Pak. J. Bot., 19(2): 225 - 227, 1987.

VARIABILITY FOR SOME QUANTITATIVE TRAITS IN SOYBEAN

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Abstract

The magnitude of genetic variability, heritability and genetic advance among 36 varieties of soybean was studied. Considerable genetic variability was observed for pods per plant, plant height and grain yield per plant. High heritability and genetic advance were recorded for number of pods per plant and branches per plant. Yield could be considerably improved through intensive selection pressure based on number of pods and number of branches per plant.

Introduction

Soybean (*Glycine max* L. Merrill) an important protein and oil rich crop yields more than 30% of the edible vegetable oil in the world. In Pakistan the crop gives an average yield of 416 kg/ha. (Anon, 1982), and its yield potential is very high (Chaudhry *et al,* 1984). An estimation of genetic variability components is essential to exploit full yield potential. In the present study the extent of genetic variability with respect to important agronomic characters in 36 cultivars of soybean available in our germ plasm pool was undertaken.

Material and Methods

Thirty six soybean varieties of diverse origin were grown in a randomized complete block design with 4 replications at the experimental farm AEARC, Tandojam. Each replication consisted single row of 4 m length. Seed was drilled at a row distance of 45 cm. Plant to plant distance was maintained at 5 cm by thinning the crop before first irrigation. At maturity 5 competitive plants from each replication of all the varieties were randomly selected and observations recorded for plant height, number of branches/plant, pod length, pods per plant, seeds per pod, 100 grain weight and grain yield/plant. Statistical analysis was performed according to procedures out-lined by Johnson *et al* (1955).

Results and Discussions

The estimates of genetic parameters viz., genotypic variance ($\sigma^2 g$) phenotypic variance ($\sigma^2 p$), heritability (h^2) and expected genetic advance (GS) are presented in Table 1. The estimate of variance due to genotypic and phenotypic effects varied widely

Table 1. Genetic parameters for various quantitative traits in soybean.

Characters	Genotypic variance	Pheno-typic variance	Genotypic coefficient of vari-ability	Phenoty-pic co-efficient of variability	Herita-bility	Genetic Advance	Genetic Advance % of mean
Plant height	275.84	383.43	24.19	28.52	71.94	29.02	42.27
Pod length	0.06	0.06	6.31	6.55	92.89	0.49	12.53
Seeds per pod	0.07	0.08	12.49	13.45	86.26	0.50	23.91
Branches per plant	1.52	1.61	47.06	48.46	94.32	2.47	94.16
Pods per plant	1163.27	1240.74	52.69	54.42	93.76	68.03	105.10
100 grain weight	6.06	6.44	16.67	17.18	94.17	4.92	33.33
Grain yield/plant	41.46	67.76	39.00	49.86	61.19	10.38	62.85

for different characters. The genotypic and phenotypic variance was found to be highest for number of pods/plant (1163.27 and 1240.74) followed by plant height (275.84 and 383.43) and grain yield/plant (41.46 and 67.76); moderate for 100 grain weight (6.06 and 6.44); and low for branches per plant (1.52 and 1.61), seeds per pod (0.07 and 0.08) and pod length (0.06 and 0.06). The phenotypic co-efficient of variation (PCV) was slightly higher than genotypic co-efficient of variation (GCV) for all the traits under study. Very little difference between phenotypic and genotypic variability of traits indicated that environment had negligible effect on these characters. Hence selection for pods, branches and grain yield per plant will provide a greater chance of genetic improvement.

A high GCV value for the characters would appear reliable if substantiated by high heritability estimates. The heritability values ranged from 61.19 to 94.32%. The branches/plant had the highest estimate followed by 100 grain weight, pods per plant, pod length, pod length, seeds per pod, plant height and grain yield/plant. In the present investigation pods and branches per plant showed the highest values for GCV as well as hertitability, thus offering a greater scope for genetic improvement by using them as a selection criteria. Similar observation for pods per plant have earlier been reported by Malik *et al* (1983) in mungbean and Nararajan & Arumugam (1979), Seth *et al* (1972) and Sharma *et al* (1977) in french beans.

Genetic advance expressed as percent of mean was highest for pods per plant (105.10) followed by branches/plant (94.16), grain yield per plant (62.85) and plant height (42.27), whereas it was lowest for pod length (12.53). A high genetic advance accompanied with high heritability estimate offers a most effective criterion of selection (Johnson *et al*, 1955; Panse, 1957). In the present study high estimates of genetic advance accompanied with high heritability and genotypic co-efficient of variation for number of pods/plant, branches per plant led to high expected genetic gain and suggest the positive role of these characters in genetic improvement of soybean through direct mass selection. Vinaya

Rai *et al* (1981) in sesamum and Khalid *et al* (1984) in mungbean have also reported high heritability and genetic advance for branches per plant, and suggested that selection for number of branches per plant would be rewarding in breeding for high yield. The higher heritability and comparatively lower estimates of genetic advance for pod length and seeds per pod indicate a relatively poor role of these characteers in helping a substantial genetic gain. Panse (1957) have reported that if hertability is mainly due to the non-additive genetic effect, the genetic gain would be low, whereas, if heritability is due to the additive gene effect, a high genetic advance may be expected.

In the present study high heritability accompanied with high expected genetic advance observed for pods/plant and number of branches per plant suggest that pods and branches are the yield components which should be given due emphasis in selecting soybean ideotype for grain yield.

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(Received for publication 2 September 1985)