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SHORT COMMUNICATION

GENETIC ARCHITECTURE, COMBINING ABILITY AND HETEROSIS FOR CERTAIN PHYSIOLOGICAL PARAMETERS IN SESAME (*SESAMUM INDICUM* L)

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In a set of 9×9 diallel set of crosses in sesame, additive gene action for harvest index (HI), both additive and non-additive gene action for leaf area index (LAI) and non-additive gene action for seed yield per plant were evident. Heritability estimates which were high for LAI and HI, however, were moderate for seed yield. R 84-4-2×VS 16 showed significant and positive specific combining ability for both LAI and HI and recorded the seed yield heterosis of 71 and 50% over mid parent (MP) and better parent (BP), respectively.

Reports on the combining ability studies and heterosis for physiological parameters like LAI and HI in sesame are very few. The present investigation was undertaken to assess the nature and magnitude of gene action and the extent of heterosis for these two important physiological traits and seed yield in sesame.

Nine diverse but homozygous lines of sesame and their 36 hybrids from a 9×9 diallel set of crosses (excluding reciprocals) were grown in a Randomized Block Design with 3 replications during dry season (summer), 1989 at the college farm, Tirupati. Each entry represented a single row of 4.05 m long in a replication. A spacing of 30 × 15 cm was maintained. Observations on LAI, dry matter (DM) and seed yield (SY) were recorded on 5 randomly tagged plants per entry per replication. LAI was recorded at 60th day stage (seed filling stage). HI was computed. The data were analysed for combining ability using Model I, and Method II of Griffing (1956). Heterosis over MP and BP was calculated. Heritabilities both in broad and narrow sense were estimated for these two traits and seed yield.

The variances due to general combining ability (*gca*) and specific combining ability (*sca*) were highly significant for all the three attributes (Table I). However, based on the relative magnitude of *gca* or *sca* and *gca* : *sca* ratio, HI was found to

Table I. Anova for combining ability.

Source	Degree of freedom	Mean sum of squares		
		Leaf area index	Harvest index	Seed yield/plant
General combining ability	8	0.06**	20.32**	6.59**
Specific combining ability	36	0.06**	13.67**	8.41**
Error	88	0.001	0.86	0.03
gca/sca ratio	—	1.00	1.49	0.78
h^2 (bs)	—	79.90	90.21	89.17
h^2 (ns)	—	50.17	58.31	43.85

**Significant at 1% level of probability.

be controlled by additive genes, LAI by both additive and non-additive genes, and SY per plant by non-additive genes.

The heritability estimates (narrow sense) were high for LAI and HI while they were moderate for SY per plant (Table II). The parental line R 84-4-2 alone possessed favourable genes for all the characters indicating its potentiality as a donor source in the simultaneous improvement of all the three traits. For SY per plant, 4 parents VS 16, R 84-360-3, R 84-4-2 and RT 54 showed significant *gca* effects, and 18 hybrids for *sca* effects. These represented all the 3 possible combinations between parents of high and low *gca* effects i.e., H × H (3 F_1 s), H × L (10 F_1s) and L × L

Table II. Heterosis over midparent (MP) and better parent (BP) for hybrids with significant specific combinating ability for both leaf area index and harvest-index.

Cross	Seed yield/ plant (g)	Leaf area index		Harvest index		Seed yield/plant	
		MP	BP	MP	BP	MP	BP
Madhavi × Rauss 17-4	10.1	44.2**	12.4**	—14.1**	—20.3**	3.5**	1.4**
RT54 × R84-4-2	15.6	13.8**	4.4**	13.3**	6.7**	31.3**	8.7**
R84-4-2 × VS 16	21.5	13.8**	11.5**	20.1**	14.0**	71.7**	50.0**
VS16 × R84-360-3	11.9	1.5**	—0.8*	16.9**	5.1**	—6.3**	—19.1**
Best parent (R84-360-3)	14.0						

*, **: Significant at 5% and 1% levels, respectively.

(5 F_1 s). Two hybrids possessed significant *sca* effects for all the traits. They were RT 54 × R 84-4-2 involving both the constituent parents as high general combiners (H × H) and R 84-4-2 × VS 16 which was a combination of both high and low general combiners as parents (H × L). Among the four hybrids i.e., Madhavi × Rauss 17-4, RT 54 × R 84-4-2, R 84-4-2 × VS 16 and VS 16 × R 84-360-3, the F_1 of the cross R 84-4-2 × VS 16 expressed highest SY heterosis of 71 and 50% over

MP and BP, respectivity. High heterosis for SY in sesame was also reported by Krishnadoss and Kadambavanasundaram (1989) and Jadon and Mehrotra (1988). This hybrid also expressed positive heterosis for LAI and HI over MP and BP. The highest SY heterosis also reflected in its highest SY per plant. Furthermore, this hybrid constituted both the parents as high general combiners which indicated additive × additive type of gene action as was also reported by Jadon and Mehrotra (1988). Therefore, selection of superior segregants in advance generations of this cross and intermating them in all possible combinations following recurrent selection procedure would simultaneously improve LAI and HI in addition to SY per plant.

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