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Path Coefficient Analysis of Grain Yield in Pearl Millet (*Pennisetum americanum* (L) Leeke)

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Nine parents and their 36 F1 hybrids were taken to study correlations among the yield and its components. Path analysis was also done to estimate the direct and indirect effects of these variables on yield. Plant height and number of internodes/main shoot were found to have positive and significant association with ear length, ear girth and hundred weight and negative association with Productive tillers/plant. Ear length was positively associated with hundred-grain weight. A negative association of grain yield with most of the characters except tillers/plant and productive tillers/plant was noted. Productive tillers showed maximum direct effect on grain yield thereby suggesting its importance as a character to be considered for selecting high yielding lines.

The knowledge of correlations helps in determining the component characters of a complex entity like yield but it does not give an exact picture of the relative importance of direct and indirect effects of the various yield attributes. Path analysis proposed by Wright (1921) facilitates the partitioning of the correlation coefficients into direct and indirect effects of various characters on grain yield or any other attribute. It also permits to study the specific forces acting to produce a given correlation in correlated variables. The present study deals with the estimation of correlation coefficients and the direct and indirect effects of one variable on the other through path analysis.

MATERIALS AND METHODS

The material comprising 9 parents and their 36 F_1 hybrids was grown in a randomized block design with 3 replications at R. B. S. College Research Farm, Bichpuri, Agra in *kharif* 1977. Each entry was assigned a single row of four meters length. The rows and plants within a row were spaced 50 cm and 15 cm apart, respectively. Observations were recorded on 10 randomly selected plants in each row for plant height, tillers per plant, fertile tilliers per plant, number of internodes per main shoot, ear length, ear girth, hundred-grain weight and grain yield per plant.

Phenotypic and genotypic correlation coefficients were calculated using the formulae suggested by Miller *et al.* (1958). The path coefficient analysis was done following Dewey and Ku (1959).

RESULTS AND DISCUSSION

The genotypic and phenotypic correlations are presented in Table-1.

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The results of correlation analysis revealed that in most of the cases the genotypic correlations were very high. However, the magnitude of both genotypic and phenotypic correlation was somewhat similar which indicated that the environmental influence was negligible and the actual genetic correlations were depicted without any marked change in degree. The association of plant height with number of ferile tillers per plant and grain yield per plant was negative though non-significant inspite of having a moderate positive correlation with total tillers per plant. Other characters like number of internodes per main shoot, ear length, ear girth and hundred-grain weight had positive and highly significant correlation at phenotypic and genotypic levels with plant height but none of these except ear girth contributed positively to grain yield though they themselves were interrelated with each other showing positive and significant correlations. Tillers per plant were found to have highly significant and positive association with fertile tillers and grain yield. With the remaining characters it showed positive but non-significant association. Fertile tillers per plant showed highly significant and positive association with grain yield per plant whereas with rest of the characters except year girth its association was negative. Internodes per main shoot showed positive and highly significant correlation with ear length, ear girth and hundred-grain weight but negative correlation with grain yield per plant. Ear length had positive and highly significant correlation only with hundred-grain weight.

The results of path anlysis summarised in Table II showed that plant height was directly responsible to decrease the grain yield per plant as it had negative direct effect on grain yield. Further its main positive indirect effect by increasing the ear length was neutralised by the negative indirect effects decreasing the number of productive tillers per plant and numbers of internodes per main shoot resulting in less number of ears per plant, less accumalation of net photosynthate due to less number of leaves per plant and less hundred grain weight and hence the reduced grain yield per plant. This also is indicated by negative association of grainyield with plant height and latter's indirect effect through hundred-grain weight. Moreover, the correlation analysis has also indicated that plant helght was negatively associated with number of productive tillers per plant. The stgnificant positive association of plant height with number of Internodes per main shoot and hundred-grain weight, therefore, did not depict the reality as they could not maintain the nature of correlation and showed negative contribution indirectly during the path analysis. The tillers per plant showed positive direct effect but its important contribution was indirectly through productive tillers per plant ultimately giving positive correlation with grain yield. Productive tillers per plant had highest direct contribution to grain yield. This character had also

positive indirect effect to augment grain yield through all the characters except ear length. Number of internodes per main shoot had negative direct effect on grain yield and has got nothing to do with the increase in grain yield as it increases the plant height and reduces the numbers of productive tillers per plant. The latter two characters showed negative indirect effects and also they were negatively interrelated. This character had high positive indirect effect oniy through ear length. The ear length had negative association with grain yield but its direct contribution was very high though it was neutralised by the high negative indirect effects via plant height, productive tillers per plant and number of indernodes per main shoot. This character showed positive indirect effects through tillers per plant and ear girth. Ear girth showed possitive correlation with grain yield which was maintained via sufficient positive indirect effects, increasing the number of productive tillers per plant and ear length inspite of high negative indirect effects via plant height, number of internodes per main shoot and hundred-grain weight. Hundred-grain weight had negative direct effect on grain yield and its high negative indirect effects through plant height, productive tillers per plant and number of internodes per main shoot had subdued the positive indirect effects via ear length and ear girth.

It is evident from correlation and path analysis that productive tillers per plant take the top priority position as its direct contribution to grain yield was exceptionally high. Burton (1951), Gupta and Athwal (1966) Phull *et al.* (1974), Gupta *et al.* (1976) Singh and Singh (1979) and Dhillon *et al.* (1977), however, have reported the total number of tillers per plant to be an important trait contributing to grain yield. In the present study this character showed comparatively lesser degree of desirable direct effect as compared to productive tillers per plant. Therefore, it is suggested that productive tillers per plant should be considered as an important trait for selecting high yielding lines.

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