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CORRELATION STUDIES IN GROUNDNUT

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Abstract: For effecting dependable selection in breeding groundnut varieties suited to kharif uplands and summer rice fallows, genotypic correlation studies and path analysis were done based on 18 characters collected from 80 divergent groundnut varieties and the results compared and contrasted. There are differences in the direction, degree of relationship and relative effects for important characters on the economic trait on both the situations. Hence, in selecting ideal genotypes for the two situations, differential considerations had to be given for the component characters.

INTRODUCTION

Groundnut is being grown traditionally in Kerala as a rainfed crop during kharif in uplands. A non-traditional, but potential area for commercial cultivation in the state is the summer rice fallows where it can be grown successfully with the residual moisture or with marginal irrigation. The varietal requirements to the kharif uplands in the monsoon period and the dry summer rice fallows are quite different. As pointed out by Nair (1978), lack of high yielding varieties suited to specific conditions is the major constraint for its wide spread cultivation.

Pod yield of groundnut is a polygenic complex character which depends on the action and interaction of a number of fitness characters and as such, direct selection may not be effective. This has added relevance to groundnut due to lack of clear cut relationships between canopy characters and pod yield as pointed out by Prasad and Kaul (1980) and the concealed nature of the economic produce. The path analysis as a method of partitioning the total correlation coefficients into their direct and indirect effects will provide the relative influence of various metric traits in the complex economic trait so that selection could be made effectively.

MATERIALS AND METHODS

Eighty groundnut varieties of indigenous and exotic origin were grown in a randomised block design, replicated thrice, during kharif in uplands and summer in rice fallows at the Agricultural Research Station, Mannuthy. In each variety and replication, three rows of ten plants each were grown at a spacing of 20 cm within and 30 cm between rows from which five observational plants were selected at random from every replication to record the data, avoiding the border plants. Eighteen characters were studied.

Correlation coefficients at the genotypic level between dry pod yield and other characters and among themselves were computed by referring to the formula of Aljibouri *et al.* (1958) and the significance tested by student Y test. Path coefficient analysis for dry pod yield was made considering eight characters as causal factors, viz., number of flowers, length of top, number of basal primary branches, fresh weight of pods, haulms yield, number of leaves, number of mature

pods and 100 pod weight as suggested by Wright (1921) and elaborated by Dewey and Lu (1959).

RESULTS AND DISCUSSION

The genotypic coefficient of correlation between dry pod yield and the other seventeen characters and among themselves are presented in Table 1. Pod yield was highly correlated positively with fresh weight of pods, haulms yield, number of mature pods, percentage of pod set and number of immature pods and moderately with duration up to maturity and 100 pod weight in kharif uplands. High positive correlation of pod yield in the summer rice fallows was noticed with length of top, fresh weight of pods, number of mature pods, percentage of pod set, number of immature pods and shelling percentage and at moderate level with oil content. Positive highly significant correlation between pod yield and number of mature pods is in conformity with the report of Rao (1980) and that between pod yield and oil content is in consonance with the result of Kuriakose (1981). Moderately significant negative correlation between pod yield and length of top was seen in kharif whereas in the summer highly significant negative correlation of pod yield was found with duration up to flowering and number of flowers and moderately with number of primary branches and number of branches.

Fresh weight of pods and number of mature pods were correlated and they in turn were correlated with a number of other important characters in both the situations. Duration up to maturity was correlated highly and positively with duration up to flowering, number of flowers, number of basal primary branches, number of branches, fresh weight of pods, haulm yield, number of leaves and 100 kernel weight and strongly but negatively with percentage of pod set; and at moderate level with number of mature and immature pods in the upland during kharif. Highly significant positive correlation of duration up to maturity was seen with duration up to flowering, length of top, number of basal primary branches, number of branches, fresh weight of pods, haulm yield, number of leaves, number of immature pods, 100 kernel weight and oil content and moderately with 100 pod weight in summer rice fallows.

Negative significant correlation between pod yield and duration up to flowering and highly significant positive correlation between duration up to flowering and maturity, but negative correlation value between pod yield and duration up to maturity in the summer rice fallow point out that early flowering as well as early maturing groundnut genotypes combining high yield can be evolved. Negative correlation between yield and duration up to maturity was reported earlier by Patra (1980). None of the adapted promising varieties is found to mature in the short span of about 90 days available in the summer rice fallows and as such this information will be of great practical value.

The results of the path analysis are presented in Table 2. Fresh weight of pods had the highest positive direct effect on pod yield on both the situations and was based on the high positive correlation between the traits. The second highest positive direct effect was registered by 100 pod weight in kharif whereas it had only negative effect in summer. Next to fresh weight of pods, number of leaves had the highest positive direct effect in summer, though the trait had negative

Table 1. Genotypic correlation coefficients between pod yield and 17 characters and among themselves in kharif upland (above the diagonal) and summer rice fallows (below the diagonal)

SI. No.	Characters	X1	X2	X3	X4	X5	X6	X7	X8
X1	Dry pod yield	-	0.086	0.160*	0.011	0.034	-0.190*	0.038	0.018
X2	Duration up to flowering	-0.209**	-	0.662**	0.097	-0.021	-0.119	0.650**	0.675**
X3	Duration up to maturity	-0.031	0.516**	-	0.308**	-0.089	-0.126	0.584**	0.629**
X4	No.of flowers	-0.272**	0.120	0.106	-	-0.247*	-0.304**	0.341**	0.469**
X5	Spread of flowering	-0.034	-0.175*	0.122	0.209**	-0.209**	-0.334**	-0.197*	-0.121
X6	Length of top	0.221**	0.052	0.442**	0.035	0.084	-	-0.097	-0.106
X7	No. of basal primary branches	-0.181*	0.757**	0.546**	0.259**	-0.184*	0.057	-	0.977**
X8	No.of branches	-0.185*	0.693**	0.545**	0.420**	-0.046	0.038	0.906**	-
X9	Fresh weight of pods	0.783**	0.104	0.368**	-0.329**	0.035	0.437**	0.113	0.101
X10	Haulm yield	0.094	0.483**	0.487**	0.231**	0.302**	0.374**	0.890**	0.914**
X11	No.of leaves	-0.150	0.669**	0.695**	0.293**	-0.020	0.327**	0.890**	0.914**
X12	No.of mature pods	0.509**	-0.001	0.053	-0.319**	-0.125	0.108	-0.229**	-0.199*
X13	Percentage of pod set	0.433**	-0.047	-0.018	-0.792**	-0.220**	0.046	-0.228**	-0.284**
X14	No.of immature pods	0.229**	0.160*	0.457**	0.104	0.104	0.093	0.242**	0.353**
X15	100 pod weight	-0.049	-0.142	0.185*	0.039	0.144	0.198*	0.197*	0.189*
X16	100 Kernel weight	0.039	0.248**	0.363**	0.080	0.175*	0.345**	0.577**	0.452**
X17	Shelling percentage	0.376**	-0.203**	0.053	-0.151	0.278*	0.104	-0.341**	0.300**
X18	Oil content	0.164*	0.262**	0.215**	-0.145	0.065	0.081	0.131	0.143

Sl. No.	X9	X10	X11	X12	X13	X14	X15	X16	X17	X18
X1	0.898**	0.214**	0.031	0.691**	0.572**	0.493**	0.169*	0.051	0.109	-0.143
X2	0.237**	0.562**	0.589**	-0.123	-0.243**	-0.063	0.082	0.424	0.178*	0.016
X3	0.294**	0.495**	0.546**	-0.201*	-0.278**	-0.189*	0.111	0.474**	0.025	-0.028
X4	-0.001	0.252**	0.448**	-0.125	-0.628	-0.187*	0.027	0.242**	-0.018	-0.156*
X5	0.043	-0.079	-0.147	0.122	-0.145	-0.151*	-0.167*	-0.202**	0.022	-0.110
X6	-0.195*	0.264*	0.063	-0.249**	0.056	0.148	0.325**	0.009	-0.250**	-0.006
X7	0.100	0.765**	0.789**	-0.295**	-0.318**	-0.159*	0.293**	0.584**	0.179*	0.166*
X8	0.103	0.792**	0.786**	-0.322**	-0.429**	-0.115	0.296**	0.539**	0.144	0.129
X9		0.270**	0.135	0.254**	0.561**	-0.378**	-0.108	0.183*	0.069	-0.060
X10	-0.032	-	-.677**	-0.087	-0.134	0.131	0.257**	0.382**	0.071	0.074
X11	0.176**	0.832**	-	-0.345**	-0.418**	-0.299**	0.334**	0.521**	-0.004	-0.003
X12	0.326**	-0.099	-0.103	-	-0.819**	0.514**	-0.576**	-0.454**	0.139	-0.039
X13	0.406**	-0.185	-0.164	0.751**	-	0.545**	-0.403**	-0.392**	0.146	0.005
X14	0.445**	0.437**	0.240**	0.087	-0.033	-	-0.186*	-0.270**	-0.046	0.198*
X15	0.246**	0.298**	0.209**	-0.584**	-0.305**	0.405**	-	0.724**	-0.305**	-0.010
X16	0.267**	0.479**	0.569**	-0.397**	-0.240**	-0.327**	0.532**	-	-0.043	-0.009
X17	0.114	-0.378**	-0.228**	0.513**	0.349**	0.366**	-0.337**	-0.234**	-	0.139
X18	0.195	0.137	0.169*	0.133	0.161*	-0.018	-0.122	-0.086	0.006	-

* Significant at 5 per cent level ** Significant at 10 per cent level

Table 2. Direct and indirect effects of eight component characters on pod yield in kharif uplands and summer rice fallows

Sl. No.	Components	Direct effects	No. of flowers	Length of top	No. of basal primary branches	Fresh weight of pods	Haulm yield	No. of leaves	No. of mature pods	100 pod weight	Total correl-ations
1.	No.of flowers	-0.074	-	0.084	-0.077	0.088	0.060	-0.079	0.009	0.009	0.011
		(0.174)	-	(0.006)	(-0.087)	(-0.362)	(-0.081)	(0.086)	(-0.002)	(0.007)	(-0.272)
2.	Length of top	-0.245	0.022	-	0.022	-0.071	0.063	-0.011	0.017	0.012	-0.190
		(-0.179)	(0.006)	-	(-0.019)	(0.480)	(-0.131)	(0.096)	(0.001)	(-0.032)	(0.221)
3.	No. of basal primary branches	-0.226	-0.025	0.024	-	0.093	0.184	-0.141	0.021	0.109	0.038
		(-0.341)	(0.044)	(-0.168)	-	(0.125)	(-0.067)	(0.261)	(-0.002)	(-0.032)	(-0.181)
4.	Fresh weight of pods	0.924	-0.007	0.048	-0.023	-	0.065	-0.115	0.046	-0.040	0.897
		(1.100)	(-0.057)	(-0.078)	(-0.039)	-	(-0.158)	(0.052)	(0.003)	(-0.040)	(0.783)
5.	Haulm yield	0.239	-0.019	-0.065	-0.173	0.249	-	-0.121	0.006	0.094	0.214
		(-0.350)	(0.040)	(-0.067)	(-0.220)	(0.496)	-	(0.244)	(-90.001)	(-0.049)	(0.094)
6.	No.of leaves	-0.179	-0.024	-0.015	-0.178	0.124	0.163	-	0.024	0.125	0.031
		(0.293)	(0.051)	(-0.059)	(-0.304)	(0.194)	(-0.291)	-	(-0.001)	(0.034)	(-0.150)
7.	No.of mature pods	0.069	0.009	0.061	0.067	0.604	-0.121	0.062	-	-0.062	**0.691**
		(0.007)	(-0.056)	(-0.019)	(0.078)	(0.399)	(0.035)	(-0.030)	-	(0.095)	(0.509)
8.	100 pod weight	0.374	-0.002	-0.079	-0.066	-0.099	0.062	-0.059	0.040	-	0.168
		(-0.163)	(-0.007)	(-0.036	(-0.067)	(0.271)	(-0.104)	(0.061)	(-0.004)	-	(-0.049)

Values for rice fallows are given in parentheses.

Residue = 0.271
(0.479)

non-significant correlation with yield. This can be due to its significant positive correlation with length of top, fresh weight of pods, 100 pod and kernel weights. But the direct effect of number of leaves in kharif is negative. Haulm yield had got appreciable effects on both situations, but in opposite directions. Number of mature pods had only low direct positive effect on pod yield in the two situations eventhough the character recorded high positive coefficient of correlation with yield. The very high positive indirect effect of this trait through fresh weight of pods in both the seasons justifies the high positive correlation and the earlier report of Singh *et al.* (1979) that number of mature pods had high positive direct effect on yield.

The highest negative direct effect on pod yield in kharif was produced by length of top which recorded negative correlation, balancing the position whereas in summer, the place was taken by haulm yield which had a non-significant positive correlation. Other attributes with negative direct effects in the kharif season were number of basal primary branches, leaves and flowers while those in the summer were number of basal primary branches, 100 pod weight and length of top.

Genotypes of medium duration, having medium compact canopy with more number of basal primary branches with medium height spread, producing moderate number of leaves and flowers, setting more number of medium sized mature pods with plumpy kernels will yield better in the uplands to be cultivated in the cloudy and rainy kharif season. But for the dry summer rice fallows, an ideal plant type will be one with compact semi-tall canopy with a few basal primary branches of short internodes, bearing moderate number of leaves, early in flowering, producing less number of flowers and setting more number of mature pods of medium size with heavy kernels of high shelling percentage and oil content. Such plants will be high yielding and early in maturity. More number of these plants could be accommodated efficiently in unit area, leading to still higher productivity.

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