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PATH COEFFICIENT ANALYSIS IN WHEAT

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Path coefficient analysis was performed on eight wheat varieties and advanced lines to study the interrelationship of grain yield and a few of its contributing components, like plant height, tillers per plant, grains per spike, peduncle length and 1000-grain weight. Significant positive genotypic correlations occurred among plant height, number of grains per spike, peduncle length and 1000-grain weight while phenotypic correlation coefficients were non-significant. Number of tillers per plant was positively related with grain yield both at genotypic and phenotypic levels. Peduncle length had a maximum (1.24) positive direct effect on grain yield, followed by 1000-grain weight, number of grains per spike and tillers per plant while plant height had negative direct effect. Peduncle length, 1000-grain weight, number of grains per spike and tillers per plant were the only characters which were found to contribute significantly to grain yield.

INTRODUCTION

Wheat being the major food staple of mankind, has always made the first call on breeders' attention. As a result, improvement of wheat yield has been their prime concern. Grain yield, a complex character, is the product of several interrelated factors which are highly susceptible to environmental variations. Estimate of their direct and indirect effects on yield is vital to the establishment of an effective breeding strategy. Path coefficient analysis provides an efficient tool for such estimation. Many plant breeders have used this technique in crop improvement and reported useful information on interrelationships between gain yield and its components. In most studies grain yield was positively correlated with its components such as plant height, number of spikes per plant and 1000-grain weight (Virk and Anand, Jaimini *et al.* (1975), Randhawa *et al.* (1975) Ketata *et al.* (1976), Sidhu *et al.* (1966), Devendra *et al.* (1979), Sinha and Sharma (1980). In the present investigation a number of wheat crosses involving some new lines were analysed for path coefficients for grain

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yield and yield components. The data obtained from this study are reported, which would be of interest to further rationalize the research in hand.

MATERIAL AND METHODS

The experimental material was comprised of 8 wheat varieties and advanced lines, LYP 73, PARI 73, PAK 81, LU26S, Indus 79, LU31, SS5 and 1407-5 66 which were sown in randomized complete block design with four replications during 1984-85. The plant-to-plant and row-to-row distance was 15 cm and 30 cm, respectively. At maturity, 15 competitive plants were selected randomly representing each genotype and replication for collecting data. The following characters were measured :

Plant Height : The main tiller of each plant was measured from the ground level to the tip of the spike.

Number of productive tillers per plant : Fertile tillers per plant were counted from the selected plants at maturity.

Number of grains per spike : The number of grains per spike were counted from the heads borne on the main tillers.

Peduncle length ; The length of peduncle was measured from the flag leaf node to the base of the spike, on the mother shoot.

1000-Grain Weight : From each plant, weight of 1000 randomly collected grains was recorded on the Mettler's balance.

Yield per plant : The grain products obtained from each plant was recorded and the average computed to arrive at single plant yield.

The data analysed according to Steel and Torrie (1960). Correlation coefficients were calculated as follows :

Phenotypic correlation coefficient :

$$r_P = \frac{M_{ij}}{\sqrt{(M_{ii})\,(M_{jj})}}$$

Genotypic correlation coefficient :

$$r_G = \frac{COV_{gij}}{\sqrt{(G^2_{gi})\,(G^2_{gj})}}$$

The path coefficients were calculated as according to Dewey and Lu (1959).

RESULTS AND DISCUSSIONS

Phenotypic and genotypic carrelations for all possible comparisons are presented in Table 1. In almost all the cases genotypic correlations were higher than the phenotypic correlations. Both the genotypic and phonotypic coefficients between plant height*and peduncle length were positive and highly significant ($P<0.01$). Significant and positive correlation between plant height and yield suggests that selection for taller dwarfs may lead to higher yields. Genotypic correlations between plant height, number of grains per spike and grain yield were positive and significant, and suggested the need for path coefficient analysis to ascertain the relative levels of contribution by these components to yield.

Table 1. *Phenotypic and genotypic correlation coefficients.*

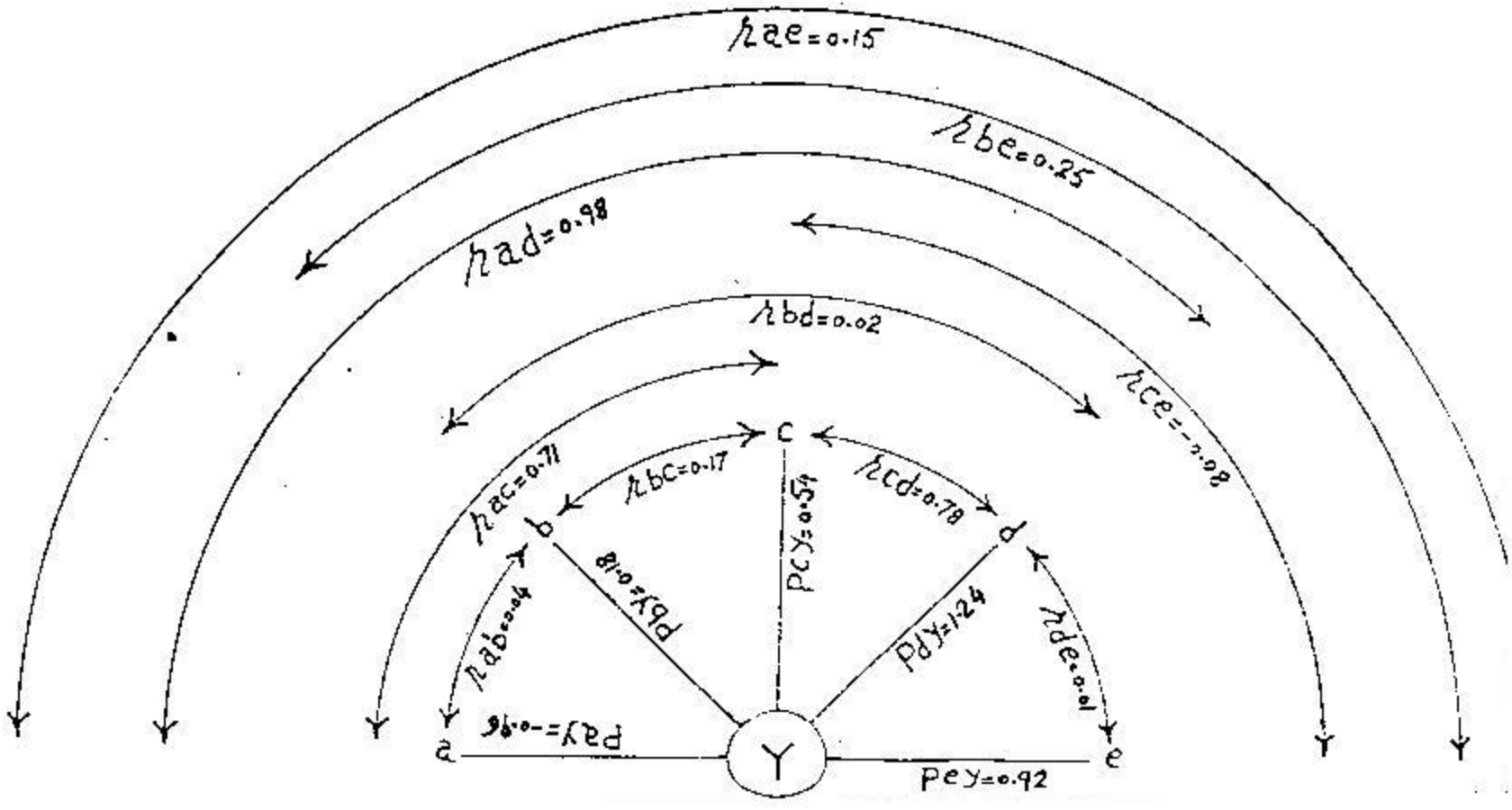
	Tiller number	Grain number	Peduncle length	1000-grain weight	Grain yield
Plant height	0.04	0.69	0.97**	0.14	0.68
	0.04	0.71*	0.98**	0.15	0.78*
Tiller		0 13	0.00	0.21	0.37
number		0.17	0.02	0 25	0.49
Grain number			0.75*	_0.09	0.67
			0.78*	_0.08	0.78
Peduncle				0.01	0.61
length				0.01	0.73*
1000-grain					0.62
weight					0.79*

The upper correlation in each cell is phenotypic.

The correlation coefficient must exceed 0.707 and 0.834 to be significant at the 0.05 and 0.01 levels, respectively.

The path diagram (Fig. 1) illustrates the relative condition of the yield components studied. Maximum direct effect was contributed by 1000-grain weight and number of grains per spike as is evident from the values obtained. Number of productive tillers per plant also had a direct positive but relatively small effect (0.18) on grain yield. Favourable correlations and direct effects of these variables suggest that yield enhancement can be obtained by selecting for these characters. Indirect effects via plant height (-0.04) and peduncle length (0.01) were very small indicating little progress via these pathways.

a = Plant height
b = No. of productive tillers
c = No. of grains per spike
d = Peduncle length
e = 1000-grain weight
y = Yield per plant



From this study it appears that effective selection from the material in hand for grain yield could be exercised on characters like tiller number, grains per spike, 1000-grain weight and plant height.

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