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Genetic Variation and Scope of Selection for Yield Attributes in Black Gram (*Phaseolus mungo* L.)

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ABSTRACT

Genotypic variability, heritability, genetic advance and the scope of selection for yield attributes were studied in sixteen cultivars of black gram (*Phaseolus mungo* L.). The genotypic and phenotypic variances are high for number of pods per plant and height of plant. Heritability was high for length of pod and height of plant while it is medium for grain weight, number of clusters per plant and number of pods per plant. High heritability combined with high genetic advance for plant height and number of pods per plant indicate the additive gene effects. The genetic advance as percentage of mean indicated that height of plant and grain weight per plant can be improved through selection by 50 per cent.

INTRODUCTION

The natural variability for yield and its component traits is very narrow in a highly self pollinated crop like black gram (*Phaseolus mungo* L.) and the scope of selection is limited. However, proper evaluation of the extent of genetic variation available for yield attributes, their heritability values and genetic advance that could be effected will be of immense help to the breeders. The information available in this respect is meagre for black gram, an important pulse crop of Tamil Nadu. Chowdhury *et al.* (1969) have studied the range of variability and heritability of eight characters in twelve varieties of *Phaseolus mungo*. Veerasamy *et al.* (1973) have studied the phenotypic variation and heritable components of variation in 25 varieties of blackgram and indicated that in selection, emphasis should be laid on three characters *viz.*, plant height, number of pods per plant and seed yield per plant. In the present investigation an attempt has been made to gain further insight into the magnitude of variability available in black gram so that the scope of selection for yield attributes could be indicated based on the estimates of heritability of the important yield attributes and the expected genetic advance which are considerably in variance with previous reports.

MATERIALS AND METHODS

Sixteen high yielding cultivars of blackgram (*Phaseolus mungo*) with medium duration ranging from 75 to 85 days, obtained from various parts of India were studied in a randomised block design with four replications during the north east monsoon season of 1973. Seven characters were taken into consideration. Mean of five plants selected at random from each replication was used for statistical analysis of each

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estimate. Heritability was worked out after Johnson *et al.* (1956) and Co-efficient of genetic variability and genetic advance were worked out after Burton (1952) and Robinson *et al.* (1949).

RESULTS AND DISCUSSION

The analysis of variance worked out for grain yield per plant, number of branches, number of clusters, number of pods, length of pod, number of seeds per pod and height of plant showed significant differences among the varieties. The estimates of mean, range, phenotypic variance, genotypic variance, heritability, genetic co-efficient of variation and genetic advance as percentage of mean are presented in the Table 1.

TABLE 1. Parameters of variances, heritability and genetic advance

Character	Pheno-typic variance (VP)	Geno-typic variance (Vg)	Range	Mean	G. C. V.	H	G. A.	G. A. as percen-tage of mean
Grain weight per plant (g)	1.73	1.05	2.0–6.3	3.86	26.42	60.69	1.64	41.94
Number of branches per plant	0.23	0.07	0.8–1.9	1.25	20.80	30.43	0.29	23.20
Number of clusters per plant	3.16	1.89	6.3–11.9	7.93	17.27	59.81	2.15	27.20
Number of pods per plant	32.52	15.58	12.0–29.5	20.08	19.62	47.91	5.63	28.03
Length of pod (cm)	0.184	0.149	4.1–5.3	4.67	8.35	80.97	0.72	15.41
Number of seeds per pod	0.31	0.09	5.9–7.2	6.34	4.88	29.03	0.33	5.21
Height of the plant (cm)	34.65	25.26	11.2–26.3	16.83	29.82	73.18	8.84	52.52

The genotypic and phenotypic variances are fairly higher for number of pods per plant and height of plants indicating wide variability in these characters and thereby confirming the findings of Veeraswamy *et al.* (1973). The range also indicates that the variability is higher in these two traits. Nevertheless, the genetic co-efficient of variation expressed as percentage over the mean indicated that the grain weight per plant, the height of plant and number of pods per plant have also shown a large extent of variability that can be ascribed to genotype. In length of pods and number of seeds/pod, the variability is found to be very low while in number of branches/plant and number of clusters/plant the variability is the least.

Heritability is high for length of pod (80.97 per cent) and height of plant (73.18 per cent) while it is medium in the case of grain weight, number of clusters per plant and number of pods per plant. This would evidently show lesser influence of environment and hence these traits are

more dependable for improvement through selection. The low heritability for number of branches per plant and number of seeds per pod, indicated larger influence of environment. The low estimate of heritability in consonance with poor genetic variability as evidenced by genotypic co-efficient of variation points to the possibility of exploring these characters for effective improvement. It has been suggested that heritability and genetic co-efficient of variation are not sufficient guides to show the expected progress that can be achieved through selection (Sivasubramanian *et al.* 1973). Genetic advance can, however, help to predict the extent of improvement that can be achieved for improving the different traits.

The high heritability values combined with a high genetic advance for plant height and number of pods per plant indicated the additive gene effects. Chowdhury *et al.* (1969) reported high heritability and high genetic advance for number of pods per plant. Johnson *et al.* (1956) observed that the genetic gain will be low when there is no additive gene effect and genetic advance will be high when there is additive gene effect. Again the height of plant exhibited the highest predicted gain (52.52) over the population mean followed by grain weight per plant (41.94), number of pods per plant (28.03) and number of clusters per plant (27.20). Veeraswamy *et al.* (1973) have reported high and moderately high heritability for number of branches per plant and number of seeds per pod respectively, while, in the present investigation, it has been found to be low for these two traits. This difference is obviously due to the genotype environment interaction of the different varieties studied under different seasons and years. Johnson and Bernard (1963) have stated that there is no single basis for comparing the various reported estimates of heritability and in applying this concept to plants, they however, suggest that the data could provide information of value.

The genetic advance as percentage of mean, indicated that height of plant and grain weight per plant are more amenable for selection and could improve these characters by 50 per cent. The number of seeds per pod could not be improved by applying selection pressure at 5 per cent level since the genetic advance recorded is the lowest (5.21 per cent).

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