https://doi.org/10.29321/MAJ.10.A02613

Madras agric. J. 70. (5): 281—283 May 1983

GENETIC VARIABIITY IN F_3 AND F_4 POPULATIONS OF A IN CROSS COWPEAS *(Vigna sinensis* L.)

I. K. VAID[1] and K. B. SINGH[2]

Genotypic coefficients of variation, heritability estimates and expected genetic advance were estimated for eight characters in 60 F_3 and 50 F_4 populations of a cross between C_{34}xC_{85} varieties of cowpeas. High estimate of phenotypic and genotypic coefficient of variation, heritability and expected genetic advance was observed for branch number, cluster number and yield. It might be worthwhile to select plants for these characters. The results about the grain yield are also quite encouraging, since it had moderately high heritability values and high genetic advance.

Yield in cowpeas, like other crops, is a complex and quantitative character depending upon numerous genetical factors interacting among themselves and with environment. It is difficult to judge whether the observed variability is heritable or is due to environmental causes. It is, therefore, of immense importance to have the knowledge of heritable and non heritable portion of total variation, which will provide an idea of heritability of a character. Knowledge concerning the heritability of quantitatively inherited characters and their associated genetic and environmental variance and covariance may be useful as a tool for improving the efficiency of selection in segregating populations.

Singh and Mehndiratta (1969) have reported genetic variability and correlation in cowpeas in pure lines, but no information is available so far on these aspects in segregating population. Present paper will deal with the information on genetic variability, heritability and genetic advance.

MATERIAL AND METHODS

The material comprising 60 F_3 and 50 F_4 populations from a cross[s] between C_{34} x C_{85} of cowpeas was grown in a randomised block design in three replications at Punjab Agricultural University, Ludhiana during Kharif, 1969. The spacing from plant to plant and row to row was maintained at 30 and 75 cm respectively. Observations were recorded on ten randomly selected plants from each entry for eight important characters including days to flowering, branch number, cluster number, pod number, pod length, seeds pod, 100-grain weight and seed yield.

Genetic coefficient of variation, heritability in broad sense and expected

---

* Part of thesis submitted by the first author for the degree of Master of Science in Agriculture (Plant Breeding) to Punjab Agriculture University in 1971.

1 Presently Research Scholar, Dept. of Genetics and Plant Breeding, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi-5.

2 Chickpea Breeder, ICARDA, Allepo, SYRIA.

genetic advance were estimated by stantard formulae.

RESULTS AND DISCUSSION

Wide range of variability was noted for branch number, cluster number, pod number, seeds per pod and grain yield in both the generations. On the other hand, days to flowering, pod length and seed weight had narrow range of variability. It was interesting to note the close similarity in range and coefficient of phenotypic and genotypic variation. For instance, wide range was odserved for branch number and also for this character coefficient of phenotypic variation high. On the contrary, pod length had narrow range and small coefficient of phenotypic variation. The data indicate that characters, branch number, cluster number, pod number seeds per pod and grain yield have given high genetic coefficient of variation which suggests high degree of genetic variability in these characters. Table 1 However, with the help of genetic coefficient of variation alone it is not possible to estimate the amount of variation that is heritable. The heritable portion of variation can be determined with the help of heritability estimates and genetic gain.

The heritability estimate in broad sense was highest for branch number in F_3 (60. 6%) and F_4 (67.0%). Table 2 This means 60.6 per cent of variation in F_3 and 67.0 per cent variation in F_4 was heritable and remaining portion of the variability was non-heritable, Moderately high heritability estimate was also present for cluster number and grain yield. The heritability estimate wa; moderate for seeds per pod and poc number, while it was low for poc length and seed weight. In general, heritability estimates were similar in F_3 and F_4 generations except days to flowering where it was high in F_3 and low in F_4 (Table 2)

In the present investigation the heritability estimates were moderate for grain yield (54.5%) in F_3 generation and (57,8) in F_4. The results are at variance with Singh and Mehndiratta (1969) who reported moderately low heritability for grain yield in cowpeas. Moderate heritability estimates have been reported in wheat (14.7%) by Gandhi *et al.* (1964) but lower values have been reported by Johnson and Bernard (1963) and Anand and Torrie (1963) in soybean. Low heritability estimates were observed for pod number and seeds per pod by Anand and Torrie (1963) in F_3 and F_4 generations of soybean. High heritability estimates for branch number have been reported in different grain legumes (Sandhu 1962 in gram; Singh *et al.*, 1971 in urdbean; Singh and Singh 1969 in lentil; Singh and Singh 1970 in fieldpeas) In contrast to the present finding, Singh and Mehndiratta (1969) observed high heritability for seed weight, days to flowering and pod length in cowpeas. Heritability estimates along with high genetic advance are usually more helpful in predicting the gain under selection than heritability estimates alone, The genetic advance as percentage of mean was high for branch number, cluster number and grain yield. Days

to flowering. pod length and seed weight had low genetic advance. In the present study, branch number, cluster number and grain yield had comparatively high heritability estimates and high genetic gain. It, therefore, appears that individual plant selection for branch and cluster number should be effective and satisfactory for practical purpose.

REFERENCES

ANAND, S. C. and J. H. TORRIE, (1963). Heritability of yield and other traits and interrelationships among traits in the F_3 and F_4 generations of three soybean crosses Crop Sci., 3: 508-11.

GANDHI, S. M., A. K SANGHI, K. S. NATHAWAT and M. P. BHATNAGAR, (1964). Genotypic variability and correlation coefficients relating to grain yield and a few other quantitative characters in Indian wheat. Indian J. Genet., 24: 1-8.

JOHNSON, H. W. and H. L. BERNARD, 1963. Soybean genetics and breeding Adv. in Agron. 14: 149-221.

SANDHU, S. S, 1962. Evaluation of genetic potentialities and estimation of heritability of important characters in crosses of gram (*Cicer arietinum* L.). M. Sc. Thesis, P. U.

SINGH, K. B., R. S. MALHOTRA, G. S BHULLER, and J. K. SINGH, 1971. Estimates of genetic variability correlation and path selection in urdbean. P. A. U. J. Res. in Press.

SINGH, K. B. and MEHNDIRATTA, 1969. Genetic variability and correlation studies in cowpeas (*Vigna sinensis* L.). Indian J. Genet., *29:* 104-9

SINGH, K. B. and S. SINGH, 1969. Genetic variability and Inter-relationship studies on yield and other quantitative characters in lentil (*Lens esculenta* L.). Indian J. Agric Sci., *39*: 747-51.

SINGH, T. P. and K. B. SINGH, 1970. Genotypic and phenotypic variability in yield and other quantitative characters in collection of field pea. Madras agric. J., 57: 723-6.

Table 1 Mean range, coefficent of phenotypic and genotypic variation in cowpeas

Character	mean		Range		(PCV)		(GCV)	
	F3	F4	F3	F4	F3	F4	F3	F4
Days to flowering	42.6	42.3	37.1—50.1	39.1—48.4	1.0	0.7	2.4	0.3
Branch number	5.4	5.5	2.7— 8.4	2.8— 8.5	3.5	3.5	2.7	3.0
Cluster number	14 9	15.2	7.1—25.3	7.8—30.4	3.4	4 0	1.9	3.6
Pod number	26.3	25.7	10.5—40.0	12.5—38.3	3.7	3.6	2.3	1.9
Pod length (cm)	13.5	13.3	10.1—17.6	10.1—16 0	1.7	1 7	0.8	1.0
Seeds per pod	9.2	9.2	6 9—10.8	6.2—12.6	2.6	2.1	1.8	1.4
100 grain weight	7.9	—	6.6— 9.3	—	1.2	—	0.5	—
Yield (gm)	15.9	15.4	7.5—24.0	6.4—22.1	3.4	3.5	2.5	2.6

Table 2 Haritability, expected genetic advance and genetic advance as per cent of mean in F3 and F4 generation of cowpea.

Character	Heritability %		Genetic advance		Genetic advance as per cent of mean	
	F3	F4	F3	F4	F3	F4
Days to flowering	56.1	16.5	4.5	0.9	10.6	2.2
Branch number	60.5	67 0	2.1	2 4	100.6	43.9
Cluster number	51.0	78.7	4.8	8 9	32.0	58.9
Pod number	38.7	27.4	6.4	4.7	26.2	18.3
Pod length	23.8	34.0	1.1	1.4	7.8	15.4
Seeds per pod	44.5	37.5	2.1	1.3	22.6	10.0
100 grain Weight	15.1	—	0.3	—	3.2	—
Yield	54.5	57.8	5.4	5.7	33.9	37.0