



Genetic Variability and Heritability Analysis for Yield and Quality Attributes in Rice (*Oryza sativa* L.)

Key words : Genetic advance, Heritability, Rice, Variability.

Rice (*Oryza sativa* L.) is an important cereal crop in India and there is also a great demand from the farmers to grow high yielding and fine grain types to get premium market price. In order to breed suitable cultivars to suit the farmer's demand, knowledge on the nature and magnitude of genotypic and phenotypic variability present in the germplasm lines plays a vital role in evolving successful selections. Hence, the present investigation has been undertaken to assess the important genetic parameters in the selected lines of rice.

The materials consisted of 48 high yielding diverse genotypes being maintained at the Andhra Pradesh Rice Institute, Maruteru. Field trials were laid out in Kharif, 2006 in a randomized block design with three replications. Thirty days old seedlings of each genotype were transplanted in the main field by adopting an inter- and intra – row spacing of 20 x15 cm and the recommended cultural operations were carried out. Observations were recorded on 14 quantitative and qualitative characters, viz., days to 50% flowering, days to maturity, number of effective tillers per plant, plant height, panicle length, number of grains per panicle, 1000-grain weight, kernel length, kernel breadth, kernel L/B ratio, kernel length after cooking, kernel elongation ratio, harvest index and grain yield per plant. GCV and PCV were worked out according to Burton (1952). The procedure given by Hanson et al. (1956) was used to estimate the heritability in the broad sense and genetic advance as per cent of mean was worked out as per Lush (1949) and Johnson et al. (1955).

Analysis of variance for all the traits showed highly significant differences suggesting substantial to moderate genetic variability in all the characters under consideration. The variability estimates of genotypic and phenotypic variances, genotypic and phenotypic co-efficient of variation, heritability and genetic advance are presented in Table 1. The estimates of genetic parameters revealed very low magnitude of difference between GCV and PCV for most of the characters studied indicating little environmental influence. The characters, number of grains per panicle and grain yield per plant showed higher estimates of GCV and PCV, as also observed by Joginder Reddy (2004) and Anandakumar and Indubala (2005). It is indicated that these characters are under the maximum influence of genetic control.

Hence, simple selection can be practiced for further improvement. The characters kernel length, kernel length after cooking and kernel elongation ratio recorded low variability estimates indicating little scope for selection.

High heritability estimates were observed for all the characters under consideration. Plant height recorded maximum heritability followed by days to 50 per cent flowering, panicle length, number of effective tillers per plant, days to maturity, 1000-grain weight, number of grains per panicle, kernel length, grain yield per plant and kernel length after cooking. Similar results were reported by Singh et al. (2005) and Vanaja and Luckins Babu (2006). This indicates that these traits were less influenced by environmental fluctuations and may respond to selection satisfactorily for improvement of yield and quality. The genetic advance values should also be considered simultaneously, as high heritability combined with high genetic advance is likely to result in maximum genetic gain during selection (Johnson et al., 1955). In the present material, the traits viz., number of grains per panicle, plant height, number of effective tillers per plant, grain yield per plant, 1000 grain weight, kernel L/B ratio, days to 50 per cent flowering, harvest index and panicle length have high genetic advance coupled with high heritability. This indicates the preponderance of additive gene effect for above traits which will be useful for direct selection.

The characters kernel length, kernel breadth, kernel length after cooking and kernel elongation ratio recorded high heritability accompanied by low genetic advance. Similar results were made by Vanaja and Luckins Babu (2006). This could be the result of non-additive gene effects such as epistasis and dominance type of interaction. Hence, direct selection will be ineffective for such characters. These traits can be improved by adapting recurrent selection method. By and large, the results of the present study indicated that in the present material for the improvement of yield and quality, relatively due importance should be given to the traits like number of grains per panicle, grain yield per plant, 1000 grain weight, days to 50% flowering, harvest index and kernel L/B ratio etc., which have high to moderate GCV and heritability coupled with high genetic advance.

Table 1. Mean, range, co-efficient of variation, heritability (broad sense), genetic advance and genetic advance as per cent of mean for 14 characters in rice

Character	Mean	Range	Phenotypic coefficient of variation	Genotypic coefficient of variation	Heritability in broad sense (h^2_b)	Genetic advance as % of mean
Days to 50% flowering	100.25	51.00-121.66	14.27	14.08	97.32	28.62
Days to maturity	127.79	84.66-148.33	10.29	10.11	96.49	20.46
Number of effective tillers per plant	7.89	5.56-10.80	17.34	16.14	96.61	30.94
Plant height (cm)	110.84	81.20-170.93	16.46	16.36	98.81	33.51
Panicle length (cm)	22.85	17.26-30.42	12.66	12.48	97.13	25.35
Number of grains per panicle	163.56	78.93-255.80	26.37	25.34	92.35	50.18
Harvest index (%)	48.08	32.42-68.05	16.45	14.35	76.14	25.80
Kernel length (mm)	6.01	5.20-7.93	9.94	9.71	90.98	19.08
Kernel breadth (mm)	2.24	1.81-2.85	12.69	11.09	76.43	19.98
Kernel L / B ratio	2.73	2.07-3.77	16.41	14.39	76.91	26.00
Kernel length after cooking	8.56	7.56-9.60	4.78	4.49	88.13	8.69
Kernel elongation ratio	1.43	1.20-1.58	7.64	6.99	83.79	13.19
1000-grain weight (g)	20.55	14.34-29.12	17.37	16.90	94.68	33.88
Grain yield per plant (g)	18.77	11.35-26.48	20.88	20.24	90.25	38.82

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