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HETEROSIS FOR YIELD AND YIELD COMPONENTS IN SESAME

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ABSTRACT

Heterosis was high, significant and positive for yield and its important attributes in 6 out of 17 hybrids of sesame involving 8 diverse parents. Heterosis for yield was generally accompanied by heterosis for yield components. The study reveals good scope for commercial exploitation of heterosis as well as isolation of pure lines among the progenies of other heterotic F_1.

Key words: Component heterosis, yield, sesame.

Sesame (*Sesamum indicum* L.) is an important oil seed crop of the tropics and subtropics. The reproductive biology of sesame, like cotton, offers good scope for exploitation of heterosis. Heterosis for yield and its attributes in 17 hybrids of sesame involving 8 parents from different geographical regions of the country is investigated in the present paper.

MATERIALS AND METHODS

An experiment involving 8 varieties of sesame selected from different regions of the country and 17 hybrids obtained by crossing the varieties at random was laid out in randomized block design having two replications. A single plot had 2 m long rows, one each of the parents and hybrids. The spacing of 10 x 30 cm was followed. The crop was raised as per the standard practice. Observations on eight quantitative characters (Table 1) were recorded on five randomly selected plants in each plot. The F_1 hybrid performance was calculated as the estimate of heterosis over midparent (MP) [1], better parent (BP) [2], and economic heterosis (EH) (i.e., comparison of F_1 with the standard variety prevalent in the region) and test of significance was done.

RESULTS AND DISCUSSION

Analysis of variance for yield and its attributes was significant (Table 1). The MP, BP heterosis and EH either alone or in combination were significant for all characters except plant

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Table 1. Analysis of variance (mean squares) for different characters of parents and hybrids in sesame

Sources	d.f.	Days to first flowering	Days to 90% flowering	Days to maturity	Plant height	No. of branches per plant	No. of capsules per plant	No. of seeds per capsule	Yield per plant
Treatments	24	36.4	31.4	70.7	204.9	0.8	522.6	130.0	19.7
Parents	7	24.2	32.3	141.2	163.6	1.5	527.5	63.5	8.8
Crosses	16	42.3	31.6	40.6	232.0	0.6	222.5	149.9	216.8
Parents vs. crosses	1	22.7	20.5	17.5	57.8	0.2	5289.3	278.1	226.4
Error	24	4.7	4.7	2.4	58.2	0.2	117.1	9.0	4.7
F value									
Treatments		7.7**	6.7**	29.7**	3.5**	5.6**	4.5**	4.6**	4.2
Parents		5.1**	7.0**	59.3**	2.8**	9.8**	4.5**	7.1**	1.9
Crosses		9.0**	6.8*	17.1**	4.0**	4.0**	1.9	16.7**	46.1**
Parents vs. crosses		4.8*	4.4*	6.8**	1.0	1.4	45.2**	31.7**	48.2**

* P = 0.05; **P = 0.01

Table 2. Heterosis (%) for yield and yield attributes in 17 sesame hybrids

Hybrid	Days to first flowering MP	Days to first flowering BP	Days to first flowering EH	Days to 90% flowering MP	Days to 90% flowering BP	Days to 90% flowering EH	Days to maturity MP	Days to maturity BP	Days to maturity EH	Plant height MP	Plant height BP
Ahutil X AT-6	5.6*	12.0	15.3**	3.6	10.5**	13.7	4.4	11.4**	3.1	9.1	0.8
Ahutil X VS-16	–2.5	4.0	0.7*	3.7	6.7**	9.8	1.3	9.5**	0.0	–4.4	–0.7
PbMT-82-2-6 X Ahutil	–1.4	4.5	–4.1	12.0	10.9**	0.0	–2.4	–8.9**	–6.2	43.8	–8.9
PbMT-82-2-6 X VS-16	5.3	19.4	9.6**	12.6	22.1**	13.7	8.2	17.8**	6.2	–0.2	–10.9
B-67 X Ahutil	–1.4	0.0	0.0	3.4	4.9*	4.9	–7.7	–3.4*	–11.7	–31.9	–32.9
B-67 X AT-6	–9.6**	–2.7	–2.7	–3.2	4.9*	4.9	–2.9	0.0	0.0	3.2	–3.4
B-67 X PbMT-82-2-6	–2.9	–1.5	–6.8*	–0.5	3.2	–3.9	5.2	0.0	0.0	5.1	–0.5
B-67 X VS-16	–7.6	0.0	0.0	–2.3	1.9	1.9	–2.7	0.0	–5.8	4.6	–1.7
BS-5-18-6(G) X B-67	–16.6**	–12.1	–20.6**	–2.1	2.2*	–6.9	7.3	15.7**	0.0	–1.5	[illegible]
BS-5-18-6(G) X Ahutil	0.7	6.1	–4.1	–1.0	5.4**	–3.9	–1.0	2.1*	–11.7	–11.2	–17.3
BS-5-18-6(G) X AT-6	–14.7**	–3.0	–12.8**	–10.4	2.2*	6.9	–3.9	7.1**	7.4	0.4	2.6
BS-5-18-6(G) X PbMT-82-2-6	–0.8	0.0	9.6**	0.0	0.1	–7.8	0.0	1.4	–11.7	–8.8	–9.0
RAUSS-17-4 X OMT-3	0.0	6.3	–6.8*	4.4	11.9**	–7.8	3.2	6.6**	0.0	9.2	7.5
RAUSS-17-4 X BS-5–18-5(G)	–18.8**	15.1	–23.3**	3.7	5.4*	–3.9	7.3	15.7**	0.0	25.3	20.2
RAUSS-17-4 X B-67	–17.2**	–16.7	–17.8**	–5.1	–2.1	–17.8	–6.2	–6.2**	–6.2	–2.7	–4.2
OMT-3 X B-67	–0.7	6.3	–6.9*	1.1	11.9**	–7.8	3.2	6.5**	0.0	–1.2	–4.2
OMT-3 X BS-5-18-6(G)	–7.7**	–6.3	–17.8**	–5.1	0.0	–17.7	4.1	8.6**	–6.2	9.0	6.1
Range: max.	5.6	19.4	15.3	12.6	22.1	–13.7	8.2	17.8	7.4	43.8	20.2
min.	–18.8	–16.7	–23.3	–10.4	–2.1	–17.7	–7.7	–8.9	–11.7	–31.9	–32.9

Note: Heterosis over midparent (MP), better parent (BP), and best economic check (EH).

height and branches/plant. However, since at F_1 stage significant BP heterosis in the desired direction is the most useful parameter, only that is discussed.

Significant BP heterosis for capsules/plant and yield/plant was observed in the crossess Ahutil x VS-16, PbMT-82-2-6 x VS-16, B-67 x AT-6, B-67 x PbMT-82-2-6, B-67 x VS-16, BS-5-18-6(G) x B-67, RAUSS-17-4 x BS-5-18-6(G), RAUSS-17-4 x B-67, and OMT-3 x BS-5-18-6(G). The hybrid PbMT-82-2-6 x Ahutil exhibited significant heterosis for days to maturity as well, in addition to capsules/plant and yield/plant. However, cross B-67 x Ahutil showed significant BP heterosis only for days to maturity. The remaining hybrids failed to register desired significant heterobeltiosis for any of the characters studied.

In the present study, the crosses B-67 x PbMT-82-2-6, B-67 x AT-6, PbMT-82-2-6 x VS-16, PbMT-82-2-6 x Ahutil, Ahutil x VS-16, and OMT-3 x BS-5-18-6(G) have shown very high BP heterosis for yield/plant. The same crosses also registered high BP heterosis for capsules/plant. Cross PbMT-82-2-6 x Ahutil exhibited BP heterosis for days to maturity also. The remaining crosses were either at par with the better parent (B-67 x AT-6 and B-67 x PbMT-82-2-6) or late for maturity. Most of the crosses which

Table 2 (continued)

Hybrid	No. of branches per plant MP	No. of branches per plant BP	No. of branches per plant EH	No. of capsules per plant MP	No. of capsules per plant BP	No. of capsules per plant EH	No. of seeds per capsule MP	No. of seeds per capsule BP	No. of seeds per capsule EH	Yield/plant MP	Yield/plant BP	Yield/plant EH
Ahutil X AT-6	33.92	–20.7	–2.7	44.0**	0.5	30.2**	10.7**	20.7	36.6**	29.7**	32.9	3.6
Ahutil X VS-16	–19.1	–20.0	–1.9	64.3**	23.2**	59.6**	–10.4**	–15.2	–3.7	137.2**	93.0**	50.4**
PbMT-82-2-6 X Ahutil	–3.5	–28.9	–12.8	43.8**	15.6**	49.7**	19.8**	20.3	36.6**	56.7**	54.7**	20.6
PbMT-82-2-6 X VS-16	–2.9	–22.7	7.4	174.6**	150.2**	97.0**	5.1**	–1.0	13.4**	155.9**	110.6**	6.0
B-67 X Ahutil	–14.4	–22.2	–4.6	–14.2**	–20.0**	–1.5	–7.4**	–12.9	–1.1	–14.6	–23.9	–23.9
B-67 X AT-6	–1.4	–2.1	–2.1	111.7**	60.0**	60.0**	39.2**	33.2	33.2**	194.7**	109.4**	109.4**
B-67 X PbMT-82-2-6	11.5	–4.6	–4.6	117.9**	94.7**	94.7**	43.4**	34.4	53.8**	148.7**	118.9**	118.6**
B-67 X VS-16	0.8	–15.9	0.8	64.7**	35.7**	35.7**	19.5**	18.7	20.2**	79.3**	33.6*	33.6*
BS-5-18-6(G) X B-67	[illegible]	5.2	5.2	32.8**	15.6**	55.8**	20.2**	10.6	31.7**	76.4**	58.9**	98.3**
BS-5-18-6(G) X Ahutil	1.3	–13.8	6.3	3.0	1.0	36.1**	–1.0	–3.6	14.8**	6.0	–13.9	7.5
BS-5-18-6(G) X AT-6	18.5	0.0	–12.8	45.7**	0.5	35.5**	11.2**	–1.7	17.1**	74.3**	16.7	45.7**
BS-5-18-6(G) X PbMT-82-2-6	6.8	–3.1	–15.5	12.0**	–11.2**	19.6**	0.7	–1.3	17.6**	27.4	2.4	27.8
RAUSS-17-4 X OMT-3	–2.7	–10.0	–1.9	20.7**	2.6	60.7**	–15.1**	–15.5	5.6**	25.5	24.5	36.2*
RAUSS-17-4 X BS-5–18-5(G)	21.2	17.6	9.0	27.7**	15.8**	56.1**	1.6	0.7	23.9**	43.8**	34.5**	68.4**
RAUSS-17-4 X B-67	13.0	9.0	9.0	60.3**	53.1**	68.0**	1.7	–9.1	13.5**	36.5*	30.7*	42.9**
OMT-3 X B-67	35.4	30.0	41.7	–2.7	–20.4**	24.9**	11.8**	1.1	25.1**	6.7	3.0	10.7
OMT-3 X BS-5-18-6(G)	11.1	–20.0	–12.8	13.5**	5.6**	65.3**	–4.1**	–5.9	16.5**	57.6**	46.5**	82.9**
Range: max.	35.4	30.0	41.7	174.6	150.2	97.0	43.4	34.4	58.8	194.7	118.9	118.9
min.	19.1	–28.9	–15.5	–14.2	–20.4	–1.5	–15.1	–15.5	–3.7	–14.6	–23.9	–23.9

registered significant BP heterosis for yield/plant also had either significant or moderately good heterosis for capsules/plant and seeds/capsule.

The present study thus suggests that heterosis for yield should be through component heterosis. Hybrid vigour of even small magnitude for individual yield components may have additive or synergistic effect on the end product. Similar heterotic effect of yield components on final yield was observed in tomato [10] and oats [11]. Evidently, manifestation of heterosis for yield and its attributes may be due to nonadditive gene effects in the parents. Additive as well as nonadditive genetic variance for yield and yield attributes have been reported in sesame [4–7, 9, 12]. Thus the present study reveals ample scope for exploitation of hybrid vigour for commercial production (with the availability of cheap labour) as well as isolation of pure lines among the progenies of other heterotic F_1, as has been done in tobacco [13], tomato [10], and wheat [14].

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