49(1) 2012

REVIEW ARTICLE

Weed management in upland rice

M. K. Singh
Institute of Agricultural Sciences, B.H.U., Varanasi-221005, India

01-09

ABSTRACT
The problem of weed competition in upland rice is of great economic importance as it may cause 50-91% reduction in grain yield. Upland rice is infested with diverse types of grasses, sedges and broad leaved weeds. Weeds usually appear in several flushes during the growing season of rice in uplands. The initial 7-30 days after rice seeding have been found to be critical with respect to crop weed competition. In upland rice, method of crop establishment and tillage operations have great influence on the nature of weed infestation. Integrated weed management is a viable and practical way to manage weeds in upland rice. Integration of indirect methods viz., crop establishment method, row sowing either manually or using seed drills, selection of suitable cultivars (e.g. Vandana, NDR -97, Virendra, Anjali, NDR-118), placement of nutrients below seeds and water management, and direct methods of weed control like, manual, mechanical and chemicals like thiobencarbs, pendemethalin, oxadiazon, oxadiagryl, oxyfluorfen, cyhalofop butyl, anilophos and nitrofen are the major options of weed management on long term basis in upland rice. Most of the herbicides available in market are mostly suitable for transplanted rice, therefore, new broad spectrum post emergence herbicide molecules which will be able to control various flushes of weeds is a necessity as availability of manual labour is becoming scarce in resource poor upland areas.

Key words: *upland rice, weed management, cultivar, herbicides, tillage*

Expression of heterosis in rice hybrids over three environments

S. Sreedhar , T. Dayakar Reddy and M.S Ramesha[1]
College of Agriculture, ANGRAU, Rajendranagar, Hyderabad (A.P.), India
[1] CSISA, IRRI, Philippines

10-17

ABSTRACT
Sixty rice hybrids developed through a line x tester fashion involving five cytoplasmic male sterile lines and 12 restorer lines were evaluated in a randomized complete block design over three locations for yield and its components. In most of the heterotic crosses, significant positive standard heterosis for single plant yield achieved due to positive and significant standard heterosis for component characters like panicle length, panicle weight, number of productive tillers per plant, number of filled grains per panicle, 1000-grain weight. The top most heterotic combinations identified for single plant yield were APMA6A x IR-54742R, APMS6A x IR- 24R, APMS6A x BR-827-35R, IR-80555A x IR-54742R, IR-80559A x IR-54742R and IR-80559A x KMR-3R over three locations.

Key words: *rice, heterosis, line, tester, pooled analysis, stability, yield components*

Estimation of genetic parameters for physico-chemical and nutritional traits in rice

D. Adilakshmi*, P. Raghava Reddy and K. Raja Reddy
Andhra Pradesh Rice Research Institute and Regional Agricultural Research Station, Maruteru 534 122, Andhra Pradesh
****Rice Research Station, Chinsurah, R.S. -712 102, Hooghly, West Bengal***

18-23

ABSTRACT
Variability and heritability studies in seven parents and their hybrids revealed the existence of significant differences for all the characteristics and indicated wide variability among the genotypes. In general, the parents exhibited high mean values for most of the quality traits studied, suggesting that parents were superior in quality than the hybrids. The heritability estimates were high which ranged from 88.00 to 99.10. Low to moderate estimates of variability high heritability and low to high genetic advance for all the quality traits indicated the preponderance of both additive and non additive gene effects in conditioning these traits. Variability was found high for iron content, while it was low for hulling percent in the genotypes under study. High heritability along with low genetic advance was exhibited for hulling percent only indicating that this traits was under the influence of environment. Remaining traits exhibited high heritability along with moderate to high genetic advance suggesting that these characters could be of great importance for selecting better genotypes in rice improvement programmes.

K**ey words:** *rice, genetic parameters, quality parameters, variability*

Effect of organic farming on productivity and quality of basmati rice

Debjani Sihi[1], D.K. Sharma[1], H. Pathak[1], Y.V. Singh*, O.P. Sharma[2], Lata[3], A. Chaudhary[1] and B. Dari[4]

CCUBGA, Indian Agricultural Research Institute, New Delhi
[1]Division of Environmental Sciences, IARI, New Delhi 110012
[2]National Centre of Integrated Pest Management, New Delhi 110012
[3]Division of Microbiology, IARI, New Delhi 110012
[4]Departmentof Agricultural Meteorology, PAU, Ludhiana, Punjab 141004

24-29

ABSTRACT

A study was carried out in farmers' fields in Kaithal district of Haryana during wet season 2009-10 to evaluate the impact of organic and conventional farming systems on productivity and quality of basmati rice. Yield and harvest index of Taraori basmati rice cultivated under both the practices were similar. Organic management enhanced grain elongation, kernel length, kernel breadth and their ratio compared to conventional practice. Organic management increased amylose content and slickness of grains but reduced crude protein content. Micronutrient (Fe, Mn and Zn) concentration in rice grain also increased with organic practices. No difference in aroma of basmati rice was observed under both the management practices. The yield data indicated that farmers adopting organic farming were able to get sustainable and comparable yield during nine years of organic farming. The study concluded that basmati rice can be grown organically with optimum productivity and improved grain quality.

Key words: *basmati rice, organic agriculture, productivity, cost analysis, grain quality, micronutrient*

Influence of crop management practices on productivity and economics of rice in south Andaman Islands

V. Damodaran*, B. K. Soren[1], N. Ravisankar[2], I. N. Bommayasamy and T. Subramani

Central Agricultural Research Institute, Port Blair-744101, Andaman & Nicobar Islands
[1]Vishva- Bharati University, Sriniketan, West Bengal.
[2] Project Directorate for Cropping System Research, Modipuram, Meerut, UP

30-34

ABSTRACT

On-farm experiments were conducted during wet seasons of 2008 and 2009 in the farmer's field at Calicut and Manjery villages in South Andaman district to select best management practices for rice to increase the Island level productivity. In on-farm trials, four best treatments of on-station experiment along with the farmer's practice of cultivation were evaluated in farmer's field. Planting of rice at 20 x 20 cm with application of 50 % recommended dose (90 kg ha^{-1}) of nitgen (RDN) through Gliricidia + 50 % RDN through urea resulted in better growth, uptake of nutrients and yield attributes which in turn led to higher grain, straw yield and monetary returns and was at par with application of 75 % RDN through Gliricidia + 25 % RDN through urea at same density. The increase in grain yield was 0.90 t ha^{-1} in Calicut village and 0.91 t ha^{-1} in Manjery compared to planting at 25 x 25 cm. The increases in grain yield at 20 x 20 cm spacing with organic-inorganic nutrient combination over farmers practice was 2.11 t ha^{-1} and 1.98 t ha^{-1} in Calicut and Manjery, respectively.

K***ey words:*** *system of rice intensification, on-farm evaluation, nutrient uptake, yield, economics*

Targeted yield approach under integrated nutrient management for assessing fertilizer requirement of rice

Poonam Gautam*, Ajaya Srivastava, Sobaran Singh and Anil Kumar Saxena

G.B.Pant University of Agriculture and Technology, Pantnagar-263145, Distt. U.S. Nagar, Uttarakhand

35-38

ABSTRACT

Response of rice to the selected combinations of four levels of N, P, K and three levels of FYM with simultaneous variations in initially available soil forms of these three nutrients were studied under soil test crop response calibration in aquic hapludoll. Grain and straw yield and soil analysis data were utilized to formulate the prescription equations for fertilizer doses under integrated nutrient management system with varying yield targets at different fertility levels.

Besides, follow up trials were conducted to test the validity of these equations. Results of these trials clearly indicate the superiority of yield target approach over other approaches.

Key words: *rice, soil test, crop response, yield target, fertilizer prescription equation*

Functional response of *Pardosa altitudis* Tikader and Malhotra, *Teragnatha maxillosa* Thorell, *Neoscona mukherjei* Tikader and *Theridion* sp. to rice green leafhopper

Akhtar Ali Khan
Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Shalimar Campus, Srinagar

39-44

ABSTRACT
Laboratory experiments were performed to determine the functional response of visual hunting spider, Pardosa altitudis Tikader and Malhotra and web-building spiders, Teragnatha maxillosa Thorell, Neoscona mukherjei Tikader and Theridion sp. to 2nd and 3rd instar nymph of rice grasshopper. The functional response of P. altitudis, T. maxillosa, N. mukherjei and Theridion sp. to the different density of 2nd and 3rd instar nymph of rice grasshopper was typically of Holling Type II with a steep initial rise in prey capture rates as the density increased. P. altitudis consumption increased to 26.7 per day 2nd instar nymphs of rice grasshopper which was higher than that of N. mukherjei (23.1), T. maxillosa (22.4) and Theridion sp. (18.8). However, in case of 3rd instar nymph of rice grasshopper, the consumption of N. mukherjei was increased to 21.2 per day which was higher than that of L. altitudus (20.4), T. maxillosa (19.2) and Theridion sp. (16.2). The search rate of N. mukherjei was not significantly higher than L. altitudes against 2nd instar nymph of rice green hopper and handing time of L. altitudes was significantly lowest as compared to N. mukherjei. In case of 3rd instar nymph of rice green hopper, the search rate of N. mukherjei was significantly higher followed P. altitudus, T. maxillosa and Theridion sp. while the handing times of N. mukherjei was not significantly higher than L. altitudes. The lowest search rate and highest handling time taken by Theridion sp. for both 2nd and 3rd instar nymph of rice grass hopper. The result suggested that P. altitudis have potential for being effective biocontrol agents.

K***ey words:*** *rice, spiders, planthopper, functional response, search rate*

Impact of training in rice cultivation on farm women of Odisha

S. K. Nath*, S. Chowdhury, R. K. Raj
Institute of Agriculture, Sriniketan, Visva-Bharati, West Bengal, India

45-49

ABSTRACT
The present investigation was carried out in Odisha state to find out the impact of training on rice cultivation by government agencies on farm women and the problems perceived by them. Training, being an important input for knowledge and skill development, is a part and parcel of all the programmes launched for enriching the existing knowledge. This study revealed that chemical pesticide application (98%), variety selection (88%), fertiliser application (87%) was the areas where most of the trained farm women had availed training. In harvesting of rice, both the trainees and non-trainees were found having maximum knowledge. The knowledge of farm women on weedicide application was very poor (3.75%). The maximum knowledge gap between trainees and non-trainees was found in safe storage method. Farm women perceived selection of time of training and much theory in training were the major hindrance in achieving the objectives of training.

Key words: *rice cultivation, training, farm women, knowledge gap*

Knowledge and adoption of improved practices in rice cultivation by farmers of Odisha

R.K. Raj, M. Behera, P. Ray and J.R. Mishra
Extension Education, OUAT, Bhubaneswar

50-52

ABSTRACT
A study was undertaken for assessing the knowledge and adoption level of farmers on various practices in rice cultivation. Information were collected from 208 farmers from two blocks each of Baragarh and Khurda district of Odisha during 2007. It was revealed that majority of the farmers were adopting various improved practices except the use of herbicide in rice cultivation. Since, holding size, possession of implements, annual income and extension contact significantly influenced the knowledge and adoption level, it is suggested for more exposure of the rice

growers through extension approaches in enriching their knowledge and experience so that the farmers could be able to adopt all recommended practices for increasing production and productivity.

Key words: *rice, cultivation, knowledge, adoption, improved practice*

Rice-fish farming – a potential venture for livelihood security for the tribal community of East Siang district of Arunachal Pradesh

Debashish Sen, Shah M. Hussain[1] and M. Pathak[1]
College of Horticulture and Forestry, CAU, Pasighat, Arunachal Pradesh
[1]KVK, East Siang Dist.,CHF, CAU, Pasighat, Arunachal Pradesh

53-56

ABSTRACT
A multi-locational trial on rizi-pisciculture was conducted to evaluate the feasibility and economic viability of rice fish culture (RFC) in the East Siang District of Arunachal Pradesh. The experiment was conducted in the wet season of 2010 and 2011 in 4 villages of the district viz. Ngorlung, Niglok, Balek and Mirem. One experimental unit at each location was prepared for RFC, while at Ngorlung, another adjacent plot of rice sole cropping (control) was studied separately. In all the location under study, survival rate of advanced fry was recorded between 41.7 % and 45.4 % with an average size of 80g to 90 g at harvest. Average grain yield recorded in RFC field (4.86 t ha^{-1}) was 12% higher than the control (4.33 t ha^{-1}) with additional mean fish productivity of 3.56 q ha^{-1}. Total cost of cultivation of RFC and sole cropping of rice was recorded to be ` 40,800 and `. 24,450 respectively. Average gross income and net income increased by `. 44,528 and `. 28,178 respectively by practicing RFC over the sole cropping of rice and it also raised the benefit-cost ratio of the system (2.19)

Key words: *rice fish culture (RFC), yield, production economics, livelihood, Arunachal Pradesh*

SHORT COMMUNICATION

Interrelationships for yield and component traits in rainfed upland rice

Sujeet Kumar, P.K. Singh, O.P. Verma, G.P. Verma, Karan Singh, R.K. Chaudhary and Manoj Kumar*[1]
N.D. University of Agriculture and Technology, Kumarganj, Faizabad
[1] Institute of Agricultural Sciences, BHU, Varanasi

57-59

ABSTRACT
A field experiment, with one hundred twelve diverse genotypes of rice, was conducted during wet season, 2007 at G.P.B. Research Farm of NDAU&T, Kumarganj, Faizabad to estimate the interrelationships under severe drought condition. The observations were recorded on eleven characters of yield and its attributes. The grain yield plant^{-1} reflected strong positive association with harvest index and spikelet fertility at phenotypic and genotypic levels. Path analysis indicated that harvest index and biological yield plant^{-1} contributed directly to grain yield plant^{-1}, while spikelet fertility, spikelets panicle^{-1}, panicle bearing tillers plant^{-1}, panicle length and days to 50% flowering were found to be important indirect contributors to grain yield. Besides, certain traits were found to be inter-correlated with each other. On the basis of overall mean performance associated with yield and its attributes the genotypes viz., NDR 509, IR 72049-B-R-22-3-1-1-B. IR 71695-3R-60-3-1 and IR 47547-3B-26-2B-1 were found promising.

Key words: *rice, correlation, path analysis, rainfed upland and drought condition*

Heterosis studies in rice hybrids involving diverse cytosteriles

R.L. Kunkerkar*, D.S. Sawant[1], V.N. Shetye[1] and P.B. Vanave[1]
****Regional Agricultural Research Station, Karjat, Raigad- 410 201, Maharashtra***
[1] Maharana Pratap University of Agriculture and Technology, Udaipur, Rajasthan

60-61

ABSTRACT
Forty hybrids were developed utilizing five cytoplasmic male sterile lines of four different sources and eight effective restorers and they were studied for the extent of heteorosis for eight different quantitative characters over popular commercial rice hybrid Sahyadri as a standard check. Seven hybrids viz., IR 58025 A/ Panvel - 1(41.90%), IR 58025 A/ IR 5 (36.43%), IR 58025 A/ Ratnagiri 3 (33.81 %), PMS 2 A / IR 54 (33.57 %), PMS 2A / IR 5 (30.95%), PMS 2A / Ratnagiri 3 (30.48%), WA base hybrids and G 46 / Ratnagiri 3 (24.05%) – Gambiaca base hybrid, expressed highly significant positive heterosis for grain yield over rice hybrid Sahyadri.

Key words: *rice, heteorosis, hybrids, cytoplasmic male sterile line*

Effect of sowing dates and weed management practices on productivity of direct seeded rice

Jitendra Kumar, Dheer Singh, Ramphool Puniya and P.C. Pandey*
G.B. Pant University of Agriculture and Technology, Pantnagar – 263145 (U.S. Nagar, Uttarakhand)

62-64

ABSTRACT
The predominant weed flora in the experimental field were Echinochloa colonum, Commelina benghalensis and Caesulia axillaris and Cyperus rotundus. Highest nutrient uptake by rice 28.09, 8.09 and 68.76 kg ha^{-1} nitrogen, phosphorus and potassium, respectively was recorded from 20 June sown crop. Use of herbicides increased nutrient uptake by rice and decreased nutrient uptake by weeds. Uptake of nutrients was higher by rice and lowest by weeds with hand weedings twice and pre-emergence application of pendimethalin at 1000 g ha^{-1} + anilophos at 400 g ha^{-1} over rest of the treatments. Reduction in grain yield due to weed competition was 70.4 and 67.4 percent in weedy plots.

Key words: *direct seeded rice, weed management, date of sowing, nutrient uptake*

Efficacy of bensulfuron methyl plus pretilachlor for controlling weeds in transplanted rice

B.G. Masthana Reddy*, G. Ravishankar, Subash Balganvi, V.R. Joshi and R.K. Negalur
Agricultural Research Station, Gangavathi, University of Agricultural Sciences, Dharwad ,Karnataka

65-67

ABSTRACT
Field experiment was conducted at Agricultural Research Station, Gangavathi, Karnataka during the wet season of 2006 and 2007 to assess the comparative performance of Bensulfuron methyl plus Pretilachlor combination against the recommended Butachlor application in controlling weeds in transplanted rice. The results revealed that pre-emergence application of Bensulfuron methyl 0.6% plus Pretilachlor 6.0% G @ 75+750 g ha^{-1}, five days after transplanting gave effective control of sedges, grasses and broad leaf weeds. The combination product was found to be non-toxic to rice crop and resulted in higher mean grain yield (6.06 t ha^{-1}), net returns (` 57624 ha^{-1}) and benefit cost ratio(3.48) than the recommended herbicide Butachlor.

Key words: *Bensulfuron methyl , Pretilachlor, Pre-emergence herbicide*

Bio-control of rice sheath blight through antagonists

S. Lenka*[1], S.K. Mishra[2], S.K. Mohanty[3], K.M. Das[3] and B. Medhi[1]
[1]Regional Rainfed Lowland Rice Research Station, Gerua, Assam
[2] College of Agriculture, OUAT, Bhubaneswar
[3] Central Rice Research Institute, Cuttack, Odisha

68-69

ABSTRACT
In vitro assessment of four biocontrol agents revealed promising effect of Trichoderma viride (Bangalore isolate) followed by T. harzianum (Bangalore isolate) and T. harzianum (Bhubaneswar isolate) in inhibiting the mycelial growth and sclerotial production of S8 isolate of Rhizoctonia solani. In pot culture experiment on rice variety Tapaswini the bioefficacy of T. viride (Bangalore isolate) was observed to be significantly higher followed by Gliocladium virens (Bhubaneswar isolate). Among the biogents, Bangalore isolate of T. viride was found very effective in restricting the growth and sclerotia production of R.solani by 67.94% and 68.62%, respectively as compared to that of the control

Key words: *rice, sheath blight, bio-control, Trichoderma*

Status and distribution of sheath blight of rice in Jammu

Upma Dutta, C.S. Kalha and J.N. Srivastava
Sher-e-Kashmir University of Science and Technology (Jammu), Chatha, Jammu

70-71

ABSTRACT
Extensive survey conducted in Jammu Division during 2005-06 indicated that inter district disease severity varied from 31.7 percent (Udhampur) to 75.18 percent (Jammu) and corresponding severity between 16.2 to 32.8 percent. In 2006, the incidence was comparatively low and ranged from 30.0 percent in Udhampur at stem elongation stage to 72.8 percent at maturity stage in Jammu with corresponding severity of 14.2 to 31.8 percent. Among the districts, the disease was rated as low in Udhampur followed by medium in Kathua and high in Jammu district

Key words: *rice, sheath blight, distribution, Jammu*

49(2) 2012

Utilization of biochemical and molecular markers for assessment of distinctness in rice varieties

Anuradha Bhartiya*, J.P. Aditya, S.C. Mani and C. S. Kar
College of Agriculture, G.B. Pant University of Agriculture and Technology, Pantnagar
73-79

ABSTRACT
Nineteen high yielding rice varieties were studied for morphological descriptors, total soluble protein, isozymes and RAPD molecular markers to determine distinctive features of each variety. In the present study out of 60 morphological descriptors 17 were monomorphic, 23 dimorphic and 20 found polymorphic. In six varieties namely Govind, Prasad, Pant Sankar Dhan 1, Pant Sankar Dhan 3, UPRI 95-17B, UPRI 92-133R and Saryu 52 were distinguished from rest of the varieties on the basis of different morphological discriptors. SDS-PAGE profile showed maximum number of bands (15) in Govind and Pant Dhan 6 and lowest number of bands (8) was obtained in Pant Dhan 10. On the basis of UPGMA cluster analysis of SDS-PAGE profile, variety Prasad was found distinct. A high degree of polymorphism was detected among the nineteen rice varieties through 12 random primers which generated a total of 68 bands with an average of 5.6 bands per primer. EO 1591, EO 1593, EO 1600 and EO 1602 generated unique bands in Pant Majhera Dhan 7, UPRI 95-17B, Govind and Pant Dhan 6, respectively. UPGMA cluster analysis revealed Pant Majhera Dhan 7 was highly diverse from other varieties.

Key words: rice, distinctness, morphological descriptor, molecular marker, Isozyme, RAPD

DNA fingerprinting of brown planthopper resistant rice cultivars

L. Behera*, A. Nanda, R.K. Sahu, M. Jena, S.C. Sahu, A. Patnaik, G.J.N. Rao and O.N. Singh
Central Rice Research Institute, Cuttack, Odisha, India
80-87

ABSTRACT
Forty two primers specific for rice microsatellite markers were used for fingerprinting and assessing genetic diversity of 19 rice cultivars differing in resistance to brown planthopper. Thirty six primers revealed polymorphism among cultivars. A total of 128 alleles were amplified, of which 120 were polymorphic. The number of alleles varied from 1 to 13 with an average of 3.05 alleles per locus. The polymorphism information content (PIC) ranged from 0 to 0.952 with an average of 0.633 per polymorphic locus, indicating the suitability of the microsatellite markers for detecting genetic diversity among these rice cultivars. Genetic similarities among cultivars varied from 0.38 to 0.897 with an average of 0.604. All the cultivars could be differentiated and grouped into two major clusters at 54% level of genetic similarity. Seven unique alleles were identified which would be useful for developing diagnostic markers

Key words: rice, brown planthopper, genetic diversity, microsatellite, molecular marker

Genetic variability and character association of agro-morphological and quality characters in rice

Nibedita Mohanty, M. Reddi Sekhar*, D. Mohan Reddy and P. Sudhakar
S.V. Agricultural College, Tirupati, Chittoor, Andhra Pradesh

88-92

ABSTRACT

Genetic variability and character association were estimated for twelve agro-morphological and quality characters in 40 rice genotypes during dry season 2007-08. High estimates of heritability coupled with high genetic advance as per cent of mean were recorded for most of the characters indicating the presence of additive gene effects in them. The genotypic and phenotypic coefficient of variation were maximum for grain yield plant^{-1} followed by 1000-grain weight and plant height. The correlation analysis revealed strong positive association of kernel length, panicle length, plant height, number of productive tillers plant^{-1}, 1000-grain weight, days to maturity and number of grains panicle^{-1} with grain yield. Path analysis revealed that kernel length, number of grains panicle^{-1}, plant height, number of productive tillers plant^{-1} and panicle length were the important characters contributing for grain yield.

Key words: *rice, genetic variability, heritability, genetic advance, correlation analysis*

Promising indigenous rice cultivars of Dhemaji district, Assam based on panicle traits

Pallabi Dutta* and P.K. Borua

Dibrugarh University, Dibrugarh, Assam

93-96

ABSTRACT

Identifying promising rice cultivars for yield and yield attributing traits by visual observation is not always effective. In this study various quantitative and qualitative panicle traits of sixty-five (65) indigenous rice cultivars were considered for selection of superior rice cultivars of Assam, by assigning ranks to each cultivar. Rank correlation study was also attempted to determine the significance of correlations among different panicle traits to grain yield. Considering seven quantitative panicle traits viz. grain yield, length of the panicle, number of spikelets panicle^{-1}, percentage of filled spikelets panicle^{-1}, spikelet density, number of panicles plant^{-1}, 1000 grain weight and one qualitative panicle trait viz. grain type simultaneously, only eight promising indigenous cultivars were selected out of sixty-five. Three high-yielding varieties were also taken for observation as check varieties.

Key words: *cultivar, rank correlation, panicle traits, spikelet density*

Molecular mapping of the chromosomal regions associated with high iron and zinc content using SSR markers

G. Usharani*[1], C.N. Neeraja[2], V. Ravindra Babu[2], P. Nagesh[1], M.V. Brahmeswara Rao[1] and S. Sumathi[1]

[1]College of Agriculture, Rajendranagar, Acharya N. G. Ranga Agricultural University, Hyderabad

[2]Directorate of Rice Research, Rajendranagar, Hyderabad

97-101

ABSTRACT

The present study was undertaken with the prime objective of mapping the chromosomal regions associated with high iron and zinc content involving the F2 populations derived from the cross of Samba Mahsuri with Ranbir Basmati using SSR markers derived from the genomic regions associated with iron and zinc metabolism. Out of the 35 microsatellite markers used for the parental polymorphism studies in Samba Mahsuri and Ranbir Basmati, 13 markers were polymorphic, 19 markers were monomorphic and 3 were not amplified. Most of the markers studied in the mapping experiment have shown a clear association with the trait.

Key words: *mapping, biofortification, iron, zinc, Samba Mahsuri, Ranbir Basmati*

Yield sustainability and quality of basmati rice as influenced by conventional, organic and integrated modes of cultivation

D.K. Singh*, Gurmukh Singh, Shilpi Gupta, Mamta Arora, and Sunil Verma

College of Agriculture, G.B.Pant University of Agriculture & Technology, Pantnagar, Uttarakhand

102-107

ABSTRACT

The impact of conventional, organic and integrated mode of cultivation on yield sustainability, soil fertility and quality of Pusa basmati-1 rice was studied. Among the different modes of cultivation studied, organic mode of cultivation sustained the productivity of basmati rice after five year of conversion period which was increased by 52.96 % over first year rice grain yield (2.26 t ha^{-1}). However, inorganic and integrated mode of cultivation maintained more or less same yields. Bulk density of soil improved to a great extent after five years under organic mode (1.26 g cc^{-1}) over initial (1.37 g cc^{-1}) followed by inorganic (1.28 g cc^{-1}) and integrated mode (1.30 g cc^{-1}). In organic mode it decreased by 8.03 per cent over initial value. Organic mode of cultivation was found superior in improving the organic carbon (0.79 %) status of soil followed by integrated mode (0.71 %). The per cent increases in organic carbon were 21.54 and 9.23 under organic and integrated modes.

Key words: *basmati rice, organic, chemical, integrated mode, soil fertility, basmati rice grain quality*

Response of hybrid rice to nutrient management during wet season

H. Banerjee* and S. Pal
Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, West Bengal
108-111

ABSTRACT

An integrated nutrient management programme on hybrid rice was conducted for two consecutive years (2005 and 2006) during wet season for sustained crop production at Research Farm of BCKV under new alluvial zone of West Bengal. The experiment was laid out in a randomized complete block design with 11 treatments. The results of the study demonstrated that plant height, dry matter production, leaf area index and crop growth rate of hybrid rice cultivar was increased with increasing doses of N, P and K fertilizers. All these growth attributes showed their maximum values with 100% recommended dose of fertilizers (RDF) NPK @ 80:40:40 kg ha^{-1}. Both both years maximum number of panicles m^{-2} (267 and 327), filled grain panicle^{-1} (116 and 158), 1000- grain weight (20.4 and 22.4g), grain yield (5.3 and 5.5 t ha^{-1}) and biological yield (11.13 and 11.75 t ha^{-1}) was recorded with 100% RDF. The second highest figures of all the above characters were observed with 75% RDF and 25% RD of N through GLM. The net return and B:C ratio were `13,425 ha$^{-1}$ and `0.61 with 100% RDF closely followed by 75% RDF + 25% RDN through green leaf manuring.

Key words: *hybrid rice, nutrient management, organic manures, soil fertility, yield*

Performance of green gram and dry season rice in arsenic uptake under different management options in West Bengal

S. Mondal*, P. Bandopadhyay and S. Pal
ICAR- Niche Area of Excellence, Directorate of Research, Bidhan Chandra Krishi Viswavidyalaya, Kalyani, Nadia, W.B.
112-116

ABSTRACT

The effect of irrigation sources viz. shallow tube well irrigation (STW) and harvested pond water irrigation (PW) and nutrient sources (100% recommended dose of fertilizer (RDF), 100% RDF with elevated phosphate (double dose of recommended), 75%RDF +FYM @ 10 t ha^{-1}, 75%RDF + FYM @ 10 t ha^{-1} with elevated phosphate] on yield and accumulation and uptake of arsenic by greengram and rice in dry season were investigated during 2007-08 and 2008-09. PW led to higher grain and straw yield in rice, as compared to STW, while, no significant difference was observed in green gram. Application of 75%RDF+FYM@10 t ha^{-1} with elevated phosphate favoured yield of both the crops. The arsenic accumulation was much higher in summer rice compared to green gram. Accumulation and uptake was much lower with PW, compared to STW. 75%RDF + FYM @ 10 t ha^{-1} with elevated phosphate proved to be the best in reducing arsenic accumulation in both the crops

Key words: *, arsenic, irrigation, nutrient, summer rice, green gram*

Variability in isolates of *Rhizoctonia solani* Kuhn, the sheath blight fungus of rice

S.R. Das[1], Shantilata Sahu[1] and M. Pradhan[2]
[1]Utkal University, Vanivihar, Bhubaneswar
[2]Ravenshaw University, College Square, Cuttack

117-120

ABSTRACT

One hundred and seventy eight isolates of Rhizoctonia solani Kuhn collected on different rice varieties from eighteen districts belonging to five agro-climatic zones of Odisha were studied for their variability. Based on the mycelia and sclerotial characters, the isolates were grouped into eighteen cultural types. Three types of mycelia viz. white, brown and deep brown were observed. The white mycelia of the isolates were thin (6.5-9.5µ) and all the brown and deep brown mycelia were thick (10.5-15.2µ). There was rapid and heavy mycelial growth (81-95mm) with scloretial production (70-88) in respect of the isolates from Cuttack, Kendrapara, Jagatsinghpur, Balasore, Bhadrak, Jajpur, Dhenkanal, Jharsuguda and Gajapati districts. The mycelial growth was very poor (33-52mm) along with scloretial production (23-39) in a few isolates from Cuttack, Kendrapara, Jagatsinghpur, Bhadrak, and Jajpur and in all the isolates from Angul, Sambalpur and Ganjam. Ten highly virulent, six moderately virulent and two avirulent isolates were identified in the population structure of the isolates studied.

Key words: Rhizoctonia solani, rice, sheath blight, pathogenicity

Evaluation of fungicides and rice genotypes for the management of Bakanae

M. A. Ahangar, S . Najeeb, A. G. Rather, Z. A. Bhat, G. A. Parray, G. S. Sanghara., Subash C. Kashap, F. A. Ahangar and Hilal Ahmad

S. K. University of Agricultural Sciences and Technology of Kashmir, Khudwani, Anantnag(J & K)

121-126

ABSTRACT

Bakanae disease of rice caused by Fusarium moniliforme is emerging as one of the major biotic challenge to rice production under temperate agro-ecosystem . The disease is an important limiting factor for rice production in higher altitudes of Kashmir valley. Six different fungicides were evaluated both in vitro and as seed dressing Carbendazim + mancozeb was found most efficient in reducing the disease severity. The resistant sources for the disease identified in the study are GSL-5, GSL-9, GSL-12, GSL-44, GSL-60, GSL-66, GSL-67, GSL 36 and GSL-68

Key words: bakanae, rice, genetic resistance, chemical control

Efficacy of insecticides against rice yellow stem borer, *Scirpophaga incertulas* (Wlk.) on Basmati rice

M.K. Mishra*, R.C. Sharma and R.B. Singh

N. D.University of Agriculture and Technology, Kumarganj, Faizabad (U.P)

127-129

ABSTRACT

Field experiments were carried out during wet seasons of 2007 and 2008 to test the efficacy of various insecticides along with check against yellow stem borer, Scirpophaga incertulas (Wlk.) with rice variety Pusa Basmati-1 at Crop Research Station, Masodha, Faizabad. Out of seven insecticides tested, fipronil 5SC @ 50g a.i.ha^{-1} superior to over other insecticides, which results the lowest incidence of yellow stem borer with highest grains yield followed by cartap hydrochloride 50SP @ 300g a.i.ha^{-1} and cartap hydrochloride 4G @ 750g a.i.ha^{-1}. However remaining insecticides were also found significantly superior over the control (check). Based on economics of the insecticides, cartap hydrochloride 50SP proved most economical than others with highest cost: benefit ratio (1:8.97) followed by fipronil 5SC (1:6.22) and cartap hydrochloride 4G (1:5.54) against lowest in indoxacarb 14.5 SC @ 75g a.i.ha^{-1} (1:2.89).

Key words: rice, yellow stem borer, insecticides, efficacy

Aspects of rice cultivation in Punjab, India

D.K. Grover

Agro-Economic Research Centre, Punjab Agricultural University, Ludhiana

130-134

ABSTRACT

The present study was conducted with a view to bring out various aspects of rice cultivation in Punjab,India. The study has been based on the sample of 100 rice growers spreading over five districts of the state during 2008-09. The

dominant variety PR-106 has lost importance and became out dated over the years. The cultivation of Pusa-44 has increased from merely 16.6 per cent in 1991-92 to as high as 35.2 per cent in 2008-09. The gross return from per hectare production of rice was `54585. The total variable cost of cultivation per hectare was `17657, leaving behind ` 36927 as returns over variable costs from rice cultivation in sample growers. The regression analysis indicated that there existed scope for further increase in the use of insecticides/pesticides, manures/fertilizers and irrigation for improving the yield of rice in Punjab. The problem of occurrence of stem borer was 'moderate' for 51.6 per cent of rice growers as per their perceptions. Bacterial blight and false smut were the major diseases for rice crop accounting for about 6.3 and 2.7 per cent of rice area, respectively. The problem of weeds, as experienced by the rice growers was not very serious. Timely planting, use proper plant protection measures and providing irrigation at the right time were the most desired practices at the farmers own level for yield improvement by rice growers.

Key words: rice, cultivation, economics, constraint analysis, Punjab

Information technology need assessment for paradigm improvement in rice research system

G. A. K. Kumar* and A. K. Mohanty[1]
Central Rice Research Institute, Cuttack, Odisha
[1] ICAR Res. Complex for NEH Region, Sikkim Centre, Ranipool, East Sikkim, Gangtok, Sikkim

135-140

ABSTRACT

Rice research system in India face new demands and challenges, arising from the process of economic liberalisation, globalisation and structural adjustment. Hence there is need to reorient the stakeholders with the skill and knowledge of information technology (IT) with capacity building through suitable training modules. Designing IT training module depends on assessment of needs of the organization and prioritizing the training needs of staff and analyzing the problems and opportunities. Based on the knowledge and work responsibilities of staffs the degree of IT need assessment was varied from scientists to administrative staff followed by effective training module for capacity building.

Key words: agricultural research systems, information technology, need assessment, training module

SHORT COMMUNICATION

Genetic analysis of blast resistance in rice

Mahendra Persaud*, A. Kumar, R.B.S. Sengar, Abhinav Sao, R.K. Dantre and M.N. Shrivastava
Indira Gandhi Agricultural University, Krishak Nagar, Raipur, Chhattisgarh

141-143

ABSTRACT

The genetic analysis of blast (Pyricularia grisea Sacc.) resistance in rice was conducted in Chhattisgarh, India. The inheritance studies revealed that, resistant parents RR 166-645 and Bala possessed a single dominant gene, which is effective against one or more races of blast. The resistant line RR 345-2 and moderately resistant lines IAC 25 and IR 42221-2-3-2 possesses two independent dominant genes, each gene providing resistance against a single but different race. Allelic tests showed that, the genes conferring resistance to blast present in RR 166-645 and RR 345-2 are non-allelic. Similarly, the resistance conferring genes in WAB 56-50 and B 61444-F-MR-6-0-0 are also non-allelic.

Key words: rice, blast, resistant donors, inheritance, allelic relationships

Efficacy of Zineb+Hexaconazole on the management of sheath blight, brown spot and grain discoloration in rice

D.Dinakaran*, S.Mathiyazhagan, S.Thiruvudainambi, G.Gajendran and G.Kathiresan
Anbil Dharmalingam Agricultural College and Research Institute, Tamil Nadu Agricultural University, Tiruchirappalli
144-146

ABSTRACT

A field experiment was conducted to study the efficacy of a combination product of Zineb+Hexaconazole (Z+H 72% WP) for the control of sheath blight, Rhizoctonia solani (Kühn); brown spot, Helminthosporium oryzae (Breda de Haan) and grain discoloration diseases of rice during wet and dry seasons of 2006 and 2007. Among the treatments, foliar spray of Z+H (2 g l^{-1}) on 30 and 45 days after transplanting was found to be effective in minimizing the severity of sheath blight (21.1%), brown spot (36.5%) and grain discoloration (31.7%) and maximizing the grain yield (4.49 t ha^{-1}) and cost benefit ratio (1:1.85). The untreated control recorded the highest severity of sheath blight (54.3%), brown spot (54.9%), and grain discoloration (48.5%), coupled with reduced grain yield (3.43 t ha^{-1}) and cost benefit ratio (1:1.49).

Key words: *rice, grain discolouration, sheath blight, brown spot, Zineb+Hexaconazole*

Evaluation of rice cultivars against bacterial blight in the field

K.M. Das*, H.N. Subudhi and R. Swain
Central Rice Research Institute, Cuttack, Odisha, India

147-151

ABSTRACT

One hundred twenty five released rice varieties from different ecosystems of India were evaluated against bacterial blight under natural condition in the varietal garden and in the bacterial blight nursery in the field at Central Rice Research Institute, Cuttack during wet season 2009. The rice varieties Parijat and Pathara of the upland ecosystem, Rajashree, IR 36, IR 64, Indrvati, Kanchan, Manik, Pratikhya, Saket-4, Supriya, Surendra, Improved Pusa Basmati 1, Khitish of the irrigated ecosystem and improved Samba Mahsuri of the lowland ecosystem were found resistant to bacterial blight under both natural and artifitial inoculation conditions.

Key words: *evaluation, bacterial leaf blight, rice varieties, ecosystem*

49(3) 2012

Evaluation of CMS system based rice hybrids for heterosis over locations

P Saidaiah, M S Ramesha, S Sudheer Kumar
Directorate of Rice Research, Rajendranagar, Hyderabad - 500 030, Andhra Pradesh

153-162

ABSTRACT

One hundred and fifteen hybrids developed by crossing five CMS lines and 23 testers in line x tester fashion were evaluated for extent of heterobeltiosis and standard heterosis of ten characters under irrigated conditions over three locations viz., Hyderabad, Warangal and Jagtial representing different agro climatic zones in Andhra Pradesh. The pooled analysis of variance revealed significant differences among locations and genotypes for all the characters studied. The line x tester interactions contributed up to 71.89 per cent for days to 50% flowering followed by productivity day^{-1} (68.54%), grain yield $plant^{-1}$ (67.69%) and spikelet fertility per cent (66.02%). The highest percentage of average heterosis was observed for productive tillers $plant^{-1}$ followed by productivity per day and grain yield $plant^{-1}$, whereas the highest percentage of standard heterosis was observed for filled grains $panicle^{-1}$ and flag leaf width. Pooled standard heterosis for grain yield $plant^{-1}$ was manifested through panicle weight, number of filled grains $panicle^{-1}$ and productivity day^{-1}. Negative standard heterosis was observed for days to 50% flowering due to earliness in six hybrids over standard checks KRH 2 and PA 6201. Five crosses viz., APMS 6A x 1005, APMS 6A x GQ-25, PUSA 5A x IR 43, APMS 6A x SC5 9-3 and PUSA 5A x KMR-3 were identified as potential hybrids with more than 28% standard heterosis for grain yield over better yielding commercial hybrid check KRH2.

Key words: *heterosis, hybrid rice, multilocation testing, yield attributes*

Impact of intermating and linkage relationship among the grain quality traits in early segregating generations of rice

A Mahalingam*, S Robin and R Pushpam
Tamil Nadu Agricultural University, Coimbatore – 641 003

163-170

ABSTRACT

Present investigation was taken up with the objective of studying the impact of biparental mating on linkage relationship among the grain quality parameters of rice. Association analysis revealed that, none of the grain quality parameters had significant positive association with grain yield except hulling parcentage in BIPs. A total of eighteen positive and significant associations in F_2s and 20 positive and significant associations in F_3 progenies were observed. But it was increased to 32 positive significant associations in BIPs. Like wise, negative association was also reduced in biparental progenies and it was only 10 negative associations in BIPs. But 23 negative associations in F_2s and 12 negative associations in F_3 progenies were observed. It indicates that, inter correlations among the grain quality parameters were strengthened in BIPs and several new recombinants were synthesized in BIPs due to intermating in F_2 population. Several such new associations were observed among the grain quality parameters in BIPs than other two segregating generations (F_2 and F_3 generation). It was evident that reshuffling of genes were responsible for correlations among some characters resulting newer recombinations which presumably, were due to changes from a coupling to repulsion phase linkages.

Key words: *rice, biparental progenies, grain quality, correlation*

Combining ability analysis for yield and its components in hybrid rice

SK Sharma, SK Singh, S Singh, V Kumer, A Singh and R Nandan

Institute of Agricultural Sciences, Banaras Hindu University, Varanasi - 221005

171-177

ABSTRACT

Sixteen fertility restorers were selected after screening 60 improved germplasm collections with 3 cytosterile lines. The restorers and their hybrids were evaluated for grain yield and its component traits. The Restorer BPT 5204, Taraori Basmati, Sarju-52, Type-3, and HUBR2-1 were found to be good general combiners for grain yield and other traits. Among CMS lines, IR68897A was found to be good general combiner for days to 50% flowering, days to maturity and number of spikelet panicle^{-1}. Pusa Sugandha-3 and Pusa Sugandha-4 both exhibited better gca for majority of the quality traits. The specific cross combinations characterized with high significant sca effects were Pusa6A Krishna Hansa, Pusa6A Type-3 and IR68897A Type-3 for grain yield plant^{-1}, number of grains panicle^{-1} and number of effective tillers plant^{-1}. BPT 5204 was found to be the best on the basis of per se performance and gca effects for grain yield plant^{-1}, number of spikelets panicle^{-1} and number of grains panicle^{-1}; Narendra-359 and Krishna Hansa for days to 50% flowering, panicle length. Pusa6A Krishna Hansa was found to be the best on the basis of per se performance and sca effects for number of effective tillers plant^{-1}, panicle length and grain yield plant^{-1}. The gca effects of the parents were not reflected in the sca effects of the crosses in all traits studied.

Key words: *rice, combining ability, yield and quality characters*

Bioefficacy and persistence of ethoxysulfuron in rice

Shobha Sondhia and Anil Dixit

Directorate of Weed Science Research, Jabalpur-482004, Madhya Pradesh

178-182

ABSTRACT

Although herbicides provide effective weed control, yet some herbicides pose serious health and environment threats. Ethoxysulfuron [3-(4, 6-dimethoxyoyrimidin-2-yl)-1-(2-ethoxyphenoxysulfonyl) urea] belongs to sulfonylurea group having a toxicity class of III and used as a selective herbicide. It acts by reducing the levels of three branched-chain aliphatic amino acids. Bio-efficacy and persistence of ethoxysulfuron (60 %WG) sprayed at 15, 17.50, 18.75 and 20 g ha-1 doses as post-emergence were evaluated in transplanted rice. Among the herbicides all the herbicidal treatments enhanced the grain yield by 50% over weedy check and were statistically at par with each other. The grain yield of rice crop was the highest under weed free situation followed by almix and ethoxysulfuron application. There were no phytotoxic symptoms of ethoxysulfuron on transplanted rice. Soil and crop samples were analyzed to see persistence of ethoxysulfuron. Residues were found below <0.001 µg g-1 in soil, grains and straw at harvest at 15 to 20 g ha-1 doses, respectively. This showed fast dissipation of ethoxysulfuron in soil and plants and thus do not pose environmental risk at applied rates.

Key words: *ethoxysulfuron, bioefficacy, persistence, soil, grains, straw, residues, bioaccumulation*

Efficacy of azimsulfuron against complex weed flora in transplanted summer rice

Sanjoy Saha* and K S Rao
Central Rice Research Institute, Cuttack - 753 006, Odisha

183-188

ABSTRACT

Efficacy of azimsulfuron was studied for controlling broad spectrum of weeds in transplanted summer rice. All the herbicidal treatments were significantly superior to weedy check. There was more than 48% reduction in the grain yield of rice due to competition with weeds in the weedy plots. Azimsulfuron at 30 g a.i. ha^{-1} was found effective in reducing the population of predominant sedges viz., Cyperus difformis and Fimbristylis miliacea and broad leaf weeds viz. Sphenochlea zeylanica and Marsilea quadrifolia. However, complete suppression of all the major weeds including late emergent grassy weed, Leptochloa chinensis, was recorded at the application rate of 35 g a.i. ha^{-1}. The highest grain yield (6.02 tonnes ha^{-1}) and N-use efficiency (60.0) were obtained in weed free check. Among the tested doses, azimsulfuron at 35 g a.i. ha^{-1} applied 18 days after transplanting was found to be the most effective (weed control efficiency 98.5%) in controlling the complex weed flora and produced comparable grain yield (5.95 tonnes ha^{-1}) with weed-free check, thereby realizing an increase of 91% yield over weedy check. The N-use efficiency (59.5) was also higher in azimsulfuron (at 35 g a.i. ha^{-1}) treated plots.

Key words: *weed flora, efficacy, azimsulfuron, transplanted rice, dry season*

Influence of Biozyme on growth and yield performance of rice in rice-rice cropping sequence

Biplab Mitra* and Bijan K Mandal
Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, West Bengal, Pin : 741252

189-194

ABSTRACT

Field experiments were conducted to study the effect of Biozyme on growth, total chlorophyll content and the grain yield of rice in rice-rice cropping sequence. Experimental results revealed that the different growth attributes and total leaf chlorophyll content of rice increased with the application of biozyme in combination with chemical fertilizers. When ¼ of the recommended dose of chemical fertilizer was substituted by 20 kg Biozyme ha^{-1}, dry matter yield outweighed the treatment of recommended dose of chemical fertilizer alone. The highest grain yield was obtained from the treatment receiving 60 kg ha^{-1} of biozyme in two equal splits at 5-7 days after transplanting and at active tillering stage along with the recommended dose of chemical fertilizer. Sole application of biozyme without chemical fertilizer did not bring about better performance.

Key words: *biozyme, chlorophyll content, growth attributes, rice, yield*

Efficacy of different formulations of penoxsulum on weeds and yield of transplanted rice

Gajendra Singh
N.D. University of Agriculture and Technology, Krishi Vigyan Kendra, Bahraich, U.P. - 271 801

195-199

ABSTRACT

A field experiment was conducted during wet season of 2006 and 2007 at Ghaghraghat, Uttar Pradesh to find out the comparative efficacy of different formulations of penoxsulum on weeds and on yield in transplanted rice in lowlands. The experiment was laid out in randomized block design with 7 treatments replicated 4 times. The major weed flora recorded in the experimental site was Echinochola crus-galli, Echinochola colona, Commelin benghalensis, Caesulia axillaris, Cynotis axillaries, Ammania baccifera, Cyperus spp., Cynodon dactylon. Weedy check till maturity reduced the grain yield of rice to the tune of 43.65%. The lowest density of weeds was recorded with two hand weeding at 20 and 40 days after transplanting, however, application of penoxsulum @22.5 g a.i. ha^{-1} at 8-12 days after transplanting resulted the lowest dry weight of weeds and higher weed control efficiency at 30, 60 and 90 days after transplanting. The grain and straw yield were highest (29.53 tons. ha^{-1} and 36.71 tons. ha^{-1}), respectively with penoxsulum @22.5g

a.i. ha^{-1} 8-10 days after transplanting. This treatment also resulted the lowest weed index (18.88%) followed by penoxulam @25g a.i. ha^{-1} @ 0-5 days after transplanting.

Key words: *penoxsulum, efficacy, transplanted rice, weeds*

Influence of weather factors on the population dynamics of chewing pests of lowland paddy

T Boopathi*, K A Pathak, Y Ramakrishna and Amitosh Kumar Verma
Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu-641 003

200-204

ABSTRACT

Chaetocnema spp. was active from the last week of August to second week of October with a peak level of population during first week of September (8.17). Monolepta signata Oliver was reached peak level of population during third week of September (5.17) followed by first week of September (5.00). The mean population of Chaetocnema spp. and M. signata over the season recorded was 4.53 and 2.88 beetles per 5 plants, respectively. Melanitis leda ismene Cramer was peak level of population during first week of September (3.42). Cnaphalocrocis medinalis Guenee recorded its peak level of population during third week of September (0.33). The mean population of M. leda ismene and C. medinalis over the season recorded was 1.56 and 0.14 larvae per 5 plants. Correlation coefficient between chewing pests and abiotic factors revealed that Chaetocnema spp. had positive significant correlation with maximum relative humidity (r=0.713), while C. medinalis established negative significant correlation with maximum temperature (r=-0.707). M. signata showed positive correlation with all the weather factors, whereas M. leda ismene had positive correlation with minimum temperature (r=0.633) and minimum relative humidity (r=0.114).

Key words: *Chaetocnema spp., Monolepta signata, Melanitis leda ismene, Cnaphalocrocis medinalis, population dynamics, weather factors, rice, chewing, insect, pests*

Plant growth promoting rhizobacteria mediated biological control of *Sclerotium oryzae* (Cattanoe)

H Meronbala Devi, NP Eswara Reddy*, S Thahir Basha, BV Bhaskar Reddy, P Sudhakara Rao
S.V. Agricultural College, ANGR Agricultural University, Tirupati-517502, Andhra Pradesh, India

205-211

ABSTRACT

Twenty bacterial isolates were evaluated for their antagonistic activity against Sclerotium oryzae (Cattanoe). The antagonists were selected based on their ability to inhibit the external growth of S. oryzae from infected rice plants. Three bacterial isolates viz., SRR-1, SRR-3 and SRR-6 were identified as potent antagonists of S. oryyzae by dual culture technique. Both SRR-1 and SRR-3 inhibited the mycelial growth of S. oryzae upto the extent of 88% followed by SRR-6 (86.66%). All the fungicides tested showed 100 per cent inhibition of mycelial growth of the pathogen except validamycin which inhibited only 88.88% when compared to control. The potential bacterial bioagent SRR-1 was found to be most compatible with the systemic fungicide thiophanate methyl (95.70%) and also with insecticide cartap hydrochloride (91.69%). Among the three antagonists, the bioagent SRR-1 produced diffusible volatile metabolites which inhibited the pathogen growth upto 100% under in vitro.

Key words: *rice, Sclerotium oryzae, stem rot, fungicides, antagonists*

Evaluation of fungicides and bio-pesticides against sheath rot of rice

Pramod Kumar, R C Rai and Bimla Rai
Rajendra Agricultural University, Bihar, Pusa - 848 125

212-214

ABSTRACT

Sheath rot of rice incited by Sarocladium oryzae (Sawada) Gama and Hawksworth is one of the important diseases of rice. Out of eight fungicides tested Saaf 75 WP (Carbendazim 12% + Mancozeb 63%) and Antracol 75 WP (Propinels 70 WP) inhibited mycelial growth of the fungus by more than 80 percent at 200 ppm concentration as well

as reduced the disease severity and increased grain yield under field condition. Among the bio-pesticides Achook (Azadirachtin 0.15% WP) and Tricure (Azadirachtin 0.03%) inhibited the mycelial growth up to 49 and 47 percent, respectively at 10% concentration. Spraying of bio-pesticides resulted in 12.9 to 21.4 percent disease control only.

Key word : *rice, sheath rot, fungicides, biopesticides*

SHORT COMMUNICATION

Correlation and path analysis for grain yield and its component traits in rice

Rupika Sharma, Dhirendra Singh*, R P Kaushik and D P Pandey
Rice and Wheat Research Centre (CSK HPKV), Malan-176 047 (HP)

215-218

ABSTRACT

Correlation and path analysis were carried out using forty rice genotypes including three checks for grain yield and its components and analyzed during wet season 2009 to know the association among different traits and causes of association. In general, genotypic correlation was higher in magnitude than the phenotypic correlation coefficient indicating the genetic association among various traits. At phenotypic and genotypic level, grain yield has positive and significant correlation with grains panicle^{-1}, fertility per cent, 1000-grain weight and grain breadth. Improvement in grain yield plant^{-1} can be obtained by improving above characters. Grain yield plant^{-1} was negatively and significantly correlated with panicle length at genotypic level. Path analysis revealed the highest positive direct effect of grains panicle^{-1} followed by tillers plant^{-1}, grain breadth, 1000-grain weight and panicle length on yield plant^{-1} at genotypic level.

Key words: *rice, genotypic correlation, phenotypic correlation, path analysis*

Genetic divergence in traditional rice accessions of Chhattisgarh

Ruth Elizabeth Ekka*, A K Sarawgi and Raja R Kanwar
Indira Gandhi Krishi Vishwavidyalaya, Raipur-492006, Chhatisgarh

219-221

ABSTRACT

Based on D^2 analysis, Ninety six genotyes of rice collected from Bastar region of Chhatisgarh were grouped. The genotypes from cluster IV (ND-8, PSR-11203, PSRSK-11181, PSR-11215, PSRSK-11183) having desired mean value for number of filled grains panicle^{-1} and grain yield plant^{-1}, cluster IX (IR-64, Chandrahasini, Mahamaya, PSRSK-11167) having high value for number of effective tillers plant^{-1}, kernel length and milling percentage; cluster II (PSRSK-11189, PSRSK-11188, PSRSK-11154) having high value for head rice recovery percentage and cluster III (ND-104) having low value for days to 50% flowering.

Key words: *rice germplasm, genetic diversity, variability, Chhatisgarh*

Characterization of farmers' varieties of rice based on morphological, physicochemical properties

Vijayakumar*, S K Chakrabarty, Y Singh, V Vashisht and M Dadlani
Indian Agricultural Research Institute, Pusa, New Delhi 110012

222-226

ABSTRACT

The morphological, physicochemical properties of milled rice were examined in 60 Farmers' varieties which revealed significant difference with respect to grain dimensions, physicochemical and cooking properties. The length and breadth of milled raw rice varied from 3.99 to 7.65 mm and from 1.43 to 3.09 mm, respectively. Based on length to breadth ratio, varieties were grouped into seven classes. Four varieties were recorded as short, slender, 23 as short, bold, four as medium, slender, six as long, slender, 21 as long, bold and one each as Basmati and Extra long, slender. The amylose content ranged from 6.82% in variety Chipdo to 29.69% in variety Sulendas. The gelatinization temperature (GT) was medium to high in 13 varieties and high in 47 varieties.

Key words: *rice, farmers' variety, characterization, morphological, physicochemical, property*

Identification of some useful scented rice mutants for grain yield and quality traits

Swapan K Tripathy, Dibya R Mishra, Rajesh Ranjan, D N Bastia and S R Das
College of Agriculture, OUAT, Bhubaneswar-3
227-230

ABSTRACT

Fifteen advanced generation mutant lines derived from recurrent mutagenesis (EMS, NG and their combinations) of PB 1, Pusa Sugandha 2 and a popular local scented rice variety Ketakijoha were assessed for seed yield and sixteen physical and cooking quality traits. ORM 250-3 and 228-3 had more longer kernel (9.12mm) than even world's largest kernel (9.04mm.)genotype PS-4 (Pusa-1121) and the former was also more slender while, the later was breadth-wise equal to PS 4. Induction of mutation in Ketakijoha led to recovery of a very slender kernel(1.55mm) mutant ORM 242-2 which even excelled in kernel L/B ratio over its grain dimension. ORM 920-3(a PB-1 mutant) and ORM 227-2(a Pusa Sugandha-2 mutant) with high yield potential and quality features serve as valuable genetic materials their use in further basmati rice breeding programme.

Key words: *scented rice mutants, grain yield, physical and cooking quality traits*

Influence of farm yard manure, brown manuring and levels of nitrogen on yield and quality parameters of direct seeded and transplanted rice

B. Kabat
Regional Research and Technology Transfer Sub Station, Motto, Odisha
231-233

ABSTRACT

The influence of farm yard manure (FYM), brown manuring and levels of nitrogen on yield and quality parameters of direct seeded and transplanted rice variety Ranidhan was assessed in a field experiment carried out on a sandy loam soil in Odisha. Field experiment comprised of 20 treatment combinations viz., five main plot treatments (Direct seeded rice with and without FYM, Direct seeded with brown manuring, Transplanted rice with and without FYM) and four nitrogen levels as sub-plot treatments (60, 80,100 and 120 kg N ha^{-1}). Rice growth and yield were statistically similar under direct seeded and transplanted conditions. The direct seeded rice gave yield comparable to that of transplanted rice with added advantage of earlier maturity of the crop by 10 days. Both transplanted and direct seeded rice responded to the application of 80 kg N ha^{-1}.

Key words: *brown manuring, direct seeded rice, FYM, nitrogen*

Resistance of hill rice genotpyes against *Xanthomonas oryzae* pv *oryzae* in mid-hills of Himachal Pradesh

R P Kaushik, S K Rana, Dhirendra Singh and Ashok Kumar
Rice & Wheat Research Centre, CSKHPKV, Malan, Himachal Pradesh 176 047

234-236

ABSTRACT

Study was conducted to identify hill rice genotypes showing resistance to the Rajiana isolate of bacterial blight in the mid-hills of Himachal Pradesh. In addition hill rice varieties and land races were also evaluated for resistance. The results showed that recessive genes xa 5, xa 8 and xa 13 and dominant gene Xa 21 imparted resistance to the prevailing isolate. Among different varieties of rice released in the state, seven viz. Himalaya 2, HPU 741, HPU 2216, HPU 957, HPR 1068, HPR 1156 and RP 2421 were found to be resistant. All the 14 traditional cultivars of HP, six hill rices from J&K and six japonica varieties tested were all found to be susceptible. Four out of 11 hill varieties from Almora viz. VL 25867-2-2, VL 30424, VL 30425 and VL 81 showed resistance to this isolate.

Key words: *rice genotype, bacterial blight, resistance, mid-hills, Himachal Pradesh*

49(4), 2012

Computational approach for the prediction of ERF and DREB proteins in indica rice using support vector machine

N Hemalatha N*, MK Rajesh and NK Narayanan

***Aloysius Institute of Management and Information Technology, St. Aloysius College, Beeri, Mangalore, Karnataka**

[1]Central Plantation Crops Research Institute, Kasaragod 671124, Kerala.

[2]School of Information Science and Technology, Kannur University, Kannur, Kerala

239-245

ABSTRACT

Drought and salt stress are considered to be major impediments in rice production systems. To understand the genetics of tolerance to these abiotic stresses and develop drought/salt tolerant cultivars, genomic regions influencing yield and its response to water deficit have to be identified. A method for predicting two drought tolerant proteins viz. dehydration-responsive element binding proteins (DREB) and ethylene responsive factor (ERF) in the genome of indica rice has been described. The proposed method, ERFDREBSVMPRED, was developed using support vector machine and a prediction accuracy of 89% for DREB and 81% for ERF was achieved. The developed tool could predict DREB protein with 100% specificity at a 71% sensitivity rate and ERF protein with 100% specificity at a 60% sensitivity rate.

Key words: *rice, ERF, DREB, protein, support vector machine*

Diversity in salt tolerant rice genotypes based on multivariate analysis

A Anandan*, R Eswaran, T Sabesan and M Prakash

Faculty of Agriculture, Annamalai University, Chidambaram – 608 002, Tamil Nadu

246-250

ABSTRACT

Forty four salt tolerant genotypes of rice from different geographic regions were used to assess diversity among them by Mahalanobis D^2 and principal component analysis (PCA). D^2 statistics grouped genotypes into 12 distinct clusters and exhibited maximum intercluster distance between cluster IX and X (144.91) followed by clusters II and X (131.87) and clusters VII and X (126.27). PCA revealed axis 1 and 2 accounted for 82.88% and 11.14% of variance, respectively with positive correlation to number of grains panicle^{-1}. Similar to D^2 analysis PCA grouped the genotypes, which have similar phenotypic performance and attain meaningful grouping of genotypes. Both the statistical analysis revealed that genetic diversity was based on pedigree and independent of geographical origin.

Key words: *rice, genetic diversity, salt tolerance, principal component analysis*

Combining ability analysis for yield and quality traits in indigenous aromatic rice

A K Srivastava*, H K Jaiswal and R K Agrawal

Institute of Agricultural Sciences, Banaras Hindu University, Varanasi- 221 005, Uttar Pradesh

251-257

ABSTRACT

Combining ability analysis for ten yield and three grain quality traits was made among 48 crosses generated in a line x tester (L x T) fashion with 12 indigenous aromatic lines and 4 testers. The LxT interaction was significant for all the traits under study. The magnitude of specific combining ability variances was higher than that of general combining ability variance for all the traits under study indicating a major role of non-additive gene effect in controlling these traits. The lines Juhi Bengal 21, Jeera Battis, Kalanamak 6, Kalanamak 11 and Kalanamak 2 were found to be good general combiners for grain yield and related traits. Among best crosses showing high sca for grain yield plant^{-1}, the cross BPT 5204 x Jeera Battis involves parents with good general combining ability for yield. The crosses BPT 5204 x Adamchini and Jaya x Kalanamak 11 involved parents with high x low general combining ability..

Key words: *combining ability, aromatic rice, yield, grain quality*

Estimation of genetic diversity among parents and F3 mapping population developed between a salt tolerant and salt susceptible rice variety

Surya P Tripathi[1,2], Sonali Das[1,2], P Ray Choudhury[2] and Asit B Mandal*[1,2]
[1]Central Agricultural Research Institute, Port Blair 744101
[2] Directorate of Seed Research, Kushmaur, Mau 275 101

258-262

ABSTRACT

Hybridization was made between a high yielding, salt susceptible rice variety IR 28 and a salt tolerant rice cultivar Pokkali to generate a mapping population aiming to tag the salt tolerant gene(s) in rice. Phenotyping of 129 F_3 segregants was done which showed varying degree of tolerance towards excess salt (12 dSm^{-1} NaCl) provided artificially. Phenotyping of the segregants and parents was done based upon tolerance (0-9 scale) towards salt stress. Three groups (highly tolerant, 0-1, moderately tolerant, 2-4 and susceptible 5-9) were formed based upon tolerance norms. Genetic analysis using RAPD grouped the segregants cultivar into two major classes with two sub-classes each. RAPD was found to be potential to tag the gene(s) as indicated by character analysis using UPGMA

Key words: *rice, salt tolerance, hybridization, phenotyping, genotyping*

Genetic variability created through biparental mating in early segregating generation of scented rice

N R Koli , R S Narolia, S S Punia and Chandra Prakash
Agricultural Research Station, Ummedganj, Kota -324001
(Maharana Pratap University of Agriculture and Technology- Udaipur) Rajasthan

263-266

ABSTRACT

Biparental mating was attempted in the F_2 of P-1460 x P-1121 of scented rice (Oryza sativa L.). The biparental population (BIP) had higher mean performance than the F3 self's for all the characters under study. The lower limit of range was, in general smaller for all the characters in the biparental population. The upper limit has also increased in the desired direction for all the characters. Sufficient high genetic variations as maintained in the BIP, for most of the characters. Biparental population also exhibited improved estimates of heritability and genetic advance. The unity of biparental mating in early segregating generation in scented rice is emphasized.

Key words: *biparental mating, scented rice genotype, heritability, genetic advance*

Assessment of critical limit of available boron for rice in old alluvial zone of West Bengal

P Debnath*
College of Horticulture and Forestry, CAU, Pasighat, 791102, Arunachal Pradesh

267-272

ABSTRACT

A pot culture experiment was conducted on rice to study the critical limit of boron in soils of old alluvial zone of West Bengal. The hot water soluble (HWS) boron in these soils was found to be positively and significantly correlated with organic carbon, clay content and per cent dry matter yield of rice, boron concentration in plant tissues and B uptake by shoots. A negative relationship was also observed between WHS boron and silt and sand content. The critical concentration of soil available boron and plant tissues boron was worked out to 0.38 and 15.0 mg kg^{-1}, respectively. Soil containing available B below the critical limit responded appreciably to B fertilization. A negative response to boron application was also observed at its higher level. The average dry matter yield increases with increasing level of boron application up to 1.5 mg kg^{-1}in boron deficient soils. The response to boron application in rice on boron deficient soils was found to be 52.5%.

Key words: *boron, critical limits, old alluvial zone, rice*

Performance of rice and blackgram with different nutrient management practices in rainfed upland

A Mishra, B Behera, AK Pal, SK Mohanty, BS Rath, CR Subudhi, SC Nayak and N Sahoo
All India Coordinated Research Project for Dryland Agriculture, OUAT, Phulbani - 762 001, Odisha

273-279

ABSTRACT

An experiment was conducted at Phulbani, Odisha to examine the performance of three cropping systems (sole rice, sole blackgram and rice + blackgram) with nine different manure and fertilizer treatments under rainfed upland condition. Different nutrient treatments include Control (Farmers' practice- no nutrient); 100% recommended N through inorganic fertilizer; 50% recommended N through inorganic fertilizer; 25kg N through FYM; 15kg N through FYM + 10kg N through inorganic fertilizer; 15kg N through FYM + 20kg N through inorganic fertilizer; 15kg N through green leaf + 10kg N through inorganic fertilizer; 15kg N through green leaf + 10kg N through inorganic fertilizer; and 15kg N through FYM + 10kg N through green leaf. Based on the data on mean rice grain equivalent yield (REY) over 12 years from 1998 to 2009, cultivation of sole blackgram was found to be more remunerative (2.43 t ha^{-1} REY) than sole rice (1.42 t ha^{-1}) or rice + blackgram (5:2) (1.28 t ha^{-1}). Considering the three cropping systems together, application of FYM to supply 15 kg N along with chemical fertilizer (urea) to supply 20 kg nitrogen + 40 kg P_2O_5 +40 kg K_2O was found to be the most effective (2.23 t ha^{-1} REY) followed by the same dose of FYM with 10 kg N through fertilizer + 40 kg P_2O_5 +40 kg K_2O (2.19 t ha^{-1}REY). The best treatment registered 37% higher REY over the recommended fertilizer dose.

Key words: *upland rainfed rice, black gram, sole crop, intercrop, nutrient treatments*

Improving productivity and profitability of rice-wheat cropping system through different methods of crop establishment

SK Singh*

ICAR, Research Complex for Eastern Region, Patna, PO- Bihar Veterinary College, Patna-800014 (Bihar)

280-283

ABSTRACT

Five rice establishment methods viz., line transplanting, random transplanting, throwing of seedlings, drum seeding under puddled field, direct dry manual line sowing; 3 methods of wheat establishment viz., manual line sowing, sowing with zero-till drill and conventional sowing were evaluated to assess the productivity and profitability of rice-wheat system to find out the suitable alternative to the random transplanting method commonly being followed by the farmers. Line transplanting of rice resulted in significantly higher grain yield (5.59 t ha^{-1}) followed by drum seeding under puddled field (5.32 t ha^{-1}). Manual line sown wheat produced 7 and 11 per cent more grain yield as compared to conventional sowing and sowing with zero-till drilled wheat, respectively. Considering the rice-wheat system as whole, line transplanted rice followed by manual line sowing of wheat resulted in highest net returns (`30,577 $ha^{-1}$) and benefit: cost ratio (1.75). Line transplanted rice followed by wheat sown with zero-till drill accrued almost similar net returns (` 29,800) and second highest benefit: cost ratio (1.68). Random transplanting followed by conventionally sown wheat can be profitably replaced with line transplanted rice with subsequent wheat established either by manual line sowing or sowing with zero-till drill.

Key words: *rice, wheat, cropping system, crop establishment methods*

Bioefficacy of Fenpropathrin 30% EC for the control of the rice leaf folder, *Cnaphalocrocis medinalis* (Guen.)

H P Misra

College of Agriculture, OUAT, Bhubaneswar - 751 003, Odisha

284-287

ABSTRACT

A field experiment was conducted at OdishaUniversity of Agriculture and Technology, Bhubaneswar with seven treatments during wet and dry season 2008-2009 to evaluate the bio-efficacy of fenpropathrin 30% EC against the rice leaf folder, Cnaphalocrocis medinalis (Guen.) and its safety to natural enemies The results revealed that the per cent leaf damaged was the lowest (1.29-1.81) at 15 days after spraying (DAS) in the treatments fenpropathrin 30%EC @ 75,100 and 125g a.i.ha^{-1} registering 84.65-89.06 per cent decrease in leaf damage over control (11.79 % leaf damage) compared to the standard check insecticides evaluated. The rice grain yield recorded significantly highest (3.94-3.98 t ha^{-1}) in the treatments fenpropathrin 30%EC @ 100 and 125g a.i. ha^{-1} with 28.43-29.14 per cent increase over control. All the insecticides evaluated proved toxic to the natural enemies, however, at 10 DAS, their population built up in all the doses of fenpropathrin was at par with control while lambda-cyhalothrin and triazophos still proved toxic.

Key words: *rice leaf folder, Cnaphalocrocis medinalis, chemical control, fenpropathrin*

Effect of high temperature on the multiplication of brown planthopper *Nilaparvata lugens* (Stal.)

Sucheta Rout and Mayabini Jena*
Central Rice Research Institute, Cuttack - 753006, Odisha

288-291

ABSTRACT

Brown planthopper, Nilaparvata lugens (Stal.) is a major pest of rice during both dry and wet season. Such occurrence made it necessary to know its chances of survival and multiplication ability during the intermediate summer period so that the possible incidence at later stage of crop period can be predicted. It was found that the insect thrived and multiplied well at a temperature of 30 ± 3ºC. Eggs hatched after 7 days of egg laying. The freshly emerged nymphs could complete their instar development within 11-14 days to become adults and 52.7% winged forms developed. With the rise in temperature, there was a gradual decrease in the number of eggs laid, the percentage of egg hatching decreased and the incubation period increased. At a temperature regime of 40-42ºC, there was no egg laying.

Key words: *rice, BPH, high temperature, ovipositionrate, egg hatching, instar duration*

Zinc utilization efficiency in different genotypes of rice

T K Nagarathna, A G Shankar, V R Ramakrishna Parama, M T Sanjay and M Udayakumar
University of Agricultural Sciences, GKVK, Bangalore 560 065

292-295

ABSTRACT

Zinc utilization efficiency (ZUE) and effect of total leaf zinc (Zn) on productivity were examined in 22 genotypes of rice. The results revealed that there was a significant genetic variability within high and low leaf Zn types with regards to ZUE. The genotypes with low leaf Zn showed relatively high ZUE. A positive significant relationship was seen between total leaf Zn and grain yield, and also with total dry matter. Increasing Zn acquisition may have a positive effect on growth, development and productivity in rice genotypes.

Key words: *rice, genotypes, zinc utilization efficiency, zinc acquisition*

SHORT COMMUNICATION

Comparative assessment of somatic embryogenesis and plant regeneration in dormant and non-dormant indica rice varieties

A K Pathak, J Ghosh[1], P Ray Choudhury[1] and Asit B Mandal*[1]
Rajiv Gandhi College, Satna(Affilated to A.P.S University), Rewa (M.P.)
[1]Directorate of Seed Research, Kushmaur, Mau 275 101, U.P.

296-298

ABSTRACT

Somatic embryogenesis (SE) and plantlet regeneration were compared in a dormant and non-dormant indica rice variety. MS and N6 media were used both for callus induction and plantlet regeneration. Both MS and N6 media emerged appropriate in facilitating increased somatic embryogenesis (%) but MS found to be better for plantlet regeneration (%). In MS, calli from individual seeds in IR64 and Swarna produced 4-9 plantlets and 2-5 plantlets, respectively, whereas, in N6 more calli appeared with no plantlet regeneration. Generation of somatic embryos from embryogenic calli is an important event since it is one of the best target tissue for undertaking rice transformation to integrate alien gene/s in rice plants.

Key words: *indica rice, in vitro culture, somatic embryogenesis, plantlet regeneration*

Evaluation for stable performance of cytoplasmic male sterile lines in rice

S S Pardhe, V V Dalvi*, B L Thaware and V G More
College of Agriculture, Dapoli-415 712, Maharashtra

299-301

ABSTRACT

An experiment was conducted to evaluate the stability of cytoplasmic genic male sterility of different male sterile lines for floral traits and yield contributing characters. The CMS lines showed 100 per cent pollen sterility. The highest angle of floret opening was recorded by KJT 2A. The maximum sigma exsertion was observed the CMS line KJT 4 A while KJT 1 A, KJT 6A and KJT 7 A had predictability to performed in favorable environment. KJT 5 A had highest panicle exsertion. It was observed that KJT 4 A CMS line performed better for most of the desirable characters.

Key words: *rice, CMS lines, pollen sterility, stigma exsertion*

Characterization of rice hybrids and their parental lines based on morphological traits

M R Chetan Kumar, P J Devaraju* and S Rajendra Prasad[1]

National seed project (NSP), University of Agricultural Sciences, Bangalore

[1]National Seed Research Centre, Mau, Uttarakhand

302-304

ABSTRACT

The genuineness of variety is one of the most important characteristics of quality seed. In addition, seed certification, which forms a link between variety registration and seed production, involves an assessment of both varietal identity and purity to assure the quality of seed for the farmer. Hence characterization of two hybrids such as KRH-2 and DRRH-2 including their parental lines viz., IR-58025A, IR-58025B, KMR-3R, IR-68897A, IR-68897B, and DR-714-1-2R based on the seed, seedling was taken up and distinguishing characters were described.

Key words: *hybrid rice, characterization, parental lines, quality seed*

Exploration, collection, conservation and characterisation of medicinal rice germplasm

BC Patra* and BC Marndi

Central Rice Research Institute, Cuttack-753006, Odisha

305-306

ABSTRACT

An exploration and collection of rice germplasm was conducted in Bastar district of Chhattisgarh state and 71 accessions were collected, of which several primitive cultivars are reported to have possessed medicinal value. The germplasm accessions were characterized and conserved ex situ both in base collection as well as in National Active Germplasm Site.

Key words: *medicinal rice, germplasm, exploration and collection, Bastar*

Integrated nutrient management in hybrid rice under terai zone of West Bengal

Biplab Mitra*

Cooch Behar Krishi Vigyan Kendra, Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar, West Bengal- 736165

307-309

ABSTRACT

A field experiment was conducted during the dry seasons of 2010 and 2011 to study the response of hybrid rice to graded levels of NPK supplied through integrated nutrient management. Experimental results revealed that application of FYM (10 t ha^{-1}) in combination with $N_{100}P_{22}K_{41.6}$ or $N_{140}P_{31}K_{58}$ produced significantly higher number of matured panicles and resulting in higher yield. Application of inorganic fertilizer level of $N_{100}P_{22}K_{41.6}$+ FYM+ Zn produced the highest grain yield (9.13 t ha^{-1}) which was at par with $N_{100}P_{22}K_{41.6}$+ FYM at 10 t ha^{-1} and $N_{140}P_{31}K_{58}$. The split application of potassium resulted in higher yield than its application only once. The higher net return (`55226.00 ha^{-1}) was recorded with application of $N_{100}P_{22}K_{41.6}$+FYM (10t ha^{-1})+$ZnSO_4$ at 25 kg ha^{-1}. The application of NPK in higher level with FYM gave the highest nutritional uptake.

Key words: *hybrid rice, grain yield, nutrient management, economics*

Multiple linear regression models for prediction of rice production and productivity based on rainfall

A S Rama Prasad*, P Krishnamurthy, R Mahender Kumar and B C Viraktamath
Directorate of Rice Research, Rajendranagar, Hyderabad 500 030

310-312

ABSTRACT

A study on the influence of monthly total rainfall on rice production and productivity was carried out taking data for five decades from 1950 to 2003. Multiple linear regression technique was used to bring out a statistical model. The correlation studies revealed that there were no interrelationship between monthly rainfall and rice production parameters. In the absence of correlations, year variable was added in the study along with the monthly rainfall to take care of trend effects in rice production parameters. Step wise backward regression brought out that only year and July rainfall were contributing to rice productivity and production. The total rainfall of July for the years 2004 to 2007 were used to validate the models and proved for their accuracy.

Key words: *prediction model, monthly rainfall, rice production and productivity*

Quantification of yield loss caused by red stripe disease in rice

S Krishnam Raju*, V Bhuvaneswari and P Madhusudhan
Andhra Pradesh Rice Research Institute & Regional Agricultural Research Station, Maruteru - 534 122, Andhra Pradesh

313-315

ABSTRACT

Field studies on effect of red stripe disease severity on yield components of rice under natural incidence levels indicated there was an increase in the per cent chaffy grains and discoloured grains based on the mean of four rice varieties viz. MTU-2077 (Krishnaveni), MTU-1001 (Vijetha), MTU-1010 (Cottondora sannalu) and MTU- 3626 (Prabhath). Number of grains panicle^{-1} decreased from 159.69 to 153.99, grain weight 30 panicles^{-1} from 109.27 to 101.88 g and healthy grains from 67.5 to 61.41 per cent. Chaffy grains increased from 28.91 to 33.48 per cent and discoloured grains from 3.59 to 5.12 per cent. Roving survey conducted during wet season 2008 and 2009 in East and West Godavari districts of Andhra Pradesh revealed very low incidence of red stripe on all the varieties grown. Similarly moderate to severe incidence of red stripe was observed in both the districts during dry season 2008 and 2009

Key words: *red stripe, rice, yield components*

Evaluation of selected plant extracts as antifungal agents against *Fusarium moniliforme* Sheldon

Surender Kumar Bhardwaj
Botanical Garden/Herbal Garden, M. D. University, Rohtak-124 001 (Haryana)

316-317

ABSTRACT

The experiments were carried out to test the aqueous extracts of twenty plants for their antifungal activity against Fusarium moniliforme caused rice foot rot. Results showed a differential activity of the plant extracts against the mycelium growth. The combined leaf extracts of Lawsonia alba (L.) and Acacia arabicae (Willd.) in general showed a strong enhancement in activities over the individual leaf extracts of Lawsonia alba and Acacia arabicae against the mycelium growth. The seed extracts of Dedonia viscosa (L.) also showed strong inhibitory effect against the tested fungi. The leaf extracts of Ocimum sanctum, Lantana macrophylae, Ocimum basilicum and Jacranda mimosaefolia (D. Don) petal extracts of Mimosa hamata (Willd) showed appreciable good inhibitory effect against the tested fungi.

Key words: *Fusarium moniliforme, antifungal, plant-extracts, phytochemicals.*

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Recent trends in utilization of rice and value addition to its byproducts

Vasudeva Singh
CSIR - Central Food Technological Research Institute, Mysore, Karnataka, India
Email : *singhva2003@yahoo.co.in*

Page - **1-17**

ABSTRACT
Rice is the staple food grain for majority of population in the world. In India, rice is being used in raw as well as parboiled form. In southern states of India, rice is also used in the form of "cured rice". From harvesting to drying, shelling and milling in raw, and parboiled form is practiced. CSIR-CFTRI has intervened in converting paddy to rice and then products. Paddy is parboiled by wet heat as well as dry heat treatments. Several properties of both rice are similar, however, some are different. Rice is also converted into different products by using parboiled rice. It is converted into expanded and popped rice. Among the latest products- noodles, diabetic rice as well as diabetic rice noodles are developed. Structure of amylopectin of rice starch is studied with gel permeation chromatography and related to behavior of cooking of rice. Energy consumption during cooking of rice by different methods have been reported. Rice is also converted into starch after removing fiber and protein, and then converted into low degree substituted acetylated starch for food applications and high degree substituted acetylated starch for the preparation of biodegradable plastics. Rice bran, an important byproduct of rice milling industry is along with husk and broken. After defatting the bran, protein is extracted and its properties have been studied. Rice is also extruded and properties of extruded products have been studied. Medicinal rice and their properties have been reported, and its different nature compared to normal rice is also discussed.

Key words: *rice, raw, parboiled, extruded, noodles, bran, pigmented, byproduct, value addition*

Phenotypic characterization and genetic analysis of dwarf and early flowering mutants of rice variety Nagina22

KP Kulkarni[1,2], C Vishwakarma[1], SP Sahoo[1], JM Lima[1], M Nath[1], P Dokku[1], RN Gacche[2], T Mohapatra[1,3], S Robin[4], N Sarla[5], M Seshashayee[6], AK Singh[7], K Singh[8], NK Singh[1] and RP Sharma[1]*
[1]National Research Centre on Plant Biotechnology, LBS Building, Pusa Campus, New Delhi
[2]School of Life Sciences, S. R. T. M. University, Nanded, Maharashtra
[3]Central Rice Research Institute, Cuttack, Odisha
[4]Tamilnadu Agricultural University, Coimbatore
[5]Directorate of Rice Research, Hyderabad
[6]University Agricultural Sciences, Bangalore
[7]Indian Agricultural Research Institute, New Delhi
[8]Punjab Agricultural University, Ludhiana, India
Email : *kulkarnikp@gmail.com*

Page - **18-25**

ABSTRACT
Plant height and flowering time are two of the important traits that affect plant architecture. Efforts were made in this study to characterize morphologically the-EMS-induced dwarf and early flowering mutants of rice variety Nagina22 and to study their mode of inheritance. Nine true breeding mutants generated earlier by EMS treatment were analysed for differences in their phenotypic characteristics recorded according to the national guidelines for Distinctness, Uniformity and Stability (DUS). The mutants exhibited variation from Nagina22 for maximum of 11 DUS characteristics to a minimum of 4 DUS descriptors, while retaining majority of the wild type features. Plant height of the dwarf mutants ranged from 69 to 101cm, while tiller number was in the range of 9 to 60. The early flowering mutants were weak in their plant stature, but flowered approximately 20-25 days earlier than Nagina22. Significant correlation among various traits of the selected mutants was observed. The mutant traits exhibited monogenic inheritance giving 3:1 phenotypic segregation ratio in F2 generation. These mutants have potential usage in functional analysis of the traits and in rice improvement programs.

Key words: *rice variety Nagina22, DUS, dwarf mutant, early flowering, inheritance*

Agro-morphological characterization and molecular diversity analysis of aromatic rice germplasm using RAPD markers

Yogendra Singh[1*], DR Pani[2], Dharmendra Khokhar[3] and US Singh[4]

G.B Pant University of Agriculture & Technology, Pantnagar, Uttaranchal
[1] College of Agriculture (JNKVV), Ganj Basoda, Vidisha, Madhya Pradesh
[2] National Bureau of Plant Genetic Resources, Base Centre, Cuttack, Odisha
[4] South Asia Regional Project Coordinator, Bill & Melinda Gates Foundation, NASC, Pusa, New Delhi
Email : yogendrasinghbt@gmail.com

Page - 26-34

ABSTRACT
Aromatic rice has special significance because of its special flavour and economic value. The present investigation was undertaken to analyze the relatedness and distances among forty five aromatic rice genotypes using twenty agro-morphological characters and forty five randomly amplified polymorphic DNA (RAPD) markers. The DNA amplification pattern revealed that out of 45 primers, 18 primers showed 100 % polymorphism and a total of 374 RAPD loci were amplified with an average of 8.31 loci per primer comprising 343 polymorphic loci (92 %) and 31 monomorphic loci (8.0 %). In the clustering pattern using RAPD primers all genotypes were grouped into two groups having forty three and two genotypes, respectively. The major cluster was further sub grouped into five small groups having three, seven, six, twelve and fifteen genotypes, respectively. Wide divergence was detected among all genotypes for twenty agro-morphological characters.

Key words: *aromatic rice, RAPD, morphological markers, genetic diversity*

Molecular characterization of rice genotypes using microsatellite markers

Biswarup Mukherjee, Pritam Das, Qadir Alam, Disharee Nath and Tapash Dasgupta*
Institute of Agricultural Science, University of Calcutta, 51/2 Hazra Road, Kolkata
Email : tapashdg@rediffmail.com

Page - 35-40

ABSTRACT
Characterization of twenty rice genotypes using 20 SSR markers exhibited high polymorphism.The markers were distributed among 10 chromosomes of rice. A total of 101 alleles were amplified by twenty markers. An average of 5.05 alleles was produced. Average effective number of alleles was 3.77. Genetic diversity per locus for most of the selected markers was high. The primers RM12921, RM18384, RM23877, RM23744 RM257, RM25181, RM25735 and RM5479 were highly polymorphic. These microsatellites are useful in assessing the genetic diversity of rice. Cluster analysis performed by DARwin V. 5.1.153 using unweighted neighbor joining method clearly separated the genotypes into 3 main clusters with different sub-clusters within a cluster. Promising selections of parents for future hybridization program to generate desirable segregates has been suggested.

Key words: *rice, DNA extraction, primers, PCR amplification*

Association of grain iron and zinc content with yield in high yielding rice cultivars

Nagesh[1], Ravindra Babu V*[2], Usha Rani G[1], Dayakar Reddy T[1], Surekha K[2] and Vishnu Vardhan Reddy D[3]
[1]Acharya N.G. Ranga Agricultural University, Hyderabad
[2]*Directorate of Rice Research, Hyderabad
[3]ADR, Warangal, Andhra Pradesh
Email : vrbabu@drricar.org

***Page -* 41-44**

ABSTRACT
Iron and zinc deficiencies have been reported to be a food-related primary health problem affecting nearly two billion people worldwide. The brown and red rice genotypes have high grain iron and zinc content and an attempt was made to study the association between these mineral content with grain yield. A field experiment was conducted during wet season 2010 involving fourteen genotypes with different viz., brown rice, red rice and basmati types. These genotypes were tested to estimate phenotypic and genotypic association among grain iron, zinc, yield attributes and grain yield. It was observed that grain yield was positively correlated with number of productive tiller plant^{-1} and number of grains panicle^{-1}. A positive correlation between iron and zinc content was observed while a negative correlation between grain iron content and grain yield was recorded. Grain iron content inversely related with grain yield plant^{-1}. Path analysis revealed the highest direct effect of test weight on grain yield followed by number of productive tillers plant^{-1} and iron content.

Key words: *rice, grain iron, zinc, correlation, path analysis*

Character association and parent progeny regression studies for yield in the segregating generations of TGMS rice lines

D Kavithamani*, S Robin, S Manonmani and K Mohanasundaram
Tamil Nadu Agricultural University, Coimbatore
E-mail: kavitharice@yahoo.co.in

***Page* - 45-51**

ABSTRACT
A study was undertaken to determine the response to selection for high grain yield and yield related components, to estimate the heritability of these traits, to compute the correlations of grain yield with yield components and to estimate the genetic potential transferred from one generation to other by using different segregating generations of rice. In the present study various segregating populations (F_2, F_3 and F_4) of TS 29 / CO(R) 49 were evaluated for yield and its related traits. The results indicated that correlation studies in F_3 generation had the positive association of single plant yield with fertility percentage, number of productive tillers plant^{-1}, panicle length, panicle exsertion percentage, stigma exsertion percentage and spikelet fertility percentage. Study on parent-progeny regression revealed positive significant regression and correlation coefficient estimates observed in F_3-F_4 generation for days to 50% flowering, number of productive tillers per plant, panicle length, panicle exsertion percentage and stigma exsertion percentage which indicated that F_3 are good indicators of F_4 performance for all these traits. Narrow sense heritability increased with advancement of generation from F_2 to F_4 indicating the additivity of gene effects for number of productive tillers per plant, panicle length and panicle exsertion percentage. It indicates the chances of selecting high yielding genotypes at early generations based on these characters are valuable.

Key words: *TGMS rice, correlation, parent-progeny regression analysis, heritability, selection*

Combining ability analysis using CMS breeding system in rice

Shyam Chandra Ghosh, PK Chandrakar*, NK Rastogi, D Sharma and AK Sarawgi
Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh
Email : chandrakarpk@yahoo.co.in

***Page* - 52-57**

ABSTRACT
Using L x T mating design with three CMS lines and seven elite testers the general combining ability (GCA) of parents and specific combining ability (SCA) of crosses were carried out for grain yield and its attributes. The SCA variance recorded greater than the GCA variance for grain yield and yield components, suggesting the preponderance of dominance and epistatic gene action in expression of these traits. The line CRMS 31 A and IR 79156 A were recorded as good combiners for head rice recovery per cent. The tester NPT 80-1 was good general combiner for grain yield per plant and TOX 981-11-2-3 for both grain yield per plant and head rice recovery per cent. Whereas, the tester R 1244-1246-1-605-1 was recorded as best general combiner for head rice recovery per cent. The cross combinations APMS 6 A/ET 1-13, CRMS 31 A/ET 1-12 and IR 79156 A/ NPT 80- 1 were found to be outstanding with respect to grain yield per plant, head rice recovery per cent and spikelets per panicle whereas, APMS 6 A/NPT 2-2-694-1 was good combiner for head rice recovery per cent. Considering the pollen fertility and spikelets fertility per cent of prime importance for development of maintainer lines, crosses APMS 6 A/ NPT 2-2-694-1 and APMS 6 A/ ET 1-13 might be utilized in three line breeding system.

Key words: *rice, CMS line, general combining ability, specific combining ability, line x tester, grain yield*

Effect of various rice-based cropping systems on system productivity, uptake, utilization and use efficiency of N, P and K

MA Alim, SS Nanda*, HK Patro and AK Barik
Orissa University of Agriculture and Technology, Bhubaneswar, Odisha

Page - 58-64

ABSTRACT

A field experiment was conducted in Central Research Station of Orissa University of Agriculture and Technology, Bhubaneswar during wet, dry and summer seasons of 2006-07 and 2007-08 with an objective to study the effect of various rice-based cropping systems on system productivity, uptake, utilization and use efficiency of N, P and K. Rice-maize-okra system showed the highest system productivity of 25.91 t ha^{-1} yr. The lowest system productivity (12.12 t ha^{-1} yr^{-1}) was with rice-groundnut-fallow system. Rice-maize-okra system removed the highest amount of N (293.5 kg ha^{-1}), P (62.1 kg ha^{-1}) and K (287.0 kg ha^{-1}) where as the lowest N, P and K uptake of 177.1, 41.0 and 201.3 kg ha^{-1} was in rice-radish-sesame, rice-groundnut-cucumber and rice-groundnut-fallow systems, respectively. The highest N harvest index was obtained in rice-french bean-sesame system (90.17 %) where as rice-french bean-bitter gourd system had the highest P and K harvest index of 95.45 and 92.52 per cent, respectively. The highest P uptake efficiency (1.49 kg uptake kg^{-1} added) was observed in rice-french beansesame system. Rice-tomato-cowpea had the highest N, P and K utilization efficiency with corresponding values of 105.64, 485.73 and 83.25 kg REY kg^{-1} uptake. This system was also best in respect of P and K use efficiency with 414.96 and 217.45 kg REY kg^{-1} added, respectively.

Key words: *system productivity, rice equivalent yield, uptake, utilization and use efficiency*

Field evaluation of native *Azotobacter* and *Azospirillum* spp. formulations for rice productivity in laterite soil

R Sahoo[1], S Mohanty[1] and TK Dangar[2*]
[1]Orissa University of Agriculture and Technology, Bhubaneswar, Odisha
[2*]Central Rice Research Institute, Cuttack, Odisha
Email : *dangartk@gmail.com*

Page- **65-69**

ABSTRACT
Effects of indigenous biofertilizer formulations of six native isolates each of Azotobacter (Az.) and Azospirillum (As.) spp. of rice (var. Khandagiri and Pooja) rhizosphere, commercial formulations one each of Azotobacter and Azospirillum spp. in combination with N0 (without N), N30 (30 kg ha^{-1}) i.e. half (N/2) of recommended N and N60 (60 kg ha^{-1}) i.e. recommended N dose, and vermicompost (5 t ha^{-1}) were assessed on productivity of the drought tolerant rice var. Khandagiri in laterite soil fields of OUAT, Odisha. Compared to untreated control, rice production was increased by about 45% for N60 and 29% for N30; 52-120% and 43-109% for N60 and N30 with experimental biofertilizers combinations, respectively, whereas, 43-75% and 49-84% for commercial formulations with N30 and N60 combinations, respectively. Productivity for combined biofertilizers with N30 or N60 did not differ significantly. The experimental formulations performed better than the commercial formulations. Productivity was enhanced by about 23-92%, 21-65% and 27% by individual experimental and commercial formulations, and vermicompost, respectively. Combination of N/2 dose with the biofertilizers could reduce about half N requirement. Among different biofertilizers, the Az. vinelandii SRIAz3 and As. Lipoferum CRRI1As6 formulations were most effective. Combination of these two organisms resulted in about 109% but with N/2 dose effected optimum (139-177%) rice production.

Key words: *azospirillum, azotobacter, BNF, formulation, rice, vermicompost*

Determination of water use efficiency of direct seeded upland rice through gravimetric method and associated physiological parameters

PC Dey, KK Sharma[1], T Ahmed, B Haloi[2] and SK Chetia
Regional Agricultural Research Station, Titabar, Assam
[1] Regional Agril. Research Station, North lakhimpur, Assam
[2] Assam Agricultural University, Jorhat, Assam
Email : *pcdey2004@yahoo.com*

Page- **70-75**

ABSTRACT
Water use efficiency (WUE) and associated physiological parameters were measured in thirty upland advanced breeding lines of rice. WUE showed an inverse trend with mean transpiration rate (r=-0.053) suggesting that stomatal control of WUE among the cultures. However net assimilation rate showed a positive relationship (r=0.79) with WUE indicating possibilities of selecting capacity type cultivars, where mesophyll efficiency would regulate WUE. WUE values of the pot experiment correlated well with those estimated in the field experiment with the same cultures utilizing specific leaf area values at 60 days after sowing. Accordingly the entries B5, B3, B11, B36, B27, B47 and the check Vandana were identified as capacity type cultivars for mining water in order to utilize it efficiently for carbon fixation.

Key words: *water use efficiency, capacity type, mesophyll efficiency, associated physiological parameters*

Screening physiology of rice drought stress protein

R Shukla[1], Aparna Dube[2] and DK Dwivedi[2]
[1] Sam Higginbottom Institute of Agriculture, Technology and Sciences, Allahabad, Uttar Pradesh
[2] College of Agriculture, N.D. University of Agriculture and Technology, Kumarganj, Faizabad
Email : rahulbio07@hotmail.com

***Page* - 76-80**

ABSTRACT
Achieving drought tolerance in rice requires a deeper understanding of the relationship between possible physiological mechanisms available for water stress tolerance and the identification of expressed proteins under adverse conditions. An investigation was carried out at N.D.U.A.T., Kumarganj, Faizabad. The introgression lines and checks were sown under drought stress and control (irrigated) condition. Drought stress situation was applied 60 days after sowing, while in case of control condition optimum moisture was maintained by frequent irrigations. The rice leaves were selected from drought and control conditions, four introgression lines were selected for 12% acryl amide gel electrophoresis, along with two checks IR 64 and NDR 97. Out of four introgression lines two lines IR 82870-26 and IR 82870-29 were susceptible and other two lines IR 82870-2 and IR 82870-11 were drought tolerant. The leaf protein produced novel bandings patterns in two lines IR 82870-2 and IR 82870-11 rice genotypes which also exhibited good response under drought environment.

Key words: *drought protein, rice leaf protein, SDS PAGE, leaf rolling scale*

SHORT COMMUNICATIONS

Variability, heritability and genetic divergence in lowland rice genotypes under the mid-hills of Sikkim

R Karuppaiyan[1], *Chandan Kapoor[2] and R Gopi[2]
ICAR Research Complex for NEH Region, Sikkim Centre, Gangtok, Sikkim
[1]Sugarcane Breeding Institute, Regional Centre, Karnal
[2]*ICAR Research Complex for NEH Region, Sikkim Centre, Tadong, Gangtok
Email: chandannaarm@gmail.com

Page - 81-84

ABSTRACT
Twenty seven genotypes of lowland rice were evaluated under organic conditions in the mid-hills of Sikkim in during the wet season of 2007-08 for 11 quantitative traits namely days to 50% flowering, days to maturity, plant height, tiller number, productive tillers, panicle length, number of grains panicle^{-1}, grain length, grain breadth, length breadth ratio and yield hectare^{-1}. Analysis of variance revealed significant differences among the genotypes for all the traits studied. Heritability in broad sense was high for all the traits, highest being recorded for plant height, grain breadth and length breadth ratio. Number of tillers, grain yield ha^{-1} and length breadth ratio were having high genetic advance coupled with high heritability. The genetic divergence among the genotypes was estimated through Mahalanobis D_2 statistics. The 27 genotypes were grouped into 4 clusters. Yield ha^{-1} (20.80 %) contributed maximum towards divergence followed by plant height (16.81 %), grain breadth (16.52 %) and grain length (15.10%).

Key words: *lowland rice, genetic divergence, mid-hill, Sikkim*

Evaluation of promising cytoplasmic male-sterile line of rice for agronomical and floral traits

Umakant Verma*, V Shrinivas Rao, GV Choudary, T Kaul, Nikhl Ch Sarkar and Prabhaker Kharade
Hi-gene Seeds (India) Pvt. Ltd, Hyderabad, Andhra Pradesh
Email : uk.verma08@gmail.com

85-87

ABSTRACT
Nine CMS lines of rice were evaluated for their morphological and floral traits. six agronomical traits with standard check CMS line IR-58025A. Five CMS lines viz., IR-6888A, HPMS-10A, HPMS-11A, HP-5001A and HP-5004A were of early in duration (75 to 89 days to 50% flowering) and other three lines were of medium duration (90-100 days). HP-5001A was the earliest in days to 50% flowering (75days); while IR-70362A was late (101 days). The lines viz.,IR-70362, IR-70372, HPMS-5A and HPMS-92 recorded, significantly more days to 50% flowering over IR-58025A (check). The maximum plant height was observed in HPMS-9A (105.0 cm) followed by HP-5001A (91.0 cm) and HP-5004A (88.00 cm). The shortest plant height was observed in IR- 70362 (65.7 cm). The maximum productive tillers plant^{-1}, observed in HP-5004 (12.0), was significantly superior to the check. The panicle length ranged from 20.0 (HPMS-5A) to 30.0 (HP-5001A) cm. Panicle exertion is an important feature in CMS lines for getting proper seed production. The panicle exertion ranged from 74.60 (IR- 70362A) to 90.00 (HP-5001A) percent. The spikelets per panicle were highest in HP-5001A (192.0). The floral characteristics, like stigma exertion was maximum in CMS line IR-6888A (61 %) followed by HP-5004A (58.85 %) and HP-5001A (51.8 %) which were significantly superior to check. Pollen sterility was cent per cent in the line HP-5001A, HP-5004A and IR-58025A. Three CMS lines viz., IR-6888A, IR-70372 and HPMS-5A showed more than 95% pollen sterility and these were categorized under highly sterile CMS lines.

Key words: *rice, cytoplasm male sterile line, agronomical, floral trait*

Response of rice-rice cropping system to different agronomic management practices

P Sujathamma, Sheik Mohammad and V Bhanumurthi
Agricultural Research Station, Nellore, Andhra Pradesh
Email : ***psujathamma@yahoo.com***

88-89

ABSTRACT
Experiments were conducted during dry and early wet seasons of 2007-08 and 2008-09 in farmers fields to study the effect of different agronomic management practices on yield and net returns of rice-rice cropping system in 12 different mandals of Nellore district of Andhra Pradesh. The results revealed that yields of rice-rice cropping system were significantly higher over farmers' practices, by adoption of all the recommended package of practices which includes maintenance of optimum plant population and application of recommended dose of NPK and zinc fertilizers at right stages of the crop growth to both the crops in the cropping system.

Key words: *nutrient management, rice-rice cropping system, optimum plant population*