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Character Association and Path Coefficient Analyses Based on Metric and Physiological Traits in Pigeonpea {*Cajanus Cajan* (L.) Millsp.}

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ABSTRACT

Forty five genotypes were studied for character association and path analysis. Observations were recorded on 21 characters *viz*., plant height (cm), days to 50% flowering, days to maturity, number of primary branches per plant, number of secondary branches per plant, number of pods per plant, pod length (cm), number of seeds per pod, shelling percentage (%), 100 seed weight (g), seed yield per plant (g), grain protein content (%), harvest index, leaf area index (LAI) at vegetative stage, LAI at flowering stage, specific leaf area (SLA) at vegetative stage (cm^2/g), SLA at flowering stage (cm^2/g), Specific Leaf Weight (SLW) at vegetative stage (mg/cm^2), SLW at flowering stage (mg/cm^2), relative water content (RWC) at vegetative stage (%) and RWC at flowering stage (%). The correlation study indicated that the plant height, days to 50% flowering, days to maturity, number of secondary branches per plant, pods per plant, shelling percentage, harvest index, LAI at flowering stage, SLA at vegetative stage and SLA at flowering stage had significant positive association with seed yield and simultaneous improvement of these characters along with seed yield is possible. Path coefficient analysis revealed that shelling percentage, SLA at vegetative stage, plant height, days to maturity, number of primary branches per plant and pods per plant had showed maximum positive direct effects on seed yield per plant indicating true relationship.

Key words : Correlation, Path Coefficient Analysis, Pigeonpea.

Pigeonpea [*Cajanus cajan* (L.) Mills.] is predominantly rainfed kharif pulse crop and 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. Though efforts were made in this crop on metric traits towards this goal (Vasantha Rao *et al.*, 2010), not much work was done on physiological traits that influence the yield and stress tolerance. In pursuit of this objective, 45 genotypes were utilized to study the nature and extent of association of metric and physiological traits through correlation coefficients and direct and indirect effects through path analysis.

MATERIAL AND METHODS

Forty five genotypes of pigeonpea [*Cajanus cajan* (L.) Millsp.] were sown in randomized block design with three replications at the Regional Agricultural Research Station, Lam, Guntur, during *kharif*, 2009-10. 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 recommendation the standard practices. Observations were recorded on ten randomly selected plants without border effect of each genotype in each replication and the mean 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 21 characters were subjected to statistical analyses using the software package Windostat version 8.6. (Vasantha Rao *et al.*, 2010).

RESULTS AND DISCUSSION

The phenotypic and genotypic correlation coefficients between seed yield and other metric and physiological traits 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 shelling percentage (0.7685**), harvest index (0.7488**), number of secondary branches per plant (0.5516**), number of pods per plant (0.5412**), SLA at flowering stage (0.4044**), plant height (0.4128**), days to 50% flowering (0.277**), SLA at vegetative stage (0.2737**), days to maturity (0.2372**) and LAI at flowering stage (0.1858*) 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.

Similarly, significant positive association was observed between days to 50% flowering with days to maturity (0.4758**), number of primary branches per plant (0.575**), number of secondary branches per plant (0.2244**), number of pods per plant (03512**), harvest index (0.2274**) and SLA at vegetative stage (0.2697**); days to maturity with number of pods per plant (0.2653**), 100 seed weight (0.4847**), harvest index (0.2297**), LAI at vegetative stage (0.2607**), SLA at vegetative stage (0.4807**) and RWC at vegetative stage (0.1985*); plant height with number of secondary branches per plant (0.495**), number of pods per plant (0.1811*), 100 seed weight (0.1927*), LAI at flowering stage (0.2205*), SLA at vegetative stage (0.2211*) and RWC at vegetative stage (0.2326**); number of primary branches per plant with number of secondary branches per plant (0.1724*), number of pods per plant (0.284**) and SLW at vegetative stage (0.2272**); number of secondary branches per plant with number of pods per plant (0.4873**), shelling percentage (0.5151**), harvest index (0.2747**), SLA at vegetative stage (0.3718**) and SLA at flowering stage (0.2951**); number of pods per plant with shelling percentage (0.223**), harvest index (0.4847**), LAI at vegetative stage (0.2143*), LAI at flowering stage (0.249**) and SLA at vegetative stage (0.3172**); pod length with number of seeds per pod (0.4119**), 100 seed weight (0.5433**), grain protein content (0.1736*), SLW at vegetative stage (0.3643**) and SLW at flowering stage (0.2372**); number of seeds per pod with grain protein content (0.3718**), SLA at flowering stage (0.1921*) and SLW at vegetative stage (0.5763**); shelling percentage with harvest index (0.6775**), LAI at vegetative stage (0.1762*) and LAI at flowering stage (0.2215**); 100 seed weight with SLA at vegetative stage (0.2288**); grain protein content with SLW at flowering stage (0.1813*); harvest index with LAI at vegetative stage (0.2969**), LAI at flowering stage 90.2112*) and SLA at flowering stage (0.4029**); LAI at vegetative stage with LAI at flowering stage (0.8159**) and RWC at flowering stage (0.2123*); LAI at flowering stage with RWC at flowering stage (0.2962**); SLA at vegetative stage with SLA at flowering stage (0.6484**); SLA at flowering stage with RWC at vegetative stage (0.2675**); and SLW at vegetative stage with SLW at flowering stage (0.6486**). Baskaran and Muthaiah (2007), Deshmukh *et al.* (2000), Khapre and Nerker (1992), Laxman Singh *et al.* (1977), Narsi Reddy and Ratna Kumari (2004), Painawadee *et al* (2009) and Vasantha Rao *et al*. (2010) also reported significant positive correlations for among than characters.

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 diagram showing cause effect relationship of direct effects with seed yield is given in Figure 1. Path coefficient analysis revealed that shelling percentage (2.8845 & 0.7685), SLA at vegetative stage (2.5688 & 0.2737), plant height (2.3884 & 0.4128), days to maturity (1.5589 & 0.2372), number of primary branches per plant (1.0945 & 0.0018) and pods per plant (0.939 & 0.5412) had showed positive direct effects together with positive correlation on seed yield per plant revealing their true relationship and direct selection for them will result in yield improvement. The correlation coefficients were positive but the direct effect were negative for days to 50 % flowering (0.277 & -0.5741), number of secondary branches per plant (0.5516 & -2.5314), seeds per pod (0.1157 & -0.4758), harvest index (0.7488 & -0.6655), LAI at vegetative stage (0.1369 & -0.766), LAI at

Table 1. Phenotypic (above diagonal) and genotypic (below diagonal) correlations for 21 characters in 45 pigeonpea [*Cajanus cajan* (L.) Millsp.] genotypes.

Character	Plant height (cm)	Days to 50% flowering	Days to maturity	Primary branches/ plant	Secondary branches/ plant	Pods / plant	Pod length (cm)	Seeds/ pod	Shelling percentage	100 seed weight (g)
Plant height (cm)	1.0000	-0.1108	-0.1499	-0.1373	0.4355**	0.1595	-0.1156	-0.0760	0.1568	0.1587
Days to 50% flowering	-0.0638	1.0000	0.3403**	0.3704**	0.1394	0.2734**	-0.0345	0.0267	0.0408	0.0584
Days to maturity	0.0369	0.4758**	1.0000	-0.1333	-0.0248	0.1467	-0.0199	-0.0127	-0.0575	0.2111*
Primary branches/ plant	-0.1607	0.5750**	-0.2770**	1.0000	0.1575	0.2606**	0.0816	0.0919	0.0361	-0.2045*
Secondary branches/ pant	0.4950**	0.2244**	0.0586	0.1724*	1.0000	0.4529**	-0.1493	-0.1000	0.3655**	-0.0125
Pods/ plant	0.1811*	0.3512**	0.2653**	0.2840**	0.4873**	1.0000	-0.0875	0.0077	0.1838*	-0.1977*
Pod length (cm)	-0.2731**	0.0500	-0.1274	0.0495	-0.2310**	-0.1825*	1.0000	0.5204**	-0.0327	0.2824**
Seeds/ pod	-0.2846**	0.1208	-0.0280	0.0613	-0.1541	0.0532	0.4119**	1.0000	-0.0274	0.0410
Shelling percentage	0.1540	0.0369	-0.0149	0.0476	0.5151**	0.2230**	-0.1577	-0.0696	1.0000	-0.0734
100 seed weight (g)	0.1927*	0.1253	0.4847**	-0.2531**	-0.0290	-0.2617**	0.5433**	0.1656	-0.2290**	1.0000
Grain protein content (%)	-0.0601	-0.0478	-0.1091	0.0250	0.1164	0.0556	0.1736*	0.3718**	-0.2786**	-0.1416
Harvest index	0.1356	0.2274**	0.2297**	0.1559	0.2747**	0.4847**	-0.2376**	-0.0658	0.6775**	-0.2269**
LAI at vegetative stage	0.1436	0.1410	0.2607**	0.0326	0.0684	0.2026*	-0.3223**	-0.0759	0.1762*	-0.0677
LAI at flowering stage	0.2205*	0.0931	0.1115	0.1238	0.0801	0.2143*	0.0478	0.0726	0.2215**	0.1045
SLA at vegetative stage (cm^2/g)	0.3080**	0.2697**	0.4807**	-0.0797	0.3718**	0.2490**	-0.3359**	-0.5806**	-0.0522	0.2288**
SLA at flowering stage (cm^2/g)	0.2211**	0.1315	0.0422	-0.1586	0.2951**	0.3172**	-0.3196**	0.1921*	0.0963	0.1175
SLW at vegetative stage (mg/cm^2)	-0.4186**	-0.0962	-0.2984**	0.2272**	-0.3181**	-0.1283	0.3643**	0.5763**	-0.1569	-0.2589**
SLW at flowering stage (mg/cm^2)	-0.1845*	-0.1776*	-0.1781*	0.0937	-0.4044**	-0.4822**	0.2372**	0.1621	-0.3094**	-0.2011*
RWC at vegetative stage (%)	0.2326**	-0.2155*	0.1985*	-0.2413**	0.1259	0.0839	-0.0905	0.1078	0.1387	0.0656
RWC at flowering stage (%)	-0.0506	-0.1290	-0.1525	-0.0444	-0.0602	-0.2708**	-0.0287	-0.1887*	-0.0576	-0.0875
Seed yield/ plant	0.4128**	0.2770**	0.2372**	0.0018	0.5516**	0.5412**	-0.0926	0.1157	0.7685**	-0.0099

Table 1. continued.....

Character	Grain protein content (%)	Harvest index	LAI at vegetative stage	LAI at flowering stage	SLA at vegetative stage (cm^2/g)	SLA at flowering stage (cm^2/g)	SLW at vegetative stage (mg/cm^2)	SLW at flowering stage (mg/cm^2)	RWC at vegetative stage (%)	RWC at flowering stage (%)	Seed yield / plant (g)
Plant height (cm)	-0.0392	0.1094	0.1026	0.0892	0.2607**	0.1055	-0.1986*	-0.1497	0.1805*	-0.0509	0.3401**
Days to 50% flowering	-0.0451	0.1427	0.0672	0.0521	0.2189*	0.0442	-0.0889	-0.1282	-0.1315	-0.0950	0.2045*
Days to maturity	-0.0785	0.0674	0.1452	0.1529	0.1701*	-0.0075	-0.1653	-0.0919	0.1123	-0.1008	0.1257
Primary branches/ plant	0.0290	0.0830	-0.0069	0.0415	-0.0317	-0.0469	0.1287	0.0477	-0.1620	-0.0343	0.0332
Secondary branches/pant	0.1134	0.2255**	0.0309	0.0411	0.2756**	0.1585	-0.1889*	-0.3382**	0.1260	-0.0560	0.5049**
Pods/ plant	0.0582	0.4374**	0.1222	0.1117	0.2172*	0.1636	-0.1165	-0.3902**	0.0818	-0.2262**	0.5997**
Pod length (cm)	0.1197	-0.1219	-0.1252	0.0936	-0.2208*	-0.1919*	0.1901*	0.0235	-0.0345	-0.0287	-0.0340
Seeds/ pod	0.1686	-0.0563	0.0960	0.0834	-0.2449**	-0.0748	0.2376**	-0.0439	0.0567	-0.1168	0.0374
Shelling percentage	-0.1965*	0.4740**	0.1007	0.1575	0.0191	0.0795	-0.0974	-0.1593	0.0844	-0.0471	0.5621**
100 seed weight (g)	-0.1094	-0.1318	-0.0110	0.1017	0.1065	0.0635	-0.0486	-0.1499	-0.0172	-0.0726	0.0110
Grain protein content (%)	1.0000	-0.3195**	0.0480	-0.0757	-0.0640	-0.1870*	-0.0172	0.1501	-0.0831	-0.0303	-0.2044*
Harvest index	-0.4006**	1.0000	0.2150*	0.1364	0.0777	0.1900*	-0.1296	-0.3306**	0.0957	-0.0065	0.6421**
LAI at vegetative stage	0.0713	0.2969**	1.0000	0.5181**	0.0166	-0.0497	-0.0321	-0.0987	-0.0797	0.1794	0.0772
LAI at flowering stage	-0.0979	0.2112*	0.8159**	1.0000	0.0377	-0.1195	0.0399	-0.0751	-0.2078*	0.2300**	0.0963
SLA at vegetative stage (cm^2/g)	-0.0767	0.1022	0.0450	0.0037	1.0000	0.2820**	-0.5902**	-0.2776**	0.0622	-0.0368	0.2333**
SLA at flowering stage (cm^2/g)	-0.3010**	0.4029**	-0.1296	-0.1160	0.6484**	1.0000	-0.2156*	-0.5198**	0.1209	-0.1802*	0.2122*
SLW at vegetative stage (mg/cm^2)	-0.0278	-0.1803*	-0.0360	-0.0099	-0.8024**	-0.5103**	1.0000	0.3508**	-0.0921	0.1297	-0.2172*
SLW at flowering stage (mg/cm^2)	0.1813*	-0.4671**	-0.0649	-0.0906	-0.4931**	-0.8339**	0.6486**	1.0000	-0.1248	0.1618	-0.3652**
RWC at vegetative stage (%)	-0.0863	0.1061	-0.0852	-0.2350**	0.0840	0.2675**	-0.1292	-0.1652	1.0000	0.0183	0.1362
RWC at flowering stage (%)	-0.0260	-0.0278	0.2123*	0.2962**	-0.0828	-0.2915**	0.1787	0.1969	0.0015	1.0000	-0.1972
Seed yield/ plant	-0.2306**	0.7488**	0.1369	0.1858*	0.2737**	0.4044**	-0.2716**	-0.4475**	0.1545	-0.2435**	1.0000

Table 2. Estimates of direct and indirect effects (genotypic) between yield and yield components in pigeonpea [*Cajanus cajan* (L.)Millsp.]

Character	Plant height (cm)	Days to 50% flowering	Days to maturity	Primary branches/ plant	Secondary branches/ plant	Pods / plant	Pod length (cm)	Seeds/ pod	Shelling percentage	100 seed weight (g)
Plant height (cm)	2.3884	-0.1524	0.0882	-0.3838	1.1822	0.4325	-0.6522	-0.6796	0.3678	0.4603
Days to 50% flowering	0.0366	-0.5741	-0.2731	-0.3301	-0.1288	-0.2016	-0.0287	-0.0694	-0.0212	-0.0719
Days to maturity	0.0576	0.7417	1.5589	-0.4317	0.0913	0.4135	-0.1986	-0.0437	-0.0233	0.7556
Primary branches/ plant	-0.1759	0.6293	-0.3031	1.0945	0.1887	0.3108	0.0542	0.0671	0.0522	-0.2770
Secondary branches/ pant	-1.2530	-0.5679	-0.1483	-0.4364	-2.5314	-1.2336	0.5847	0.3901	-1.3039	0.0734
Pods/ plant	-0.1701	-0.3298	-0.2491	-0.2667	-0.4576	0.9390	0.1714	-0.0500	-0.2094	0.2457
Pod length (cm)	-0.0141	0.0026	-0.0066	0.0026	-0.0119	-0.0094	0.0517	0.0213	-0.0081	0.0281
Seeds/ pod	0.1354	-0.0575	0.0133	-0.0292	0.0733	-0.0253	-0.1960	-0.4758	0.0331	-0.0788
Shelling percentage	0.4442	0.1065	-0.0430	0.1374	1.4858	0.4652	-0.4548	-0.2009	2.8845	-0.6605
100 seed weight (g)	-0.0836	-0.0544	-0.2102	0.1098	0.0126	0.1135	-0.2357	-0.0718	0.0993	-0.4338
Grain protein content (%)	-0.1101	-0.0876	-0.1998	0.0458	0.2132	0.1018	0.3180	0.6811	-0.5103	-0.2593
Harvest index	-0.0903	-0.1513	-0.1529	-0.1037	-0.1828	-0.3226	0.1581	0.0438	-0.4509	0.1510
LAI at vegetative stage	-0.1100	-0.1080	-0.1997	-0.0250	-0.0524	-0.1552	0.2469	0.0581	-0.1350	0.0519
LAI at flowering stage	-0.0338	-0.0143	-0.0171	-0.0190	-0.0123	-0.0329	-0.0073	-0.0111	-0.0340	-0.0160
SLA at vegetative stage (cm^2/g)	0.7911	0.6927	1.2348	-0.2047	0.9551	0.1397	-0.8628	-1.4914	-0.1340	0.5878
SLA at flowering stage (cm^2/g)	-0.0277	-0.0165	-0.0053	0.0199	-0.0369	-0.0397	0.0400	-0.0241	-0.0121	-0.0147
SLW at vegetative stage (mg/cm^2)	-1.8102	-0.4159	-1.2905	0.9825	-1.3757	-0.5549	1.5755	2.4922	-0.6785	-1.1196
SLW at flowering stage (mg/cm^2)	0.5455	0.5250	0.5264	-0.2769	1.1955	0.2255	-0.7012	-0.4792	0.9148	0.5944
RWC at vegetative stage (%)	-0.1100	0.1019	-0.0939	0.1141	-0.0595	-0.0397	0.0428	-0.0510	-0.0656	-0.0310
RWC at flowering stage (%)	0.0027	0.0069	0.0082	0.0024	0.0032	0.0145	0.0015	0.0101	0.0031	0.0047
Seed yield/ plant	0.4128**	0.2770**	0.2372**	0.0018	0.5516**	0.5412**	-0.0926	0.1157	0.7685**	-0.0099

Table 2 continued.....

Character	Grain protein content (%)	Harvest index	LAI at vegetative stage	LAI at flowering stage	SLA at vegetative stage (cm^2/g)	SLA at flowering stage (cm^2/g)	SLW at vegetative stage (mg/cm^2)	SLW at flowering stage (mg/cm^2)	RWC at vegetative stage (%)	RWC at flowering stage (%)
Plant height (cm)	-0.1436	0.3240	0.3429	0.5267	0.7356	0.5280	-0.9997	-0.4407	0.5556	-0.1208
Days to 50% flowering	0.0274	-0.1305	-0.0809	-0.0534	-0.1548	-0.0755	0.0552	0.1019	0.1237	0.0741
Days to maturity	-0.1701	0.3581	0.4064	0.1739	0.7493	0.0658	-0.4652	-0.2776	0.3094	-0.2378
Primary branches/ plant	0.0274	0.1706	0.0357	0.1354	-0.0872	-0.1736	0.2486	0.1025	-0.2641	-0.0486
Secondary branches/ pant	-0.2946	-0.6954	-0.1730	-0.2029	-0.9412	-0.7470	0.8053	1.0236	-0.3186	0.1524
Pods/ plant	-0.0522	-0.4552	-0.1903	-0.2013	-0.2338	-0.2978	0.1205	0.4528	-0.0788	0.2543
Pod length (cm)	0.0090	-0.0123	-0.0167	0.0025	-0.0174	-0.0165	0.0188	0.0123	-0.0047	-0.0015
Seeds/ pod	-0.1769	0.0313	0.0361	-0.0345	0.2763	-0.0914	-0.2742	-0.0771	-0.0513	0.0898
Shelling percentage	-0.8037	1.9543	0.5083	0.6388	-0.1505	0.2777	-0.4526	-0.8926	0.4002	-0.1662
100 seed weight (g)	0.0614	0.0984	0.0294	-0.0453	-0.0993	-0.0510	0.1123	0.0872	-0.0284	0.0379
Grain protein content (%)	1.8317	-0.7338	0.1307	-0.1793	-0.1404	-0.5514	-0.0510	0.3321	-0.1582	-0.0477
Harvest index	0.2666	-0.6655	-0.1976	-0.1405	-0.0680	-0.2681	0.1200	0.3108	-0.0706	0.0185
LAI at vegetative stage	-0.0546	-0.2274	-0.7660	-0.6250	-0.0345	0.0993	0.0276	0.0497	0.0653	-0.1627
LAI at flowering stage	0.0150	-0.0324	-0.1251	-0.1533	-0.0006	0.0178	0.0015	0.0139	0.0360	-0.0454
SLA at vegetative stage (cm^2/g)	-0.1969	0.2624	0.1157	0.0094	2.5688	1.6655	-2.0612	-1.2667	0.2157	-0.2128
SLA at flowering stage (cm^2/g)	0.0377	-0.0504	0.0162	0.0145	-0.0812	-0.1252	0.0639	0.1044	-0.0335	0.0365
SLW at vegetative stage (mg/cm^2)	-0.1203	-0.7796	-0.1556	-0.0427	-3.4701	-2.2066	4.3246	2.8048	-0.5588	0.7729
SLW at flowering stage (mg/cm^2)	-0.5361	1.3809	0.1918	0.2678	1.4579	2.4655	-1.9175	-2.9565	0.4884	-0.5821
RWC at vegetative stage (%)	0.0408	-0.0502	0.0403	0.1111	-0.0397	-0.1265	0.0611	0.0781	-0.4728	-0.0007
RWC at flowering stage (%)	0.0014	0.0015	-0.0114	-0.0159	0.0044	0.0157	-0.0096	-0.0106	-0.0001	-0.0537
Seed yield/ plant	-0.2306**	0.7488**	0.1369	0.1858*	0.2737**	0.4044**	-0.2716**	-0.4475**	0.1545	-0.2435**

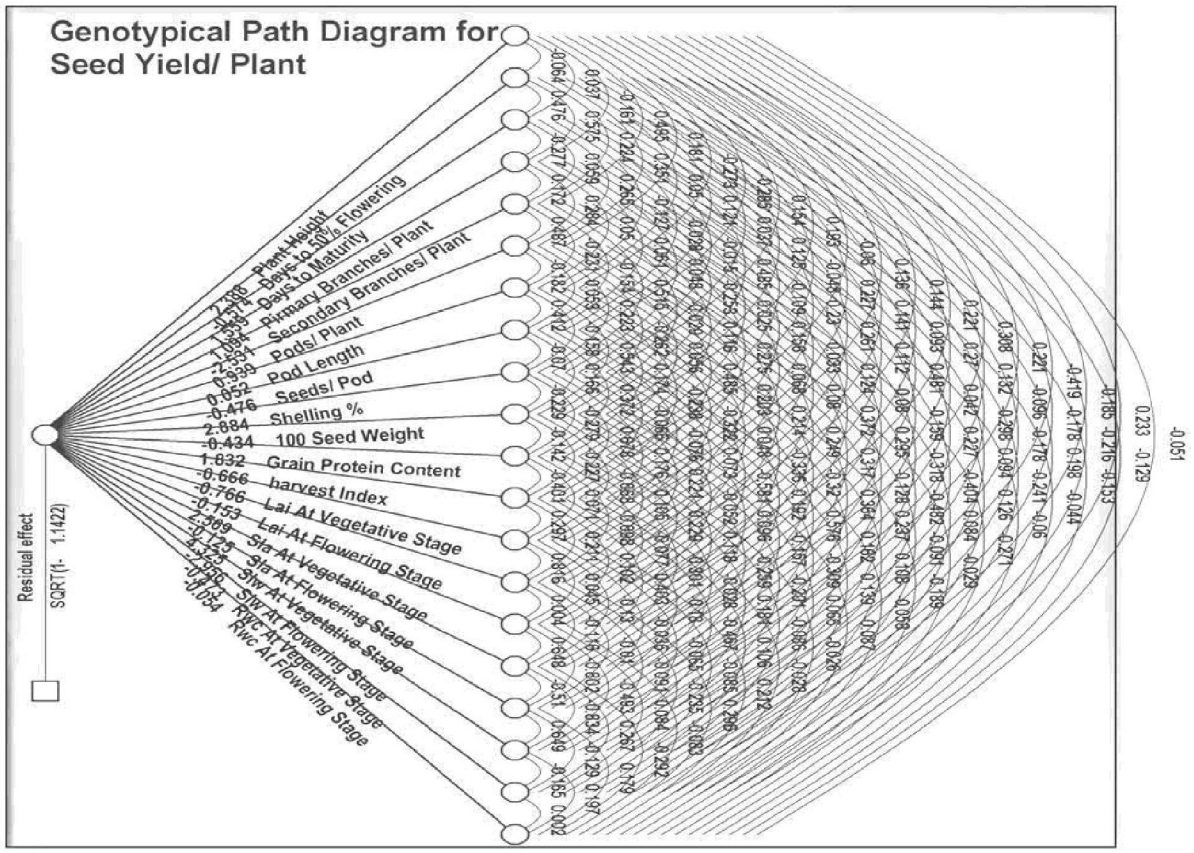
* = Significant at 5% level, ** = Significant at 1% level, Residual effect =SQRT (1- 1.1422), Diagonal values indicate direct effects

flowering stage (01858 & -0.1533), SLA at flowering stage (0.4044 & -0.1252) and RWC at vegetative stage (0.1545 & -0.4728) indicating the indirect effects to be cause 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 effect were positive for pod length (-0.0926 & 0,0517), grain protein content (-0.2306 & 1.8317) and SLW at vegetative stage (-0.2716 & 4.3246). 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 like Baskaran and like Muthaiah (2007), Khapre and Nerker (1992), Marekar and Nerker, (1987), Narsi Reddy and Ratna Kumari (2004), Painawadee *et al.* (2009), Preetha and Ravindran (2007), Sodavadia *et al*, (2010) and Vasantha Rao *et al*. (2010).

The residual effect values were 0.515 and SQRT (1-1.1422) 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.

From this investigation, character association studies indicated that plant height, days to 50% flowering, number of secondary branches per plant, pods per plant, shelling percentage, harvest index, SLA at vegetative stage and SLA at flowering stage had significant positive association with seed yield and simultaneous improvement of these characters along with seed yield is possible. Path coefficient analysis revealed that shelling percentage, SLA at vegetative stage, plant height, days to maturity, number of primary branches per plant and number of pods per plant had showed maximum positive direct effects together with strong positive correlation on seed yield per plant revealing their true relationship.

Fig. 1. Genotypic path diagram showing cause and effect relationship of yield components with seed yield per plant in pigeonpea [*Cajanus cajan* (L.) Millsp].



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