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GENETIC VARIABILITY AND SELECTION PARAMETER FOR SEED YIELD IN PIGEON PEA [*CAJANUS CAJAN* (L.)MILLSP.]

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ABSTRACT

An experiment consisting 35 diverse genotypes of Pigeon pea [*Cajanus cajan* (L.) Millsp.] was conducted in Randomized Block Design (R.B.D.) with three replications at Oilseed Research Farm, Kalyanpur of Chandra Shekhar Azad University of Agriculture and Technology Kanpur during kharif 2020-2021. Each genotype was sown in single row of single row 4m., distance between row to row 75cm. and distance of plant to plant 25 cm. respectively. Data were recorded on plant height, days to flowering, days to maturity, number of primary branches, number of secondary branches, number of seeds per pod, number of pods per plant, biological yield per plant (g), harvest index (%) and seed yield per plants (g). The analysis of variance showed highly significant variations of means sum of squares for all the characters under study. High level of genetic variability was noted for all the characters. High heritability coupled with high genetic advance was observed for majority of the characters under study and under the control of additive genetic effects. Grain yield per plant showed positive and significant correlations with plant height, number of secondary branches, biological yield per plant and harvest index.

KEYWORD: Pigeon pea, Genetic variability, Heritability, Genetic advance, correlation.

INTRODUCTION

The pigeon pea [*Cajanus cajan* (L.) Millspough] is one of the most important legume crops in tropical and subtropical regions of the world. It is consumed in the form of split pulse (dhal). Its seeds are rich sources of protein (22.3%), fat (1.7%), carbohydrate (57.6%), iron, iodine and other essential amino acids such as lysine, cysteine and arginine as well. The per capita consumption of pigeon pea is slightly higher than chick pea. A minimum combination of pulse with rice or *chapati* is must to fulfill the protein and amino acids supplement for vegetarian diet. India has attained self-sufficiency in cereals, vegetables, milk, poultry products but still for behind for getting self-reliance in pulses and vegetable oils. Our country still pay big amount of foreign currency to import these two commodities to meet the domestic demands. India remains responsible for 15% of import-export, about 27% of the total consumptions at global level, and about 25% of the total production of pulses every year. Although, the pulses production increased by 3.45% (Singh, 2021) but the position of availability of pulses in every one is still not satisfactory. A projected demand in pigeon pea by 2025 will be about 5.78 million tons against production of about 2.69 million tones resulting 3.09 million tones deficit (IIPR projection data). Pulses were the integral part of subsistence farming in India in past and attain further prominent position in recent year by giving emphasis on the long-term sustainability of production system by researcher and policy makers alike. Pulses are the rich source of inexpensive plant based protein (20-25%), vitamins, minerals and dietary fibers besides having low fiber content, zero cholesterol and gluten and consequently have got significant place in the human being where vegetarian diet is predominant (**Anonymous, 2016**).

Pigeon pea and faba bean are unique among grain legumes which are cross-pollinated and are not exclusively self-fertilized**.** Pigeon pea is a kharif crop, India ranked first in area and production in the world with 80% and 67% of world acreage and production respectively. Highest production of pigeon pea is from Maharashtra which is around 30% of national production. More than 90% of production and contribution of Tur is comes from 8 states, namely Maharashtra, Karnataka, Madhya Pradesh, Uttar Pradesh, Gujrat, Jharkhand, Telangana and Andhra Pradesh. The market prices of pigeon pea during May and June, 2018, 2019 and 2020 showed higher market prices as comparison to their MSPs and away from a poor man diets. Hence it is a need to enhance the production and productivity of this crop to control the increasing prices and to make available to everyone at reasonable prices.

Pigeon pea thrives in hot dry environments, its drought tolerance and ability to utilize residual moisture with low inputs during the dry season makes it important for the livelihood of small holders in the semi-arid tropics. The chick pea is amongst the most researched crop worldwide unlike pigeon pea. Considering the significance of this crop besides the yield and maturity characters, concerted efforts are in progress on CGMS based hybrid development. Research priorities for development of stable sources of resistance for wilt and Sterility Mosaic Diseases which are highly destructing and endemic in India in almost all the pigeon pea growing areas are also.

MARTIAL AND METHODS

35 diverse genotypes of Pigeon pea [*Cajanus cajan* (L.) Millsp.] were evaluated for ten growth and yield parameters in a replicated trial at Oilseed Research Farm, Kalyanpur, Chandra Shekhar Azad University of Agriculture and Technology Kanpur during the kharif season of 2020-2021. The experiment was conducted in Randomized Block Design (R.B.D.) with three replications. Each genotype was sown in a single row of four meter long spaced at 75cm. The plant to plant distance was kept at 25 cm. respectively. The observations were recorded on five randomly selected plants for days to 50% flowering, days to maturity, plant height (cm), number of primary branches / plant, number of secondary branches / plant, number of seeds / pod, number of pods / plant, biological yield/plant (g), harvest index (%) and seed yield / plant (g).

The mean data were analyzed for various statistical parameters as usual procedures while genetic variability was worked out according to **Burton and De vane (1953)**. The heritability in broad sense was calculated as per the method suggested by **Allard (1960)**. The phenotypic and genotypic correlation coefficients according to **Miller *et al*. (1958)** were estimated.

RESULT AND DISCUSSION

Estimation of Genetic variability

The analysis of variance revealed highly significant differences for all of the characters under study indicating that the evaluated set of materials has high level of variability and has ample opportunity to breeder for selection **(Table-1)**. Wide range of phenotypic and genotypic coefficients variation was observed plant height, days to maturity, number of pods per plant, days to 50% flowering and biological yield. Low range coefficient variations were noted for number of primary branches, number of secondary branches, number of seeds per pod and harvest index.

In general, phenotypic coefficients of variation (PCV %) were higher than the corresponding genotypic coefficients of variation (GCV %) for all the characters indicating the role of environment for expression of characters. The characters namely, number of primary branches, days to maturity, seeds per pod, biological yield per plant and harvest Index which showed higher differences between these two indicated that these characters are more influenced by environments. The other characters which showed fewer differences between PCV and GCV indicated the stability of characters. The findings of **Choudhary (2017), Mula *et al.* (2019)** and **Vanniarajan *et al*. (2021)** were also in accordance with these results.

Estimation of heritability and genetic advance

Heritability, in broad sense, includes both additive and epistatic components and it is realize only when accompanied by genetic advance. Higher value of heritability estimates was observed for all the characters under study except for number of seeds per pod which showed moderate heritability. High heritability coupled with high genetic advance for plant height, days to flowering, days to maturity, number of secondary branches and pods per plant showed that these characters were under the control of additive gene action while Harvest index, number of primary branches and seed yield per plant were under the control of both additive and non-additive genetic system. Similar findings has also reported by **Patel and Patel (1998); Baskaran and Muthaiah (2006), Sreelakshmi *et al* (2010), Rao and Rao (2015) and Mallesh *et al.* (2017),**

Genotypic and phenotypic correlation coefficients

To quantify the relationship between the features under investigation, the genotypic and phenotypic correlation coefficients between pair of characters were calculated and presented in **Table2&3**

In a plant breeding effort are being made to increase seed yield and extensive information on relationship between various characters with seed yield and among the characters themselves.

For most of the characters studied, the magnitudes of genotypic correlation were higher than the magnitude of phenotypic correlation. This suggested that genetic factors played a larger role in determining these associations and these correlations were due to pleiotropic effects,

The analysis of variance indicated highly significant differences among all the genotypes for all the characters studied. The major advantages of phenotypic and genotypic correlation between yield and its contributing characters are most important for effective indirect selection. In present investigation, biological yield (0.554), days to maturity (0.368), plant height (0.482), number of primary branches (0.568), number of secondary branches (0.209) and harvest index (0.583) showed positive and significant phenotypic correlation with seed yield per plant. These results are in conformity with those of **Bhadru (2010), Chandana *et al.* (2014)** and **Choudhary (2017)** about days to flowering, number of pods per plant, no. of primary and secondary branches as significantly positive correlation with seed yield at phenotypic and genotypic levels as well.

For day to maturity and number of pods per plant, days to flowering, days to maturity, number of primary and secondary branches, pods/plant, plant height, and harvest index with seed yield/plant showed significant and positive relationship.

Negative and significant association between Biological yield/plant and harvest index (-0.345) at genotypic level alarmed the negative impact of vegetative growth on harvest index.

Table 1: Coefficient of Genetic Variability, Heritability and Genetic Advance in Pigeon pea.

Character	Mean	PCV (%)	GCV (%)	Heritability (h^2bs) (%)	Geneticadvance	G. A. in % Overmean
Plant Height (cm)	180.04	8.05	7.871	95.6	28.54	15.85
Days to50% flowering	127.23	10.56	10.48	98.6	27.30	21.46
Days to maturity	216.69	17.50	16.48	88.7	69.29	31.98
No. of primary branches/plant	22.48	18.73	17.85	90.8	7.88	35.05
No. of secondarybranches/ plant	49.66	20.95	20.77	98.3	21.06	42.41
No. seeds /pod	4.44	14.70	11.64	62.7	0.84	18.99
No.of pods/plant	230.19	13.76	13.19	92.0	60.01	26.07
Biological yield/plant(g)	120.21	14.70	11.64	99.00	36.01	29.96
Harvest Index (%)	17.59	16.97	15.95	88.30	5.43	30.87
Seed Yield/plant (g)	20.98	18.50	17.58	90.30	7.22	34.40

Table 2: Genotypic Correlation between pair of characters in Pigeon pea.

Traits	Plant Height (cm)	Days to 50% flowering	Days to maturity	No. of primary branches/plant	No. of secondary branches/plant	No. seeds per pod	No. of pods/ plant	Biological yield/ plant (g)	Harvest index (%)	Seed Yield/plant (g)
Plant Height (cm)	1.000	0.482**	0.599**	0.511**	0.641**	-0.097	0.215*	0.166	0.231*	0.384**
Days to 50% flowering		1.000	0.571**	0.399**	0.575**	0.306**	0.239*	-0.125	0.340**	0.176
Days to maturity			1.000	0.368**	0.518**	0.131	0.605**	-0.037	0.164	0.125
No. of primary branches/plant				1.000	0.568**	0.257**	0.366**	-0.049	0.160	0.121
No. of secondary branches/plant					1.000	0.209*	0.373**	0.151	0.086	0.196*
No. seeds per pod						1.000	0.260**	0.089	0.098	0.129
No. of pods/plant							1.000	-0.032	0.004	-0.036
Biological yield/plant (g)								1.000	-0.345**	0.554**
Harvest index (%)									1.000	0.583**
Seed yield/plant(g)										1.000

* Significant at p=0.05, ** Significant at p=0.01

Table 3: Phenotypic Correlation coefficient between characters in Pigeon Pea.

Character	Plant Height (cm)	Days to 50% flowering	Days to maturity	No. of primary branches	No. of secondary branches	No. of seeds/ pod	No. ofpods/ plant	Biological yield/ plant	Harvest Index (%)	Yield/ Plant (g)
Plant Height (cm)	**1.000**	0.482**	0.599**	0.511**	0.641**	-0.097	0.215*	0.166	0.231*	0.365**
Days to 50% flowering		**1.000**	0.571**	0.399**	0.575**	0.306**	0.239*	-0.125	0.340**	0.174
Days to maturity			**1.000**	0.368**	0.518**	0.131	0.605**	-0.037	0.164	0.115
No. of primary branches				**1.000**	0.568**	0.257**	0.366**	-0.049	0.160	0.113
No. of secondary branches					**1.000**	0..209*	0.373**	0.151	0.086	0.201*
No. of seeds/ pod						**1.000**	0.260**	0.089	0.098	0.054
No. of pods/ plant							**1.000**	-0.032	0.004	-0.047
Biological yield (g)								**1.000**	-0.345**	0.530**
Harvest Index (%)									**1.000**	0.623**

* Significant at p=0.05, ** Significant at p=0.01

REFERENCES

1. Ajay, T., Sharma, R. N., Markam, N.K., Harsh, M. and Sarawgi, A.K., Genetic variability analysis for plant selection in pigeon pea [*Cajanus cajan* (L.) Millsp.] under different environments. *Environment and Ecology*, 2017; 35(3D): 2479-2485.
2. Allard, R. W. Principles of Plant Breeding. *J. Wiley and Sons, Inc., New York.*, 1960; 84-85.
3. Burton, G. W. and De vane, E. M. Estimating heritability in tall Fecue (*Festuca arundinacea*) from replicated clonal material. *Agron. J.*, 1953; 45: 478-481.
4. Anonymous. Agricultural statistics at a glance, Department of Agriculture and Cooperation. Ministry of Agriculture, Government of India, 2015.
5. Anonymous. (2016). Agricultural statistics at a glance, Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India.
6. Bhadru, D. Correlation and path analysis for yield and its attributing traits in white coated pigeon pea [Cajanus cajan (L.) Millsp.]. *Legume Research*, 2010; 33(3): 196-200.
7. Bhaskaran, K. and Muthaiah, A.R. Variability studies in pigeon pea. *Res. Crops*, 2006; 7: 243-248.
8. Chandana, K. C., Prasanthi, L., Reddi Sekhar. M. and Bhaskara Reddy, B.V. Studies on Correlation and Path Analysis for Yield and its Attributes in Rabi Red Gram. *Indian Journal Agricultural Research*, 2014; 48(1), 47-51.
9. Choudhary, R. Genetic Variability and Inter-Relationship among Yield Contributing Characters in Advance Lines of Pigeon pea [*Cajanus cajan* (L.) Millsp.] Grown at Different Altitudes. *Chem Sci Rev Lett.*, 2017; 6(22): 1120-1128.
10. Jagan Mohan Rao, P. and Thirumala Rao, V. Genetic analysis for yield and its Components in pigeonpea (*Cajanus cajan* (L.) Millsp). *International Journal of Applied Biology and Pharmaceutical Technology*, 2015; 6(2): 189.
11. Mallesh, P., Nanda, H.C., Durgaraju, Ch., Kumar, C.V.S., Mohan, N. and lee, J., Variability, Heritability and Genetic Advance for Quantitative Traits in Pigeon pea (*Cajanus cajan* (L.) Mill sp.). *Int. J. Pure App. Biosci*, 2017; 5(5): 25-28.
12. Miller, P.A.; William, J. C.; Robinson, M. E. and Comstock, R. E. Estimates of genotypic and environmental variances and covariance in upland cotton and their implication in selection. *Agron. J.*, 1958; 50: 131-136.
13. Mula, M.G., Galian, J.L. and Mula, R.P., Variability, heritability and genetic advance of medium to long duration pigeon pea (*Cajanus cajan* (L.) Mllsp.) Lines. *Green Farming*, 2019; 10(2): 127-130.
14. Patel, K.N. and Patel, D.R. Studies on genetic variability in Pigeonpea, *International pea Chickpea and Pigeon Newsletter*, 1998; 5: 28-30.
15. Rangare, N. R., Reddy, G.E., and Kumar, S.R., Study of heritability, genetic advance and variability for yield contributing characters in pigeon pea (*Cajanus cajan* (L.) Millspaugh). *Trends in Biosciences*, 2013; 6.5: 660-662.
16. Sreelakshmi. Ch., Sameer Kumar, C.V. and Shivani, D. Genetic analysis of yield and its component traits in drought tolerant genotypes of pigeonpea (*Cajanus cajan* L. Millspaugh). Electron. *J. Plant Breed.*, 2010; 1(6): 1488-1491.
17. Vanniarajan, C., Magudeeswari, P., Gowthami, R., Indhu, S.M., Ramya, K.R. and Monisha, K., Assessment of Genetic Variability and Traits Association in Pigeon pea [*Cajanus cajan* (L.) Millsp.] Germplasm. *Legume Research-An International Journal*, 2021; 1: 8.
18. Yerimani, A.S., Subhash Mehetre and Kharde, M.N. Association analysis for yield and its component traits in F3 and F4, populations pigeon pea [*Cajanus cajan* (L.) Millsp.). *Molecular Plant Breeding*, 2013; 189-195.