

No. 1

Studies on Variability and Heritability in Segregating Populations of Sesamum (*Sesamum indicum* L.) Crosses

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Seven economic traits of sesamum were studied. F_2 and F_3 generations derived from three intervarietal crosses for their variability, heritability and genetic advance. The study revealed that cross A and C combined high mean and variability for capsule number, primary branches, capsule length and seed yield. High heritability with high genetic advance was observed for capsule number, primary branches, secondary branches and seed yield.

The existence of variability in yield and yield components is an essential pre-requisite for a plant breeder for the improvement of crops. The variability can be enhanced in the segregating populations through hybridisation. Besides, the estimates of heritability and genetic advance provides a reliable criterion in selection programme.

MATERIAL AND METHODS

The experiment was carried out at Tamil Nadu Agricultural University, Coimbatore. Three crosses namely Si 1277 x KRR 2 (Cross A), Si 1277 x Si 2511 (Cross B) and Si 1277 x TMV. 4 (Cross C) were studied in F_2 and F_3 generations. A total of 300 F_2 segregants were studied in F_2 generation. Thirty out of 300 F_2 plants were forwarded to F_3 generation and raised in randomized block design replicated thrice. The observations were made on individual plant basis

in F_2 . In F_3 generation observation were made on five randomly selected single plants from each family in each replication. Observations were recorded on (1) plant height, (2) number of primary branches per plant, (3) number of secondary branches per plant, (4) number of capsules per plant, (5) capsule length, (6) days to maturity and (7) seed yield per plant in both the generations.

RESULTS AND DISCUSSION

The estimates of coefficient of variability, heritability and genetic advance are presented in Table 1 and 2 for F_2 and F_3 generations respectively. The superiority of a cross was assessed by the magnitude of variability in the segregating progenies. Mean performance of a cross facilitates as a base for eliminating the undesirable cross, where as the variability serves as a criterion for selection. High mean with high variability for a

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character in F_2 populations constitute the ideal source for selection (Allard, 1960). The variability recorded by cross A was high for capsule number and seed yield, whereas cross B exhibited high variability for secondary branches and days to maturity. High variability for plant height, primary branches and capsule length was observed in cross C. In sesamum varieties Krantikumar *et al.* (1967) observed high variability for capsule number. Govindadas (1975) and Murugesan *et al.* (1979) were also of the same opinion but their studies also indicated primary branches, secondary branches and seed yield as most variable characters. Considering both mean and variability together Cross A accounted for a high mean combined with higher magnitude of variability for capsule number and seed yield, while plant height and capsule length were next in merit. Cross C, registered high mean with substantial variability for Primary branches, secondary branches and days to maturity but the variability for secondary branches, capsule number and seed yield was low compared to that of cross A. The variability exhibited by cross B was inconsistent and almost lower than that of the other two crosses. In general, considering mean and variability cross A ranks first followed by cross C in maintaining superiority in both the generations for all the characters studied. Cross A, therefore, may be considered to be superior than the other two crosses as far as mean performance and variability are concerned.

Johnson *et al.* (1955) suggested that heritability estimates along with genetic advance shall be more useful

and valid in predicting yield under phenotypic selection than heritability estimate alone. High heritability with high genetic advance as percentage of mean were observed for secondary branches, capsule number and seed yield in all the three crosses in F_2 . This result is in accordance with the findings of Tilak Raj Gupta (1975) for seed yield, Gupta and Gupta (1977) for capsule number and seed yield and Murugasen *et al.* (1979) for secondary branches in sesamum. F_2 of cross A and cross B recorded high heritability with high genetic gain for capsule number and seed yield. Days to maturity, capsule length and plant height were observed to have high heritability, but of moderate to low genetic advance under both F_2 and F_3 . These results suggested that high heritability does not necessarily mean an increased genetic advance (Chaudhary *et al.* 1977).

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Character	Mean	Standard deviation	Standard error	Coefficient of variation	Heritability
Days to maturity	108.8	10.74	1.23	12.11	0.11
Seed yield/m ²	5.35	0.13	0.00	0.11	0.11
Seed weight	102.01	10.34	1.00	10.10	0.11
Seedling characters	5.30	1.31	0.13	20.9	0.11
Leaf area (cm ²)	27.1	3.23	0.31	11.9	0.11
Stem girth (cm)	10.11	0.88	0.09	8.7	0.11
Stem length (cm)	12.80	1.02	0.11	7.9	0.11
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Chlorophyll u					
Chlorophyll v					
Chlorophyll w					
Chlorophyll x					
Chlorophyll y					
Chlorophyll z					

TABLE-1 ESTIMATES OF VARIANCE, HERITABILITY, (h^2), GENETIC ADVANCE (GA), AND GENETIC ADVANCE AS PERCENTAGE OF MEAN IN F_3 GENERATION OF SESAMUM CROSSES

CROSS A

Characters	Mean	Phenotypic Variance	Genotypic variance	Heritability (h^2)	(Genetic advance) G. A.	Genetic advance as percentage of mean	Coefficient of variability (CV)
Seed yield	16.42	33.41	30.55	91.45	9.30	56.55	52.74
Plant height	113.20	227.68	169.22	74.32	19.74	17.44	13.01
Primary branches	3.97	1.76	0.68	38.47	0.89	22.63	35.53
Secondary branches	2.57	3.08	3.07	99.84	3.08	119.99	46.26
Capsule number	124.30	1703.80	1577.76	92.60	67.27	54.12	46.14
Capsule length	3.21	0.29	0.28	95.89	0.91	28.31	16.19
Days to maturity	84.40	5.63	5.54	98.40	4.11	4.87	2.87

CROSS B

Characters	Mean	Phenotypic variance	Genotypic variance	Heritability (h^2)	Genetic advance (GA)	Genetic advance as percentage of mean	Coefficient of variability (CV)
Seed yield	15.99	76.74	73.80	96.17	14.83	92.73	35.74
Plant height	107.77	113.50	38.82	34.20	6.41	5.95	9.88
Primary branches	5.40	4.01	2.92	72.82	2.57	47.53	33.50
Secondary branches	3.30	4.29	4.27	99.49	3.63	109.90	62.98
Capsule number	106.07	2395.55	2279.34	95.15	81.96	77.27	40.67
Capsule length	2.75	0.20	0.12	60.00	0.47	17.17	12.60
Days to maturity	80.83	138.76	104.49	75.34	15.61	19.32	14.36

CROSS C

Secondary branches	3.30	4.29	4.27	99.49	3.63	109.90	62.98
Capsule number	106.07	2395.55	2279.34	95.15	81.96	77.27	40.67
Capsule length	2.75	0.20	0.12	60.00	0.47	17.17	12.60
Days to maturity	80.83	138.76	104.49	75.34	15.61	19.32	14.36

CROSS C

Character	Mean	Phenotypic variance	Genotypic variance	Heritability (h^2)	Genetic advance (GA)	Genetic advance as percentage of mean	Coefficient of variability (CV)
Seed yield	15.43	29.14	26.43	89.67	8.52	55.21	34.79
Plant height	102.93	213.34	163.78	55.27	17.22	16.73	17.00
Primary branches	5.07	2.09	1.17	55.76	1.42	27.98	43.06
Secondary branches	3.37	2.52	2.42	95.93	2.68	79.53	60.65
Capsule number	104.06	1111.01	925.30	83.28	48.86	46.95	32.88
Capsule length	3.06	0.39	0.19	48.98	0.54	17.59	16.99
Days to maturity	82.87	69.29	56.72	81.86	11.99	14.47	9.82

TABLE-2 Estimates of variance, heritability (h), genetic advance (GA) and genetic advance as percentage of mean for F_2 Generation of sesamum crosses

CROSS A

Character	Mean	Phenotypic variance	Genotypic variance	Heritability (h^2)	Genetic advance (GA)	Genetic advance as percentage of mean	Coefficient of variability (CV)
Seed yield	10.42	35.27	28.99	82.19	8.59	82.44	53.42
Plant height	83.70	637.91	50.00	7.86	3.49	4.17	21.56
Primary branches	3.80	2.76	1.37	49.53	1.45	38.11	35.95
Secondary branches	1.48	5.57	0.76	13.61	0.57	38.19	33.78
Capsule number	61.54	1833.59	1616.62	88.17	66.48	107.97	51.63
Capsule length	2.38	0.35	0.11	30.99	0.32	13.56	14.28
Days to maturity	87.77	38.65	8.26	21.38	2.34	2.66	2.45

CROSS B

Characters	Mean	Phenotypic variance	Genotypic variance	Heritability (h ²)	Genetic advance (GA)	Genetic advance as percentage of mean	Coefficient of variability (CV)
Seed yield	7.24	14.77	10.10	68.42	4.63	156.44	48.75
Plant height	76.92	172.05	41.81	24.29	5.61	7.30	23.05
Primary branches	4.29	2.04	1.45	71.17	1.79	41.70	35.20
Secondary branches	2.04	4.18	1.29	30.81	1.11	54.35	61.60
Capsule number	51.34	1635.86	915.88	55.99	39.86	77.59	49.19
Capsule length	2.12	0.51	0.32	63.30	0.80	37.53	21.23
Days to maturity	82.31	109.41	86.05	78.64	14.48	17.59	2.99

CROSS C

Characters	Mean	Phenotypic variance	Genotypic variance	Heritability (h ²)	Genetic advance (CA)	Genetic advance as percentage of mean	Coefficient of variability (CV)
Seed yield	8.81	22.21	10.08	45.39	3.76	42.73	47.67
Plant height	76.21	1201.37	600.56	49.99	30.50	40.01	21.10
Primary branches	4.20	5.26	0.26	14.99	0.61	14.41	38.09
Secondary branches	1.19	5.04	0.44	8.79	0.38	29.19	46.22
Capsule number	53.98	1186.14	209.79	17.69	10.72	19.80	47.74
Capsule length	2.01	0.81	0.25	30.90	0.49	19.58	19.92
Days to maturity	86.50	109.13	86.16	78.95	14.52	16.78	17.34