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Character Association and Path Coefficient Analyses in Pigeonpea (*Cajanus cajan* (L.) Millsp.)

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ABSTRACT

Forty nine genotypes were studied for character association and path analysis for yield and twelve characters. The correlation study indicated that the number of pods per plant, harvest index, 100 seed weight, shelling percentage, days to 50% flowering and protein content had significant positive association with seed yield and simultaneous improvement of these characters along with seed yield is possible. Path coefficient analysis revealed that number of pods per plant, shelling percentage, harvest index, plant height and protein content had showed positive direct effects together with positive correlation on seed yield per plant.

Key words : Correlation, Path Coefficient Analysis, Pigeonpea.

Pigeonpea [*Cajanus cajan* (L.) Mills.] is originated from Indian Eastern Ghats. Its botanical name was derived from Malayein word ('Katchung') which is a corrupt form of 'Kandi' (Telugu word) that evolved from 'Kand' (Sanskrit for stem). (Nene, 2006). Direct selection for its yield is not reliable approach since it is influenced by the environment. Therefore it is essential to identify the component characters through which yield can be improved. In order to improve its yield the study of correlations will help the plant breeder to know how the improvement of one character will bring simultaneous improvement in other characters. In addition, path coefficient analysis is a standardized regression coefficient and measures the direct influence of one variable upon another. Present investigation was taken up to study the nature and extent of association of yield and yield components through correlation coefficients and path analysis.

MATERIAL AND METHODS

Forty nine genotypes of pigeonpea were sown in randomized block design with three replications at the Regional Agricultural Research Station, Lam, Guntur, during *kharif*, 2010-11. Each genotype was represented by six rows of four meter length in each replication with a spacing of 90 cm between rows and 20 cm within row. Crop was managed as per recommended package of practices. Observations were recorded on ten randomly selected plants without border effect of each genotype in each replication and the average values were subjected for statistical analysis except for days to 50% flowering, days to maturity, 100 seed weight and grain protein content which were recorded on plot basis. The data recorded on various characters were subjected to the statistical analysis using the software package Windostat version 8.6. (Rao, *et al*, 2010).

RESULTS AND DISCUSSION

The phenotypic and genotypic correlation coefficients between seed yield and other yield component characters and among themselves were given in Table 1. Genotypic correlations in general were higher than phenotypic correlations. This may be due to relative stability of genotypes as majority of them were subjected to certain amount of selection. The correlation study indicated that the number of pods per plant, harvest index, shelling percentage, 100 seed weight and days to 50% flowering had significant positive association with seed yield at genotypic level. So improvement in seed yield is possible by taking above characters as criteria in selection scheme.

Days to 50% flowering recorded significant positive association with number of pods per plant besides seed yield per plant. Days to maturity showed significant positive association with number of seeds and pod length. Plant height (cm) showed significant positive association with number

Table 1. Phenotypic (above diagonal) and genotypic (below diagonal) correlations in Pigeonpea genotypes.

Character	Days to 50% flowering	Days to maturity	Plant height (cm)	Primary branches/ plant	Secondary branches/ plant	Pods/ plant	Pod length (cm)	Seeds/ pod	Shelling Percent-age	100 seed weight (g)	Harvest index	Grain protein content (%)	Seed yield/ plant (g)
Days to 50% flowering	1.0000	0.1440	0.0388	0.0047	0.0294	0.2697**	-0.1368	0.0152	0.0157	0.0558	0.1001	-0.1001	0.1635*
Days to maturity	0.1081	1.0000	-0.0542	-0.1048	-0.1146	0.0026	0.2296**	0.1844*	-0.1770*	0.0328	-0.0355	0.0096	-0.003
Plant height (cm)	0.0388	-0.0142	1.0000	0.7759**	0.6592**	-0.0918	-0.2540**	0.1264	0.2031*	0.0178	-0.0956	0.1569	0.0450
Primary branches/ plant	0.0072	-0.1564	0.8443**	1.0000	0.8006**	-0.1340	-0.2855**	0.1790*	0.2723**	-0.0486	-0.1523	0.1478	-0.0517
Secondary branches/ plant	0.0282	-0.1923*	0.8036**	0.8901**	1.0000	0.0067	-0.1346	0.1666*	0.1606	-0.0332	-0.0587	0.0510	-0.0285
Pods/plant	0.3233**	0.1133	-0.1095	-0.1531	-0.0486	1.0000	0.0518	-0.0406	-0.0726	0.0395	0.2083*	-0.0012	0.5539**
Pod length (cm)	-0.1188	0.4325**	-0.3780**	-0.4372**	-0.3116**	0.0968	1.0000	0.2281**	-0.1157	0.0775	0.0970	0.0365	0.0405
Seeds/pod	0.0874	0.5221**	0.3131**	0.3117**	0.3146**	-0.0679	0.3626**	1.0000	0.0887	0.0979	-0.1288	0.1439	-0.1019
Shelling percentage	0.0957	-0.1715*	0.4715**	0.4906**	0.4168**	-0.2394**	-0.4345**	0.0645	1.0000	0.0126	0.0132	0.1003	0.1097
100 seed weight (g)	0.0529	-0.0073	0.0231	-0.0718	-0.0236	0.0640	0.3245*	-0.0975	-0.0467	1.0000	0.1345	0.0152	0.1435
Harvest index	0.1528	0.1235	-0.2258**	-0.2305**	-0.1098	0.3999**	0.1930*	-0.3434**	-0.0255	0.1844*	1.0000	-0.0293	0.4684**
Grain protein content (%)	-0.0245	-0.0789	0.2051*	0.1742*	0.0843	0.0398	0.0913	0.3615**	0.1888*	-0.1122	-0.0575	1.0000	0.1271
Seed yield/ plant (g)	0.2139**	0.0571	0.0257	-0.0532	0.0035	0.6614**	0.0893	-0.1433	0.2193*	0.2665**	0.5957**	0.1886*	1.0000

* = Significant at 5 % level, ** = Significant at 1 % level of confidence

Table 2 . Estimates of direct and indirect effects (genotypic) between yield and yield components in pigeonpea genotypes.

Character	Days to 50% flowering	Days to maturity	Plant height (cm)	Primary branches/ plant	Secondary branches/ plant	Pods/ plant	Pod length (cm)	Seeds/ pod	Shelling Percent-age	100 seed weight (g)	Harvest index	Grain protein content (%)
Days to 50% flowering	-0.0657	-0.0071	-0.0025	-0.0005	-0.0019	-0.0212	0.0078	-0.0057	-0.0063	-0.0035	-0.0100	0.0016
Days to maturity	-0.0002	-0.0018	0.0000	0.0003	0.0003	-0.0002	-0.0008	-0.0009	0.0003	0.0000	-0.0002	0.0001
Plant height (cm)	0.0053	-0.0019	0.1371	0.1158	0.1102	-0.0150	-0.0518	0.0429	0.0647	0.0032	-0.0310	0.0281
Primary branches/ plant	0.0001	-0.0012	0.0065	0.0076	0.0068	-0.0012	-0.0033	0.0024	0.0038	-0.0005	-0.0018	0.0013
Secondary branches/ plant	-0.0048	0.0330	-0.1381	-0.1529	-0.1718	0.0083	0.0535	-0.0541	-0.0716	0.0041	0.0189	-0.0145
Pods/plant	0.2075	0.0727	-0.0703	-0.0982	-0.0312	0.6417	0.0621	-0.0435	-0.1536	0.0411	0.2566	0.0255
Pod length (cm)	-0.0142	0.0516	-0.0451	-0.521	-0.0372	0.0115	0.1193	0.0432	-0.0518	0.0387	0.0230	0.0109
Seeds/pod	-0.0069	-0.0412	-0.0247	-0.0246	-0.0248	0.0054	-0.0286	-0.0789	-0.0051	0.0077	0.0271	-0.0285
Shelling percentage	0.0413	-0.0741	0.2036	0.2119	0.1800	-0.1034	-0.1877	0.0279	0.4319	-0.0202	-0.0110	0.0815
100 seed weight (g)	0.0081	-0.0011	0.0035	-0.0110	-0.0036	0.0098	0.0498	-0.0149	-0.0072	0.1533	0.0283	-0.0172
Harvest index	0.0462	0.0374	-0.0683	-0.0697	-0.0332	0.1210	0.0584	-0.1039	-0.0077	0.0558	0.3026	-0.0174
Grain protein content (%)	-0.0029	-0.0092	0.0240	0.0204	0.0099	0.0047	0.0107	0.0423	0.0221	-0.0131	-0.0067	0.1170
Seed yield/ plant (g)	0.2139**	0.0571	0.0257	-0.0532	0.0035	0.6614**	0.0893	-0.1433	0.2193*	0.2665**	0.5957**	0.1866*

* = Significant at 5 % level, ** = Significant at 1 % level of confidence; Residual effect = 0.477,

Diagonal values indicate direct effects

of primary branches per plant, number of secondary branches per plant, shelling percentage, seeds per pod and protein content. Number of primary branches per plant showed significant positive association with number of secondary branches per plant, shelling percentage and protein content. Number of secondary branches per plant showed significant positive association with shelling percentage and number of seeds per pod. Number of pods per plant showed significant positive association with harvest index besides seed yield per plant. Pod length showed significant positive association with seeds per pod, 100 seed weight and harvest index. Number of seeds per pod showed significant positive correlation with protein content**.** Shelling percentage showed significant positive association with protein content besides seed yield per plant. 100 seed weight showed positive significant association with harvest index in addition to seed yield per plant. Positive correlation indicates possible simultaneous improvement {Vasantha Rao *et al*. (2010) and Bhanuprakash (2011)}.

The direct and indirect effects of different yield components on seed yield worked out through path analysis at phenotypic and genotypic levels (Table 2). Path coefficient analysis revealed that pods per plant, shelling percentage, harvest index, 100 seed weight, plant height, pod length and protein content had showed positive direct effects together with positive correlation on seed yield per plant. The correlation coefficients were positive but the direct effects were negative for days to 50 % flowering, Days to maturity and number of secondary branches per plant indicating the indirect effects because of positive correlation. In such situations, the indirect causal factors are to be considered simultaneously for selection. Contrary to the fore mentioned situation, Correlation coefficients were negative but the direct effects were positive for number of primary branches per plant. Under these circumstances, a restricted simultaneous selection model is to be followed i.e. restrictions to be imposed to nullify the undesirable indirect effects in order to make use of the direct effect. These results are in agreement with the previous reports (Sodavadia, *et al*, 2010; Vasantha Rao *et al*., 2010 and Bhanu Prakash, 2011).

In the present study the residual effect values were (0.704 and 0.477) at phenotypic and genotypic levels, respectively. This clearly shows the importance of inclusion of some more characters for clear partition of the direct and indirect effects among the yield components and seed yield per plant.

Character association and Path coefficient analysis revealed that number of pods per plant, shelling percentage, harvest index, plant height and protein content had showed positive direct effects together with positive correlation on seed yield per plant.

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