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PATH ANALYSIS IN GROUNDNUT

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Abstract: Eighty groundnut varieties were raised in a randomised block design with three replications in upland during kharif. Pod yield and 17 characters were studied. Correlation coefficients at the genotypic and phenotypic levels were computed between pod yield and other characters and among themselves. Path analysis for dry pod yield was done considering eight important component characters.

Dry pod yield was highly correlated positively with fresh weight of pods, haulms yield, number of mature pods, number of immature pods, duration upto maturity and 100 pod weight at the genotypic level. Negative significant correlation was seen for pod yield with plant height at the 50th day, height of main shoot and length of top. Fresh weight of pods had the highest positive direct effect followed by 100 pod weight, haulms yield and number of mature pods whereas length of top, number of flowers, number of basal primary branches and number of leaves exerted negative direct effect to dry pod yield in that order.

INTRODUCTION

Yield in groundnut, as in other crops, is a polygenic complex character which depends on a number of fitness characters and as such direct selection of better plants may be misleading. This is all the more relevant to groundnut, since the economic produce is concealed and due to lack of clear-cut relationships between canopy characters and pod yield as pointed out by Prasad and Kaul (1980). Wright (1921) deviced the method of path coefficient analysis as a measure of partitioning the total correlation coefficients into their direct and indirect effects indicating the relative influence of various metric traits on the observed response. An insight into these relationships will be of use in visualising an ideal plant type for groundnut in kharif uplands of Kerala.

MATERIALS AND METHODS

Eighty divergent groundnut varieties of indigeaous and exotic orgin, selected from various sources were grown in a randomised block design, replicated thrice in uplands during Kharif 1982 at the Agricultural Research Station, Mannuthy. In each variety and replication, three rows of 10 plants each were grown at a spacing of 20 cm within and 30 cm between rows.

Five observational plants were marked at random from all the varieties in each replication avoiding the border plants. Eighteen metric traits were studied including oil content which was estimated by the cold percolation method of Kartha and Sethi (1957).

The analysis of variance technique was used to test the significance of variation of each character between varieties. Correlation coefficients between all the characters at the genotypic and phenotypic levels were computed. Path coefficient analysis for the economic trait, viz. dry pod yield at the genotypic level was carried out using eight selected characters as the causes and dry pod yield as the effect. The direct and indirect effects on the characters on pod yield were worked out.

RESULTS AND DISCUSSION

The coefficients of correlation at the genotypic and phenotypic levels between dry pod yield and the other 17 characters and among themselves were considered. At the genotypic level, the coefficients of correlation of dry pod

Table 1. Direct and indirect effects of eight component characters on pod yield under upland conditions during kharif

Sl. No.	Components	Direct effects	Indirect effects via								Total correlations
			No. of flowers	Length of top	No. of basal primary branches	Fresh weight of pods	Haulms yield	No. of leaves	No. of mature	100 pod weight	
1	No. of flowers	-0.073	-	0.084	-0.77	0.087	0.060	-0.079	0.009	0.009	0.011
2	Length of top	-0.245	0.022	--	0.022	-0.070	0.063	-0.011	0.017	0.012	-0.190
3	No. of basal primary branches	-0.226	-0.025	0.023	--	0.092	0.183	-0.140	0.020	0.109	0.037
4	Fresh weight of pods	0.923	-0.007	0.047	-0.022	--	0.064	-0.115	0.045	-0.040	0.896
5	Haulms yield	0.239	-0.018	-0.064	-0.173	0.249	--	-0.120	0.006	0.095	0.214
6	No. of leaves	-0.178	-0.023	-0.015	-0.178	0.124	0.162	--	0.024	0.124	0.030
7	No. of mature pods	0.069	0.009	0.061	0.066	0.604	-0.120	0.061	--	-0.061	0.690
8	100 pod weight	0.373	-0.001	-0.079	-0.066	-0.099	0.061	-0.059	0.040	--	0.168

Residue = 0.271

yield were positive and significant with fresh weight of pods, haulms yield, number of mature pods, number of immature pods, duration up to maturity and 100 pod weight. Dry pod yield was significantly and positively correlated with all the above characters except duration up to maturity and 100 pod weight at the phenotypic level in addition with number of flowers and number of basal primary branches. Similar relationships were reported earlier by Kushwaha and Tawar (1973) and Stephen *el al.* (1979). Negative significant correlation at the genotypic level was seen for pod yield with plant height at the 50th day, height of main shoot and length of top. In consonance with the result, Lin *et al.* (1969) recorded significant negative correlation between pod yield and height of main shoot.

The number of mature pods is correlated significantly and positively with fresh weight of pods and number of immature pods. But the character is correlated negatively and significantly with 100 pod weight and 100 kernel weight. This is in agreement with the report by Kushwaha and Tawar (1973). Haulms yield was correlated significantly with duration up to flowering, number of branches on the 50th day, duration up to maturity, number of flowers, height of main shoot, length of top, number of basal primary branches, fresh weight of pods, number of leaves, 100 pod weight and 100 kernel weight.

Pod yield was correlated moderately with duration up to maturity which in turn was found to be correlated significantly with duration up to flowering, number of branches on the 50th day, number of flowers, number of basal primary branches, fresh weight of pods, haulms yield, number of leaves, 100 pod weight and 100 kernel weight. Further, pod yield was highly but negatively correlated with plant height on the 50th day which was correlated positively

with height of main shoot, length of top, 100 pod and 100 kernel weights. These relationships indirectly support the conclusion made by Patra (1973) that high yielding forms will have shorter internodes at the flowering stage. The report of Patil (1972) that the coefficient of correlation between oil content and kernel weight was negative was found to be so in this investigation as well.

The path analysis at the genotypic level was done by considering eight selected characters as the causes and dry pod yield as the effect (Table 1). Fresh weight of pods had the highest positive direct effect on pod yield which was based on its very high positive genotypic correlation with pod yield. Chandola *et al*. 1973) recorded appreciable positive direct effect on pod yield by weight of green pods. Pod weight had the next highest positive direct effect on pod yield. The relatively low correlation coefficient as compared to the direct effect can be due to the negative indirect effect of this character through fresh weight of pods, number of flowers and number of basal primary branches. Pod weight exerted positive indirect effects through haulms yield and number of mature pods, both in turn were highly correlated with yield. Haulms yield registered appreciable positive diret effect which itself had correlated significantly with yield. Since the direct effects and correlation coefficients are almost equal in respect of fresh weight of pods and haulms yield, a direct selection on these fraits will result in the improvement of pod yield as pointed out by Singh and Chaudhary (1977). Number of mature pods had only a low positive direct effect even though the character recorded very high positive genotypic and phenotypic correlation with yield. The very high positive indirect effect of this trait through fresh weight of pods justifies the high positive correlation and the reported high positive direct effect of number of mature pods on yield, earlier by Singh *et al.* (1979).

The highest negative direct effect was produced by length of top which recorded a negative correlation, balancing the position. Number of flowers, number of basal primary branches and number of leaves also exerted negative influence. The indirect effects of these traits via the most important yield component viz., fresh weight of pods, were found to be positive, suggesting their significance.

An efficient plant type of groundnut for the upland to be cultivated in the cloudy and rainly kharif season should be genotypes of medium duration, having medium compact canopy with large number of basal primary branches of short internodes with moderate height/spread producing moderate number of flowers, setting more number of medium sized heavy pods so that a high yield of fresh pods with plumpy Kernels obtained.

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