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Path Coefficient and Correlation response for Yield Attributes in Pigeon Pea (Cajanas cajan L.)

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Abstract- Correlation and path coefficient analysis were completed with 84 Pigeon pea genotypes to find out association among characters and to measure the direct and indirect contribution of ten characters on grain yield. The experiment was laid out in a Randomized Complete Block Design with three replications. The genotypic correlation studies indicated that grain yield per plant exhibited stable positive association with all traits except days of pod initiation ((-0.2191). While the phenotypic correlations revealed that days to pod initiation (-0.0125), pod length (-0.0177) and100 seed yield (-0.0475) were negatively correlated with grain yield per plant. The direct effects of phenotypic path correlation coefficient analysis revealed that the grain yield per plant had positive and significant correlation with number of seed per pod (0.0789) and it was followed by number of seeds per plant (0.7493) days to 50% of flowering (0.1812) plant physical maturity (0.0876), plant height (0.091) number of seed per pod (0.0789) & number of seeds per plant (0.7493) were positive and the rest effects of few characters were negative like days to pod initiation (-0.0406), primary (-0.0305), secondary braches (-0.0409), and number of pods per plant (-0.252). Path analysis revealed high positive and direct influence of number of seed per pod with seed yield per plant followed by number of seed per pod and number of pods per plant. Moreover, it was noticed that high indirect contribution was via grain yield per pod with most of the yield components. Hence, these two parameters (number of seed per pod and number seed per plant) should be given more consideration while deciding about selection criteria of genotypes for drought resistance.

Index Terms- Pigeon pea, Yield attributes Path coefficient analysis

I. INTRODUCTION

Pigeon pea (*Cajanus cajan* L.) commonly known as gram is the fifth most important food legume crop in the world after soybean, groundnut, dry beans and peas. This crop occupies an essential place in our daily diet as very high-quality source of protein. It is mainly cultivated for its dry seeds and green vegetables in dry areas of the tropics and subtropics.The major pigeon pea producing areas in the world are India, Eastern Africa, Central and South America, the Caribbean and West Indies. India with a total area of 2, 6 million hectares and an average yield of 719 kg/ha (Sharma and Jodha, (1982) produces nearly 92% of the world's entire pigeon pea crop. To increase its yield potential, several genetic improvement methods have been employed. Seed yield being the most important and polygenically controlled complex character, is also governed by many physiological changes within the plant and influenced by many environmental factors when cultivated, hence it is not an efficient character for selection. Interrelationship among direct and indirect effect of component characters of yield is important in predicting the correlated response to direct selection and in the detection of traits with much effects as markers. The present study was undertaken to elucidate the association between yield and its attributes in pigeon pea, over drought condition.

II. MATERIAL AND METHODS

The present investigation comprised 84 genetically diverse true breeding genotypes of Pigeon pea procured from ICRISAT along with a local check for yield and other its components. The genotypes are WC-25,WC-41,WC-2,WC-32, WC-1, WC-34, WC-5, WC-20, PPE-45-2, WC-9, NALLAKANDI, WC-42, WC-39, ICP-7035, ICP-7066, WC-44, 4985-10, PRG-158, 4985-11, ICP-10531, 4985-7, WC-30, ICP-20062, 4979-2, ICP-6364, ICP-77303, ICP-7044, WC-6, WC-3, WC-16, ICP-8863, WC-24, WC-10, ICP-20036, WC-13, ICP-7532, WC-26, WC-31, WC-29, WC-11, ICP-7529, WC-8, 4985-4, WC35, ICP-13198, ICP-6682, ICP-98008, ICP-85060, WC-45, WC-21, WC-14, LRG-41, WC -17, WC-7, ASHA, WC-19, ICP-87089, WC-37, ICP-2711, PRG-100, 4985-1, 332WR, WC-18, ICP-7068, ICP-8634, ICP-909, ICP-7061, WC-36, ENT-11, WC-43, ICP-97253, ICP-6628, LAXMI, WRG-79, 4978-5, ICP-85063, WC-15, LRG-37, TTB-7, BRG-2, LRG-30, 87089, ICP-332, 4985-4. The experiment was laid out in a Randomized Complete Block Design with three replications. The following data was collected. They are days to 50% flowering, days to pod initiation, days to physical maturity, plant height at harvest (meter), Number of effective primary, secondary branches, Number of pods per plant, Number of seed per plant, pod length, Number of seeds per pod , 100 seed weight and total yield.

III. RESULTS

The simple genotypic and phenotypic correlation for the association among the characters studied for the 84 genotypes were shown in Table 1&2. The genotypic correlation of Total grain yield per plant was found to be positively correlated with days to 50% flowering (0.3862), days to physical maturity (0.4367), plant height (0.5774), and number of primary (0.1367) and secondary branches (0.0838), Number of pods per plant

(0.8053), Number of seed per plant (0.8032), pod length (0.0345), Number of seed per pod (0.0345)and 100 seed yield (0.1636). The days to pod initiation (-0.2191) was negatively correlated with Total plant yield. The phenotypic correlation of Total grain yield per plant was found to be positively correlated with days to 50% flowering (0.2214), days to physical maturity (0.2476), plant height (0.2676), and number of primary (0.0045) and secondary branches (0.0502), Number of pods per plant (0.5641), Number of seed per plant (0.5636) and Number of seed per pod (0.106) The days to pod initiation (-0.0125), pod length (-0.0177) and100 seed yield (-0.0475) was negatively correlated with Total plant yield. The phenotypic and genotypic correlation of days to 50% flowering was positively correlated with days to pod initiation, days to physical maturity, plant height, number of primary and secondary branches, Number of pods per plant, Number of seeds per plant, pod length, and Total plant yield, but negatively correlated with Number of seeds per pod and 100 seed weight. The genetic correlation of days to pod initiation was positively correlated with days to 50 % of flowering, days to maturity, primary branches, Number of pods per plant and Number of seed per plant, but negatively correlated with plant height, secondary branches, Number of seeds per pod, 100 seed weight and Total plant yield. The phenotypic correlation of days to pod initiation was positively correlated with all traits except days to maturity, Number of seeds per pod and Total plant yield. The phenotypic and genotypic correlation of days to maturity was negatively correlated with secondary branches; Number of seeds per pod, pod length and 100 seed weight, reaming all traits was positively correlated. The genetic correlation of plant height, primary and secondary branches were positively correlated with all traits, but negatively correlated with 100 seed weight. The phenotypic correlation of plant height was negatively correlated with pod length and 100 seed weight, also primary branches of phenotypic correlation was negatively correlated with Number of pods per plant and Number of seed per plant. The phenotypic and genotypic correlation of Number of pods per plant and Number of seed per plant were negatively correlated with pod length in case of genetic correlation Number of seeds per pod and 100 seed weight also negatively correlated.

The results of genotypic and phenotypic correlation coefficients were partitioned into direct and indirect effects through various yield contributing characters (Table 3). The direct effects of days to 50% of flowering (**0.1812**) plant physical maturity (**0.0876**), plant height (**0.091**) number of seed per pod (**0.0789**) & number of seeds per plant (**0.7493)** were positive and the rest effects of few characters were negative like days to pod initiation (**-0.0406**), primary (**-0.0305**), secondary braches (**-0.0409**), and number of pods per plant (**-0.252**). The highest direct effect was exhibited by number of seed per pod (**0.0789)** and it was followed by number of seeds per plant (**0.7493)**.

IV. Discussion

In the present investigation, the phenotypic correlation coefficient indicating the strong inherent association for the various traits studied pointing out the possibility of effective phenotypic selection. Total grain yield per plant per plant exhibited stable positive association with number of seed per pod followed by number of pods per plant, plant height, days to maturity and 50 percent of flowering at phenotypic levels. Thus, it can be inferred that selection based on any one of these traits either alone or in combination, would result in identifying high yielding genotypes as reported by Sharma *et al.* (1989) and Singh *et al.* (1990). When interrelationship of different characters were monitored in individual as well as combined over seasons, it was observed that number of seed per pod exhibited positive and significant association with number of pods per plant and secondary branches through indirect contribution. The plant height was positively correlated with grain yield. This was supported by Rahman et al., (1995), Spanner et al., (1996), Kumar and Kumar (1997) Gautan et al., (1999), similarly accordance with our results. Plant height positively correlated with Total plant yield. The high value of genotypic and phenotypic variation suggest that there is good scope for yield improvement through selection for pods/plant, seeds/plant and yield/plant. These findings are in agreement with other reports. (Kumar and Dubey et al., 1996).

V. Conclusion

Number of seed per pod and number of seed per plant had the maximum contribution in determining grain yield in pigeon pea. It was also observed that high indirect contribution was also exhibited via Number of seed per pod by most of the yield components and hence these two traits may be given more emphasis while selecting high yielding pigeon pea genotypes for drought condition.

References

[1] Gamtam, A.S., R.K Mittal and J.C. Bhandari, 1999. Correlation and path coefficient analysis in maize(*Zea mays L.*). Ann.Agrc. Biol. Res., 4:1169-1171.

[2] Kumar S, Dubey DK. 1996. Variability and correlation studies in grasspea (*Lathyrus sativus* L.). FABIS Newsletter 38/39, 26-30.

[3] Kumar, A. and D.Kumar, 1997. Correlation studies in maize(Zea mays L.) Ann. Biol.Ludhiana, 13:271-273.

[4] Rahman, M.M., M.R.Ali, M.S.Islam, M.K.Sultan and B. Mitra, 1995. Correalation and path coefficient studies in maize(Zea mays L.) compasities. Bangladesh J.Sci.Ind.Res., 30:87-92

[5] Sharma, B.D. *et al.* (1989). *Crop Improv.*, **16:**190-192.

[6] Sharma, D. and Jodha, N.S. 1982. Contrains and opportunities of pulses production in semi-arid regions of India, Paper presented at the symposium increasing pulse production in India, Constraints and opportunities organized by Hindustan Lever Research Foundation, New Delhi.

[7] Singh, K.B. *et al.* (1990). *Euphytica* **49:**83-88.

[8] Spaner, D., R.A.I. Brathwaite and D.E. Mather, 1996. Diallel study of open pollinated maize varieties in Trinidad. Euphytica, 90: 65-72.

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Table 1:Genotypic correlation

S.No.		50% days of Flowering	Days of pod initiation	Days to maturity	Plant Height (cm)	primary branches	secondary branches	No. of pods/ plant	No. of seeds/plant	Pod length (cm)	No. of seeds/pod	100 seed weight (gm)	Total yield
1	50% days of Flowering	1	1.3674	0.348	0.1879	0.1016	0.0049	0.3466	0.3435	0.1454	-0.0629	-0.197	0.3862
2	Days of pod initiation		1	0.0106	-0.2677	1.5742	-0.2113	0.0333	0.0297	-0.5248	-0.2558	-0.5464	-0.2191
3	Days to maturity			1	0.3024	0.0302	-0.2079	0.2993	0.2961	-0.2887	-0.0404	-0.0332	0.4367
4	Plant Height				1	0.3102	0.529	0.534	0.5375	0.5001	0.2499	-0.2983	0.5774
5	primary branches					1	0.4127	0.1151	0.1225	0.0091	0.4692	-0.01	0.1367
6	secondary branches						1	0.3403	0.3523	0.0872	0.483	-0.0408	0.0838
7	No. of pods/ plant							1	0.9999	-0.313	-0.0675	-0.2034	0.8053
8	No. of seeds/plant								1	-0.3199	-0.0602	-0.2024	0.8032
9	Pod length									1	0.7582	-0.3913	0.0345
10	No. of seeds/pod										1	0.2056	0.1636
11	100 seed weight											1	0.0215
12	Total plant yield yield												1

Table 2: Phenotypic correlation

S.No.		50% days of Flowering	Days of pod initiation	Days to maturity	Plant Height	primary branches	secondary branches	No. of pods/ plant	No. of seeds/plant	Pod length	No. of seeds/pod	100 seed weight	Total plant yield
1	50% days of Flowering	1	0.1179	0.344	0.1456	0.0739	0.0022	0.207	0.2044	0.0311	-0.0271	-0.0408	0.2214
2	Days of pod initiation		1	-0.0036	0.0079	0.1603	0.0102	0.0431	0.0432	0.0079	-0.0383	0.0169	-0.0125
3	Days to maturity			1	0.2307	0.0294	-0.13	0.1899	0.1873	-0.0655	-0.0106	-0.0034	0.2476
4	Plant Height				1	0.1701	0.2957	0.2848	0.2862	-0.0205	0.0661	-0.0107	0.2676

5	primary branches					1	0.158	-0.0108	-0.0079	0.0225	0.1107	0.0622	0.0045
6	secondary branches						1	0.1449	0.1485	0.0867	0.092	0.0373	0.0502
7	No. of pods/ plant							1	0.9995	-0.0539	0.052	0.0077	0.5641
8	No. of seeds/plant								1	-0.0541	0.052	0.0075	0.5636
9	Pod length									1	0.0929	-0.0291	-0.0177
10	No. of seeds/pod										1	-0.0371	0.106
11	100 seed weight											1	-0.0475
12	Total plant yield												1

Table 3. The Phenotypic Path correlation Coefficient of direct and indirect effects for different characters on yield and its components in Pigeon pea.

	50% days of Flowering	Days of pod initiation	Days to maturity	Plant Height (cm)	Primary branches	secondary branches	No. of pods/ plant	No. of seeds/plant	No. of seeds/pod	100 seed weight (gm)
50% days of Flowering	**0.1812**	-0.0048	0.0301	0.0133	-0.0023	-0.0001	-0.0523	0.1532	-0.0021	0.0011
Days of pod initiation	0.0214	**-0.0406**	-0.0003	0.0007	-0.0049	-0.0004	-0.0109	0.0324	-0.003	-0.0004
Days to maturity	0.0623	0.0001	**0.0876**	0.021	-0.0009	0.0053	-0.048	0.1404	-0.0008	0.0001
Plant Height	0.0264	-0.0003	0.0202	**0.091**	-0.0052	-0.0121	-0.072	0.2145	0.2052	0.0003
primary branches	0.0134	-0.0065	0.0026	0.0155	**-0.0305**	-0.0065	0.0027	-0.0059	0.0087	-0.0016
secondary branches	0.0004	-0.0004	-0.0114	0.0269	-0.0048	**-0.0409**	-0.0366	0.1113	0.0073	-0.001
No. of pods/ plant	0.0375	-0.0017	0.0166	0.0259	0.0003	-0.0059	**-0.2527**	0.7489	0.0041	-0.0002
No. of seeds/plant	0.0371	-0.0018	0.0164	0.0261	0.0002	-0.0061	-0.2525	**0.7493**	0.0041	-0.0002
No. of seeds/pod	-0.0049	0.0016	-0.0009	0.006	-0.0034	0.0038	0.0131	0.0389	**0.0789**	0.001
100 seed weight	-0.0074	-0.0007	-0.0003	-0.001	-0.0019	-0.0015	-0.002	0.0056	-0.0029	**-0.026**