybrid released for problem soils in the country.

Till date, the centre has collected/acquired 1020 accessions including local and exotic germplasm, covering diverse genetic

variability. These germplasm have been assessed for morphological traits, quality traits and resistance to prevailing disease and pests.

In addition to the AICRIP project the centre also collaborates with the national and International institutes. The projects in operation at centre are Sodh Yojana, Consortium for unfavourable rice environments (CURE), Upland Rice Shuttle Breeding network Project (IRRI-NDUAT, collaborative project), IRRI-India Drought Breeding Network and Networking project on collection, evaluation, cataloguing and improvement of traditional scented rice.

**Varieties developed and recommended by Masodha Centre for various ecosystems**

| Variety | Parentage/Designation | Year of release | Maturity (days) | Yield (q/ha) | Grain type |
|---|---|---|---|---|---|
| **A. Upland drought prone** | | | | | |
| Narendra-1 | Belle PatnalL.8 | 1981 | 105 | 35-40 | MB |
| Narendra-118 | IR 36/Hansraj A | 1987 | 85 | 35-40 | MS |
| Narendra-97 | Nagina-22/Ratna | 1992 | 90 | 35-40 | LS |
| Barani Deep | C1064-5!IR9129 - 120-3-3-3/fR 54 | 2001 | 100 | 35-40 | LS |
| Shushk Samrat | C 1064-5/Kalkari//IR 54 | 2007 | 105 | 35-40 | LS |
| **B. Irrigated** | | | | | |
| **Early(l00-l15d)** | | | | | |
| Narendra-2 | IR 8/Tadukan / (TKM6 /TNI )/ /IR8/IR24 | 1982 | 115 | 40-45 | LS |
| Narendra-80 | Nagina-22/IR 36 | 1986 | 115 | 40-45 | MS |
| NDR 2026 | SIPI 632063 /CHLANING SENYU47/ ITAICH UNG SEN 12 | 2005 | 115 | 40-45 | MS |
| NDR 2064 | Pant Dhan 4/Saket4 // NDR 2017 | 2007 | 115 | 50-55 | MS |
| **Medium Duration (120-130d)** | | | | | |
| Sarjoo-52 | TNl/Kashi | 1980 | 130 | 60-65 | LB |

| Variety | Parentage/Designation | Year of release | Maturity (days) | Yield (q/ha) | Grain type |
|---|---|---|---|---|---|
| Narendra-359 | BG90-2-4/OYE77 | 1993 | 130 | 60-65 | LS |
| **Hybrid Rice** | | | | | |
| Narendra Sankar Dhan-2 | IR58025A/NDR3026- 3-1 | 1998 | 130 | 65-70 | LS |
| **C. Rainfed Lowland** | | | | | |
| **Shallow Deep (30-50cm)** | | | | | |
| NDR 8002 | IR 67493-M – 2 | 2004 | 140 | 40-45 | LS |
| Jal Lahri | Pankaj/Mahsuri// TKM6 | 1993 | 145 | 40-50 | MS |
| **D. Usar/Problem Soil** | | | | | |
| Narendra Usar Dhan - 2 | IR1814/IR1366- 120 -3-1//IR1539- 37-3-1 | 1995 | 125 | 30-40 | LS |
| NarendraUsar Dhan -3 | LeungYAI 148/IR 9129-209-2-2-1 //IR 18272-27-3-1 | 1999 | 130 | 45-50 | LS |
| NDURH-3 | IR58025A/NDRK5026 -1 R | 2005 | 130 | 50-55 | LS |
| **E. Aromatic Rice** | | | | | |
| Lalmati | Land Race | 2007 | 110 | 30-35 | SS |

## Regional Agricultural Research Station –Titabar

Regional Agricultural Research Station, Titabar, erstwhile known as Rice Research Station, one of the six Zonal Research Stations of Assam Agricultural University, was established in 1923. It is situated 20 km south of its parent institution *i.e.*, Assam Agricultural University, Jorhat. Geographically it is located at 90°11 E′ longitude and 26°55′ N latitude with an elevation of 90m above MSL. Average rainfall of the locality is 2250mm. The soil is clay loam with pH of 5.4. Altogether 11 scientists from the disciplines of Plant Breeding, Agronomy, Soil Science, Entomology, Plant Pathology and Crop Physiology are working hard to develop technologies for the main crop of the state.

### Achievements

Rice is grown in a wide range of agro-ecological situations in Assam. Therefore, rice varieties have been developed to suit these situations. The research station has developed sixty rice varieties and forty of them have been developed under AAU regime. Thirty-three varieties have been identified through AICRIP and are recommended for cultivation in the state. The station has made significant achievements in popularizing rice varieties like Ranjit, Bahadur, Luit, Jaymati and Gitesh through DRR sponsored FLD programme in the state since 1990. The station has been producing quality seeds of the promising varieties and the demand for quality seeds has been increasing year after year.

Under FLDs from 1990 - 2006, 22 districts have been covered through 307 demonstrations of 22 varieties benefitting about 4578 farmers.

**Rice varieties developed at RARS, Titabar**

| Sl.No. | Variety | Parentage | Year | Remarks |
|---|---|---|---|---|
| **A. Varieties for favourable situation (sali)** | | | | |
| **I.** | **For shallow water (<30 cm) submergence** | | | |
| 1. | Ranjit | Pankaj x Mahsuri | 1992 | Very good grain |
| 2. | Bahadur | -do- | 1992 | Non lodging & blast tolerant |
| 3. | Piyolee | -do- | 1992 | Good grain type |
| 4. | Moniram | -do- | 1992 | Blast tolerant |
| 5. | Kushal | -do- | 1992 | -do- |
| **II** | **For double cropped area** | | | |
| 6. | Satyaranjan | IET 9711 x IET 11162 | 1996 | Resistant to blast, BLB, gallmidge |
| 7. | Basundhara | -do- | 1996 | -do- |
| **III** | **Waxy rice varieties** | | | |
| 8. | Aghoni | Gandhibora x Kmj 1-52-2 | 1992 | High yielding high amylo-pectin content in grain |
| 9. | Rongilee | -do- | 1992 | -do- |
| 10. | Bhogali | -do- | 1992 | -do- |
| **IV** | **Aromatic rice** | | | |
| 11. | Ketekijoha | Savitri x Badshahbhog | 1995 | Short slender aromatic rice variety |
| **B.Varieties for unfavourable situation** | | | | |
| **I.** | **Submergence tolerant varieties** | | | |
| 12. | Jalashree | Pankaj x FR 13 A | 2000 | Can tolerate submergence up to 15 days in vegetative stage |
| 13. | Jalkunwanri | -do- | 2000 | -do- |
| 14. | Plaban | -do- | 2000 | -do- |
| **II.** | **Varieties for pre and post flood situation** | | | |
| 15. | Luit | Heera x Annada | 1993 | Very short duration variety |
| 16. | Kapilee | -do- | 1995 | -do- |
| 17. | Disang | Lachit x Kalinga III | 2005 | -do- |
| **III.** | **Varieties for delayed planting** | | | |
| 18. | Prafulla | Akisali x Kushal | 2000 | Can be planted as late as September with 80 days old seedling. |
| 19. | Gitesh | -do- | 2000 | Can be planted up to last week of August with 60 DOS. |
| **C. Varieties for ahu (irrigated)** | | | | |
| 20. | Lachit | CRM 13-1341 x Kolinga II | 1987 | Sali rice can be followed after harvest of this variety |
| 21. | Chilarai | IR 24 x CR 44-118-1 | 1987 | -do- |
| 22. | Gopinath | Pusa 2-21 x IR 36 | 1997 | Good grain quality. |
| **D. Varieties for boro** | | | | |
| 23. | Jyotiprasad | K 343-29-1-1 x Suweon 334 | 1997 | Escapes early flood and rain |
| 24. | Bishnuprasad | -do- | 1997 | -do- |
| 25. | Jaymoti | Jaya x Mahsuri | 2000 | Good grain quality. Escapes heavy flood and rain |
| 26. | Kanaklata | -do- | 2000 | For traditional marshy boro areas. |

## Indira Gandhi Krishi Vishwa Vidyalaya (IGKVV) AICRIP CENTERS - Raipur

Raipur Research Station of the Indira Gandhi Krishi Vishwavidyalaya was started in 1968-69. Established in 1903 during British rule as "Labhandi Farm", the Raipur farm became the Rice Research Station (RRS) in mid sixties and then became the Madhya Pradesh Rice Research Institute (MPRRI) in 1974 under the leadership of great rice scientist Dr. R.H. Richharia. Under the NARP, Raipur campus was elevated as Zonal Agricultural Research Station (ZARS) and the MPRRI was merged into this. Indira Gandhi Krishi Vishwavidyalaya, Raipur was established on January 20, 1987.

**Varieties and hybrids released**

| | | |
|---|---|---|
| Upland Bunded | : | Poornima, Danteshwari, Samleshwari |
| Bunded low land rainfed/Irrigated | : | Mahamaya, Chandrahasin, Indira Sugandhit Dhan-1, Shyamla, Bamleshwari and Karma Mahsuri |
| Hybrid Irrigated/ Shallow low land | : | Indira Sona |
| Semi deep | : | Jaldubi |


More than 23000 rice germplasm accessions are being maintained and a catalogue of 5000 accessions has been published. High precision field screening protocol for drought tolerance has been developed. Number of high yielding drought tolerant genotypes have been developed which are in state evaluation as well as IRRI-India drought screening network programme. About 400 rice lines have been identified for BPH resistance after screening 10,000 germplasm lines. Donors for gallmidge resistance have been identified under field screening. Nine different genes for gall midge resistance have been identified. Different BLB pathotypes prevalent in Chhattisgarh have been identified.

Division of Rice, IGKV, Raipur has been recognized as a leading centre for Rice Research in Chhattisgarh by institutes like, IRRI, DRR, CRRI, DBT and Rock Feller foundation etc. and the Scientists working here have received National and International awards in the field of Rice Breeding, Hybrid rice, Molecular Breeding, Rice Based farming systems and crop protection.

### Forthcoming Events

1. National Science Day celebrations at DRR on 28th February 2008
2. Farmers' Day at Ramachandrapuram Farm on 3rd March 2008 (Tentative)
3. Training programme on Integrated Pest Management in Rice from 11 – 15th March 2008
4. DRR Foundation Day 2nd April 2008
5. 43rd Annual Rice Workshop from 11 – 14th April 2008 (Tentative)

# A novel eco- friendly technology for management of yellow stem borer, *Scirpophaga incertulas*

*A.P.Padmakumari, I.C.Pasalu and G. Katti*
Directorate of Rice Research, Rajendranagar, Hyderabad

Yellow stem borer (YSB), *Scirpophaga incertulas*, is a highly monophagous and widespread pest of rice. The pest damage manifests as dead hearts at the vegetative phase and white ears at reproductive phase of crop leading to losses that range from 38 to 80%. Need based insecticide application and use of sex pheromones are the available management options.

We have developed and successfully tested yet another eco-friendly way of management of this pest through the use of Pusa Basmati 1 (PB1), an aromatic rice cultivar highly susceptible to YSB, as a trap crop (TC) to minimize the stem borer damage on the main crop. One row of PB 1 as trap crop for every 9 rows of main crop (MC) planted in east-west direction was found effective in minimising the YSB damage on main crop (MC). Being highly susceptible variety, PB1 attracted the stem borer moths in larger numbers and eggs were laid on the trap crop, thus sparing the MC.

Results of the recent studies on farmers field showed that damage in MC was reduced by half when planted along with the trap crop as compared to plots planted with main crop alone (Table 1). The yield with and without trap cropping would be almost same or at times higher in the main crop where trap crop is grown, but yield from the trap crop would be of added advantage.

**Table 1 : Impact of trap cropping on yellow stem borer damage in farmers' fields**

| Sl.No. | Variety | Dead hearts (%) | | White ear (%) | | Total yield (kg/ha) | Benefit : Cost |
|---|---|---|---|---|---|---|---|
| | | MC | TC | MC | TC | | |
| 1 | Main crop grown alone (*cv* 303)<br>Main crop + Trap crop - (*rabi* 2006) | 11.8<br>11.9 | -<br>14.9 | 10.6<br>5.4 | -<br>10.3 | 5318<br>5556 | 1.3:1<br>1.9:1 |
| 2. | Main crop grown alone (*cv* 6666)<br>Main crop + Trap crop - (*rabi* 2006) | 9.2<br>6.0 | -<br>11.8 | 4.95<br>3.3 | -<br>7.9 | 6600<br>7094 | 1.03:1<br>1.5:1 |
| 3 | Main crop grown alone (*cv* BPT 5204)<br>Main crop + Trap crop - (*kharif* 2006) | 8.8<br>3.6 | -<br>4.2 | 5.0<br>1.7 | -<br>12.3 | 4200<br>4916 | -<br>2.5:1 |

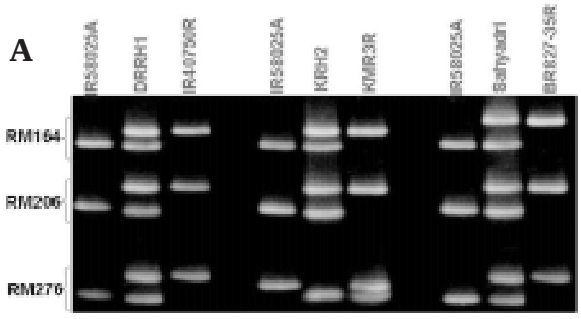
The technology was extensively tested and popularized in farmers' fields in both Ranga Reddy and Mahaboobnagar districts, covering 15 acres of land in *Rabi* and *Kharif* seasons of 2006 under Front line demonstrations.

To facilitate easy adoption by the farmers, the technology was fine tuned to suit any of the cultivars that farmers choose as their main crop. For a trap crop to be effective, it should reach booting stage 6-7 days before the main crop. To ensure this, based on the duration of the main crop *i.e.* 120, 135 and 150 days, sowing of trap crop PB 1 should be taken up 10 or 6 days before or 13-15 days after the main crop, respectively. However, both the varieties are transplanted at the same time in the field. PB1 as a trap crop was tested with varieties like Krishnahamsa, Swarna, MTU1010, BPT 5204 etc. and popular rice hybrids as main crop. It was also tested in situations where alley ways of 30cm are left for easy movement in BPH endemic areas.

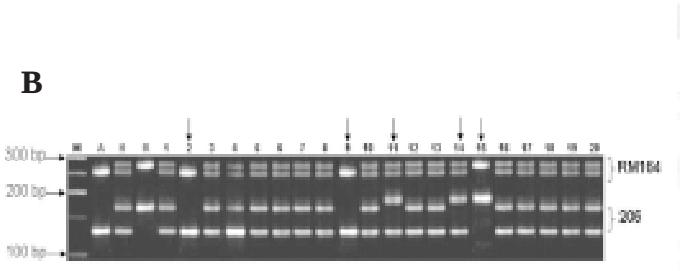
## Seed genetic purity assessment of rice hybrids and parental lines using 'informative' SSR markers

*R. M. Sundaram, B. Naveenkumar, S. K. Biradar, S. M. Balachandran, B. Mishra, M. IlyasAhmed, B. C. Viraktamath, M. S. Ramesha and N. P. Sarma*
Directorate of Rice Research, Rajendranagar, Hyderabad

With the objectives of identifying 'informative' SSR markers suitable for characterization of hybrid rice parental lines and to utilize them in genetic purity assessment of seed-lots of rice hybrids and parental lines, we characterized 10 each of cytoplasmic male sterile (CMS) lines and restorer (R) lines using a set of 60 hyperpolymorphic SSR markers uniformly distributed across the rice genome (4-6 marker per chromosome). A set 15 SSR markers (RM70, RM164, RM202, RM206, RM209, RM215, RM219, RM228, RM247, RM276, RM334, RM335, RM336, RM475 and RM547) were identified to be highly polymorphic and capable of distinguishing a majority of parental lines. Further, SSR alleles which are unique for 7 CMS lines and 9 R lines were also identified using these markers. A 20 x 20 grow-out matrix based bulk sample assay has been designed for testing purity of parental lines using the informative SSR markers. This assay is considerably cheaper than single seed based assay since it involves only 40 PCRs as compared to 400 PCRs required for single seed assays. We have also identified marker combinations suitable for multiplex PCR. A combination of three SSR markers RM70 + RM164 + RM206, through multiplex PCR is helpful in distinguishing the public bred hybrids DRRH1, KRH2, Sahyadri, CoRH2 and Narendra Sankar (Figure A) and for analysis of impurities in their seed-lots (Figure B). A database of hyperpolymorphic SSR markers which can be used for seed genetic purity assessment of public bred rice hybrids and parental lines has been developed by DRR, Hyderabad for the benefit of the seed industry.




Rice hybrids DRRH1, KRH2 and Sahyadri can be distinguished from each other through multiplex PCR using SSR markers RM164+RM206+RM276




Detection of contaminants in a seed sample of the hybrid KRH2 through multiplex PCR involving 'informative' SSR markers RM164 and RM206. M-50 bp ladder, A-IR58025A, H-KRH2, R-KMR3R, Sample Nos. 1 to 20 - seed samples of KRH2

**Reference:** R. M. Sundaram, B. Naveenkumar, S. K. Biradar, S. M. Balachandran, B. Mishra, M. IlyasAhmed, B. C. Viraktamath, M. S. Ramesha and N. P. Sarma (2007). Identification of informative SSR markers capable of distinguishing hybrid rice parental lines and their utilization in seed purity assessment. *Euphytica*. DOI 10.1007/s10681-007-9630-0

## Genetic improvement of restorers and maintainers

*M.S. Ramesha, M. IlyasAhmed and B. C. Viraktamath,*
Directorate of Rice Research, Rajendranagar, Hyderabad

In order to increase the profitability of hybrid rice technology there is an urgent need to enhance the magnitude of heterosis besides improving grain quality, combining ability and other plant and floral traits of restorers and maintainers. We took directed breeding of restorers and maintainers for desirable traits following recombination breeding methods to achieve these goals.

Single, three way and in complete back crosses among restorers/ outstanding partial restorers as one group and maintainers/ outstanding partial maintainers as the other divergent group were made and desirable segregants were selected in different generations. A few maintainers/partial restorers/restorers with desirable plant type traits in the tropical japonica background were also utilized in the crossing program. A separate breeding

program for the improvement of parental lines with medium slender grain type and better grain quality traits was also taken up and more than 300 new restorers and 80 maintainers were developed.

In the restorer breeding program the major selection criteria were relatively tall stature, improved plant type with synchronous tillering, lower panicle position, sturdy culm, long/heavy panicles, moderate to heavy tillering, MS/LS grain type with intermediate amylose content, delayed leaf senescence, better pollen production and dispersal ability. However, in the maintainer breeding program selections were carried based on desirable traits viz., relatively short stature, improved plant type, high rate of exserted stigma (> 30%), MS/LS grain type with better grain quality, moderate to heavy tillering, lower panicle position and synchronous tillering and slow leaf senescence with high number of opened spikelets. The new array of parental lines developed over the years was subjected to test cross evaluation and the frequency of restorers/maintainers was calculated.

Among the restorer breeding material, out of 1200 test crosses evaluated, highest frequency of restorers were found in lines derived from crosses among restorers (61 – 64%) as compared to that of restorer x partial restorer crosses. Most of the new restorers possess ideal plant stature and floral traits suitable as good pollinators in commercial hybrid seed production. New array of hybrids developed by using these restorers showed 25 – 30% heterosis with improved grain quality and better plant type traits. In the maintainer breeding lines, out of 500 test crosses evaluated, 260 were found to be good maintainers (52%) with desirable traits. Crosses involving all maintainers gave higher frequency of maintainers (56-65%) as compared to maintainer x partial maintainer crosses (35–44%) (Table 1).

Potential maintainers with desirable traits are being converted into CMS lines through recurrent backcrossing. In $BC_4$ generation of conversion program, stigma exsertion and out-crossing ability on A lines ranged from 79 – 89 and 48 – 56 percents respectively (Table 2).

**Table 1 : Development of restorers and maintainers**

| Type of crosses | Number of lines | | Frequency (%) |
|---|---|---|---|
| | Developed | Tested | |
| ***Restorers*** | | | |
| $R_1$ x $R_2$ | 500 | 400 | 64 |
| $R_2$ x PR | 400 | 250 | 39 |
| $R_1$ x ($R_2$ x PR) | 250 | 150 | 53 |
| R x ($PR_1$ x $PR_3$) | 300 | 200 | 31 |
| $R_1$ x ($R_2$ x $R_3$) | 250 | 200 | 61 |
| ***Maintainers*** | | | |
| $B_1$ x $B_2$ | 405 | 200 | 65 |
| $B_1$ x PM | 150 | 75 | 40 |
| $B_1$ x ($B_2$ x $B_3$) | 135 | 60 | 56 |
| $B_1$ x (PM x $B_2$) | 120 | 70 | 48 |
| $B_1$x ($PM_1$ x $PM_2$) | 115 | 55 | 41 |
| $B_1$ x PM//PM | 126 | 40 | 35 |

**Table 2 : Desirable traits of A lines**

| B Line | Stigma Exsertion (%) | | OC(%) on A line |
|---|---|---|---|
| | A Line | B Line | |
| 21-30 | 86 | 32 | 48 |
| 23-33 | 89 | 29 | 52 |
| 23-53 | 84 | 31 | 56 |
| 22-58 | 80 | 34 | 53 |
| 21-65 | 79 | 30 | 51 |

*High rate of stigma exsertion*

Commercial exploitation of newly developed restorers and maintainers/CMS lines in the development of new generation hybrids will go a long way in enhancing the magnitude of heterosis and thereby enhance the profitability of the technology in the near future.

## Genotypic variation in rice to applied P fertilizers under low to medium soil fertility conditions

*P. Krishnamurthy*
Directorate of Rice Research, Rajendranagar, Hyderabad

Twelve rice genotypes *viz.* Pant Sankar Dhan-1, IET 11907, IET 19909, RNR 23064, IET 19799, Rajendra, Satya, IET 19817, IET 19799, IET19863 PHB-71 and RASI were tested for their grain yield response at graded levels of P in a P-deficient vertisol during the *kharif* season of 2006.

Four distinct patterns in rice growth and grain yield response due to P application were observed (Table 1). Among rice cultures, at 0 P level, IET19799, Pant Sankar Dhan –1, IET 19907, Satya, PHB-71, and Rasi were found to be tolerant to low soil P- fertility status and recorded grain yields of 1.17-2.79 t/ha. At 10 kg $P_2O_5$ level, also these cultures along with IET 19798 and IET19863 recorded higher grain yields of 2.17-3.27 t/ha. At medium fertility level of 20-30 kg $P_2O_5$ /ha, Pant Sankar Dhan-1, followed Rasi, IET 19798 , Satya, IET 19799 , RNR 23064, PHB-71, IET 19817 and IET 19863 performed well. However, at higher P-levels of 40-60 kg $P_2O_5$ / ha, PHB-71 exhibited the best performance followed by Pant Sankar Dhan –1. Thus the results indicated that although IET 19799, Satya, Rasi, Pant Sankar Dhan-1 and IET 19907 recorded significant tolerance to low P and higher yield response at lower P –levels at higher P-levels PHB-71 proved to be the best with highest grain yield response of 106.1- 88.4 kg grain/ kg $P_2O_5$.

**Table 1 : Effect of graded levels of phosphorus on grain yield (kg/ha) of rice genotypes**

| Variety/P level (kg/ha) | 0 | 10 | 20 | 30 | 40 | 50 | 60 |
|---|---|---|---|---|---|---|---|
| Pant Shankerdhan 1 | 2788 | 3268 | 4020 | 4223 | 4535 | 4968 | 5636 |
| IET 11907 | 1717 | 2465 | 2868 | 3190 | 3693 | 4060 | 5034 |
| IET 19909 | 0 | 2085 | 2456 | 3137 | 3492 | 3950 | 4188 |
| RNR 23064 | 0 | 1130 | 3207 | 3863 | 4200 | 4601 | 5079 |
| IET 19799 | 2245 | 2514 | 3251 | 3491 | 4062 | 4341 | 4434 |
| Rajendra | 733 | 1673 | 2099 | 2590 | 2816 | 3236 | 3662 |
| Satya | 1168 | 2176 | 3362 | 3725 | 4118 | 4634 | 4928 |
| IET 19817 | 726 | 2132 | 3090 | 3501 | 4120 | 4415 | 4817 |
| IET 19798 | 0 | 2944 | 3388 | 3564 | 3965 | 4315 | 4732 |
| IET 19863 | 0 | 2797 | 3025 | 3587 | 4064 | 4355 | 4634 |
| PHB 71 | 1257 | 2204 | 3182 | 3870 | 5500 | 5912 | 6559 |
| Rasi | 1673 | 2693 | 3359 | 3994 | 4465 | 4770 | 5119 |

# INSTITUTIONAL ACTIVITIES

## New Projects/Schemes/Programs initiated

1. DBT has sanctioned a new project on "Promoter mining for identification of novel regulatory elements of candidate genes in rice for abiotic and biotic stresses" submitted by Dr. Seshu Madhav under the 'Rapid Grant for Young Investigator' scheme.
2. DBT has approved the extension of the ABSP II project on Development of Golden Rice indica lines for a further period of three years. Mr.R.M. Sundaram is the PI for this project.
3. DBT has sanctioned a new network project on "Characterization and use of EMS mutant lines of rice variety Nagina 22 for yield, drought tolerance and P use efficiency" in which DRR is one of the participants with Dr. N. Sarla as the PI with the budget outlay of Rs. 66.98 lakhs for a period of 5 years.

## Awards/ Recognition

1. Best paper presentation award to Dr. Ch Padmavathi *et al.*, at Second National symposium on "SRI in India – Progress and Prospects", October 3-5, 2007, Agartala, Tripura, India.
2. Best poster awards were given to Dr. S. Ravichandran *et al.*, Mr. I. Sudarshan *et al.*, Anirudh Kumar *et al.*, and Dr. T. Ratnasudhaker *et al* for their posters presented at the National symposium on "Research Priority and Strategies in Rice production System for second Green Revolution" held at the CRRI, Cuttack during 20-22 November 2007.
3. Best paper presentation award to Mr. Deepak K. Sinha *et al* at the National Conference on "Recent Trends in Rice Pest Management" held at the CRRI, Cuttack during 8-9 December, 2007.
4. Best poster awards were given to Dr. M. Srinivas Prasad *et al.*, and Dr. G.S. Laha *et al* for their posters presented at the 2nd Asian Congress of Mycology and Plant Pathology, held at Osmania University, Hyderabad during 19-22 December 2007.
5. Dr. J.S.Prasad, Principal Scientist (Nematology) has been nominated as a reviewer to International Seed Testing Association - Seed Health Committee for validation of protocols regarding the seed borne nematodes.
6. Dr. S.M.Balachandran, Principal Scientist (Biotechnology) has been nominated as DBT representative to the Institute Biosafety Committee (IBSC) of Bayer Biosciences Pvt. Ltd., Hyderabad and as Expert member to IBSC of Dupont Knowledge Centre and Directorate of Oilseeds Research, Hyderabad.

## Personalia

Dr. S.V.Subbaiah, Principal Scientist & Head, Crop Production and five Supporting Staff members superannuated from the Council's service on 31.10.2007.

Smt. M. Kamala, UDC was transferred to the Project Directorate on Poultry, Hyderabad on permanent absorption basis on 4.10.2007.

Mr. A. Prem Kumar and Mr. S. Ram Murthy, Stenographer Grade III have been promoted to the post of Personal Assistant on 2.11.2007 and Mr. Shaik Ahmed Hussain, LDC has been promoted to the post of UDC on 01.11.07. Shri. D. Venkateshwarlu, T-6 (Hindi) joined at this Directorate on 14.11.07 on permanent transfer from NAARM along with the post.

## Deputations abroad

Dr. R.M. Sundaram, Scientist (SS) participated in the Harvest Plus Rice Crop Team/Biofortification meeting organized by IRRI at Bangkok in Thailand during 3-5th November 2007.

Dr. B.C. Viraktamath, Project Director attended the Global Conservation Strategy meeting for Rice at IRRI, Philippines from 4 - 6th Dec, 2007.

## Important Meetings

"Institutional Biosafety Committee Meeting was held on 19th December 2007, under the chairman ship of Project Director, DRR. Dr. K.K.Sharma, Scientist, ICRISAT participated as the new DBT nominee of the Committee.

## Distinguished Visitors/ Seminars

Dr. K.K.Sharma, Head (Cell Biology) and Leader, Agribusiness Incubator, ICRISAT delivered a lecture on "Development and deployment of transgenic crops: Status, Issues and Future directions" on 19th December 2007.

## DIRECTOR'S MESSAGE

I am pleased to present first issue of 6th Volume of the DRR newsletter, in time to welcome the new year. Continuing our efforts to improve scope and getup of the newsletter, we have started a new feature – research notes - from this issue onwards. This will bring to light new, unique and important research findings from all the AICRIP centers and DRR. I invite all our AICRIP scientists to contribute research notes covering important research findings. Based on the response, this section may be enlarged in times to come. Four more of the centers have been covered under profiles of AICRIP centres. I urge other centres to submit their profiles for the future issues. Suggestions for further improvement are always welcome. Finally, my warm wishes to you all for a very happy and productive new year - 2008


***Compiled & Edited by :***

Dr. Chitra Shanker
Dr. G. Padmavathi
Dr. J.S. Bentur

***Published by :***

**Dr. B.C. Viraktamath**
Project Director
Tel : 091-40-2401 5120

***Contact Address :***

**Directorate of Rice Research**
Rajendranagar, Hyderabad - 500 030, A.P.
e-mail : pdrice@drricar.org

**DIRECTORATE OF RICE RESEARCH**
Rajendranagar, Hyderabad - 500 030. India
Tel : 091-40-2401 5036-39, 2401 3111 - 112, Fax : 091-40-2401 5308 website : www.drricar.org

*Printed at Suneetha Offset Printers, Kuthbiguda, Koti, Hyderabad - 500 027. A.P. Ph : 091 040 2465 7269.*