GLOBAL JOURNAL OF BIO-SCIENCE AND BIOTECHNOLOGY

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VARIABILITY STUDIES IN EARLY GENOTYPES OF PIGEON PEA (*Cajanus cajan* (L.) Millsp.)

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ABSTRACT
The study of general mean, range, genotypic, phenotypic and environmental variance, genotypic, phenotypic and environmental coefficient of variance, heritability and genetic advance were conducted for grain yield and its components among parents, 34 genotypes of the pigeon pea. All the characters studied exhibited significant variability among all population. Higher estimates of genotypic and phenotypic coefficients of variation indicating high level of variability and ample scope for effective improvement. The higher estimates of heritability coupled with high genetic advance as per cent of mean indicated additive gene action for the characters considered.

KEYWORDS: pigeon pea, variability, heritability, genetic advance.

INTRODUCTION

Pigeon pea is also known as 'arhar, tur or redgram' with chromosome number i.e. 2n=2x=22, belongs to family 'leguminosae' act both as a food crop (dried peas, flour or green vegetable peas) and a forage or cover crop. Pigeon pea is important legume crop of rainfed agriculture in the semiarid tropics. Pigeon pea are cultivated in more than 25 tropical and subtropical countries either as sole crop or intermixed with cereals. It's benefits are protein rich seed (21% protein), fuel, fodder and erosion control. It is largely consumed in the form of split pulse as 'dal' while its tender green pods constitute a very favourite vegetable in some parts. The stalks are utilized for various purposes, such as roofing, walling, sides of carts and basket making and burning as fuel. The trait of grain yield is controlled by complex gene action and hence traits contributing to yield must be considered and evaluated. To retrieve culture yielding superiorly with better nutrient value, utilization of diverse parents for introgression is essential. It is therefore, necessary to estimate relative amounts of genetic and non-genetic variability exhibited by different characters using suitable parameters like genotypic coefficient of variability (GCV), Phenotypic coefficient of variability (PCV), heritability estimates (h2) and genetic advance (GA) and genetic association between yield and yield contributing, the information on their aspects will help in the breeders to determine the selection criteria for isolating high yielder genotypes in pigeonpea.

MATERIALS & METHODS

The present study comprised a set of selected 34genotypes. These were sown during Rabi 2014-15 in Randomized Block Design, with a spacing of about 30 x 20 cm in three replication and standard agronomic practices were followed. Five plants selected at random were tagged from each genotype and observations on thirteen quantitative characters (plant height, days to initiation of flowering, days to 50% flowering, days to maturity, number of primary branches per plant, number of pods per plant, pod length, pod breadth, number of seeds per pod, hundred seed weight, grain yield per plant, straw yield per plant and harvest index) were recorded on these plants.

Genetic variability parameter viz., mean, variance, phenotypic coefficient of variation (PCV) and genotypic coefficient of variation (GCV) (Burton and De Vane, 1953), heritability (h^2) and Genetic advance (GA) (Johnson *et al*., 1955) among characters were calculated by following the standard procedures with the help of INDOSTST software's.

RESULTS & DISCUSSION

Wide range of variation was observed among the genotypes for all the characters studied. The characters showing significant mean sum of squares for all the characters indicated the extent of variability existed in the population (table 1). The character plant height and days to initiation of flowering showed high range of variation. Genotype ICPH 2671 (70.43 cm) was the tallest and genotype ICPL 20340 (61.47 cm) was the dwarfest one, whereas genotype ICPL 11249 (57 days) and ICPL 11263 (57 days) were earliest in initiation of flowering. Chandra *et al.* (1975), Dodake *et al.* (2009), Vijayalakshmi *et al.* (2013) and Sharma *et al.* (2014) also reported wide range of variation for these characters in pigeon pea. Wide genetic variability for plant height was also reported by Aher *et al.* (1998). Another important character having direct bearing on yield are number of primary branches per plant and number of pods per plant. More the branches more will be the number of pods and ultimately more will be the yield. This result is in conformation with Rao and Rao (2015) and Venketeswarlu (2001) observed maximum variability for number of pods per plant.

TABLE 1. Analysis of variance for thirteen quantitative characters

Source of variation	df	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}
Replication	2	734.030	152.529	57.020	64.647	31.809	3534.512	3.526	4.247	1.602	1.998	12.650	1350.580	88.376
Genotypes	33	702.909*	9695.578*	8893.333*	7214.627*	139.28*	60779.21*	28.110*	65.162*	32.006*	334.148*	846.118*	1294.350*	2592.834*
Error	66	58.897	1306.804	790.314	806.020	1.745	417.328	16.509	1.186	17.163	23.722	64.910	173.980	315.951

X_1=Plant height(cm), X_2= days to initiation of flowering, X_3= days to 50% flowering, X_4= days to maturity, X_5= number of primary branches per plant, X_6= number of pods per plant, X_7= pod length(cm), X_8= pod breadth, X_9= number of seeds per pod, X_{10}= hundred seed weight X_{11}= grain yield per plant(g) ,X_{12}= straw yield per plant(g) and X_{13}=Harvest index

TABLE 2. Estimation of genetic variability parameters for fourteen characters

Sr. No.	Characters	PCV (%)	GCV (%)	h^2	GAM
1	Plant height (cm)	4.207	3.955	88.403	7.662
2	Days to initiation of flowering	15.727	14.257	82.183	26.626
3	Days to50% flowering	12.956	12.137	87.758	23.422
4	Days to maturity	7.669	7.068	84.926	13.418
5	Number of primary branches per plant	20.578	20.386	98.144	41.604
6	Number of pods per plant	36.686	36.498	98.977	74.800
7	Pod length	14.027	9.357	44.500	12.859
8	Pod breadth	12.694	12.522	97.318	25.448
9	Number of seeds per pod	18.099	12.492	47.64	17.763
10	100 seed weight	21.641	20.537	90.057	40.148
11	Grain yield per plant(g)	37.97	35.883	89.312	69.859
12	Straw yield per plant(g)	10.418	9.447	82.226	17.647
13	Harvest index (%)	30.816	28.194	83.707	53.138

The total variability in each of the eleven characters could be partitioned into three components *viz*., phenotypic, genotypic and environmental variation. . In present investigation genotypic variances were relatively smaller than phenotypic variances. Maximum phenotypic variance for thirty-four genotypes was found in number of pods per plant (618.14) and Pod length (0.45) indicated lower magnitude of phenotypic variance and similar results in genotypic variance also. PCV was found to be higher than genotypic coefficient of variation for all the traits studied. Grain yield per plant (37.97%) exhibited maximum PCV. Highest value of genotypic coefficient of variation was registered for number of pods per plant (36.498%) whereas, the character plant height (3.955%) exhibited minimum genotypic coefficient of variation. These results are in agreement with Rathanaswamy *et al.* (1973), Shoram (1983), Balyan and Sudhakar (1985), Khapre *et al.* (1993) and Rao and Rao (2015) in pigeon pea.

Heritability estimates was highest for number of pods per plant (98.977%) followed by number of primary branches per plant (98.144%), pod breadth (97.318%), hundred seed weight (90.057%) and grain yield per plant (89.312%). These results are in agreement with Rathanaswamy *et al.* (1973), Patil *et al.* (1989) and Rao and Rao (2015) in pigeon pea. High heritability coupled with high genetic advance reveals the presence of lesser environmental influence and prevalence of additive gene action in their expression. . Sharma *et al.* (2014), Rao and Rao (2015) also reported high heritability along with high genetic advance for number of pods per plant. High heritability estimates with low genetic advance as percent of mean were indicated by the characters pod breadth, straw yield per pant, days to maturity and plant height suggested the influence of non-additive gene action. Therefore, improvement of the traits which are having high heritability along with high genetic advance would be more effective if the selection pressure in the present material could be rigorously applied (table 2).

CONCLUSION & RECOMMENDATION

The analysis of variance revealed significant variation among the genotypes for all the characters studied. The estimates of mean sum of squares showed comparatively wide range of variation for the characters number of pods per plant and days to initiation of flowering, while the lowest variation was recorded for pod length.

Among the genotypes, ICPL 20340 was the dwarfest, while genotype ICPH 2671 was the tallest.The genotype ICP 7035 recorded maximum number of pods per plant. The genotype ICPL 20325 showed maximum value for pod length. The genotype ICPL 7035 showed maximum value for pod breadth whereas maximum number of seeds per pod was recorded in ICPL 11285. The genotype ICPL 20329 (17.17 g) recorded maximum grain yield per plant. The genotype ICP 7035 recorded maximum hundred seed weight. The genotype ICPL 11339 recorded maximum straw yield per plant whereas maximum harvest index was recorded in ICPL 20329. Phenotypic variances were higher than genotypic variances for all the characters studied. Most of the characters showed comparatively higher estimates of environmental variance indicating the influence of environment on those characters. The genotypes that showed better performance for yield and yield contributing characters can be evaluated further for selection.

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