The Pharma Innovation Journal 2021; 10(12): 2523-2526

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2021; 10(12): 2523-2526

www.thepharmajournal.com
Received: 06-10-2021
Accepted: 13-11-2021

VB Ghule
Oilseeds Research Station, Latur, VNMKV, Parbhani, Maharashtra, India

AM Misal
Oilseeds Research Station, Latur, VNMKV, Parbhani, Maharashtra, India

SM Durge
Oilseeds Research Station, Latur, VNMKV, Parbhani, Maharashtra, India

MK Ghodke
Oilseeds Research Station, Latur, VNMKV, Parbhani, Maharashtra, India

Corresponding Author:
VB Ghule
Oilseeds Research Station, Latur, VNMKV, Parbhani, Maharashtra, India

Studies on heterosis in sesame (*Sesamum indicum* L.)

VB Ghule, AM Misal, SM Durge and MK Ghodke

Abstract
The present investigation entitled "Line x Tester analysis for yield and yield contributing traits in sesame (*Sesamum indicum* L.)" were undertaken with the objective to study the extent of heterosis in 32 hybrids obtained by crossing 4 x 8 genotypes in 'L x T' fashion and their 12 parents and 2 standard checks were evaluated in RBD with 2 replications during late *kharif* 2015-16 at Oilseeds Research Station, Latur, Maharashtra. Data were recorded on 11 traits. The cross GT-3 x AT-255 (32.10%, 22.79%, 23.00% and 21.72%) and the cross RT-54 x MT-10-8-1 (19.23%, 18.95%, 17.63% and 16.41%) showed highest magnitude of significantly positive heterosis over mid parent, better parent and both standard check JLT-408 and Phule Til-1 respectively for seed yield per plant.

Keywords: Sesame, seed yield, heterosis, hybrid

Introduction
Though sesame is a self pollinated crop, the large degree of out-crossing to the extent of 65% (Bar and Ahuja, 1979) [5] and easiness in crossing through a massive manual hybridization technique (Yadav and Mishra, 1991) were reported. Heterosis is the genetic expression of the beneficial effects of hybridization (Shall, 1948) [4]. Identifying parental combinations with better yield heterosis is the important step in developing hybrids. Heterosis is the complex phenomenon depending upon the balance of additive, dominance and their interacting components as well as distribution of genes in parental lines. For obtaining the higher production per unit area, heterosis breeding is most important and has been exploited in self and cross-pollinated crops. Exploitation of heterosis is attempted to break yield barrier. The extent of heterosis relies upon the extent of diversity among parental lines. Heterotic parental combinations are more likely to occur from the divergent populations than from the narrow based populations. Success of hybrid development programme is determined by the level of heterosis for yield. The present study was undertaken to assess the magnitude of heterosis for yield and yield components for utilization in breeding programmes.

Materials and Method
The present investigation on sesame was conducted at Plant Breeding Farm, Oil seed Research Station Latur. The experimental materials for this study consisted of four lines and six testers *viz*., L1 - PRAGATI, L2 - GT-3, L3 - AT-231, L4 - RT-54, T1- MT-10-8-2, T2-AT-207, T3-SSD-9, T4-MT-10-8-1, T5-JLS- 301-24, T6-SSD-11, T7-SSD-22 and T8-AT-255. The four lines and eight testers were crossed in a Line x Tester mating design resulting in thirty two hybrids. Thirty four hybrids and their twelve parents were sown in rows with spacing of 45 cm between rows and 20 cm between plants in a row during late *kharif* 2016. In each cross, 20 plants were maintained. The experiment was conducted in randomized block design with two replications. Border rows were grown all around the experimental block. A fertilizer schedule of 30:60:30kgs of NPK per hectare was followed along with the recommended cultural operations and plant protection measures. Observations were recorded on elevan traits *viz*., days to 50 per cent flowering, days to maturity, plant height, number of branches per plant, number of capsules per plant, capsule length, width of capsule, number of seeds per capsule, 1000-seed weight, oil content and seed yield per plant. The means of the character were subjected to L x T analysis and relative heterosis, heterobeltiosis and standard heterosis was worked out based on the procedure given by Kempthorne (1957) [7].

Result and Discussion
The analysis of variance revealed the presence of considerable amount of genetic differences among the genotypes, parents and crosses for majority of the characters.

All the traits under study showed significant differences (Table1). Range of heterosis over mid and better parent is presented in the Table 2. The hybrids PRAGATIxAT-207 and GT-3xAT-207 showed maximum significant negative hetrosis over mid parents and better parents respectively for days to 50% flowering, other hybrids RT-54 x SSD-22 and RT-54xMT-10-8-1 showed maximum significant negative hetrosis over mid parents and better parents for days to maturity. Among the crossRT-54xAT-207 exhibited maximum positive heterosis over mid parent and better parent for plant height. Significant positive heterosis for plant height was reported by Mishra and Sikarwar (2001) [2], Mothilal and Ganesan (2005) [1]. The hybrid PRAGATIxAT-255 showed highest positive heterosis for number of branches per plant over mid parent (77.97%) and over better parent (34.62%) and hybrid AT-231 x SSD-9 (56.58%) for this trait.

The range of heterosis for number of capsules per plant was -21.26 to 37.87 and -24.25 to 25.58 over mid and better parent respectively. Highly significant positive heterosis for number of capsules per plant was exhibited by RT- 54xSSD-22 over mid parent and better parent. For width of capsule cross RT-54xMT-10-8-1 showed highest heterosis over mid and better parent. For the character number of capsule per plant the cross RT-54xSSD-22 and the cross PRAGATIxMT-10-8-1 showed highest heterosis over mid and better parent respectively and for number of seed per capsule the hybrid RT-54 xMT-10-8-1 and GT-3x AT-207 over mid parent and over better parent for the character 1000 seed weight and other hybrid GT-3 xAT-255 and RT-54xMT-10-8-1 showed highest heterosis over mid parent and better parent for seed yield per plant highest significant positive heterosis over mid and better parent showed by the hybrids RT-54 xMT-10-8-1 for 1000-seed weight and GT-3x AT-255 for seed yield per plant. For oil content the RT-54 x MT-10-8-2 showed highest significant positive heterosis over mid and better parent.

The extent of heterosis over standard check for eleven characters is presented in Table2. The crosses PRAGATI x SSD-9 (-4.42%) and exhibited highest significant negative heterosis over standard check for days to 50% flowering and for the days to maturity AKT-306 x GT-3 (- 7.10%) exhibited the highest significant negative heterosis over standred check. Plant height is of great importance to get higher biomass and economic yield. Increased plant height has positive relation with seed yield. The hybrid AKT-306xPRACHI (40.33%) recorded highly significant and positive heterosis over standard check for plant height. Higher significance and positive heterosis over check was observed to the extent of 68.12 per cent by the cross AKT- 306 x PARCHI followed by AKT-101xPRACHI (52.17%), AKT-101xIS-424 (44.93%), TKG-22 x PRACHI (42.03%) and AKT-306xGT-3 (37.68%). for number of branches per plant. For number of capsules per plant The cross AKT- 306 x PRACHI (38.71%) exhibited the highest significant positive heterosis over the check followed by AKT-306 X IS-424 (24.41%), AKT-101xPRACHI (24.39%), AKT-101xYLM-17 (23.38%). For length of capsule AKT-306 x PRACHI showed highest positive heterosis and for width the hybrid JLT-07x PRACHI showed highest significant heterosis. For number of seeds per capsule, positive heterosis for days to maturity is desirable. The highest significant heterosis effects was recorded by the cross GT-3x AT-255 (23.00%) for seed yield per plant over the standard check JLT-408. In the present investigation highest magnitude of heterosis was observed for seed yield per plant (gm) by the hybrid GT-3 xAT-255 (23 and 21.72%) followed by RT-54 xMT-10-8-1 (17.63 and 16.41%), RT-54 xSSD-22 (14.48 and 13.29%), GT-3x AT-207 (13.72 and12.54%) and GT-3x JLS-301-24 (13.37 and 12.19%) (Chaudhari *et al.*, 2015; Rajput 2003; Toprope 2009; Sundari and Kamala 2012; Parimala *et al.*, 2013, Ramesh *et al.*, 2014) [3, 10, 6, 8, 9]. For the character oil content the hybrid RT-54 x MT-10-8-2 (14.74 and 16.70%) showed highest positive heterosis over both checks JLT-408 and Phule Til-1.

Table 1: Analysis of variance for different characters in sesame

Source of Variation	d.f.	Days to 50% flowering	Days to maturity	Plant height (cm)	No. of branches / plant	No. of capsule / plant	Length of capsule (cm)	Width of capsule	No. of seed / capsule	1000-Seed weight (gm)	Seed yield / plant (gm)	Oil content (%)
Replications (MSS)	1	2.227	3.681	131.932	0.013	315.631	0.008	0.00029	6.944	0.075	0.076	3.131
Treatments (MSS)	43	10.472**	5.650*	459.752**	2.403**	361.667**	0.091**	0.00398**	104.491**	0.231**	0.647**	8.140**
Parents (MSS)	11	9.920**	4.041	439.576**	2.474**	109.674	0.058*	0.00042	37.060	0.109**	0.336	1.530
Lines (MSS)	3	15.458**	1.791	218.759*	1.938**	3.553	0.102**	0.00050	12.144	0.193**	0.048	2.261
Testers (MSS)	7	8.535*	2.142	583.201**	3.053**	103.213	0.038	0.00033	40.018	0.075*	0.502	1.432
Lines vsTesters (MSS)	1	3.000	24.083**	96.64523	0.02521	473.260*	0.067	0.00083	91.107	0.090	0.038	0.020
Parents vs Crosses (MSS)	1	5.833	37.386**	0.34008	0.509*	503.745*	0.227**	0.00967**	9.344	1.844**	1.653*	37.867**
Crosses (MSS)	31	10.818**	5.197	481.732**	2.439**	446.500**	0.098**	0.00506**	131.487**	0.222**	0.725**	9.527**
Error (MSS)	43	2.785	3.100	62.758	0.123	105.450	0.022	0.00127	23.211	0.029	0.241	3.096

*and ** indicated significance at 5and 1 percent level, respectively

Table 2: Estimates of standard heterosis for yield and yield contributing traits in sesame

Crosses	Days to 50 % flowering	Days to maturity	Plant height (cm)	No. of branches /plant	No. of capsule /plant	Length of capsule (cm)	Width of capsule (cm)	No of seed/ capsule	1000-seed weight (gm)	Seed yield/ plant (gm)	Oil content (%)
PRAGATI X MT-10-8-2	1.37	-1.10	57.34 **	15.00	20.54	2.56	-5.52	3.40	2.84	1.79	0.34
PRAGATI X AT-207	-8.22	-4.97 *	-1.12	7.50	-3.29	4.27	-1.23	20.38 *	-1.52	-3.70	-1.49
PRAGATI X SSD-9	-2.74	-4.42 *	47.24 *	42.50 *	10.16	23.08 **	3.68	-7.17	-10.42	-2.95	-1.86
PRAGATI X MT-10-8-1	0.00	-3.31	49.24 *	5.00	-1.57	0.00	-5.52	31.93 **	-2.84	1.56	1.07
PRAGATI X JLS-301-24	-9.59 *	-0.55	53.75 **	92.50 **	9.30	0.43	7.36	10.75	4.17	-3.99	-2.71
PRAGATI X SSD-11	0.00	-3.31	11.95	80.00 **	25.04	7.26	2.45	21.11 **	-20.45 **	0.64	-4.05
PRAGATI X AT-255	-5.48	-4.97 *	109.47 **	162.50 **	51.80**	17.95 **	0.00	17.02 *	-15.72 *	5.37	0.71
PRAGATI X SSD-22	-6.85	-6.63 **	64.24 **	30.00	7.44	-3.85	-3.68	-3.73	-13.83 *	-1.21	0.71
GT-3 X MT-10-8-2	-8.22	-3.31	29.26	42.50 *	3.44**	-5.13	6.13	-0.52	5.68	0.46	-1.12
GT-3X AT-207	-5.48	-3.31	58.74 **	-15.00	56.37	22.01 **	12.27 **	25.74 **	32.39 **	12.54 *	5.83
GT-3X SSD-9	-9.59 *	-0.55	52.24 **	100.00 **	25.54	4.70	7.36	9.82	0.00	-0.17	2.05
GT-3 X MT-10-8-1	-8.22	-2.21	17.98	-25.00	21.20	24.36 **	4.29	29.56 **	3.03	0.81	2.17
GT-3 X JLS-301-24	-10.96 *	-3.87	135.50 **	157.50 **	32.76*	14.96 *	6.75	15.37	-0.95	12.19 *	-1.98
GT-3 X SSD-11	-6.85	-4.97 *	77.84 **	105.00 **	45.21**	10.26	13.50 **	30.09 **	3.22	6.93	2.17
GT-3 X AT-255	6.85	-2.21	57.58 **	100.00 **	57.80**	20.51 **	14.11 **	24.84 **	30.87 **	21.72 **	2.54
GT-3 X SSD-22	-1.37	-4.42 *	29.68	0.00	-2.86	-0.85	0.61	8.52	-2.46	-2.43	8.15
AT-231 X MT-10-8-2	-5.48	-1.66	50.06 *	32.50	5.01	-2.99	-5.52	-12.49	-5.30	-15.71 **	-3.93
AT-231 X AT-207	4.11	-1.66	60.95 **	87.50 **	47.85**	11.54	14.11 **	5.98	-3.03	5.03	-2.59
AT-231 X SSD-9	-12.33 *	-2.76	80.02 **	197.50 **	54.22**	9.19	4.29	-4.04	-1.52	-0.58	0.34
AT-231 X MT-10-8-1	-2.74	-2.21	-11.76	10.00	-3.86	22.22 **	-6.75	15.45 *	-13.83 *	-2.77	2.54
AT-231 X JLS-301-24	-9.59 *	-4.42 *	55.11 **	92.50 **	46.92**	1.71	9.20 *	1.21	-12.50	1.73	-5.03
AT-231 X SSD-11	9.59 *	-4.97 *	79.51 **	105.00 **	40.06*	0.85	3.07	9.35	-1.33	4.39	-0.27
AT-231 X AT-255	12.33 *	-4.97 *	70.45 **	0.00	5.44	28.85 **	0.00	-4.35	-0.19	0.40	-2.34
AT-231 X SSD-22	-1.37	-2.21	42.83 *	35.00	10.30	0.85	7.36	-8.11	-5.87	1.10	0.95
RT-54 X MT-10-8-2	-9.59 *	-5.52 **	47.07 *	35.00	12.81	5.13	5.52	4.73	13.83 *	1.10	16.70**
RT-54 X AT-207	6.85	-2.21	129.68 **	102.50 **	46.07**	9.62	7.36	-2.94	13.45 *	-0.98	10.96
RT-54 X SSD-9	-1.37	-6.63 **	135.57 **	120.00 **	41.77	6.84	9.82 *	6.45	10.98	5.89	10.72*
RT-54 X MT-10-8-1	-4.11	-6.63 **	130.95 **	10.00	59.37**	13.25 *	13.50 **	28.06 **	30.30 **	16.41 **	4.25
RT-54 X JLS-301-24	5.48	-4.42 *	30.57	92.50 **	28.33	9.62	3.07	4.88	8.52	5.26	12.79**
RT-54 X SSD-11	2.74	-4.42 *	58.79 **	100.00 **	45.49**	8.76	4.29	12.63	5.30	0.52	6.08
RT-54 X AT-255	-4.11	-6.08 **	63.30 **	35.00	15.74	12.39	0.00	5.82	5.49	-0.58	-2.47
RT-54 X SSD-22	-6.85	-6.08 **	38.17	45.00 *	57.15**	-8.12	12.88 **	-9.83	7.39	13.29 *	8.76*

*and ** indicated significance at 5 and 1 per cent level, respectively

References

1. Mothilal A, Ganesan KN. Heterosis studies in sesame (*Sesamum indicum* L.). Agril. Sci. Digest. 2005;25(1):74-76.
2. Mishra AK, Sikarwar RS. Sesame and Safflower Newsletter. 2001;16:1-5.
3. Chaudhari GB, Naik MR, Anarase SA, Ban YG. Heterosis studies for quantitative traits in sesame. Electronic J Plant Breed 2015;6(1):218-224.
4. Shall GH. What is heterosis. *Geneti* 1948;l(33):439-446.
5. Brar GS, Ahuja KL. Sesame: its culture, genetics, breeding and biochemistry In: Malik, C.P (ed.). Annual Review of Plant Science, Kalyani publishers, New Delhi 1979, pp. 245-313.
6. Sundari MP, Kamala T. Heterosis in *Sesamum indicum* L. Asian J. Agricul, Sci. 2012;4(4):287-290.
7. Kempthrone O. An introduction to genetic statistics. John Wiley and Sons Ins., New York, 1957, pp:458-471.
8. Parimala K, Swarnalatha Devi I, Bharathi V, Raghu B, Srikrishnalatha K, Vishnuvardhan RA. Heterosis for yield and its component traits in sesame. Inter. J App. Bio. Pharma. Tech. 2013;4(4):65-68.
9. Ramesh Shekhawat N, Macwana SS, Choudhary R, Patel BR. Line × tester analysis in sesame. Inter. J life Sci. 2014;9(4):1657-1660.
10. Toprope VN. Heterosis and inbreeding depression in sesame. J Maharashtra Agril. Univ. 2009;34(2):220-222.