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GENETIC VARIABILITY AND CORRELATION IN SHORT DURATION RICE CULTIVARS

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Abstract: In order to understand the nature and extent of variability and association of various quantitative characters with grain yield, a field experiment was conducted with 45 short duration rice genotypes at the Rice Research Station, Moncompu. The environmental influence on the different traits was evident from the phenotypic coefficient of variability being higher than the genotypic coefficient of variability. Characters such as plant height, flag leaf area, panicle exsertion, number of grains per panicle and grain yield exhibited moderate to high heritability and genetic advance. Grain yield was found to be positively correlated both at genotypic and phenotypic level with number of productive tillers per hill, plant height, flag leaf area, panicle length and number of grains per panicle.

Key words: Correlation, genetic advance, heritability, rice

INTRODUCTION

A generally determined variability in plant population is essential for making effective selection in crop improvement programmes. Hence, the estimation of genetic variability and different genetic parameters such as heritability, genetic advance etc and the nature of association among the yield attributing characters is a prerequisite in crop improvement. The present study was undertaken to derive information on the extent of genetic variability and genetic association between grain yield and other component characters in some short duration rice varieties.

MATERIALS AND METHODS

Forty-five short duration rice genotypes were grown in field plots laid in randomised block design with three replications during the kharif and rabi seasons of 1990 under irrigated conditions. Twenty day old seedlings were transplanted to the main field in 5 x 2 m^2 plots at a spacing of 20 x 15 cm. The crop was fertilised as per the package of practices recommendations of the Kerala Agricultural University. Observations were recorded on plant height at maturity, flag leaf area, number of productive tillers per plant, panicle exsertion, length of panicle, number of grains per panicle and grain yield from random samples taken from each plot. Statistical significance of varietal differences was tested using the analysis of variance. The phenotypic, genotypic and environmental variances along with the phenotypic coefficients of variation were calculated from the analysis of variance for randomised block design. Heritability in the broad sense and genetic advance under 5% selection intensity were also calculated. The phenotypic, genotypic and error correlations were estimated.

RESULTS AND DISCUSSION

The analysis of variance showed highly significant differences among the 45 rice strains with regard to the various characters examined (Table 1). There was wide range in the mean values for all the characters studied. In all the cases, phenotypic coefficient of variation (PCV) was higher than genotypic coefficient of variation (GCV) (Table 1). The difference in PCV and GCV estimates indicates that the characters are highly influenced by the environment. A similar observation was made by Gomathinayagam *el al.*(1990) in drought tolerant rice genotypes in characters like plant height, number of tillers per plant, dry matter production per plant, number of filled grains per panicle, grain yield per plant and length, number and weight of roots. Singh *et al.* (1990) also reported the same trend in rice genotypes planted in sodic soils.

The estimate of heritability in the broad sense (H^2) ranged from 44.5% to 91.4% in the number of productive tillers per hill and plant height respectively. Relatively higher value of H^2 was observed in panicle exsertion (73.7%),

Table 1. Estimates of genetic parameters in rice genotype

Characters	Range	Mean sum of squares			PCV %	GCV %	H^2 %	OA*
		Repli-cation	Variety	Error				
Productive tillers per hill	3.0-11.3	2.1	13.0	3.8	100.2	44.6	44.5	35.0
Plant height, cm	65-136	24.3	917.6	27.8	355.3	324.8	91.4	37.2
Flag leaf area, cm^2	13.0-46.8	112.8	172.5	40.6	309.0	160.6	52.0	36.0
Panicle exsertion, cm	1.0-9.8	0.9	16.8	1.8	191.0	140.9	73.7	111.6
Length of panicle, cm	17.2-28.2	2.4	16.9	2.9	33.6	20.7	61.7	15.5
No. of grains per panicle	61.0-168.3	1067.8	2459.2	427.5	891.3	546.4	61.3	33.9
Grain yield per plant, g	5.8-25.1	17.7	77.3	17.0	288.5	156.0	54.1	52.8

*at 5% selection index

Table 2. Genotypic (G), phenotypic (P) and environmental (E) correlation coefficients among the different quantitative characters

Character		Plant height	Flag leaf area	Panicle exsertion	Length of panicle	No. of grains/panicle	Grain yield/plant
No. of productive tillers/hill	G	-0.068	0.112	-0.056	0.226*	0.188	0.721
	P	-0.042	0.140	-0.025	0.118	0.081	0.648
	E	0.008	0.166	0.020	-0.0002	-0.037	0.583
Plant height	G		0.369**	0.708**	0.463**	0.396**	0.477**
	P		0.233*	0.601**	0.357**	0.295**	0.332**
	E		-0.103	0.130	0.049	-0.005	-0.015
Flag leaf area	G			0.223*	0.516**	0.599**	0.456
	P			0.183	0.474**	0.301**	0.296**
	E			0.128	0.424**	-0.086	0.116
Panicle exsertion	G				0.256*	0.284**	0.281**
	P				0.174	0.163	0.134
	E				0.005	-0.090	-0.126
Length of panicle	G					0.712**	0.502**
	P					0.489**	0.290**
	E					0.131	0.000
No, of grains/panicle	G						0.519**
	P						0.361**
	E						0.145**

*Significant at 5% level; **Significant at 1% level

length of panicle (61.7%) and number of grains per panicle (61.3%). The genetic advance (GA) was observed to be maximum in panicle exsertion (11.6%) and minimum in length of panicle (15.5%). Singh *et al.* (1990) reported a higher value of H^2 for all quantitative characters except grain per plant in rice genotypes. Low H^2 and moderate GA estimates for number of productive tillers per hill as observed in the present study was also reported by Chauhan *et al.* (1990). For plant height, H^2 was high and GA was in contrast

with the observation of Singh *et al.* (1990) who noticed high values of H^2 and GA for this trait. Regarding the panicle exsertion, a high H^2 estimate coupled with high GA was noticed. This indicates the possibility of higher additive gene action for this trait and scope for further selection through pedigree breeding. Similar observation was made by Jebaraj *et al.* (1990). The expected genetic advance in respect of panicle length was low although the H^2 estimate was quite high. According to Panse (1957), if the H^2 is mainly due to non-additive gene effects (i.e., dominance and epistasis), the genetic gain would be low. In general, the quantitative characters such as plant height, flag leaf area, panicle exsertion, number of grins per panicle and grain yield exhibited moderate to high values of H^2 and GA estimates and hence these traits can be taken as good basis for selection.

The genotypic correlations (r_g) were higher than the phenotypic correlations (r_p) (Table 3). This indicates that r_p is slightly reduced by environmental influence. Grain yield per plant was found to have a positive significant correlation with number of productive tillers per hill, plant height, flag leaf area, length of panicle and number of grains per panicle both at genotypic and phenotypic levels. Panicle exsertion had also a positive significant association with grain yield, but only at the genotypic level. Chauhan *et al.* (1986) suggested that at both the r_g and r_p levels, yield per plant was positively and significantly associated with days to flowering, leaf angle, leaf length, plant height, panicle length, sheath length, tillers per plant and graias per plant. Characters such as plant, height, flag leaf area, panicle exsertion, length of panicle and number of grains per panicle are positively associated among themselves also, either at genotypic level alone or both at genotypic and phenotypic level. Number of productive tillers per hill has genotypic association with length of panicle apart from grain yield. All these traits can be utilized as selection criteria for yield improvement in rice.

REFERENCES

Chauhan, J.S., Loppez, F.S.R. and Vergara, B.S. 1990. Heritability and genetic advance in early segregating populations of rice. *Oryza* 27 : 15-20

Chauhan, S.P., Singh, R.S., Maurya, D.M. and Vaish, C.P. 1986. Character association in upland cultivars of India. *Int. Rice Res. Newsl.* 11(2) : 8

Gomathinayagam, P., Natarajan, S. and Subramanian, M. 1990. Genetic variability in drought tolerant genotypes of rice. *Oryza* 27 : 328-330

Jebaraj, S., Palanisamy, S. and Subramanian, M. 1990. Genetic variability in panicle exsertion. *Oryza* 27 : 405-408

Panse, V.G. 1957. Genetics of quantitative characters in relation to plant breeding. *Indian J. Genet.* 17 : 318-328

Singh, R.B., Ram, P.C. and Singh, B.B. 1990. Genetic variability in rice genotypes planted in sodic soil. *Int. Rice. Res. Newsl.* 14(3) : 10