

GENETIC VARIABILITY, HERITABILITY AND GENETIC ADVANCE IN COWPEA (*VIGNA UNGUICULATA*[L.] WALP)

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Abstract : Genetic variability studies in thirty one genotypes of vegetable cowpea revealed significant difference for all the characters except primary branches. A wide range of phenotypic coefficient of variation (7.4 to 56.7) was observed. High genotypic coefficient of variation was observed for pod weight (54.6) and pod yield per plant (53.1). All the characters exhibited high heritability (78% to 97%). Heritability and genetic advance were high for pod weight and yield per plant, which can be relied upon for the effective genetic improvement of cowpea.

Key words : Cowpea, genetic advance, genetic gain, heritability and variability.

INTRODUCTION

Cowpea (*Vigna unguiculata* [L.] Walp.), the common leguminous vegetable is a rich and inexpensive source of vegetable protein. Despite its high economic and nutritive values, high yielding varieties with acceptable vegetable quality are lacking. Studies on variability, a basic necessity for the crop improvement is limited in vegetable cowpea. Hence, the present study was undertaken with a view to understand the genetic variability in cowpea for yield and its contributing characters.

MATERIALS AND METHODS

Thirty one genotypes of vegetable cowpea collected from different parts of India, were evaluated in a randomised block design with three replications during September-November 1993. Plot size was 2.4 x 1.8 m with three rows of plants / genotype / replication. There were 32 plants / replication at a spacing of 60 x 30 cm.

The observations were recorded on plant height, primary branches per plant, days to flowering, pod length, pod weight, pods per plant, seeds per pod, 100 seed weight and yield per plant. The data were analysed and the genetic parameters such as phenotypic and

genotypic coefficient of variation (pcv and gcv), heritability in broad sense (H^2), genetic advance and genetic advance as per cent of mean (genetic gain) were worked out as per Burton and Devane (1953) and Lush (1949).

RESULTS AND DISCUSSION

General analysis of variance showed significant differences among the 31 genotypes for all the characters except primary branches per plant (Table 1).

The extent of variability in respect of nine polygenic characters in thirty one cowpea genotypes in terms of range, mean, genotypic and phenotypic coefficient of variation along with heritability and genetic gain is given in Table 2.

Considerable amount of variation was observed for all the characters. The plant height ranged from 27.2 to 53.1 cm. Primary branches per plant ranged from 2.5 to 6.1. The number of days to flower after sowing varied from 33.5 to 44.1 days. Pod length ranged from 8.8 cm to 32.4 cm. Average weight of a single pod ranged from 1.4 to 13.1 g. Pods per plant varied from 15 to 90.8. Seeds per pod ranged from 6.6 to 20.7. Hundred seed weight varied from 6.2 to 16 g. Yield per plant had a wide range of 56 g to 457.3 g.

Table 1. General analysis of variance for nine characters in cowpea (31 genotypes)

Source of variation	df	Plant height	Primary branches	Days to flowering	Pod length	Pod weight	Pods / plant	Seeds / pod	100 seed weight	Yield / plant
Replication	2	1.5	0.05	1.96	0.56	0.35	12.8	0.50	0.43	1110.0
Treatment	30	155.4**	1.3	25.5**	104.96**	21.9**	616.2**	29.5**	22.5**	20456.4**
Error	60	12.2	0.22	0.95	1.10	0.57	14.5	0.43	0.22	283.6

** Significant at 1 per cent level

Table 2. Range, mean, pcv, gcv, heritability, genetic advance and genetic advance as per cent of mean (genetic gain) for nine characters in cowpea

Characters	Range	Mean \pm SE	gcv	pcv	Heritability	Genetic advance	Genetic gain
1 j Plant height, cm	27.2-53.1	403 \pm 2.90	17.2	19.2	0.79	12.7	31.6
2 Primary branches	2.5-6.1	45. \pm 0.40	20.0	22.6	0.78	1.6	36.4
3 Days to flowering	33.5-44.1	40.9 \pm 0.80	7.0	7.4	0.90	5.6	13.6
4 Pod length, cm	8.8-32.4	18.7 \pm 0.9	31.3	31.8	0.97	11.9	63.8
5 Pod weight, g	1.4-13.1	4.9 \pm 0.61	54.6	56.7	0.93	5.3	108.1
6 Pods / plant	15.0-90.8	34.5 \pm 3.1	41.2	42.5	0.93	28.2	81.6
7 Seeds / pods	6.6-20.7	13.4 \pm 0.54	23.3	23.8	0.96	6.3	46.9
8 100 seed weight, g	6.2-16.0	10.8 \pm 0.38	25.3	25.7	0.97	5.5	51.6
9 Yield / plant, g	56.0457.3	154.3 \pm 13.8	53.1	54.2	0.96	165.5	107.2

The phenotypic coefficient of variation (pcv) was higher than the genotypic coefficient of variation (gcv) in all the characters. The highest gcv (54.6) with high heritability of 93% resulting in a higher value of expected genetic advance of 108.1 as per cent of mean was observed for pod weight. Yield per plant exhibited variability of 53.1 (gcv) with very high heritability (6%) and genetic gain (107.2). This indicated that genotypic variation contributed markedly to the total variability for the above characters. Similar results of high gcv were reported by Ramachandran *et al.* (1982) and Jalajakumari (1981) for these two characters. The lowest variability (gcv = 7.0) was observed for days to flower with a high heritability (90%) but with very low genetic

advance (13.6) as per cent of mean. For other characters like plant height, primary branches per plant, pod length, pods per plant, seeds per pod and 100 seed weight, the extent of genetic gain was 31.6, 36.4, 63.8, 81.6, 46.9 and 51.6 respectively, and that of heritability was 79, 78, 97, 93, 96 and 97 per cent respectively.

The heritability estimates obtained for all the characters were quite high in the present investigation. Such high heritability estimates find its usefulness in selection of superior genotypes on the basis of phenotypic performance with respect to quantitative characters. However, the heritability estimates along with the genetic gain is more useful than the heritability alone in predicting the resultant

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effect for selecting the best individuals. In the present study the character pod weight showed high heritability with high genetic advance as per cent of mean. This revealed the preponderance of additive type of gene action in controlling this character. This confirms the earlier findings of Pandita *et al.* (1982) and Vaid and Singh (1983) and Savithramma (1992). In general, the characters which exhibit high heritability with high genetic advance are more amenable to improvement through selection while the characters which exhibit high heritability with moderate or low genetic advance can be improved by intermating the superior genotypes of the segregating population developed from multiple crosses and the desirable genes can be accumulated in the lines.

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