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Research article

HETEROSIS FOR YIELD AND ITS COMPONENT TRAITS IN SESAME (*Sesamum indicum* L.)

K.Parimala, I.Swarnalatha Devi, V.Bharathi, B.Raghu, K.Srikrishnalatha and A.Vishnuvardhan Reddy

Seed Research and Technology Centre, Rajendranagar, Hyderabad -30
Corresponding Author: pari_mala123@rediffmail.com

ABSTRACT: The present study revealed that all characters showed in variable crosses depicted heterosis in both positive and negative directions indicating that genes with negative as well as positive effects were dominant. The cross JCS-596 x Swetha showed highest positive heterosis for number of branches per plant over mid parent. The range of heterosis for number of capsules per plant was 74.27 to 50.74 over better parent. Maximum positive heterosis for number of capsules per plant was exhibited by NIC 8283x KMR-74 over mid parent and better parent. The magnitude of heterosis was 103.62 % and 98.53 % over mid parent and better parent for yield per plant respectively. The hybrids Rajeswari x Swetha, Chandana x Swetha, JCS-596 x KMR-74, JCS-596 x Swetha and NIC 8283x KMR-74 recorded highly significant positive standard heterosis for plant height. Maximum significant standard heterosis for number of capsules per plant was found in the crosses NIC 8283 x KMR-74, Chandana x Swetha and NIC-8392 x Swetha. The crosses Chandana x Swetha (36.63%) and NIC 8283 x KMR-74 (18.26%) were exhibited highest standard heterosis for seed yield per plant.The crosses JCS-596 x Swetha, NIC 8283 x KMR-74 and Chandana x Swetha can be utilized in heterosis breeding.

Key words: Sesame, heterosis, mid parent, better parent

INTRODUCTION

Though sesame is a self pollinated crop, the large degree of out-crossing to the extent of 65% (Bar and Ahuja, 1979) and easiness in crossing through a massive manual hybridization technique (Yadav and Mishra, 1991) were reported. Heterosis is the genetic expression of the beneficial effects of hybridization (Shall, 1948). Identifying parental combinations with better yield heterosis is the important step in developing hybrids.Heterosis is the complex phenomenon depending upon the balance of additive, dominance and their interacting components as well as distribution of genes in parental lines. For obtaining the higher production per unit area, heterosis breeding is most important and has been exploited in self and cross-pollinated crops. Exploitation of heterosis is attempted to break yield barrier. The extent of heterosis relies upon the extent of diversity among parental lines. Heterotic parental combinations are more likely to occur from the divergent populations than from the narrow based populations. Success of hybrid development programme is determined by the level of heterosis for yield. The present study was undertaken to assess the magnitude of heterosis for yield and yield components for utilization in breeding programmes.

MATERIALS AND METHODS

The material for the present study consists of the crosses made by utilizing seven lines and three testers in a line x tester mating design. The crosses were effected during *Rabi* 2010 and resulting 21 hybrids alongwith their parents were evaluated in randomized block design during *Kharif*, 2011. Parents and hybrids were raised in rows of 4 m in length following a spacing of 30 x 15 cm between plants and replicated thrice. Data was recorded on five randomly chosen plants for the characters *viz.*, plant height (cm), number of branches per plant, number of capsules per plant, capsule length (cm), 1000 seed weight (g), Number of seeds per capsule and seed yield per plant (g).The F_1 hybrid performance was evaluated on the basis of the estimates of heterosis over mid parent, better parent and standard check. The mean of the character for the different entries was subjected to L x T analysis and relative heterosis, heterobeltiosis and standard heterosis was worked out based on the procedure given by Kempthorne (1957).

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RESULTS AND DISCUSSION

The analysis of variance revealed the presence of considerable amount of genetic differences among the genotypes, parents and crosses for majority of the characters. All the traits under study showed significant differences except for capsule length and 1000 seed weight (Table-1).Range of heterosis over mid and better parent is presented in the Table-2. Among the crosses, Rajeswari x Swetha and Chandana x Swetha exhibited maximum positive heterosis over mid parent and better parent respectively for plant height. Significant positive heterosis for plant height was reported by Mishra and Sikarwar (2001), Ananda Kumar (1995) and Mothilal and Ganesan (2005). The hybrid JCS-596 x Swetha showed highest positive heterosis for number of branches per plant over mid parent (25.06%), while rest of the crosses showed either negatively significant heterosis or non-significant heterosis for this trait. The range of heterosis for number of capsules per plant was -64.76 to 65.55 and -74.27 to 50.74 over mid and better parent respectively. Highly significant positive heterosis for number of capsules per plant was exhibited by NIC 8283 x KMR-74 over mid parent and better parent. Most of the crosses showed negative heterosis for capsule length and the crosses RT-127 x KMR-74 and NIC 8283 x KMR-74 recorded maximum positive heterosis over mid parent and better parent respectively.The cross JCS-596 x KMR-74 (15.25%) exhibited positive significant heterosis for number of seeds per capsules over mid parent. Significant heterosis for number of seeds per capsule was reported by Mishra and Sikarwar (2001), Mishra and Yadav (1996) and Mothilal and Ganesan (2005). The cross NIC 8283 x KMR-74 was found to be top hybrid over mid and better parent heterosis for 1000 seed weight. The heterosis was pronounced to the magnitude of 103.62 % and 98.53 % over mid and better parent for yield per plant

Table-1. Anova of combining ability variances for line x tester analysis in sesame

Source	d.f	Plant height	No. of branches per plant	No. of capsules per plant	Capsule length	No. of seeds per capsule	1000 seed weight	Seed yield per plant
Replications	2	41.49	0.66	7.25	0.01	44.91	0.17	0.05
Treatments	30	500.26**	1.80**	2875.41**	0.12	267.50**	0.26	172.65**
Parents	9	341.58**	1.01	2056.91**	0.21	195.02**	0.15	129.98**
Crosses	20	551.67**	1.87*	3053.95**	0.07	251.07**	0.25	156.79**
Crosses *vs* parents	1	900.35**	7.52**	6670.84**	0.37	1248.52**	1.52	873.73**
Error	60	16.13	0.33	24.81	0.01	9.78	0.01	0.45

Table -2. Heterosis over mid parent (MP) and better parent (BP) for seven characters with top ranking hybrids in sesame

Characters		Range	Top hybrid	MP	BP
Plant height	MP	-37.25 to 30.62	Rajeswari x Swetha	30.62**	12.92**
	BP	-39.43 to 12.92	Chandana x Swetha	21.60**	8.68**
No. of branches per plant	MP	-54.64 to 25.06	JCS-596 x Swetha	25.06**	NS
	BP	-59.50 to 11.82	JCS-596 x Swetha	25.06**	NS
No. of capsules per plant	MP	-64.76 to 65.55	NIC 8283 x KMR-74	65.55**	50.74**
	BP	-74.27 to 50.74	NIC 8283 x KMR-74	65.55**	50.74**
Capsule length	MP	-20.69 to 12.78	RT-127 x KMR-74	12.78**	NS
	BP	-24.18 to 9.72	NIC 8283 x KMR-74	10.49**	9.72**
No. of seeds per capsule	MP	-40.38 to 15.25	JCS-596 x Swetha	15.25**	NS
	BP	-41.51 to 5.95	NIC 8283 x KMR-74	10.90**	NS
1000 seed weight	MP	-22.09 to 23.87	NIC 8283 x KMR-74	23.87**	18.52**
	BP	-26.37 to 18.52	NIC 8283 x KMR-74	23.87**	18.52**
Yield per plant	MP	-76.52 to 103.62	NIC 8283 x KMR-74	103.62**	98.53**
	BP	-84.71 to 98.53	NIC 8283 x KMR-74	103.62**	98.53**

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Table -3.Estimates of standard heterosis for yield and component traits in sesame

Crosses	Plant height	No. of branches per plant	No. of capsules per plant	Capsule length	No. of seeds per capsule	1000 seed weight	Seed yield per plant
RT-127 x KMR-24	-31.57 **	-25.03	-63.59 **	-26.37 **	-29.41 **	-25.56 **	-76.87 **
RT-127 x KMR-74	-22.82 **	-25.03	-16.21 **	-17.58 **	-12.75 **	-10.00 **	-48.41 **
RT-127 x Swetha	-15.84 **	-19.26	-35.45 **	-20.88 **	-22.55 **	-16.67 **	-64.44 **
G.Til-3 x KMR-24	2.52	-30.80	-16.83 **	-23.08 **	-24.02 **	-17.78 **	-67.59 **
G.Til-3 x KMR-74	11.45 *	-7.73	-22.62 **	-25.27 **	-20.59 **	-15.56 **	-68.11 **
G.Til-3 x Swetha	1.17	-3.92	-10.62 *	-18.68 **	-22.55 **	-21.11 **	-65.31 **
NIC 8392 x KMR-24	3.03	-36.56 *	-58.83 **	-25.27 **	-48.53 **	-25.56 **	-80.83 **
NIC 8392 x KMR-74	10.75 *	-34.60 *	-51.59 **	-27.47 **	-32.84 **	-21.11 **	-72.67 **
NIC 8392 x Swetha	29.59 **	30.68	57.65 **	-19.78 **	0.49	-3.33	33.67 **
JCS 596 x KMR-24	6.74	-3.92	-1.52	-21.98 **	-14.22 **	-18.89 **	-57.78 **
JCS 596 x KMR-74	29.78**	15.34	35.31 **	-16.48 **	0.00	-17.44 **	8.13 **
JCS 596 x Swetha	29.62**	41.87 *	40.44 **	-17.58 **	-15.20 **	-17.78 **	-18.68 **
Rajeswari x KMR-24	4.09	-1.96	-0.97	-14.29 **	-13.24 **	4.44	-48.02 **
Rajeswari x KMR-74	14.95 **	-7.73	13.79 **	-16.48 **	-10.78 **	-13.33 **	-45.34 **
Rajeswari x Swetha	54.91 **	-30.80	-47.86 **	-24.18 **	-39.22 **	-27.78 **	-74.60 **
Chandana x KMR-24	9.77 *	-4.84	-22.93 **	-21.98 **	-0.98	-3.33	-23.53 **
Chandana x KMR-74	22.15**	-0.00	-3.45	-16.48 **	-13.24 **	-12.22 **	-16.78 **
Chandana x Swetha	38.02**	23.41	63.45 **	-9.89 **	-0.49	-4.44	39.63 **
NIC 8283 x KMR-24	18.07**	-7.73	8.83	-10.99 **	-12.75 **	-11.11 **	-55.29 **
NIC 8283 x KMR-74	21.76**	73.01 **	69.65 **	-13.19 **	-18.14 **	6.67 **	18.26 **
NIC 8283 x Swetha	2.29	-7.73	-32.14 **	-24.18 **	-37.25 **	-25.56 **	-76.87 **

The extent of heterosis over standard check for seven characters is presented in Table-3. Plant height is of great importance to get higher biomass and economic yield. Increased plant height has positive relation with seed yield. The hybrids Rajeswari x Swetha, Chandana x Swetha, JCS-596 x KMR-74, JCS-596 x Swetha and NIC 8283 x KMR-74 recorded highly significant and positive heterosis over standard check for plant height. Significant positive heterosis was pronounced to the magnitude 73.01% in the hybrid NIC 8283 x KMR-74 for number of branches per plant. Five hybrids exhibited significant positive standard heterosis for number of capsules per plant and maximum heterosis was found in the crosses NIC 8283 x KMR-74 (69.65%), Chandana x Swetha (63.45%) and NIC-8392 x Swetha (57.65%). Highest standard heterosis for seed yield per plant was recorded in Chandana x Swetha (39.63%) followed by NIC 8283 x KMR-74(18.26%). Earlier reports also indicated the differences in magnitude and direction of heterosis for mid parent, better parent and standard parent (Torpore, 2008; Singh *et al*., 2005Yadav*et al*., 2005; Padma Sundari and Kamala, 2012).

CONCLUSION

From the study it was concluded that the maximum standard heterosis for number of capsules per plant and seed yield per plant was recorded in the crosses Chandana x Swetha and NIC 8283 x KMR-74. These can be utilized for yield improvement through heterosis breeding.

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