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## Assessment of genetic variability in recombinant inbred lines of rice derived from high temperature tolerant parent 01-05

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### ABSTRACT

An investigation was carried out utilizing 148 recombinant inbred lines of rice derived from cross between IR 64 and high temperature stress / heat tolerant donor N 22 at Agricultural College and Research Institute, Madurai, Tamil Nadu. The aim of the study was to assess the extent of variability in order to identify high temperature tolerant lines that could be utilized either directly or in hybridization programme to keep pace with the global climate changes. The variability studies indicated that single plant yield, number of ill-filled grains panicle<sup>-1</sup>, number of productive tillers plant<sup>-1</sup>, number of filled grains panicle<sup>-1</sup>, 1000 grain weight, flag leaf length and flag leaf width had relatively high PCV and GCV estimates. High genetic advance along with high heritability were found for all the characters except days to 50 per cent flowering and number of ill-filled grains indicating the presence of additive gene action for controlling these traits. High positive direct effect with single plant yield was exerted by the traits viz., number of productive tillers plant<sup>-1</sup>, number of filled grains panicle<sup>-1</sup> and spikelet fertility.

**Key words:** rice, recombinant inbred lines, high temperature, variability, yield trait

## Genetic performance of medicinal landraces and improved cultivars for grain and nutritional quality traits in rice 06-11

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### ABSTRACT

Rice is the most important food crop in South and South East Asian countries, particularly in developing countries like India. The nutritive and grain cooking qualities of the rice is one of the most serious problems in many rice producing areas of the world. The experimental material used were four traditional medicinal landraces and six improved high yielding varieties of Tamil Nadu raised in randomized block design during wet season 2012-2013. Observation were recorded and analysed for variability parameters. Moderate values of PCV, GCV were observed for L/B ratio, L/B ratio after cooking, kernel length after cooking, volume expansion ratio, kernel breadth and amylose content while high PCV, GCV recorded for biochemical characters viz., magnesium, calcium, copper, zinc and crude protein indicated large extent of genetic variability for these traits in the materials studied. The estimates of genotypic variances showed a considerable range of variation for most of the characters. High values of heritability coupled with high genetic advance as per cent of mean were observed for L/B ratio, L/B ratio after cooking, volume expansion ratio, kernel length after cooking, kernel breadth and amylose content along with high values of all the biochemical traits indicating involvement of additive gene action for these traits and phenotypic selection based on these traits in the future generations would likely to be more effective. When compared with the high yielding varieties, the landraces Veeradangan and Kavuni recorded very high nutritive values viz., calcium, iron and zinc content.

**Key words:** rice, genetic components, grain, nutritional quality, heritability

## Physiological and molecular profiling of rice genotypes under drought stress 12-23

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### ABSTRACT

Water availability is one of the major limiting factors that seriously influence rice production in the rainfed ecosystems and rice genotypes exhibit differential response to drought stress. With an objective to understand the physiological factors and the genomic loci that influence the tolerance to drought stress in rice, five weeks old seedlings of 38 rice genotypes were subjected to drought stress for 5, 7 and 9 days. Significant variation was observed for traits like shoot length, root length and tiller number plant<sup>-1</sup> in all the treatments studied and 14 genotypes displayed higher levels of tolerance similar to controls. Among the physiological traits, high relative water content (> 75%) under severe drought stress, was recorded in 10 genotypes while 10 genotypes recorded higher levels of proline accumulation under stress. Eight genotypes and CR-143-2-2 (control) possessed high levels of tolerance to drought stress. In the molecular analysis with thirty microsatellite (SSR) markers linked to different drought tolerance QTLs, twelve markers confirmed the association of the markers with the associated drought tolerance traits in these tolerant genotypes.

**Key words:** drought, rice, germplasm, microsatellite markers, relative water content, proline,

## High frequency regeneration and transformation of *indica* rice variety Pusa Sugandh2 24-33

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### ABSTRACT

A study was undertaken to examine the interactive effects of rice genotypes, media composition and desiccation treatment on regeneration frequency (RF) and total number of regenerated plantlets (green shoot induction, GSI). Out of four tested genotypes, the aromatic *indica* rice variety Pusa Sugandh2 (PS2) showed similar regeneration frequency ( $94 \pm 12.81$ ) and green shoot induction ( $387.33 \pm 2.91$ ) on RM-1 medium as that of japonica genotype Taipei309 (TP309), which was significantly higher than those in Pusa Basmati1 (PB1) and IR64. The better performing genotype (PS2) was subjected to genetic transformation using AtDREB1A by biolistic method. The regeneration frequency of transformed embryogenic calli of PS2 was found to be 87.02% which was not significantly different from non-transformed embryogenic calli of PS2, where as 50% lower frequency was observed in case of GSI ( $178.66 \pm 0.28$ ). Successful transformants were analysed by PCR using *hptII* and DREB specific primers. High frequency regeneration coupled with genetic transformation makes PS2 a preferred genotype for large scale functional validation of candidate genes in transgenics.

**Key words:** genetic transformation, *indica* rice variety, Pusa Sugandh2, regeneration

## **In silico analysis of gall midge resistance gene Gm4 in rice cultivar PTB10**

**34-42**

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### **ABSTRACT**

*Rice gall midge is considered as one of the most important insect pests of rice. Host plant resistance assumes a central role in pest management in order to alleviate crop loss as well as increase in crop production and productivity. Eleven gall midge resistant genes have been identified out of which eight genes have been mapped using molecular markers but their use in molecular breeding programs is still limited. The resistant gene, Gm4 identified from PTB10 is an ideal candidate for deployment in gene pyramiding. In the present study, in silico analysis was performed using 'Rice GE' database to scan the fine mapped region of 0.141Mb on chromosome 8 between RM547 and RM22550. This region contains 412 transcriptional active genes out of which 49 candidate genes involved in host plant resistance mechanism were identified and primers were designed. Four oligo specific genes showing resistant linked allele suggesting their possible R gene mediated role in plant-pathogen interaction were validated with the F9, mapping population of TN1/PTB10. Further Marker Assisted selection using these candidate gene markers can be an important approach to develop stable resistance against rice gall midge.*

*Key words: rice, gall midge, in silico analysis, candidate gene*

## **Estimating future yield of wet season rice in Chhattisgarh using crop simulation model**

**43-47**

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### **ABSTRACT**

*Crop forecasting through anticipation of future weather pattern and timely decision of proper agricultural management practices to avoid sudden crop failure is one of the advanced ways of sustainable agriculture. Crop growth simulation model can be successfully used to assess the yield under changing climatic condition which may be useful for developing adaptation and mitigation measures. Considering the fact, an attempt has been made to predict the future yield of rice in plain region of Chhattisgarh using Decision Support System for Agrotechnology Transfer (DSSAT v 4.5). Management combinations simulated were three sowing dates 11<sup>th</sup> June, 21<sup>th</sup> June and 29<sup>th</sup> June in 2011 and 10<sup>th</sup> June, 15<sup>th</sup> June and 22<sup>nd</sup> June in 2012 for wet season rice cv. Karmamasuri under rainfed and irrigation condition. Thirty three year (1981-2012) weather data (Max T, Min T, Rainfall and Radiation) was collected from IGKV, Raipur. First, the DSSAT v4.5 model was calibrated and validated for locally popular medium duration variety Karmamasuri for wet season (2011-2012). The result showed that the early and late sowing dates gave lower yield as compared to optimum sowing dates. The weighted yield was observed more than actual yield in central Chhattisgarh.*

*Key words: rice, climate change, estimated, yield, simulation model*

## Impact of organic nutrient management on dry matter partitioning, growth and productivity of scented rice 48-54

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### ABSTRACT

Field experiment was conducted during wet seasons to study the effect of organic nutrient management on dry matter partitioning, growth and productivity of scented rice cv. Birsamati. Pooled analysis of two years data revealed that scented rice grown with 100:21.8:20.8 Kg NPK ha<sup>-1</sup> having higher growth parameters produced maximum grain (3.95 t ha<sup>-1</sup>) and straw yield (5.55 t ha<sup>-1</sup>), net return (₹ 39,557 ha<sup>-1</sup>) and benefit: cost ratio (3.62), owing to higher value of yield attributing characters. Among various organic sources, use of green manuring @ 5 t ha<sup>-1</sup> + FYM @ 10 t ha<sup>-1</sup> was observed to be superior with maximum dry matter (1337.5 g m<sup>-2</sup>) at maturity and its partitioning into grain, 40% of the total dry matter in panicle, higher grain (3.28 t ha<sup>-1</sup>) and straw yield (4.35 t ha<sup>-1</sup>), net return (₹ 35,975 ha<sup>-1</sup>), benefit- cost ratio (2.61) owing to more number of panicles m<sup>-2</sup> (289.5), maximum grains panicle<sup>-1</sup> (88) and bolder grains (1000 grain weight-22.12g), higher crop growth rate compared to rest of the organic treatments

**Key words:** organic nutrient management, dry matter, scented rice

## Effect of Integrated nutrient management on rice under mountainous foothill of Manipur 55-60

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### ABSTRACT

Two field experiments were conducted during wet season 2008 and 2009 to evaluate the best integrated nutrient management system for rice in the mountainous foothill conditions of Manipur. The field experiments were conducted comprising of 15 treatments with integrated approach of nutrient management involving fertilizer, compost and rice husk ash (RHA) at various levels. On the basis of mean of two years, the treatment 100% RDF + RHA @ 5t ha<sup>-1</sup>, receiving 100% recommended dose of fertilizer (RDF) (N-P-K: 100- 80-50 kg ha<sup>-1</sup>) with 5t ha<sup>-1</sup> RHA showed maximum yield (1.76 t ha<sup>-1</sup>) which was at par with 100%+FYM @ 5t ha<sup>-1</sup> giving 1.74 t ha<sup>-1</sup>. The performance of 100% RDF + compost @ 5t ha<sup>-1</sup> however, was significantly lower than RHA and FYM at the same level of each input but showed better performance than all other treatments except all organic sources @ 5t ha<sup>-1</sup>. Control with no input showed lowest yield in both the years. Plant biometric characters showed a mixed response of performances. Yield components like, panicle length, tiller numbers, grain numbers, test weight etc. were better with the treatment, 100% RDF + RHA @ 5t ha<sup>-1</sup>. Nutrient uptake was significant between the best treatment 100% RDF + RHA @ 5t ha<sup>-1</sup> and the rest including control, except 100% RDF + FYM @ 5t ha<sup>-1</sup>. The highest cost : benefit ratio was however, recorded with Compost @ 5t + FYM 5t + RHA 5t ha<sup>-1</sup>. Hence, the use of pure organics (FYM+Compost+RHA) would be a profitable proposition which is not only economical, but also eco-friendly in widening the traditional jhum cycle.

**Key words:** compost, economics, fertilizer, FYM, Jhum rice, RHA, yield

## Response of rice varieties to forms of urea and levels of N in rice-zero till maize cropping system 61-66

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### **ABSTRACT**

*A field experiment was conducted to evaluate the performance of rice varieties of different duration in relation to levels of N and forms of urea during wet seasons of 2006-07 and 2007-08 on sandy clay loam soils of Rajendranagar, Hyderabad. Results indicated that the long duration variety BPT-5204 out yielded other two varieties, M-7 (medium) and Tellahamsa (short) in terms of growth, dry matter production, per day productivity, grain yield and straw yield. Increasing levels of nitrogen from 75% recommended dose of nitrogen (RDN) i.e. 100kg N ha<sup>-1</sup> to 125% RDN brought significant improvement in growth parameters, yield attributes and grain yields irrespective of the rice varieties.*

*Key words: rice, response, N levels, zero till, maize, cropping system*

## Effects of nitrogen management and Tricyclazole treatment on leaf blast severity in rice 67-69

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### **ABSTRACT**

*Field experiment was conducted at Chiplima, Sambalpur, Odisha during wet and dry seasons of 2011-2013 to assess the effect of nitrogen application, fungicidal sprays and varietal resistance on leaf blast disease severity and yield of rice. There was a progressive increase of leaf blast severity with full doses of nitrogen as compared to the application of two-third of the recommended dose in the susceptible variety Swarna. During wet season, the best treatment observed was Swarna with 2-3 sprays of Tricyclazole 75 WP @0.6 g l<sup>-1</sup> and 2/3rd nitrogen level showing 89.65% disease control, whereas during dry season, treatment having the resistant variety Pratikshya with 100% N was the best giving 96.92% disease control over check and was significantly superior to other treatments. The resistant variety with 100% N showed constantly low disease severity throughout the experiment in both the seasons. Two to three applications of Tricyclazole 75 WP @0.6 g l<sup>-1</sup> along with two third recommended dose of N showed maximum increase in yield (43.74% in dry season and 59.96% in wet season) in the susceptible variety.*

*Key words: rice, leaf blast, nitrogen, fungicide, cultivar*

## Economics of direct seeded and transplanted methods of rice production in Haryana 70-73

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### ABSTRACT

*Direct seeding is becoming an important alternative of rice transplanting and spreading rapidly in Haryana due to labour shortage and escalating cost of production. Present study is an attempt to analyze the economics of direct seeded and transplanted methods of rice cultivation in Haryana. It was revealed that the use of human labour, machine labour and irrigation water were saved by 13.16, 41.34, and 11.88 per cent, respectively, in direct seeded rice as compared to the transplanted method of rice production. The expenditure incurred on machine, irrigation and human labour was substantially lower by 41.34, 22.45 and 6.62 per cent, respectively, in direct seeded rice than transplanted method. Direct seeded rice technology enabled farmers to increase net return and save crucial inputs.*

**Key words:** direct seeded rice, transplanted, rice, economics

## Economic assessment of technology adoption in summer rice production in the Konkan region - methodology for excess adoption 74-80

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### ABSTRACT

*An attempt was made to study the economic assessment of technology adoption of summer rice and to suggest the methodology for measurement of technology adoption in case of excess adoption. Study is based on primary data collected from 120 summer paddy growers from Raigad district of Maharashtra, India. An attempt is also made to suggest a methodology for excess use of inputs up to any level which is more than the recommended level. As the per cent use of inputs more than the recommended level increases, the technology adoption index also decreases in the same proportion. The study revealed that seed was utilized in excess quantity in all groups and use of fertilizers was more in higher adoption group. Input gap was ranging from 33 per cent to 48 per cent which was higher in low adoption group. The total yield gap was 10.42 q (22.53 per cent). The increase in yield was 17.25 per cent more in high adoption group than the check (low adoption). It is concluded that, in addition to increase in adoption of technology by more number of farmers, the extent of adoption also needs to be increased for increasing productivity of rice, reducing yield gap and per quintal cost of rice production.*

**Key words :** summer rice, technology adoption, yield gap, unit cost reduction

## Extent of adoption of practices under system of rice intensification in Odisha 81-85

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### **ABSTRACT**

*System of rice intensification (SRI) has been popularized in all the rice growing areas across the World. Department of Agriculture, Govt. of Odisha has made intensive effort for popularization of SRI. But the area expansions were not significantly increased. A study was made with 115 SRI growers covering 81 villages and 42 blocks in 23 districts of Odisha. It was observed that the farmers have good perception about advantages of rice in comparison to their conventional practice and adopting SRI since last five years. There were deficiencies in adoption of suitable variety, optimum seed rate, selecting quality seeds with salt solution, preparing channels in 2 mts. distance in the main field, transplanting 8-12 days old seedling, putting seedlings in a thin metal sheet for transplanting, transplanting immediately after uprooting, applying recommended quantity of manures, not practicing green manuring/brown manuring, maintaining water at soil saturation, alternate drying and wetting, light irrigation during hair line cracks, keeping 2-3 cms. standing water after flowering, four weeding at 10 days interval and uprooting weeds manually near to the plant. Since, social participation, cosmopolitanism and holding size of the respondents positively and significantly influence adoption, it is therefore suggested that the farmers need to be further exposed through training, demonstration etc. so that they will convince and realize the importance and adopt all these practices under SRI and harvest the desired yield.*

*Key words: SRI, adoption, respondents, practices, Odisha*

### **SHORT COMMUNICATION**

## Study of genetic diversity among different rice varieties using quantitative characters 86-89

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### **ABSTRACT**

*Eighteen rice varieties which are mostly grown in Bihar state of India were studied for genetic diversity on the basis of sixteen quantitative characters using numerical taxonomic approach. Eighteen varieties were grouped into nine different clusters revealing sufficient amount of variability among the varieties. Hybridization involving Rajendra Shweta and Dhan Lakshmi with Sudha, Rajendra Bhagwati and Rajshree with Satyam, Rajendra Suwasni and Super Katarni with Nata Mahsuri, Rajendra Bhagwati and Satyam with Sudha were found to be more suitable parents for increasing the grain yield.*

*Key words: rice, genetic diversity, quantitative characters*

## Effect of different organic manures on yield, nutrient availability and soil microflora in transplanted rice 90-92

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### ABSTRACT

Field investigation was conducted during wet season of 2012-13 at Zonal Agricultural Research Station, Brahmavar, Bengaluru, to study the effect of different organic manures on growth and yield of transplanted rice. The results indicated that application of 50 per cent recommended dose of nitrogen ( $60 \text{ kg ha}^{-1}$ )(RDN) through goat manure + 50 per cent N through bio-digested liquid manure increased grain yield and straw yield in transplanted rice which is evidenced by increase in soil microflora resulting in better availability of nutrients to crop.

*Key words:* transplanted rice, yield, nutrient availability, soil microflora

## Relative efficacy of straw bin and gunny bag to control ageing process in paddy seeds 93-95

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### ABSTRACT

Freshly harvested seeds of paddy (var. Lalat) were stored in gunny bag and straw bin under ambient condition for 10 months. The initial values for seed moisture content, germination, vigour index, field emergence, conductivity of seed leachate, insect infestation and dehydrogenase activity were 8.98%, 93%, 1350, 91%, 0.36 mmhos  $\text{cm}^{-1}$ , 0% and 0.038 OD  $\text{g}^{-1}$  dry weight of seed, respectively. The initial average temperature of stored seeds in both the containers was 27.2°C. After 4 months of storage, seed moisture content tended to increase in gunny bag due to rise in atmospheric relative humidity caused by onset of monsoon but less so in straw bin. Seed moisture content approached maximum values after 6 months and 8 months of storage in gunny bag (11.44%) and straw bin (10.32%), respectively. Seeds stored in straw bin maintained germinability above minimum seed certification standard (MSCS)(80%) for 8 months while in gunny bag the germination value fell below MSCS just after 5 months of storage.

*Key words :* rice, germinability, storability, storage container

## Control of complex weed flora in direct-seeded and transplanted rice with early post emergence herbicide 96-99

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### ABSTRACT

A field experiment was conducted during wet season of 2010 at the research farm of the Indian Agricultural Research Institute, New Delhi to study the efficiency of new low dose herbicide penoxsulam on growth and development of rice, associated weeds and micro flora. Penoxsulam 24 SC at  $25 \text{ g ha}^{-1}$  applied at 10 DAS/DAT significantly reduced the weed population, increased growth, grain yield ( $4.86 \text{ t ha}^{-1}$ ) and yield attributes of rice crop. Herbicidal treatments provided an yield advantage of 65.98% to 72.63%, respectively over weedy check. Herbicides exerted a significant detrimental effect on soil bacteria, fungi and actinomycetes. The soil microbes were more sensitive



at 10 DAS/DAT to penoxsulam 25 g ha<sup>-1</sup> and pre-mergence application pretilachlor @ 750 g ha<sup>-1</sup> as evident from significant reduction in their population, eventually microbial density started to recover slowly.

**Key words:** rice, direct seeded, transplanted, microbial population, weeds, penoxsulam, pretilachlor

## **Studies on the host range of *Rhizoctonia solani* Kuhn causing sheath blight disease in rice** **100-102**

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### **ABSTRACT**

*Host range of sheath blight disease in rice caused by Rhizoctonia solani Kuhn was studied in different non-paddy hosts viz. maize, wheat, jowar, bajra, ragi, sugarcane and weed hosts namely Digitaria ciliaris, Dactyloctenium aegyptium, Eclipta alba, Euphorbia hirta, Scoparia dulcis, Echinochloa colonum, Ageratum conyzoides, Cyperus rotundus, Paspalum scrobiculatum, Cynodon dactylon and Commelina benghalensis, which served as collateral hosts for the survival of the pathogen. Production of the highest lesion length was recorded in the weed host Dactyloctenium aegyptium while the lowest lesion length was observed in Euphorbia hirta.*

**Key words:** rice, sheath blight, non-paddy host, weed