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Studies on Correlation and Path Coefficient Analysis for Yield and Yield Contributing Characters in Pigeonpea [*Cajanus cajan* (L). Millips]

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A B S T R A C T

Correlation between yield and yield attribute component traits in forty two genotypes of pigeonpea revealed that seed yield per plant had positive and highly significant association with number of pods per plant, number of secondary branches per plant, plant height, number of seeds per pod and days to maturity. Selection criterion can be done based on these characters for seed yield will give successful for yield improvement in pigeonpea. Path coefficient analysis of different traits on seed yield per plant recorded that traits viz., number of secondary branches per plant, 100 seed weight, number of seeds per pod, plant height and number of primary branches per plant showed highest positive direct effect. Hence selection on these studied characters might be useful in pigeonpea yield improvement.

Introduction

In the semi-arid tropics, pigeon pea (*Cajanus cajan* (L). Millisp) is a significant grain legume crop grown through rainfed agriculture. The pigeonpea is a food crop exclusively grown in the Cajaninae sub tribe and is a member of the genus *Cajanus* of the sub tribe *Cajaninae*, tribe phaseoleae of the subfamily *papilionaeae* under the family *Leguminaceae*. With 11 pairs of chromosomes (2n=2x=22) and an estimated genome size of 858 Mbp, it is a diploid species. Of the 32 species in the genus *Cajanus,* 18 are found in India. The majority of vegetarians in India depends on red grams as a source of protein supplements. According to estimates, the country's per capita protein availability is just 28 grams per day, compared to the WHO's recommended of 80 grams per day (Prasad *et al.,* 2013). Yield is a complex character which is controlled by polygenes. For enhancing the yield, better understanding of contributing character is essential and keeping the view the present study was carried out to find the inter relationship among the yield and its contributing traits and also their direct and indirect effect contribution to yield.

Materials and Methods

The research experiment was conducted at College of Agriculture, Badnapur during *kharif* - 2023 were evaluated in Randomized Block Design with two replications for nine quantitative characters viz, days to

50% flowering, days to maturity, plant height, number of primary branches per plant, number of secondary branches per plant, number of pods per plant, number seeds per pod, 100 seed weight and seed yield per plant. Phenotypic coefficient correlations were computed using the formula suggested by Falconer (1960). The Path coefficient analysis was conducted as described by Dewey and Lu (1959). List of genotypes presented in Table 1.

Results and Discussion

The phenotypic and genotypic correlations for yield and its components characters studied are presented in Table 2 and Table 3. Seed yield per plant had significant positive associations with number of pods per plant (p=0.8135; g=0.8596), number of secondary branches per plant (p= 0.5618; g= 0.6237), plant height (p=0.2764; g=0.3323), number of seeds per pod (p=0.0440; g=0.0341), Days to maturity (p=0.0717, g=0.0730) both at phenotypic and genotypic level. Days to 50% flowering had genotypic correlation positive (g=0.0060) and phenotypic correlation negative (p=-0.0105) with seed yield per plant. Whereas, 100 seed weight (g=-0.2437) had negative correlation with seed yield per plant. In the present study significant association of seed yield per plant in desirable direction at phenotypic and genotypic levels was observes for pods per plant by Baria *et al.,* (2023) and Chaudhary and Chhabra (2020). Strong positive association of seed yield with number of pods per plant, number of secondary branches per plant and plant height observed earlier by Rekha *et al.,* (2013); Hemavathy *et al.,* (2017).

Path coefficient analysis was done to determine direct and indirect contribution of different traits towards seed yield per plant with phenotypic and genotypic level. The result were presented in Table 4 and Table 5. In the present investigation it was found that number of pod per plant (P=0.7040) recorded the highest positive direct effect on seed yield per plant followed by number of secondary branches per plant (P=0.2350), 100 seed weight (P=0.1526) number of seeds per pod (P=0.1094), plant height (P=0.0653) and number of primary branches per plant (P=0.0268). The character days to 50 percent flowering (P=-0.3206) recorded negative direct effect on seed yield per plant followed by days to maturity (P=-0.3013).

Table.1 List of genotypes of Pigeonpea**.**

Sr. No	Name of Genotype	Sr. No	Name of Genotype
1.	ICP-10384	**21.**	ICP-752
2.	ICP-7952	**22.**	ICP-238
3.	ICP-7949	**23.**	ICP-709
4.	ICP-7265	**24.**	ICP-15153
5.	ICP-1878	**25.**	ICP-16553
6.	ICP-7172	**26.**	ICP-15068
7.	ICP-9905	**27.**	ICP-810
8.	ICP-7242	**28.**	ICP-811
9.	ICP-1861	**29.**	ICP-15600
10.	ICP-2925	**30.**	AKTM-2117
11.	ICP-10325	**31.**	AKTM-1637
12.	ICP-14056	**32.**	AKTM-1914
13.	ICP-7999	**33.**	AKTM-1644
14.	ICP-7939	**34.**	AKTM-1917
15.	ICP-7947	**35.**	AKTE-1604
16.	ICP-9922	**36.**	BDN-2013-2
17.	ICP-14147	**37.**	BDN-2019-9
18.	ICP-13947	**38.**	BDN-2019-5
19.	ICP-11667	**39.**	BDN-2019-33
20.	ICP-13872	**40.**	BDN-2013-5
41.	BDN-716 (Ch)	**42.**	Godawari (Ch)

Table.2 Estimation of phenotypic correlation coefficient in Pigeonpea

Characters	Days to 50 % Flowering	Days to Maturity	Plant Height (cm)	Number of primary branches/Plant	Number of secondary branches/Plant	Number of pods/Plant	Number of seeds/Pod	100 seed Weight(g)	Seed yield /Plant
Days to 50% Flowering.	**1.0000**	0.8800**	0.1868	0.0424	0.0258	-0.0011	0.1959	0.0314	**-0.0105**
Days to Maturity		**1.0000**	0.2311*	0.0737	0.0180	-0.0194	0.1746	-0.0099	**-0.0717**
Plant Height (cm).			**1.0000**	0.1887	-0.0750	0.2746*	0.0114	0.1262	**0.2764***
Number of primary branches/Plant.				**1.0000**	0.7442**	0.5526**	-0.1909	-0.4762**	**0.5181****
Number of secondary branches/Plant					**1.0000**	0.5895**	-0.2478*	-0.4805**	**0.5618****
Number of pods/Plant						**1.0000**	-0.0542	-0.4072**	**0.8135****
Number of seeds/Pod.							**1.0000**	0.2984**	**0.4405****
100 seed weight (g).								**1.0000**	**0.2319***

Table.3 Estimation of genotypic correlation coefficient in Pigeonpea.

Characters	Days to 50 % Flowering	Days to Maturity	Plant Height (cm)	Number of primary branches/Plant	Number of secondary branches/Plant	Number of pods/Plant	Number of seeds/Pod	100 seed Weight(g)	Seed yield /Plant
Days to 50% Flowering.	**1.0000**	0.9879**	0.1749	0.0309	0.0152	-0.0132	0.1892	0.0300	**-0.0060**
Days to Maturity		**1.0000**	0.2829*	0.1008	0.0056	-0.0285	0.1997	-0.0126	**-0.0730**
Plant Height (cm).			**1.0000**	0.1691	-0.1107	0.2878*	-0.0132	0.1311	**0.3323****
Number of primary branches/Plant.				**1.0000**	0.9072**	0.6310**	-0.2407	-0.5507**	**0.6227****
Number of secondary branches/Plant					**1.0000**	0.6327**	-0.2690*	-0.5242**	**0.6237****
Number of pods/Plant						**1.0000**	-0.0563	-0.4227**	**0.8596****
Number of seeds/Pod.							**1.0000**	0.3139**	**0.3410****
100 seed weight (g).								**1.0000**	**0.2437***

Table.4 Direct and indirect effect of yield and its components characters on grain yield and at phenotypic level.

Characters	Days to 50 % Flowering	Days to Maturity	Plant Height (cm)	Number of primary branches/Plant	Number of secondary branches/Plant	Number of pods/Plant	Number of seeds/Pod	100 seed weight(g)	Correlation with Seed yield /Plant.
Days to 50% Flowering.	**-0.3206**	-0.2821	-0.0599	-0.0136	-0.0083	0.0003	-0.0628	-0.0101	**-0.0105**
Days to Maturity	0.2652	**-0.3013**	0.0696	0.0222	0.0054	0.0058	0.0526	-0.0030	**-0.0717**
Plant Height (cm).	0.0122	0.0151	**0.0653**	0.0123	-0.0049	0.0179	0.0007	0.0082	**0.2764**
Number of primary branches/Plant.	0.0011	0.0020	0.0051	**0.0268**	0.0200	0.0148	-0.0051	-0.0128	**0.5181**
Number of secondary branches/Plant	0.0061	0.0042	-0.0176	-0.1749	**0.2350**	0.1385	-0.0582	-0.1129	**0.5618**
Number of pods/Plant	0.0008	0.0136	0.1934	0.3890	0.4150	**0.7040**	-0.0382	-0.2867	**0.8135**
Number of seeds/Pod.	0.0214	0.0191	0.0012	-0.0209	-0.0271	-0.0059	**0.1094**	0.0326	**0.4405**
100 seed weight(g).	**0.0048**	**-0.0015**	**0.0193**	**-0.0727**	**-0.0733**	**-0.0621**	**0.0456**	**0.1526**	**0.2319**

Table.5 Direct and indirect effect of yield and its components characters on grain yield and at genotypic level.

Characters	Days to 50 % Flowering	Days to Maturity	Plant Height (cm)	Number of primary branches/Plant	Number of secondary branches/Plant	Number of pods/Plant	Number of seeds /Pod	100 seed weight (g)	Seed yield /Plant
Days to 50% Flowering.	**-1.2979**	1.2337	0.9268	0.1637	0.0807	0.0698	1.0024	0.1589	**-0.0060**
Days to Maturity	-1.4406	**-1.5074**	-1.5579	-0.5549	-0.0311	-0.1568	-1.0997	0.0695	**-0.0730**
Plant Height (cm).	0.0409	0.0662	**0.2340**	0.0396	-0.0259	0.0674	-0.0031	0.0307	**0.3323**
Number of primary branches/Plant.	0.0691	0.2253	0.3780	**2.2356**	2.0282	1.4108	-0.5380	-1.2311	**0.6227**
Number of secondary branches/Plant	-0.0264	-0.0098	0.1918	-1.5716	**1.7323**	-1.0960	0.4661	0.9081	**0.6237**
Number of pods/Plant	0.0075	0.0163	0.1646	0.3610	0.3619	**0.5721**	-0.0322	-0.2418	**0.8596**
Number of seeds/Pod.	0.0460	0.0485	-0.0032	-0.0585	-0.0654	-0.0137	**0.2431**	0.0763	**0.3410**
100 seed weight (g).	**-0.0004**	**0.0002**	**-0.0019**	**0.0078**	**0.0075**	**0.0060**	**-0.0045**	**0.1428**	**0.2437**

At genotypic level the present investigation it was found that number of primary branches per plant (G=2.2356) the highest positive effect on seed yield per plant followed number of secondary branches per plant (G=-1.7323), number of pod per plant (G=0.5721), number of seeds per pod (G=0.2431), plant height (G=0.2340), 100 seed weight (G=-0.1428). The character recorded highest negative direct effect on days to 50% flowering (G=-1.2979) and days to maturity (G=-1.5074).

Similar finding were registered by Rekha *et al.,* (2013) and Nag and Sharma (2012) path analysis indicate high positive direct effect of pods per plant on seed yield. The character recorded highest negative direct effect on days to 50% flowering with seed yield concluded by Pandey *et al.,* (2021). Based on correlation studies number of pods per plant and number of secondary branches per plant showed highly positive association with seed yield per plant. Hence this trait could be used for breeding programme. The path coefficient analysis the residual effect of path coefficient analysis was 0.1950 which is indicating the sufficiency of number of traits under the consideration for crop improvement.

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Author Contribution

P. R. Chavan: Investigation, formal analysis, writing—original draft. V. K. Gite: Validation, methodology, writing—reviewing. D. K Patil:—Formal analysis, writing—review and editing. V. R. Bhakad: Investigation, writing—reviewing. A. A. Madake: Resources, investigation writing—reviewing.

Data Availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

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References

Baria, K. G, Patil, S. S, Pandya, H. D and Bhargav, S. M. (2023). Genetic variability, correlation and path analysis studies in pigeon pea [*Cajanus cajan* (L.) Millsp.]. The *Pharma Innovation Journal*12(5): 3008-3013.

Chaudhary, L. and Chhabra, A. K. (2020). Estimation of Genetic Parameters, Correlation and Path Analysis in Advance Lines of Pigeonpea [*Cajanus cajan* (L.) Mills paugh.]. *Ind. J. Pure App. Biosci***.** 8(6), 369-374.

Dewey, D. R., and Lu, K. H. (1959). A correlation and path coefficient analysis of component of wheat grass seed production. Agron. J.,51: 515-518.

Falconer, D. S. (1960). Correlated character, introduction to quantitative genetics, 312, published by *Longman Group Ltd., London*.

Hemavathy, A. T., Bapu, J. R. and Priyadharshini, C. (2017). Principal Component Analysis in Pigeonpea (*Cajanus cajan* (L.) Millsp.) *Electronic Journal of Plant Breeding*, 8(4): 1133-1139.

Nag, Y. K. and Sharma, R. N. (2012). To study the direct and indirect contribution of various characters influencing seed yield in pigeonpea germplasm accessions. *International Journal of Agriculture Sciences.*

Pandey, V. P., Singh, M. K., Meshram, P., Gupta, V. K., Singh, N. and Banjare, A. K. (2021). Phenotypic and Genetic Study on Native Pigeonpea Germplasm of Chhattisgarh for Yield Attributing Traits. *International Journal of Plant & Soil Science.*

Prasad, Y., Kumar, K. and Mishra, S. B. (2013). Studies on genetic parameters and inter-relationships among yield and yield contributing traits in pigeonpea [*Cajanus cajan* (L.) Millsp.]. *TheBioscan*, 8(1):207-211.

Rekha R, Prasanthi L, Sekhar M. R and Priya M. S (2013). Variability, character association and path analysis for yield and yield attributes in pigeonpea. *Electronic Journal of Plant Breeding*, 4(4): 1331-1335.

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