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IDENTIFICATION OF HETEROTIC CROSSES IN SESAME (*SESAMUM INDICUM*)

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ABSTRACT

Nine genotypes, consisting of six cultures (lines) and three varieties (testers) were crossed in line x tester fashion. The 18 hybrids and their parents were used to estimate three types of heterosis for 12 traits, including seed yield. Based on standard heterosis and per se performance, the superior crosses were identified for each trait. The cross TNAU 12 x TMV 3, which showed superior performance in yield and seven yield contributing traits, can be considered as the best combination among the 18 crosses evaluated.

Key words: Heterosis, sesame, F_1 performance, standard parent.

Though sesame is predominantly a self-pollinated crop, considerable cross pollination has been recorded [1]. The epipetalous nature of stamens and high heterosis will pave the way to development of hybrid sesame. An attempt has been made in this study to find out the level of hybrid vigour in sesame.

Six high yielding homozygous genotypes from different regions of Tamil Nadu, viz., TSS 6, TNAU 12, TNAU 17, TNAU 86, VS 117 and DPI 1589, were used as female parents and the high yielding varieties CO 1, TMV 3 and TMV 6 were used as female parents in a line x tester mating design. The 18 hybrids along with their parents were raised in randomized block design with three replications. Each plot with 9 m^2 area had 120 plants of which 20 plants were taken randomly to record observations on 12 economic traits (Table 1). The character means for all genotypes were used to determine three types of heterosis, i.e., heterosis over midparent (MP), over better parent (BP), and standard heterosis (SH) as per cent increase over the best commercial check variety CO 1.

The range of heterosis and number of superior crosses showing positive heterosis are given in Table 1. For days to first flowering, the extent of variation was from – 10.4 to 10.9%

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when all the three types of heterosis are considered (Table 1), while for 50% flowering the extent of variation ranged from – 10.9 to 19.6% with seven crosses exceeding the check variety CO 1. Heterotic expression for this trait was also reported earlier [2].

Heterosis for plant height varied from – 26.2 to 34.1% for all the three types of heterosis with eight crosses showing superiority over the standard variety CO 1 (Table 1). Sodani and Bhatnagar [3] also reported similar results for plant height in sesame.

For first capsule forming node, heterosis was used as a criterion. Eleven crosses showed significant negative heterosis over the standard check variety, CO 1 (Table 1). Yermanos and Kotecha [4] reported greater variation for this trait. For number of capsules on the main stem and branches, heterosis up to 105.8 and 190.9%, respectively, was recorded, which was in agreement with the findings of [5].

The heterotic expression for leaf area ranged from – 49.2 to 201.1%, signifying lot of variation. Only 7 crosses exceeded the standard variety, CO 1 (Table 1). More the leaf area in better photosynthetic response, is expected.

Dry shoot weight and root weight, showed heterosis up to 94.9 and 53.7%, respectively. Similar results were reported by Sharma and Chauhan [6].

Table 1. Heterosis for yield and its components in hybrids of sesame

Character	Heterosis (%)			No. of hybrids superior on the basis of		
	MP	BP	SH	MP	BP	SH
1st flowering	– 6.8–10.9	– 10.4–7.4	– 7.9–9.5	5	4	5
50% flowering	– 6.8–18.3	– 10.9–11.5	– 4.4–19.6	5	4	7
Plant height	– 14.3–34.1	– 26.2–15.4	– 15.4–24.1	5	3	8
1st productive node	– 26.7–25.9	– 30.0–17.0	– 37.8–14.6	4	6	11
No. of capsules/main stem	– 9.8–90.6	– 12.3–71.4	21.1–105.8	9	4	17
No. of capsules/branch	7.1–190.9	– 15.4–133.3	5.6–133.3	8	7	15
Leaf area	– 38.5–201.0	– 41.7–179.7	– 49.2–155.1	10	7	7
Shoot weight	– 22.3–80.9	– 26.1–70.2	– 17.3–94.9	6	4	7
Root weight	– 35.3–57.5	– 38.8–51.3	– 38.5–53.7	3	3	3
1000-seed weight	– 21.1–11.7	– 23.9–14.1	– 20.2–14.6	2	1	3
Oil content	– 11.4–13.9	– 15.4–12.3	– 1.2–17.4	9	7	16
Seed yield/plant	1.6–169.9	– 4.8–143.0	– 4.9–124.7	16	15	15

For 1000-seed weight, the heterotic vigour varied in the narrow range from – 23.9 to 14.6%, while for oil content, heterosis varied from – 15.4 to 17.4% and 16 crosses had significantly higher oil content than the check, CO 1 (Table 1). Tyagi and Singh [7] reported similar heterosis value for oil content.

For seed yield, hybrid vigour varied from – 4.9 to 169.9% with 15 crosses showing significant positive standard heterosis. Highest value of 169.9% of heterosis was expressed by the cross TSS 6 x TMV 6. Heterosis for yield was also reported earlier [8].

Based on the values of standard heterosis and per se mean performance, superior crosses were identified for each traits (Table 2).

There cannot be any separate gene system for yield per se and the yield is an end product of the multiplicative interactions between various yield components [9]. This means that yield superiority can be only due to superior performance for individual yield components or, alternatively, due to multiplicative effects of partial dominance of the component characters. Accordingly, the cross TNAU 12 x TMV 3, which showed superior performance for seven yield traits as well as yield itself (Table 2), can be considered to be the best cross combination among the 18 crosses evaluated in the present study and can be used for development of hybrid sesame.

Table 2. Identification of superior crosses in sesame

Trait	Cross	Per se performance of		Standard heterosis
		hybrid	best parent	
Days to 1st flower	VS 117 x TMV 6	38.4*	32.7	9.5**
Days to 50% flowering	VS 117 x TMV 6	45.4*	37.1	19.6**
	Dpi 1589 x TMV 3	45.4*	—	19.6**
Plant height (cm)	TNAU 12 x TMV 3	111.1*	113.6	24.1**
1st productive node (no.)	VS 117 x TMV 3	6.0*	9.7	– 37.8**
	Dpi 1589 x TMV 3	6.5*	—	– 32.7**
Capsules/main stem	TNAU 12 x TMV 3	29.4*	24.2	105.8**
	TNAU 17 x CO 1	26.6*	—	86.0**
Capsules/branch	TNAU 12 x TMV 3	80.8*	22.4	99.4**
	VS 117 x CO 1	94.5*	—	133.3**
Leaf area (cm^2)	TNAU 12 x CO 1	33.3*	21.6	67.5**
	TNAU 86 x TMV 6	30.3*	—	155.1**
Shoot wt. (g)	TNAU 12 x TMV 3	36.4*	22.4	94.9**
Root wt. (g)	TNAU 12 x TMV 3	8.2*	6.9	35.9**
	DPI 1589 x CO 1	9.3*	—	53.7**
1000-seed wt. (g)	TSS 6 x CO 1	2.5*	2.5	14.1**
Oil content (%)	TSS 6 x TMV 3	45.6*	46.4	14.7**
	TNAU 12 x TMV 3	45.8*	—	15.4**
	VS 117 x CO 1	46.6*	—	17.4**
Seed yield/plant (g)	TSS 6 x TMV 6	8.8*	6.0	86.9**
	TNAU 12 x TMV 3	10.5*	—	124.7**
	TNAU 17 x TMV 6	8.8*	—	86.8**
	TNAU 86 x CO 1	7.4	—	57.8**
	VS 117 x TMV 3	9.3*	—	69.9**

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

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