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Heterosis in sesame (*Sesamum indicum* L.)

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ABSTRACT

The study of heterosis in 45 F1s of sesame resulting from 10 x 10 diallel, excluding reciprocals in four environments indicated pronounced hybrid vigour for yield and most of the yield components. The hybrid ABT 23 x ABT 26 expressing the highest heterobeltiosis for seed yield per plant followed by Mrug 1 x PT 64 also manifested high heterobeltiosis for yield contributing traits *viz*., number of capsules per plant, length of main branch, number of effective branches per plant, number of seeds per capsule, capsule length and harvest index on pooled basis. None of the hybrids exhibited significant heterobeltiosis for earliness and dwarfness.

Key words : Heterosis, Heterobeltiosis, Sesame

INTRODUCTION

Sesame, although predominantly a self pollinated crop, its reproductive biology and making crosses offers a good scope for exploitation of heterosis. The heterosis in sesame has not been exploited by developing high yielding heterotic hybrid to increase productivity. The present study was undertaken to study the extent of heterosis and heterobeltiosis for seed yield and its components to develop superior hybrids.

MATERIALS AND METHODS

The experimental materials comprised of 55 genotypes consisting of 10 parents (*viz.*, GT 1, GT 2, C 1013, Mrug 1, GT 10, PT 64, Tapi, ABT 23, ABT 26 and AT 123) and 45 F1s following half diallel mating design. The experimental material was grown in a randomized block design with three replications under four environments created by four different dates of sowing during *Kharif* 2005 at the Main Castor-Mustard Research Station, S. D. Agricultural University, Sardarkrushinagar. All the management practices were followed as per recommendations, so as to raise a normal crop. The observations were recorded on five randomly selected plants from each genotype in each replication and each environment for different characters. Heterosis over mid parent (relative heterosis) and better parent (heterobeltiosis) were calculated according to Fonseca and Petterson (1968).

RESULTS AND DISCUSSION

Pooled analysis over environments for all the characters (Table 1) revealed that, for days to 50 per cent flowering the heterobeltiosis varied from –9.21 per cent to 2.85 per cent. Heterobeltiosis for earliness was depicted in cross GT 2 x Tapi (-9.21%) followed by Mrug 1 x GT 10 (-9.09%) and C 1013 x GT 10 (-8.16%). The estimates of heterosis indicated that none of the crosses exhibited significant negative relative heterosis as well as heterobeltiosis for the character like days to maturity, plant height and harvest index. For length of main branch, cross PT 64 x Tapi registered high significant positive relative heterosis (25.49%) as well as heterobeltiosis (22.70%). These results are in agreement with Mothilal and Manoharan (2004). For number of capsules on main branch only one cross ABT 23 x ABT 26 exhibited significant positive relative heterosis (23.85%).The relative heterosis was high for number of effective branches per plant *i.e.*, 84.93% and heterobeltiosis was 23.97%. Similar results were obtained by Dikshit and Swain, 2000, Dusane *et al*., 2002 and Mothilala and Ganesan, 2005. The highest significant positive relative heterosis (33.40%) and heterobeltiosis (26.76%) observed for number of capsules per plant were depicted by the cross Mrug 1 x PT 64 on pooled basis. Similar results were obtained by Dikshit and Swain (2000), Dusane *et al.* (2002) and Anuradha and Lakshmikantha Reddy (2005). Five crosses exhibited significant positive relative heterosis, while, none of the crosses showed significant positive heterobeltiosis for the capsule length. The hybrid PT 64 x Tapi registered the highest significant heterobeltiosis (11.53%) for number of seeds per capsule. Similar results were obtained by Dikshit and Swain (2000). and Mothilala and Ganesan (2005). For seed yield per plant, the mid-parent heterosis ranged from –9.54 per cent to 33.19 per cent, whereas, heterobeltiosis varied from -19.27 per cent to 26.95 per cent. The ABT 23 x ABT 26

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Table 1 : Range of heterosis (%) and heterobeltiosis (%), number of significant hybrids along with best three heterotic combinations for yield and yield components in sesame on the basis of polled over environments

Characters	Range of heterosis over		No of significant hybrids on the basis		Best heterotic combination over	
	MP	BP	MP	BP	MP	BP
Days to 50 per cent flowering	-7.50 to 5.31	-9.21 to 2.85	1	3	GT 1 x ABT 26	GT 2 x Tapi Mrug 1 x GT 10 C 1013 x GT 10
Days to maturity	-2.48 to 2.30	-3.77 to 1.78	0	0	-	-
Plant height (cm)	-3.59 to 26.93	-6.88 to 23.81	0	0	-	-
Length of main branch (cm)	-9.22 to 25.49	-12.39 to 22.70	2	1	PT 64 x Tapi PT 64 x ABT 23	PT 64 x Tapi
Number of capsules on main branch	-55.32 to 23.85	-69.66 to 11.43	1	0	ABT 23 x ABT 26	-
Number of effective branches per plant	-23.91 to 84.93	-29.19 to 23.97	13	2	C 1013 x PT 64 GT 10 x PT 64 Mrug 1 x PT 64	Mrug 1 x ABT 23 C 1013 x ABT 23
Number of capsules per plant	-17.54 to33.40	-27.13 to 26.76	6	3	Mrug 1 x PT 64 GT 2 x GT 10 Mrug 1 x Tapi	Mrug 1 x PT 64 Mrug 1 x Tapi GT 2 x GT 10
Capsule length (cm)	-6.36 to 8.98	-10.20 to 7.8	5	0	Tapi x ABT 26 C 1013 x PT 64 GT 2 x C 1013	-
Number of seeds pr capsule	-4.58 to 14.97	-11.24 to 11.53	10	1	Mrug 1 x GT 10 PT 64 x Tapi GT 10 x ABT 23	PT 64 x Tapi
Seed yield per plant (g)	-9.45 to 33.19	-19.27 to 26.95	9	5	Mrug 1 x PT 64 C 1013 x ABT 23 GT 2 x GT 10	ABT 23 x ABT 26 Mrug 1 x PT 64 C 1013 x ABT 23 GT 2 x GT 10
Harvest index (%)	-36.39 to 12.28	-38.12 to 6.44	0	0	-	-

was the best hybrid for seed yield per plant, which registered significantly higher heterobeltiosis (26.95%), which is followed by Mrug 1 x PT 64 (25.04%), C 1013 x ABT 23 (23.44%) and GT 2 x GT 10 (21.05%) and also manifested high heterobeltiosis for yield contributing traits *viz.*, number of capsules per plant, length of main branch, number of effective branches per plant, number of seeds per capsule and harvest index. The cross Mrug 1 x PT 64 also exhibited highest relative heterosis (33.19%) and high heterobeltiosis in desired direction for yield components *viz*., number of capsules per plant, length of main branch and capsule length. Similar findings were also reported by Krishnaiah *et al*. (2003), Dikshit and Swain (2000) and Dusane *et al*. (2002).

In the present study, for almost all the characters, varying number of crosses depicted heterosis in both positive and negative directions indicating that genes with negative and positive effects or a complementary type of gene interaction or simply correlated gene distribution may seriously inflate the mean degree of dominance and convert partial dominance into apparent over dominance (Hayman, 1954).

Thus the overall results suggested that the hybrids ABT 23 x ABT 26, Mrug 1 x PT 64, C 1013 x ABT 23 and GT 2 x GT 10 may be selected for the commercial exploitation of heterosis and getting transgressive segregants in later generations. Since sesame is highly autogamous and in absence of economical methods of large scale seed production the exploitation of heterosis is not feasible. However, selection pressure can be applied in segregating generations to isolate pure lines having better performance.

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