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Character association and path analysis for yield and yield contributing traits and in Groundnut (*Arachis hypogaea* L.)

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Abstract
The experiment was done to evaluate the character association as well as direct and indirect effects by path analysis for pod yield and its components by employing thirty groundnut genotypes during *kharif* 2020. The extent of genotypical coefficient of correlation found higher compared to the respective phenotypical coefficient of correlation. The pod yield per plant displays highly significant and positive correlation with the traits number of mature pods per plant, kernel yield per plant, hundred kernel weight and sound mature kernel at both phenotypic and genotypic level. Path analysis divulged that the number of mature pods per plant had high positive direct effect on pod yield per plant.

Keywords: Groundnut, *kharif*, yield, character association, path analysis

Introduction
Groundnut (*Arachis hypogaea* L.) is widely planted throughout the tropics and subtropics, with both small and big commercial farmers dependent on it. Groundnut is the largest oil seed crop in India and is a major contributor to the vegetables oil deficiency of the country. Groundnuts are accessible all year in India due to a two-crop season produced in March and October. Because the economic portion of the groundnut known as the pod develops underneath the soil, predicting its performance based on aerial morphological characteristics is inconceivable (Weiss, 2000). In general, the plant breeder has a bigger stake in yield. Because pod yield is a polygenic trait, genetic enhancement in strictly pod yield is not achievable. Therefore, referring the correlated response selection, which involves numerous contributing elements that impact pod yield both directly and indirectly, will be most appropriate. Character association study examines the precise link between various plant features and assists plant breeders in developing selection criteria for pod yield in parental lines and segregating populations. There is no complete image of the causal foundation of association by the correlation coefficients. The trajectory co-efficiency study of various yield components offers a real image of this direct and indirect effect's relative relevance and gives an obvious interpretation of its yield relationship. Thus, present experiment was undertaken to understand correlation and path analysis in the groundnut genotypes.

Materials and methods
Thirty groundnut genotypes obtained from Oilseed Research Station, Latur were cultivated under rainfed condition in Randomized Block Design (R.B.D.) at research farm during *kharif* 2020. Each genotype assembled at the spacing of 30 cm in between rows and 10 cm within plants. The method of sowing followed was dibbling. One plant per hill was maintained by thinning 15 days after sowing. The recommended dose of 25 kg N + 50 kg P_20_5 per hectare was applied at the time of sowing. To ensure a healthy crop, all culturally specific techniques and plant protection measures were implemented. Findings was recorded on randomly selected five plants of each genotype and mean value was taken into consideration for statistical analysis for ten characters namely days to 50% flowering, days to maturity, plant height, number of mature pods per plant, pod yield per plant, kernel yield per plant, shelling percentage, hundred kernel weight, sound mature kernel and oil content. The phenotypic and genotypic correlation coefficient were computed by the formulae suggested by Falconer and Mackay (1964) [5] and path coefficient analysis was calculated as suggested by Wright (1921) [12] and elaborated by Dewey and Lu (1959) [4].

Result and discussion

Analysis of variance revealed highly significant differences among the genotypes for all the characters examined. This illustrated the existence of quite variation in all the characters for successful selection in the material under study. Findings observed, the genotypic correlation coefficient found higher than the corresponding phenotypic correlation coefficient indicating least influence of an environment on the expression of the traits (Table 1). Observation displayed pod yield per plant had positive significant association with the traits number of mature pods per plant, kernel yield per plant, hundred kernel weight and sound mature kernel. These findings show contiguity with earlier reports portrayed by various researchers.

The positive significant association between pod yield per plant and number of mature pods per plant by, Reddy *et al.* and (2017). Bhargavi *et al.* (2017) [8, 2] also reported that pod yield per plant positive significant association with kernel yield per plant. Bhargavi *et al.* (2015) and Rao *et al.* (2019) [1, 7] published that pod yield per plant had positive significant association with hundred kernel weight. Positive significant correlation between pod yield and sound mature kernel reported by Vachhani *et al.,* (2015) [11].

Pod yield per plant had negative significant correlation with plant height this result coincident with Hampannavar *et al.* (2019) as well as oil content had negative significant correlation with pod yield this result confirmative with Bharti *et al.* (2017) [3].

Characters number of mature pods per plant, kernel yield per plant and sound mature kernel had positive significant correlation with pod yield as well as with each other. This correlation shows that the improvement of the one character will enhance the others, which in turn will naturally raise the pod yield.

Path coefficient analysis demonstrated that number of mature pods per plant exhibited high and positive direct effect on pod yield per plant at both genotypic level phenotypic level (Table 2). This result shows coincidence with Solanki *et al.,* (2019) [9]. Also, number of mature pods per plant had highest indirect effect on pod yield per plant. Trait kernel yield per plant evinced high and positive direct effect on pod yield per plant at phenotypic level and moderate positive direct effect at genotypic level Tirkey *et al.,* (2018) [10] published similar kind of results. The character plant height shows moderate direct effect but in negative direction with pod yield per plant, report published by Ganvit and Jagtap (2018) [6] are looks familiar with these findings.

Table 1: Estimates of genotypic (G) and phenotypic (P) correlations for yield and yield contributing traits in groundnut

Sr. No.	Name of the Character		Days to 50% flowering	Days to maturiy	Plant height (cm)	No. of mature pods per plant	Kernel yield per plant (g)	Shelling percentage (%)	100 kernel weight (g)	Sound mature kernel (%)	Oil content (%)	Pod yield per plant (g)
1	Days to 50% flowering	r_g	1.000	0.502**	-0.128	0.334**	0.346**	0.396**	0.310*	0.242	-0.251	0.316*
		r_p	1.000	0.663**	-0.140	0.235	0.271*	0.197	0.237	0.211	-0.199	0.244
2	Days to maturity	r_g		1.000	0.101	0.157	0.154	0.582**	0.075	0.065	0.019	0.086
		r_p		1.000	-0.017	0.112	0.125	0.299*	0.084	0.135	0.024	0.079
3	Plant height(cm)	r_g			1.000	-0.958**	-0.930**	-0.010	-0.974**	-0.997**	0.950**	-0.977**
		r_p			1.000	-0.912**	-0.818**	0.028	-0.828**	-0.882**	0.828**	-0.865**
4	No. of mature pods per plant	r_g				1.000	0.943**	0.088	0.972**	0.991**	-0.965**	0.990**
		r_p				1.000	0.922**	0.012	0.932**	0.923**	-0.924**	0.977**
5	Kernel yield per plant (g)	r_g					1.000	0.369**	0.981**	0.949**	-0.928**	0.964**
		r_p					1.000	0.310*	0.973**	0.845**	-0.903**	0.950**
6	Shelling percentage (%)	r_g						1.000	0.241	0.143	-0.033	0.119
		r_p						1.000	0.205	0.004	-0.023	0.029
7	100 kernel weight(g)	r_g							1.000	0.913**	-0.967**	0.985**
		r_p							1.000	0.846**	-0.933**	0.954**
8	Sound mature kernel (%)	r_g								1.000	-0.948**	0.991**
		r_p								1.000	-0.850**	0.898**
9	Oil content (%)	r_g									1.000	-0.982**
		r_p									1.000	-0.934**
10	Pod yield per plant (g)	r_g										1.000
		r_p										1.000

* Indicates significance at 5% level

** Indicates significance at 1% level

Table 4.5: Genotypic and phenotypic path analysis for Direct (Diagonal) and Indirect (off diagonal) effects of yield components on seed yield

Sr. No.	Name of the Character		Days to 50% flowering	Days to maturity	Plant height (cm)	No. of mature pods per plant	Kernel yield per plant (g)	Shelling percentage (%)	100 kernel weight(g)	Sound mature kernel (%)	Oil content (%)	Pod yield per plant (g)
1	Days to 50% flowering	G	-0.0556	-0.0279	0.0071	-0.0186	-0.0193	-0.0221	-0.0173	-0.0135	0.0140	0.3168
		P	0.0138	0.0092	-0.0019	0.0033	0.0037	0.0027	0.0033	0.0029	-0.0027	0.2447
2	Days to maturity	G	-0.1350	-0.2688	-0.0274	-0.0424	-0.0416	-0.1565	-0.0202	-0.0177	-0.0052	0.0868
		P	-0.0086	-0.0130	0.0002	-0.0015	-0.0016	-0.0039	-0.0011	-0.0018	-0.0003	0.0794
3	Plant height (cm)	G	-0.0777	0.0618	0.6061	-0.5809	-0.5639	-0.0063	-0.5907	-0.6649	0.5758	-0.9770
		P	-0.0174	-0.0022	0.1239	-0.1130	-0.1014	0.0036	-0.1026	-0.1094	0.1026	-0.8653
4	No. of mature pods per plant	G	0.4845	0.2283	-1.3879	1.4481	1.3659	0.1276	1.4076	1.5947	-1.3978	0.9905
		P	0.1017	0.0487	-0.3941	0.4319	0.3984	0.0056	0.4027	0.3986	-0.3994	0.9779
5	Kernel yield per plant (g)	G	0.0999	0.0446	-0.2683	0.2720	0.2884	0.1066	0.2831	0.3027	-0.2678	0.9644
		P	0.1981	0.0918	-0.5976	0.6731	0.7298	0.2264	0.7102	0.6169	-0.6590	0.9509

6	Shelling percentage (%)	G	0.0334	0.0490	-0.0009	0.0074	0.0311	0.0842	0.0203	0.0120	-0.0028	0.1195
		P	-0.0409	-0.0620	-0.0060	-0.0027	-0.0642	-0.2070	-0.0425	-0.0009	0.0048	0.0293
7	100 kernel weight (g)	G	-0.0267	-0.0065	0.0838	-0.0836	-0.0844	-0.0208	-0.0860	-0.0958	0.0832	0.9859
		P	0.0037	0.0013	-0.0128	0.0145	0.0151	0.0032	0.0155	0.0131	-0.0145	0.9549
8	Sound mature kernel (%)	G	0.0167	0.0045	-0.0757	0.0760	0.0724	0.0099	0.0768	0.0690	-0.0724	0.9915
		P	0.0065	0.0042	-0.0272	0.0285	0.0261	0.0001	0.0261	0.0309	-0.0262	0.8988
9	Oil content (%)	G	-0.0228	0.0018	0.0861	-0.0875	-0.0842	-0.0030	-0.0878	-0.0951	0.0907	-0.9822
		P	-0.0121	0.0015	0.0503	-0.0561	-0.0548	-0.0014	-0.0567	-0.0516	0.0607	-0.9341

Residual (G): 0.0957, Residual (P): 0.0937. Dark figures denote direct effects.

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