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Heterosis for yield and yield attributes in Sesame (*Sesamum indicum* L.)

A. R. Phadtare*[1], B. C. Nandeshwar[2] and P. B. Wadikar[1]

ABSTRACT: *The performance of twenty one hybrids of sesame (*Sesamum indicum *L.) which were derived from different ten parents of diverse origin was studied to estimate heterosis for seed yield and other yield contributing components. A line x tester analysis was carried out to estimate the heterosis on the ten quantitative traits* viz, *days to 50% flowering, days to maturity, plant height (cm), number of branches per plant, number of capsules per plant, number of seeds per capsule, length of capsule (cm), 1000 seed weight (g), oil content (%) and seed yield per plant (g). Heterosis was worked out over mid parent, better parent and on two standard checks, Phule Til and JLT-7. The best combinations for the seed yield based on the heterosis and per* se *performance were BSG-8 x LT-7, BSG-12 x IC-413193, BSG-8 x IC-413214 and BSG-8 x IC-413193 were reported superior hybrids for exploitation of seed yield and other contributing characters and can be utilized for the hybrid development.*

Key words: *Sesame, Heterosis, Line x Tester.*

INTRODUCTION

Sesame (*Sesamum indicum* L.) is one of the ancient important oilseeds crop cultivated in the India. It can be generally grown either in pure or in mixed form with other suitable and compatible crops. It has been also recently attracted special attention as important salad dressers and due to the high quality edible oil for the human consumption and keeping quality, offers scope for the commercial exploitation of heterosis (Sankar and Ananda Kumar, 2001). The seed contains approximately 45-52 oil content %, which has excellent stability due to the presence of natural antioxidants such as sesamolin, sesamin and sesamol. In recent years, efforts have been made to improve the productivity of this crop using high yielding varieties. Heterosis is one of the important tools in sesame breeding. Commercial exploitation of heterosis is feasible only if the means of producing hybrid seeds are economically available. It is possible in sesame because indeterminate plant type with epipetalous nature of the flowers which facilitating the easy emasculation, frequent visit by large number of insects including honey bees and higher number of seeds setting in a single pollination by crossing one plant and possibility to get thousands of seeds (Praveenkumar *et al*., 2012). The exploitation of heterosis has been practical importance in many allogamous as well as few autogamous crops. Shull (1948) explained that heterosis is the genetic expression of the benefit effects of hybridization. A study on heterosis breeding in sesame is paramount importance to achieve the highest goal in the form of seed yield. Hybrid vigor of even a small magnitude for individual components may have an additive or synergistic effect on the end product (Sasikumar and Sardana, 1990). Therefore, the present study was undertaken to study the extent of heterosis for yield and yield contributing components in sesame.

MATERIAL AND METHODS

The present investigation on sesame was conducted at the Agricultural Research Farm, Department of Agricultural Botany, College of Agriculture, Latur, Maharashtra during *kharif*-2013. The experimental materials were received from the NBPGR, Akola, Maharashtra. Three lines, *viz,* BSG-8, BSG-12 and BSG-15 and seven testers *viz,* IC-413193, IC-413214, IC-413229, IC-413248, LT-6, LT-7 and LT-10 with varying

[1] Department of Agricultural Botany, College of Agriculture, Latur 413 512, Vasantrao Nike Marthawada Krishi Vidyapeeth, Parbhani, Maharashtra, India

[2] Department of Agricultural Botany, Collage of Agriculture, Phaltan 415 523, Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra, India

E-mail: phadtare.a.r@gmail.com; phadtare.a.r@gmail.com

agronomic and morphological charecters were selected. The three lines and seven testers were crossed in line x tester manner during *Kharif*, 2013 resulting in twenty one hybrids. These twenty one hybrids and ten parents along with two standard checks *viz,* Phule Til and JLT-7 were raised in a randomized block design, replicated in two times during September 2013. The spacing adopted was nearly about 30 cm in between the rows and 20 cm maintained in between the plants in a row. A recommended fertilizer dose of 40: 25: 25 kgs of NPK per hectare was applied during the whole crop growth period along with the recommended cultural operations in different stages of crop establishment with plant protection measures to have better and healthy crop plant stand. Observations on five plants from each replication were recorded for the ten quantitative traits *viz,* days to 50 % flowering, days to maturity, plant height (cm), number of branches per plant, number of capsules per plant, number of seeds per capsule, length of capsule (cm), 1000 seed weight (g), oil content (%) and seed yield per plant (g). The estimation of heterosis was done based on the method developed by Rai, (1979). The mean values were used for the estimation of the relative heterosis (deviation of hybrid from mid parent), heterobeltiosis (deviation of hybrid from better parent) and standard heterosis (deviation of hybrid from standard cheeks) using Phule Til and JLT-7. Significance for the heterosis was tested by using 't' test (Wynne *et al*., 1970).

RESULT AND DISCUSSION

Heterosis was calculated as percent increase over mid parent, corresponding better parent and standard parent. The range of the heterosis and number of crosses showing desirable heterotic response for the particular character studied are presented in Table 1. Table 2 shows the top crosses with the highest relative heterosis, heterobeltiosis and standard heterosis along with per se performance in terms of yield for all the characters studied. In case of relative heterosis it has been found that total seventeen heterotic crosses were reported significant heterosis for the character seed yield per plant (with range of 2.12 to 44.14 (g) yield per plant) followed by the character number of branches per plant (with the range of -16.48 to 87.47 branches per plant) which reported total eleven significant heterotic crosses. In case of heterobeltiosis lot of variation have been noted in the heterotic crosses and maximum number of desired crosses have been reported again for the character seed yield peer plant (with the range of -8.54 to 36.39 (g) yield per plant). Similarly in case of standard heterosis deviation of hybrids from both the checks, total twenty one desired crosses have been observed for each cheek with the range of 8.42 to 49.75 (g) yield per plant for cheek 1 and with the range of 10.36 to 52.43 (g) yield per plant for cheek 2 (Table 1). In the present study four cross combinations *viz,* BSG-8 x LT-7(11.93(g) yield per plant), BSG-12 x IC-413193(11.58 (g) yield per plant), BSG-8 x IC-413214(10.67 (g) yield per plant) and BSG-8 x IC-413214 (10.40 (g) yield per plant) exhibited the significant and positive relative hetrosis, heterobeltiosis and standard hetrosis along with the *per se* performance where crosses BSG-8 x LT-7 and BSG-12 x IC-413193 reported maximum significant and positive heterosis for the characters number of branches per plant, number of capsules per plant and number of seeds per capsule. Similar results were also reported by Senthil kumar and Ganesan (2001).

Table 1
Range of heterosis and number of crosses showing significant heterosis in desired direction for yield and yield contributing characters in sesame

Sr. No.	*Name of the character*	*Heterosis (%) over MP*		*Heterosis (%) over BP*		*Heterosis (%) over SC-1*		*Heterosis (%) over SC-2*	
		Range	*No. of desired crosses*	*Range*	*No. of desired crosses*	*Range*	*No. of desired crosses*	*Range*	*No. of desired crosses*
1	Days to 50 per cent flowering	-3.40 to 5.63	2	-4.05 to 4.17	2	-2.74 to 4.11	0	-2.74 to 4.11	0
2	Days to maturity	-1.19 to 7.51	0	-4.55 to 6.55	1	-3.49 to 5.81	1	-4.05 to 5.20	1
3	Plant height (cm)	-8.22 to28.49	4	-21.10 to28.06	2	-6.88 to 31.12	4	-2.94 to 36.66	6
4	Number of branches / plant	-16.48 to 97.47	11	-25.49 to81.40	8	-33.33 to36.84	2	-5.00 to 95.00	10
5	Number of capsule / plant	-13.88 to 43.88	8	-24.41 to 24.12	4	11.81 to 86.18	20	17.11 to 86.84	21
6	Number of seed / capsule	-12.35 to 21.73	7	-29.24 to 19.93	5	-17.69 to 20.92	9	-18.38 to 19.90	9
7	Length of capsule (cm)	-10.68 to 6.78	1	-11.26to 5.63	0	-6.82 to 10.91	2	-8.89 to 8.44	1
8	1000 seed weight (g)	-21.43 to 44.33	8	-26.67 to 34.62	8	-35.29 to 2.94	0	-37.14 to 1.00	0
9	Oil content (%)	-8.47 to 3.67	3	-9.34 to 3.39	0	-6.26 to 7.03	5	-6.03 to 7.26	5
10	Seed yield / plant (g)	2.12 to 44.14	17	-8.54 to 26.39	10	8.42 to 49.75	21	10.36 to 52.43	21

Table 2
Best 4 crosses showing high heterotic vigor based on *per se* performance for yield and its components in sesame

Sr. No.	*Crosses*	*Per se performance Seed yield/ plant (g/pl.)*	*Heterosis*				*Significant heterosis in desired direction for other traits*
			M.P(%)	*B.P(%)*	*SC-1 Phule Til (%)*	*SC-2 JLT-7 (%)*	
1	BSG-8 X LT-7	11.92	44.14**	25.74**	49.75**	52.43**	No. of branches/ plant, No. of capsule / plant, No. of seed/ capsule, Oil content, Seed yield / plant.
2	BSG-12 X IC-413193	11.58	39.35**	22.02*	45.48**	48.08**	No. of branches/ plant, No. of capsule/ plant, No. of seed / capsule, Seed yield/ plant.
3	BSG-8 X IC-413214	10.67	32.63**	12.55	34.05**	36.45**	1000 Seed weight, No of capsule/ plant, Seed yield /plant.
4	BSG-8 X IC-413193	10.40	25.23**	9.70	30.65**	32.99**	No. of capsule/ plant 1000 Seed weight, Oil content, Seed yield / plant

Hybrid, BSG-8 x IC-413214 showed significantly positive heterosis over mid parent, better parent and standard parent for the traits *viz,* 1000 seed weight, number of capsules per plant and seed yield per plant Senthil kumar e*t al.* (2003). Cross combination, BSG-8 x IC-413214 exhibited significant and positive heterosis over mid parent, better parent and standard parent for the traits *viz,* number of capsules per plant, 1000 seed weight, oil content (%) and yield per plant. Similar results were also corroborated by Parimala *et al*., (2001). Cross combination, BSG-8 x IC-413214 also reported low heterosis for the trait oil content (%) along with the yield attributing characters (Table 2). Low heterosis for the character oil content (%) was reported by the Navadiya *et al.,* (1995). From the foregoing discussion, it may be concluded that the hybrid BSG-8 x LT-7 can be rated as the best hybrid among the above four discussed better performer hybrids based on standard heterosis. Eventually, it recorded the significant and positive standard heterosis for the traits yield per plant and number of seeds per capsule. The high heterotic crosses are always desirable for the utilization of developing superior hybrids. Thus, above cross combination can be exploited in subsequent generations to isolate desirable segregrants for developing sesame hybrid verities, as a better response to selection is expected.

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