Indian Journal of Science and Technology, *Vol 9(6), DOI: 10.17485/ijst/2016/v9i6/56568, February 2016*
ISSN (Print) : 0974-6846
ISSN (Online) : 0974-5645

Character Association Trend among Yield Attributing Traits in Pigeonpea [*Cajanus cajan* (L.) Millsp.]

R. S. Singh* and M. N. Singh

Department of Genetics and Plant Breeding, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi - 221005, Uttar Pradesh, India; singhrscoh@gmail.com

Abstract

Background/Objectives: To understand the nature and magnitude of character association relationships in segregating and non-segregating populations. **Methods/Statistical Analysis**: Phenotypic correlation coefficient of parents, F_1s and F_2s was calculated following formulae given by Panse and Sukhatme, (1967). **Results/Findings**: In case of parents and F_1s, only pods per plant were positively and significantly associated with seed yield whereas in segregating populations (F_2s), plant height, pods per plant and seeds per pod revealed positively significant associations with seed yield. **Conclusion/ Application**: From the findings it is suggested that during selection, due weightage should be given for Plant height, number of pods per plant and seeds per pod by taking care of number of secondary branches, 100-seed weight and harvest index for isolating high yielding genotypes in pigeonpea.

Key words: Correlation, Character, Pigeonpea, Yield

1. Introduction

Pigeonpea [*Cajanus cajan* (L.) Millsp.], belonging to the *Cajaninae* sub-tribe of the leguminous tribe *Phaseoleae*, is a most important grain legume after chickpea. It is a versatile crop and is ideally suited for drought-prone areas. Being a leguminous crop, it fixes atmospheric nitrogen to fortify fertility benefit equivalent to about 40 kg of nitrogenous fertilizer per ha and its heavy shedding adds considerable organic matter to the soil. Legumes occupied a unique place due to its very high quality protein of vegetarian's daily diet. India, Eastern Africa, Central and South America, the Caribbean and West Indies are major pigeonpea producing areas in the world. India with a total area of 264.02 lakh hectares and an average yield of 789 kg/ha (Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India, 2013-14) produces nearly 92% of the world's entire pigeonpea crop. To increase its yield potential, several genetic improvement methods have been employed.

Complex characters like yield have several component characters and *per se* may not be a reliable criterion for selection because of its low heritability and high genotypes x environmental interaction. Understanding of the extent to which the component characters can effectively be utilized in selecting for the ultimate character is expected to increase the efficiency of selection. The main component characters are positively associated with ultimate character, while among themselves the association may be positive or negative. An understanding of the nature and magnitude of these relationships in segregating and non-segregating populations of this investigation may be useful for determining the criterion of selection for developing most productive genotypes.

2. Materials and Methods

The present investigation was carried out at Agricultural Research Farm, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi during *Kharif*, 2003-04 to 2005-06. Geographically, it is situated at 25.18^{O}N latitude and 83.03^{O}E longitude in the North Gangetic plain in the eastern part of Uttar Pradesh. The experimental material was comprised of seven parents i.e. NDA1, MAL

**Author for correspondence*

17, BHUA 96-13-3, BHUA 96-21-4, MAL 19, NDA 99-1, NDA 49-6, twelve F_1s (NDA-1 X MAL-19, NDA-1 X NDA 99-1, NDA-1 X NDA 49-6, MAL-17 X MAL-19, MAL-17 X NDA 99-1, MAL-17 X NDA 49-6, BHUA 96-13-3 X MAL-19, BHUA 96-13-3 X NDA 99-1, BHUA 96-13-3 X NDA 49-6, BHUA 96-21-4 X MAL-19, BHUA 96-21-4 X NDA 99-1, BHUA 96-21-4 X NDA 49-6 and their twelve F_2s were grown in Randomized Block Design with three replications. The parents and F_1s have single row and F_2s have six rows each. Each row consisted of 4 m length and row to row and plant to plant distances were 75 and 25 cm, respectively. All the recommended agronomical practices were followed to raise a good crop. Observations were recorded on 10 randomly selected plants from each of parents and F_1s and 60 plants from each of F_2s per replication excluding border plants on Days to 50 % flowering, Days to maturity, Plant height (cm.), Number of primary branches, Number of secondary branches, Pods per plant, Pod length (cm.), Number of seeds per pod, 100-seed weight (g.), Harvest Index and Seed yield per plant (g.). Correlation coefficient was calculated at the phenotypic levels using means of the parental, F_1s and F_2s data following formulae given by Panse and Sukhatme,[1].

3. Results

Estimates of phenotypic correlation coefficients among the eleven characters in three sets of populations, namely, parents, F_1s and F_2s are depicted separately in Table 1, 2 and 3, respectively. In case of parents, only pods per plant were positively and significantly associated with seed yield. However harvest index (0.606) followed by 100-seed weight (0.491) and number of secondary branches (0.439) exhibited comparatively higher correlation values with seed yield though they were non-significant. Among yield components, none of the yield trait showed significant association among each other.

However in F_1s, seed yield per plant was positively and significantly correlated with pods per plant whereas number of secondary branches (0.548), harvest index (0.492) and number of primary branches (0.476) though had positive and high correlation values with seed yield but were observed to be non-significant. Among yield components, number of pods per plant was positively and significantly associated with number of secondary branches whereas correlations among the other yield component were non-significant.

Table 1. Correlation coefficients for eleven characters in seven parents in pigeonpea

Characters	Plant height	No. of pri. branches	No. of sec. Branches	Pods/plant	Pod length	seeds / pod	100-seed weight	Harvest Index	Days to 50% flowering	Days to maturity	Seed yield per plant
Plant height	1.000	0.084	0.404	0.385	-0.082	0.175	0.173	–0.095	0.020	0.140	0.340
No. of pri. Branches		1.000	0.134	–0.163	-0.061	–0.096	–0.123	–0.635	0.307	0.170	–0.257
No. of sec. Branches			1.000	0.439	-0.180	0.022	0.435	–0.085	–0.141	–0.196	0.439
Pods per plant				1.000	0.145	0.310	0.319	0.388	–0.446	–0.030	0.897**
Pod length					1.0000	0.486	–0.141	0.480	–0.254	–0.209	0.262
Seeds per pod						1.000	–0.169	0.297	–0.185	0.166	0.288
100-seed weight							1.000	0.314	0.121	–0.352	0.491
Harvest Index								1.000	–0.387	–0.184	0.606
Days to 50 % flowering									1.000	–0.090	–0.361
Days to maturity										1.000	–0.246
Seed yield/plant											1.0000

Significant levels: 0.05 0.01 (d.f. = 5)
If correlation r => 0.7545 0.8745

Table 2. Correlation coefficients for eleven characters in twelve crosses (F_1s) in pigeonpea

Characters	Plant height	No. of pri. branches	No. of sec. Branches	Pods/plant	Pod length	seeds/pod	100-seed weight	Harvest Index	Days to 50% flowering	Days to maturity	Seed yield Plant
Plant height	1.000	0.399	0.437	0.419	0.458	0.344	0.285	–0.384	0.128	–0.412	0.295
No. of pri. .branches		1.000	0.563	0.556	0.325	0.278	0.232	0.054	–0.013	–0.103	0.476
No. of sec. Branches			1.000	0.654*	0.353	0.331	0.356	0.122	–0.242	–0.181	0.548
Pods per plant				1.000	0.129	0.380	0.296	0.319	–0.168	–0.039	0.830**
Pod length					1.000	0.370	0.319	–0.192	0.165	0.037	0.170
Seeds per pod						1.000	0.223	0.205	0.042	–0.031	0.349
100-seed weight							1.000	–0.007	–0.240	0.137	0.366
Harvest Index								1.000	–0.256	0.282	0.492
Days to 50 % flowering									1.000	0.183	–0.229
Days to maturity										1.000	0.069
Seed yield/plant											1.000

Significant levels: 0.05 0.01 (d.f. = 10)
If correlation r => 0.5760 0.7079

Table 3. Correlation coefficients for eleven characters in twelve F_2s in pigeonpea

Characters	Plant height	No. of pri. branches	No. of sec. Branches	Pods/plant	Pod length	seeds/pod	100-seed weight	Harvest Index	Days to 50% flowering	Days to maturity	Seed yield Plant
Plant height	1.000	0.529	0.225	0.404	0.494	0.704*	0.846**	0.067	–0.165	0.025	0.619*
No. pri. .branches		1.000	0.497	0.248	0.040	0.175	0.541	–0.034	0.179	0.180	0.411
No. of Sec. Branches			1.000	0.454	–0.042	–0.001	0.176	0.122	0.188	0.025	0.399
Pods per plant				1.000	0.276	0.404	0.283	0.434	–0.033	–0.185	0.893**
Pod length					1.000	0.686*	0.267	0.111	0.019	–0.031	0.355
Seeds per pod						1.000	0.529	0.017	–0.235	–0.034	0.522
100-seed weight							1.000	0.000	–0.226	0.156	0.538
Harvest Index								1.000	0.027	–0.444	0.520
Days to 50 % flowering									1.000	–0.032	–0.093
Days to maturity										1.000	–0.174
Seed yield/plant											1.000

Significant levels: 0.05 0.01 (d.f. = 10)
If correlation r => 0.5760 0.7079

In segregating populations, pods per plant and plant height revealed positively significant associations with seed yield whereas 100-seed weight, seeds per pod and harvest index had positive and high correlation values with seed yield but were statistically non-significant. As regard the associations among the yield components, it was observed that plant height with 100-seed weight as well as number of seeds per pod and pod length with number of seeds per

pod exhibited positive and significant correlation values. Rests of the yield components though had mostly positive correlation values but were non-significant.

4. Discussion

Improvement of economic characters, like yield is affected through selection of superior genotypes as judged from phenotypic appearances. Keeping the fact complexer the phenotype, greater the interaction. Seed yield, an extremely complex entity, is result of many growth and development processes in plant and each step is liable to environmental fluctuation. Since, selection for increased yield is usually concern with changing two or more characters simultaneously, an understanding of the nature and magnitude of their relationship in segregating and non-segregating populations would be of immense value in assigning rational weights to the different component characters during selection.

In the present investigation, it is important to mention here that in all the three sets of materials (parents, F_1s, and F_2s), only pods per plant was strongly associated with yield per plant indicating the significant role of pods per plant for increasing pigeonpea productivity[2,3]. In respect to the other yield components, number of secondary branches, harvest index and 100-seed weight appear to contribute positively to increase yield[4,5,6]. However, in F_1s number of secondary branches was positively associated with pods per plant whereas plant height was positively associated with seed yield per plant via seeds per pod and 100-seed weight[7,8,9].

5. Conclusion

From these observations it is suggested that during selection, due weightage should be given for number of pods per plant by taking care of number of secondary branches, 100-seed weight and harvest index for isolating high yielding genotypes in pigeonpea.

6. References

1. Panse VG, Shukhatme PV. Statistical Methods for Agricultural Workers (2nd Ed). ICAR, Publications, New Delhi. 1967.
2. Yerimani AS, Mehetre S, Kharde MN. Association Analysis for Yield and its Component Traits in F3 and F4 Populations of Pigeonpea (*Cajanus cajan* (L.) Mill Sp.). Molecular Plant Breeding. 2013; 4(23):189–95.
3. Sharma R, Gangwar RK, Yadav V. A Study on Genetic Variability and Correlation in Pigeon Pea [*Cajanus cajan* (L) Millsp.]. International Journal of Science and Research. 2014; 3(9):826–8.
4. Kumara BN, Santoshagowda GB, Nishanth GK, Dharmaraj PS. Genetic diversity, variability and correlation studies in advanced genotypes of Pigeonpea [*Cajanuscajan* (L.) Millsp.]. Acta Biologica Indica. 2013; 2(2):406–11.
5. Rao PJM, Malathi S, Reddy DVV, Upender M. Genetic Studies of Association and Path Coefficient Analysis of Yield and its Component Traits in Pigeon Pea (*Cajanus Cajan* L. Millsp.). International Journal of Scientific and Research Publications. 2013; 3(8):1–5.
6. Vijayalakshmi P, Anuradha C, Pavankumar D, Sreelaxmi A, Anuradha G. Path Coefficient and Correlation response for Yield Attributes in Pigeon Pea (*Cajanas cajan* L.). International Journal of Scientific and Research Publications. 2013; 3(4):1–6.
7. Udensi1 O, Ikpeme1 EV. Correlation and Path Coefficient Analyses of Seed Yield and its Contributing Traits in *Cajanus cajan* (L.) Millsp. American Journal of Experimental Agriculture. 2012; 2(3):351–8.
8. Chetukuri A, Vijayalakshmi P, Bhargavi V, Kumar DP, Sreelaxmi A, Siddiq EA. Correlation, Variability and Heritability in Pigeon Pea. Advances in Bioresearch. 2013; l4(2):129–34.
9. Saroj SK, Singh MN, Kumar R, Singh T, Singh MK. Genetic variability, correlation and path analysis for yield attributes in pigeonpea. The Bioscan. 2013; 8(3):941–4.