



Correlation Studies for Grain Yield and Yield Contributing Characters in Short Duration Genotypes of Pigeonpea [*Cajanus cajan* (L.) Millsp.]

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ABSTRACT

An experiment was planned and conducted to evaluate the relationship between grain yield in pigeonpea and its components through correlation studies. Yield being a complex character is governed by a large number of genes. The influence of each character on yield could be known through correlation studies with a view to determine the extent and nature of relationships prevailing among yield and yield attributing characters. In the present study, the grain yield per plant showed high positive correlation with number of pods per plant (0.9695G, 0.9309P), days to 50 percent flowering (0.6454G, 0.5671P) plant height (0.6054G, 0.5227P) and days to maturity (0.5039G, 0.4088). Selection for these traits would be effective for achieving the success in breeding programme for crop yield improvement.

Keywords: pigeonpea, grain yield, correlation.

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INTRODUCTION

Global population explosion is triggering the serious problem malnutrition. Pulses are one of the reliable options to overcome malnutrition. They are major sources of proteins among the vegetarians in India, and complement the staple cereals in the diets with proteins, essential amino acids, vitamins and minerals. Pulses with 22-24% protein, have almost twice the protein in wheat and thrice that of rice. Pigeonpea [*Cajanus cajan*] is one of the important pulse crop with rich dietary protein in its seed satisfying the protein requirements of human. The seed contains 18-29% protein on dry weight basis which is of excellent quality, being high in lysine. The crop is, therefore; an important complements to cereal and root based diet [11]. Nationally (In India), pigeonpea [*Cajanus cajan*] stands second after chickpea among the pulses in terms of area of cultivation. India produces 4.23 million tonnes of pigeonpea from an area of 5.21 million hectares [3]. The country alone contributes nearly 92 per cent of the total pigeonpea production in the world. About 85% of the pigeonpea is grown in six states namely, Maharashtra, Karnataka, Madhya Pradesh, Andhra Pradesh, Gujarat and Jharkhand Although India leads the world both in area and production of pigeonpea, its productivity is lower (673 kg/ha) than the world average (762.4 kg/ha) [4].

To plan an effective breeding programme clear cut understanding of the character association between yield and yield attributing traits is of utmost importance. Grain yield in pigeonpea is of complex nature and is made up of several contributing traits, each under separate genetic control. Selection for desirable genotypes should be made based on grain yield and also other yield component characters which influence the yield. For this, the information on inter-relationship of important quantitative traits is of much value. In the correlation analysis is usually taken up to measure the relative magnitude of influence of each of this independent variable on a dependent variable like grain yield as described by Robinson *et al.* [7]. Therefore the present investigation was conducted in order to estimate the character association in pigeonpea so that the desired targets can be achieved successfully.

MATERIAL AND METHODS

Experimental material:

The material under evaluation comprised of 42 pigeonpea genotypes of early maturing group. This experimental material is maintained by the Pigeonpea Breeding Department, International Crops Research Institute for the Semi-Arid Tropics.

Experimental Design and Land Preparation:

The experiment was conducted in the field located in the International Crops Research Institute for the Semi-Arid Tropics, Patancheru during *kharif* 2016-17. The genotypes were grown in a Randomized Block Design with three replications. Each genotype was raised in four rows of four meter length in each replication with the spacing of 75×25 cm². The crop was given a uniform basal dose of 25 kg N and 50 kg P2O5/ha. Cultural practices like weeding and plant protection measures were followed as and when required.

Observations:

Five competitive plants were selected randomly from each row in each replication for recording the observations. Average value of the line for each character was computed from these plants for the characters 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, number of seeds per pod, 100 seed weight, grain yield per plant (gm) and harvest index (%).

Statistical Analysis:

To understand the association among the characters, genotypic and phenotypic correlations coefficient were worked out by adopting method described by Singh and Chaudhary [10]. Significance of correlation coefficient was tested by 't' test [6].

RESULTS AND DISCUSSION

In the present study, genotypic and phenotypic correlation among the eleven characters of pigeonpea genotypes was computed. The correlation co-efficient for grain yield per plant and its contributing characters for 42 genotypes at phenotypic and genotypic level are presented in Table 1 and 2 respectively. Grain yield per plant in pigeonpea had high positive correlation with number of pods per plant (0.9695G, 0.9309P), days to 50% flowering (0.6454G, 0.5671P) plant height(0.6054G, 0.5227P) and days to maturity(0.5039G, 0.4088). The other traits also exhibited positive however low correlation with grain yield per plant viz., number of secondary branches per plant (0.3293G, 0.2114P), pollen fertility (0.1008G, 0.0496P), number of primary branches per plant (0.0702G, 0.0395P), hundred seed weight (0.0731G, 0.0428P) which indicated the importance of these traits in selection for yield. Negative correlation with grain yield per plant is exhibited by number of seeds per pod (-0.2511G, -0.0934P). Salunke *et al.* [8], Gowda *et al.* [5] and Sharma *et al.* [9] reported positive correlation of plant height with seed yield in pigeon pea. Aher *et al.* [1] also reported positive association of 50% flowering with grain yield. The present study indicated highly significant positive association of number of pods per plant (0.9695G, 0.9309P) both at phenotypic and genotypic level with seed yield per plant. Gowda *et al.* [5], Aher *et al.* [1] and Bhadraru *et al.* [2] noted the positive and significant association of grain yield per plant with number of pods per plant.

Table 1: Estimates of genotypic correlation coefficient between different characters in pigeonpea.

Character	Plant Height (cm)	Days to 50% Flowering	Pollen Fertility (%)	Days to Maturity	Primary Branches/ Plant	Secondary Branches/ Plant	Pods Per Plant	Seeds Per Pod	100 Seed Weight	Harvest Index	Grain Yield Per Plant
Plant Height (cm)	----	0.6268	-0.0235	0.5474	0.4998	0.5381	0.6576	-0.1217	-0.1383	-0.0338	0.6054
Days to 50% Flowering		----	-0.0181	0.9244	0.3065	0.2939	0.7144	-0.4421	-0.3726	0.1603	0.6454
Pollen Fertility (%)			----	-0.2079	-0.0062	-0.3681	0.0846	-0.1483	-0.0096	-0.1418	0.1008
Days to Maturity				----	0.3247	0.2204	0.5600	-0.3649	-0.2614	0.1945	0.5039
Primary Branches/ Plant					----	0.4807	-0.0178	0.1712	0.5053	-0.0924	0.0702
Secondary Branches/ Plant						----	0.3239	-0.3304	-0.0193	-0.2960	0.3293
Pods Per Plant							----	-0.3309	-0.1457	0.0990	0.9695
Seeds Per Pod								----	0.2594	-0.2701	-0.2511
100 Seed Weight									----	-0.2384	0.0731
Harvest Index										----	0.0366

Table 2: Estimates of phenotypic correlation coefficient between different characters in pigeonpea.

Character	Plant Height (cm)	Days to 50% Flowering	Pollen Fertility (%)	Days to Maturity	Primary Branches/Plant	Secondary Branches/Plant	Pods Per Plant	Seeds Per Pod	100 Seed Weight	Harvest Index	Grain Yield Per Plant
Plant Height (cm)	----	0.5217*	0.0084	0.4450*	0.1232	0.3025*	0.5840*	-0.1491	-0.1242	-0.0156	0.5227*
Days to 50% Flowering		----	-0.0074	0.8516*	0.0760	0.1840*	0.6622*	-0.2039*	-0.2566**	0.0787	0.5671*
Pollen Fertility (%)			----	-0.1479	0.0027	-0.2236*	0.0790	-0.0395	-0.0079	-0.1051	0.0496
Days to Maturity				----	0.0751	0.1522	0.4910*	-0.1982*	-0.1337	0.1051	0.4088*
Primary Branches/Plant					----	0.1143	0.0028	-0.0158	0.1481	0.0297	0.0395
Secondary Branches/Plant						----	0.2057*	-0.0473	0.0456	-0.1128	0.2114*
Pods Per Plant							----	-0.1588	-0.1101	0.0867	0.9309*
Seeds Per Pod								----	0.0949	-0.0602	-0.0934
100 Seed Weight									----	-0.1262	0.0428
Harvest Index										----	0.0284

* significant at 5% level

** significant at 1% level

Association among the yield contributing characters:

To have a better understanding of the plant type, it would be desirable to know the association among the other characters contributing to yield. Plant height had significant positive correlation with days to 50% flowering (0.5217P), days to maturity (0.4450P), number of secondary branches per plant (0.3025P) and number of pods per plant(0.5840P). Days to 50% flowering exhibited significant positive correlation with days to maturity(0.8516P), number of secondary branches per plant (0.1840) and number of pods per plant (0.6622P) and significant negative correlation with number of seeds per pod(-0.2039 P) and hundred seed weight (-0.2566P). Days to maturity exhibited significant positive correlation with number of pods per plant (0.4910P) and significant negative correlation with number of seeds per pod(-0.1982P). Number of secondary branches per plant exhibited significant positive correlation with number of pods per plant (0.2057P).

CONCLUSION

Based on the findings of the current study it can be concluded that the characters number of pods per plant, days to 50 percent flowering, plant height, days to maturity and number of secondary branches per plant are highly correlated with the grain yield per plant. It can be suggested that while planning a breeding programme for yield improvement in the crop, these traits should be given importance so that there will be simultaneous improvement in the grain yield per plant.

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