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VARIABILITY STUDIES IN HYBRID AND SEGREGATING POPULATIONS OF SESAME

D.P.BARUAH and J.V. GOUD *

ABSTRACT

Variability parameters such as phenotypic and genotypic coefficients of variability, heritability and genetic advance expressed as percentage of mean were studied in the F1s and F2s of a 10 x 10 diallel set. Higher estimates of GCV coupled with high heritability and expected genetic advance were noted for seed yield per plant, seed weight per capsule, height of branching, plant height and number of capsules per plant in both the generations. Selection criteria comprising these characters have been suggested for improvement in seed yield through phenotypic selection.

Any crop improvement programme heavily leans on the magnitude of genetic variability and the extent to which it is heritable. Unless the amount of genetic gain measured as percentage of mean is substantial, heritability alone cannot depict the possible improvement of a character achievable through selection. Further estimates of heritability together with genetic advance would help the breeders to infer, to certain extent, about the nature of gene action involved for a character. Keeping in view the above points, phenotypic, genotypic coefficients of variability (PCV and GCV), heritability, genetic advance (GA) and genetic advance as percentage of mean (GAM) were studied in hybrid (F1) and segregating (F2) generations of sesame.

MATERIAL AND METHODS

The material for the present study comprised of 90 F1 hybrids and 45 direct crosses of a common 10 x 10 diallel set, which were grown in two separate experiments in randomized block design with four repeats. Three rows in F1 and 10 rows in F2 accommodating 20 plants in each row with a plant to plant and row to row spacing of 20 cm and 45 cm, respectively were grown at the Research Farm of the University of Agricultural Sciences, Dharwad. Fertilizer and other cultural practices were followed as per recommended schedule. Observations on 10 and 30 random plants in F1 and F2 generations, respectively were recorded on 13 characters viz., days to flowering, days to maturity, height of branching (cm), plant height (cm), number of capsules per plant, length of capsule (cm), number of seeds per capsule, weight of seeds per capsule (mg), seed weight per capsule (mg), 1000-seed weight (g), number of primary branches per plant, seed yield per plant (g) and oil content (%). The coefficients of phenotypic and genotypic variability were estimated following the formula of Burton (1952). Expected genetic advance (GA) was calculated as per formula suggested by Johnson et al. (1955). The ratio of GA out GAM. Broad sense heritability was worked out as per method of Lush (1940).

RESULTS AND DISCUSSION

Analysis of variance indicated that the F1s and the F2s differed significantly amongst themselves. The range, mean, PCV, GCV, heritability, GA and GAM for F1 and F2 generations are furnished in Table 1 and 2, respectively. Although the values of PCV were higher than GCV for all the characters in both the generations, the low margin of difference between them (PCV - GCV) implied that phenotypic variability is a reliable measure of genotypic variability except for number of primary branches per plant and seed yield per plant where the difference between PCV and GCV was relatively high. Low margin of difference

* Dept. of Plant Breeding and Genetics, University of Agricultural Sciences, Dharwad, Karnataka

Table 1. Variability parameters for thirteen characters in F_1 generation of 10 x 10 diallel set sesame

	Characters	Range	Mean	PCV (%)	GCV (%)	PCV-GCV	Heritability (%)	Ga	GAM
1.	Days to flowering	29.5 - 42.7	34.65	6.95	6.61	0.34	90.34	4.48	12.93
2.	Days of maturity	76.6 - 115.2	90.95	6.43	6.23	0.20	94.03	11.32	12.45
3.	Height of branching (cm)	5.0 - 17.1	11.48	22.78	20.81	1.97	83.48	4.50	39.20
4.	Plant height (cm)	72.4 - 160.2	105.70	16.89	16.69	0.20	97.70	35.93	33.99
5.	Number of capsules/plant	45.4 - 101.1	73.26	16.15	16.25	0.30	96.35	24.07	32.86
6.	Length of capsule (cm)	2.0 - 3.9	2.87	15.58	14.78	0.80	90.00	0.83	28.92
7.	Number of seeds/capsule	40.2 - 87.4	61.77	16.30	15.88	0.42	94.93	19.69	31.88
.	Weight of capsule (mg)	119.0 - 667.0	331.10	17.88	16.10	1.78	81.03	98.84	29.85
).	Seed weight/capsule (mg)	90.0 - 254.0	145.20	26.22	25.89	0.33	97.49	76.46	52.66
0.	1000-Seed weight (g)	2.1 - 4.4	2.64	11.61	10.64	0.97	88.89	0.55	20.83
1.	Number of primary branches/plant	3.2 - 7.9	5.45	14.65	10.26	4.39	48.44	0.80	14.68
2.	Seed yield/plant (g)	3.9 - 16.8	8.95	32.13	30.60	1.53	90.69	5.39	60.22
.	Oil content (%)	38.4 - 51.9	45.07	5.46	5.20	0.26	90.76	4.61	10.23

Table 2. Variability parameters for thirteen characters in F_2 generation of 10 x 10 diallel set sesame

	Characters	Range	Mean	PCV (%)	GCV (%)	PCV-GCV	Heritability (%)	Ga	GAM
1.	Days to flowering	28.0 - 41.7	34.27	7.29	6.03	1.26	68.43	3.50	10.21
2.	Days of maturity	79.4 - 109.1	90.11	8.74	5.32	0.42	86.00	9.16	10.17
3.	Height of branching (cm)	5.0 - 17.3	11.36	22.51	18.63	3.88	68.50	3.58	31.18
4.	Plant height (cm)	72.4 - 133.9	101.30	13.12	12.54	0.58	91.38	24.91	24.59
5.	Number of capsules/plant	45.4 - 93.1	71.77	15.18	13.89	1.29	83.69	18.63	25.96
6.	Length of capsule (cm)	2.0 - 3.8	2.86	12.61	11.06	1.55	76.92	0.56	19.58
7.	Number of seeds/capsule	40.2 - 82.6	60.15	14.89	13.90	0.99	87.16	16.05	26.68
8.	Weight of capsule (mg)	248.0 - 434.0	323.20	14.18	13.47	0.71	90.28	85.00	26.69
9.	Seed weight/capsule (mg)	90.0 - 230.0	141.30	22.68	21.71	0.97	91.62	60.08	42.52
10.	1000-Seed weight (g)	2.1 - 3.3	2.61	10.84	10.14	0.70	87.50	0.51	19.54
11.	Number of primary branches/plant	3.1 - 8.0	5.35	15.30	9.53	5.77	38.18	0.66	12.34
12.	Seed yield/plant (g)	3.7 - 14.5	8.31	29.18	26.80	2.38	84.35	4.20	50.54
13.	Oil content (%)	38.4 - 49.1	44.65	4.69	4.21	0.48	80.82	3.49	7.82

between PCV and GCV for plant height and number of capsules per plant was also noted by Sanjeevaiah and Joshi (1974). Comparatively large estimates of GCV in F1 as well as F2 were obtained for seed yield per plant (30.60 in F1, 26.80 in F2), seed weight per capsule (25.89 in F1, 21.71 in F2) and height of branching (20.81 in F1, 18.63 in F2). Relatively lower values of GCV as noted in the present study for days to flowering, days to maturity, 1000-seed weight, number of primary branches per plant and oil content have been reported earlier by Solanki and Paliwal (1981). Burton (1952) suggested that high GCV along with high heritability would provide a better picture of the genetic advance that can be expected by phenotypic selection. Estimates of heritability were in the range of 80 to 90 per cent for all the traits in F1 with the exception of number of primary branches per plant (48%). High estimates of broad sense heritability in hybrid population of sesame were observed by Salazar and Onoro (1975), Gupta (1981) a and Rathnaswamy and Jagathesan (1984). In F2 generation also, the heritability values for plant height, weight of capsule, seed weight per capsule, days to maturity, number of capsules per plant and oil content were in the range of 80 to 92 per cent as was also reported by Hu (1985).

The heritability estimates in the present investigation are of broad sense containing both additive and non-additive portions of genetic variance and hence cannot provide clear predictability of the breeding value of a genotype. As such, heritability value can be a reliable measure of predicting the resultant effects of selection only when it is accompanied by high genetic advance expressed as percentage of mean (Johnson *et al.*, 1955). High heritability coupled with high GAM in F1 generation was observed for seed yield per plant, seed weight per capsule, height branching, plant height and number of capsules per plant confirms the results of Gupta and Gupta (1977) and Reddy and Reddy (1976). The trend of heritability and expected genetic advance expressed as percentage of mean in F2 was similar to that of F1 for seed yield per plant and seed weight per capsule as was also noted by Paramasivam and Prasad (1981). Predominance of non-additive gene action and genotype-environment interaction (Panse, 1957) might result in high heritability (above 80%) for oil content with very low GAM both in F1 (10.23%) and F2 (7.82%). Similar observations were also realised by Thangavelu and Rajasekaran (1982) for oil content while evaluating 40 genotypes of diverse origin. The results obtained in the present investigation suggests that improvment for seed yield per plant could be achieved through simple selection giving due weightage to characters like seed weight per capsule, height of branching, plant height and number of capsules per plant. However, it is felt essential to mention that the conclusions drawn in the present study are applicable to the materials generated from a 10-parent full diallel set of sesame.

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SCREENING OF BENGAL GRAM ACCESSIONS FOR RESISTANCE TO PULSE BEETLE

Y.S. JOHNSON THANGARAJ EDWARD[1] and K. GUNATHILAGARAJ[2]

ABSTRACT

Two hundred bengal gram accessions (Cicer arietinum L.) were screened for their resistance to Callosobruchus maculatus(F) by Free Choice Test. The number of eggs laid varied from 4 to 60. The adult emergence ranged between one in 11 and 27 in 5 accessions. Hundred per cent survival was observed in four accessions (Shahkot- 2, P-1675, RFG 30 and NEC-1592) as against only five per cent survival in RBH 99 and RC 109. Ovipositional preference was found not related with the suitability of the accession for further development. C. maculatus took 25 to 41 days for development. Based on the suitability index, 22 accessions were categorised as resistant, 40 as moderately resistant, 109 as susceptible and 29 as highly susceptible to C. maculatus.

Any reduction in losses between harvest and consumption helps increase the availability of food protein. The bruchids are the most destructive to stored pulses, of which *Callosobruchus maculatus*(F) is the dominant species (Gangrade, 1974). Storage scientists throughout the world are reporting with increasing frequency, that newly introduced varieties have exacerbated storage problems and increased the need to resort to the use of pesticides to prevent serious losses. In the present study, 200 bengal gram (*Cicer arietinum* L.) accessions were evaluated for their resistance to *C. maculatus* in the laboratory at the Agricultural College and Research Institute, Madurai, Tamil Nadu.

MATERIALS AND METHODS

Two hundred bengal gram accessions received from the International Crops Research Institute for Semi-Arid Tropics (ICRISAT) were screened by Free Choice Test for their resistance to *C. maculatus* in the laboratory employing the method of Gibson and Raina (1972), with slight modifications. Fifteen circular disks of 3 cm diameter were arranged along the circumference of desiccators (15 cm diameter). In each disk, 10 seeds per accession were taken. Fifteen pairs of 0-12 h old *C. maculatus* adults were released at the bottom of the desiccator and were allowed for free choice oviposition in the seed. The desiccator was covered with the lid. Paper

1. Senior Research Fellow (Entomology), Centre for Plant Molecular Biology, Tamil Nadu Agricultural University, Coimbatore - 641 003.
2. Professor of Entomology, Department of Environmental Sciences, Tamil Nadu Agricultural University, Coimbatore - 641 003.