

GENETIC VARIATION AND GENOTYPE-ENVIRONMENT INTERACTION IN SESAMUM (*Sesamum Indicum*. L.)

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The genetic parameters viz., genotypic and phenotypic variations, genotypic and phenotypic coefficient of variation, heritability and genetic advance as percentage of mean were assessed from nine varieties of sesamum. Genotype x environment interaction was not significant for height up to first capsule, number of branches, number of capsule on main stem, number of capsule on branches and number of capsule per plant. The genetic coefficient of variability for number of branches was consistent at all environments. Number of branches, number of capsule on branches, number of seeds per capsule and yield have high values for both heritability (56.4 to 95.4) and genetic advance (14.8 to 48.0) and indicated additive gene effects in these traits. Due importance might be given in selection programme for the traits number of branches, number of capsule, number of seeds per capsule and yield.

Seed yield in Sesamum is a complex character contributed by a number of morphological traits. Information available on the extent of genetic variation for yield attributes, their heritability values and genetic advance in sesamum will be of much use to the plant breeder. Unbiased information on different genetic parameters can be had by evaluating the materials under different environments. (Comstock and Robinson, 1952; Johnson *et al.*, 1956). Since limited information is available on the genetic variability and genotype environment interactions in sesamum (*Sesamum indicum* L.) the present study was undertaken.

MATERIALS AND METHODS :

A field trial was conducted at the Oilseeds Experiment Station, Tindivanam during 1975 with 9 sesamum varieties viz., TMV.1, TMV 2, TMV 3, Si.3237, Si.3240, Si.3232, Si.1159, Si. 1160 and Si.1720. The varieties were raised in three seasons namely i) irrigated (February - May) (E1), ii) rain-fed (E2) July September and iii) cold weather (November to January) (E3). In each environment these genotypes were raised in a randomised block design with four replications. The plot size was of 5.1 x 3.6 Sq m. with a spacing of 30 x 30 cm.

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Table 1. Estimates of phenotypic variance, genotypic variance, coefficient of genetic variability, heritability and genetic advance (% of mean) in sesamum

Character	Phenotypic variance			Genotypic variance			Genotypic Coefficient of variability			Heritability			Genetic advance % of mean		
	E1	E2	E3	E1	E2	E3	E1	E2	E3	E1	E2	E3	E1	E2	E3
Yield	5583.0	1046.5	5371.0	5004.3	633.5	5144.0	13.8	29.8	11.7	58.3	65.1	57.7	21.7	38.4	14.8
Height of plant	44.5	30.5	35.9	17.2	22.1	33.7	4.5	5.8	7.9	38.4	72.6	93.9	5.8	10.5	15.3
Height upto first capsule	11.9	15.5	9.3	9.7	13.2	7.3	810.4	8.4	25.1	81.1	84.8	78.4	22.2	14.1	16.0
Number of branches per plant	0.5	1.1	0.2	0.4	0.8	0.1	15.4	22.2	8.7	80.1	76.2	56.4	23.5	30.2	18.8
Number of capsules on main stem	4.9	6.5	4.1	2.1	4.8	3.6	13.3	13.9	11.1	43.1	75.8	87.2	12.5	24.5	21.4
Number of capsules on branches	255.2	159.7	35.9	170.8	105.2	26.7	28.1	21.5	10.3	66.9	65.8	74.4	48.0	36.4	18.5
Number of capsules per plant	20.6	195.0	55.4	17.0	123.9	26.5	6.7	17.6	7.3	82.3	63.5	49.6	12.5	29.0	10.9
Length of capsule	0.5	1.7	0.1	0.2	0.8	0.04	20.2	40.9	25.8	51.1	47.0	62.9	29.4	55.9	51.5
Number of seeds per capsule	38.3	132.4	63.7	32.5	126.4	58.4	11.2	19.7	14.0	84.9	95.4	91.1	21.5	39.5	28.2

Table 2. Pooled analysis of variance

Source of variation	DF	MEAN SQUARES								
		Yield	Height of Plant	Height upto first capsule	Number of branches	No. of capsule on main stem	No. of capsule on branches	No. of capsule per plant	Length of capsule	Seeds per capsule
Environment (E)	2	2860712	2415.29	9592.42	1.01	37.64	548.36	796.20	2.81	410.51
Strains (S)	8	29264	231.41	38.46	4.04	53.32	1099.43	1478.14	0.051	761.44
SxE interaction	16	21081	96.50	7.59	1.32	8.24	187.64	194.23	0.046	88.04
Pooled error	78	10690	55.39	15.66	0.84	7.43	180.41	258.46	0.025	30.75

* Significant at $p = 0.05$ ** Significant at $p = 0.01$

Data relating to height of plant, height up to first capsule, number of branches per plant, number of capsule on main stem, number of capsule on branches, number of capsule per plant, length of capsule, number of seeds per capsule and seed yield were collected from five randomly selected plant in each replication. Individual and combined analysis of variance and the estimates of genetic variability under different environments were estimated adopting the procedure outlined by Johnson *et al.* (1956).

RESULTS AND DISCUSSION :

The variance estimated for all the characters under different environments brought out the differential response of characters to varied environmental effects (Table 1). The variances in respect of plant height, number of capsule on main stem, number of capsule on branches and length of capsule at (E1), length of capsule at (E2) and number of capsule per plant at (E3) were not significant. The estimates of phenotypic and genotypic coefficient of variation and genetic advance as percentage of mean are presented in Table 1.

Table 3. Coefficient of genetic variation, heritability and genetic advance (GA) after eliminating the genotype - environment interaction

Character	Coefficient of genetic variation	Heritability	G. A. (% of mean)
Yield	11.18 (18.41)*	26.59 (60.36)	12.18 (24.96)
Height of plant	7.10 (6.08)	58.48 (68.28)	11.23 (10.54)
Height upto first capsule	10.29 (14.76)	80.33 (81.44)	18.23 (17.46)
Number of branches per plant	16.00 (15.44)	67.32 (70.90)	20.19 (24.15)
Number of capsule on main stem	21.20 (12.77)	85.10 (68.67)	16.11 (19.53)
Number of capsule on branches	30.93 (19.94)	82.93 (69.05)	33.96 (34.32)
Number of capsule per plant	30.58 (10.53)	86.86 (65.16)	34.38 (17.49)
Length of capsule	10.00 (28.95)	99.04 (53.64)	42.27 (45.61)
Number of seeds per capsule	21.45 (14.90)	88.43 (90.45)	47.13 (29.76)

* figures in parentheses indicate average estimates over environments

The phenotypic and genotypic variances were comparatively high for yield, number of capsule on branches, number of capsule per plant and seeds per capsule indicating wide variability in these characters. The coefficient of genetic variability was low (4.5 to

7.9) for plant height at all environments, while for number of capsule per plant was low under E1 (6.7) and E3 (7.3) only.

The genetic coefficient of variability of number of branches as indicated by the average of three

environments as well as pooled analysis 15.44 and 16.0 respectively was consistent at all environments (Table 3). Burton (1952) suggested that coefficient of genetic variability together with heritability estimates gave picture of genetic advance to be expected from a selection. Johnson *et al.* (1956) stated that in predicting the resultant effects of selection, the genetic advance should be given weightage alongwith heritability. Measured by this yardstick, number of branches, number of capsule on branches, number of seeds per capsule and yield have high values for both heritability ranging from 56.4 to 95.4 and genetic advance ranging from 14.8 to 48.0, indicating additive gene effects in these traits (Panse, 1957). Bhargava and Saxena (1964) reported high heritability for number of branches. Paramasivam and Prasad (1981) also observed high heritability with high genetic advance for capsule number, primary branches, secondary branches, and seed yield. Janardhanam *et al.*, (1981) reported additive gene effect for capsules on main stem, number of capsules on branches and total number of capsules per plant and both additive and non-additive gene effect for number of seed per capsule. Other characters, which had low values for the two parameters, may not respond favourably to selection.

For evolving high yielding strains,

the plant breeder has to depend upon the economic characters which are quantitatively inherited and are considerably influenced by the environment. Johnson *et al.*, (1956) pointed out that genotypic variance estimated on the basis of a single environment would include variance due to environment interactions and that conclusions based on the inflated estimates of genotypic variance might not hold true at other locations. In the present investigation, which was carried out under three different environments, the environment exerted significant effect in the expression of characters.

The combined analysis (Table 2) revealed that there were significant environmental effects on all the characters barring the number of branches per plant. Intraction effects were significant for yield, height of plant, length of capsule and seeds per capsule. This suggests that the effect of environment on the expression of genotypes was much pronounced on these characters. On the other hand influence of environment was the least on the number of branches and number of capsules. This suggested that the least influenced characters could be improved to the extent expected on the basis of individual environment. The number of branches showed almost similar estimates of coefficient of genetic variation, heritability and genetic advance based on

the three individual environment average as well as on the basis of pooled analysis (Table 3). It proved to be a stable character, least influenced by environment.

The results indicate that number of branches, number of capsule, number of seeds per capsule and yield might be given due importance as indicated by additive gene effects, in selection programmes as considerable

improvement can be obtained in these characters

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