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STUDIES THE MAGNITUDE OF HETEROSIS FOR SEED YIELD AND ITS COMPONENTS IN SESAME [*Sesamum indicum L.*]

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ABSTRACT

The present investigation on sesame comprised of a half-diallel set of seven parents and their 21 crosses. The experiment was laid out in randomized block design with three replications at College Farm, N. M. College of Agriculture, Navsari Agricultural University, Navsari during late kharif 2016-17. The observations were recorded on days to flowering and days to maturity, plant height (cm), number of branches per plant, number of capsules per plant, capsule length (cm), seed yield per plant (g), 1000 seed weight (g), harvest index (%) and oil content (%) on randomly selected five competitive individual plants. The data were subjected to estimation of heterosis. Analysis of variance revealed significant differences among the genotypes, hybrids and parents for all the traits except harvest index for parent studied. Several crosses exhibited significantly desirable heterobeltiosis and economic heterosis for seed yield per plant and other characters. On the basis of per se performance and estimates of heterobeltiosis, the crosses AT 242 x AT 255 (17.58%) and AT 242 x G.Til 3 (17.19%) were found to be most promising for seed yield per plant, hence could be evaluated further to exploit the heterosis or utilized in future breeding programme to obtain desirable segregants for the development of superior genotypes.

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INTRODUCTION

Sesame *(Sesamum indicum* L.), commonly known as gingelly, til, benniseed, simsim, is a member of the order *Tubiflorae* and family *Pedaliaceae.* It is probably the most ancient oilseed known and used by man and its domestication is lost in the mists of antiquity. Although originated in sub-saharan Africa, it spread early through West Asia to India, China and Japan, which themselves became secondary distribution centers (Weiss, 1983). In Gujarat sesamum cultivation is concentrated mostly in Rajkot, Amreli, Bhavnagar, Bhuj, Jamnagar, Junagarh. and Surendranagar districts. Sesame is a short-day plant and is normally self-pollinated, although cross pollination ranging from 5 to 50 per cent occurs through the insect (Flies, butterflies, wasps, honeybee) (Pathirana, 1994), so it can also be kept under often cross pollinated group. It is an erect herbaceous annual plant that has two growth characteristics indeterminate and determinate, with the plants reaching height of up to two meters. Most of the varieties show an indeterminate growth habit, which is shown as a continuous production of new leaves, flowers and capsules as long as the environment remains suitable for growth (Carlsson *et al.,* 2008). The growth period range from 70 to 150 days depending on the variety and the conditions of cultivation and it thrives best on well-drained soil with a moderate fertility and a pH between 5.5 and 7.0. Sesame is highly drought tolerant, and it can adapt and produce seed well under fairly high temperatures (Ashri, 1998). It is called as the "Queen of oil seeds" because of its excellent qualities of the seed, oil and meal. Sesame is highly nutritive (oil 50%, protein 25%) and its oil contains an antioxidant called sesamol which imparts a high degree of resistance against oxidative rancidity. Sesame cake is nutritious feed for dairy cattle and it can also be used as fertilizer (Ashri, 1989).

Brown or black seeded are valued more for oil (for medicinal purpose) extraction, whereas white seeded are rich in iron. Sesame seeds are digestive, rejuvenative, anti-aging and rich in vitamins E, A and B complex and minerals like calcium, phosphorus, iron, copper, magnesium, zinc and potassium. This unique composition coupled with high-unsaturated fatty acids (linolenic and tocopherol) make the sesame nearly perfect food (Lokesha and Theertha, 2006). Possibly for this reason, sesame oil is widely considered to prevent diseases of different kinds. Beside food, sesame also finds its uses in application areas such as pharmaceuticals, industrial and as biofuel. India ranks second in area (18.62 lakh ha) and production (8.13 lakh tones) among the sesame growing countries (FAOSTAT, 2013). Gujarat secured first place in area having 3.55 lakh ha with production of 1.43 lakh tonnes (Anonymous, 2016). However, the productivity is low in India (413.6 kg/ha) as compared to world's average (464.6 kg/ha) and it is far below as compared to Egypt (1200 kg/ha) being the highest and China (897.7 kg/ha) (FAOSTAT, 2016). High levels of morphological genetic diversity do exist in sesame (Arriel *et al.,* 2007) but this has not been fully harnessed for genetic improvement of the existing cultivars through heterosis breeding. Heterosis for seed yield is due to simultaneous manifestation of allelic and inter-allelic interactions of innumerable number of genes controlling important morpho-economic component traits under certain environmental conditions. Hybrid vigour of even a small magnitude for individual components may have an additive or synergistic effect on the end product (Sasikumar and Sardana, 1990). Thus, extent of heterotic response of F1 hybrids largely depends on the breeding value and genetic diversity of the parents involved in the crosses (Young and Virmani, 1990). Heterosis over better parent (heterobeltiosis) is relatively more important than relative heterosis for commercial exploitation of hybrids. Heterobeltiosis for seed yield and yield components in sesame has been reported by many workers (Prajapati *et al.,* 2010, Padmasundari and Kamala, 2012). Besides, heterotic crosses may be aminable for selection of high yielding transgressive segregants in F2 and follow up selfing generations. Therefore, in the present investigation, an attempt has been taken to identify mostdesirableheteroticcombination(s) in sesame following half diallel mating design.

MATERIALS AND METHODS

The present investigation entitled "Genetic architecture for seed yield and its components in sesame". *(Sesamum indicum* L.)" was carried out at College Farm, N. M. College of Agriculture, Navsari Agricultural University, Navsari during late *kharif* 2016-17. The experimental material for present investigation consisted of 7 parents viz., AT- 242, AT-222, AT-231, AT-255, ASRT 8, Gujarat Til 3 and Vijapadi selection obtained from Main Oilseeds Research Station, Junagadh Agricultural University, Amreli. All the seven sesame genotypes were crossed in every possible combination (excluding reciprocals) and thus obtained total 21 hybrids along with one standard check viz., G. Til 3 was evaluated. The experiment was laid out in a Randomized Block Design with three replications. Each entry was planted in a single row consisting of 20 plants in each row with a spacing 45 x 15 cm. The standard agronomical practices were followed to raise the good experimental crop. Five competitive plants were randomly selected and tagged excluding border plants to minimize border effects.

Observations were recorded for 10 different characters viz., days to 50 per cent flowering, plant height (cm), number of branches per plant, number of capsules per plant, capsule length (cm), days to maturity, 100 seed weight (g), seed yield per plant (g), harvest index (%) and oil content (%). The analysis of variance for randomized block design (RBD) was carried out as per the procedure outlined by Panse and Sukhatme (1985). Heterosis expressed as per cent, increase or decrease in the value of of F_1 over better parent (Heterobeltiosis) and standard check (Standard heterosis) was calculated for various characters using standard formula.

RESULTS AND DISCUSSION

Analysis of variance was performed to test the difference among parents and hybrids for all the ten characters studied and are presented in Table 1. The results revealed that the mean squares due to genotypes were highly significant for all the characters (Fig.1). This indicated that sufficient amount of genetic variability was present in the experimental material for all the characters under study. The mean squares due to genotypes were further partitioned into parents, hybrids and parents vs. hybrids for all the traits. The hybrids differed significantly for all the characters. This indicated the existence of considerable genetic variability among the hybrids for all characters. The parents differed significantly for all the characters except harvest index under study, indicated sufficient amount of genetic variability among the parents. Similar results were reported earlier by Kumar *et al.* (2006) and Gawade *et al.* (2007), Aladji et al. (2015) and Pawar and Aher (2016). Mean squares due to parents vs. hybrids were also significant for days to maturity, number of branches per plant, harvest index and oil content suggesting sufficient amount of differences for these traits.

The aim of estimation of heterosis in the present study was to find out the superior combinations of parents giving the high degree of useful heterosis for yield and its contributing characters and for its future use in breeding programme. The magnitude of heterosis was measured as per cent increase or decrease of F_1 value over better parent (heterobeltiosis) and over standard check, G.Til 3 for all 10 characters. The character wise results of heterosis over better parent (BP), Mid Parent (MP) and over standard check are presented in Table 2. The results revealed that the majority of hybrids for most of the traits viz., seed yield per plant, number of branches per plant, number of capsules per plant, harvest index, 1000-seed weight and oil content exhibited positive significant relative heterosis, thereby indicating that for these traits the genes with positive effects were dominant.

While for traits such as plant height, days to flowering and days to maturity, majority of the hybrids exhibited negative significant relative heterosis indicating that for these traits the genes with negative effects were dominant. Similar heterotic effects for different traits in sesame have been reported by Das *et al.* (2003), Prajapati *et al.* (2006), Jadhav and Mohrir (2013) and Parimala *et al.* (2013). An examination of performance of hybrids over better parent revealed that four hybrids manifested significant positive heterobeltiosis for seed yield per plant. The maximum heterobeltiosis for seed yield per plant was exhibited by the hybrids AT 242 x AT 255 (17.58%) and AT 242 x G.Til 3 (17.19%) followed by AT 242 x Vijapadi selection (6.97 %) and AT 231 x G. Til 3 (6.66%) (Table 2) (fig.2).

Table 1: Analysis of variance (mean squares) for various characters in Sesame

Source of variation	d.f.	Days to 50% flowering	Plant height (cm)	No. of branches per plant	No. of capsules per plant	Capsules length
Replications	2	0.226	8.471	0.332	25.511	0.083
Genotypes (G)	27	14.954 **	323.870 **	0.971 **	299.937 **	0.348 **
Parents (P)	6	12.190 **	405.596 **	0.770 **	263.570 **	0.172 *
Hybrids (H)	20	16.163 **	310.605 **	0.920 **	225.790 **	0.409 **
Parent vs.Hybrids	1	7.337	98.813 *	3.185 **	2001.073 **	0.187
Error	54	3.152	19.689	0.114	11.408	0.061
Total	83	6.921	118.369	0.398	105.607	0.155

Source of variation	d.f.	Days to maturity	1000 seed weight (g)	Seed yield per plant (g)	Harvest Index (%)	Oil content (%)
Replications	2	6.151	0.073	1.275	26.507	0.62
Genotypes (G)	27	26.642 **	0.162 **	5.188 **	57.818 **	16.54**
Parents (P)	6	11.173	0.07	5.229 **	32.719 *	27.18**
Hybrids (H)	20	32.324 **	0.197 **	5.434 **	67.728 **	12.63**
Parent vs.Hybrids	1	5.815	0.001	0.022	10.204	47.86**
Error	54	11.472	0.041	0.494	11.606	5.39
Total	83	16.279	0.081	2.04	26.998	8.95

Table 2. Per cent Mid parent Heterosis, Heterobeltiosis (BP) and Standard Heterosis (SH) for days to 50% flowering and plant height

Hybrids	Days to 50% flowering			Plant Height		
	MP	BP	SC	MP	BP	SC
AT 242 x AT 222	-10.08 **	-8.66 *	-7.20 *	-17.93 **	-31.32 **	4.33
AT 242 x AT 231	9.62 **	16.96 **	4.80	-21.82 **	-30.93 **	4.92
AT 242 x AT 255	2.40	4.07	2.40	0.57	-9.45 *	37.55 **
AT 242 x ASRT 8	-10.59 **	-10.24 **	-8.80 *	-27.96 **	-36.15 **	-3.01
AT 242 x Vijapadi selection	-0.40	0.81	0.00	19.28 **	-1.15	50.17 **
AT 242 x G.Til 3	-7.94 *	-7.20 *	-7.20 *	-15.42 **	-29.87 **	6.53
AT 222 x AT 231	-4.53	3.57	-7.20 *	35.57 **	27.35 **	48.35 **
AT 222 x AT 255	-4.72	-1.63	-3.20	6.32	-2.10	19.07 **
AT 222 x ASRT 8	-7.34 *	-6.25	-4.00	-5.09	-11.16 *	4.27
AT 222 x Vijapadi selection	-4.31	-1.61	-2.40	20.47 **	19.02 **	21.82 **
AT 222 x G.Til 3	3.91	6.40	6.40	1.31	0.15	2.51
AT 231 x AT 255	3.83	8.93 *	-2.40	12.77 **	10.40 *	34.26 **
AT 231 x ASRT 8	-5.00	1.79	-8.80 *	-13.50 **	-13.82 **	1.14
AT 231 x Vijapadi selection	18.64 **	25.00 **	12.00 **	23.63 **	14.81 **	33.75 **
AT 231 x G.Til 3	-3.80	1.79	-8.80 *	23.26 **	14.54 **	33.43 **
AT 255 x ASRT 8	1.99	4.07	2.40	-0.67	-2.41	18.69 **
AT 255 x Vijapadi selection	1.21	1.63	0.00	2.32	-6.82	13.32 *
AT 255 x G.Til 3	-3.23	-2.44	-4.00	23.87 **	12.86 **	37.27 **
ASRT 8 x Vijapadi selection	-7.94 *	-6.45	-7.20 *	0.55	-6.94	9.23
ASRT 8 x G.Til 3	-4.35	-3.20	-3.20	6.73	-1.17	16.00 **
Vijapadi selection x G.Til 3	0.40	0.81	0.00	18.45 **	18.38 **	18.38 **
Minimum	-10.59	-10.24	-8.80	-27.96	-36.15	-3.01
Maximum	18.64	25.00	12.00	35.57	27.35	50.17
SE.d	1.255	1.449	1.449	3.13	3.62	3.62

Hybrids	No. of branches per plant			No. of capsules per plant		
	MP	BP	SC	MP	BP	SC
AT 242 x AT 222	3.33	-8.13	-19.09 **	0.09	-2.61	-27.44 **
AT 242 x AT 231	-1.26	-7.03	-18.12 **	15.06 **	12.72 **	-12.46 **
AT 242 x AT 255	46.38 **	30.82 **	15.21 *	54.19 **	46.71 **	9.31 **
AT 242 x ASRT 8	2.15	-1.27	-13.05 *	34.00 **	25.90 **	-6.20
AT 242 x Vijapadi selection	7.51	-1.78	-13.50 *	21.08 **	15.86 **	-5.54
AT 242 x G.Til 3	-11.42 *	-16.70 **	-16.70 **	6.28	-7.26 *	-7.26 *
AT 222 x AT 231	31.80 **	23.97 **	-3.58	-10.65 *	-14.78 **	-33.81 **
AT 222 x AT 255	53.49 **	52.58 **	5.82	49.00 **	45.61 **	2.63
AT 222 x ASRT 8	22.61 **	12.43	-7.61	36.58 **	31.75 **	-7.14 *
AT 222 x Vijapadi selection	-0.95	-3.89	-29.98 **	10.02 *	2.56	-16.38 **
AT 222 x G.Til 3	-1.42	-16.93 **	-16.93 **	8.53 *	-7.49 *	-7.49 *
AT 231 x AT 255	-4.82	-9.97	-29.98 **	11.96 **	4.47	-18.86 **
AT 231 x ASRT 8	31.75 **	28.22 **	5.37	41.16 **	30.10 **	1.04
AT 231 x Vijapadi selection	-4.75	-7.77	-28.26 **	-6.49	-8.70 *	-25.57 **
AT 231 x G.Til 3	19.38 **	6.11	6.11	18.02 **	4.84	4.84
AT 255 x ASRT 8	12.99	4.17	-14.39 *	41.26 **	39.39 **	-6.22
AT 255 x Vijapadi selection	38.75 **	35.41 **	-1.34	20.77 **	10.21 *	-10.14 **
AT 255 x G.Til 3	17.75 **	-0.30	-0.30	16.15 **	-2.86	-2.86
ASRT 8 x Vijapadi selection	7.65	1.54	-16.55 **	17.59 **	6.02	-13.56 **
ASRT 8 x G.Til 3	-0.70	-9.55	-9.55	7.67 *	-10.90 **	-10.90 **
Vijapadi selection x G.Til 3	8.71	-6.04	-6.04	11.28 **	1.00	1.00
Minimum	-11.42	-16.93	-29.98	-10.65	-14.78	-33.81
Maximum	53.49	52.58	15.21	54.19	46.71	9.31
SE.d	0.23	0.27	0.27	2.38	2.75	2.75

Hybrids	Capsules length			Days to maturity		
	MP	BP	SC	MP	BP	SC
AT 242 x AT 222	5.35	-2.77	-12.74	-4.11	-2.99	-6.25 *
AT 242 x AT 231	0.49	-1.68	-11.77	-2.33	-0.98	-2.08
AT 242 x AT 255	42.65 **	39.93 **	30.56 **	4.33	5.36	2.16
AT 242 x ASRT 8	-1.77	-3.48	-10.26	-8.85 **	-7.59 *	-11.08 **
AT 242 x Vijapadi selection	2.36	-0.84	-11.02	-6.44 *	-6.16 *	-7.21 *
AT 242 x G.Til 3	-13.72 *	-18.14 **	-18.14 **	-4.78	-4.24	-5.31
AT 222 x AT 231	10.41	4.03	-10.69	3.22	5.88	2.33
AT 222 x AT 255	26.74 **	14.93 *	7.24	4.12	4.29	0.79
AT 222 x ASRT 8	6.52	-3.25	-10.04	1.74	1.96	-1.88
AT 222 x Vijapadi selection	-1.21	-6.03	-20.95 **	-0.38	1.07	-2.32
AT 222 x G.Til 3	-3.13	-14.79 *	-14.79 *	1.38	3.14	-0.32
AT 231 x AT 255	-9.34	-12.96	-18.79 **	-3.66	-1.34	-4.34
AT 231 x ASRT 8	13.65 *	9.29	1.62	-3.09	-0.37	-4.13
AT 231 x Vijapadi selection	14.36 *	13.21	-2.81	-1.63	-0.56	-1.09
AT 231 x G.Til 3	17.84 **	9.50	9.50	-3.46	-2.68	-2.68
AT 255 x ASRT 8	-8.29	-8.45	-14.58 *	3.87	4.27	0.33
AT 255 x Vijapadi selection	8.09	2.78	-4.10	-0.67	0.61	-2.44
AT 255 x G.Til 3	-11.06	-14.04 *	-14.04 *	1.57	3.16	0.02
ASRT 8 x Vijapadi selection	0.61	-4.18	-10.91	2.52	4.24	0.31
ASRT 8 x G.Til 3	-1.29	-4.75	-4.75	4.38	6.42 *	2.41
Vijapadi selection x G.Til 3	-11.55	-18.57 **	-18.57 **	-0.75	-0.49	-1.01
Minimum	-13.72	-18.14	-20.95	-8.85	-7.59	-11.08
Maximum	42.65	39.93	30.56	4.38	6.42	2.41
SE.d	0.17	0.20	0.20	2.39	2.76	2.76

Hybrids	1000 seed weight			Seed yield per plant		
	MP	BP	SC	MP	BP	SC
AT 242 x AT 222	-4.16	-8.76	-9.10	-1.19	-14.89 **	11.52
AT 242 x AT 231	17.28 **	14.02 **	8.73	-20.72 **	-32.83 **	-8.41
AT 242 x AT 255	-4.72	-6.11	-12.91 **	36.39 **	17.58 **	53.76 **
AT 242 x ASRT 8	-2.97	-8.11	-7.43	-0.98	-6.33	-0.55
AT 242 x Vijapadi selection	14.53 **	12.93 *	4.64	18.24 **	6.97	25.18 **
AT 242 x G.Til 3	1.03	-3.99	-3.99	20.38 **	17.19 *	17.19 *
AT 222 x AT 231	-3.33	-5.41	-5.76	-13.16 **	-14.86 **	16.10 *
AT 222 x AT 255	-7.24	-10.44 *	-10.77 *	5.11**	5.00	37.58 **
AT 222 x ASRT 8	-3.80	-4.33	-3.62	-17.14 **	-24.99 **	-1.72
AT 222 x Vijapadi selection	12.70 **	8.76	8.36	1.98	-3.46	26.48 **
AT 222 x G.Til 3	7.44	7.24	7.24	-13.61 *	-23.84 **	-0.21
AT 231 x AT 255	-1.48	-2.82	-7.34	-6.81	-8.72	24.46 **
AT 231 x ASRT 8	-8.81 *	-11.24 *	-10.58 *	12.93 *	0.43	36.95 **
AT 231 x Vijapadi selection	-3.41	-4.77	-9.19	-25.65 **	-30.92 **	-5.80
AT 231 x G.Til 3	-9.51 *	-11.61 *	-11.61 *	23.07 **	6.66	45.44 **
AT 255 x ASRT 8	1.82	-2.21	-1.49	-4.98	-13.92 *	12.57
AT 255 x Vijapadi selection	6.56	6.51	-1.21	-13.49 *	-18.03 **	7.19
AT 255 x G.Til 3	-4.05	-7.52	-7.52	-9.65	-20.28 **	4.25
ASRT 8 x Vijapadi selection	11.19 **	6.73	7.52	3.20	-1.58	15.17 *
ASRT 8 x G.Til 3	-9.62 *	-9.95 *	-9.29 *	1.61	-1.35	4.75
Vijapadi selection x G.Til 3	-3.90	-7.43	-7.43	7.22	-0.57	16.35 *
Minimum	-9.62	-11.61	-12.91	-25.65	-32.83	-8.41
Maximum	17.28	14.02	8.73	36.39	17.58	53.76
SE.d	0.14	0.16	0.16	0.49	0.57	0.57

Hybrids	Harvest index(%)			Oil content(%)		
	MP	BP	SC	MP	BP	SC
AT 242 x AT 222	6.79	0.01	-1.52	-3.45	-5.95	-3.99
AT 242 x AT 231	-7.03	-11.30 *	-16.05 **	-3.61	3.17	5.32
AT 242 x AT 255	31.34 **	31.33 **	12.90 *	0.83	3.41	5.56
AT 242 x ASRT 8	-3.34	-9.13	-11.26 *	2.91	0.24	2.32
AT 242 x Vijapadi selection	10.96 *	5.39	0.71	6.69	3.92	6.09
AT 242 x G.Til 3	-3.14	-9.94 *	-9.94 *	4.09	1.39	3.50
AT 222 x AT 231	-2.48	-4.38	-5.84	-3.17	3.64	5.80
AT 222 x AT 255	16.81 **	9.39	7.73	-2.73	-0.25	1.82
AT 222 x ASRT 8	-12.74 **	-13.10 *	-14.43 **	3.73	-0.33	1.75
AT 222 x Vijapadi selection	-3.44	-4.87	-6.32	-3.24	-7.02	-5.09
AT 222 x G.Til 3	-17.73 **	-18.36 **	-18.36 **	7.90	4.20	6.37
AT 231 x AT 255	6.66	1.77	-3.68	1.23	8.35*	10.61*
AT 231 x ASRT 8	9.81 *	8.11	5.58	-13.58**	-7.50	-5.57
AT 231 x Vijapadi selection	1.07	0.58	-3.89	-9.56*	-3.20	-1.18
AT 231 x G.Til 3	12.73 **	9.71	9.71	-8.97*	-2.56	-0.54
AT 255 x ASRT 8	-3.65	-9.42	-11.54 *	-1.15	1.37	3.48
AT 255 x Vijapadi selection	0.61	-4.44	-8.69	-8.47*	-6.14	-4.18
AT 255 x G.Til 3	-2.25	-9.11	-9.11	1.39	3.98	6.14
ASRT 8 x Vijapadi selection	0.02	-1.05	-3.37	10.25*	2.89	5.03
ASRT 8 x G.Til 3	-4.14	-5.26	-5.26	-3.19	-6.51	-4.56
Vijapadi selection x G.Til 3	-0.75	-2.96	-2.96	-4.06	-7.34	-5.42
Minimum	-17.33	-18.36	-18.36	-13.58	-7.50	-4.56
Maximum	31.34	31.33	12.90	10.25	8.35	10.61
SE.d	2.40	2.78	2.78	1.51	1.67	1.67

Table 3: Comparison of top five promising crosses on the basis of per se performance for yield per plant and their respective Heterobeltiosis, Standard Heterosis, Specific combining ability effect and significant heterotic effects for other characters

Hybrids	*Per se* Performance	Better Parent Heterosis	Standard Heterosis	Significant heterosis for other traits over better parent	Significant heterosis for other traits over standard check
AT 242 x AT 255	12.19	17.58*	53.76 **	SW, HI, OC,CP,	SW, HI, BP,CP, CL
AT 242 x G.Til 3	9.29	17.19*	17.19 **	HI, CP, DM, CL	SW, HI, PH, CP, CL, DM, PH
AT 242 x Vijapadi selection	9.92	6.97*	25.18 **	SW, DFF, PH, BP, CL, PH	SW, HI, DFF, CP, BP, PH
AT 231 x G.Til 3	11.53	6.66*	45.44 **	HI, DFF, PH, BP, CP, DM	SW, HI, DFF, PH, BP, CP, DM,

DFF :	Days to 50 per cent flowering	PH :	Plant height (cm)	BP :	No. of effective branches per plant	CP :	No. of capsules per plant
CL :	Capsule length (cm)	DM :	Days to maturity	SC :	No. of seeds per capsule	SW:	1000-seed weight
		HI :	Harvest index (%)	OC :	Oil content (%)		

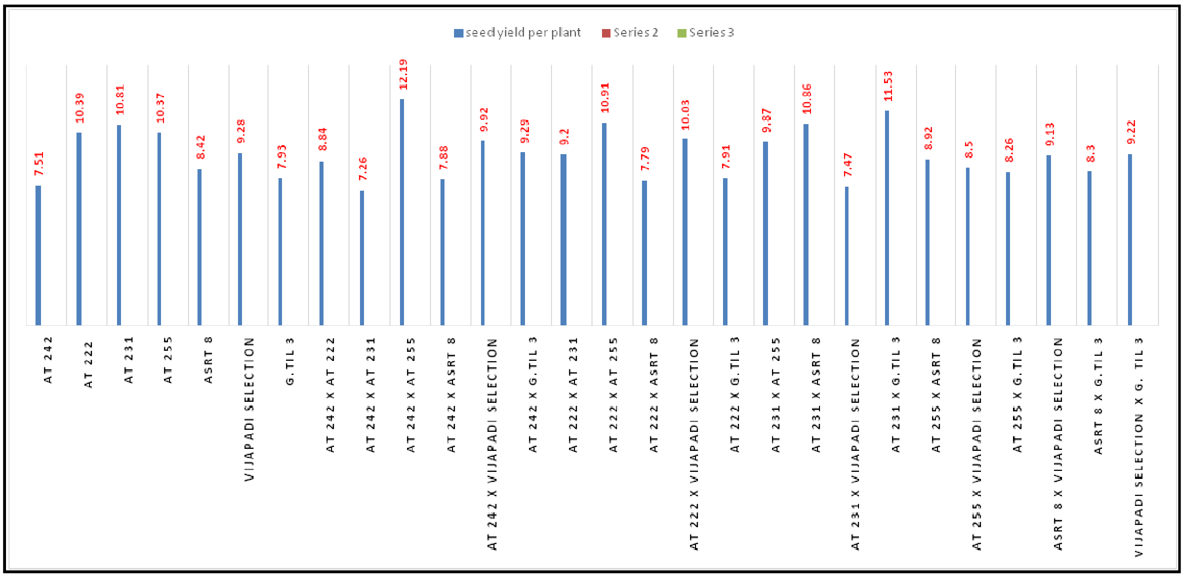

Fig 1 Analysis of variance (mean squares) for yield in sesame

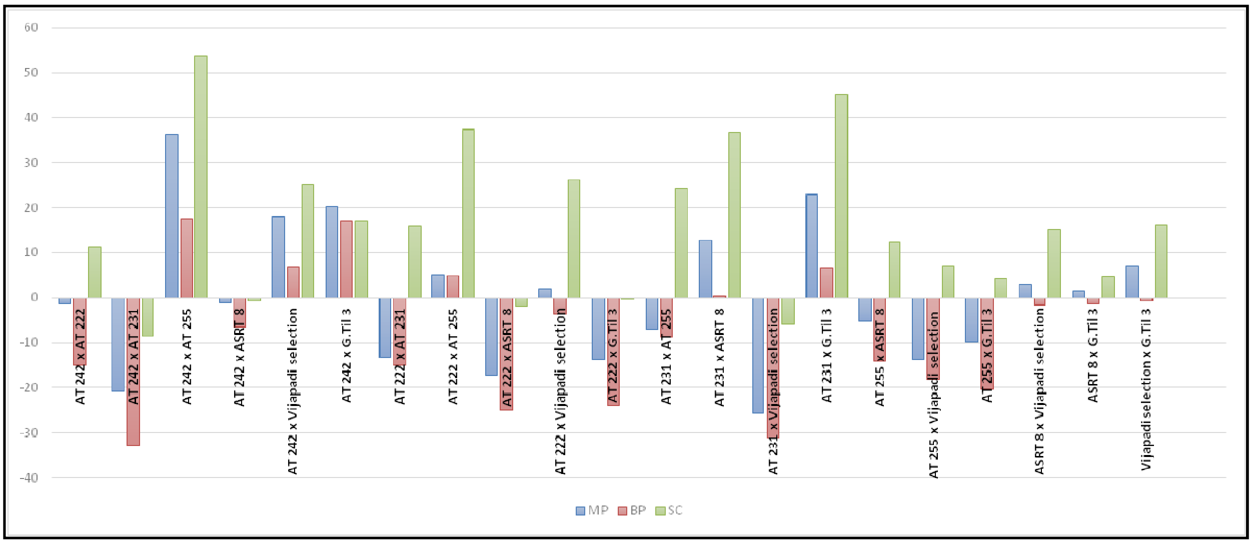

Fig. 2. Per cent Mid parent Hetrosis, Heterobeltiosis (BP) and Standard Heterosis (SH) for 1000-seed weight (g) and seed yield per plant (g)

The hybrid AT 242 x Vijapadi selection (14.02%) and AT 242 x Vijapadi selection (12.93%) depicted high heterobeltiosis for 1000-seed weight, while hybrid AT 242 x AT 255 (31.33%) and AT 231 x G.Til 3 (9.71%) for harvest index. For oil content, hybrid AT 231 x AT 255 (8.35%) and AT 222 x G.Til 3 (4.20%) depicted high heterobeltiosis. These findings were also supported by Patel *et al.* (2005), Salunke *et al.* (2013) and Subashini *et al.* (2014). In case of standard heterosis, five hybrids manifested significant and desirable heterosis for seed yield per plant over the checks. The maximum significant and positive heterosis over check G.Til 3 was observed in hybrid AT 242 x AT 255, AT 242 x G.Til 3, AT 242 x Vijapadi selection, AT 222 x AT 255 and AT 231 x G.Til 3, The heterotic response over the standard check in sesame was also reported by Jadhav and Mohrir (2013), Vavdiya *et al.* (2013) and Subashini *et al.* (2014), which are in accordance with the present findings. The comparison of top five promising crosses on the basis of *per se* performance for yield per plant and their respective heterobeltiosis, standard heterosis and significant heterotic effects for other characters in sesame is presented in Table 3. As far as economic importance is concerned, seed yield and oil content are the important traits in oilseeds crop, which in turn directly influence the oil yield. Hitherto varietal improvement of sesame was confined to hybridization of promising genotypes and selecting superior segregants for seed yield. The outcome of this breeding strategy did not yield spectacular gains in upgrading yield plateau in sesame. An alternate strategy viz., heterosis breeding has been given importance to increase the productivity. Earlier commercial exploitation of heterosis breeding was confined to cross pollinated group of crop plants. In recent period successful attempts have been made to develop hybrids in autogamous crop plants also. Sesame is the most suitable crop for exploiting heterosis on a commercial scale because of Low seed rate, High seed multiplication ratio (1:50), epipetalous floral structure enabling easy emasculation and natural out crossing to an extent of 5 to 50 per cent

Conclusion

From the above discussion, it can be concluded that four crosses, AT 242 x G.Til 3, AT 242 x G.Til 3, AT 242 x Vijapadi selection and AT 231 x G.Til 3 found to be most promising crosses for seed yield and other desirable traits, hence these hybrids could be evaluated further to exploit the heterosis after identifying suitable hybrid seed production technology and in future breeding programme by utilizing biparental mating or recurrent selection breeding approaches to obtain desirable segregants for development of further superior genotypes for seed yield and its component traits.

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