

Gene action in eggplant landraces and hybrids for yield and quality traits

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ABSTRACT

Combining ability for yield and its components was studied in Line $\times$ Tester crosses involving 14 genotypes of eggplant. The analysis indicated a significant genotypic and environmental variation for all the 15 characters studied. Both general combining ability (GCA) and specific combining ability (SCA) variances showed significant interactions. The genotypes Palamedu Local (L_3), Alagarkovil Local (L_4), Melur Local (L_6) and Annamalai (T_1) were found to be good general combiners and crosses viz $L_3 \times T_3$ (Kariapatty Local $\times$ Punjab Sadabahar), $L_8 \times T_1$ (Nilakottai Local $\times$ Annamalai), $L_4 \times T_1$ (Alagarkovil Local $\times$ Annamalai), $L_6 \times T_2$ (Melur Local $\times$ KKM 1), $L_7 \times T_3$ (Keerikai Local $\times$ Punjab Sadabahar) and $L_7 \times T_2$ (Keerikai Local $\times$ KKM 1) have been identified as good specific combiners for fruit yield and other related traits. These hybrid combinations can be used for commercial exploitation of fruit yield in brinjal.

Keywords: Brinjal; genetic components; combining ability; GCA; SCA

INTRODUCTION

Eggplant or brinjal is a nationally important vegetable which is highly productive and often referred to as poor man's crop belonging to Solanaceae (Sharma et al 2004). India is the major producer of brinjal in the world and it is grown in an area of 0.61 million ha with an estimated annual production of 13.37 MT with a productivity of 17.3 tons per ha. In Tamil Nadu the production was 8.5 lakh tons from 0.75 lakh ha of area (Anon 2010). In view of very high local preferences for colour, shape and taste there are specific

genotypes suited for specific locality. It is not possible to have one common cultivar to suit different localities and local preferences. It is therefore required to improve the yield potential of local types through hybridization to yield good hybrids or varieties. The knowledge of combining ability helps in identifying best combiners, heterosis breeding or to accumulate fixable genes through selection. Such information forms a backbone of any breeding programme. Among several methods Line $\times$ Tester analysis provides information about the

combining ability of genotypes. A knowledge of general combining ability (GCA) and specific combining ability (SCA) helps in choice of parents or hybrids and the nature of gene action provides a basis for choosing an effective breeding methodology (Jay et al 2013). For the development of an effective breeding programme in brinjal one needs to have information about genetic architecture and combining ability effect of different genotypes (Abdul and Singh 2014). In Madurai region hardly any round or oval fruited eggplant is preferred. Generally the preference is for green with white streaks or green with purple streak types, having glossy surface, medium size and round shape in many markets. Local types such as Sedapatty Local, Kariapatty Local, Alagarkovil Local, Palamedu Local, Melur Local, Keerikai, Singampunari Local etc which are grown in this region suffer from low productivity and susceptibility to pests and diseases. Hence there is an urgent need to improve these genotypes or to develop hybrids superior to these types in yield and other characters. To realize such a hybrid one has to be meticulous in selection of parents and their combinations and not just highly distant parents for heterotic purpose. Further in the recent years breeding for regional specificity has acquired the importance in brinjal improvement. In view of this

combining ability analysis was done using ten lines and four testers.

MATERIAL and METHODS

The experimental material comprised 40 F_1 s and 14 parents (10 lines and 4 testers) which were evaluated in RBD with three replications at orchard of Agricultural College and Research Institute, Madurai which is situated at 147 meters amsl. Forty hybrids along with 14 parents were raised in a randomized complete block design with three replications. Cultural practices were followed as per Anon (2005) with a spacing of 60 × 60 cm. Observations were recorded from the five plants selected randomly in each genotype. The data recorded for 15 biometrical traits viz plant height, days to first flowering, number of branches per plant, fruit length, fruit pedicel length, fruit circumference, calyx length, number of fruits per plant, average fruit weight, shoot borer infestation, fruit borer infestation, little leaf incidence, ascorbic acid content, total phenol content and fruit yield per plant in 14 parents and 40 hybrids were used for estimating combining ability.

Combining ability analysis was computed according to Kempthorne (1957). Parents/hybrids that had negative and significant GCA effects were considered for days to first flowering, fruit length, calyx length, shoot and fruit borer infestation and little leaf incidence while for

other traits parents/hybrids with positively significant GCA effects were taken into consideration. Combining ability analysis was carried out by using TNAUSTAT software package.

The selections were made in the F_1 hybrids based on fruit shape, colour, size and yield per plant. The superior hybrids were selected and selfed. The seeds were collected from the selfed fruits and stored for further breeding programme.

RESULTS and DISCUSSION

The analysis of variance revealed highly significant differences among all parents and hybrids for all the characters indicating presence of considerable amount of genetic variability (Table 1). The hybrids vs parents comparison was significant for all the traits revealing the occurrence of heterotic effects. Knowledge on the relative importance of additive and non-additive gene action is essential to a plant breeder for development of an efficient hybridization programme. Panse (1942) suggested that if additive genetic variance is greater the chance of fixing superior genotypes in early segregating generation would be greater whereas if dominant and epistatic interactions are predominant the selection should be postponed to later generation and appropriate breeding techniques should be adopted to obtain useful genotype. From the analysis of combining ability estimates it was observed that non-additive gene action

was operating for all the characters studied in the present study because variance due to general combining ability (GCA) and specific combining ability (SCA) was highly significant (Table 2). Further it was observed that the variance due to SCA was higher in magnitude than GCA for all the traits. Thus it supports the predominance of non-additive gene effects on governing the expression of most of the characters. The results are in accordance with Muthulakshmi (2007), Prakash (2008) and Suneetha (2006) in brinjal.

A total of 14 parents which included ten lines and four testers were evaluated for growth and yield component traits. The potential of a variety is judged by comparing the mean performance and combining ability of the parents. In the parents having high GCA the effect was due to additive gene action and fixable. Therefore in the present study the parents were evaluated based on mean performance and GCA effect both individually and in combination.

General combining ability estimates are presented in Table 3. The line L_5 (Palamedu Local) was adjudged as the best general combiner since it expressed significant GCA effects for 9 traits viz days to first flowering, number of branches per plant, fruit pedicel length, fruit circumference, number of fruits per plant, average fruit weight, shoot borer infestation, little leaf incidence and fruit yield per plant.

Table 1. Details of the parents used in the study

Name of the local type	Source	Symbol
Line		
Alavayal Local	Alavayal, Madurai, Tamil Nadu	L ₁
Sedapatty Local (Green)	Sedapatty, Madurai, Tamil Nadu	L ₂
Kariapatty Local	Kariapatty, Virudhunagar, Tamil Nadu	L ₃
Alagarkovil Local	Alagarkovil, Madurai, Tamil Nadu	L ₄
Palamedu Local	Palamedu, Madurai, Tamil Nadu	L ₅
Melur Local	Melur, Madurai, Tamil Nadu	L ₆
Keerikai Local	Sempatty, Dindigul, Tamil Nadu	L ₇
Nilakottai Local	Nilakottai, Dindigul, Tamil Nadu	L ₈
Singampunari Local	Singampunari, Virudhunagar, Tamil Nadu	L ₉
Sedapatty Local (Blue)	Sedapatty, Madurai, Tamil Nadu	L ₁₀
Tester		
Annamalai	Vegetable Research Station, Palur, Tamil Nadu	T ₁
KKM 1	Agricultural College and Research Institute, Tuticorin, Tamil Nadu	T ₂
Punjab Sadabahar	TNAU, Coimbatore, Tamil Nadu	T ₃
EP 65	Vegetable Research Station, Palur, Tamil Nadu	T ₄

Table 2. Magnitude of variance for yield components

Character	GCA variance	SCA variance	$\hat{\sigma}^2 A$	$\hat{\sigma}^2 D$	Ratio of $\hat{\sigma}^2 A:\hat{\sigma}^2 D$
Plant height (cm)	67.02	98.15	2.91	98.15	0.02
Days to first flowering	2.06	14.97	0.20	14.97	0.01
# branches/plant	4.52	17.34	0.26	17.34	0.01
Fruit length (cm)	-0.01	2.15	0.05	2.15	0.02
Fruit pedicel length (cm)	0.07	0.41	0.03	0.41	0.07
Fruit circumference (cm)	1.17	4.40	0.06	4.40	0.01
Calyx length (cm)	0.15	0.38	0.007	0.38	0.01
# fruits/plant	11.80	62.29	0.75	62.29	0.01
Average fruit weight (g)	19.12	51.88	0.83	51.88	0.01
Shoot borer infestation (%)	5.48	19.66	0.25	19.66	0.01
Fruit borer infestation (%)	1.58	18.65	0.03	18.65	1.60
Little leaf incidence (%)	6.61	26.49	0.32	26.49	0.01
Ascorbic acid content (mg/100g)	1.45	6.84	0.09	6.84	0.01
Total phenols content (mg/100g)	47.28	159.27	1.67	159.27	0.01
Fruit yield/plant (kg)	0.02	0.20	0.02	0.20	0.10

Table 3. General combining ability effects of parents

Parent	Plant height (cm)	Days to first flowering	# branches /plant	Fruit length (cm)	Fruit pedicel length (cm)	Fruit circumference (cm)	Calyx length (cm)
Line							
L ₁	11.29**	1.30*	0.24	0.31**	-0.11*	1.78**	-0.18**
L ₂	13.92**	3.14**	-2.87**	0.25**	-0.42**	-0.48*	-0.32**
L ₃	6.51*	3.19**	-2.23**	-0.27**	0.38**	-2.08**	0.59**
L ₄	1.14	-3.16**	-0.35	0.53**	0.28**	-1.31**	0.63**
L ₅	-7.68**	-2.16**	3.53**	-0.07	0.39**	1.79**	0.38**
L ₆	-9.69**	-3.48**	3.03**	-0.25**	0.41**	0.69**	0.39**
L ₇	5.36*	-1.03	2.26**	-0.04	-0.80**	-0.55**	-0.46**
L ₈	-2.20	1.52**	-0.12	1.26**	-0.41**	-0.91**	-0.68**
L ₉	-7.83**	-1.29*	0.66	-0.64**	0.23**	0.16	-0.27**
L ₁₀	-10.83**	1.97**	-4.13**	-1.08**	0.05	0.89**	-0.07
SE	2.66	0.52	0.49	0.08	0.04	0.19	0.05
Tester							
T ₁	1.54	-0.96**	1.32**	-0.71**	-0.02	0.86**	-0.07
T ₂	-2.01	-0.17	1.34**	0.08	-0.15**	-0.05	-0.15**
T ₃	0.48	0.26	-1.05**	-0.05	0.02	-0.95**	0.14**
T ₄	-0.01	0.86*	-1.61**	0.68**	0.15**	0.14	0.08*
SE	1.68	0.33	0.31	0.05	0.02	0.12	0.03

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

Table 3. General combining ability effects of parents (contd...)

Parent	# fruits/plant	Average fruit weight (g)	Shoot borer infestation (%)	Fruit borer infestation (%)	Little leaf incidence (%)	Ascorbic acid content (mg/100 g)	Total phenol content (mg/100 g)	Fruit yield/plant (kg)
Line								
L ₁	-4.73**	6.34**	-3.33**	-0.40	1.38**	2.90**	-4.95**	-0.07*
L ₂	2.10**	-0.98	0.38	-2.45**	0.74**	0.35**	-4.66**	0.07*
L ₃	-6.12**	-4.74**	-5.91**	1.26**	-2.73**	0.51**	1.94**	-0.45**
L ₄	4.53**	2.20**	0.81**	-1.86**	-4.71**	-0.41**	8.96**	0.30**
L ₅	8.13**	4.17**	-0.67*	-0.76	-3.61**	-0.46**	0.64	0.43**
L ₆	-0.21	-1.05	-1.20**	0.25	-2.77**	-0.17	5.87**	-0.04
L ₇	-2.57**	5.48**	0.58*	-1.28**	1.67**	0.19	18.28**	0.06*
L ₈	4.47**	-10.28**	3.01**	3.36**	2.44**	-1.57**	-11.06**	0.03
L ₉	0.41	-3.95**	3.62**	5.03**	2.02**	1.01**	-10.24**	-0.06*
L ₁₀	-6.03**	2.80**	2.71**	-3.16**	5.57**	-2.35**	-4.77**	-0.27**
SE	0.39	0.57	0.28	0.42	0.26	0.11	0.58	0.02
Tester								
T ₁	1.44**	0.11	0.52**	-0.68*	0.56**	1.14**	-0.48	0.11**
T ₂	3.43**	-0.78*	1.29**	-0.51	-0.10	-0.07	0.34	0.15**
T ₃	-4.13**	2.12**	-0.34	1.59**	-2.05**	0.31**	-1.54**	-0.17**
T ₄	-0.74**	-1.46**	-1.47**	-0.41	1.59**	-1.38**	1.69**	-0.09**
SE	0.25	0.36	0.17	0.26	0.16	0.07	0.37	0.01

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

This was followed by L_4 (Alagarkovil Local) which showed good general combining ability for the traits viz days to first flowering, fruit pedicel length, number of fruits per plant, average fruit weight, fruit borer infestation, little leaf incidence, total phenol content and fruit yield per plant. Among the lines Alavayal Local (L_1) and Sedapatty Local Green (L_2) were also considered as good general combiners because they had high GCA values for seven characters.

Among the testers, T_1 (Annamalai) was adjudged to be the good general combiner as it showed significantly favourable GCA effect for days to first flowering, number of branches per plant, fruit length, fruit circumference, number of fruits per plant, fruit borer infestation, ascorbic acid content and fruit yield per plant. From the above points it is inferred that Palamedu Local (L_5), Alagarkovil Local (L_4), Melur Local (L_6) and Annamalai (T_1) among parents were found to be best general combiners since they expressed good GCA effects for majority of the traits including growth, yield and quality characters.

Evaluation of parents based on mean and GCA effects might result in identification of different sets of parents as promising ones. Hence combination of per se performance and GCA effects will result in the selection of parents with good reservoir of superior genes. Parents with high mean may not be able to transmit

their superior traits into hybrids and hence they insist for need for combining ability of parents also. Hence both per se and GCA effects were taken into account for parental selection. Parents with desirable mean and GCA effects for various traits are given in Table 4. On the basis of mean values and GCA effects together the line Palamedu Local (L_5) possessed high mean value and GCA effects for seven characters viz days to first flowering, fruit circumference, average fruit weight, shoot borer infestation, little leaf incidence and fruit yield per plant. It was followed by Alavayal Local (L_1) and Keerikai Local (L_7) which showed significantly high mean value and GCA effects for five and four traits respectively.

Among the testers Annamalai (T_1) was identified as best parent since it showed high mean and GCA effects for six traits viz number of branches per plant, fruit length, number of fruits per plant, fruit borer infestation, ascorbic acid content and fruit yield per plant. An analysis of per se performance and GCA effects of the parents with regard to fruit yield per plant and other desirable traits revealed that production of elite hybrids with the aforesaid parents will lead to fixation of heterotic effects through the isolation of high yielding homozygous lines in advance generation. Chaudhary and Malhotra (2000) also reported the production of hybrids in crosses involving both the parents with high per se and GCA effects for yield and its component traits in brinjal. Similarly

Table 4. Specific combining ability effects of hybrids

Hybrids	PH	DFF	NB/ P	FL	FPL	FC	CL
$L_1 \times T_1$	-13.03*	-2.80**	2.62*	0.17	-0.12	-1.46**	-0.36**
$L_1 \times T_2$	-2.48	-0.08	-0.07	-0.29	-0.36**	1.02**	-0.13
$L_1 \times T_3$	-2.68	1.58	-1.36	-0.25	0.79**	0.96*	0.53**
$L_1 \times T_4$	18.19**	1.30	-1.19	0.37*	-0.31**	-0.52	-0.04
$L_2 \times T_1$	13.08*	2.82**	-1.51	1.42**	-0.33**	2.28**	0.06
$L_2 \times T_2$	-5.44	-2.98**	-0.91	-1.29**	-0.11	-0.62	0.22
$L_2 \times T_3$	0.13	4.10**	0.54	-0.39*	-0.14	-0.82*	0.08
$L_2 \times T_4$	-7.77	-3.94**	1.88	0.26	0.58**	-0.83*	-0.37**
$L_3 \times T_1$	8.55	4.48**	1.59	0.32	-0.76**	0.53	-0.66**
$L_3 \times T_2$	0.34	5.67**	-0.58	-0.11	-0.42**	-0.04	-0.26*
$L_3 \times T_3$	-3.44	-4.44**	-2.11*	0.47**	-0.15	-0.21	0.06
$L_3 \times T_4$	-5.46	-5.71**	1.11	-0.68**	1.32**	-0.28	0.87**
$L_4 \times T_1$	1.83	-1.28	3.37**	-0.30	-0.17*	1.79**	0.25*
$L_4 \times T_2$	-3.15	-1.31	2.32*	-0.09	-0.54**	0.75	0.08
$L_4 \times T_3$	3.92	1.76	-3.52**	-1.43**	-0.00	-0.69	-0.64**
$L_4 \times T_4$	-2.59	0.83	-2.15*	1.81**	0.72**	-1.85**	0.31*
$L_5 \times T_1$	-2.62	-2.13*	-3.90**	-0.05	-0.02	-0.50	-0.20
$L_5 \times T_2$	-0.44	0.44	0.03	-0.42*	-0.31**	-0.95*	-0.47**
$L_5 \times T_3$	7.13	3.88**	2.11*	0.03	-0.01	1.12**	0.89**
$L_5 \times T_4$	-4.07	-2.20*	1.81	0.43*	0.34**	0.33	-0.22
$L_6 \times T_1$	4.25	2.59*	-3.47**	-1.49**	0.96**	-0.46	-0.24*
$L_6 \times T_2$	1.94	-1.56	1.97*	3.50**	0.67**	-0.90*	0.58**
$L_6 \times T_3$	-14.13**	-1.06	0.91	-0.20	-0.64**	-0.80*	0.21
$L_6 \times T_4$	7.94	0.03	0.59	-1.81**	-0.99**	2.17**	-0.55**
$L_7 \times T_1$	-5.83	4.52**	-2.08 *	-0.48**	0.16	-0.23	0.29*
$L_7 \times T_2$	4.19	1.11	1.74	1.03**	0.73**	1.69**	-0.19
$L_7 \times T_3$	5.42	-6.12**	-0.66	-0.99**	-0.25**	0.96*	-0.46**
$L_7 \times T_4$	-3.78	0.48	1.00	0.45*	-0.64**	-2.42**	0.36**
$L_8 \times T_1$	-1.24	-8.00**	3.45**	-0.50**	0.35**	-0.74	0.16
$L_8 \times T_2$	-4.85	1.00	-0.39	-2.26**	0.58**	-1.10**	-0.11
$L_8 \times T_3$	2.72	-2.46*	1.20	2.67**	-0.84**	0.10	-0.21
$L_8 \times T_4$	3.38	9.46**	-4.26**	0.08	-0.09	1.74**	0.16
$L_9 \times T_1$	-2.85	1.63	4.08**	0.03	-0.26**	-1.19**	0.44**
$L_9 \times T_2$	7.38	-0.74	-4.69**	-0.56**	0.01	-1.26**	0.00
$L_9 \times T_3$	-1.04	2.59*	1.11	0.65**	0.84**	0.69	-0.57**
$L_9 \times T_4$	-3.49	-3.49**	-0.49	-0.12	-0.59**	1.76**	0.13
$L_{10} \times T_1$	-2.13	-1.84	-4.09**	0.88**	0.18*	-0.01	0.25*
$L_{10} \times T_2$	2.51	-1.56	0.58	0.48**	-0.25**	1.43**	0.30*
$L_{10} \times T_3$	1.95	0.16	1.81	-0.57**	0.41**	-1.32**	0.10
$L_{10} \times T_4$	-2.33	3.23**	1.70	-0.79**	-0.34**	-0.10	-0.65**
SE	5.32	1.05	1.20	0.17	0.08	0.38	0.11

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Table 4. Specific combining ability effects of hybrids (contd...)

Hybrids	NF/P	AFW	SBI	FBI	LLI	ACC	TPC	FY/P
L ₁ × T ₁	6.95**	8.88**	4.91**	-1.34	2.07**	-0.37	1.57	0.71**
L ₁ × T ₂	-5.98**	-5.01**	-2.78**	1.27	-3.57**	-0.20	-2.65*	-0.46**
L ₁ × T ₃	-2.55**	3.25**	-4.11**	1.50	-3.02**	0.74**	3.09*	-0.13*
L ₁ × T ₄	1.58*	-7.12**	1.98**	-1.43	4.52**	-0.16	-2.01	-0.12*
L ₂ × T ₁	7.54**	-5.21**	-0.67	4.02**	2.01**	-0.68**	10.98**	0.16**
L ₂ × T ₂	-11.26**	2.01	5.59**	-0.35	-0.12	0.88**	18.87**	-0.52**
L ₂ × T ₃	7.02**	2.60*	-2.19**	-0.99	-3.89**	-0.97**	13.72**	0.51**
L ₂ × T ₄	-3.32**	0.60	-2.74**	-2.69**	2.00**	0.77**	-21.61**	-0.15**
L ₃ × T ₁	6.03**	-5.95**	1.44*	-1.19	-0.31	0.02	9.34**	0.06
L ₃ × T ₂	-6.94**	-4.12**	-2.49**	4.04**	-0.24	-2.01**	-9.39**	-0.43**
L ₃ × T ₃	6.42**	10.53**	-2.39**	-3.97**	-3.91**	0.72**	7.77**	0.63**
L ₃ × T ₄	-5.52**	-0.47	3.43**	1.12	4.46**	1.26**	-7.72**	-0.27**
L ₄ × T ₁	3.08**	4.52**	-7.04**	3.76**	-2.05**	-0.79**	4.09**	0.26**
L ₄ × T ₂	4.03**	-2.86*	-1.11	1.54	-1.48**	1.64**	-0.08	0.14*
L ₄ × T ₃	-4.31**	-5.02**	5.40**	-2.93**	4.35**	-0.47*	-4.18**	-0.37**
L ₄ × T ₄	-2.81**	3.36**	2.76**	-2.37**	-0.82	-0.38	0.18	-0.03
L ₅ × T ₁	-11.37**	7.78**	-0.77	-5.82**	3.56**	2.09**	-9.24**	-0.56**
L ₅ × T ₂	0.98	2.17	0.97	0.32	4.43**	-0.70**	4.76**	0.04
L ₅ × T ₃	6.31**	-4.33**	0.13	-3.64**	-3.53**	-1.04**	-5.68**	0.38**
L ₅ × T ₄	4.04**	-5.62**	-0.32	9.14**	-4.45**	-0.35	10.16**	0.14*
L ₆ × T ₁	-4.57**	-1.49	2.99**	2.82**	-6.30**	2.63**	-16.57**	-0.32**
L ₆ × T ₂	4.85**	3.72**	-4.26**	-6.05**	0.21	-1.15**	0.85	0.41**
L ₆ × T ₃	-2.13**	-1.67	3.46**	6.15**	4.74**	-1.12**	3.35**	-0.16**
L ₆ × T ₄	1.85*	-0.56	-2.18**	-2.91**	1.35*	-0.38	12.37**	0.07
L ₇ × T ₁	-10.8**	-3.11**	1.48*	3.27**	1.40*	-0.01	4.12**	-0.77**
L ₇ × T ₂	8.24**	10.71**	0.74	-1.19	-4.24**	-1.64**	5.06**	0.91**
L ₇ × T ₃	1.13	-7.17**	-1.28*	-1.86*	6.59**	1.99**	-10.10**	-0.18**
L ₇ × T ₄	1.46	-0.43	-0.94	-0.22	-3.75**	-0.34	0.92	0.04
L ₈ × T ₁	1.67*	-1.86	4.76**	10.69**	-1.39*	-2.05**	3.32**	0.39**
L ₈ × T ₂	4.86**	-0.27	0.55	4.82**	1.28*	3.03**	-8.37**	-0.24**
L ₈ × T ₃	-0.97	-5.07**	-1.15*	6.32**	-3.07**	-0.91**	5.97**	-0.54**
L ₈ × T ₄	-6.66**	7.20**	-4.16**	-0.45	3.18**	-0.07	-0.92	0.39**
L ₉ × T ₁	5.95**	-3.58**	-4.54**	2.34**	2.94**	1.05**	-11.79**	0.51**
L ₉ × T ₂	9.17**	-2.48*	3.17**	-1.76*	-0.30	0.50*	-5.28**	-0.08
L ₉ × T ₃	1.06	4.18**	2.00**	1.42	3.65**	0.36	-1.16	-0.27**
L ₉ × T ₄	-6.60**	1.87	-0.63	-2.00*	-6.29**	-1.90**	18.23**	-0.16**
L ₁₀ × T ₁	-3.63**	0.02	-2.55**	2.83**	-1.92**	-1.95**	26.14**	-0.45**
L ₁₀ × T ₂	-7.73**	-3.89**	-0.38	-2.64**	4.04**	-0.35	-3.78**	0.24**
L ₁₀ × T ₃	5.97**	2.70*	0.12	-2.00*	-1.91**	0.75**	-12.77**	0.14*
L ₁₀ × T ₄	1.37	1.17	2.80**	1.80*	-0.21	1.55**	-9.59**	0.08
SE	0.77	1.15	0.56	0.84	0.53	0.23	1.17	0.05

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

PH= Plant height, DFF= Days to first flowering, NB/P= 3 branches/plant, FL= Fruit length (cm),

FPL= Fruit pedicel length (cm), FC= Fruit circumference (cm), CL= Calyx length (cm), NF/P= # fruits/plant,

AFW= Average fruit weight (g), SBI= Shoot borer incidence (%), LLI= Little leaf incidence (%), ACC=

Ascorbic acid content (mg/100 g), TPC= Total phenol content

Das and Barua (2001) inferred crosses involving two good general combiners to be of particular merit in practical brinjal breeding programmes and suggested biparental mating among the F_2 progenies for evolving of better genotypes through the combination of desirable attributes. Thus an overview of per se performance and GCA effects of parents revealed that the lines Palamedu Local (L_5), Alavayal Local (L_1) and Keerikai Local (L_7) and the tester Annamalai (T_1) were identified as the good parents for further breeding programme to exploit high yield along with low incidence of pests and diseases.

The prime criterion used for the evaluation of hybrids was based on per se performance of different characters. The hybrid $L_5 \times T_4$ exhibited significantly favourable mean performance for all the growth, yield and quality traits except plant height, fruit pedicel length, average fruit weight, fruit borer infestation and ascorbic acid content. This was followed by $L_7 \times T_2$ which recorded significantly favourable mean values for ten characters viz days to first flowering, number of branches per plant, fruit length, fruit circumference, calyx length, number of fruits per plant, average fruit weight, fruit borer infestation, total phenol content and fruit yield per plant. The next best hybrids were $L_1 \times T_1$, $L_4 \times T_1$, $L_5 \times T_1$ and $L_5 \times T_3$ which recorded significant mean performance for nine characters. The hybrids $L_4 \times T_2$ and $L_6 \times T_2$ can also be considered because these hybrids had significantly favourable mean values for eight

characters. Hence the above said hybrids could be outstanding ones for improving growth, yield and quality traits coupled with lower incidence of pests and diseases.

The estimates of specific combining ability of hybrids are given in Table 3. The SCA effects of hybrids have been attributed to the combination of positive favourable genes from different parents or might be due to the presence of linkage in repulsion phase (Sarsar et al 1986). Hence selection of hybrids based on SCA effects would excel in their heterotic effect. In the present study the hybrid $L_3 \times T_3$ (Kariapatty Local $\times$ Punjab Sadabahar) excelled with superior SCA effect for nine characters viz days to first flowering, number of fruits per plant, average fruit weight, shoot and fruit borer infestation, little leaf incidence, ascorbic acid content, total phenol content and fruit yield per plant. The crosses $L_8 \times T_1$ and $L_4 \times T_1$ were the next best specific combiners for eight traits. They were followed by $L_6 \times T_2$, $L_{10} \times T_3$, $L_7 \times T_3$ and $L_7 \times T_2$ which were identified as specific combiners for seven traits each. In general among the 40 hybrids studied the hybrids $L_3 \times T_3$ (Kariapatty Local $\times$ Punjab Sadabahar), $L_8 \times T_1$ (Nilakottai Local $\times$ Annamalai), $L_4 \times T_1$ (Alagarkovil Local $\times$ Annamalai), $L_6 \times T_2$ (Melur Local $\times$ KKM 1), $L_7 \times T_3$ (Keerikai Local $\times$ Punjab Sadabahar) and $L_7 \times T_2$ (Keerikai Local $\times$ KKM 1) were the good specific combiners for majority of growth and yield attributing characters including fruit yield.

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