Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 9, Issue, 09, pp.57721-57727, September, 2017

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

RESEARCH ARTICLE

TO ESTIMATE THE GENERAL COMBINING ABILITY AND SPECIFIC COMBINING ABILITY FOR SEED YIELD AND CONTRIBUTING CHARACTERS IN SESAME (*Sesamum indicum* L.)

***Chaudhari, M. H., Patel S. R. and Chaudhari V. B.**

Dept. of Genetics and Plant Breeding, College of Agriculture, Navsari Agricultural University, Gujarat

ARTICLE INFO

Article History:
Received 21st June, 2017
Received in revised form
02nd July, 2017
Accepted 19th August, 2017
Published online 30th September, 2017

Key words:
Combining ability,
Gene action,
Seed yield, Sesame.

ABSTRACT

The experiment was conducted on sesame comprised of a half-diallel set of seven parents and their 21 crosses and it 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, 2016-2017. The observations such as days to flowering and days to maturity, plant height (cm)], number of branches per plant, number of capsules per plant, capsule length, seed yield per plant (g), 1000 seed weight (g), harvest index (%) and oil content (%) carried out on randomly selected five competitive individual plants. The data were subjected to analyze combining ability and presence of both additive and non-additive gene effects. Combining ability analysis revealed presence of both additive and non-additive gene effects. The estimates of general combining ability effects suggested that parents AT 231 and AT 255 were good general combiners for seed yield per plant and its related attributes. As regards, specific combining ability effects cross combinations AT 242 x AT 255 (2.71) followed by AT 231 x G. Til 3 (2.23) and AT 231 x ASRT 8 (1.63) were significant positive effect for seed yield per plant. Looking to the role of additive as well as non-additive gene effects in the inheritance of most of the traits in the population under study, suggest diallel selective mating followed by heterosis breeding and biparental mating or recurrent selection breeding approaches for creation of more variability and to identify desirable transgressive segregants for further improvement of yield and yield component traits. On the basis of per se performance and combining ability effects for seed yield per plant and its components, parents AT 231 and AT 255 and the hybrids AT 242 x AT 255, AT 231 x G. Til 3 and AT 231 x ASRT 8 were identified superior hybrids for their large scale testing.

Citation: Chaudhari, M. H., Patel S. R. and Chaudhari V. B. 2017. "To estimate the general combining ability and specific combining ability for seed yield and contributing characters in sesame (*Sesamumindicum* L.)", *International Journal of Current Research*, 9, (09), 57721-57727.

INTRODUCTION

Sesame (*Sesamum indicum* L., 2n=2x=26) is very ancient oil seed crop and is an important self pollinated annual crop in tropics and warm subtropics. Practically 100% of the world's sesame area is found in developing countries, with the largest areas in India, Myanmar, China, Sudan, Nigeria, and Uganda. India produced 770.1 thousand tonnes of sesame from 1775.6 thousand ha (Anon, 2017). The states, West Bengal and Gujarat accounted first and second place for the maximum production of 240.8 thousand tonnes and 143.0 thousand tonnes of sesame under area of 402.4 thousand ha and 185.3 thousand ha respectively. Sesame seeds contain 50-60% oil and 19-25% protein with antioxidants lignans such as sesamolin and sesamin which prevent rancidity and give sesame oil a long shelf life. The lignin contents have useful physiological unsaturated fatty acid are oleic and linoleic with about 40% of each and about 14% saturated acids.

Corresponding author:* **Chaudhari, M. H.
Dept. of Genetics and Plant Breeding, College of Agriculture, Navsari Agricultural University, Gujarat

Sesame is considered to have both nutritional and medicinal values. The seeds are used either decorticated or whole in sweet such as sesame bars and halva, in baked products or milled to get high grade edible oil or tahini, an oily paste (Bedigian, 2004). Sesamol has phenolic and a benzodioxide group in its molecular structure. The phenolic group of molecules are generally responsible for antioxidant activity of many natural products. On the other hands, benzodioxide derivatives are widely distributed in nature and have been shown to possess antitumor, antioxidant and many other biological activities. It is grown well in tropical to temperate climates. It can set seed and yield well under fairly high temperatures, and grow on stored soil moisture without rainfall or irrigation. It is good crop in rotation and its tap root makes the soil more permeable. The genus sesame, Pedaliacea, contains over 30 species, of which only *Sesamum indicum* L. is cultivated. The wild species *Sesamum angustifolium* L. and *Sesamum radiatum* L. are sometimes cultivated in Africa. Myers (2002) referred to 34 species and Kobayashi (1991), in studied summing up many years of research, listed 37 species. New species, such as Samummulayanum Nair and

Sesamum.indicum var. sencottai and var. yanamalami have been added since then. However, many of wild species remain unknown, their chromosomes numbers have not been determined, and their distribution areas have not been fully described. According to Kobayashi 22 of the species were found only in Africa, 5 were found only in Asia, and one each was reported in Crete and Brazil. The flowering, pollination and hybridization of sesame have been reviewed by Weiss (1983). Sesame is an indeterminate plant with acropetal flowering. Flowers vary in size, and markings the 5 stamens (4 functional, 1 sterile) are inserted at base of corolla which is tubular and campanulate. Emasculation is easily performed by pulling off the corolla from the buds on the day before opening. The flowers open at dawn; the pollen grains are shed shortly after, and remain viable for about 24h. The stigmas remain receptive for 2 more days if not fertilized. Sesame is classified as short day plant. However, long-term selection in regions with varying day length produced types with different photoperiod requirements.

MATERIALS AND METHODS

The present investigation on "Combining ability and gene action studies for seed yield and contributing characters in sesame (*Sesamum indicum*L.)" was carried out at College Farm, N. M. College of agriculture, Navsari Agricultural University, Navsari during late kharif 2016-2017. The experimental material for investigation consisted 7parentsviz., AT 242, AT 222, AT 231, AT 255, ASRT 8, Vijapadi selection and G. Til 3 obtained from Main Oilseeds Research Station, Amreli. All the eight sesame genotypes were crossed in every possible combinations (excluding reciprocals), thus 21 hybrids along with one local checkviz., G. Til 3 used for diallel analysis. The crossing programme was taken up during Latekharif 2016-2017 at College farm, Navsari and at the same time, the parents were selfed to get pure seeds. Hybridization was carried out through hand emasculation and pollination. 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 on tagged plants except days to 50 per cent flowering and days to maturity (plot basis) were recorded on the following ten characters and mean values over five plants were subjected to statistical analysis i.e. analysis of variance for randomized block design (RBD) as per Panse and Sukhatme (1978). The mean values for various traits were used for analysis of combining ability by employing model-I (fixed effect) and method-II of Griffing (1956a). Clean seeds with 10-12 per cent moisture were used for oil estimation through Nuclear Magnetic Resonance (NMR) spectrometer (Brucker, Minispec 20pl).

RESULTS AND DISCUSSION

The Analysis of variance for combining ability for partitioning the total genetic variance into general combining ability, representing additive type of gene action and specific combining ability as a measure of non-additive gene action was carried out by the procedure suggested by Griffing (1956b) model-I and method 2. The analysis of variance for combining ability for all the characters is presented in Table 1 revealed that, mean square due to GCA as well as SCA were significant for all the characters except days to flowering indicated the importance of additive as well as non-additive gene action in the inheritance of characters studied. The analysis of variance for combining ability indicated that the mean squares due to general combining ability and specific combining ability were significant for all the characters under study except days to 50% flowering in GCA. The variance due to SCA was higher than that of due to GCA for all the characters except days to maturity and number of branches per plant under study indicated the predominant role of non-additive gene action. Results were in agreement with the studies of Parameshwarappa *et al.* (2010), Kumar *et al.* (2012) and Sarvaliya*et al.* (2013). The presence of predominantly large amount of non-additive gene action would be necessitating the maintenance of heterozygosity in the population. Breeding methods such as biparental mating followed by reciprocal recurrent selection may increase frequency of genetic recombination and hasten the rate of genetic improvement. The estimates of general combining ability effects of parents and specific combining ability effects of hybrids for ten traits are presented in Table 2 and 3 (Fig 1 and 2).

Out of seven parents, AT 231 (-0.77) expressed significant negative GCA effects for days to 50% flowering, which indicated that they was good combiners for early flowering. Among the 21 crosses, five crosses exhibited significant and negative SCA effects. The values of SCA effects ranged from -2.62 (AT 242 x AT 222) to 5.82 (AT 231 x Vijapadi selection) for days to flowering. On the basis of SCA effects the cross AT 242 x AT 222 was found to be the best for exploiting early flowering.

The estimates of GCA effects for plant height revealed that out of seven parent, three parents expressed highly significant negative GCA effects *i.e.* AT 222 (-3.093), ASRT 8(-4.781) and G.Til 3(-2.45) which were observed as good combiners for dwarfness. In contrast to this, two parents registered highly significant and positive GCA effects *i.e*, AT 242 (3.88) and AT 231 (2.80).The estimation of specific combining ability effect for plant height revealed that out of the 21 cross combination, five cross combination expressed significant and positive SCA effects they are good combiner for tallness. The value of specific combining ability effects ranged from -15.36 (AT 242 x AT 231) to 19.108 (AT 222 x AT 231). General combining ability effects for number of branches per plant i.e. G.Til 3 (0.286) were highly significant and positive for no. of branches per plant. While, two parents exhibited highly significant and negative GCA effects. The perusal of specific combining ability effects revealed that six crosses recorded significant positive SCA effects for number of branches per plant. The value of specific combining ability effects ranged from -0.36 (AT 222 x Vijapadi selection) to 0.916 (AT 222 x AT 255). An examination of GCA effects of parents revealed that only four parents*viz.* G.Til 3 recorded highly significant and positive GCA effects. While, two parents (AT 222 and AT 231) recorded highly significant and negative GCA effects. The range of SCA effects varied from -10.231 (AT 222 x AT 231) to 16.602 (AT 242 x AT 255). Among the hybrids, nine hybrids expressed positive and significant SCA effects and thus those were good cross combinations. *i.e* AT 242 x AT 255 (16.602), AT 222 x AT 255 (15.536) and AT 231 x ASRT 8 (14.375) were the three best promising hybrids. Among the seven parents, three parents viz. AT 222 (-0.144) and Vijapadi selection (-0.110) expressed significant negative GCA effects.

Table 1. Analysis of variance for combining ability for various character in sesame

Characters	d.f.	Days to 50% Flowering	Plant height (cm)	No. of branches per plant	No. of capsules per plant	Capsules length	Days to maturity	1000 seed weight	Seed yield per plant(g)	Harvest index (%)	Oil content (%)
GCA	6	2.28	114.12**	0.27**	111.95**	0.08**	8.01	0.03 *	1.68**	2.93	8.73**
SCA	21	5.75**	106.19**	0.33**	96.55**	0.12**	9.12**	0.05**	1.74 **	23.94**	4.17**
Error	54	1.05	6.56	0.03	3.80	0.02	3.82	0.01	0.16	3.86	1.79
σ 2 GCA	-	0.13	11.95	0.02	12.01	0.03	0.46	0.07	0.16	0.10	0.69
σ 2 SCA	-	4.70	99.63	0.30	92.75	0.10	5.30	0.04	1.57	20.07	2.91
σ 2 GCA / σ 2 SCA	-	0.02	0.12	0.08	0.13	0.06	0.08	0.05	0.10	0.05	0.23

*Significant at 5% level, ** Significant at 1% level

Table 2. Estimation of general combining ability (GCA) effects associated with each parent for various character

Sr.No.	Parents	Days to 50% Flowering	Plant height (cm)	No. of branches per Plant	No. of capsules per plant	Capsules length	Days to maturity	1000 seed weight	Seed yield per plant(g)	Harvest index (%)	Oil content (%)
1	AT 242	0.07	3.88**	0.05	0.10	0.04	-1.77**	-0.03	-0.36**	-0.88**	0.47
2	AT 222	0.29	-3.09**	-0.16**	-4.16**	-0.14**	0.11	0.07	0.19	-0.16	-0.25
3	AT 231	-0.77*	2.80**	-0.05	-2.46**	0.02	0.71	-0.05	0.45**	0.90*	1.24**
4	AT 255	0.29	3.82**	0.07	0.90	0.14**	0.62	-0.09*	0.63**	-0.07**	0.95*
5	ASRT 8	-0.48	-4.78**	0.04	-0.91	0.01	-0.66*	0.03	-0.44**	-0.36	-0.48
6	Vijapadi selection	0.70*	-0.18	-0.24**	-0.47	-0.11*	0.06	0.07*	-0.09	0.36*	-1.76**
7	G.Til 3	-0.11	-2.45**	0.28**	7.02**	0.02	0.91	-0.03	-0.37**	0.21	0.13
8	S.E.$_{(gi)}$ ±	0.31	0.79	0.03	0.60	0.04	0.60	0.03	0.12	0.60	0.63
9	S. E. $_{(gi-gj)}$ ±	0.48	1.20	0.09	0.91	0.06	0.92	0.05	0.19	0.92	0.11

*Significant at 5% level, ** Significant at 1% level

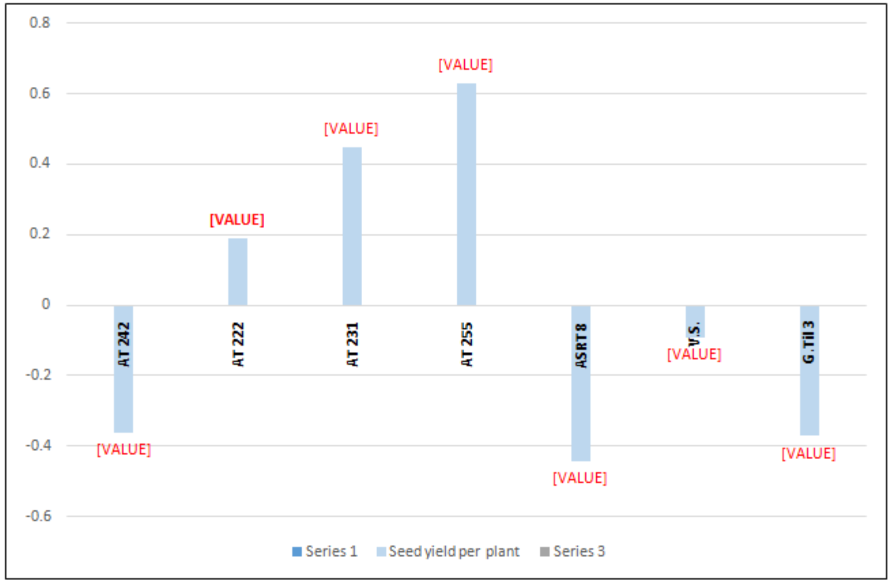

Fig. 1. Estimation of general combining ability effect associated with each parent for yield per plant in sesame

Table 3. Estimation of specific combining ability (SCA) effect associated with each cross for various character

Sr. no.	Hybrids	Days to 50% flowering	Plant height (cm)	No. of branches per plant	No. of capsules per plant	Capsules length (cm)	Days to maturity	1000 seed weight (g)	Seed yield per plant (g)	Harvest Index (%)	Oil Content (%)
1	AT 242 x AT 222	-2.62**	-9.84	-0.18	-7.7	-0.03	-2.5	-0.22	-0.2	2.97	-2.62*
2	AT 242 x AT 231	3.54**	-15.36	-0.24	2.57	-0.17	0.9	0.54**	-2.04	-6.37	0.21
3	AT 242 x AT 255	1.38	4.26	1.11**	16.60**	1.01**	5.09**	-0.19	2.71**	11.11**	0.6
4	AT 242 x ASRT 8	-2.50**	-12.8	-0.12	6.01**	-0.12	-6.38	-0.12	-0.52	-2.37	0.89
5	AT 242 x Vijapadi selection	-0.02	16.2**	0.14	6.11**	-0.01	-3.37	0.26	1.17**	3.71*	3.57*
6	AT 242 x G.Til 3	-2.21**	-9.08	-0.52	-2.76	-0.37	-2.39	0.03	0.81*	-2.19	0.74
7	AT 222 x AT 231	-1.76	19.10**	0.62**	-10.23	0.05	3.27	-0.08	-0.65	-1.27	1.17
8	AT 222 x AT 255	-1.17	-0.45	0.91**	15.53**	0.49**	1.87	-0.21	0.86*	7.43**	-0.39
9	AT 222 x ASRT 8	-0.73	-1.21	0.34	9.53**	0.08	0.59	-0.09	-1.17	-4.9	1
10	AT 222 x Vijapadi selection	-1.25	5.29	-0.36	1.71	-0.13	-0.55	0.29	0.71	-1.01	-0.89
11	AT 222 x G.Til 3	3.23**	-4.65	-0.31	1.32	-0.07	0.52	0.33*	-1.12	-7.71	2.82**
12	AT 231 x AT 255	0.23	3.27	-0.79	-3.34	-0.48	-3.66	0.02	-0.43	-0.13	2.19*
13	AT 231 x ASRT 8	-1.65	-9.08	0.81**	14.37**	0.27*	-2.17	-0.21	1.63**	5.43**	0.22
14	AT 231 x Vijapadi selection	5.82**	6.95*	-0.39	-7.32	0.26*	0.03	-0.21	-2.1	-0.69	-0.57
15	AT 231 x G.Til 3	-2.02**	9.02**	0.61**	9.47**	0.50**	-2.35	-0.21	2.23**	7.21**	-1.90*
16	AT 255 x ASRT 8	1.93*	0.99	-0.2	5.20**	-0.34	2.2	0.15	-0.47	-3.34	0.59
17	AT 255 x Vijapadi selection	-0.25	-7	0.67**	1.63	0.1	-1.19	0.11	-1.24	-2.44	-1.69
18	AT 255 x G.Til 3	-1.1	10.42**	0.19	-0.04	-0.33	0.33	-0.02	-1.21	-2.52	1.49
19	ASRT 8 x Vijapadi selection	-2.47**	-0.98	0.02	0.71	0.01	2.75	0.3	0.45	0.86	4.40**
20	ASRT 8 x G.Til 3	0	5.57	-0.19	-4.66	0.07	3.92*	-0.221	-0.09	-0.05	-2.05*
21	Vijapadi selection x G.Til 3	0.15	2.48	0.25	4.42*	-0.22	-0.09	-0.2	0.47	0.53	-1.17
22	S.E.$_{(sij)}$ ±	0.92	2.29	0.17	1.75	0.12	1.75	0.1	0.36	1.76	1.45
23	S.E.$_{(sij - sik)}$ ±	1.36	3.41	0.26	2.6	0.19	2.6	0.15	0.54	2.62	2.56
24	S.E.$_{(sij - skl)}$ ±	1.27	3.19	0.24	2.43	0.17	2.43	0.14	0.5	2.45	2.42

*Significant at 5% level, ** Significant at 1% level

Table 4. Summary table showing general combining ability effects of the parents for various characters in sesame

Parents	Days to 50 per cent flowering	Plant height (cm)	No. of effective branches per plant	No. of Capsules per plant	Capsule length (cm)	Days to maturity	1000-seed weight (g)	Seed Yield per plant (g)	Harvest index(%)	Oilc ontent (%)
AT 242	A	G	A	A	A	G	A	G	P	A
AT 222	A	P	P	P	G	A	A	A	A	A
AT 231	G	G	A	P	A	A	A	G	G	G
AT 255	A	G	A	A	A	A	P	G	P	G
ASRT 8	G	P	A	P	A	G	A	P	A	A
Vijapadi selection	A	A	P	P	G	A	G	A	G	P
G.Til 3	G	P	G	G	A	A	A	P	A	A

G = Good parent having significant gca effects in desired direction
A = Average parent having either positive or negative but non-significant gca effects
P = Poor parent having gca effect in the undesired direction

In contrast, AT 255 (0.140) registered significant and positive GCA effects. AT 255 (0.410) showed highest significant positive GCA effect. Among all the 21 crosses, only four crosses exhibited significant positive SCA effects. The value of specific combining ability effects ranged from -0.481 (AT 231 x AT 255) to 1.017 (AT 242 x AT 255). On the basis of SCA effects the cross AT 242 x AT 255 and AT 222 x AT 255 (0.49) was found to be the best hybrid for capsule length. In days to maturity, out of seven parents, only two parents *viz.* AT 242 (-1.77), and ASRT 8 (-0.660) expressed significant negative GCA effects. AT 242 and ASRT which are found to be best parent for earliness. Among all the 21 crosses, only two crosses exhibited significant positive SCA effects. The value of specific combining ability effects ranged from -6.384 (AT 242 x ASRT 8) to 5.09 (AT 242 x AT 255). On the basis of SCA effects the cross AT 242 x ASRT 8 was found to be the best hybrid for earliness.

The SCA effects ranged from -0.221 (AT 242 x AT 222) to 0.541 (AT 242 x AT 231). Out of 21, none of crosses recorded significant negative SCA effect. The estimates of GCA effects indicated that AT 231 (0.455) and AT 255 (0.630) had found highly significant positive GCA effects for this trait. Hence AT 231 and AT 255 were proved to be good combiners for this trait. Similarly AT 242 (-3.36), ASRT 8 (-0.443) and G.Til 3 (-0.370) exhibited highly significant and negative GCA effects and thus, they were poor combiners. Among 21 hybrids, five hybrids exhibited significant positive effects for seed yield per plant. The range of SCA effects for seed yield per plant was from -2.041 (AT 242 x AT 231) to 2.714 (AT 242 x AT 255). Among the seven parents, three parents *viz.*, AT 231 (0.909) and Vijapadi selection (0.36)) and G.Til 3 (0.211) had significant positive GCA effect. Therefore, this parent was proved to be good combiner for harvest index.

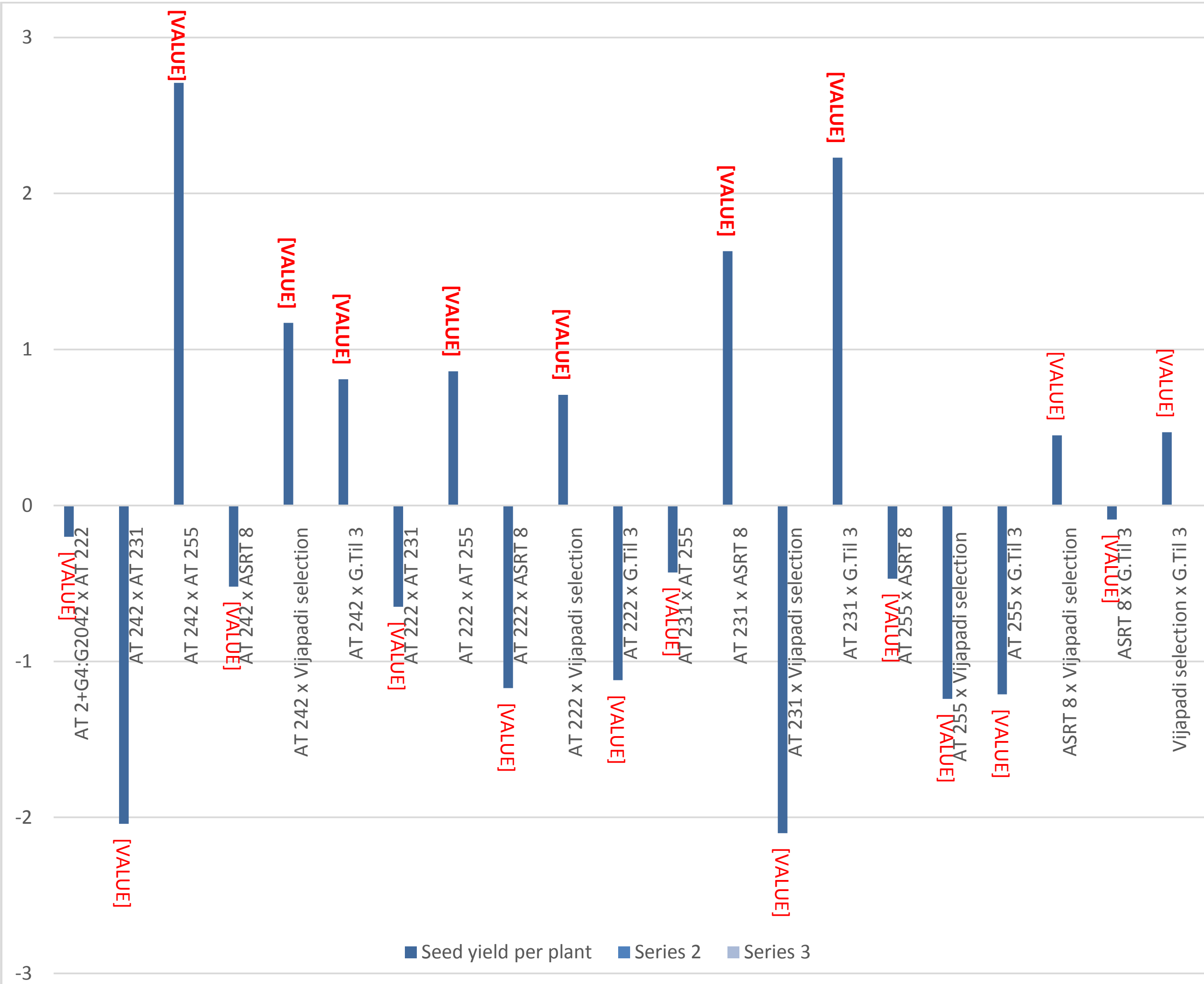

Fig. 2. Estimation of specific combining ability effect associated with each cross for seed yield per plant in sesame

An examination of GCA effects of parents for this trait revealed that, one parent Vijapadi selection (0.079) recorded significant and positive GCA effects for 1000 seed weight. While, AT 255 (-0.095) was recorded significant and negative GCA effects for 1000 seed weight. The estimation of specific combining ability effects found that two crosses recorded significant positive SCA effects.

While, two parents AT 242 (-0.887) and AT 255 (-0.077) had exhibited significant and negative GCA effect. Out of all the 21 hybrids, four hybrids exhibited significant positive effects for harvest index. The range of SCA effects for harvest index was from -6.375 (AT 242 x AT 231) to 11.114 (AT 242 x AT 255). The promising hybrids based on the SCA effects are AT 242 x AT 255 (11.114), AT 222 x AT 255 (7.43) and AT 231 x G.Til 3 (7.21).

Table 5. A summary table showing the best specific combination along with the general combining ability effects of the parents involved the combination for different characters in sesame

Characters	*Best specific combination*	sea	Per se	gea*effects of the*
Days to 50 per cent flowering	AT 242 x AT 222	-2.62	38	G x G
	AT 231 x G.Til 3	-2.02	38	G x G
	AT 242 x ASRT 8	-2.5	38	A x G
Plant height (cm)	AT 242 x Vijapadi selection	16.25**	95.06	G x A
	AT 222 x AT 231	19.10**	93.91	P x G
	AT 242 x AT 255	4.26	87.07	G x G
No. of effective branches per plant	AT 242 x AT 255	1.11**	5.15	A x A
	AT 231 x G.Til 3	0.61**	4.74	A x P
	AT 222 x AT 255	0.91**	4.73	P x G
No. of capsules per plant	AT 242 x AT 255	16.60**	86.71	A x A
	AT 231 x G.Til 3	9.47**	83.8	P x G
	AT 222 x AT 255	15.53**	82.04	P x A
Capsule length (cm)	AT 242 x AT 255	1.01**	4.03	A x A
	AT 231 x G.Til 3	0.50**	3.38	A x A
	AT 222 x AT 255	0.49**	3.31	G x A
Days to maturity	AT 242 x ASRT 8	-6.38	85.72	G x G
	AT 242 x Vijapadi selection	-3.37	89.45	G x A
	AT 242 x G.Til 3	-2.39	91.28	A x A
1000-seed weight (g)	AT 242 x AT 255	-0.19	3.9	A x P
	AT 231 x G.Til 3	-0.21	3.89	A x A
	AT 222 x AT 255	-0.21	3.86	A x P
Yield per plant (g)	AT 242 x AT 255	2.71**	12.19	G x G
	AT 231 x G.Til 3	2.23**	11.53	A x A
	AT 222 x AT 255	0.86**	10.91	A x G
Harvest index (%)	AT 242 x AT 255	11.11**	64.35	P x P
	AT 231 x G.Til 3	7.21*	62.53	G x A
	AT 222 x AT 255	7.43**	61.4	A x P
Oil content (%)	AT 242 x AT 255	0.6	39.98	A x G
	AT 231 x G.Til 3	-1.90*	41.96	G x A
	AT 222 x AT 231	1.17	37.02	A x G

The estimates of GCA effects for oil content of parent AT 231 (1.24) which had significant positive GCA effects. They proved their ability as good combiners for oil content. While, parents Vijapadi selection (-1.76) exhibited significant and negative GCA effects for this trait. The perusal of specific combining ability effects revealed that four hybrids exhibited significant positive effects for oil content. The range of SCA effects was from -2.62 (AT 242 x AT 222) to 4.40 (ASRT 8 x Vijapadi selection). While, three crosses were shows significant and negative SCA effect. Based on the estimates of general combining ability effects, the parents were classified as good, average and poor combiners for ten traits depicted in Table 4. Nature and magnitude of combining ability effects help in identifying superior parents and their utilization in further breeding programme. None of the parents found good general combiner for all the traits under studied. The parent AT 231 was good general combiner for days to maturity, plant height, seed yield per plant, harvest index, oil content.

The parents AT 242 and AT 255 was good general combiner for plant height, days to maturity, seed yield per plant and oil content, were G. Til 3 was good general combiner for no. of effective branches per plant, no. of capsules per plant. AT 242 and AT 255 can be considered as a good source of favorable genes for increasing seed yield along with other yield attributes. It is evident from these results that high GCA effects for seed yield per plant in the varieties AT 242 and AT 255 was mainly due to yield contributing characters. Therefore, it would be worthwhile to use above parental lines in the hybridization programme. For quality components, parents AT231and AT 255 selection were found to be good general combiner for oil content. The best specific combination along with the general combining ability effects of the parents involved the combination for different characters in sesame showing in summary table Table 5.

A perusal of the data in the table revealed that the crosses having higher estimates of SCA had resulted from Good x Poor, Good x Average and Poor x Average general combiners. Better performance of hybrids involving average x poor general combiners indicated dominance x dominance (epistasis) type of gene action (Jinks, 1953). A cross combination exhibited high SCA effects as well as high per se performance having at least one parent as good general combiner for a particular trait, it is expected that such cross combinations would exhibited desirable transgressive segregants in later generations. Significant SCA effects of those combinations involving good x good combiners showed the major role of additive type of gene effects, which is fixable.

Similarly, the superior crosses involving both the poor x poor general combiners, very little gain is expected from such crosses because high SCA effects may dissipate with the progress towards homozygosity. In the present study, top three crosses which exhibited high SCA effects for yield per plant involved at least one good general combiner, indicated additive x dominance type of gene interaction, which could produce desirable transgressive segregants in subsequent generations. Thiyagu *et al*. (2007), and Bangar *et al*. (2010) have reported the involvement of additive x additive, additive x dominance and epistatic type of gene action in expression of yield and other traits in Sesame. The crosses, where poor x poor and poor x good general combiners produced high SCA effects may be attributed due to presence of genetic diversity in the form of heterozygous loci for specific traits. Thus, the ideal crosses would be the one, which have good per se performance, at least one good general combiner parent and high SCA effects. On the basis of combining ability, the parents AT 242 and AT 255 were good general combiner for yield and yield component traits.

REFERENCES

Anonymous, 2017. http://www.indiastat.com/agriculture/2/oilseeds/17204/sesamum/19579/stats.aspx

Bangar, N. D., Gawade, S. A. and Meher, B. B. 2010. Combining ability analysis for yield and yield components in sesame. *Journal of Maharashtra Agricultural Universities*, 35(1): 52-56.

Bedigian, D. 2004. History and lore of sesame in southwest Asia. Economic Botany, 53(3): 329-353.

Griffing, B. 1956a. Concept of General and specific combining ability in relation to diallel cross system. *Aust. Journal of Biological Science,* 9(3): 463-493.

Griffing, B. 1956b. A general treatment of the use of diallel cross in quantitative inheritance. Heridity, 10(2): 31-50.

Jinks, J. I. and Hayman, B. I. 1953. The analysis of diallel crosses. Maize Genetics News Letter, 27(5): 48-54.

Kobayashi, T. 1991. Cytogenetics of sesme (*Sesamum indicum* L.). *Crop Science*, 4(5): 124-127.

Kumar, P. M. K., Nadaf, H. L., Patil, R. K. and Deshpande S. K. 2012. Combining ability and gene action studies in inter-mutant hybrids of sesame (*Sesamum indicum* L.). Karnataka *J. Agric. Sci.,* 25(1): 1-4.

Myers, R. L. 2002. Alternative crop guide. Jefferson institute Columbia. Clinical and experimental, 48(10): 541-549.

Panse and Sukhatme, 1978. *Stastical method for agricultural worker journal publish* by I.C.A.R. pp 54-87.

Parameshwarappa, S. G., Salimath, P. M. and Hussain, A. 2010. Studies on combining ability and heterosis for yield and yield components in sesame (*Sesamum indicum*L.). Green Farming, 3(2): 91-94.

Sarvaliya, V. M., Savaliya, J. J., Sharma, L. K., Pansuriya, A. G.,Kelaiya, D. S. (2013). Combining ability studies for yield and yield components in sesame (*Sesamum indicum* L.). *Progressive Research*, 8(3): 560-563.

Thiyagu, K., Kandasamy, G., Manivannan, N. and Muralidharan, V. 2007. Studies on heterosis in genetically diverse lines of cultivated sesame (*Sesamum indicum* L.). *Madras Agric. J.,* 94(7-12): 162-167.

Weiss, E. A. 1983. Oilseed Crops, Longman, New York, pp.660.

****