Vegetable Science (2018) 45 (1) : 68-72

Combining ability and heterosis studies in brinjal (*Solanum melongena* L.)

Niranjan Kumar Chaurasia, Prabalee Sarmah*, Nagen Sarma Baruah and Debojit Sarma

Received: February 2018 / Accepted: April 2018

Abstract

The combining ability, magnitude of gene action and heterosis for quantitative traits were assessed in brinjal using six lines and three testers in L x T mating design. The estimate of *gca* for lines and *sca* for hybrids represented that the lines Sagoli Xingiya, Baromohiya, MLC-1 and the testers SM-6-7 and Longai were best general combiners for most of the traits whereas the hybrids Utsav x Longai, Dari Hariharka x Longai, MLC-3 x SM-6-7, MLC-1 x JC-1, Baromohiya x SM-6-7 and Sagoli Xingiya x JC-1 were the best specific combiners for yield and yield contributing traits. The crosses BM x JC-1, Utsav x Longai, MLC-1 x JC-1, BM x SM-6-7, MLC-3 x SM-6-7 and MLC-3 x JC-1 had significant (good x poor/ poor x good) *sca* effect for the traits fruit weight, number of fruits per plants and yield per plant which resulted from one good and one poor general combiner. The ratio of *gca* and *sca* variance ranged from 0.04 to -1.44. The variance due to *sca* was higher than *gca* for all the characters except number of branches per plant indicating the preponderance of non-additive gene action which can be utilized for the development of hybrids. The study highlights the facts that not always good combiner x good combiner gives cross combinations with high *sca* effect, even cross combinations with poor general combiners can be equally exploited for crop improvement.

Key words: Brinjal, combining ability, gene action, heterosis

Introduction

Brinjal (*Solanum melongena* L.) often regarded as poor man's crop belongs to the family *Solanaceae* and has chromosome number 2n=2x=24. According to Bhaduri, 1951 and Vavilov (1931) India is regarded as the primary centre of origin where as China as the secondary centre of origin. It is a versatile crop adapted to different agro-climatic regions and can be grown throughout the year. It is an important crop in the tropical regions of world and is being grown extensively in India, Bangladesh, Pakistan, China, Philippines, Egypt, France, Italy and United StatesGlycoalkaloids have antimicrobial, insecticidal and fungicidal properties which account for their activity against several insects, pests and herbivores. Small quantities of glycoalkaloids are known to improve flavour, but at levels above 200 mg/kg it imparts the bitter taste. The present production is not in commensurate with the demand by the burgeoning population at geometric rate. Brinjal deserves a deep contemplation for improvement because consumer preferences differ in different regions based on fruit shape, size and colour. In this regard, local cultivars having the desired characteristics but low yield come to preference to the consumers. This requires improvement in yield and other economic traits in these cultivars.

Exploitation of hybrid vigour in brinjal has been recognized as a practical tool in providing the breeder a means of increasing yield and other economic traits. Line × Tester analysis is a potential tool for preliminary evaluation of genetic stock for use in hybridization programme to identify best combiners. India has a huge reservoir of genetic diversity which has not been fully exploited in the brinjal improvement program. Locally adaptable varieties have many important traits that could elevate the performance of the improved varieties when combined together by the process of hybridization. The combining ability, gene action and heterosis of these locally adaptable lines with improved varieties will give information on their utility for future breeding works. Keeping in view the above facts, the present investigation was undertaken to evaluate the information on the combining ability and nature of gene action of brinjal lines for fruit yield and its component traits in addition to identification of well performing hybrids.

Materials and Methods

The experimental material comprised of nine varieties of brinjal (*Solanum melongena*), out of which six were used as lines viz. Utsav (IIVR, Varanasi), Dari Hariharka (DH, farmer's Field, Gamharia Kala, Bihar), Manipur local-3 (MLC 3, farmer's Field, Imphal, Manipur),

Assam Agricultural University, Jorhat, Assam
*Corresponding author, Email: prabalee@rediffmail.com

Manipur Local-1 (MLC 1, farmer's Field, Imphal, Manipur),Baromohiya (BM, farmer's Field, Golaghat, Assam) and Sagoli Xingiya (SX, farmer's Field, Golaghat, Assam) and three were used as testers viz. JC-1 (released variety from AAU, Jorhat, Assam), SM-6-7 (IIVR, Varanasi, UP) and Longai (farmer's Field, Karimganj, Assam). The crosses were made as per Line x Tester mating design given by Kempthorne (1957) and eighteen F_1 crosses were generated in the first *rabi* season of 2015-16. These F_1s were evaluated along with their nine parental lines in completely randomized block design in the three replications during second *rabi* season 2016-17 at the Horticultural Experimental Farm, AAU, Jorhat. Each plot of sized 3m x 3m consisted of four rows with five plants each spaced at 75 x 60 cm and twenty plants per plot were maintained. The data were recorded from five competitive plants selected randomly from each plot of each replication on quantitative traits such as days to 50% flowering, plant height (cm), number of branches per plant, fruit length (cm), fruit girth (cm), fruit weight (g), number of fruits per plant, number of seeds per fruit, fruit yield per plant (kg), crude fiber content (%), shelf life of fruits (days). The data were statistically analysed using WINDOSTAT software for assessment of combining ability of parental lines and hybrids as well as estimation of average heterosis, heterobeltiosis and standard heterosis.

Results and Discussion

The presence of the extent of genetic variability in the gene pool is a prerequisite for crop improvement programme in any crop plant. Hence, the knowledge of the nature and extent of genetic variation available in the germplasm helps the breeders for planning a sound breeding programme. The analysis of variance (Table 1) for different growth parameter such as days to flowering, plant height, and number of branches per plant reveals the significant differences among genotypes, parents, parent vs. crosses and hybrids. The partitioning of the mean squares into line effect, tester effect and L x T effect was also highly significant for most of the yield and yield attributing traits except for plant height and number of branches per plant in the testers and for number of branches per plant in the Line x Tester effect. This indicated the presence of great variability among lines, testers and L x T interaction. The mean squares due to *sca* as revealed by the variability among the crosses for all the traits under study suggested that there was presence of sufficient non additive variance which could be exploited for good combinations for heterotic hybrids. Similar results were observed by Desai et al. (2017), Venkata et al. (2014), Singh et al. (2013), Bhusan et al. (2012) and Ramireddy et al. (2011). The estimates of variance components for various parameters indicated a lower ratio of (*gca* / *sca*) variance (Table 2) for all traits except for number of branches per plant indicating predominance of non-additive gene action which can be exploited through heterosis breeding. Additive gene action predominated for number of branches per plant that indicated the prospect of hybridization followed by selection for this trait. The traits showing predominance of both additive and non-additive gene action simultaneously can be improved by reciprocal recurrent selection. The importance of additive and non-additive components for several traits in brinjal has been reported by Uddin et al. (2015), Dubey et al. (2014), Venkata et al. (2014), Mishra et al. (2013) and Prasad et al. (2010).

The *gca* effect of parents (Table 3) revealed that among the lines BM and Sagoli Xingiya and among the testers SM-6-7 possessed good performance in the desirable direction for plant height, number of branches per plant, fruit length, fruit girth, fruit weight, number of seeds per fruit, fruit yield per plant, fiber content, shelf life in BM and for plant height, fruit length, fruit girth, fruit weight, number of fruit per plant and fruit yield per plant in Sagoli Xingiya and for days to 50 per cent flowering, number of branches per plant, number of

Table 1: Analysis of variance for Line X Tester analysis (Including parents)

Sources of variation	DF	Mean sum square										
		Days to 50% flowering	Plant height (cm)	No. of branches per plant	Fruit length (cm)	Fruit girth (cm)	Fruit wt. (g)	Number of fruit/ plant	Number of seeds/fruit	Fruit yield/ plant (kg)	Fiber content (%)	Shelf life (days)
Replication	2	5.15**	51.49	0.66	2.91	0.57	314.71*	0.74	227.75	0.01	0.06	0.39
Genotype	26	39.52**	253.32**	41.51**	75.65**	27.58**	10772.61**	29.51**	74570.75**	1.95**	5.14**	2.96**
Parents	8	33.23**	389.73**	4.57**	108.13**	45.63**	13336.57**	20.44**	72407.54**	1.59**	1.04**	5.25**
Parent Vs crosses	1	364.50**	411.88**	701.25**	12.43**	62.63**	14158.89**	289.39**	871.48	22.53**	11.82**	0.72*
Line	5	31.30**	600.41**	5.80**	109.09**	29.57**	6457.47**	22.48**	34735.44**	1.23**	1.29**	6.78**
Tester	2	45.78**	30.42	3.31	99.76**	25.83**	28278.79**	21.87**	122338.47**	1.87**	0.87**	1.35**
L x T	10	16.51**	101.76**	0.96	38.27**	2.53**	3248.72**	7.83**	56473.04**	0.32**	2.40**	1.16**
crosses	17	23.37**	179.80**	20.08**	64.09**	17.03**	9366.85**	18.49**	79923.98**	0.90**	6.68**	2.02**
Error	52	2.65	16.39	1.51	1.53	0.64	89.40	0.42	434.65	0.01	0.07	0.16

*P<0.05; **P<0.01

fruit per plant, number of seeds per fruit, fruit yield per plant, fiber content, shelf life of fruits in the tester SM-6-7. These parental lines were found to be best combiners for most of the traits (7-8) which is in the agreement with the findings of Biradar et al. (2005). The best combiners for yield and related traits from commercial point of view was found among the lines MLC-1, BM, Sagoli Xingiya and testers SM-6-7 and Longai. The high *gca* effect were observed primary due to additive and additive x additive gene action which could be exploited through hybridization followed by selection. Summarizing the *gca* effects (Table 5) of the parents for different traits revealed that among lines Sagoli Xingiya, BM and MLC-1 and among testers SM-6-7 was found to be good general combiner.

The ratio of due to *gca* and *sca* (Table 2) indicated predominance of non-additive gene for fiber content and shelf life of fruits. The parental lines Baromohiya and SM-6-7 were good general combiner for fiber content. The cross Baromohiya x SM-6-7 showed highly significant positive heterosis over all the three types of heterosis. Among all the crosses, DH x JC-1, DH x Longai, MLC-3 x SM-6-7, MLC-1 x Longai, BM x JC-1 and BM x SM-6-7 were best specific combiners involving poor x average, poor x poor, poor x good, poor x poor, good x average and good x good general combining parents, respectively. Perusal of data depicted that the lines Baromohiya and SM-6-7 were found to the best general combiners and only three crosses viz. Utsav x JC-1, MLC-3 x SM-6-7 and SX x JC-1 were good specific combiner for shelf life of fruits. These crosses involved average x poor, poor x good and average x poor general combiners, respectively.

The desirable *sca* effect for marketable yield of fruits per plant (Table 4) was observed in six numbers of crosses Utsav x Longai, DH x Longai, MLC-3 x SM-6-7, MLC-1 x JC-1, BM x SM-6-7 and SX x JC-1. The *sca* effect represents dominance and epistatic effect which can be used as an index to determine the usefulness of a particular cross combination in the expression of heterosis. The cross combinations which were found to be highly significant for yield and attributing traits were DH x Longai, MLC-3 x SM-6-7, BM x JC-1, JC-1, Utsav x Longai, MLC-1 x Longai were the combinations of good x good, poor x poor, good x poor, good x poor, poor x good, good x good general combiners respectively for fruit weight; DH x JC-1, MLC-1 x JC-1, BM x SM-6-7 and BM x Longai were the combinations of poor x poor, good x poor, poor x good and poor x poor general combiners respectively for number of fruits per plant and Utsav x Longai, DH x Longai, MLC-3 x SM-6-7, MLC-1 x JC-1, BM x SM-6-7 and SX x JC-1 were the combinations of poor x good, poor x good, poor x good, good x poor, good x good and good x poor general combiners respectively for fruit yield per plant. Thus, it is evident that two parents with high *gca* may not always result in combinations with high *sca* and these traits cannot be improved through heterosis breeding. In the present study, the crosses MLC-3 x SM-6-7, DH x JC-1, BM x

Table 2: Estimates of general and specific combining ability variance in brinjal for various traits

Sources	Days to 50% flowering	Plant height (cm)	No. of branches/plant	Fruit length (cm)	Fruit girth (cm)	Fruit weight (g)	Number of fruits/plant	Number of seeds/fruit	Fruit yield/plant (kg)	Fiber content (%)	Shelf life (days)
σ^2gca	0.21	2.34	0.57	0.77	0.43	183.44	0.32	703.11	0.02	0.13	0.03
σ^2 sca	4.58	30.47	-0.40	12.17	0.63	1055.36	2.46	18658.30	0.10	0.80	0.33
σ^2gca / σ^2sca	0.04	0.08	-1.44	0.06	0.69	0.17	0.13	0.04	0.17	0.16	0.08

Table 3: Estimates of general combining ability effects

Parents	Days to 50% flowering	Plant height (cm)	No. of branches per plant	Fruit length (cm)	Fruit girth (cm)	Fruit weight. (g)	Number of fruit/plant	Number of seeds/fruit	Fruit yield/plant (kg)	Fiber content (%)	Shelf life (days)
Lines											
Utsav	-3.20 **	-8.38 **	-1.58 **	-2.60 **	-2.16 **	-73.69 **	1.48 **	-169.43 **	-0.84 **	-0.59 **	0.26
Dari Hariharka	-0.76	-6.47**	2.34 **	-0.02	0.90 **	7.72 *	-0.77 **	37.13 **	-0.05	-0.28 **	-0.59 **
MLC-3	1.57 **	-2.49	-0.73	-4.31 **	-1.07 **	-17.86 **	0.03	100.77 **	-0.20 **	-1.02 **	-0.31 *
MLC-1	1.02	5.32 **	-1.46 **	-2.23 **	-0.04	8.53 *	0.62 **	81.28 **	0.30 **	-0.80 **	-0.13
Baromohiya	0.46	5.43 **	2.69 **	4.45 **	1.71 **	60.46 **	-2.44 **	-93.40 **	0.26 **	2.77 **	0.65**
SagoliXingiya	0.91	6.60**	-1.26 **	4.72 **	0.65 *	14.84 **	1.08 **	43.65 **	0.53 **	-0.09	0.11
Testers											
JC-1	0.07	-1.05	-1.98 **	1.43**	-0.69 **	-8.01 **	-0.46 **	43.77**	-0.22 **	0.07	-0.41 **
SM-6-7	-1.65 **	-0.45	2.18 **	-0.62 *	-1.78 **	-28.14 **	2.19 **	-100.94 **	0.05 **	0.15 *	0.72 **
Longai	1.57 **	1.50	-0.20	-0.81 **	2.46 **	36.15 **	-1.72 **	57.17 **	0.17 **	-0.22 **	-0.31 **
SE(gi) lines	0.54	1.35	0.41	0.44	0.27	3.03	0.16	7.44	0.02	0.09	0.13
SE(gj) testers	0.38	0.95	0.29	0.31	0.19	2.14	0.39	5.26	0.02	0.06	0.10

*P<0.05; **P<0.01

Table 4: Estimates of specific combining ability effects

Crosses	Days to 50% flowering	Plant height (cm)	No. of branches per plant	Fruit length (cm)	Fruit girth (cm)	Fruit wt. (g)	Number of fruits/plant	Number of seeds/fruit	Fruit yield/plant (kg)	Fiber content (%)	Shelf life (days)
Utsav x JC-1	-0.63	-2.97	-0.05	1.44	-0.92	-9.70	-1.20**	155.73 **	-0.25 **	-0.32 *	1.002 **
Utsav x SM-6-7	0.43	4.02	0.88	-0.59	0.00	-2.15	0.60	51.11**	-0.20 **	0.08	-0.68 **
Utsav x Longai	0.20	-1.05	-0.83	-0.85	0.92	11.84 *	0.61	-206.84 **	0.45 **	0.24	-0.32
DH x JC-1	-1.07	-1.16	-0.43	-6.99 **	-0.45	-49.14 **	2.16 **	-47.85 **	-0.23 **	0.43**	-0.48 *
DH x SM-6-7	3.65 **	-2.17	0.09	5.42 **	-0.25	6.25	-1.57 **	126.35 **	-0.15 **	-1.13 **	0.17
DH x Longai	-2.57 **	3.32	0.34	1.57 *	0.71	42.90 **	-0.60	-78.49 **	0.37 **	0.70 **	0.31
MLC-3 x JC-1	2.26 *	-5.54 *	-0.13	0.66	1.28 **	-11.15 *	0.68	-122.02 **	0.01	-0.07	-0.46
MLC-3 x SM-6-7	-0.69	2.87	-0.12	-1.02	0.06	25.49**	-0.48	84.71 **	0.28 **	0.39*	0.77**
MLC-3 x Longai	-1.57	2.67	0.25	0.37	-1.34**	-14.35 *	-0.21	37.31 **	-0.29 **	-0.31 *	-0.31
MLC-1 x JC-1	1.82	-4.34	0.28	-0.89	1.005 *	-6.11	1.83 **	-58.07 **	0.35 **	-0.35 *	-0.16
MLC-1 x SM-6-7	-1.46	1.63	-0.03	-1.44	-0.17	-6.75	-0.62	-94.95 **	-0.23 **	-0.62 **	-0.11
MLC-1 x Longai	-0.35	2.71	-0.25	2.33 **	-0.84	12.87 *	-1.22 **	153.02 **	-0.12 **	0.97 **	0.28
BM x JC-1	-1.96 *	7.92 **	0.35	1.53 *	-0.36	50.70 **	-2.38 **	86.25**	-0.05	0.40 *	-0.50 *
BM x SM-6-7	-1.57	0.58	-0.88	0.36	0.34	-15.98 **	1.23 **	-148.30 **	0.27 **	1.21 **	0.22
BM x Longai	3.54 **	-8.50 **	0.53	-1.89 *	0.02	-34.72 **	1.15 **	62.04 **	-0.22 **	-1.60 **	0.29
SX x JC-1	-0.41	6.08 *	-0.03	4.25**	-0.55	25.39 **	-1.09 **	-14.03	0.17 **	-0.08	0.60 *
SX x SM-6-7	-0.35	-6.93 **	0.05	-2.73 **	0.02	-6.85	0.83 *	-18.93	0.03	0.07	-0.36
SX x Longai	0.76	0.85	-0.02	-1.52 *	0.53	-18.54 **	0.26	32.96 **	-0.19 **	0.007	-0.24
SE(Sij)	0.94	2.34	0.71	0.77	0.46	5.46	0.37	12.04	0.04	0.15	0.23
SE(Sij-Sik)	1.33	3.31	1.00	1.01	0.65	7.72	0.53	17.02	0.06	0.21	0.33
SE(Sij-Skl)	2.03	5.05	1.53	1.54	1.00	11.79	0.81	26.00	0.09	0.32	0.50

*P<0.05; **P<0.01. DH: Dari Hariharka, MLC-1: Manipur local-1, MLC-3: Manipur local-3, SX: SagoliXingiya, BM: Baromohiya

Longai (poor x poor general combiner) has significant positive *sca* effect for yield contributing traits which may be due to the presence of high non additive gene action specially, complementary epistatic effect which could be utilized for commercial exploitation of heterosis. The crosses BM x JC-1, Utsav x Longai, MLC-1 x JC-1, BM x SM-6-7, MLC-3 x SM-6-7 and MLC-3 x JC-1 had significant (good x poor/ poor x good) *sca* effect (Table 5, 6 & 7) for the traits fruit weight, number of fruits/plants and yield/plant which resulted from one good and one poor general combiner. Heterosis breeding and recurrent selection may be utilized for the exploitation of both additive and non-additive gene effect.

The best cross combinations for marketable yield of fruits per plant along with their parental value, *gca* estimates and *sca* estimates presented in Tables 3 and 4, revealed that majority of the cross combinations exhibiting higher yield had at least one of the parents as good general combiner. Similar findings has also been reported by Uddin et al. (2015), Prasad et al. (2015), Venkata et al. (2014), Ansari and Singh (2014), Mishra et al. (2013), Mishra et al. (2013), and Ramireddy et al. (2011). The study emphasizes the significance of assessing *gca* for plant height, number of branches per plant, fruit weight, number of fruits per plant and fruit yield per plant which helps in identifying superior parents and appropriate breeding techniques for development of potential cultivars or hybrids. The best performing parents and crosses based on *gca* and *sca* effects with respect to each traits in desirable direction (Table 5)

Table 5: Best performing parents and crosses based on GCA and SCA effects with respect to traits in desirable direction

Traits	desirable direction	Best general combiner	Best specific combiner
Days to 50% flowering	Negative	Utsav and SM-6-7	DH x Longai and BM x JC-1
Plant height (cm)	Positive	MLC-1, Baromohiya and SagoliXingiya	BM x JC-1 and SX x JC-1
No. of branches per plant	positive	Dari Hariharka, Baromohiya and SM-6-7	-
Fruit length (cm)	Positive	Baromohiya,SagoliXingiya and JC-1	DH x SM-6-7, SX x JC-1 and MLC-1 x Longai
Fruit girth (cm)	Positive	Baromohiya, Longai and SagoliXingiya	MLC-3 x JC-1
Fruit weight.(g)	Positive	Baromohiya, Longai and SagoliXingiya	BM x JC-1, DH x Longai, MLC-3 x SM-6-7 and SX x JC-1
Number of fruit/plant	Positive	SM-6-7, Utsav, SagoliXingiya and MLC-1	DH x JC-1, MLC-1 x JC-1, BM x SM-6-7 and BM x Longai
Number of seeds/fruit	Negative	Utsav, SM-6-7 and Baromohiya	Utsav x Longai, BM x SM-6-7, MLC-1 x SM-6-7, DH x Longai, MLC-3 x JC-1, MLC-1 x JC-1 and DH x JC-1
Fruit yield/plant (kg)	Positive	SagoliXingiya, MLC-1, Baromohiya, Longai and SM-6-7	Utsav x Longai, DH x Longai, MLC-3 x SM-6-7, MLC-1 x JC-1, BM x SM-6-7 and SX x JC-1
Fiber content (%)	Positive	Baromohiya and SM-6-7	BM x SM-6-7, MLC-1 x Longai, DH x Longai and DH x JC-1
Shelf life (days)	positive	SM-6-7 and Baromohiya	Utsav x JC-1, MLC-3 x SM-6-7

revealed that the parents which were found to be the best general combiner for yield and yield contributing traits could be exploited for development of homozygous lines. The best specific combiners (BM x SM-6-7, MLC-1 x JC-1, SX x JC-1, DH x JC-1, MLC-1 x Longai, BM x JC-1, BM x Longai, Utsav x Longai, DH x Longai and MLC-3 x SM-6-7) could be exploited for hybrid breeding programme. The cross combinations MLC-3 x SM-6-7 and SX x JC-1 showed significant positive heterosis over MP, BP and SP. Since seeds in fruits are a major constrains for consumer acceptance, hence lesser number of seed per fruit is desirable. Seven out of eighteen cross combinations namely Utsav x Longai, BM x SM-6-7, MLC-3 x JC-1, MLC-1 x SM-6-7, DH x Longai, MLC-1 x JC-1 and DH x JC-1 exhibited highly significant and negative *sca* effect which can be exploited for commercialization.

Ikjka'k

बैंगन में संयोजन क्षमता जीन क्रिया परिमाण और मात्रात्मक गुणों के निर्धारण हेतु 6 ओज लाइनों 3 टेस्टरों का प्रयोग प्रजनन विधि से किया गया। लाइनों हेतु सामान्य संयोजन क्षमता एवं संकरों हेतु विशिष्ट संयोजन क्षमता के प्रतिनिधित्व से ज्ञात हुआ कि सागोली एक्सिंगिया, बारमोहिआ, एमएलसी–1 और टेस्टर्स एस एम–6–7 और लोंगाई अधिकांश लक्षणों के लिए सर्वश्रेष्ठ सामान्य संयोजन क्षमता रखते हैं जबकि संकरों में उत्सव x लोंगाई, दारी हरिहरका x लोंगाई, एमएलसी–3 x एसएम–6–7, एमएलसी–1 x जेसी–1, बारमोहिया x एसएम–6–7 सागोली एक्सिंगिया x जेसी–1 उपज और उपज गुणों के योगदान के लिए सर्वश्रेष्ठ विशिष्ट संयोजक क्षमता रखते हैं। संकरण संयोज बीएम x जेसी–1, उत्सव x लोंगाई, एमएलसी–1 x जेसी–1,बीएम x एसएम–6–7, एमएलसी–3 x एसएम–6–7, एमएलसी–3 x जेसी–1 महत्वपूर्ण (अच्छा x दुर्बल x अच्छा) गुणों के लिए फल भार प्रति पौध फलों की संख्या और प्रति पौध उपज के लिए विशिष्ट संयोजन क्षमता प्रभाव एक अच्छा और एक दुर्बल है। सामान्य संयोजन क्षमता एवं विशिष्ट संयोजन क्षमता विचरण का अनुपात 0.04 से –1.44 तक है। विशिष्ट संयोजन क्षमता प्रभाव की वजह से विचलन (भिन्नता) सामान्य संयोजन क्षमता की तुलना में अधिक थी जो प्रति पौध शाखाओं की संख्या को छोड़कर सभी गुणों के लिए अधिक थी, जो संकर (हाइब्रिड) विकास के लिए उपयोग किया जा सकने वाले गैर–प्रोज्य जीन मित्र के महत्व को दर्शाती है। अध्ययन में इस तथ्य पर प्रकाश डाला गया है कि हमेशा अच्छा संयोजक नहीं, अच्छा संयोजक उच्च विशिष्ट संयोजन क्षमता प्रभाव के साथ संकरण संयोजन देता है। यहाँ तक कि दुर्बल सामान्य संयोजन क्षमता के साथ संकरण संयोजन भी फसल सुधार के लिए समान रूप से उपयोग किया जा सकता है।

References

Ansari AM and Singh YV (2014) Combining ability effects for fruit characters in brinjal (*Solanum melongena* L.). Elect J Plant Breed 5 (3): 385-393.

Bhushan B, Sidhu AS, Dhatt AS and Kumar A (2012) Studies on combining ability for yield and quality traits in brinjal (*Solanum melongena*L.). J Hort Sci 7(2): 145-151.

Biradar AB, Dumbre AD and Navale PA (2005) Combining ability studies in brinjal (*Solanum melongena* L.). J Maharashtra Agril Univ 30(3): 342.

Bhaduri PN (1951) Inter-relationship of non-tuberiferous species of *Solanum* with some consideration on the origin of brinjal. Indian J Genet Plant Breed 11: 75-82.

Desai KM, Saravaiya SN and Pate DA (2017) Combining ability for yield and different characters in brinjal (*Solanum melongena* L.). Elect J Plant Breed 8(1): 311-315.

Dubey R, Das A, Ojha, MD, Saha B, Ranjan A and Singh PK (2014) Heterosis and combining ability studies for yield and yield attributing traits in brinjal (Solanum melongena L.). The Bioscan 9(2): 889-894.

Kempthorne O (1957) An introduction to Genetics Statistics. John Wiley & Sons Inc, New York.

Makani AY, Patel AL, Bhatt MM and Patel PC (2013) Heterosis for yield and its contributing attributes in brinjal (*Solanum melongena* L.). The Bioscan 8(4): 1369-1371.

Mishra R, Singh AK, Vani VM, Singh BK, Kumar H and Rajkumar BV (2013) Combining ability studies in elite breeding lines of brinjal (*Solanum melongena* L.) for plant characters. Asian J Biol Life Sci 3: 275- 278.

Prasad V, Dwivedi VK, Deshpande AA and Singh BK (2010) Gene action of economic traits in brinjal (*Solanum melongena*L.). Veg Sci 37(1): 97-99.

Prasad V, Dwivedi VK, Deshpande AA and Singh BK (2015) Genetic combining ability for yield and other economic traits in brinjal (*Solanum melongena* L.). Veg Sci 42(2): 25-29.

Ramireddy SRKM, Lingaiah HB, Reddy PVK, Naresh P and Kuchi VS (2011) Combining ability studies for yield and yield attributing characters in brinjal (*Solanum melongena* L.). Plant Archives 11(2): 849-852.

Singh U, Patel JP, Kashyap SP, Singh DK, Goswami A, Tiwari SK and Singh M (2013) Combining ability for yield and other quantitative traits in eggplant. Veg Sci 40(1): 61-64.

Uddin MS, Rahman MM, Hossain MM and Khaleque MMA (2015) Combining ability of yield and yield components in eggplant during summer. Univ J Plant Sci 3(4): 59-66.

Venkata NB, Dubey AK, Tiwari PK and Dabbas MR (2014) Line x Tester analysis for yield components and cercospora leaf spot resistance in brinjal. Elect J Plant Breed 5(2): 230-235

Vavilov NI (1931) The role of Central Asia in the origin of cultivated plants. Bull App Bot Genet Plant Breed 26(3): 3-44.