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CORRELATION AND PATH COEFFICIENT ANALYSIS OF PLANT HEIGHT AND ITS COMPONENTS IN BASMATI RICE

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Different inevitable phenotypic and genotypic correlations were observed between plant height and its components. The path coefficient analysis indicated the maximum positive direct effect of third internodal length on plant height, followed by peduncle length and fourth internodal length. The traits of peduncle length, first, second, fourth and fifth internodal lengths had substantial positive indirect effect on plant height through third internodal length. Third and fourth internodal and peduncle length may be a good selection criteria for semidwarf plant posture in Basmati rice.

Key words: Orysa sativa, Correlation path analysis, Semidwarfism.

INTRODUCTION

The world famous fine quality aromatic rice variety Basmati-370 possesses undesirable traits like tall plant, soft stem and non responsiveness to nitrogenous fertilizers. Due to these defects the variety has the tendency to lodge, which deteriorates the quality and reduces the yield quantity of rice. The hybridization of Basmati 370 rice with exotic dwarfing sources predominantly of DGWG origin has not been successful to develop semidwarf hybrids possessing comparable aroma and cooking qualities of parent. Therefore, development of semidwarf models of Basmati 370 by induced mutation technique seems to be the only alternative approach [1].

Before, the initiation of attempts to induce semidwarf mutants, it is imperative togather information about the selection criteria for semidwarf trait in rice. The selection criteria of semidwarfism in rice by studying correlation and path coefficients analysis of plant height and its components have been designed by previous workers [2-7]. But such studies are rather scanty for variety Basmati 370 of rice [2,7]. Therefore, the present investigation was carried out.

MATERIALS AND METHODS

The details of the genotypes studied are as under:

1. EF-20 Early maturing mutant derived from Basmati 370.
2. EF-26 Early maturing mutant derived from Basmati 370.
3. DM-28 Semidwarf mutant derived from Basmati 370.
4. DM-179-1 Semidwarf mutant derived from Basmati 370.
5. C32-4-81 Derivatives from the cross between DM16-5-1 and Kashmir Basmati (Derivatives of Basmati 370)
6. C45-2-81 Derivative from the cross between DM107-4 and Kashmir Basmati (Derivatives of Basmati 370)
7. C45-12-81 Derivative from the cross between DM107-4 and Kashmir Basmati (Derivatives of Basmati 370).
8. C107-3-81 Derivative from the cross between DM107-4 and Kashmir Basmati (Derivatives of Basmati 370)
9. Basmati 370 Parent and standard variety

A month old nursery was transplanted using single seedling per hill with a plant row distance of 20cm. The experiment was conducted using completely randomized block design with 4 replications. The net area per entry was $8m^2$.

Ten randomly selected plants per replication per entry were used for recording the data on plant height and length of internodes. The designation of the internode were I_1, I_2 and I_3 from the ground respectively.

The estimation of phenotypic and genotypic correlation and path coefficient was done by techniques of Dewey and Lu [8].

RESULTS AND DISCUSSION

Correlations

(i) *Peduncle length.* Significant positive phenotypic

(Continued.....)

and genotypic correlations were observed between peduncle length I_3 and plant height (Table 1). Peduncle length had

Table 1. Phenotypic (P) and genotypic (G) coefficients of correlation among plant height and its components in rice.

Chracters		I_1	I_2	I_3	I_4	I_5	Plant height
Peduncle	P	0.5986	0.5644	0.6780*	0.3488	0.6034**	0.8287**
	G	0.5953	0.6034	0.7482*	0.6074	0.8394**	0.8993**
I_1	P		0.9678**	0.9552**	0.3815	0.9078**	0.8521**
	G		0.9967**	1.0000**	0.5317	1.2000**	0.8833**
I_2	P			0.9435**	0.3152	0.9226**	0.8167**
	G			0.9551**	0.3352	1.1000**	0.8229**
I_3	P				0.5653	0.8341**	0.9481**
	G				0.6242	1.0000**	0.9562**
I_4	P					0.1896	0.6758*
	G					0.2623	0.7663*
I_5	P						0.7250*
	G						0.9168**

* Significant at P = 0.05; ** Significant at P = 0.01

a positive non-significant phenotypic correlation with I_5 length but it showed genotypic correlation (0.8394) which was significant and positive.

(ii) *I_1 length.* Both the phenotypic and genotypic correlations between I_1 and I_2, I_3 and I_5 and plant height were positive and highly significant.

(iii) *I_2 length.* Similarly I_2 length showed significant and positive phenotypic and genotypic correlations with I_3, I_5 and plant height. It showed non significant but positive phenotypic (0.3152) and genotypic (0.3352) correlations with I_4 length.

(iv) *I_3 length.* It had significant positive phenotypic and genotypic correlations with I_5 and plant height.

(v) *I_4 length.* I_4 length had non significant phenotypic (0.1896) and genotypic (0.2623) correlations with I_5 length, but with plant height it had positive significant phenotypic and genotypic correlations.

(vi) *I_5 length.* I_5 length showed positive significant phenotypic (0.7250) and genotypic (0.9168) correlations with plant height.

Path coefficient analysis

Peduncle length. Peduncle length had a substantial direct (0.3530) and indirect effects through I_3 (0.4479) and I_4 (0.1145) on plant height. The peduncle length had a minor negative effect on plant height trait too, indirectly through I_1 (–0.0080), I_2 (–0.0281) and I_5 (–0.0054) lengths.

(i) *I_1 length.* I_1 length had low negative direct (–0.0134) and substantial positive indirect effects through I_3, (0.5987) peduncle length (0.2102) and I_4 (0.1002) length on plant height. But the indirect influence of the trait on plant height through I_2 (–0.0047) and I_5 (–0.0077) length was negative.

(ii) *I_2 length.* It also had low direct negative (–0.0047) and substantial positive indirect effects through I_3 (0.5718) peduncle (0.2130) lengths on plant height. The influence of I_2 length indirectly through I_1 (–0.0133) and I_5 (–0.0071) was negative.

(iii) *I_3 length.* I_3 length had susbtantial positive direct effect (0.5987) and indirect effect through peduncle length (0.2641) and I_4 (0.1177) lengths. The indirect effects of the trait on plant height through I_1, I_2 and I_5 were negative.

(iv) *I_4 length.* I_4 length had enough positive direct (0.1885) and substantial indirect effects through I_3 (0.3737) and peduncle (0.2144) length on plant height. The trait showed negative and minor indirect effect on plant height through I_1 (–0.0071), I_2 (–0.0016) and I_5 (–0.0017) lengths.

(v) *I_5 length.* I_5 length had a negligible negative direct (–0.0064) and substantial positive indirect effects through I_3 (0.5987)peduncle (0.2963) lengths on plant

Table 2. Path analysis depicting direct (parentheses) and indirect effect of five internodal and peduncle length on plant height in rice.

Characters	Penducle length	I_1	I_2	I_3	I_4	I_5
Peduncle length	(0.3530)	–0.0080	–0.0281	0.4479	0.1145	–0.0054
I_1	0.2102	(–0.0134)	–0.0047	0.5987	0.1002	–0.0077
I_2	0.2130	–0.0133	(–0.0047)	0.5718	0.0632	–0.0071
I_3	0.2641	–0.0133	–0.0045	(0.5987)	0.1177	–0.0064
I_4	0.2144	–0.0071	–0.0016	0.3737	(0.1885)	–0.0017
I_5	0.2963	–0.0160	–0.0052	0.5987	0.0495	(–0.0064)

height. The indirect effect of the trait on plant height through I_1, I_2 and I_5 lengths was negative.

Estimates of genotypic correlations between I_1 and I_5, I_2 and I_5 lengths exceeded unity, which may be ascribed due to sampling error. But has been taken as one suggested by Ornan *et al.* [9].

Therefore it may be concluded that for selection of semidwarf plants, the criteria of short I_3, peduncle length and I_4 plays an important role.

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