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Research Notes

Genetic variability and correlation for yield and grain quality characters of rice grown in coastal saline low land of Tamilnadu

T. Sabesan*, R. Suresh and K. Saravanan

Abstract
Fifty four rice varieties of diverse origin were studied for genetic variability and correlation analysis under coastal saline low lands. The PCV values were slightly greater than GCV, revealing little influence of environment in character expression. High values of heritability along with genetic advance were observed for grain yield per plant, 100 grain weight, productive tillers per plant, grain per panicle, grain length, grain breadth, kernel length, panicle length and plant height. Grain yield per plant showed positive significant association with plant height and productive tillers per plant at both genotypic and phenotypic levels. The 100 grain weight was positively significantly correlated with plant height, grains per panicle and grain breadth.

Key words: Rice, genetic variability, correlation, coastal salinity

Introduction

The progress in breeding for yield and its contributing characters of any crop is polygenically controlled, environmentally influenced and determined by the magnitude and nature of their genetic variability (Wright, 1935 and Fisher, 1981). Genetic variability, character association and path coefficients are pre-requisites for improvement of any crop including rice for selection of superior genotypes and improvement of any trait (Krishnaveni *et al*., 2006). It is very difficult to judge whether observed variability is highly heritable or not. Moreover, knowledge of heritability is essential for selection based improvement as it indicates the extent of transmissibility of a character into future generations. Knowledge of correlation between yield and its contributing characters are basic and fore most endeavor to find out guidelines for plant selection. Partitioning of total correlation into direct and indirect effect by path coefficient analysis helps in making the selection more effective. Keeping in view the above facts, the present investigation was undertaken to know variability and correlation among yield and its contributing characters using 54 rice genotypes under coastal saline ecosystem.

Genetics and Plant Breeding, Department of Agricultural Botany, Faculty of Agriculture, Annamalai University, Annamalai nagar 608 002, Cuddalore District, Tamilnadu, India
*sabavani@gmail.com

The experiment comprised of 54 genotypes of rice grown during *Samba,* 2008 at the Plant Breeding Farm (11º 24´ N latitude, 79 º 44´ E longitude and + 5.79 m MSL), Faculty of Agriculture, Annamalai University located at East coastal region of Tamil Nadu, India with soil pH of 8 to 8.5 and EC of 2.51 to 2.8 dSm^{-1} in a randomized block design with three replications. Twenty five days old seedlings were transplanted in 3 m rows at a spacing of 20 x 15 cm between and within rows respectively. All the recommended package of practices were followed to raise a good crop. For this study, genetic divergence, correlation and path coefficient of yield contributing and grain quality traits *viz*., days to first flower, days to 50 per cent flowering, plant height, productive tillers per plant, panicle length, grains per panicle, 100 grain weight, grain length, grain breadth, kernel length, kernel breadth and grain yield per plant were recorded on five randomly selected plants in each replication. The variability was estimated as per procedure for analysis of variance suggested by Panse and Sukhatme (1985), GCV and PCV by Burton and De Vane (1953) and heritability and genetic advance by Johnson *et al.* (1955). Correlation coefficient was worked as per Al-Jibouri *et al.* (1958).

The analysis of variance revealed significant difference among the genotypes for all the characters studied (Table 1). Close relationship between GCV and PCV was found in all the characters and PCV values were slightly greater than GCV, revealing very little influence of environment for their expression. More than 80 per cent heritability values were observed for all the characters except productive tillers per plant and panicle length which indicated good scope of selection. High heritability along with high values of genetic advance was observed for almost all the traits except days to first flower and 50 per cent flowering, which recorded moderate genetic advance. In the present investigation, the characters namely, productive tillers per plant, grains per panicle, 100 grain weight and grain yield had high values of GCV accompanied with high heritability which indicated additive gene action and good scope for selection. Johnson *et al*. (1955) also suggested that high GCV along with high heritability and genetic advance gave better picture for the selection of the genotypes. Similar results were also reported by Sarkar *et al*. (2007) and Anbanandan *et al*. (2009).

Genotypic correlations were observed to be greater than the corresponding phenotypic correlation coefficients for all the characters indicating the superiority of phenotypic expression under the influence of environmental factors (Table 2). Days to 50 per cent flowering showed maximum positive and significant correlation with days to first flower at both genotypic (0.99) and phenotypic (0.97) levels. Grain yield per plant recorded positive and significant correlation with plant height (0.25) and productive tillers per plant (0.24) at both genotypic and phenotypic levels while it recorded positive correlation with panicle length (0.30) at genotypic level only. This corroborates with the findings of Yugandhar Reddy *et al*. (2008) for panicle length and Babu *et al*., (2006) and Saravanan and Sabesan (2009) for productive tillers per plant. It suggests that priority should be given to these traits while making selection for yield improvement. Days to first flower and days to 50 per cent flowering had significant positive correlation with plant height (0.33) and productive tillers per plant. Plant height recorded significant positive correlation with panicle length (0.44 and 0.34) and kernel breadth (0.40 and 0.37) at both levels and with grains per panicle (0.30) at genotypic level alone. The 100 grain weight exhibited significant positive correlation with grain breadth (0.29) at both levels. It suggests that interdependency of these characters should be given due consideration in selection programme. Negatively significant correlation (0.32) was observed between grain breadth and grains per panicle while positive significant association was observed between grain length, kernel length and kernel breadth at both levels.

The genetic architecture of grain yield is based on the balance or overall net effect produced by various yield components interacting with one another. Based on the studies on genetic variability and correlation analysis, it may be concluded that plant height, productive tillers per plant, panicle length and days to 50 per cent flowering appeared to be primary yield contributing characters and could be relied upon for selection of genotypes to improve genetic yield potential of rice.

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Table 1. Variability, heritability and genetic advance for 12 characters in 54 genotypes of rice

Characters	Range	Mean	Variability (%)		Heritability BS (%)	Genetic advance as % of mean
			PCV	GCV		
Days to first flower	61.00 - 88.00	72.75	8.06	7.86	95.10	15.79
Days to 50 Per cent flowering	66.50 – 96.00	78.66	7.25	6.90	90.60	13.53
Plant height (cm)	57.00 – 117.90	88.92	15.16	14.01	85.31	26.65
Productive tillers per plant	6.50 – 24.50	14.23	33.77	28.32	70.32	48.92
Panicle length (cm)	12.85 – 25.75	18.31	17.11	14.17	68.63	24.19
Grains per panicle	23.50 – 146.00	88.50	26.99	25.54	89.55	49.73
100 grain weight (g)	0.42 – 2.85	1.69	31.10	30.96	99.15	63.52
Grain length (mm)	4.28 – 10.80	7.93	18.59	18.58	99.97	38.29
Grain breadth (mm)	2.35 – 4.63	2.82	13.47	13.46	99.90	27.72
Kernel length (mm)	3.26 – 9.62	6.21	15.57	15.56	99.98	32.07
Kernel breadth (mm)	1.85 – 3.25	2.37	8.62	8.59	99.14	17.62
Grain yield per plant (g)	5.60 – 42.55	21.67	46.24	46.17	99.72	94.98

Table 2. Phenotypic and genotypic correlation coefficients among 12 characters in rice

Characters		DF	DFF	PH	PTP	PL	GPP	HGW	GL	GB	KL	KB	GYD
DF	P	1.000	0.970**	0.287	0.310*	0.182	-0.075	-0.142	0.156	-0.037	0.159	-0.004	0.205
	G	1.000	0.991**	0.337*	0.423**	0.258	-0.082	-0.146	0.160	-0.038	0.161	-0.004	0.210
DFF	P		1.000	0.267	0.295*	0.163	-0.050	-0.187	0.159	-0.062	0.139	0.015	0.173
	G		1.000	0.333*	0.394*	0.242	-0.047	-0.197	0.169	-0.065	0.146	0.012	0.179
PH	P			1.000	0.158	0.342*	0.256	-0.107	0.013	-0.038	0.119	0.372**	0.233*
	G			1.000	0.202	0.445**	0.301*	-0.117	0.017	-0.040	0.135	0.400**	0.259*
PTP	P				1.000	0.142	0.049	-0.112	-0.051	-0.137	0.107	0.057	0.204*
	G				1.000	0.276*	0.046	-0.133	-0.058	-0.164	0.135	0.078	0.246*
PL	P					1.000	0.101	-0.051	0.042	0.136	0.027	0.244	0.253
	G					1.000	0.138	-0.063	0.051	0.165	0.030	0.298*	0.305*
GPP	P						1.000	-0.028	0.092	-0.308*	0.027	0.799**	0.165
	G						1.000	-0.029	0.095	-0.327*	0.023	0.845**	0.173
HGW	P							1.000	0.071	0.423**	0.039	0.103	-0.068
	G							1.000	0.071	0.423**	0.039	0.103	-0.068
GL	P								1.000	0.146	0.479**	0.288*	0.196
	G								1.000	0.146	0.481**	0.290*	0.196
GB	P									1.000	-0.079	-0.066	-0.078
	G									1.000	-0.079	-0.067	-0.078
KL	P										1.000	0.250	0.108
	G										1.000	0.249	0.108
KB	P											1.000	0.118
	G											1.000	0.118
GYD	P												1.000
	G												1.000

DF-Days to first flower, DFF- Days to 50 per cent flowering, PH- Plant height, PTP-Productive tillers per plant, PL-Panicle length, GPP-Grain per panicle, HGW-100 grain weight, GL-Grain length, GB-Grain breadth, KL-Kernel length, KB-Kernel breadth, GYD-Grain yield per plant.
*,** significant at 5 and 1 per cent level respectively