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CORRELATION AND PATH COEFFICIENTS ANALYSES IN MEDIUM DURATION GENOTYPES OF RICE (*ORYZA SATIVA* L.)

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Abstract

Twenty six genotypes of rice were grown in seasons samba 2016 observed for thirteen yield and yield contributing characters. The phenotypic and genotypic correlations among the traits and their path coefficients were estimated. Correlation coefficient analysis showed significantly positive correlation between grain yield was higher with panicle length, harvest index, number of productive tillers and number of grains per panicle at genotypic level. Significantly negative correlation between days to 50% flowering and plant height at genotypic level. Higher phenotypic correlation significantly showed harvest index and panicle length at phenotypic level. Path analysis revealed that grain breadth, grain length and breadth ratio, number of productive tillers, number of grains per panicle, total dry matter production and harvest index have shown high positive direct effects on grain yield.

Key words : Rice, phenotypic, genotypic, correlation, path coefficient, positive, negative.

Introduction

Rice is an important food crop in India. About half of the world's population depends on rice for their survival. Rice is being cultivated in around 113 countries of the world. The present world area, production and productivity under rice is 159.17 million hectares, 472.16 MMT and 4.42 metric tons per hectare (World Agricultural Production, USDA, 2015-16). In India, rice is being grown in an area of 43.5 million hectares with a production of 104.41 MMT and productivity of 3.60 metric tons per hectare (World Agricultural Production, USDA, 2015-16). Genotype and environmental factors extensive effects on growth and yield of rice. Most of the characters of interest to breeder are complex and result of the interaction of a number of components (Sarawgi *et al*., 1997). The world population is expected to reach 8 billion by 2030 and rice production must be increased by 50% in order to meet the growing demand (Khush and Brar, 2002). In order to meet the fastest growing demand for rice grain, development of high yielding genotypes with desirable agronomic traits for diverse ecosystem is therefore a necessity. Hence, rice breeders are interested in developing cultivars with improved yield and other desirable agronomic characters. Yield is a complex character and composed of several components. Hence the study of relationships among quantitative traits is important for assessing the feasibility of joint selection for two or more traits instead of selection of secondary traits on genetic gain for the primary trait under consideration. Path coefficient analysis partitions the genetic correlation between yield and its component traits direct and indirect effects and hence has effectively been used in identifying useful traits as selection criteria to improve grain yield in rice (Sadeghi, 2011). Hence, the present study was undertaken to know the inter-relation among different yield contributing characters and their association with grain yield.

Materials and Methods

The study was conducted in the experimental field Annamalai University, Chidambaram, Cuddalore, Tamilnadu, India. Twenty six rice genotypes were sown in raised nursery beds during Samba 2016. In each genotypes, one seeding per hill was transplanted in the main field after 25 days with the spacing of 20 cm between rows and 15 cm between plants in 3 m long rows. The experiment was carried out in Randomized Block Design

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Table 1 : Genotypic (G) and Phenotypic (P) correlations for various characters in rice.

Character		Days to 50% flowering	Plant height (cm)	Number of tillers	Number of pro-ductive tillers	Panicle length (cm)	Number of grains per panicle	Grain length (mm)	Grain breadth (mm)	Grain L/B ratio	100 seed weight (g)	Total dry matter production	Harvest index	Grain yield/ plant(g)
Days to 50% flowering	**G**	-1.000	0.863**	0.555**	1.710**	-11.715**	0.357**	3.155**	-1.912**	3.637**	2.283**	-2.088**	-1.222**	-2.998**
	P	1.000	-0.127	-0.221	-0.294	-0.167	-0.139	0.024	-0.031	0.029	0.028	-0.151	0.059	-0.154
Plant height	**G**		1.000	-0.850**	-0.586**	-0.418**	-0.154	-0.172	0.047	-0.183	-0.016	0.465**	-0.613**	-0.389**
	P		1.000	-0.058	-0.028	0.192	0.046	-0.090	0.007	-0.042	-0.019	0.321	-0.352**	-0.140
Number of tillers	**G**			1.000	0.656**	-0.239	-0.050	0.262	0.718**	-0.476**	0.608**	-0.064	0.028	0.177
	P			1.000	0.627**	0.002	-0.141	0.162	0.250	-0.100	0.265	0.194	-0.112	0.086
Number of productive tillers	**G**				1.000	0.387**	-0.234	0.446**	0.480**	-0.140	0.537**	0.005	0.531**	0.570**
	P				1.000	0.059	0.040	0.286	0.171	0.055	0.258	0.170	0.153	0.272
Panicle length	**G**					1.000	0.672**	-0.103	-0.009	-0.140	-0.260	0.282	0.619**	0.728**
	P					1.000	0.312	-0.093	0.028	-0.069	-0.123	0.079	0.201	0.345**
Number of grains per panicle	**G**						1.000	-0.009	-0.226	0.223	-0.246	-0.281	0.639**	0.449**
	P						1.000	0.006	-0.101	0.065	-0.167	-0.160	0.425**	0.293
Grain length	**G**							1.000	0.461**	0.392**	0.563**	-0.297	0.069	-0.190
	P							1.000	0.396**	0.345**	0.528**	-0.224	0.039	-0.176
Grain breadth	**G**								1.000	-0.626**	0.244	-0.130	-0.303	-0.353**
	P								1.000	-0.686**	0.207	-0.116	-0.162	-0.297
Grain L/Bratio	**G**									1.000	0.261	-0.0767**	0.319	0.175
	P									1.000	0.194	-0.013	0.139	0.141
100 seed weight	**G**										1.000	0.105	-0.248	-0.036
	P										1.000	0.072	-0.178	-0.033
Total dry matter production	**G**											1.000	-0.493**	0.309
	P											1.000	-0.537**	0.217
Harvest index	**G**												1.000	0.694**
	P												1.000	0.553**
Grain yield/plant	**G**													1.000
	P													1.000

Note: *, ** Significant at 5% and 1% level, respectively.

with three replications in season. A uniform population of 20 plants in a row was maintained. The data were recorded from five randomly selected plants for each genotypes from each replication leaving the first two border rows from all the four sides, in order to avoid the sampling error. The observations were recorded as per the following procedure. Readings from five plants were averaged replication wise and the mean data was used for statistical analysis for the 13 characters *viz.,* days to 50% flowering, plant height (cm), number of tillers per plant, number of productive tillers per plant, panicle length (cm), number of grains per panicle, grain length, grain breadth, grain L/B ratio, hundred seed weight (g), total dry matter production, harvest index (%) and grain yield per plant (g). The data recorded for all the characters were subjected to analysis of variance technique on the basis of model proposed by Panse and Sukhatme (1961). Correlation analysis was computed as per Karl Pearson (1932) and the partitioning of correlation coefficient into direct and indirect effects. Path analysis was carried out using the procedure suggested by Dewey and Lu (1959).

Results and Discussion

Genotypic and phenotypic correlation coefficients of the characters studied are presented in table 1. Grain yield per plant showed positive significant correlation with panicle length, harvest index, number of productive tillers and number of grains per panicle. This indicates that all these characters were important for yield improvement. These results were in consonance with the earlier reports of Shahidhar *et al.* (2005), Krishna Tandekar *et al.* (2008) for harvest index, Akhtar *et al.* (2011) for number of grains per panicle. It indicates that grain yield could be increased whenever there was an increase in characters that showed positive and significant association with grain yield. Hence, these characters could be considered as criteria for selection for higher yield as these were mutually and directly associated with grain yield. It was observed that number of tillers, grain length and breadth ratio, total dry matter production were recorded non-significant positive association with grain yield per plant.

Days to 50% flowering had significantly positive association with plant height, number of tillers, number of productive tillers number of grains per panicle (Swain and Reddy, 2006), (Samir Y. Durai, 2016), grain length, grain L/B ratio and hundred seed weight, while significant negative association with panicle length, grain breadth, total dry matter production, harvest index and grain yield at genotypic level. Plant height had significantly positive association with grain breadth and total dry matter production, while negative significantly association with

Table 2 : Path co-efficient analysis for grain yield per plant and its components in rice.

Character	Days to 50% flowering	Plant height (cm)	Number of tillers	Number of productive tillers	Panicle length (cm)	Number of grains per panicle	Grain length (mm)	Grain breadth (mm)	Grain L/B ratio	100 seed weight	Total dry matter production	Harvest index
Days to 50% flowering	**-0.023**	-0.237	-0.093	1.092	0.406	0.146	-4.778	-2.562	4.837	-0.091	-1.261	-0.434
Plant height	0.020	**-0.274**	0.143	-0.374	0.014	-0.063	0.261	0.063	-0.243	0.000	0.280	-0.217
Number of tillers	0.012	0.233	**-0.168**	0.419	0.008	-0.207	-0.397	0.963	-0.633	-0.024	-0.039	0.010
Number of productive tillers	0.039	0.160	-0.110	**0.638**	-0.013	-0.096	-0.675	0.643	-0.186	-0.021	0.003	0.188
Panicle length	-0.273	0.114	0.040	0.247	**-0.034**	0.275	0.150	-0.012	0.186	0.010	0.170	0.220
Number of grains per panicle	0.008	0.042	0.084	-0.149	-0.023	**0.410**	0.014	-0.303	0.297	0.009	-0.169	0.227
Grain length	0.073	0.047	-0.044	0.285	0.003	-0.004	**-1.514**	0.617	0.522	-0.022	-0.179	0.024
Grain breadth	-0.044	-0.013	-0.120	0.306	0.000	-0.092	-0.698	**1.339**	0.833	-0.009	-0.078	-0.108
Grain L/B ratio	0.085	0.050	0.080	-0.089	0.004	0.091	-0.594	-0.839	**1.329**	-0.010	-0.046	0.113
100 seed weight	0.053	0.004	-0.102	0.343	0.009	-0.101	-0.853	0.327	0.347	**-0.039**	0.063	-0.088
Total dry matter production	-0.048	-0.127	0.010	0.003	-0.009	-0.115	0.450	-0.175	-0.102	-0.004	**0.603**	-0.175
Harvest index	-0.028	0.168	-0.004	0.339	-0.021	0.262	-0.105	-0.407	0.424	0.009	-0.298	**0.355**

Residual effect = 0.1191, **Bold:** Direct effects, **Normal:** Indirect effects.

number of tillers, number productive tillers, panicle length, grain yield and harvest index at genotypic and phenotypic level. Number of tillers had significantly positive association with number of productive tillers, grain breadth, hundred seed weight and while negative significantly association with number of grains per panicle and grain length and breadth ratio at genotypic level. Phenotypic correlation had positive significantly number of productive tillers. Number of productive tillers had significantly positive association with panicle length, grain length, grain breadth, hundred seed weight and harvest index and grain yield at genotypic level. Panicle length had significantly positive association with number grains per panicle, harvest index, grain yield at genotypic and phenotypic level. Number of grains per panicle had significantly positive association with grain yield and harvest index at genotypic and phenotypic level. Grain length had significantly positive association with grain breadth, grain length and breadth ratio and hundred seed weight at genotypic and phenotypic level. Grain breadth had significantly negative association with grain length and breadth ratio and grain yield at genotypic and phenotypic level. Total dry matter production had significantly negative association with harvest index at genotypic and phenotypic level. Harvest index had significantly positive association with grain yield at genotypic and phenotypic level.

Path coefficient analysis for grain yield per plant and its components in rice shown in table 2 revealed the results of direct and indirect effects of various grain components on grain yield. It was observed that the highest positive direct effect of grain breadth was on grain yield followed by grain length and breadth ratio, number of productive tillers, total dry matter production and number of grains per panicle. Highest negative direct effect grain length followed by plant height and number of tillers. The residual effect results was 0.1191 indicated that be contribution of component characters on grain yield was 88.09%, by the thirteen characters studied in path analysis, the rest 11.91% was the contribution of other factors such as traits not studied.

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