Indian J. Genet., **62**(2): 169-170 (2002)

Short Communication

Heterosis and inbreeding depression in sesame (*Sesamum indicum* L.)

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(Received: August 1999; Revised: March 2002; Accepted: April 2002)

The present study was conducted with seven genetically diverse genotypes of sesame (*Sesamum indicum* L.) *viz.*, T-4, MT-2, TRS-9, RT-274, RT-264, AT-09 and DSS-13 crossed in half diallel fashion. The parents along with their 21 F_1s and F_2s were grown in randomized block design with three replications during *Kharif*, 1998. Each replication comprised of single row in case of parents and F_1s whereas, F_2s were represented by three rows of 5m length. Inter plant distance between and within rows was 30 and 15 cm, respectively. A single non- experimental row was grown all around the experi- mental area to neutralize border effect. Data were recorded on five randomly selected plants in each row for plant height, number of primary branches per plant, days to maturity, number of capsules per plant, number of capsules on main stem, 1000-seed weight and seed yield per plant. Heterosis over better parent (Heterobeltiosis) and inbreeding depression was calculated as per standard procedures.

The results on the estimate of heterosis over better parent and best heterotic cross combination for all the seven characters have been presented in Table 1. The range of heterosis was quite wide, except for days to maturity indicating wide variability in the parent material. Seven crosses recorded significant positive heterosis for plant height, the highest being 11.42 per cent in cross TRS-9 × RT-264, where as nine crosses recorded significant negative heterosis. Similar results have been reported by several workers in past [1-4]. Significant negative heterosis was recorded by ten crosses for days to maturity which is desirable for the development of short duration varieties. Eight hybrids each showed significant positive heterosis for number of capsules on main stem and 1000-seed weight, respectively. Sixteen crosses showed positive significant heterosis for number of capsule while only three crosses recorded significant positive heterosis for number of primary branches. For seed yield per plant, seventeen crosses exhibited significant positive heterosis with highest value of 120.69 per cent recorded in the cross TRS-9 × AT-09 indicating considerable dominance in these crosses. In the present study, heterosis recorded for seed yield per plant was maximum, thus confirming the earlier results [3]. Furthermore, the crosses showing heterosis for one or more yield components were also heterotic for seed yield per plant (Table 2). This clearly implied that heterosis in a complex character like yield can be achieved through single or several characters

Table 1. Range of heterosis and inbreeding depression (I.D.) along with best heterotic combinations for seven traits in sesame

Character	Range of heterosis Better parent (%)	Best heterotic cross Better parent (%)	CD at 5%	Crosses showing Lowest I.D. (%)	Crosses showing Highest I.D. (%)	CD at 5%
Plant height (cm)	-19.92^{**} - 11.42^{**}	TRS-9 × RT- 264	3.63	RT-274 × RT-264 (-42.69^{**})	T-4 × MT-2 (6.88^{**})	2.59
Days to maturity	-13.21^{*} - 8.68^{**}	AT-09 × DSS-13	1.57	RT-274 × RT-264 (-19.07^{**})	T-274 × AT-09 (10.37^{**})	1.53
No. of primary branches/plant	-26.67^{*} - 62.50^{**}	RT- 274 × DSS-13	1.20	MT-2 × AT-09 (-66.67^{*})	RT-264 × AT-09 (54.55^{**})	1.20
No. of capsules/plants	-9.69 - 96.32^{**}	T-4 × MT-2	7.02	RT-264 × DSS-13 (-20.91^{**})	RT-264 × AT-09 (55.84^{**})	5.98
No. of capsules on main stem	-31.82^{**} - 49.30^{**}	T-4 × DSS-13	4.19	T-4 × MT-2 (19648.39^{**})	TRS-9 × RT-274 (55.79^{**})	3.86
1000-seed weight (g)	-22.35 - 17.79	RT-274 × AT-09	0.02	AT-09 × DSS-13 (-22.69^{**})	T-4 × TRS-9 (27.26^{**})	0.02
Seed yield/plant (g)	-10.26 - 120.69^{**}	TRS-9 × AT-09	2.14	MT-2 × RT-274 (2.50)	T-4 × DSS-13 (50.00^{**})	2.16

*, **: Significant at Po.05 and Po.01 level, respectively.

[5]. Number of capsules per plant produced heterotic effects in almost all the crosses. Other important characters contributing to yield heterosis in the present study were number of capsules on main stem, plant height and 1000-seed weight.

The extent of inbreeding depression for all the seven characters have been given in Table 1. The inbreeding depression was maximum in seed yield per plant. Sixteen crosses exhibited significant inbreeding depression which also showed high heterotic response suggesting that non-additive gene action are operative in the inheritance of this complex trait. Low inbreeding depression was recorded for plant height and number of primary branches per plant. A close relationship between heterotic response and inbreeding depression was observed for seed yield per plant except only one cross (T-4 × MT-2). The cross T-4 × MT-2, manifested high seed yield and non-significant inbreeding depression suggesting the preponderance of additive gene action and as such single plant selection following pedigree method could be effective. These results corroborated earlier findings [6]. Specific combining ability (*sca*) was also computed for all the 21 crosses. The crosses with highly significant sca for seed yield per plant, also exhibited highly significant heterosis for most of the characters studied including seed yield per plant.

The best specific combiner for seed yield TRS-9 × DSS-13 (Table 2) involved the parents having low and high gca effects indicating that additive × dominance type of gene interaction was involved. The other specific combinations for seed yield were having high × low and low × low general combiners. It is evident that parents with highest gca effects will not necessarily generate top specific cross combinations as also reported by Fatteh *et al.* [7]. However, few crosses between low × low general combiners for seed yield produced high sca effects, suggesting over dominance and epistatic gene action which may be due to the genetic diversity in the form of heterozygous *loci.* Heterotic crosses with significant sca effects can also give transgressive segregants provided gca effects of parents are of greater magnitude.

Keeping in view, the mean seed yield, heterosis for seed yield and its components and sca effects recorded in present study, three crosses *viz.*, TRS-9 × RT-264, TR-S9 × DSS-13 and T-4 × RT-264 may be selected both for the commercial exploitation of heterosis and getting transgressive segregants in later generations whereas, the cross TRS-9 × AT-09 would be exclusively for the commercial exploitation of yield heterosis in sesame.

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Table 2. Relationship between heterosis and sca for seed yield per plant along with significant heterosis of component traits in sesame

Crosses	Mean seed yield per plant (g)	heterosis over better parents (%)	sca	gca status of the parents		Significant heterosis of component traits					
				P1	P2	1000-seed wt.(g)	No. of capsules on main stem	No. of capsules per plant	No. of primary branches per plant	Days to maturity	Plant height (Cm)
TRS-9 × AT-09	21.33	120.69**	5.19**	l	l	-	22.73**	40.31**	-	-	-
TRS-9 × DSS-13	25.00	97.73**	7.00**	l	h	-	-	29.59**	44.44**	-	7.54**
TRS-9 × RT-264	25.33	90.00**	6.81**	l	h	-	20.45**	19.30**	-	-	11.42**
T-4 × AT-09	18.67	80.65**	2.85**	l	l	2.44**	44.62**	26.25**	-	7.63**	10.02**
RT-2874 × AT-09	17.67	70.97**	3.44**	l	l	17.79**	-	26.88**	-	-	-
T-4 × RT-264	22.67	70.00**	4.48**	l	h	6.04**	38.14**	13.45**	-	-	-
T-4 × DSS-13	21.33	68.42**	3.67**	l	h	-	49.30**	66.41**	-	2.41**	5.47**
MT-2 × RT-264	21.67	62.50**	3.44**	l	h	2.99**	-	-	50.00*	2.97**	-
T-4 × MT-2	19.33	48.72**	3.85**	l	l	-	-	96.32**	-	-	5.92**
CD at 5%	2.14										

*, **: Significant at Po.05 and Po.01 level, respectively.
l-low (non-significant gca, h- high (significant gca) # : Significant heterosis in negative direction was only considered.