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HETEROSIS IN RELATION TO GENERAL AND SPECIFIC COMBINING ABILITY IN SESAME

S. N. GOYAL* AND SUDHIR KUMAR

Deptt of Genetics and Plant Breeding, R.C.A., Sukhadia University, Udaipur 313 001

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ABSTRACT

Heterosis in relation to gca and sca was studied in an 8 × 8 diallel, for seven characters in sesame. High heterosis was observed for yield and its components. Mean performance of the crosses was in close association with sca effects, suggesting that it can be taken as a criterion for effective heterosis breeding. Additive × dominance gene effects were predominant in the best cross combinations.

Key words: Heterosis, combining ability, sesame.

Seed yield in sesame has been found to be significantly correlated and directly affected by number of capsules, branches, plant height and height of the first capsule bearing node from ground level [1, 2]. Therefore, any breeding programme aiming at improvement of this crop will largely depend on these attributes. Further, exploitable heterosis also very much depends on general combining ability (gca) and specific combining ability (sca) and the breeding procedure adopted. In the present study, therefore, heterosis in relation to general and specific combining ability has been discussed.

MATERIALS AND METHODS

Eight diverse varieties of sesame, viz. Gujarat Til-1 (Gujarat), Pratap (Rajasthan), TC 25 (Punjab), N 32 (M.P.), Vinayak (Orissa), SP 1162 (A.P.) and ES 22 (U.S.A.) were crossed in all possible combinations, excluding reciprocals. The resultant crosses along with parents were grown in single row plots of 4.5 m length with three replications. The distances between rows and plants were 45 and 15 cm, respectively. Observations were recorded on plant height, days to flower, number of branches, height of the first capsule bearing node (fruiting node) from ground level, number of capsules, seeds per capsule and seed yield. Heterosis (%) was calculated over better parent (BP) and combining ability as per Griffing [3] Model 1, Method 2.

*Present address: Associate Professor, NARP, Gujarat Agriculture University, Maktampur, Bharuch, Gujarat 392012.

RESULTS AND DISCUSSION

Analysis of variance showed high significant difference between parents and hybrids for all the characters. The crosses showing high heterosis and sca effects revealed that none of the hybrids was consistantly good for all the attributes and different crosses were superior for different characters. Highest heterosis for seed yield was observed in cross Pratap × Vinayak, followed by Vinayak × SP 1162, Type 12 × Vinayak, and Gujarat Til 1 × Vinayak. Among these crosses, Pratap × Vinayak and Vinayak × SP 1162 were also desirable for capsule number, plant height, branches, and height of the first fruiting node and Gujarat Til 1 × Vinayak for number of branches and capsules. Other better crosses were Pratap×Type 12 (number of capsules and plant height), N 32 × ES 22 (earliness and height of first fruiting node), and Vinayak × ES 22 and Gujarat Til 1 × Pratap (seed/capsule). Further, most of the heterotic crosses identified as superior for different attributes were also significantly better specific combinations.

Table 1. Per se performance of the parents and their general combining ability in sesame

Parent	Plant height		Days to flower		Number of branches		Height of first fruiting node		Number of capsules		Seeds per capsule		Seed yield	
	cm	gca	No.	gca	No.	gca	cm	gca	No.	gca	No.	gca	g	gca
Gujarat Til-1	94.1	−5.6	38.7	−2.1	1.9	−0.3	36.4	−2.3	62.8	−2.9	54.6	0.7	9.1	0.2
Pratap	102.3	7.1	51.0	2.1	0.0	−0.4	36.6	4.1	48.2	0.7	36.6	−0.9	5.1	−0.2
Tc 25	99.2	6.0	40.3	−1.5	3.3	−0.2	33.2	−4.9	58.9	−5.1	49.8	−0.3	4.9	−0.8
Type 12	103.7	−3.3	45.0	−0.6	3.4	0.4	40.8	0.2	47.2	−2.9	51.9	2.8	4.4	−0.0
N 32	124.1	8.8	53.0	4.2	2.1	−0.5	56.6	9.0	60.1	−6.8	40.6	−3.7	4.7	−0.8
Vinayak	108.4	1.5	46.3	0.7	3.9	1.2	38.4	−0.8	75.7	18.9	68.4	3.9	10.6	2.8
SP 1162	107.8	1.0	43.7	0.5	3.7	0.4	46.1	1.8	74.3	5.5	64.5	1.0	7.5	0.2
ES 22	106.8	−3.5	39.3	−1.4	2.9	−0.1	36.3	−7.0	59.5	−7.4	44.9	−0.5	6.1	−1.0
SE	5.5	1.1	0.6	0.1	0.8	0.2	3.3	0.7	6.4	1.3	1.1	0.2	1.1	0.4
σ^2gca		17.5		2.2		0.3		16.5		32.4		—		0.9
σsca		132.2		5.4		1.0		87.5		418.7		96.0		5.0

In general, a good relationship between gca and per se performance of the parents was observed (Table 1), but no such relationship was noticed between gca and sca of these crosses. Most of the best crosses involved high × low and very few high × high gca parents, which stated the importance of additive × dominance type of gene effects.The mean performance of hybrids was associated with sca effects which was evident from the significant correlation between them. Thus, mean performance of hybrids could be considered as a criterion of high sca effects in sesame. Similar results have been reported in other autogamous crops like pigeonpea [4] and linseed [5].

Normally sca effects do not contribute much to the improvement of self-pollinated crops. However, when sca effects are observed in the crosses having at least one

good general combiner parent, the possibility of their exploitation in practical breeding increases. In the present study, most of the heterotic crosses, which were also good specific combiners, involved at least one good general combiner and the best parent per se. Such crosses are likely to throw some transgressive segregates in advanced generations.

Thus, looking to the relationship between per se performance of parents and gca effects and mean performance of hybrids and sca effects, parents having high gca and better performance in hybrids should be utilised in breeding programme. The resultant crosses should be handled either by recurrent selection procedure or by the method suggested by [6].

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