



DRR



Directorate of Rice Research NEWSLETTER

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RICE IS LIFE

January - March 2013

From Director's Desk...



Welcome 2013

I wish you all a very happy New Year

I wish each one of you a very happy and prosperous New Year-2013.

I also convey my sincere thanks to all the co-operators for successfully conducting the AICRIP trials and sending the data in time. In general, the year 2012 was not so favourable for rice crop. For the country as a whole, the rainfall for the season (June-September) was 92 % of its long period average (LPA). Monthly rainfall over the country as a whole was 72% of LPA in June, 87% of LPA in July, 101% of LPA in August and 111% of LPA in September (<http://www.imd.gov.in/>). In June, deficient rainfall was observed over most of the subdivisions (27 out of 36). According to government's preliminary planting report, estimated area planted to kharif rice as of September 28, 2012 was 36.8 million hectares, about 1.6 million hectares less than last year (Global Agricultural Information Network; 1st Oct, 2012) primarily because of less rainfall in the month of June and July. While rice production prospects improved due to excellent rains in August/September, overall production is likely to be slightly lower than last year due to the 2-3 week delay in planting. Heavy rains followed by cyclone 'NILAM' in the first week of November in Andhra Pradesh was another setback wherein about 4-5 lakh hectares of standing rice crop was damaged.

A number of activities took place at DRR during this period. Annual cum New Year day was celebrated in a big way where family members of DRR staff also took part. A marathon race was organized with a focus on rice and women's welfare and several slogans and messages on rice and women were displayed. Honourable Minister of State for

Agriculture, GOI, Shri Tariq Anwar visited DRR on 8th January, 2013 and addressed the scientists. Republic day was celebrated with great enthusiasm. Two conferences/seminars were organized at DRR. One of our colleagues, Dr. N. Sarla was appointed as ICAR National Professor, a prestigious position. Fourteen senior scientists were promoted to principal scientists through Career Advancement Scheme in different disciplines. Thirty four DRR staff members participated in South Zone sports Meet at Coimbatore and won several medals. Institute Management Committee (IMC) and Quinquennial Review Team (QRT) meetings (final meeting) was organized on 8th and 9th March, 2013, respectively.

This quarter is a testing time for DRR scientists as huge AICRIP data have to be analysed, interpreted and reports prepared for forthcoming Annual Rice Group Meeting to be held at Srinagar from April 13-16, 2013. I also take this opportunity to thank outgoing editorial team of DRR Newsletter and welcome the new editorial team of DRR newsletter. I hope that the contents of the newsletter would be quite informative and useful for all those involved in rice research. I request your valuable suggestions for further improvement.

(B.C. Viraktamath)

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General Article

Agronomic Practices for Enhancing Rice Productivity

R. Mahender Kumar and M.B.B. Prasad Babu

India's population which is increasing at a rate of 1.8% would need around 145 million tons of rice by 2050. Hence, there is a need to maintain sustainability of rice production with low cost of cultivation and evolve innovative agronomic techniques for increasing production. Some of the promising agro-techniques and cost-effective management practices are out-lined here under:

Tips for better Nursery:

- ❖ Select bold and filled seed
- ❖ Change nursery bed if the variety is changed for maintaining purity
- ❖ 12.5 cents (500 m²) of nursery is required for one ha in normal transplanting while 100 m² is sufficient for one ha for SRI and hybrids.
- ❖ Follow raised bed nursery with organics for better seedling growth
- ❖ Pull the seedlings when they are in light green colour for planting

Seed rate and seed treatment:

- ❖ Seed rate: 30 kg/ha for varieties and 15 kg/ha for hybrids and in SRI method use 5 kg/ha.
- ❖ Treat seeds with carbendazim (2 g/kg)

Planting Techniques:

- ❖ Perfect leveling of land – saves water and increases productivity
- ❖ 4 leaf stage is best for planting for normal and 2.5 leaf stage for SRI
- ❖ Shallow planting leads to more tillering and uniform maturity
- ❖ 2-3 seedlings/hill is best for normal planting and 1 seedling/hill for SRI method and hybrids
- ❖ Young seedlings tiller more and yield better
- ❖ Optimum plant population should be 33 hills/m² in Normal and 16 hills/m² for SRI
- ❖ Alley ways (20-30 cm) for every 2 m help in sunlight and aeration, decrease pests (BPH) and diseases and help in easy application of pesticides.

Integrated Nutrient Management:

Organic Manures

- ❖ Apply FYM or compost @ 10-12 t/ha; poultry manure @ 5 t/ha. Dry the manure/compost for one month before applying, since it contains 60% uric acid
- ❖ Sheep penning is also useful for rice

- ❖ Grow green manure crops like dhaincha, sunhemp or pillipesara before kharif rice but not between kharif and rabi due to unfavourable temperature for their growth as well as decomposition
- ❖ Apply vermicompost up to 15 days after transplanting followed by incorporation into soil.
- ❖ Grow pulses like green gram and cowpea and use as green manure if water release is early and if it is delayed, harvest pods and incorporate straw as green manure.
- ❖ Add neem cake, castor cake or karanj cake

Bio-fertilizers:

- ❖ **Blue Green Algae:** Apply 7-10 days after planting when thin film of water is available at 10 kg/ha along with sand. BGA fixes about 25 kg N/ha
- ❖ **Azolla:** Apply 250-400 kg/ha along with 125 kg SSP/ha at puddling when field has thin film of water and incorporate it 2-3 weeks later. It adds 7.5 t/ha green manure and fixes 30 kg N/ha
- ❖ **Azospirillum and Azotobacter:** Inoculate 500-1000 g/ha in nursery or spread 2.5 kg in 50 kg FYM in one ha of main field. Fixes 20-40 kg N/ha
- ❖ **Phosphobacteria:** Apply 500-1000g/ha as seed treatment or spread 2.5 kg in 50 kg FYM/ha. Unavailable phosphorus is made available by phosphobacteria

Time of Application

- ❖ **Nitrogen:** Apply nitrogen in three equal splits (1/3rd each) as basal and at active tillering and panicle initiation stages. Leaf colour chart based N top dressing will optimize and reduce the N requirement by 20-25 kg/ha.

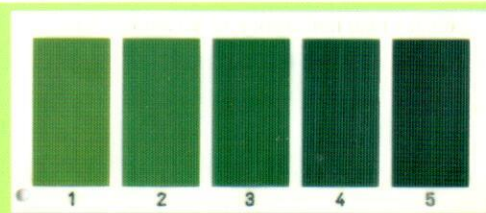


Figure-1-1: Leaf color chart modified at DRR for N top dressing

- ❖ **Phosphorus:** Apply all the required P basally before transplanting. In nursery, double the P dose if cold is more.
- ❖ **Potassium:** Apply all the required K basally in black soils. In coarse textured (light) soils and for hybrids, apply in two splits (50% basal + 50% at PI stage)
- ❖ Zinc deficiency is more prevalent in rabi which can be rectified by spraying 2g ZnSO₄/L of water

Method of Application

Nitrogen:

- ❖ Top dress under saturated condition without standing water so that the fertilizer granules fall in the reduced zone (3-4 mm depth). Irrigate after 36-48 hours.
- ❖ If it is not possible to drain water, incubate 50 kg urea with 10 kg neem cake or 250 kg moist soil for 48 hours and apply as top dress
- ❖ Apply 20-25 kg N/ha as top dressing when leaf color chart reading is <3 and continue up to PI stage.
- ❖ Avoid top dressing of complex fertilizers.

Zinc:

- ❖ Do not mix zinc sulphate with phosphorus fertilizers. Maintain a gap of three days between application of Zn and P fertilizers.

Iron:

- ❖ Spray 20 g annabedi + 2 g nimmauppu/L of water
- ❖ In case of higher day temperatures, decrease the concentration to 5 to 10 g/L (0.5 to 1.0%).

Hydrogen Sulphide Injury:

- ❖ Occurs in black soils under ill-drained conditions at tillering stage
- ❖ A rotten egg smell emits from the field
- ❖ Roots are black in colour which turn pink when exposed to sunlight
- ❖ Drain out water until fine hair cracks are formed
- ❖ Avoid sulphur containing fertilizers like ammonium sulphate, single super phosphate, zinc sulphate, potassium sulphate, gypsum, iron pyrites and ferrous sulphate.

Weed Control:

Nursery:

- ❖ Spray butachlor 2.5-5.0 L/ha (5 mL/L) or benthocarb 2.5-5.0 L/ha (5 mL/L) at 7 days after sowing (DAS).
- ❖ Spray cyhalofop-butyl 1 L/ha (2 mL/L) at 15 DAS.
- ❖ Spray bispyribac sodium 250 ml/ha at 15 DAS after planting in the main field.
- ❖ Keep weed free up to 40-50 days after planting.
- ❖ Butachlor 2.5-4.0 L/ha or anilophos 1.25 L/ha or pretilachlor 1.25 L/ha or benthocarb 2.5-5.0 L/ha at 3-5 DAT mixing with 50 kg sand and broadcast when there is thin film of water or as post-emergence spray of 2,4-D sodium salt 1 L/ha (2 ml/L) at 25 DAS when dicots are problematic or ethoxysulfuron 125 g/ha at 25 DAT.

Water Management

- ❖ At the time of transplanting A thin film of water has to be maintained
- ❖ From panicle initiation to hard dough stage, maintain 1-2 cm of water

- ❖ There should not be any water stress from 10 days before flowering to 10 days after flowering
- ❖ Alternate wetting and drying is better than continuous flooding
- ❖ Drain out water gradually 10-12 days before harvest
- ❖ Water saving technologies like alternate wetting and drying, saturated soil culture, warabandi, aerobic rice and SRI can be followed in water scarcity areas

Management of over-aged seedlings

- ❖ Cut the top portion of nursery
- ❖ Resort to dense planting of 5-6 seedlings/hill
- ❖ Up to 60 day-old nursery, fertilizer recommendations are same as that of normal crop
- ❖ If nursery is more than 60-day old, increase N dose by 25-50% and apply 2/3rd N basally and 1/3rd at panicle initiation

Direct Seeding

- ❖ Land must be perfectly leveled
- ❖ Direct seeding can be done either under puddled condition or with onset of monsoon without puddling
- ❖ Provide channels for proper drainage
- ❖ Maintain a thin film of water at the time of broadcasting
- ❖ Until the first leaf is fully developed (10 days) maintain the crop as irrigated dry crop
- ❖ Weed problems are more in direct seeded rice. Spray benthocarb (3L/ha) or butachlor + safener (3L/ha) or mix anilophos (1.25 L/ha) in 50 kg sand and apply at 8-10 days after seeding
- ❖ If broad leaved weeds are present, spray 2,4-D sodium salt 2 g/L of water at 25 days after seeding
- ❖ Apply N in three equal splits at 15, 35 and 60 days after seeding
- ❖ Apply entire P dose and half of required K as basal, and the remaining K at panicle initiation stage
- ❖ Direct seeded crop matures 7-10 days earlier than transplanted crop

Management practices in Problem Soils (Salinity)

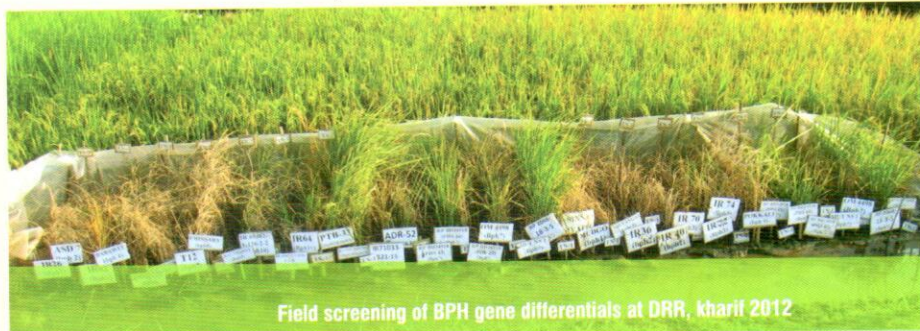
- ❖ Select suitable variety like Vikas, CSR 13, Co 43, Somasila, Deepthi, Vedagiri, Swarnamukhi, Swarna
- ❖ Plant over aged seedlings
- ❖ Plant more seedlings per hill
- ❖ Follow close planting
- ❖ Adapt furrow irrigation
- ❖ Double the dose of P and Zinc

The grain yields of rice can be maximized by resorting to proper nursery management, conjunctive use of organic manures and inorganic fertilizers, optimization of N use with LCC, effective weed management with suitable herbicides both in transplanted and direct seeded rice.

Research Highlights

Preliminary evaluation of BPH gene differentials in field

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Field screening of BPH gene differentials at DRR, kharif 2012

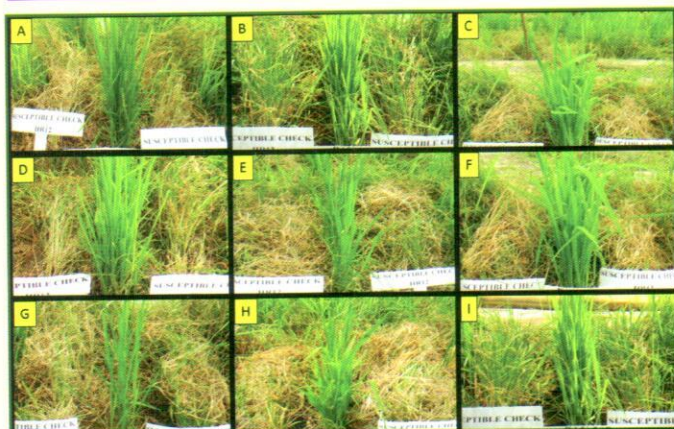
studies carried out in other countries. We do not have precise information of effectiveness of these genes against BPH populations within India.

To bridge this knowledge gap, we evaluated a set of 31 entries, received from IIRRI, Philippines (kind courtesy of Dr. F. Horgan) in the field. Insecticide induced resurgence technique was adopted for field screening

Brown planthopper, *Nilaparvata lugens* along with white backed planthopper *Sogatella furcifera* has become a major pest again in the recent past. There can be total crop loss in case of hopper burn. Though we have an array of management options, host plant resistance still holds a promise in managing this pest. However, suitable source, genetic basis and linked molecular markers will help in exploiting host-plant resistance, effectively. More than 27 resistance genes against BPH have been reported from cultivated and wild species of rice. Except for three genes, all other genes have been mapped and flanking markers are reported from

with single replication. Results suggested effectiveness of PTB 33 (with *bph2* + *Bph3* + unknown QTL) and Rathu henathi (*Bph3* + *Bph17*). Two local sources of resistance with unknown gene(s) viz., RP 2068-18-3-5 and RP Bio 4918 (Introgressed line from *O. nivara*) also showed high level of resistance. IR64 (with *Bph1* + QTL) and OM4498 with unknown gene(s) recorded moderate level of resistance. Two of the breeding lines viz., IR 65482-7-216-1-2-B (with *Bph18*) and IR 71033-121-15 (with *Bph20*+*Bph21*) were found to be susceptible. More detailed greenhouse and field studies are in progress.

Identification of New Genetic Resources for Durable Blast Resistance in India

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Introgression lines showing immune response for rice blast disease. Susceptible check HR12 on either side of the IL showing high susceptibility. Designation of ILs: A. NMSM-1 (*O. glumaepatula*); B. NMSM-2 (*O. glaberrima*); C. NMSM-3 (*O. glaberrima*); D. NMSM-4 (*O. glaberrima*); E. NMSM-5 (*O. longistaminata*); F. NMSM-6 (*O. longistaminata*); G. NMSM-7 (*O. rufipogon*); H. NMSM-8 (*O. nivara*); I. NMSM-9 (*O. barthii*)

Rice Blast caused by *Magnaporthe oryzae* is one of the major diseases and accounts for nearly 50% yield loss per annum. Although, many resistant genes have been identified, most of them are not truly broad spectrum and durable. The wild species of *Oryza* have rarely been used for the identification of blast resistance genes except for the two genes i.e., *Pi 9* and *Pi 40*. The

maintenance of wild species and the crossing barriers hinders their utilization in resistance breeding programmes. But the constant efforts of the breeders have led to develop the stabilized introgression lines (ILs). The availability of such ILs with various wild species facilitate their evaluation and to determine the level and spectrum of resistance contributed by the wild species. It is noteworthy to use these ILs to identify the genes which have the broad spectrum of resistance for major Indian isolates. In the current study, 326 ILs (genetic background of PR114 and Pusa44) derived from the cross of various accessions of six different wild species viz. *O. rufipogon*, *O. nivara*, *O. glaberrima*, *O. barthii*, *O. glumaepatula* and *O. longistaminata* (obtained from PAU, Ludhiana) were used for blast disease screening and identified 50 ILs which are highly resistant (score: 1-3). These resistant ILs were genotyped with the tightly linked markers of 10 important blast genes (*Pi54*, *Pi-1*, *Pi-2*, *Pib*, *Pita*, *Pi-z*, *Pi9*, *Pi33*, *Pitp* and *Pi40*) revealed 16 ILs possessing more than one gene, six ILs have single gene and nineteen ILs didn't show the presence tested *Pi* genes. These ILs which do not have any of the tested genes could be a good resource for mining of the novel blast genes. Further tagging and mapping of these genes will surely lead to the identification of novel genes for durable blast disease resistance.

Orange headed leafhopper damage in deep water rice, Ghagharaghat

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The orange headed leafhopper of the typhlocybinae genus *Thaia* Ghauri, 1962 belongs to the tribe Erythroneurini with *Thaia oryzivora* Ghauri, 1962 as its type species. It is distributed throughout the oriental region (India; Pakistan; Thailand; Vietnam; Indonesia; Malaysia; Singapore; China; Japan; Sri Lanka; Sikkim; Burma; Java) and Afrotropical region (Congo).

Thaia oryzivora Ghauri was first described from paddy in Thailand. Two species are common on rice: *T. oryzivora* reported from Bangladesh, Thailand and other Asian countries and *T. subrufa* from hilly tracts of Karnataka. We observed widespread damage by the orange-headed leaf hopper in the deep water rice fields at Ghagharaghat in Uttar Pradesh, during Kharif, 2012. The orange-headed leafhopper is smaller than the green leafhopper, *Nephotettix* spp. The genus can be identified by its orange colored head and sub-hyaline fore wings (in set). Body is usually brown or light brown. The orange headed leafhoppers belonging to the genus *Thaia* are different from other leafhoppers and planthoppers of rice in both their feeding pattern and damage symptoms. These leafhoppers do not feed on the vascular tissues namely xylem or phloem, but on the cells of the leaf blade. Feeding takes place on the under surface of leaves and removal of sap during feeding removes chlorophyll, producing small yellowish white spots or speckles on the leaf surface. The orange-headed leafhopper does not transmit any viral diseases. Studies on its biology show that nymphal period consists of 5 instars lasting 23-25 days and adults live 33-45 days. In Bangladesh, the orange-headed leafhopper population peaked in October- November and February-March and high population caused hopper burn. In Mudigere, Karnataka, the leafhopper populations were so high in some years with 150 to 200 adults

collected in each net sweep. Panicle size was found to be considerably reduced in affected plots. The pest has also been observed on several grass weeds and on finger millet *Eleusine coracana* Gaertn. At Ghagharaghat, the maximum number of hoppers per sweep recorded was 60. The per cent leaf damage was assessed in various lines and was found to reach a maximum of 63 per cent of leaf area. The leaf damage in various local deep and semi deep water accessions are given in the following table.

Variety	% leaf damage
Jalpriya	29.5
Madhukar	20.5
Barh Avarodhi	22.0
Jalmagna	26.5
Dinesh	14.0
Jalnidhi	63.0



Leaf stippling damage by the orange-headed leafhopper

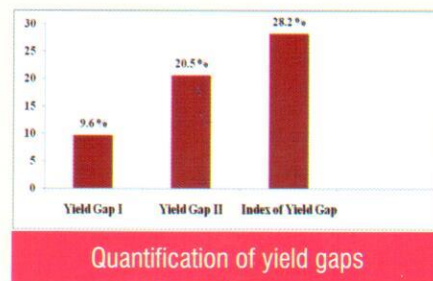
Yield gaps and constraints in rainfed low land rice production

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In India, 1/3rd of rice cultivated area belongs to rainfed low lands. Significance of rainfed lowland rice cultivation warrants for systematic assessment of yield gaps and production constraints. One of the districts in eastern Uttar Pradesh viz., Faizabad was selected for the study. Data were collected from 100 rice farmers through personal interview method and the data pertains to Kharif 2011. There is a significant gap (about 9.6%) between potential yields of varieties released for this region compared to maximum yield achieved in the farmers demonstration plots (Yield gap I; Figure). Even the difference between the demonstration yields and the actual yields realized by farmers was found to be very high (Yield Gap II, Figure). It was found that if production constraints experienced by farmers in this region are addressed, productivity can be increased to the tune of 20.5%. The Index of yield gap was found to be 28.2%.

To understand what contributes to the yield gaps, Garrett's ranking technique was used. Major constraints in realizing the potential

yield as perceived by the farmers are; the problem of submergence, pests, weed infestation and nutrient deficiency (a Garrett score of 70, 60, 56 and 49 respectively). Adoption of location specific submergence tolerant varieties and recommended package of practices would help the farmers in realizing the potential yield in the study area. Since majority of the farmers in the study area have small and marginal land holdings, they need credit facilities to procure critical inputs blended with timely suitable extension advisory services.



Varanasi centre (Banaras Hindu University) of the AICRIP was established as a sub centre in June, 1976 at Institute of Agricultural Sciences, Dept. of Genetics & Plant Breeding, BHU., Varanasi. The soil is sandy loam and clay Loam, typical Indo Gangetic alluvial soil. Irrigation is through bore wells and crops in this region follow Rice-Wheat crop rotation under Irrigated Ecology. Presently, four scientific staffs are working in the AICRIP centre viz., Dr. Ravi Pratap Singh as Prof. (Rice Breeding) and I/C AICRIP; Dr. H. K. Jaiswal, Sr. Rice Breeder; Dr. V. K. Srivastava, Senior Agronomist and Dr. R. K. Singh, Plant Pathologist. In Eastern U.P. rice is the staple crop. In Kharif nearly 63% of the cropping area is occupied by rice in Varanasi division. Rice is grown in fragile agro-ecosystem in eastern India and faces problems of high rainfall, poor drainage and poor soil fertility. In addition 30% area under rice cultivation is rainfed. Due to concerted efforts of AICRIP and State department of Agriculture, area under hybrid rice is increasing and presently the area under hybrid rice is about 80,000 ha. Boro rice cultivation is a good option for improving production potential in this region. Boro rice is currently grown on about 0.3 m.ha in Eastern U.P.

Major accomplishment

Crop Improvement/varieties developed and entries nominated

The AICRIP centre at BHU is working on Rice breeding with a mandate for developing rice varieties for early, intermediate and Indigenous aromatic (basmati included) groups for the last three decades. The rice varieties **HUR-3022 (Early)** and **HUBR 2-1** (Scented, medium maturity) were released by SVRC, Uttar Pradesh in 2004 and notified from Government of India in 2005. In 2008, **HUR-105 (Malviya Sugandh-105)**, NBPGR IC No. 560495) and **HUR-4-3 (Malviya Sugandh-4-3)**, NBPGR IC No. 560496; were identified by the SVRC Uttar Pradesh, and notified by CVRC Government of India in 2009. In 2011, **HUR5-1** (Slender grain) and **HUR 46005** (High yielding aromatic variety) were identified by SVRC and have been submitted to CVRC for notification. In 2010, **HUR-PB-7M** (IET 20847) was recognized as a very good culture for Basmati quality traits and recommended for soft registration by Central Varietal Identification Committee of Rice at DRR, Hyderabad. In April 2012, **HUBR 10-9 Basmati rice variety** was identified by VIC at the annual workshop held at DRR for Punjab and Haryana. The proposal has been submitted to CVRC for notification.

Crop Production:

With concerted efforts of AICRIP, area under hybrid rice has increased in UP (9% of national coverage) as compared to other hybrid rice growing states. Generally hybrid rice suffers from sterility problem coupled with poor quality. The centre has

contributed significantly in overcoming the sterility problem and improving the quality of hybrid rice by recommending application of 1 kg ha⁻¹ Boron and 20 kg ha⁻¹ Mg with RFD (150, 75, 60 and 5.25 kg ha⁻¹ N, P₂O₅, K₂O and Zn). Farmers are motivated to adopt

SRI cultivation of hybrid and high yielding inbred varieties to increase productivity. About 5-7% farmers are now practicing SRI cultivation. A new herbicide (**Bispyribac-sodium**) was tested in co-



ordinated trials and has been found very effective in controlling all categories of weeds in rice and this herbicide is getting popular among the farmers. The centre is also popularizing "double transplanting" (locally known as "Sunda planting") among the farmers. It has been observed that under double transplanting of rice, plant can tolerate high temperature, moisture stress as well as excess moisture in flash flood areas, with no adverse effect on yield. The centre recommends 3 weeks old seedlings for first transplanting at normal spacing and second transplanting again after another 3 weeks at closer spacing. For sustainable production of hybrid rice the centre recommends application of 75% RFD (112.5, 56.25 and 45 kg N, P₂O₅ and K₂O ha⁻¹) in addition of 50 kg N through organic manures like FYM, green leaf manure. This practice can save 25% of inorganic fertilizer for rice with positive nutrient balance for succeeding crop of wheat. Rice physiology experiments are being conducted on photothermic indexing, effect of Boron on spikelet fertility, rain fed upland rice trials and terminal heat tolerance/ Drought tolerance of rice cultures.

Crop Protection

Root-knot nematode (*Meloidogyne graminicola*) has become a serious problem in this region. Soil application of solid substrate bioformulation of nematode trapping fungus *Arthrobotrys oligospora* @ 10g/kg soil 10-15 days prior to nursery sowing has been found very effective for managing root knot nematode in nursery and transplanted rice. Under AICRIP Rice pathology activities, National Screening Nursery 1 and 2 are being conducted every year for screening against BLB, sheath blight and blast.

FLDs

Front Line Demonstrations are being conducted by this centre since last 10 years. These front line demonstrations are being conducted by this center to popularize rice varieties developed from this center and hybrid and few inbred high yielding varieties of other centers. The popularization of hybrid rice, SRI, INM, Organic farming are also carried out through FLD. Looking at the FLD performance of the centre, DRR has given responsibility to popularize rice varieties developed at DRR viz., Sampada and Vardhan in eastern U.P.

New varieties released

BNKR-1 (Dhiren)-A late duration high yielding rice variety for irrigated late situation of West Bengal

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CN1340-76-1-BNKR 23-7-1 (IET 20760), a rice culture, was released by the State Variety Release Committee (SVRC), West Bengal as BNKR-1 (Dhiren) on 17th November 2011. CN1340-76-1-BNKR 23-7-1, a derivative of the cross between IR 42 and Patnai 23, developed at Rice Research Station, Bankura, West Bengal and completed three years of National testing in kharif 2010 (IVT-L in kharif 2008, AVT-1L in kharif 2009 and AVT-2L in kharif 2010). It is semi erect (average plant height: 129 cm), late duration (140-145 days), medium tillering and high yielding variety (average yield: 5000-5500 kg ha⁻¹, potential yield: 10793 kg ha⁻¹). It is non-lodging, non-shattering and found to respond well to

recommended dose of N, P₂O₅ and K₂O @ 60, 30 and 30 kg ha⁻¹. It's grain type is short bold with intermediate amylose content (22.5%), medium gel consistency (46 mm) and recording 18.5 ppm Fe and 28.1 ppm Zn content in whole grain. It is moderately resistant to leaf blast, neck blast, brown spot, sheath rot and leaf folder. The farmers have accepted the variety for its high yield.



A short duration rice variety for upland areas of West Bengal

Puspa (IET 17509)

G. K. Mallick¹, M. Mandal², K. Jana¹, S. Ghosh¹, A. Ghosh³ and A. Biswas¹
¹RRS, Bankura-722 101; ²Seed Testing Laboratory, Burdwan; ³ZARS, Krishnanagar, West Bengal

One culture of rice CNB 1259-5-2-1 (IET 17509) was released by State Variety Release Committee (SVRC), West Bengal as Puspa on 17th November, 2011 for irrigated upland ecosystem under transplanted condition and rainfed upland under direct seeded condition of West Bengal. CNB 1259-5-2-1, a selection from BG 731-2, developed at Rice Research Station, Bankura, West Bengal and completed three years of National testing in kharif 2005 (IVT-E in kharif 2003, AVT -1E in kharif 2004 and AVT-2E in kharif 2005). It is semi-dwarf (118 cm), short duration (100-110 days), medium tillering and high yielding variety (average yield: 4500-5000 kg ha⁻¹ and yield potentiality: 8216 kg ha⁻¹) with short bold grains. It is non-

lodging, non-shattering, drought tolerant and suitable for early and late sown condition. It is resistant to leaf blast, sheath blight, sheath rot, bacterial blight, brown spot and BPH and tolerant to tungro disease,



SBWE, SBDH and leaf folder. It has a high milling (73.7%) and head rice recovery (58.7%), intermediate ASV (5.0), intermediate AC (24.8%) and GC (55 mm) and recording comparatively higher Fe (96.2 ppm) content in grain.

Panorama of Institutional activities

Marathon Run for Rice and Women welfare organized



As part of welcoming the new year-2013, a marathon run with focus on rice and women's welfare was organized by DRR on 31st, December, 2012 during 10-11 AM covering a distance of 5 kilometres. About 70 participants took part in this run and displayed the key slogans 'Rice is Life', 'Run for Rice', and 'Respect Women to respect Yourself' besides several slogans on rice to create awareness among 'Aam Admi' about rice and do's and don'ts on its better use, production and consumption. Several messages like rice does not need so much water, brown rice is good for health, organic rice saves soil health were displayed.

New Year cum annual day celebrated

All employees of Directorate of Rice Research celebrated New Year day-2013 on 1st January, 2013. Project Director Dr. B. C. Viraktamath congratulated all DRR staff for significant achievements of the institute and also emphasized to continue this sincere effort and take DRR to a new height. Project Director felicitated Dr. N. Sarla, Principal Scientist, Plant Biotechnology for getting the prestigious post of National Professor. He also felicitated successful staffs of DRR.





New Year cum Annual Day of the institute was celebrated on 5th January, 2013. The cultural evening began on a traditional note by the lighting of the lamp by Dr. B. C. Viraktamath, Project Director,

Dr. Ravindra Babu, President, Recreation club and Dr. J. S. Prasad, Head, Crop Protection. About 300 members (DRR staff and their family members) attended the function. After the melodious welcome song, Dr. J. S. Bentur, Head, PMEC briefed the gathering about the scientific achievements of the institute and also the century mark in rice production which our country could proudly achieve. A mention was also made of the prestigious awards won by the DRR scientists. A plethora of cultural activities like songs and skits and games were organized which kept all the children and adults hooked to their seats. A series of indoor and outdoor games were organised for the DRR staff by the recreation club leading to the Annual Day celebrations on January 5, 2013 and prizes were distributed to the proud winners. The Project Director appreciated the splendid efforts of the recreation club in bringing out the latent talent of the DRR and project staffs in making the DRR family have a memorable evening. The function ended with vote of thanks by Dr. R. Mahender Kumar, Secretary, Recreation club.

Honourable Minister of State for Agriculture visits DRR



Honourable Minister of State for Agriculture, Government of India, Sri Tariq Anwar visited Directorate of Rice Research on 8th January, 2013. Dr. B. C. Viraktamath, Project Director, DRR welcomed him at the

Directorate. After a discussion with Project Director, honourable minister visited some of the key facilities in the Directorate. He then addressed scientific staffs of DRR. He expressed his happiness for significant achievement of DRR. He mentioned the importance of food security in the background of depleting resources especially land and water and expressed his confidence on the agricultural scientists to tackle these challenges. He also stressed that the technologies should be taken to the farmers so that they get benefited from the agricultural science innovation. At the end, he congratulated Project Director and his team of scientists for the good work and asked to continue this good work. The meeting was also attended by Dr. S. L. Goswami Director, NAARM and Dr. Harvir Singh, Head, Crop Protection, DOR. The meeting ended with vote of thanks by Dr. J. S. Prasad, Head, Crop Protection, DRR.

DRR celebrates republic day

Directorate of Rice Research grandly celebrated republic day. Dr. J.S. Prasad (I/C Project Director) hoisted the flag. He narrated the achievements of DRR in the past and emphasized that the DRR community should strive for further excellence to improve rice



productivity and production. He also emphasized that the government aspirations on gender issues, communal harmony and rural development through agriculture for benefitting the farmers and rural prosperity should be given priority for meeting the national goals of development. The message given by the president of India was translated which emphasized to maintain the integrity of India, peace and prosperity. The DRR

community participated in large numbers and paid tributes to Father of the Nation on this day.

17th Institute Management Committee held

The 17th Institute Management Committee meeting of DRR was held on 08.03.2013. The meeting was chaired by Dr. B.C. Viraktamath, Project Director, DRR. The other members of the meeting were Dr. R. P. Dua, ADG (FFC), Dr. K. S. Varaprasad, Project Director, DOR, Dr. R. N. Rao, Principal Scientist, CRRI, Dr. Y. G. Prasad, Principal Scientist, CRIDA, Dr. S. M. Balachandran, Principal Scientist, DRR and Convener and Shri M. K. M. Nair, Administrative Officer and member secretary. Dr. N. Shobha Rani, Head, Crop Improvement, Dr. K.V. Rao, Head, Crop Production, Dr. Mangal Sain, Head, TTT, Dr. G.R. Katti, Principal Scientist, Entomology and Mr. Srinivasa Rao, FAO, DRR also attended the meeting.



At the outset, Dr. B.C. Viraktamath, Chairman, welcomed the members and briefed about IMC and research highlights of DRR. Drs. N. Shobha Rani, S.M. Balachandran, K.V. Rao, Dr. Mangal Sain, and Dr. G.R. Katti, briefly discussed about the latest research highlights of the concerned disciplines. This was followed by presentation of the proceedings of the 16th IMC meeting along with Action Taken Report by Dr. S. M. Balachandran. He also read out the response from ICAR with respect to the 16th IMC Proceedings. The Proceedings and the ATR were unanimously approved by the members. After the presentation, the following agenda items were taken up for discussion: 1) Prioritized equipments proposed for purchase during 2013-14 under XII Plan; 2) Prioritized farm implements proposed for purchase during 2013-14 under XII Plan and 3) Repair and renovation work of Rice Museum, CTC Hostels and Library. The IMC suggested that all the above three agenda items could be taken up as per the availability of funds. Finance and

Accounts Officer, DRR, briefed about the DRR Annual budget, status of expenditure, revenue generation and utilization. The meeting ended with vote of thanks proposed by Shri. M.K.M. Nair.

Final Quinquennial Review Team (QRT) meeting held on March 9, 2013

The QRT constituted vide ICAR letter F.No. 16-6/11-1A.-IA.IV dated 1 March 2012 completed the review of research and development of the Directorate of Rice Research (DRR) and the All India Coordinated Rice Improvement Programme (AICRIP) and a meeting was held at DRR, Hyderabad on 9 March, 2013 to finalize the report. The review team consisting of Dr. B. Mishra (Chairman), Dr. A.P.K. Reddy (Member), Dr. S.K. Sharma (Member), Dr. S.R. Das (Member), Dr. K.P.C. Rao (Member), Dr. N.P. Sarma (Member), Dr. B.C. Viraktamath (Project Director) and Dr. J.S. Prasad (Member Secretary) earlier had meetings with Dr. S.K. Datta, Deputy Director General (Crop



Sciences) and Dr. R.P. Dua, Assistant Director General (Food and Fibre crops) followed by regional meetings at different centres to review the work done under AICRIP. Based on the information inputs by DRR, Hyderabad, cooperating centres and on field verification of results, the QRT adjudged that the work carried out during 2007-2012, was highly satisfactory and productive.

14th Institutional Bio-safety Meeting held

Institutional Bio-safety meeting was held on 22nd March, 2013 under the chairmanship of Dr. B. C. Viraktamath. Prof. P. B. Kirti, HCU was the DBT expert. Six other members attended the meeting. Dr. S. M. Balachandran presented the progress of the ongoing projects on GM rice and action taken report of the previous IBSC meeting. Three new project proposals were made for the approval of the IBSC.

Discussion on rice IPM held

Dr. Chirantan Chattopadhyay, Director, NCIPM, New Delhi along with other scientists from NCIPM visited DRR on 27.2.13 and had a day long discussion with plant protection scientists of DRR



on integrated pest management in rice and forecasting of rice pests and diseases.

Orientation and sensitization meeting of project staff organized

A meeting for orientation and sensitization of project staff was organized on 28.12.2012. This meeting was attended by 120 Project staff attached to 17 Principal Investigators under 42 externally funded projects. Project Director in his opening



remarks emphasized the importance of meeting of this nature once in a year for providing guidelines to the newly recruited project staff and to review the progress and performance of all the staff. This was followed by briefing of administrative and accounts guidelines by Mr. M. K. M. Nair. Dr. N. Sarla gave brief account of laboratory etiquettes specially to those staff working in molecular biology laboratories. Dr. S.R. Voleti spoke on do's and don'ts that are to be considered by all the project staff. Dr. J.S. Bentur gave few hints on importance of publication and presentation and gave few tips for improving scientific writing and making an effective presentation in meetings. Dr. C.N. Neeraja touched upon the issues related to women project staff. This was followed by a guest lecture by Dr. Suri Babu, Performance Manager, Monsanto on Beachell-Borlaug International Scholarship Program. He and Project Director encouraged all the PI's to help prepare applications for the eligible Ph.D. students under them for this fellowship award. The meeting ended with vote of thanks by Mr. P. Manimaran, senior most project staff of DRR.

DRR technologies displayed

DRR technologies were displayed and explained to Honourable Minister of State for Agriculture, Government of India, Shri Tariq Anwar in an exhibition organized at NAARM, Hyderabad on 7th January, 2013.



Training program organized

A 3 day training program on "Crop Management and capability building program" sponsored by Mahendra and Mahendra Agro Division was organized by Directorate of Rice Research from 17-19th January, 2013. Thirty participants attended and successfully completed the program.



Awareness program on PPV&FR organized

One day awareness-cum-training program on Protection of Plant Varieties and Farmers' Rights (PPV&FR) Act 2001 with special emphasis on registration of farmers' varieties was held at DRR on

25th March, 2013. About 130 participants from Dept. of Agriculture, horticulture and ANGRAU attended the meeting. The chief guest, Dr. Anishetty Murthy, Former FAO scientist, exhorted that the protection of plant varieties/farmers'



varieties is very much relevant and required. Dr. L. V. Subba Rao, Nodal Officer (DUS) who organized the program informed that this awareness program helps the line department officials to facilitate the registration of Farmers' varieties.

Agricultural engineering symposium organized at DRR



Indian society of Agricultural Engineers (ISAE), Hyderabad chapter and CRIDA, Hyderabad organized an "International symposium on Bio-Energy-Challenges and Opportunities from Jan-28th-30th,

2013 at DRR Auditorium. The symposium had 400 participants from India and Abroad.

DRR staffs participate in South Zone sports meet:

Thirty four DRR staffs participated in the south zone sports meet held at Sugarcane Breeding Institute, Coimbatore from 18-22

February, 2013. DRR Staffs won gold medals in 3 events, silver in one event, bronze in one event and were runners in 3 events. Project Director and other staffs of DRR congratulate them.



Salient points from monthly meetings

January, 2013: Monthly all scientists Institutional meeting was held on 30th January. Some of the salient points were (i) discussion on maintenance of proper records such as stock registers and equipment log books, (ii) presentation on Results Framework Document (RFD) by Dr. MBB Prasad Babu, (iii) discussion on the renovation of DRR rice museum and (iv) DRR publications to be made during the forthcoming 48th ARGM.

February, 2013: Monthly all scientists Institutional meeting for February was held on 28th February. Some of the salient points were (i) updates on renovation of DRR rice museum and DRR publications during forthcoming 48th ARGM, (ii) contribution of photographs for the preparation of banner called "Seed to Seed" to be put in the CTC quadrangle.

STAFF ACTIVITIES

Bon Voyage



Dr Satendra K. Mangrauthia, Scientist, DRR was selected for prestigious Indo-US Research Fellowship Awards-2012 sponsored by Indo-US Science and Technology Forum (IUSSTF). He has been deputed to Purdue University, West Lafayette USA for a period of 12 month starting from January 15, 2013 and he will be working on micro-RNA mediated regulation of heat stress response in rice with Prof. Jian-Kang Zhu

AWARDS



Dr. J. S. Bentur, Principal Scientist (Entomology) and Head, PMEC was felicitated by the Karnataka Agri-professional Association (KAPA) on 30th December, 2012 at ICRISAT. Dr. Bentur was honoured for his significant contribution to rice in general and pest management in particular. This felicitation in which another scientist, Dr. C. L. L. Gowda, Global Theme leader, ICRISAT was also felicitated in the presence of Dr. B. C. Viraktamath, Project Director, DRR

AWARDS



Dr. Brajendra received Krishi Shodh Shiromoni Award-2012 by farmers youth foundation, Sahri Barh, Patna on 23rd December, 2012

Dr Nethi Somasekar was conferred / declared as Fellow of Plant Protection Association of India (PPAI), Hyderabad

Ms. Vijayalakshmi (Research Associate, NICRA Project) got young scientist award from Indian Society of Plant Physiology

AWARDS



Dr. N. Sarla, Principal Scientist (Genetics & Cytogenetics), DRR has been appointed ICAR National Professor for working on the research project "Development of chromosome segment substitution lines of rice from elite x wild crosses to map QTLs/genes for yield traits" at Directorate of Rice Research, Hyderabad with effect from 14.2.13

Dr. R.M. Sundaram and Dr. M. Sheshu Madhav, Senior Scientists in the Biotechnology Laboratory, DRR have been elected as Associate Fellows of National Academy of Agricultural Sciences, New Delhi w.e.f. Jan. 2013 for a period of five years for their outstanding contribution to rice biotechnology

Trainings/symposium attended by DRR scientists:

Name of the Official	Name of training / workshop/Symposium	Venue	Period
Dr. M. B. B. Prasad Babu, Sr. Scientist and Dr. C. N. Neerja, Pr. Scientist	MDP Workshop on PME of Agricultural Research Project (NAIP)	NAARM, Hyderabad	21-25 Jan, 2013
Dr. K. Surekha and Dr. V. Jhansi Lakshmi, Pr Scientists	Communication and presentation skills	IMTR, Goa	7-11 Jan, 2013
Dr. L. V. Subba Rao and Dr. B. Gangaiah, Pr. Scientists	Managerial Effectiveness Enhancement Program	IMTR, Goa	4-8 Feb, 2013
Dr. B. Jhansi Rani, Pr. Scientist	Technology management for researchers	NAARM, Hyderabad	Feb 28-Mar 6, 2013
Dr. A. S. Hari Prasad, Pr. Scientist	International Symposium on 'Sustainable Rice Production and Livelihood Security: Challenges and Opportunities'	CRRI, Cuttack	March 1-3, 2013
Dr. R. M. Sundaram, Sr. Scientist	1 st Conclave of Indo-US fellows	Marriott Hotel, Pune	16-18 March, 2013

PROMOTIONS

The following scientists were promoted from Senior Scientist to Principal Scientist through Career Advancement Scheme which was conducted during 2012

Names	Discipline	Names	Discipline
Dr. M. S. Ramesha	Plant Breeding	Dr. N. Somasekhar	Nematology
Dr. A. S. Hari Prasad	Plant Breeding	Dr. V. Jhansi Lakshmi	Entomology
Dr. G. Padmavathi	Plant Breeding	Dr. A. P. Padma Kumari	Entomology
Dr. M. Srinivas Prasad	Plant Pathology	Dr. Ch. Padmavathi	Entomology
Dr. G. S. Laha	Plant Pathology	Dr. K. Surekha	Soil Science
Dr. D. Krishnaveni	Plant Pathology	Dr. P. Muthuraman	Agril. Extension
Dr. B. Sreedevi	Agronomy	Dr. T. Vidhan Singh	Ag. Engineering/ Farm Machinery

Retirements/Voluntary retirements

Dr. J. S. Prasad, Principal Scientist (Nematology) and Head, Division of Plant Protection, DRR, retired from active service upon super annuation on 31st January, 2013. He made significant contribution to Rice research in general and rice nematology in particular. All DRR staffs wish him and his family a happy and healthy retired life.

Dr. M. S. Ramesha, Principal Scientist, Plant Breeding took voluntary retirement from ICAR service on 31st January, 2013. He made a significant contribution in development of several parental lines, rice hybrids and varieties. DRR staffs wish him all success in his future endeavour.

***Echinochloa crusgalli* (BarnYard Grass)-A serious weed of rice****Pests of rice**

B. Sreedevi, Principal Scientist, DRR, Hyderabad-500 030

Echinochloa crusgalli (2n=54) is an obnoxious annual weed of Poaceae family and widespread biological constraint in tropical, subtropical and warmer regions of temperate zones in 36 different crops in 61 countries.



It is native to Europe and Asia, although its exact origin is not known. It grows well in wet soils with 35–65% soil moisture and can continue to grow under partially submerged conditions in wide soil pH range of 4.7 to 8.3. A crop mimic and it is almost indistinguishable from rice plants during the early vegetative phase in rice fields. It requires higher temperature for germination. The root system may extend down to around 100 cm depth which enables the species to withstand drought conditions. It is tuft forming star-shaped and creeps on open ground. The leaf has no ligule, auricles and youngest leaf is rolled. These plants can be distinguished from other genera by absence of a ligule. Leaf blade is glabrous with white mid-rib; nodes are bearded and reddish-violet striped at base. Inflorescence is green to purplish; axis and branches with stout bristles, erect to nodding terminal panicle with 5–25 ascending racemes. Spikelets are single and has glumes with stiff hairs, lemmas with awns. Spikelets have one terminal perfect floret with a sterile floret below having two glumes. Spikelets are sessile and

have barren lemmas and rudimentary awns. Seed is caryopsis, ovate, flat on one side and round on the other, abruptly pointed, 2.5–3.5 mm long, tan to brown in colour, striate. Reproduction is exclusively from seed and seed production ranges from 2000 – 40000/plant. Water and bird dispersal of the seeds are common. Seeds exhibit innate dormancy and have more discontinuous germination pattern. It also reproduces from rooted tillers.

Season long competition of 50 plants/m² can reduce grain yields by 28–65% depending on cultivars. It also can influence rice yields when its density reaches 20 plants/m². Heavy infestation may remove 60–80% Nitrogen from the soil, as well



as considerable amounts of other macronutrients at the expense of rice plants. It has higher P content than Onions and Potatoes which may suggest that it is more efficient in phosphorus absorption from the soil. Control measures apart from chemical herbicides (pre-emergent and early post-emergent application of butachlor/pretilachlor /anilophos/ oxadiargyl/ oxyflorfen/ fenoxaprop-p-ethyl/ bispyribacsodium/ chlorimuron+ metsulfuronmethyl, 2, 4 -D etc.), include use of clean tillage equipment, crop rotation, sanitation, weed-competitive variety, high seeding rate, optimum sowing time, periodical draining and using plastic mulch.

Rice News around the Globe

- A gene called *PSTOL1* (Phosphorus Starvation Tolerance) has been identified from a traditional Indian rice variety called **Kasalath** which helps rice grow a larger, better root system and thereby access more phosphorus resulting in increased grain yield. (Gamuyao, et al., Nature, 2012; 488 (7412): 535-539.)
- The brown plant hopper resistance gene BPH27 from wild rice *Oryza rufipogon* has been mapped on the long arm of chromosome 4 (Huang et al., 2013, Theor Appl Genet (2013) 126:219–229).
- A research publication has shown that roasted rice bran can be used as an ingredient in high-fibre cereal bars (Garcia et al., 2012, Cienc. Tecnol. Aliment., Campinas, 32(4): 718-724.)
- Introgression of 4 QTLs from rice variety Azucena to Indian upland rice variety Kalinga III increased the root length and increased the grain yields in farmers fields. (Steele et al. 2013, Theor Appl Genet (2013) 126:101–108)
- A recent publication from Colorado Cancer Centre shows that rice bran offers promising cancer prevention properties (Henderso et al (2012). Advances in Nutrition 3 (5): 643-653)
- A research study shows that higher intake of white rice or polished rice is associated with a significantly elevated risk of type 2 diabetes, especially among Asian populations (Hu et al. 2012, BMJ, 2012, ; 344 (mar15 3): e1454 DOI: 10.1136/bmj.e1454)

Book published

International Dialogue on Perception and Prospects of Designer Rice



Society for Advancement of Rice Research
Directorate of Rice Research, Hyderabad 50030, India

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ANNOUNCEMENT

Forthcoming event: 48th Annual Rice Research Group Meeting (ARGM)

Venue: SKUAST-K, Srinagar, Jammu and Kashmir

Date: 13-16 April, 2013

BOOK POST

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