Full Length Research Article

© 2025, Centre for Advanced Research in Agricultural Sciences
Research Journal of Agricultural Sciences
Volume 16; Issue 06 (Nov–Dec 2025); pp 597–601

ISSN: 0976-1675 (P)
ISSN: 2249-4538 (E)

Studies on Combining Ability and Heterosis for Fruit Yield and Related Traits in Brinjal (*Solanum melongena* L.) through Line × Tester Mating Design

S. Ranjith Raja Ram*[1] and R. Elakkya[2]

[1] Assistant Professor, Plant Breeding and Genetics, Tapioca and Castor Research Station (TCRS), Yethapur, Salem - 636 119, Tamil Nadu, India
[2] Department of Plant Breeding and Genetics, Faculty of Agriculture, Annamalai University, Annamalai Nagar, Tamil Nadu, India

Received: 05 October 2025; Revised accepted: 10 Nov 2025

Abstract

To estimate combining ability, heterosis and nature of gene action involved in the inheritance of fruit yield and its components traits in brinjal by using seven lines and three testers and their resulting 21 hybrids through Line x Tester mating design. The analysis of variance for experimental design revealed highly significant differences among genotypes, parents and hybrids for all the characters, indicating the presence of sufficient amount of genetic variability for the 10 traits studied. Among the parents, based on *per se* performance and gca effect, the lines L4, L1, L7, L2 and the testers T3 were found to be the better for most of the traits studied. Among the hybrids, the crosses L2 x T3, L7 X T3, L4 x T3 and L6 x T3 exhibited high *per se* performance for fruit yield per plant. The high sca status of the hybrids indicated dominance and epistatic interaction. The combining ability variances indicated the preponderance of non - additive gene action, for characters like days to 50% flowering, plant height, number of flowers per cluster, number of fruits per cluster, number of fruits per plant, fruit weight, fruit yield per plant. Hence these characters could be exploited through heterosis breeding. The hybrid L4 x T3 was promising among all the hybrids studied, followed by L7 x T3 which possessed desirable sca. Based on *per se* performance, sca effect and standard heterosis the hybrid L4 x T3 and L7 x T3 can be recommended for hybrid breeding. The use of heterosis breeding or recurrent selection or biparental mating followed by pedigree selection may prove to be effective in simultaneous exploitation of both the type of gene actions for improvement of fruit yield and its attributes in brinjal.

***Key words*:** Line × Tester, *Solanum melongena*, Brinjal, Combining ability, Heterosis, Gene action

Brinjal (*Solanum melongena* L.) belongs to the family of *Solanaceae* and has diploid chromosome number (2n = 2x = 24) widely cultivated as one of the most important vegetable crops in both tropical and sub-tropical areas throughout the world wide. Due to its versatile use in Indian food, brinjal is often described as the "king of vegetables". It is popular among the people of all the social strata and hence it is called as "Vegetable of masses" [1]. According [2-3]. The genus *Solanum* includes about 2000 species belonging to herbs and shrubs. Almost all the varieties belong to the three main botanical varieties under the species *melongena* namely, the *Solanum melangena depressum* variety consist of dwarf brinjal plant, the *Solanum melangena serpentinum* variety consist of long brinjal plant and the *Solanum melangena esculentum* variety consists of round or ovoid varieties.

Fruits are a rich source of various nutrients [4] 100 g of fresh contain 1.4 g protein, 92.7 g moisture, 0.3 g minerals, 0.3 g fat, 1.3 g fibre and 4 g carbohydrates. The mineral components per 100 g serving are 18 mg Ca, 16 mg Mg, 0.47 mg Riboflavin, 0.17 mg Cu, 44 mg S, 52 mg Cl, 0.9 mg Fe, 3 mg Na, 2.4 mg Mn and iodine (7 microgram / kg). The vitamins contained per 100 g edible serving are vitamin A (124 IU), thiamine (0.4 mg), niacin (0.9 mg), vitamin C (12 mg) and chlorine (25 mg) [5]. Health benefits of eggplants, it protects from harmful infection and diseases, including cancer and heart diseases, very good for people at higher risk of bone degradation and osteoporosis, delicious and useful snacks or dietary addition for pregnant women, Regulator of glucose and insulin activity within the body, very good for people trying to lose weight and it bulk up your bowl movements so they pass move easy through the digestive system. Eggplants are rich in natural chemicals called phyto nutrients, which have been known to improve mental health. In addition, eggplants are a source of phenolic compound that act as antioxidant.

In India Andhra Pradesh, Maharashtra, Bihar, Odisha, Karnataka, Gujarat and West Bengal are the major brinjal growing states. In Tamil Nadu, Brinjal cultivation covers an area of 0.15 million hectares including rainfed and irrigated conditions, resulting in a production of 1.96 million tons and a productivity of 13.29 tons per hectare [6].

Earlier, egg plant breeders got relief both on mass selection and pure line selection from the land races for the

***Correspondence to:** S. Ranjith Raja Ram, E-mail: ranjithplantbreeder@gmail.com

Citation: Ram SRR, Elakkya R. 2025. Studies on combining ability and heterosis for fruit yield and related traits in brinjal (*Solanum melongena* L.) through line × tester mating design. *Res. Jr. Agril. Sci*. 16(6): 597-601.

development of improved varieties. It is a fact that selection of parents on the basis of the performance does not necessarily lead to desired result. Therefore, devising a sound breeding strategy to improve the yield of this crop is of supreme importance. The combining ability analysis help breeders in choosing suitable genotypes of parents for hybridization and superior cross combinations through general combining ability (*gca*) and specific combining ability (*sca*) studies. The required goals of increasing productivity as quickly as possible can only be achieved through heterosis breeding that is practicable in this crop [7].

The line x tester mating design [8] is a tool that provides reliable information to study the combining ability of genotypes. It helps in understanding the genetic architecture of various traits, which allows the breeder to design an effective breeding plan for future upgrading of the materials at hand. Therefore, the present study was conducted to identify the potential combinations to obtain superior hybrids with excellent qualities paired with high yields. From this point of view, heterosis and combining ability studies are pre requisite for any plant breeding program that provides the desired information for cultivar improvement or commercial exploitation of heterosis [9].

MATERIALS AND METHODS

The Line x Tester experimental study was carried out in Plant Breeding Farm, Department of Genetics and Plant Breeding, Faculty of agriculture, Annamalai University, Annamalainagar, Chidambaram, Tamil Nadu, India during two seasons April to August 2021 and December to April 2022. The experimental materials comprised of ten genetically diversified brinjal genotypes, out of which seven genotypes used as lines such as Violet brinjal (L_1), Arka keshav (L_2), Bhavani brinjal (L_3), Sevanthipatti brinjal (L_4), Kollampatti brinjal (L_5), Manaparai brinjal (L_6), Kulasai brinjal (L_7) and three genetically diversified genotypes used as testers such as White brinjal (T_1), Large bhavani brinjal (T_2), Arka harshita (T_3) collected from Namakkal, Tamil Nadu and IIHR, Bangalore were used for this studies. These Seven lines and three testers were crossed to generate 21 F_1 hybrids. The observation data was recorded on ten selected plants of each hybrid and parents for all ten characters viz., days to 50% flowering, plant height, number of branches per plant, number of flowers per cluster, number of fruits per cluster, number of fruits per plant, fruit length, fruit weight, fruit breadth and fruit yield per plant. The parents were evaluated based on mean performance as well as gca for different traits. The combining ability analysis was computed as per Kempthorne [8]. Parents/ hybrids that showed negative and significant gca effect were considered for days to 50% flowering.

RESULTS AND DISCUSSION

The line x tester analysis showed predominance of non-additive gene for days to 50% flowering, plant height, number of branches per plant, number of flowers per cluster, number of fruits per cluster, number of fruits per plant, fruit weight, fruit yield per plant. The character fruit length and fruit breadth showed predominance of additive gene action. The analysis of variance on biometrical traits revealed that significant differences among lines and testers in respect of *gca* for all the characters. The significance of *gca* variances thus reflected the importance of non-additive gene action for these traits. Similar results were also reported by Das and Barua [10], Rai and Asati [11]. The differences among hybrids due to interaction between lines and testers in respect of *sca* were also found significant for all the characters in F_1 generation indicating the importance of non-additive gene action. Similar results of gene action for these traits were also reported by Reddy and Patel [12]. The predominant role of non-additive gene action in F_1 generation was observed for all the traits. For all the ten characters the ratio (GCA/SCA) value less than unity except fruit length indicated the predominance of non-additive gene action in the inheritance of these traits and its good for heterosis breeding to improve yield (Table 1).

Days to 50% flowering

The crosses L_1 x T_2 (62.85 days) followed by L_1 x T_3 (63.86 days) and L_1 x T_1 (65.18 days) recorded minimum mean value for days to 50 % flowering. Among the hybrids evaluated, the *sca* effects for this trait varied from L_2 x T_1 (-0.68) to L_5 x T_3 (-7.59) and hybrid L_5 x T_3 (-7.59) showed the maximum significant and negative *sca* effect followed by L_6 x T_1 (-5.78). The crosses (Violet brinjal x Large bhavani brinjal) L_1 x T_2 recorded maximum negative standard heterosis (-7.52 per cent) followed by (Violet brinjal x Arka harshita) L_1 x T_3 (-6.04%).

Plant height (cm)

Among the 21 hybrids, twelve hybrids recorded the significant mean value for this trait. The crosses L_5 x T_2 (57.37 cm) followed by L_5 x T_3 (59.95 cm) recorded minimum plant height. The hybrids L_4 x T_1 (-8.80) recorded maximum negative *sca* effect followed by L_5 x T_2 (-7.03). Fourteen out of twenty-one cross combinations recorded maximum negative significant standard heterosis for this trait. The crosses (Kollampatti brinjal x Large bhavani brinjal) L5 x T2 (Kollampatti brinjal x Large white brinjal) recorded maximum negative standard heterosis.

Number of branches per plant

The hybrids L_4 x T_2 (5.88) followed by L_4 x T_1 (5.51) recorded maximum significant value for this trait. Five hybrids have exceeded the general mean value of 4.61 for this character. The hybrids L_4 x T_2 (0.78) showed the maximum significant and positive *sca* effect. The crosses of (Sevanthipatti brinjal x Large bhavani brinjal) L_4 x T_2 recorded maximum significant positive standard heterosis of (29.30 per cent) followed by (Sevabthipatti brinjal x White brinjal) L_4 x T_1 (21.17 per cent) for this trait.

Number of flowers per cluster

The mean performance was ranged from L_1 x T_2 (6.16) to L_2 x T_3 (7.26) and the hybrid L_2 x T_3 recorded maximum number of flowers per cluster followed by L_1 x T_3 (6.49). The hybrid L_5 x T_1 (0.70) showed the maximum significant and positive *sca* effect of followed by the hybrid L_4 x T_3 (0.60). The cross of L_2 x T_3 (Arka keshav x Arka harshitha) recorded maximum significant positive standard heterosis (26.19 per cent) followed by (Manaparai brinjal x White binjal) L_6 x T_1 (25.67 per cent) and (Violet brinjal x Arka harshitha) L_1 x T_3 (12.80 per cent) for this trait.

Number of fruits per cluster

In the case of hybrids, the maximum number of fruits per cluster was ranged from L_5 x T_3 (4.65) to L_1 x T_1 (5.54) and the hybrid L_1 x T_1 (5.54) recorded maximum of fruits per cluster. The hybrid L_2 x T_3 showed the maximum significant and positive *sca* effect of (0.51) followed by the hybrids L_3 x T_2 (0.48) for this character. The cross of L_1 x T_1 recorded maximum significant positive standard heterosis (63.68 per cent) followed by (Kollampatti brinjal x White brinjal) (52.95 per cent) and (Violet brinjal x Large bhavani brinjal) (50.79 per cent) for this trait.

Table 1 ANOVA for ten characters in brinjal

Source	Df	Days to 50% flowering	Plant height	No. of branches plant^{-1}	No. of flowers per cluster	No. of fruits per cluster	No. of fruits^{-1}	Fruit length	Fruit weight	Fruit breath	Fruit yield plant^{-1}
Replication	2	0.92	0.06	0.12	0.08	0.04*	1.94	0.61	0.64	0.54	0.53
Lines	6	220.79*	138.1*	4.21*	4.86*	5.22**	158.8*	25.68**	1870.3*	13.04*	78658.98*
Testers	2	22.51**	115.07**	1.21**	0.21**	0.80**	110.78**	53.61**	2482.61*	4.79*	71719.46**
L × T	12	62.28**	130.78*	0.60*	0.48**	0.23**	16.96**	1.22**	221.08*	0.74**	8285.21**
Error	60	0.30	0.24	0.09	0.04	0.006	0.36	0.20	0.42	0.23	430.26**
GCA	-	0.90	0.79	0.02	0.03	0.02	1.33	0.47	20.10	0.11	615.85
SCA	-	20.66	43.49	0.16	0.14	0.05	5.52	0.33	73.52	0.16	2623.18
GCA/ SCA	-	0.043	0.018	0.13	0.21	0.48	0.24	1.42	0.27	0.67	0.23

Number of fruits per plant

In case of hybrids, the hybrid L_1 x T_1 (27.99) recorded the maximum number of fruits per plant followed by L_2 x T_1 (26.67) and L_1 x T_3 (25.86) respectively. Among the hybrids, the maximum significant and positive *gca* effect was noticed in L_5 x T_2 (4.33) followed by the hybrid L_3 x T_3 (3.24) and L_6 x T_1 (2.14) for this character. The cross of (Violet brinjal x White brinjal) recorded maximum significant positive standard heterosis (28.12 per cent) followed by (Arka keshav x Violet brinjal) (22.08 per cent).

Fruit length (cm)

The crosses L_2 x T_3 (11.31 cm) recorded maximum fruit length followed by L_4 x T_3 (11.11 cm) and L_6 x T_3 (10.74 cm) respectively. Among the hybrid evaluated, L_4 x T_3 (0.88) recorded significant *sca* effect followed by L_2 x T_2 (0.83). One out of twentyone cross combinations recorded maximum significant positive standard heterosis with (Sevanthipatti brinjal x Arka harsitha) (11.99 per cent) for this trait.

Fruit weight (g)

Among the 21 hybrids ten hybrids have recorded maximum significant value than the general mean value of 104.90 and it was ranging from L_1 x T_1 (106.33 g) to L_4 x T_3 (142.39 g). The crosses L_4 x T_3 recorded (142.39 g) followed by L_5 x T_3 (132.21 g) and L_4 x T_1 (127.90 g) for this trait. The lowest and highest *sca* effects were noticed in the crosses L_6 x T_1 (2.90) and L_7 x T_3 (11.15) respectively. The hybrid L_7 x T_3 (11.15) recorded maximum significant *sca* effect followed by L_6 x T_2 (9.00) and L_2 x T_3 (7.05) for this trait. The cross (Manaparai brinjal x Large bhavani brinjal) L_6 x T_2 recorded maximum significant positive Standard heterosis (36.88 per cent) followed by (Manaparai brinjal x White brinjal) L_6 x T_1 (30.38 per cent) for this trait.

Fruit breadth (cm)

Out of 21 hybrids five hybrids exceeded the general mean value of 5.55 and it ranged from L_4 x T_3 (6.93 cm) to L_6 x T_2 (7.40 cm) and the crosses L_6 x T_2 (7.40 cm) recorded the maximum fruit breadth followed by L_6 x T_1 (7.17 cm) and L_1 x T_2 (7.05 cm) respectively. The crosses L_4 x T_3 (0.59) recorded maximum significant positive *sca* effect for this trait. The cross (Manaparai brinjal x Large bhavani brinjal) recorded maximum significant positive standard heterosis of (128.53 per cent) followed by (Bhavani brinjal x Large bhavani brinjal) (127.70 per cent) for this trait.

Fruit yield per plant (g)

Among the 21 hybrids eight hybrids have exceeded the general mean value of 730.98 and it ranged from L3 x T1 (775.65 g) to L4 x T3 (955.82 g). The hybrid L4 x T3 (955.82 g) recorded maximum fruit yield per plant followed by L5 x T3 (853.26 g) and L7 x T3 (850.25 g). Among the 21 hybrids seven crosses recorded positive *sca* effect. The crosses L_2 x T_3 (71.98) recorded maximum significant positive *sca* effect followed by L_7 x T_3 (49.68). The standard heterosis ranged from (Kulasai brinjal x Arka harshitha) (8.62 per cent) to (Sevanthipatti brinjal x Arka harshitha) (12.33 per cent) and it was maximum with the cross (12.33 per cent) followed by (Arka keshav x Large bhavani brinjal) (11.72 per cent) and (Kulasai brinjal x Arka harshitha) (8.62 per cent) for this trait.

Considering all the growth parameters, the results showed relatively higher in the crosses viz: Thus, the study indicates that (Sevanthipatti brinjal x Arka harshitha) (L_4 x T_3) should be considered for exploitation of hybrid vigour in brinjal for vegetable traits. Similar results were found in Deshmakh *et al*. [13], Badr *et al*. [14].

Among the parents Kulasai brinjal and sevanthipatti brinjal was good general combiner for almost all the yield contributing characters such as plant height, number of flowers per cluster, number of fruits per cluster, number of fruits per plant, fruit length, fruit yield per plant. Arka keshav showed good for earliness and high *gca* for yield contributing characters such number of flowers per cluster, number of fruits per plant, fruit length. These parents were noted as good source of favourable genes for increasing fruit yield per plant through various yield contributing characters and use of these parental lines would be more rewarding for boosting fruit yield in brinjal [15-20].

Based on the *sca* effect three F_1hybrid L_4 x T_3, L_7 x T_3, L_2 x T_3 were identified as promising specific combiners for fruit yield per plant and other characters. Sevanthipatti brinjal x Arka harshita was good specific combiner for days to 50% flowering, plant height, number of flowers per cluster, number of fruits per cluster, fruit length, fruit weight, fruit yield per plant. Kulasai brinjal x Arka harshita was good specific combiner for days to 50% flowering, plant height, number of flowers per cluster, number of fruits per plant, fruit weight, fruit yield per plant. Arka keshav x Arka harshita was good specific combiner for number of flowers per cluster, number of fruits per cluster, fruit weight, fruit yield per plant.

For exploitation of heterosis, the information on *gca* should be supplemented with *sca* and hybrid performance. The estimates of *sca* effects revealed that none of the F_1 hybrids were constantly superior for all the traits. This indicated that the specific combining ability of the F_1 hybrids was not always dependent on the *gca* of the parents involved [21-23].

Fruit yield per plant being the most important attribute exhibited non -additive gene action at the ratio between general combining ability (*gca*) and specific combining ability (*sca*) variance is less than one. Similar results in fruit yield per plant in brinjal also reported by Gangadharan *et al*. [24], for the trait exhibited additive gene action, simple selective would be desirable for improvement of these character as it is flexible. In

the traits where non- additive gene action is present, it is advocated for heterosis breeding. The commercial exploitation of this crop is possible due to the low cost of F_1 seed production and the low seed requirement / unit area [25].

Table 2 Estimates of SCA effects of hybrids in brinjal

F_1 hybrids	Days to 50% flowering	Plant height	No. of branches plant^{-1}	No. of flowers per cluster	No. of fruits per cluster	No. of fruits plant^{-1}	Fruit length	Fruit weight	Fruit breath	Fruit yield plant^{-1}
Violet brinjal × White brinjal	0.04	-6.07**	-0.29	0.07	0.44*	0.09	-0.17	6.13**	0.39	38.38 **
Violet brinjal × large bhavani brinjal	-0.43	5.18**	-0.38*	-0.19	-0.01	0.04	0.00	-1.46**	-0.07	20.94
Violet brinjal × Arka harshita	0.39	0.89**	0.66**	0.12	-0.42*	-0.13	0.17	-4.67**	-0.32	-59.32 **
Arka keshav × White brinjal	-0.68**	0.84**	0.59**	-0.25	-0.19	0.91*	0.48	-7.49**	-0.57	-82.31 **
Arka keshav × Large bhavani brinjal	-0.94**	2.72**	-0.28	-0.31*	-0.12	-1.36**	0.83**	0.44	0.41	10.32
Arka keshav × Arka harshita	1.63**	-3.57**	-0.30	0.56**	0.51**	0.45	-1.31**	7.05**	0.16	71.98 **
Bhavani brinjal × White brinjal	5.14**	5.60**	0.14	-0.32*	-0.03	-3.34**	0.61*	5.13**	-0.54	38.24**
Bhavani brinjal × Large bhavani brinjal	-1.10**	-4.22**	-0.20	0.56**	0.48**	0.10	-0.56*	0.46	0.16	8.03
Bhavani brinjal × Arka harshita	-4.04**	-1.38*	0.05	-0.24	0.08	3.24**	-0.05	-5.59**	0.38	-46.27**
Sevanthipatti brinjal × White brinjal	-0.11	-8.80**	-0.46*	0.04	-0.17	0.88*	-0.53	6.88**	-0.03	9.60
Sevanthipatti brinjal × Large bhavani brinjal	-0.94**	6.70**	0.78**	-0.10	0.05	-0.06	-0.35	-10.69**	-0.57	-40.45**
Sevanthipatti brinjal × Arka harshita	-1.05**	2.10**	-0.32	0.60**	0.46**	-0.81*	0.88**	3.81**	0.59*	30.85**
Kollampatti brinjal × White brinjal	1.38**	12.13**	0.14	0.70**	0.47**	-0.97*	-0.10	-3.08**	0.22	40.73**
Kollampatti brinjal × Large bhavani brinjal	6.22**	-7.03**	-0.09	-0.30*	-0.24	4.33**	0.12	2.94**	-0.15	-25.23**
Kollampatti brinjal × Arka harshita	-7.59**	-5.09**	-0.04	-0.40**	0.08	-3.36**	-0.02	0.14	-0.08	-15.50**
Manaparai brinjal × White brinjal	-5.78**	-1.66**	-0.28	-0.24	0.16	2.14**	-0.31	2.90**	0.56	-11.00**
Manaparai brinjal × Large bhavani brinjal	-2.07**	-1.58**	0.31	0.32*	0.07	-1.62**	-0.13	9.00**	0.22	42.43**
Manaparai brinjal × Arka harshita	7.87**	3.24**	-0.03	-0.09	-0.23	-0.52	0.44	-11.90**	-0.78**	-31.43**
Kulasai brinjal × White brinjal	0.02	-2.04**	0.16	-0.01	-0.36*	0.29	0.02	-10.45**	-0.04	-33.64**
Kulasai brinjal × Large bhavani brinjal	-0.70*	-1.77**	-0.14	0.01	0.29	-1.43**	0.08	-0.69	-0.01	-16.04
Kulasai brinjal × Arka harshita	-0.71**	3.81**	-0.02	0.12**	0.07	1.14**	-0.10	11.15**	0.05	49.68**

Table 3 Evaluation of twenty-one hybrids based on the standard heterosis

Hybrids	Days to 50 % flowering	Plant height	No. of branches plant^{-1}	No. of flowers per cluster	No. of fruits per cluster	No. of fruits plant^{-1}	Fruit length	Fruit weight	Fruit breath	Fruit yield plant^{-1}
	SH	SH	SH	SH	SH	SH	SH	SH	SH	SH
$L_1 \times T_1$	-4.09**	-1.85**	14.43*	-6.20	63.68**	28.12**	-64.91**	-23.69**	117.92**	-32.69**
$L_1 \times T_2$	-7.52**	0.77	-6.52	7.01*	50.79**	2.21	-54.63**	-40.02**	62.00**	-22.58**
$L_1 \times T_3$	-6.04**	-4.08**	19.05**	12.80**	24.51**	18.39**	-20.78**	-18.84**	4.22	-37.84**
$L_2 \times T_1$	2.81**	10.60**	15.38**	-6.03	7.09	22.08**	-37.66**	-38.73**	52.32**	-37.08**
$L_2 \times T_2$	-0.32	0.76	-22.71**	10.66**	9.65	-13.99**	-25.96**	-43.92**	-3.91	11.72**
$L_2 \times T_3$	3.74**	-6.76**	-20.37**	26.19**	8.07	11.25**	-10.40**	-15.69**	88.36**	-16.64**
$L_3 \times T_1$	17.49**	14.03**	5.35	-25.72**	6.89	-29.74**	-57.54**	-21.65**	127.70**	-29.08**
$L_3 \times T_2$	5.57**	-11.37**	-21.10**	7.36*	7.09	-39.65**	-57.88**	-35.88**	85.99**	-16.18**
$L_3 \times T_3$	1.53*	-6.74**	-12.82*	-6.20	-3.54	-8.35**	-21.34**	-16.74**	62.31**	-9.09**
$L_4 \times T_1$	1.26	-6.45**	21.17**	-6.66*	30.02**	9.17**	-64.56**	-8.21**	63.34**	-23.67**
$L_4 \times T_2$	-2.71**	1.82**	29.30**	8.75**	37.20**	-20.83**	-54.29**	-31.71**	50.88**	12.33**
$L_4 \times T_3$	-1.78**	-3.46**	8.06	11.99**	24.90**	-7.31**	11.99**	2.19**	55.30**	-11.79**
$L_5 \times T_1$	16.24**	14.08**	9.67	-8.92**	52.95**	-28.98**	-67.78**	-20.03**	61.59**	-28.07**
$L_5 \times T_2$	20.62**	-23.73**	-14.36*	-8.57**	42.03**	-30.41**	-57.09**	-26.59**	15.45	-8.30**
$L_5 \times T_3$	0.57	-20.30**	-10.40	-9.91**	37.30**	-48.65**	-25.72**	-5.12**	121.52**	-29.58**
$L_6 \times T_1$	3.05**	-3.12**	10.04	25.67**	36.61**	10.90**	-62.32**	30.38**	128.53**	-33.03**
$L_6 \times T_2$	5.73**	-15.34**	4.10	1.80	34.35**	-32.03**	-52.02**	36.88**	49.33**	-22.24**
$L_6 \times T_3$	20.67**	-8.09**	-0.66	-4.87	11.52	-10.03**	-14.89**	28.39**	43.87**	-27.11**
$L_7 \times T_1$	-0.20	1.98**	9.67	-6.03	5.81	6.97**	-61.05**	-36.50**	62.62**	-34.41**
$L_7 \times T_2$	-4.00**	-10.00**	-15.75**	11.88**	25.39**	-26.57**	-51.62**	-40.39**	16.17	8.62**
$7_7 \times T_3$	-1.68**	-1.73**	-10.40	12.34**	4.63	7.87**	-20.54**	8.41**		

CONCLUSION

Among the parents, sevanthipatti brinjal, kulasai brinjal were promising general combiners for fruit yield and other yield contributing traits viz., plant height, number of flowers per cluster, number of fruits per cluster, number of fruits per plant, fruit yield per plant. Based on the *sca* effects, three hybrids viz., L_4 x T_3, L_7 x T_3, L_2 x T_3 were identified as promising specific combiners for major traits. The hybrids Sevanthipatti brinjal x Arka harshitha, Arka keshav x Arka harshitha and Kulasai brinjal x Arka harshitha recorded as superior hybrids based on the magnitude of standard heterosis for fruit yield per plant. The hybrids Violet brinjal x Large bhavani brinjal recorded for days to 50% flowering based on the magnitude of standard heterosis.

Hybrids such as Kollampatti brinjal x White brinjal and Bhavani brinjal x White brinjal identified as tall plant, the crosses Sevanthipatti brinjal x Large bhavani brinjal and Sevanthipatti brinjal x White brinjal score more number of branches per plant. The hybrid Sevanthipatti brinjal x Arka harshitha was identified as the best hybrid since it had significant standard heterosis for most of the traits. The next best hybrids were Kulasai brinjal x Arka harshitha possessed desirable standard heterosis for some traits. It can be concluded from the above results that hybrid Sevanthipatti brinjal x Arka harshitha is the most promisinh hybrid and may be exploited in practical plant breeding program.

LITERATURE CITED

1. Patel KK, Sarnaik DA. 2003. Performance study of long fruited genotypes of brinjal under Raipur condition. *The Orissa Jr. Horticulture* 31(1): 74-77.
2. Bhaduri PN. 1951. Inter-relationship for non-tuberiferous species of Solanum with some consideration on the origin of brinjal (*Solanum melongena* L.). *Indian Jr. of Genetics and Plant Breeding* 11: 75-82.
3. Vavilov NI. 1931. Mexico and Central America as the principal center of origin of cultivated plants of the New World. *Bulletin of Applied Botany GPB* 2(3): 135-199.
4. Hedges LJ, Lister CE. 2007. Nutritional attributes of spinach, silver beet and eggplant. Crop Food Research Confidential, Report No. 1928.
5. Singh N, Singh G, Kalda TS. 1999. Genetic diversity in eggplant. IPGRI News Letter.
6. Anonymous. 2018. Ministry of Agriculture and Farmers Welfare, 2018.
7. Kakizaki Y. 1931. Hybrid vigour in eggplant and its potential utilization. *Jr. Heredity* 21: 253-258.
8. Kempthorne O. 1957. *An Introduction to Genetic Statistics*. John Wiley and Sons. Inc., New York.
9. Singh AP, Chaudhary V. 2018. Genetic analysis for yield and yield contributing characters in brinjal (*Solanum melongena* L.) *Annals of Horticulture* 6(2): 279-283.
10. Das G, Barua NS. 2001. Heterosis and combining ability for yield and its components in brinjal. *Annuals of Agricultural Research* 23: 399-403.
11. Rai N, Asati BS. 2011. Combining ability and gene action studies for fruit yield and yield contributing traits in brinjal. *Ind. Jr. Horticulture* 68: 212-215.
12. Reddy EEP, Patel AI. 2014. Heterosis studies in yield and yield attributing characters in brinjal (*Solanum melongena* L.) *Sch. Jr. Agri. Science* 4: 109-112.
13. Deshmukh JD, Kalpande HV, Kalyankar SV. 2020. Heterosis and combining ability analysis for productivity traits in brinjal (*Solanum melongena* L.). *The Pharma Innovation Journal* 9(11): 177-180.
14. Badr LA, El Nagar MM, Hassan EA, Abeer A, El. Soliman, Ameer MS. 2021. Determination of heteosis in eggplant (*Solanum melongena* L.) Hybrids. *Egypt. Jr. of Appl. Science* 36(3): 25-42.
15. Prakash KT, Shivashankar RT, Gowda PHR. 1994. Line x tester analysis for combining ability in brinjal (*Solanum melongena* L.). *Crop Research* 8(1): 296-301.
16. Patel JA, Godhani PR, Fougat RS. 1994. Combining ability analysis in brinjal (*Solanum melongena* L.). *Gujarat Agriculture University Research Journal* 19(2): 72-77.
17. Padmanabham V, Jagadish CA. 1996. Combining ability studies on yield potential of round fruited brinjal (*Solanum melongena* L.). *Indian Journal of Genetics and Plant Breeding* 56(2): 141-146.
18. Ingale BV, Patil SJ. 1997. Diallel analysis of fruit characteristics in eggplant. *Punjabrao Krishi Vidhyapeeth Research Journal* 21(1): 30-34.
19. Venkatesan V. 2007. Studies on the genetic parameters through diallel analysis in brinjal (*Solanum melongena* L.). *M. Sc. Agri. Thesis*, Annamalai University, Chidambaram.
20. Pachiyappan R, Saravanan K, Kumar R. 2012. Heterosis is yield and yield components in eggplant (*Solanum melongena* L.). *International Journal of Current Agricultural Sciences* 2(6): 17-19.
21. Patil BR, Ajri DS. 1993. Studies on the biophysical factors associated with resistance to shoot and fruit borer (*Leucinodes orbonalis)* in brinjal (*Solanum melongena* L.). *Maharashtra Journal of Horticulture* 7(2): 75-82.
22. Aswani RC, Khandelwal RC. 2005. Combining ability studies in brinjal. *Indian Journal of Horticulture* 62(1): 37-40.
23. Sao A, Mehta N. 2010. Heterosis in relation to combining ability for yield and quality attributes in brinjal (*Solanum melongena* L.). *Electronic Journal of Plant Breeding* 1(4): 783-788.
24. Gangadhara K, Abraham M, Selvakumar R. 2021. Combining ability and gene action for structural and economical traits in brinjal (*Solanum melongena* L.). *Indian Journal of Agricultural Sciences* 91(7): 32-36.
25. Chaudhari BN, Patel AI, Vashi JM. 2020. Study on heterosis over environments in brinjal (*Solanum melongena* L.). *International Journal of Current Microbiology and Applied Sciences* 9(7): 3358-3367.