PATH COEFFICIENT STUDIES IN INDIAN MUSTARD (Brassica Juncea (L.) Czern & Coss.)

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Indian mustard is an important oilseed crop. It is preferred due to its tolerance against aphids,drought and high salt conditions where yellow sarson (B. campestris var. yellow sarson) suffers a considerable loss. Average national yield of this crop is, however, about 6 q/ha. While better agronomic inputs and optimum environmental conditions can raise the yield figure, it is realized that considerable room exists for the development of a highyielding strain in this crop.

Because of low heritability and high genotype x environment interaction for yield in many instances, seed yield cannot be used as a criterion for selection. In such cases selection based on the traits contributing towards yield is likely to be effective as regards the development of a highyielding strain. To ascertain the traits to be adopted for selection, correlation as well as path coefficient studies are essential.

Correlation between yield and its components have been worked out by Chaudhari (1967), Singh et al. (1969), Gupta (1972) and Kariyar and Singh (1974) in a varietal collection of Indian mustard. Information on the relative importance of direct and indirect influences of various traits on seed yield in a population including hybrids is very limited. The objectives of the present investigation were (1) to study the association of traits contributing towards yield, among themselves and with seed yield and (2) to obtain information on the direct and indirect effects of the contributing characters on seed yield.

MATERIALS AND METHODS

Sixteen hybrids were produced using Appressed Mutant and T 59 as male and h 300, P11/12,26/17, P11/7-1, BR-13,IB 64, Cult. V, T16,T6342, Rai 219,NSJ,Patan 67 and RG-6 as female parents. These hybrids and parents were grown during Rabi 1971-72 at the experimental farm, C.S.Azad University of Agriculture & Technology, Kanpur. Thirty one entries consisting of fifteen parents and sixteen hybrids were grown in a randomized complete block design with two replications. Inter-row spacing was 0.65 m. Data were recorded on random five competitive plants in each plot. A plot consisted of a single row of 5 m. long. The characters studied were plant height, number of primary and secondary branches per plant, number of siliqua per plant and grain yield per plant.

Path coefficient analysis was carried out in hybrids according to the method outlined by Dewey and Lu (1959).

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RESULTS AND DISCUSSION

The differences among treatments were highly significant for all the characters (Table 1). Results reveal that secondary branches, primary branches and plant height are highly, positively and significantly correlated with seed yield (Table 2). Similar results were obtained by Chaudhari (1967), Singh et al. (1969) and Gupta (1972). The number of siliqua per plant had positive but non-significant correlation with seed yield. This situation leads one to believe that to evolve high yielding genotypes out of this population one should select tall plants with large number of primary and secondary branches.

Path coefficient analysis permits the separation of correlation coefficient into measures of direct and indirect effects. (Wright 1921, Ramanujam and Rai 1963 and Paroda and Joshi 1970). Estimates of direct and indirect effect of path coefficients are also presented in Table 2. The path coefficient analysis of inter-relationship of plant height, number of primary and secondary branches and number of siliqua per plant with seed yield is shown diagramatically in Figure 1. The correlation coefficient between secondary branches and seed yield was 0.616 which is the highest among all pairs estimated in this study. Thus it is believed that secondary branch is the trait influencing the post upon seed yield. Direct path value, P35=0.701 indicates that the secondary branches have the major influence upon the seed yield. Besides, plant height and primary branches exert their maximum indirect influence upon seed yield through secondary branches.

On the basis of correlation, plant height is considered as third major factor exerting influence upon seed yield. Path analysis reveals that plant height is next to secondary branches in rendering direct influence upon seed yield. In addition, number of siliqua per plant exerted maximum indirect influence upon seed yield via plant height. Primary and secondary branches too exerted their major indirect influences through plant height. On the whole plant height proved to be the second most important factor exerting influence upon the seed yield.

The correlation between number of siliqua and seed yield (r=0.248) is not significant and this is the factor exerting least influence upon the seed yield. Path analysis reveals that the direct influence of the number of siliqua per plant upon the seed yield is negligible. It exerts major indirect influence through plant height and is followed by secondary branches. Thus, the number of siliqua per plant is found to be not a major important trait.

The correlation coefficient between primary branches and seed yield (r=0.609), is considerably high and suggests that primary branches have much to do in relation to seed yield. The path coefficient analysis reveals that the direct effect of primary branches on seed yield is negative (P25=0.236). In addition, the indirect effects of other traits through primary branches are negative. Thus the number of primary branches which seems to have a major influence upon seed yield on the basis of correlation studies can hardly be relied upon as a trait of importance. The result also reveals that the secondary branches and plant height are two traits through which yield is influenced an the estimated correlation raised mainly because of the influence exerted by these two traits.

On the basis of correlation as well as path analysis it may be concluded that to obtain high-yielding hybrids, selection should be based on the secondary branches and plant height.

TABLE 1

ANALYSIS OF VARIANCE FOR DIFFERENT CHARACTERS

Source of variation	D.f.	Mean squares				
		Plant height	No. of primary branches	No. of Secondary branches	No.of Siliqua per plant	Yield per plant
Treatments	30	714.22***	4.73**	91.73**	161573.95**	317.92**
Error	30	126.27	1.56	45.50	26790.01	129.12

**Significant at 1 percent level.

TABLE 2

PATH COEFFICIENT ANALYSIS SHOWING DIRECT AND INDIRECT EFFECTS OF 4 CHARACTERS ON SEED YIELD IN INDIAN MUSTARD

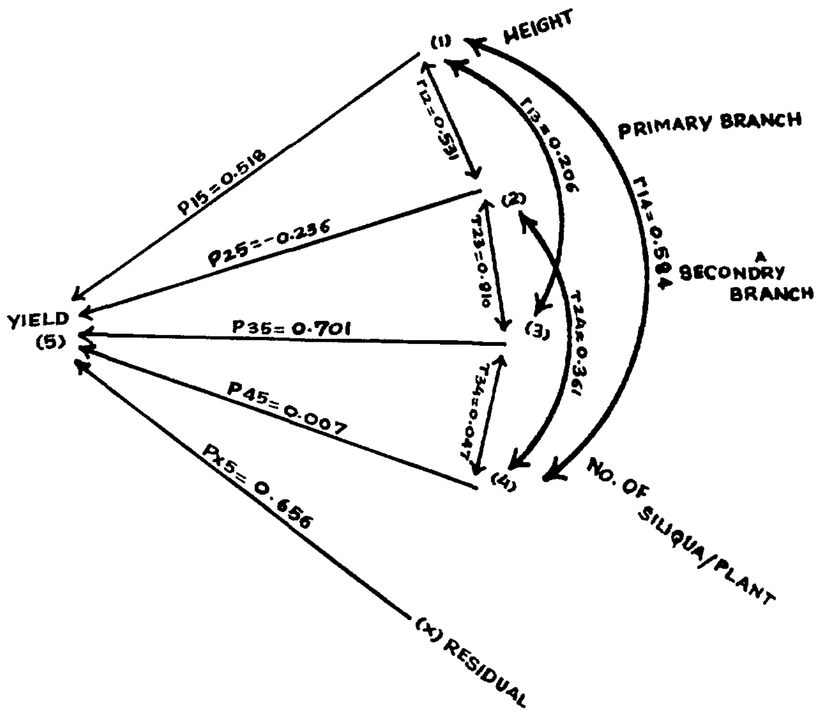
Character	Plant height	Number of primary branches	Number of secondary branches	Number of siliqua per plant	Correlation with yield
Plant height	0.518	-0.125	0.144	0.004	0.541
Number of primary branches	0.275	-0.236	0.567	0.002	0.609
Number of secondary branches	0.106	-0.191	0.701	0.000	0.616
Number of siliqua per plant	0.302	-0.092	0.032	0.007	0.248

Residual effects = 0.656

Note: Underlined figures denote the direct effects.

FIG. 1

PATH ANALYSIS IN INDIAN MUSTARD



Path coefficient analysis shows that there are some other characters of importance which have not been included in this study since $P_x = 0.656$. It may be of interest to include the major yield components such as seed weight, seeds per pod, etc. along with the present characters in path coefficient analysis.

SUMMARY

The materials consisted of sixteen hybrids produced using T59 and Appressed Mutant as pollinators, and thirteen female parents. The study revealed that the secondary branches and plant height are characters of prime importance on the basis of both path coefficient and correlation coefficient estimates. Primary branches with high correlation coefficient with yield do not appear to be a character of importance on the basis of path analysis.

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