

Research Article**Character association and path analysis for yield attributes in full sib progenies in Pigeonpea (*Cajanus cajan* (L.) Mill Sp.)**

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Abstract :

The estimates of nature and magnitude of association of seed yield with other components and their direct effects on seed yield were studied in Pigeonpea. Character association studies indicated that branches per plant, clusters per plant, pods per plant, pod length, seeds per pod and 100 seed weight were strongly associated with seed yield. Path coefficient analysis revealed that 100 seed weight, days to maturity, days to 50 per cent flowering, pod length and seeds per pod had high positive direct effect on seed yield. It is inferred that for improving seed yield in pigeonpea, due emphasis should be given on characters viz., branches per plant, clusters per plant, pods per plant, seeds per plant and 100 seed weight.

Key words: Pigeonpea, Correlation, Path coefficient analysis.

Introduction

Pigeonpea (*Cajanus cajan* (L.) Mill sp. (2n=22)) is the most important pulse crop in the world. It contains 21% protein. It is an important constituent of the Indian meal. Improvement over existing varieties is a continuous process and the increase in yield potential is the basic criteria in any crop improvement programme. The knowledge of association is useful to the breeders in the improvement of complex characters like yield through selection whereas the path analysis provides an effective means of partitioning direct and indirect causes of association (Wright, 1921). However scanty information is available on character association in pigeonpea. This is essential for planned heterosis breeding programme to give due weightage to the characters responsible for increased seed yield of hybrids. Correlation and path analysis thus help in identifying suitable selection criteria for improving the yield. The present investigation was undertaken to assess the correlation of yield contributing traits with seed yield and the direct and indirect effects of characters on seed yield in pigeonpea.

Material and methods

The experimental material consisted of full-sib progenies developed according to North Carolina Design-I from the cross combinations of MS Prabhat

DT x Vamban 1 and were raised adopting a spacing of 60 x 30 cm in three rows at Agricultural College and Research Institute, Madurai. Eight different male plants from F₂ populations were randomly selected and each male plant was crossed with randomly selected female plants (different from the selected male plants and were male sterile in nature). The progeny of each male x female plant constituted a full-sib family and progenies with common male parent were designated as one male group. Eight male groups were divided into two sets and each set contained four male groups each (16 matings). The sets were evaluated in randomized block design with two replications. In each replication the sets were randomized first. Within each set, the male groups were again randomized. Each full-sib family consisted of three rows. Each row was 4.5m in length. At the time of maturity, the observations on various traits like days to 50 per cent flowering, days to maturity, plant height, branches per plant, clusters per plant, pods per plant, pod length, seeds per pod, 100 seed weight and seed yield were recorded. The mean values were subjected to correlation analysis as per method given by Al-Jibouri *et al.* (1958) and path analysis according to Dewey and Lu (1959).

Results and discussion

The correlation coefficients among characters in F₃ and full-sibs are presented in Table 1. The data revealed that seed yield had highly significant and positive correlation with branches per plant, clusters

per plant, pods per plant, pod length, seeds per pod and 100 seed weight both in F_3 and full-sibs. Such positive interrelations between seed yield and these attributes have also been reported in pigeonpea by Brar (1993) and Sodavadiya *et al.* (2009). Except pods per plant and pod length, the remaining seven characters showed negative correlation coefficients with days to 50 per cent flowering.

All the characters except seed yield changed their association with days to maturity as positive in full-sibs. Except pod length and seed yield, all the other five characters showed positive association with plant height both in F_3 and full-sibs. No change was noticed in the direction of relationships with the branches per plant both in F_3 and full-sibs. But level of significance has changed in clusters per plant, seeds per pod, 100 seed weight and seed yield in F_3 and full-sibs. It was evident that reshuffling of genes responsible for correlation amongst some characters resulted in new recombinants which presumably were due to changes from a coupling to repulsion phase linkages. The results of correlation in present study revealed that branches per plant, clusters per plant, pods per plant, pod length, seeds per pod and 100 seed weight were the most important attributes which may contribute considerably towards higher seed yield.

Path coefficient analysis considers direct as well as indirect effects of the variables by partitioning the correlation coefficients. Path coefficient analysis in the present study revealed that 100 seed weight, days to maturity, days to 50 per cent flowering, pod length and seeds per pod in F_3 had high positive direct effect on seed yield per plant (Table 2). Thus these characters turned-out to be the major components of seed yield. Similar contribution of these characters on yield in pigeonpea was reported by Balakrishnam and Natarajaratnam (1989), Dahiya and Singh (1994), Dhameliya and Pathak (1995) and Sodavadiya *et al.* (2009).

The characters *viz.*, 100 seed weight, seeds per pod and branches per plant had maximum influence on seed yield through plant height, pod length *via* days to maturity, 100 seed weight, clusters per plant through branches per plant, 100 seed weight and pod length *via* clusters per plant, 100 seed weight, clusters per plant, seeds per pod, pod length through pods per plant, 100 seed weight, branches per plant and plant height *via* seeds per pod, seeds per pod, pods per plant, branches per plant and days to maturity *via* 100 seed weight. The indirect effect of clusters per plant *via* pods per plant was reported by Sodavadiya *et al.* (2009).

From the present study, it is inferred that for improving seed yield in pigeonpea due emphasis should be placed on characters *viz.*, branches per plant, clusters per plant, pods per plant, seeds per plant and 100 seed weight. All these five characters had positive correlation and had high direct and indirect effect on seed yield. Hence, seed yield can be improved in pigeonpea through selection of these characters.

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**Table 1. Correlation coefficients between different pairs of characters in F₃ and Full-sib progenies**

Characters	Progenies	Days to maturity	Plant height (cm)	Branches/plant	Clusters/plant	Pods/plant	Pod length (cm)	Seeds/pod	100 seed weight (g)	Seed yield (g)
Days to 50% flowering	F ₃	-0.289	-0.168	-0.196	-0.236	0.469*	0.145	-0.652**	-0.301	-0.559*
	Full-sibs	0.269	0.135	0.365	0.492*	0.222	0.172	0.251	0.553*	-0.411
Days to maturity	F ₃		-0.351	-0.235	-0.213	0.761**	-0.331	-0.474*	-0.157	-0.347
	Full-sibs		0.252	0.120	0.132	0.242	0.353	0.320	0.314	-0.748**
Plant height (cm)	F ₃			0.495*	0.660**	0.369	-0.194	0.652**	-0.331	-0.521*
	Full-sibs			0.198	0.479*	0.289	-0.137	0.156	0.258	-0.323
Branches /plant	F ₃				0.487*	0.632**	0.358	0.415	0.437*	0.652**
	Full-sibs				0.325	0.468*	0.349	0.452*	0.232	0.204
Clusters/plant	F ₃					0.468*	0.465*	-0.291	0.367	0.632**
	Full-sibs					0.292	0.398	0.192	0.471*	0.450*
Pods/plant	F ₃						0.368	0.233	0.561**	0.671**
	Full-sibs						0.358	-0.323	0.311	0.501*
Pod length (cm)	F ₃							0.122	-0.712**	0.468*
	Full-sibs							0.332	0.435*	0.356
Seeds/pod	F ₃								0.340	0.482*
	Full-sibs								0.236	0.212
100 seed weight (g)	F ₃									0.821**
	Full-sibs									0.498*

* Significant at 5% level

** Significant at 1% level



Table 2. Path coefficient analysis of seed yield with its components of F3 and full-sib progenies

Characters	Progenies	Days to 50% flowering	Days to maturity	Plant height (cm)	Branches/plant	Clusters/plant	Pods/plant	Pod length (cm)	Seeds/pod	100 seed weight (g)	Seed yield (g)
Days to 50% flowering	F ₃	15.526	-3.621	-1.654	1.365	-2.860	-2.615	3.256	-4.175	-6.693	-0.559*
	Full-sibs	4.236	1.032	-1.369	-1.359	0.654	-3.037	1.236	-1.290	-1.653	-0.411
Days to maturity	F ₃	-0.658	15.528	-0.651	1.023	-2.052	-3.369	-1.623	-3.359	-3.036	-0.347
	Full-sibs	5.369	1.325	-1.365	0.326	-2.369	-1.505	0.759	-2.369	0.962	-0.748**
Plant height (cm)	F ₃	-3.568	-4.365	6.359	-6.325	2.369	2.325	2.369	6.365	-1.263	-0.521*
	Full-sibs	2.364	0.136	-23.265	3.265	3.265	-1.656	0.326	-2.365	5.369	-0.323
Branches/plant	F ₃	-1.236	-2.365	3.621	-21.210	3.265	2.321	7.236	4.251	7.326	0.652**
	Full-sibs	-2.321	0.626	-0.627	9.365	-0.365	-4.237	-1.265	-1.365	-3.265	0.204
Clusters/plant	F ₃	-3.268	-5.362	2.369	-7.236	4.563	2.365	5.362	-4.236	5.236	0.632**
	Full-sibs	3.069	2.327	-1.236	2.366	3.245	-3.265	2.315	-1.236	-2.321	0.450
Pods/plant	F ₃	-5.236	-5.369	2.321	-111.23	2.320	4.325	5.236	2.321	11.023	0.671**
	Full-sibs	2.321	1.023	-1.236	3.265	1.236	-5.324	3.265	2.321	-1.023	0.501*
Pod length (cm)	F ₃	-2.325	-2.013	2.321	-7.426	1.236	2.365	15.324	2.321	-11.236	0.468*
	Full-sibs	2.231	1.236	-1.236	3.262	2.360	-3.236	2.365	-2.365	-2.321	0.356
Seeds/pod	F ₃	-6.325	-5.362	3.265	-3.265	-3.265	2.365	2.325	11.256	6.325	0.482*
	Full-sibs	2.302	2.321	-2.321	2.321	2.321	2.123	3.214	-3.265	-3.265	0.212
100 seed weight (g)	F ₃	-3.265	-3.265	-1.236	-11.203	2.321	3.265	-9.365	2.365	21.236	0.821**
	Full-sibs	2.365	3.265	-3.265	3.265	1.265	-2.321	1.236	-2.365	-6.325	0.498*

* Significant at 5% level

** Significant at 1% level

Dark figures denote direct effects

Residual effect for F3 : 0.2365

Residual effect for Full-sibs : 0.3562