

Path Coefficient Analysis in Hill Zone Rice (*Oryza sativa* L.) Genotypes of Karnataka

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Abstract

An experiment was conducted to evaluate forty medium duration rice genotypes at six farming situations of hill zone in Karnataka. The experiment was laid out in randomized block design in three replications. Plant height manifested poor direct effect (0.224). Tillers per plant showed negative direct effects (-0.1492), panicle length showed high direct effects (0.4124), grain number per panicle showed direct effect (0.0788) and 100 grain weight showed positive low direct effects (0.0355) on grain yield.

Key words : Hill zone rice, Path coefficient analysis, Rice genotypes.

Rice is one of the important food crop of hill zone in Karnataka. It is grown under three topographical situations viz. upland, midland and low land situations during *kharif* season under rainfed conditions. It is grown in an area of 2.85 lakh hectares with a production of 7.23 lakh tones per hectare and with a productivity of 2,050 kg/ha (1). Path coefficient analysis permits the partitioning of the correlation coefficient of its components into direct and indirect effects (2). Plant breeders use path analysis to identify the traits that are useful as selection criteria to improve crop yield. The present investigation was made to assess the direct and indirect effects of grain and straw yield in 40 hill zone rice genotypes.

Methods

The experiment was conducted in six farming situations of hill zone of Karnataka (1. Madikeri—high elevation and high rainfall belt ; 2. Mudigere—high elevation and high rainfall belt ; 3. Sringeri—medium elevation and high rainfall belt, 4. Chikamagalur—medium elevation and medium rainfall belt ; 5. Thirthahally—medium elevation, high rainfall belt ; and 6. Sorabha—low elevation and medium rainfall belt). Forty medium duration hill zone rice genotypes were laid out in randomized block design with three replications. The spacing between the rows was 20 cm and between plants was 10 cm. Each plot was 2 m in length and 1 m in width. The crop was raised following the recommended package of practices (1)

during *Kharif* season. The observations were recorded on 10 randomly chosen plants in each replication and finally average values were computed and used in the statistical analysis.

Results and Discussion

The pooled analysis of variance revealed highly significant variances indicating the presence of genetic variability in the genotypes (Table 1). Highly significant variances in the environment indicated adequate heterogeneity among the environments for evaluating the genotypes. Linear and non-linear components also revealed that the characters were highly sensitive to environmental changes. Similar results were also reported earlier (3–5).

The results of direct and indirect effects of several characters showed significant association with grain yield (Table 2). Plant height manifested poor direct contribution (0.224) to grain yield ; positive and significant correlation between plant height and grain yield could be attributed to its positive indirect effect via panicle length. Hence, panicle length itself could be considered for selection as it was reported to exert direct positive effect on grain yield (6, 7).

Tillers per plant had significant and negative correlations with grain yield due to spikelet sterility during *kharif* season in hill zone and hence it showed negative direct effects (-0.1492) via most of the characters. However, in a majority of the cases, tillers per

Table 1. Pooled analysis of variance for eight characters in forty medium duration hill zone rice types. * = Significant at $P = 0.05$, ** = Significant at $P = 0.01$.

Source	Df	Mean sum of squares			
		Days to 50% flowering	Plant height	Tillers/ plant	Panicle length
Varieties	39	742.71*	1731.78*	1.13**	12.87**
Environments	51	1621.05*	4046.52**	41.92**	51.22**
Variety × Environments	195	39.09**	266.68	0.92**	3.13
Total	239				
Pooled error	468	1.94	686.95	0.21	13.83
Environment + (Var *Env)	200	78.63	361.35	1.95	4.33
Environ (linear)	1	8105.55*	20231.57**	209.61**	256.16**
Var × Environ (linear)	39	91.64**	612.75**	1.28**	2.92
Pooled deviation	160	25.30**	175.89	0.81**	3.11**
Pooled error for testing pooled deviations	-	0.64	228.98	0.07	1.07

Table 1. Continued.

Source	Mean sum of squares			
	Grains/ panicle	100- grain weight	Grain yield/plot (kg)	Straw yield/plot (kg)
Varieties	112.37	0.62**	0.11**	1.18**
Environments	2177.73*	0.35**	69**	99.59**
Variety × Environments	82.7**	0.06**	0.0377**	0.41**
Total				
Pooled error	13.83	0.04	0.004	0.08
Environment + (Var +Env)	135.07	0.07	0.20	2.88
Environ (linear)	10889.31**	1.79**	34.51**	497.99**
Var × Environ (linear)	140.72**	0.06**	0.06**	1.27**
Pooled deviation	66.48**	0.06**	0.0307**	0.18**
Pooled error for testing pooled deviations	4.61	0.01	0.001	0.02

plant had direct positive effect on grain yield as also reported earlier (8, 9).

Panicle length had high direct effect (0.4124) due to high positive correlation between panicle length and grain yield. Panicle length needs to be given emphasis during selection compared to plant height.

Similar positive direct effects were reported earlier (6, 7).

Grain number per panicle had fairly high direct effect (0.0788) on grain yield due to its high correlation with grain yield. It also manifested comparatively high indirect effects via panicle length, plant height

Table 2. Estimates of direct (diagonal) and indirect effects of grain yield in 40 medium duration hill zone rice genotypes. Residual = 0.4423.

Characters	Plant height	Tillers/ plant	Panicle length	Grain number/ panicle	100 grain weight	<i>r</i> values
Plant height	0.224	0.0145	0.1695	0.0386	0.0911	0.536
Tillers/plant	-0.0216	-0.1492	-0.0495	-0.0227	-0.0751	-0.318
Panicle length	0.0914	0.0179	0.4124	0.0343	0.0340	0.590
Grain number	0.1090	0.0430	0.1798	0.0788	0.0355	0.446
100-grain weight	0.0798	0.0441	0.0553	0.0117	0.2537	0.444

and 100 grain weight and tillers per plant as also reported earlier (7, 10).

One hundred grain weight had positive low direct effect (0.0355) on grain yield because of comparatively low correlation between 100 grain weight and grain yield. Indirect effects via grain number per panicle, panicle length and plant height were also of lower magnitude. Similar reports were also made earlier (10—12).

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