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Genetic Variation and Trait Relationships in Wild Crosses of Pigeonpea, *(Cajanus cajan)*

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ABSTRACT

In a study on fourty wild crosses of redgram (*Cajanus cajan* L.) high magnitude of GCV and PCV for number of primary branches per plant, number of pods per plant, 100-seed weight and seed yield per plant were observed indicating large extent of genetic variability for these traits. High heritability was accompanied by high genetic advance for days to maturity, plant height, number of pods per plant and seed yield, whereas, moderate heritability was associated with high GCV and PCV for number of primary branches per plant. Days to maturity, plant height and number of pods per plant and seed yield expressed high genetic advance with high heritability. Days to 50% flowering was associated strongly and positively with days to maturity, plant height, number of secondary branches and number of pods per plant. Plant height, number of pods per plant and 100-seed weight showed positive significant association with seed yield per plant. Plant height manifested maximum direct effect towards seed yield followed by days to maturity and number of secondary branches per plant. Number of pods per plant and 100-seed weight also contributed major share to seed yield per plant indirectly through other traits. Plant height, number of pods per plant and 100- seed weight may be considered important traits for enhancing yield in pigeonpea.

Key words : Correlation,Path analysis, Pigeonpea, Variability, Wild crosses.

Pigeonpea (*Cajanus cajan* L.) is an important pulse crop cultivated for its premier pulse with manifold uses. The variability present in the population is the pre requisite for selection in any crop improvement programme. Selection of superior genotype will be possible only when adequate variability exists in the gene pool. Hence, an insight into the magnitude of variability present in the gene pool of a crop species is of utmost importance to plant breeder for starting a judicious plant breeding programme. Further, correlation and path analysis is helpful in determining the magnitude of association among the variables and relative contribution of the traits under study on yield. Such information in wild crosses of pigeonpea is limited. Therefore, the present study was undertaken to know the extent of variability, nature and magnitude of relationships among yield traits and their direct and indirect effects towards seed yield in wild crosses of redgram.

MATERIAL AND METHODS

The experimental material comprising of 40 wild crosses of pigeonpea was laid out in a randomized block design with two replications at Agricultural Research Station, Tandur under rainfed condition during kharif 2009. Each entry was accommodated in a single row of 4m length with a spacing of 100 x 20cm. All management practices in vogue for kharif redgram cultivation were followed for reaping good crop. The observations were recorded on five randomly selected plants in each entry for 8 yield and its attributing traits and the average values were used for statistical analysis. Phenotypic coefficient of variation (PCV) and genotypic coefficient of variation (GCV) were estimated along with heritability in broadsense and genetic advance as percentage of mean were calculated. Genotypic correlation coefficients were estimated as per the procedure given by Falconer (1964) and path analysis in accordance with Dewey and Lu (1959).

RESULTS AND DISCUSSION

There was a considerable role of environmental factors in expression of all the traits as depicted by higher values of PCV than corresponding GCV (Table 1). It was noted that

Table 1. Estimates of mean, range, phenotypic and genotypic coefficient of variance, heritability and genetic advance for eight characters in wild crosses of pigeonpea.

Character	Mean	Range		Genotypic coefficientof variation	Phenotypic coefficientof variation	Heritability %	Genetic advance	Genetic advance as% of mean
		Min.	Max.					
Days to 50 % flowering	137.7	120	154	74.44	75.67	0.010	2.077	1.509
Days to maturity	198.1	182	216	5.28	5.31	0.991	21.473	10.838
Plant height (cm)	188.3	151	215	7.82	8.01	0.954	29.675	15.755
No. of primary branches / plant	5.0	2	8	76.07	79.90	0.107	0.881	17.533
No. of secondary branches / plant	24.9	17	35	16.86	17.06	0.976	8.547	34.324
No. of pods/ plant	200.7	109	505	37.36	37.37	0.999	154.420	76.934
100 seed weight	8.3	6	10	102.46	104.26	0.014	0.257	3.071
Seed yield / plant (g)	53.9	24	96	30.80	30.81	1.000	34.199	63.449

Table 2. Genotypic correlation coefficients in redgram.

Character	Days to flowering	Days to maturity	Plant height (cm)	Number of primary branches per plant	Number of secondary branches per plant	Number of pods per plant	100-seed weight (g)	Seed yield (kg/ha)
Days to 50 % flowering	1.0000	0.9424**	0.3949*	0.1361	0.2322*	0.3021*	0.0466	0.1899
Days to maturity		1.0000	0.3886*	0.1137	0.1280	0.3163*	0.0467	0.1950
Plant height (cm)			1.0000	-0.0429	0.1608	0.1797	0.0057	0.2914*
No. of primary branches / plant				1.0000	0.4525**	0.0147	0.1632	0.0920
No. of secondary branches / plant					1.0000	-0.0067	-0.1673	0.1264
No. of pods/ plant						1.0000	-0.0187	0.0846
100 seed weight (g)							1.0000	0.0747
Seed yield / plant (g)								1.0000

** Significance at ($P \leq 0.01$) * Significance at ($P \leq 0.05$)

the magnitude of GCV and PCV was high for number of primary branches per plant, number of pods per plant and seed yield per plant and low for days to maturity and plant height. Number of secondary branches per plant recorded moderate values for these estimates. Our findings are in close agreement with the results reported by Sameer Kumar (2006). Lower magnitude of variability for the above traits in the present study suggested that large number of genotypes needs to be screened for identifying genotypes with desirable values for these traits.

The estimates of heritability in broad sense varied from 1% for days to 50% flowering to 100% for Seed yield per plant. Similarly genetic advance as percentage of mean observed to be minimum for days to 50% flowering followed by 100-seed weight. However, it is evident from the data that magnitude of heritability was high for seed yield per plant (100%), number of pods per plant (99.9%), days to maturity (99.1%), number of secondary branches per plant (97.6%) and plant height (95.4%). Likewise, high magnitude of genetic advance was observed for number of pods per plant

Table 3. Direct and indirect effects of different traits in redgram.

Character	Days to flowering	Days to maturity	Plant height (cm)	Number of primary branches per plant	Number of secondary branches per plant	Number of pods per plant	100-seed weight (g)	Seed yield (kg/ha)
Days to 50 % flowering	-0.1059	-0.0998	-0.0418	-0.0144	-0.0246	-0.0320	-0.0049	0.1899
Days to maturity	0.1604	0.1702	0.0661	0.0194	0.0218	0.0538	0.0080	0.1950
Plant height (cm)	0.0993	0.0977	0.2513	-0.0108	0.0404	0.0452	0.0014	0.2914
No. of primary branches / plant	0.0066	0.0055	-0.0021	0.0483	0.0218	0.0007	0.0079	0.0920
No. of secondary branches / plant	0.0189	0.0104	0.0131	0.0368	0.0813	-0.0054	-0.0136	0.1264
No. of pods/ plant	0.0072	0.0075	0.0043	0.0003	-0.0016	0.0237	-0.0004	0.0846
100 seed weight (g)	0.0036	0.0036	0.0004	0.0125	-0.0128	-0.0014	0.0764	0.0747

Residual effect: 0.9441

(154.42), seed yield per plant (34.19), plant height (29.67) and days to maturity (21.47).

High heritability coupled with high genetic advance and high GCV was noted for number of pods per plant and seed yield per plant indicating the involvement of additive gene action and scope of improvement of these characters through selection. Economically important characters like number of primary branches per plant and 100- seed weight showed low heritability along with low genetic advance and moderate to high GCV suggesting that these characters should largely be under the control of non- additive gene action and lower estimates of heritability may be due to larger influence of environmental factors. In many instances including number of pods per plant and seed yield per plant high estimates of heritability were associated with high values of genetic advance and vice-versa. In such a situation, variability in base population would be more useful than the magnitude of heritability alone for selecting better genotype. Similar observations was also been reported by Pandey and Singh (2001).

The genotypic correlation coefficients (Table 2) obtained among eight characters revealed most striking association of plant height, number of pods per plant and 100- seed weight with seed yield per plant. These findings are in accordance with the results obtained by Baskaran and Muthaiah (2006). Days to 50% flowering was positively and significantly associated with days to maturity (0.9424), plant height (0.3949), number of secondary branches per plant (0.2322) and number of pods per plant (0.3021). There was a positive significant association between number of primary branches per plant with number of secondary branches per plant and 100- seed weight. Positive significant association of number of pods per plant and 100- seed weight with seed yield indicated the scope of simultaneous improvement of these characters for yield enhancement. These results are in agreement with the earlier findings of Aher *et al.,* (1998).

Plant height had highest direct contribution (0.2513) towards seed yield followed by days to maturity (0.1702), number of secondary branches per plant (0.0813) and 100- seed weight (0.0764) (Table 3). It was further noted that number of pods per plant and 100- seed weight manifested positive indirect effects through other yield attributes resulting in positive significant association with seed yield. Direct contribution of number of primary branches per plant appeared to be low but at the same time negative indirect effect of days to 50% flowering towards seeds yield was considerable. Days to maturity appeared to be major indirect contributor towards seed yield towards most of the characters studied.

A situation like this where few characters shared a major responsibility in enhancing the yield potential in redgram was also reported by Lal and Rajni (2002). The present study thus indicated that prime emphasis should be given to number of pods per plant and 100- seed weight for yield improvement in redgram breeding programme.

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