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Genetic Variability, Heritability and Genetic Advance for yield and its contributing characters in Rice (*Oryza sativa* L.)

Key words : Gentic Advance, Heritability and Variability

Rice is the most important staple food crop providing 43% of calorie requirement for more than 70% of Indian population. For the formulation of successful breeding programme, knowledge of the nature and magnitude of the genotypic and phenotypic variability present in any crop species plays a vital role. Therefore, present study was undertaken to find the genetic variability, heritability and genetic advance of yield and yield component traits in rice.

In the present investigation four wild abortive source CMS lines and thirteen elite *indica/ indica* derivates were crossed in line x tester design at Andhra Pradesh Rice Research Institute and Regional Agricultural Research Station, Maruteru during *kharif,* 2010. The crosses along with their parents and three checks (*viz*., MTUHR 2089-hybrid check, MTU 1075 and MTU 1010-varietal checks) were evaluated in a randomized block design with two replications during *rabi,* 2010-11.

Twenty eight days old seedlings were transplanted at a spacing of 20x15 cm and the plots were periodically top dressed with urea, watered regularly and necessary plant protection measures were taken against pests and diseases. Observations were recorded on ten randomly selected plants for plant height, number of ear bearing tillers palnt^{-1}, panicle length, number of filled grains panicle^{-1}, spikelet fertility per cent and grain yield plant^{-1} whereas data on days to 50% flowering and test weight were recorded on plot basis. The mean of replications was used for statistical analysis. Genotypic and phenotypic co-efficient of variation (Burton and Devane, 1953), heritability and genetic advance as per cent of mean (Johnson *et al.*, 1955) were estimated.

Analysis of variance indicated the existence of highly significant differences among the genotypes for all the characters studied (Table 1). The phenotypic coefficient of variance (PCV) was slightly higher in magnitude than genotypic coefficient of variance (GCV) for all the characters studied (Table 2) indicating the influence of environment. Among the yield and yield attributing characters, PCV and GCV were observed to be highest (26.89 and 24.41) only for grain yield. Similar high PCV and GCV for grain yield was also reported by Karthikeyan *et al.* (2007), Krishna *et al*. (2008), Prasad *et al*. (2009), Mohan Lal and Chauhan (2011), Siva Parvathi *et al.* (2011) and Shiva Prasad *et al*. (2011). Value of PCV and GCV were found to be moderate for number of ear bearing tillers palnt^{-1} (14.67and 11.78), spikelet fertility (10.99 and 10.42) and test weight (12.94 and 12.48). Similar findings were given by Saidaiah *et al.* (2010) for spikelet fertility and Satish (2000) for test weight. For the characters days to 50% flowering, plant height and panicle length PCV (9.44, 8.28 and 5.36) and GCV (9.31, 7.82 and 4.73) were low. Low PCV and GCV for days to 50% flowering was reported by Satish Chandra *et al*. (2009), Kuchanur *et al*. (2009), Saidaiah *et al.* (2010), Siva Parvathi *et al.* (2011) and Shiva Prasad *et al*. (2011), whereas for panicle length low PCV and GCV were obtained by Rita Binse *et al*. (2006), Mamta Singh *et al*. (2007), Karthikeyan *et al.* (2007), Krishna *et al*. (2008) and Prasad *et al.* (2009). The character number of filled grains panicle^{-1} recorded high PCV (20.71) and moderate GCV (19.86). Kuchanur *et al*. (2009) reported similar results for this trait.

High estimates of heritability coupled with high genetic advance as per cent of mean was observed for number of filled grains panicle^{-1} (92.00 and 39.22), spikelet fertility (90.00 and 20.35), test weight (93.00 and 24.79) and grain yield plant^{-1} (82.00 and 45.63). High heritability coupled with high genetic advance as per cent of mean suggested the role of additive gene action in the inheritance of these traits and directional selection could be

Table 1. Analysis of variance for yield and yield contributing characters in rice (*Oryza sativa* L.) during *rabi,* 2010-11

Source of variations	df	Days to 50% flowering	Plant height (cm)	No. of ear bearing tillers plant^{-1}	Panicle length (cm)	No. of filled grains panicle^{-1}	Spikelet fertility (%)	Test weight (g)	Grain yield plant^{-1} (g)
					MSS				
Replications	1	1.78	0.38	0.11	0.03	32.30	7.93	0.16	9.71
Genotypes	71	152.32**	181.59**	3.35**	3.84**	6358.54**	151.56**	10.91**	162.58**
Error	71	2.17	10.29	0.73	0.47	267.18	8.07	0.39	15.72

** Significant at 1 % level df = Degrees of freedom

Table 2. Estimates of genetic parameters for yield and yield component characters during *rabi,* 2010-11

S.No.	Character	Mean	Range		PCV (%)	GCV (%)	Heritability (%)	Genetic advance as % of mean (5 % GAM)
			Min	Max				
1.	Days to 50% flowering	93.10	77.50	112.50	9.44	9.31	97.00	18.90
2.	Plant height (cm)	118.34	98.10	141.00	8.28	7.82	89.00	15.22
3.	No. of ear bearing tillers per plant	9.74	7.30	14.50	14.67	11.78	64.00	19.47
4.	Panicle length (cm)	27.40	24.58	32.27	5.36	4.73	78.00	8.61
5.	No. of filled grains panicle^{-1}	277.93	165.55	403.60	20.71	19.86	92.00	39.22
6.	Spikelet fertility (%)	81.30	42.28	91.55	10.99	10.42	90.00	20.35
7.	Test weight (g)	18.38	13.31	24.06	12.94	12.48	93.00	24.79
8.	Grain yield plant^{-1} (g)	35.11	11.40	54.60	26.89	24.41	82.00	45.63

PCV = Phenotypic coefficient of variation GCV = Genotypic coefficient of variation

profitably applied on these traits in the genetically diverse material. Similar findings for grain yield plant^{-1} and number of filled grains panicle^{-1} were reported earlier by Karthikeyan *et al.* (2007), Prasad *et al*. (2009), Umadevi *et al.* (2010) and Siva Parvathi *et al.* (2011). For test weight, high heritability coupled with high genetic advance as per cent of mean was recorded by Vijayalakshmi *et al*. (2008), Satish Chandra *et al*. (2009), Saidaiah *et al.* (2010), Mohan Lal and Chauhan (2011) and Shiva Prasad *et al*. (2011).

High estimates of heritability coupled with moderate genetic advance as per cent of mean was observed for rest of the traits *viz.,* days to 50% flowering (97.00 and 18.90), plant height (89.00 and 15.22) and number of ear bearing tillers palnt^{-1} (64.00 and 19.47) revealing the involvement of both additive and non additive gene action in the inheritance of these traits and improvement of these traits may be possible by simultaneous exploitation of both additive and non additive components by adopting breeding procedures like biparental mating, diallel selective mating system or cyclic hybridization. High heritability (78.00) with low genetic advance as per cent of mean (8.61) was recorded for panicle length. The results were in agreement with the earlier findings of Mamta Singh *et al*. (2007), Prasad *et al*. (2009) and Shiva Prasad *et al*. (2011) indicating the role of non-additive gene action, which may be exploited through heterosis breeding. Therefore, from variability, heritability and genetic advance studies the traits *viz.,* grain yield plant^{-1} number of filled grains panicle^{-1} test weight and spikelet fertility may be considered as favourable attributes as they recorded high magnitude of variability parameters and high extended genetic gain obtained from selection of superior genotypes.

LITERATURE CITED

Burton G W and Devane E W 1953 Estimating heritability in tall fescue (*Festuca arundiraceae*) from replicated clonal material. *Agronomy Journal,* 45: 478-481.

Johnson H W, Robinson H F and Comstock R E 1955 Estimates of genetic and environmental variability in soybean. *Agronomy Journal.,* 47 (7): 314-318.

Karthikeyan P, Anbuselvan Y, Venkatesan M and Palaniraja K 2007 Genetic studies in rice (*Oryza sativa* L.) under saline situation. *Madras Agricultural Journal,* 94 (7-12): 272-276.

Krishna L, Raju Ch D and Raju Ch S 2008 Genetic variability and correlation in yield and grain quality characters of rice germplasm. *The Andhra Agricultural Journal,* 55 (3): 276-279.

Kuchanur P H, Naresh D and Vijayakumar A G 2009 Genetic variability and divergence in New Plant Type rice genotypes. *Crop Improvement,* 36 (1): 20-24.

Mamta Singh, Kumar K and Singh R P 2007 Study of coefficient of variation, heritability and genetic advance in hybrid rice. Oryza. 44 (1): 160-162.

Mohan Lal and Chauhan D K 2011 Studies of genetic variability, heritability and genetic advance in relation to yield traits in rice. *Agricultural Science Digest,* 31 (3): 220-222.

Prasad R, Prasad L C and Agarwal R K 2009 Genetic diversity in Indian germplasm of aromatic rice. Oryza. 46 (3): 197-201.

Rita Binse, Motiramani N K and Sarwgi 2006 Association analysis and variability analysis in rice. *Mysore Journal of Agricultural Sciences,* 40 (3): 375-380.

Saidaiah P, Sudheer Kumar S and Ramesha M S 2010 Variability for yield and yield component attributes in rice. *Crop Research,* 39 (1, 2 & 3): 91-93.

Satish B, 2000 Heterosis and combining ability analysis for yield and grain quality characteristics in rice (*Oryza sativa* L.). M.Sc. (Ag) Thesis. Acharya N. G. Ranga Agricultural University, Hyderabad, India.

Satish Chandra B, Dayakar Reddy T and Sudheer Kumar S 2009 Variability parameters for yield, its components and quality traits in rice (*Oryza sativa* L.). *Crop Research,* 38: 144-146.

Shiva Prasad G, Sujatha M, Chaitanya U and Subba Rao L V 2011 Studies on variability, heritability, genetic advance, correlation and path analysis for quantitative characters in rice (*Oryza sativa* L.). *Journal of Research ANGRAU*, 39 (4): 104-109.

Siva Parvathi P, Satyanarayana Rao V, Lal Ahamed M and Anil Kumar P 2011 Variability, heritability and genetic advance for yield and grain quality characters in rice. *The Andhra Agricultural Journal,* 58 (1): 116-118.

Umadevi M, Veerabadhiran P, Manonmani S and Shanmugasundaram P 2010 Physico-chemical and cooking characteristics of rice genotypes. Electronic *Journal of Plant Breeding,* 1 (2):114-123.

Vijayalakshmi B, Vijay D, Raju P R K and Satyanarayana P V 2008 Genetic divergence of qualitative and quantitative characters in lowland rice germplasm. *Crop Research,* 36 (1, 2 & 3): 212-214.

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