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COMBINING ABILITY ANALYSIS IN OKRA [*Abelmoschus esculentus* (L.) Moench]

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ABSTRACT
A study was conducted to estimate the combining ability analysis through the best combiners for yield and quality parameters in okra. Thirty six F_1 generated by line × tester mating design these F_1s along with 15 parents and commercial check were evaluated in Randomized Block Design with three replications at Vegetable Research Farm, Banaras Hindu University, Varanasi, during 2012 and 2013. The line IC-212267 for Days at first flowering (-8.44), Days at 50% flowering (-8.55) and Plant height (11.59), Pusa Makhmali for number of branches plant^{-1} (1.02), Kashi Kranti for internodal length (-0.52) and fruit length (3.76), SA-29 for fruit diameter (0.25), IC-140927 for average fruit weight (1.47), number of fruits plant^{-1} (2.18) and total fruit yield q/hectare (26.43) were identified as good general combiners. In order of merit the crosses IC-43742 × Varsha Uphar (-5.84) IC-43742 × Varsha Uphar (-5.95) IC-85814 × Varsha Uphar (12.88) IC-140927 × Hissar Unnat (1.48) IC-43742 × VRO-5 (-0.87) VRO-6 × Varsha Uphar (4.73) Pusa Makhmali × VRO-5 (2.82) VRO-3 × Varsha Uphar (0.25) Pusa Makhmali × VRO-5 (2.37) SA-29 × Varsha Uphar (45.57) were identified as good specific combiners. The present study reveals good scope for commercial exploitation of heterosis in okra.

INTRODUCTION

Okra (*Abelmoschus esculentus* (L.) Moench) belonging to the family Malvaceae is an important vegetable crop of the tropics and subtropics. Okra is specially valued for its tender, delicious green fruits which are cooked, canned and consumed in various forms in different parts of the country. India is the largest producer of okra covering an area of 0.531 million hectares with an annual production of 6.350 million tonnes (Anon., 2014). It is a potential export earner accounting for 13% of export of fresh vegetables. The ease in emasculation, very high per cent of fruit set and large number of seeds per fruit makes commercial exploitation of hybrid vigour easy in okra. Being an often cross-pollinated crop, out crossing to an extent of 5~9% by insects is reported which render considerable genetic diversity (Duggi *et al.,* 2013).

Hence, the first step in okra improvement should involve evaluation of the germplasm for genetic variability. As a second step, it is required to generate crosses employing a suitable mating design to know the extent of heterosis for various economic traits and inheritance pattern of desired characters, which in turn, would help in deciding the breeding strategies as well as identifying potential parents and crosses for further use in breeding programme (Singh and Singh, 2012). Hybrid vigour in okra has been first reported by Vijayaraghavan and Warier (1946). Several workers have reported notable heterosis for growth, yield and yield attributing traits (Lyngdoh *et al.,* 2013, Weerasekara *et al.,* 2007, Krushna *et al.,* 2007 and Manivannan *et al.,* 2007). Line × Tester analysis is a useful tool for preliminary evaluation of genetic stock for use as combiners, which may be used to build up a population with favorable fixable and genes for effective yield improvement. Combining ability helps in the evaluation of inbreds in terms of their genetic value, selection of suitable parents for hybridization and identification of superior cross combinations, which may be utilized for commercial exploitation of heterosis. Hence an investigation was carried out with objectives of assessing the combining ability analysis for yield and quality parameters in okra.

MATERIALS AND METHODS

The investigation on combining ability analysis in okra was undertaken at the Research Farm, Department of Horticulture, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, during the summer and rainy, 20012; and summer seasons of 2013 under normal sown conditions. The farm is situated at Banaras Hindu University, intersected by 25^0 18′ N latitude and 83^0 03′ E longitudes in the Northern Gangetic alluvial plain on the left of the river Ganga and at the altitude of 128.93 meter above the mean sea level. Experimental materials comprised twelve female parents (lines) viz., IC-212267, IC-43742, IC-85814, SA-29, IC-288877, IC-140927, VRO-6, SEL.-4 (Arka Abhay), Pusa Makhmali, Kashi Kranti, SEL.-10 (Arka Anamika) and VRO-3 and three pollen parents (testers) viz., HRB-9-2 (Versha Uphar), HRB-55 (Hissar Unnat) and VRO- 5 were selected on the basis of per se performance, adaptation and geographical diversity. Three pollen testers were crossed with each line and thus 36 F_1s were produced.

The 36 F_1s their parents and one commercial check (Larm-1) were grown in randomized block design with three replications. The seeds were sown in six metre long five rows plots keeping at a spacing of 60 x 30 cm. The observations were recorded on ten randomly selected plants from each plot for Days to first flowering, days to 50% flowering, plant height (cm), number of branches/plant, internodal length (cm), green pod weight (g), green pod length (cm), green pod diameter (cm), number of fruits/plant and green fruit yield (q/ha). Combining ability analysis was computed through Line x Tester mating design developed by Kempthorne (1957).

RESULTS AND DISCUSSION

Combining ability for yield and quality parameters are presented in Table 1 and gca and sca effects are presented in Table 2, 3 and 4 respectively.

The analysis of variance revealed highly significant difference among all the parents and hybrids for all the characters which indicated the presence of considerable amount of genetic variability (Table 1). The treatment mean squares were partitioned into lines, testers and lines x testers. The mean squares due to lines were significant for all the traits. The mean squares due to testers were significant for all the traits except fruit diameter. However, the mean squares due to lines x testers (sca) were highly significant for all the traits. High average degree of dominance ($ó^2$ sca/2 $ó^2$ gca) $^{1/2}$ indicated the predominance of non-additive gene effects for all the traits. These results are in accordance with findings of Weerasekara *et al.* (2008) and Singh *et al.* (2006 & 2009). Recurrent selection could be used for the improvement of these characters. Out of ten traits under study, the negative gca and sca effects estimates of three characters viz., days to first flowering, days to 50% flowering and internodal length were considered desirable, since these traits are negatively correlated with fruit yield (q/ha). However, positive estimates of gca or sca effects for the remaining traits were considered desirable. The estimates of gca effects of 12 female lines and 3 male testers for 10

Table 1: Analysis of variance (mean square) for combining ability for deferent characters in okra

Source of Variations	DF	Days to first flowering	Days to 50 % flowering	Plant height (cm)	Number of branches per plant	Internodal length (cm)	Fruit length (cm)	Fruit diameter (cm)	Fruit weight (g)	Number of fruits per plant	Fruit yield (q/ha)
Replications	2	0.12	1.58	0.54	0.08	0.35	0.72	0	0.18	0.24	41.77
Male T	2	40.69**	114.06**	7.75	1.12**	0.3	14.86**	0.19**	19.84**	10.00**	823.18**
Female L	11	199.24**	163.36**	678.21**	1.81**	1.58**	24.03**	0.20**	22.66**	14.62**	2365.23**
M × F	22	33.07**	31.06**	163.78**	1.32**	1.29**	7.05**	0.08**	23.80**	5.83**	1764.12**
Error	70	0.78	1.66	6.83	0.12	0.12	0.46	0	1.26	1.08	74.3
gca		7.72	9.57	15.93	0.01	-0.03	1.1	0.01	-0.23	0.58	-15.1
sca		10.76	9.8	52.32	0.4	0.39	2.2	0.03	7.51	1.58	563.27
Degree of dominance		1.18	1.01	1.81	5.44	3.61	1.41	1.68	5.71	1.66	6.11

*, ** Significant at 5% and 1% probability levels, respectively

Table 2: Estimation of general combining ability effects of parents from line × tester design in respect of 10 characters in okra

Parents	Days to first flowering	Days to 50 % flowering	Plant height (cm)	Number of branches per plant	Internodal length (cm)	Fruit length (cm)	Fruit diameter (cm)	Fruit weight (g)	Number of fruits per plant	Fruit yield (q/ha)
(A) Line										
IC-212267	-8.44**	-8.55**	11.59**	-0.21	0.32**	1.26**	-0.08**	1.82**	-0.98**	1.50
IC-43742	-1.55**	-2.01**	9.95**	-0.09	-0.34**	0.37	-0.31**	1.73**	0.13	11.16**
IC-85814	-1.77**	-1.30**	10.06**	-0.78**	0.51**	-0.84**	0.12**	-1.41**	0.44	-1.60
SA-29	6.78**	5.74**	-3.81**	-0.32**	-0.34**	-1.28**	0.25**	1.39**	-0.80*	1.70
IC-288877	7.38**	5.88**	-7.13**	-0.36**	-0.09	1.57**	0.09**	-1.64**	0.29	-9.83**
IC-140927	-0.35	0.88*	5.35**	0.19	0.44**	-1.10**	-0.05**	1.47**	1.35**	26.43**
VRO-6	-4.71**	-3.44**	-16.73**	0.11**	-0.05	0.30	0.02	-1.46**	-2.76**	-34.14**
SEL.-4	-1.17**	-1.39**	-5.81**	0.22*	0.81**	-2.40**	0.11**	1.22**	0.15	11.58**
Pusa Makhmali	1.58**	1.34**	6.93**	1.02**	-0.13	-0.98**	0.01	-0.82*	2.18**	16.49**
Kashi Kranti	1.49**	1.03*	-2.27*	0.33**	-0.52**	3.76**	-0.13**	-1.20**	1.09*	-4.93
SEL.-10	-3.95**	-3.24**	-4.66**	0.15	-0.29*	0.19	-0.12**	1.23**	-0.54	0.79
VRO-3	4.71**	5.05**	-3.48**	-0.25*	-0.32**	-0.83**	0.11**	-2.33**	-0.56	-19.15**
(B) Tester										
HRB-9-2 (VU)	-0.56**	-1.31**	-0.08	0.19**	-0.07	-0.69**	0.08**	-0.80**	0.05	-5.46**
HRB-55 (HU)	-0.67**	-0.71**	-0.42	-0.15**	-0.03	0.10	-0.04**	0.66**	-0.55**	3.47*
VRO-5	1.23**	2.03**	0.50	-0.04	0.10	0.58**	-0.04**	0.14	0.50**	1.99
SE gca lines	0.30	0.42	1.07	0.11	0.12	0.20	0.01	0.37	0.36	3.14
SE gca testers	0.15	0.21	0.54	0.05	0.06	0.10	0.01	0.18	0.18	1.57
SE gi-gj lines	0.43	0.59	1.52	0.15	0.17	0.29	0.02	0.52	0.50	4.43
SE gi-gj testers	0.21	0.29	0.76	0.07	0.08	0.14	0.01	0.26	0.25	2.22

*, ** Significant at 5% and 1% probability levels, respectively.

Table 3: Estimation of specific combining ability effects of hybrids from line × tester design in respect of 10 characters in okra

Hybrids	Days to first flowering	Days to 50 % flowering	Plant height (cm)	Number of branches per plant	Internodal length (cm)	Fruit length (cm)	Fruit diameter (cm)	Fruit weight (g)	Number of fruits per plant	Fruit yield (q/ha)
IC-212267 × Varsha Uphar	-1.09*	-1.02	-6.61**	-0.46*	0.78**	-2.28**	-0.06*	-0.05	-1.43*	-16.40**
IC-212267 × Hissar Unnat	0.96	1.45*	4.02*	-0.25	-0.73**	1.56**	0.21**	0.52	0.11	2.14
IC-212267 × VRO-5	0.13	-0.43	2.59	0.71**	-0.06	0.72*	-0.14**	-0.47	1.32**	14.26**
IC-43742 × Varsha Uphar	-5.84**	-5.95**	4.74	0.49	0.51	0.58	-0.08*	-3.86**	-1.28	-37.23**
IC-43742 × Hissar Unnat	4.34**	4.98**	-4.85*	-0.03	0.36	-0.25	-0.07**	3.84**	0.13	25.82**
IC-43742 × VRO-5	1.51**	0.97	0.10	-0.47*	-0.87**	-0.33	0.15**	0.02	1.15	11.40*
IC-85814 × Varsha Uphar	2.25**	2.94**	12.88**	-0.02	0.13	0.69	-0.15**	-3.93**	-0.65	-33.91**
IC-85814 × Hissar Unnat	-4.24**	-4.13**	-5.08**	0.39*	0.25	-0.67	0.08**	0.64	0.29	12.90*
IC-85814 × VRO-5	2.00**	1.20	-7.80**	-0.38*	-0.38	-0.02	0.07**	3.29**	0.37	21.02**
SA-29 × Varsha Uphar	-1.51**	-1.04	0.69	0.05	0.31	0.46	-0.05*	3.34**	2.06**	45.57**
SA-29 × Hissar Unnat	0.67	-0.04	-7.14**	-0.07	-0.04	-0.84*	-0.02	-3.76**	-1.07	-39.72**
SA-29 × VRO-5	0.84	1.09	6.45**	0.02	-0.27	0.38	0.07**	0.42	-0.99	-5.86
IC-288877 × Varsha Uphar	-0.58	-0.04	-4.28*	-0.04	-0.24	0.84*	-0.12**	-2.06**	0.30	-6.57
IC-288877 × Hissar Unnat	-1.80**	-0.71	0.63	-0.09	-0.08	-0.55	0.10**	2.87**	0.57	23.13**
IC-288877 × VRO-5	2.37**	0.75	3.65	0.13	0.32	-0.29	0.02	-0.81	-0.88	-16.55**
IC-140927 × Varsha Uphar	2.82**	2.09**	-4.65*	-0.59**	-0.51*	0.48	-0.20**	-1.37*	1.37*	9.23
IC-140927 × Hissar Unnat	0.14	0.62	8.03**	1.48**	0.92**	0.05	0.10**	1.60*	0.84	14.25**
IC-140927 × VRO-5	-2.96**	-2.71**	-3.38	-0.89**	-0.41*	-0.53	0.10**	-0.22	-2.21**	-23.48**
VRO-6 × Varsha Uphar	1.31*	1.00	-6.61**	0.16	-0.22	0.51	0.12**	4.73**	0.21	25.82**
VRO-6 × Hissar Unnat	2.16**	2.80**	-1.13	-0.43*	0.27	0.42	-0.09**	-1.94**	0.62	-10.98*
VRO-6 × VRO-5	-3.47**	-3.80**	7.74**	0.27	-0.06	-0.93**	-0.03	-2.79**	-0.83	-14.84**
SEL.-4 × Varsha Uphar	0.58	-0.44	-6.63**	0.45*	-0.74**	0.44	0.09**	2.48**	0.57	22.47**
SEL.-4 × Hissar Unnat	-0.24	-0.98	5.44**	0.46*	0.12	-1.55**	0.08**	-0.08	0.51	0.46
SEL.-4 × VRO-5	-0.34	1.42	1.19	-0.91*	0.62**	1.11**	-0.17**	-2.40**	-1.08	-22.93**
Pusa Makhmali × Varsha Uphar	-0.11	0.16	-9.04**	0.05	-0.71**	-1.57**	-0.04	0.35	-1.65**	-9.49
Pusa Makhmali × Hissar Unnat	-2.06**	-2.18**	3.41	-0.27	0.05	-1.25**	0.02	-0.62	-0.71	-6.18
Pusa Makhmali × VRO-5	2.17**	2.02**	5.64**	0.22	0.65**	2.82**	0.02	0.27	2.37**	15.67**
Kashi Kranti × Varsha Uphar	6.91**	6.14**	2.74	0.34	-0.34	-0.48	0.14**	-2.27**	1.77**	-5.90
Kashi Kranti × Hissar Unnat	-4.91**	-5.20**	-1.48	0.15	-0.61**	-0.50	-0.04	-0.67	-0.56	-0.80
Kashi Kranti × VRO-5	-2.00**	-0.94	-1.26	-0.49**	0.95**	0.98**	-0.11**	2.95**	-1.21	6.69
SEL.-10 × Varsha Uphar	-1.84**	-1.26	4.61*	-0.15	-0.11	-0.31	0.10**	2.34**	-0.14	11.31*
SEL.-10 × Hissar Unnat	2.00**	0.20	1.47	-0.54**	0.02	0.80*	-0.33**	-2.76**	-0.67	-19.60**
SEL.-10 × VRO-5	-0.16	1.06	-6.08**	0.69**	0.09	-0.48	0.24**	0.42	0.81	8.29
VRO-3 × Varsha Uphar	-2.91**	-2.55**	12.15**	-0.28	1.13**	0.64	0.25**	0.33	-1.12	-4.90
VRO-3 × Hissar Unnat	3.00**	3.18**	-3.32	-0.81**	-0.55**	2.78**	-0.03	0.36	-0.05	-1.43
VRO-3 × VRO-5	-0.09	-0.63	-8.83**	1.09**	-0.58**	-3.43**	-0.22**	-0.69	1.17	6.33
SE sca effects	0.52	0.72	1.86	0.18	0.20	0.35	0.02	0.63	0.62	5.43
SE sij-skl effects	0.74	1.02	2.63	0.26	0.29	0.50	0.04	0.90	0.87	7.68

*, ** Significant at 5% and 1% probability levels, respectively.

characters (Table 2) indicated that the best combiners for earliness first and 50% flowering were showed by parents IC-212267 (-8.44 & -8.55) followed by VRO-6 (-4.71 & -3.44) and Sel.10 (-3.95 & -3.24) while the lines IC-212267 (11.59) followed by IC-85814 (10.06) and IC-43742 (9.95) were best combiners for plant height similar results was given by Nagesh, *et al.,* 2014. Highly significant gca effects were recorded for the lines, Pusa Makhmali (1.02) followed by Kashi Kranti (0.33) and HRB-9-2 (Varsha Uphar) (0.19) for number of branches per plant these conformity was confirmed by Adigar *et al*. (2013). Kashi Kranti (-0.52) followed by IC-43742 (-0.34) and SA-29 (-0.34) for internodal length similar results was given by Nagesh *et al*., 2014. Kashi Kranti (3.76) followed by IC-288877 (1.57) and IC-212267 (1.26) for fruit length; SA-29 (0.25) followed by IC-85814 (0.12) and SEL.-4 (0.11) for fruit diameter; IC-212267 (1.82) followed by IC-43742 (1.73) and IC-140927 (1.47) for fruit weight; Pusa Makhmali (2.18) followed by IC-140927 (1.35) and Kashi Kranti (1.09) for number of fruits/ plant and IC-140927 (26.43) followed by Pusa Makhmali (16.49) and SEL.-4 (11.58) for fruit yield (q/ha) were found good general combiners. This indicates that parent showing high effects for fruit yield (q/ha) might have been because of their high gca effects for number of branches per plant, fruit length, fruit diameter fruit weight and number of fruits/plant similar report had been reported by Adigar *et al*. (2013), Pawar *et al*. (1999), Dahake and Bangar (2006), Kumar *et al*. (2006, 2009). Therefore, these lines can be used for hybridization for producing promising recombinants (Nagesh *et al.,* 2014).

The range of sca effects and superior specific combiner for hybrids pertaining to different characters are given in Table (3 & 4). A specific combining ability effect which represents the predominance of non-additive gene action is a major component that may be utilized in heterosis breeding. Similarly, out of 36 crosses, 12 for days to first flowering; 7 for days to 50% flowering and number of branches per plant; 9 for plant height, internodal length and fruit weight; 6 for number of fruits/plant fruit diameter, 26 for plant height, 18 for intermodal length, 2 for number of branches/plant; 8 for fruit length; 15 for fruit diameter and 11 for fruit yield (q/ha) expressed significant sca (sij) effect in favorable direction. In general, the cross IC-212267 × Varsha Uphar (-5.84 & -5.95) exhibiting best sca effect for earliness in first and 50% flowering while the cross IC-85814 × Varsha Uphar (12.88) for plant height Similar observation for sca was reported by Solankey *et al.,* 2013. The cross IC-140927 × Hissar Unnat (1.48) exhibited best sca effects for number of branches/plant Nagesh, *et al.,* 2014. For the characters like internodal length, fruit length, fruit diameter and fruit weight were shown by the

Table 4: Estimation of range of gca effects, number of significant specific crosses and best five general specific combiners for various trait in okra.

Particulars	Direction	Days to first flowering	Days to 50 % flowering	Plant height (cm)	Number of branches per plant	Internodal length (cm)
Range of gca effects	-	-0.09 (VRO-3 × VRO-5) to -5 .84 (IC-43742 × Varsha Uphar)	-0.43 (IC-212267 × VRO-5) to -5.95 (IC-43742 × Varsha Uphar)	-1.13 (VRO-6 × Hissar Unnat) to -9.04 (Pusa Makhmali × Varsha Uphar)	-0.02 (IC-43742 × Varsha Uphar) to -0.89 (IC-140927 × VRO-5)	-0.04 (SA-29 × Hissar unnat) to -0.89 (IC-43742 × VRO-5)
	+	0.13 (IC-212267 × VRO-5) to 4.34 (IC-43742 × Hissar Unnat)	0.16 (Pusa Makhmali × Varsha Uphar) to 6.14 (Kashi Kranti × Varsha Uphar)	0.10 (IC-43742 × VRO-5) to 12.88 (IC-85814 × Varsha Uphar)	0.02 (SA-29 × VRO-5) to 1.09 (VRO-3 × VRO-5)	0.02 (SEL.-10 × Hissar unnat) to 1.13 (VRO-3 × Varsha Uphar)
No. of significant specific crosses	-	12	7	12	10	9
	+	12	8	9	7	6
S_E (sij) ±		0.74	1.02	2.63	0.26	0.29
Best specific combiners		IC-43742 × Varsha Uphar (-5.84)	IC-43742 × Varsha Uphar (-5.95)	IC-85814 × Varsha Uphar (12.88)	IC-140927 × Hissar Unnat (1.48)	IC-43742 × VRO-5 (-0.87)
		Kashi Kranti × Hissar Unnat (-4.91)	Kashi Kranti × Hissar Unnat (-5.20)	VRO-3 × Varsha Uphar (12.15)	VRO-3 × VRO-5 (1.09)	SEL.-4 × Varsha Uphar (-0.74)
		IC-85814 × Hissar Unnat (-4.24)	IC-85814 × Hissar Unnat (-4.13)	IC-140927 × Hissar Unnat (8.03)	IC-212267 × VRO-5 (0.71)	IC-212267 × Hissar Unnat (-0.73)
		VRO-6 × VRO-5 (-3.47)	VRO-6 × VRO-5 (-3.80)	VRO-6 × VRO-5 (7.74)	SEL.-4 × Hissar Unnat (0.46)	Pusa Makhmali × Varsha Uphar (-0.71)
		IC-140927 × VRO-5 (-2.96)	IC-140927 × VRO-5 (-2.71)	SA-29 × VRO-5 (6.45)	SEL.-4 × Varsha Uphar (0.45)	Kashi Kranti × Hissar Unnat (-0.61)

Particulars	Fruit length (cm)	Fruit diameter (cm)	Fruit weight (g)	Number of fruits per plant	Fruit yield (q/ha)
Range of gca effects	-0.02 (IC-85814 × VRO-5) to -3.43 (VRO-3 × VRO-5)	-0.02 (SA-29 × Hissar unnat) to -0.33 (SEL.-10 × Hissar Unnat)	-0.05 (IC-212267 × Varsha Uphar) to -3.93 (IC-85814 × Varsha Uphar)	-0.05 (VRO-3 × Hissar unnat) to -2.21 (IC-140927 × VRO-5)	-0.80 (Kashi Kranti × Hissar unnat) to -39.72 (SA-29 × Hissar unnat)
	0.05 (IC-140927 × Hissar unnat) to 2.82 (Pusa Makhmali × VRO-5)	0.02 (Pusa Makhmali × VRO-5) to 0.25 (VRO-3 × Varsha Uphar)	0.02 (IC-43742 × VRO-5) to 4.73 (VRO-6 × Varsha Uphar)	0.11 (IC-212267 × Hissar unnat) to 2.37 (Pusa Makhmali × VRO-5)	0.46 (SEL.-4 × Hissar unnat) to 45.57 (SA-29 × Varsha Uphar)
No. of significant specific crosses	7	13	10	3	10
	8	15	9	6	11
S_E (sij) ±	0.9	0.04	0.5	0.87	7.68
Best specific combiners	Pusa Makhmali × VRO-5 (2.82)	VRO-3 × Varsha Uphar (0.25)	VRO-6 × Varsha Uphar (4.73)	Pusa Makhmali × VRO-5 (2.37)	SA-29 × Varsha Uphar (45.57)
	VRO-3 × Hissar Unnat (2.78)	SEL.-10 × VRO-5 (0.24)	IC-43742 × Hissar Unnat (3.84)	SA-29 × Varsha Uphar (2.06)	IC-43742 × Hissar Unnat (25.82)
	IC-212267 × Hissar Unnat (1.56)	IC-212267 × Hissar Unnat (0.21)	SA-29 × Varsha Uphar (3.34)	Kashi Kranti × Varsha Uphar (1.77)	VRO-6 × Varsha Uphar (25.82)
	SEL.-4 × VRO-5 (1.11)	IC-43742 × VRO-5 (0.15)	IC-85814 × VRO-5 (3.29)	IC-140927 × Varsha Uphar (1.37)	IC-288877 × Hissar Unnat (23.13)
	Kashi Kranti × VRO-5 (0.98)	Kashi Kranti × Varsha Uphar (0.14)	Kashi Kranti × VRO-5 (2.95)	IC-212267 × VRO-5 (1.32)	SEL.-4 × Varsha Uphar (22.47)

crosses, IC-43742 × VRO-5 (-0.87), Pusa Makhmali × VRO-5 (2.82), VRO-3 × Varsha Uphar (0.25), VRO-6 × Varsha Uphar (4.73), respectively. The crosses Pusa Makhmali × VRO-5 (2.37) followed by SA-29 × Varsha Uphar exhibited best sca for number of fruits/plant whereas the cross SA-29 × Varsha Uphar (45.57) was the best specific combiner for fruit yield (q/ha) followed by IC-43742 × Varsha Uphar (25.82) and VRO-6 × Varsha Uphar (25.82) similar results have also reported by Dahake and Bangar (2006) and Rajani *et al*. (2001). It was noted that parents with high × high, low × high, low × low, gca and sca effect could produce desirable transgressive segregants of additive genetic system present in the good combiner and complementary epistatic effect in case of average and poor combiner parents. From this study, it can be concluded that the crosses SA-29 × Varsha Uphar, VRO-6 × Varsha Uphar, IC-43742 × Varsha Uphar, IC-288877 × Hissar Unnat and Sel.4 × Varsha Uphar could be exploited for hybrid vigour in okra.

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