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Genetic Variability and Correlation in Early Maturing Genotypes of Pigeonpea

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ABSTRACT

Drymatter per plant, plant height and pods per plant showed a wide range of phenotypic variation. The genotypic and phenotypic coefficient of variation were higher for drymatter per plant, harvest index, pods per plant and grain yield per plant. Heritability estimates were higher for all the characters studied. However, high genetic advance was obtained only for drymatter per plant followed by pods per plant and plant height. High heritability coupled with high genetic advance for these traits indicated that additive gene effects were probably more important in the inheritance of these traits. Grain yield was significantly and positively correlated with pods per plant and drymatter per plant indicating that selection on the basis of these traits would be effective for yield improvement.

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INTRODUCTION

Improvement over existing varieties is a continuous process in plant breeding. One of the important considerations in any crop improvement programme is the detailed study of genetic variability. The estimates of heritable and non-heritable variation give a clue to improvement possible in the trait under study. Knowledge about interrelationship among yield components and their influence on yield is important for a fruitful selection. The present investigation was, therefore, carried out to estimate the phehotypic and genotypic variation, heritability, expected genetic advance and interrelationship among the traits in germplasm collection of pigeonpea, keeping the view for selection of supeior genotypes.

MATERIALS AND METHODS

The experimental material comprised 20 early maturing genotypes of pigeonpea laid out in a randomized block design with four replications at Instructional Farm, GAU, Junagadh during 1990-91. Each genotype was grown in a single row of 5 m length with 60 cm spacing between rows and 30 cm between plants within the rows. Five competitive plants were selected randomly for each genotype in every replication to record observations on yield and 10 related traits (Table 1). Phenotypic and genotypic coefficients of variation, heritability and genetic advance were worked out as per the procedure given by Johnson *et al.* (1955). Correlation coefficients were worked out for all possible combinations

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TABLE 1

Variability, heritability and genetic advance for different characters in early maturing genotypes of pigeonpea.

Character	*Range*	*Mean ± SE*	*GCV (%)*	*PCV (%)*	*Heritability (%)*	*Genetic advance (%)*
Days to flowering	81.50 (ICPL-87) – 108.75 (GAUT-82-55)	95.80 ± 1.99	7.60	8.66	77.09	13.17
Branches/plant	8.95 (GAUT-82-104) – 16.45 (GAUT-82-137)	11.93 ± 0.59	13.73	16.68	67.72	2.78
Plant height (cm)	112.70 (ICPL-312) – 207.50 (ICPL-151)	152.03 ± 1.98	14.59	14.83	96.90	44.99
Days to maturity	128.00 (ICPL-87) – 164.50 (GAUT-85-7)	145.58 ± 1.49	6.70	7.00	91.49	19.21
Pods/plant	45.55 (GAUT-85-7) – 119.10 (GAUT-82-137)	81.27 ± 3.77	28.55	30.02	90.44	45.45
Pod length (cm)	3.24 (GAUT-83-18) – 5.00 (ICPL-312)	4.40 ± 0.07	9.55	10.80	91.11	0.83
Grains/pod	3.10 (GAUT-84-13) – 4.84 (GAUT-85-7)	3.80 ± 0.10	11.51	12.73	81.75	0.82
100-grain weight (g)	9.83 (GAUT-84-2) – 13.60 (GAUT-85-7)	11.86 ± 0.17	12.90	13.22	95.24	3.08
Drymatter/plant (g)	30.22 (ICPL-312) – 194.49 (GAUT-82-137)	93.32 ± 2.90	38.55	39.05	97.47	73.17
Harvest Index	19.40 (GAUT-82-91) – 52.41 (ICPL-312)	28.24 ± 1.98	26.89	30.33	78.57	13.87
Grain yield/plant (g)	21.60 (GAUT-82-56) – 58.77 (GAUT-82-137)	34.52 ± 2.63	25.12	29.37	73.18	15.28

TABLE 2

Genotypic (r_G) and phenotypic (r_P) correlation coefficients various characters in early maturing genotypes of pigeonpea.

Character		Branches/ plant	Plant height	Days to maturity	Pods/ plant	Pod length	Grains/ pod	100-grain weight	Drymatter/ plant	Harvest index	Grain yield/ plant
Days to flowering	r_G	0.472**	0.587**	0.763**	0.090	-0.359	-0.428	0.146	0.139	-0.230	-0.086
	r_P	0.355	0.498	0.635**	0.066	-0.314	-0.341	0.150	0.120	-0.200	-0.066
Branches/plant	r_G		0.207	0.289	0.504*	-0.319	-0.402	-0.027	0.544*	-0.227	0.454*
	r_P		0.171	0.194	0.416	-0.275	-0.271	-0.024	0.424	-0.116	0.348
Plant height	r_G			0.553*	0.182	-0.188	-0.241	0.126	0.250	-0.371	0.083
	r_P			0.528*	0.173	-0.175	-0.242	0.111	0.244	-0.319	0.069
Days to maturity	r_G				-0.065	-0.067	-0.184	0.367	0.173	-0.345	-0.079
	r_P				-0.064	-0.035	-0.177	0.339	0.171	-0.281	-0.041
Pods/plant	r_G					-0.406	-0.512*	-0.362	0.611**	-0.030	0.867**
	r_P					-0.382	-0.446	-0.310	0.564**	-0.046	0.669**
Pod length	r_G						0.782**	0.319	-0.307	0.469*	0.037
	r_P						0.687**	0.293	-0.286	0.415	0.065
Grains/pod	r_G							0.135	-0.489*	0.527*	-0.162
	r_P							0.127	-0.428	0.401	-0.138
100-grain weight	r_G								0.242	-0.231	0.154
	r_P								0.231	-0.201	0.136
Drymatter/plant	r_G									-0.676**	0.699**
	r_P									-0.628**	0.573**
Harvest index	r_G										0.001
	r_P										0.214

*, ** Significant at 5% and 1% levels, respectively.

of characters as per the procedure outlined by Panse and Sukhatme (1961).

RESULTS AND DISCUSSION

Analysis of variance revealed highly significant differences among genotypes for all the characters which proved adequacy of material chosen for the study. Estimates of genetic parameters of variation, heritability and expected genetic advance are given in Table 1. Phenotypic range was higher for drymatter per plant, followed by pods per plant and plant height. Among the genotypes studied, GAUT 82-137 exhibited highest grain yield per plant alongwith branches per plant, pods per plant and drymatter per plant while days to maturity, grains per pod and 100-grain weight were highest for GAUT 85-7. The genotype ICPL 312 was found to be superior in pod length and harvest index. Among all the genotypes, ICPL 87 was earliest in maturity. The genotypic coefficient of variation (GCV) and phenotypic coefficient of variation (PCV) were found higher for drymatter per plant followed by pods per plant, harvest index and yield per plant. In general, the values of GCV were close to corresponding values of PCV for almost all the characters indicating least influence of environment on the expression of the characters. Godawat *et al.* (1980) also found high GCV for grain yield per plant and harvest index.

The estimates of heritability were higher for all the characters studied. Similar results were also noted by Sidhu *et al.* (1985) and Raman Kapur *et al.* (1988). Genetic advance was higher for drymatter per plant, pods per plant height. Thus, these three traits had high heritability copuled with high genetic advance. Sidhu *et al.* (1985) also observed high heritability and high genetic advance for pods per plant. High heritability coupled with high genetic advance indicates that these traits are controlled by the additive gene action, hence, phenotypic selection could be effective for the improvement of such traits.

The genotypic and phenotypic correlation coefficients among various characters studied are presented in Table 2. The grain yield was significantly and positively correlated with pods per plant and drymatter per plant at both genotypic as well as phenotypic levels, while its correlation with branches per plant was significant and positive only at genotypic level. These results are in agreement with the earlier findings of Bhopalsingh and Pawankumar (1987) and Marekar and Nerkar (1987). Amongst the components, significant and positive association was observed between days to flowering and days to maturity, pod length and seeds per pod and pods per plant and drymatter per plant at both the levels, while correlation coefficient of days to flowering with branches per plant and plant height; harvest index with pod length and grains per pod; and branches per plant with pods per plant and drymatter per plant was found positive and significant only at genotypic level. Hence, pods per plant appeared to be the most important selection criterion for the grain yield in pigeonpea. Gartan (1990) also reported the similar findings in pigeonpea.

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