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Full Research Article

Combining Ability Studies in Brinjal (*Solanum melongena* L.)

Tinku Kumar Sharma[1*], Satish Chandra Pant[1], Sandeep Kumar[1&2], Ajay Paliwal[1], Pankaj Bahuguna[3] and Harish Chandra Badhani[1]

[1]Dept. of Vegetable Science, College of Horticulture, Uttarakhand University of Horticulture and Forestry Bharsar, Pauri Garhwal, Uttarakhand (246 123), India
[2]ICAR-IARI Regional Station, Katrain, Kullu Valley, Himachal Pradesh (175 129), India
[3]Dept. of Basic Sciences and Humanities, College of Horticulture, V.C.S.G. Uttarakhand University of Horticulture and Forestry, Bharsar, Pauri Garhwal, Uttarakhand (246 123), India

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Correspondence to

E-mail: tksharma13128@gmail.com

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Abstract

Six diverse brinjal lines were crossed in a diallel fashion (excluding reciprocals) to obtain fifteen cross combinations to study combining ability for important horticultural traits. Significant differences were observed among genotypes for all the traits studied. The parent Pusa Purple Cluster emerged as good general combiner for day to first flowering, days to 50% flowering, days to first harvesting, per cent fruit set and number of fruits plant^{-1}. Whereas, the Arka Shirish was identified as good for plant height, plant stem girth, number of primary branches plant^{-1}, fruit length, fruit diameter and average fruit weight. Similarly Pant Samrat was good for number of flowers cluster^{-1} and yield plant^{-1}. The highest specific combining ability effects in desirable direction were observed in cross Pusa Purple Cluster×Pant Samrat for days to first flowering, days to 50% flowering, days to first harvesting, plant height and per cent fruit set, Pusa Purple Cluster×Arka Shirish for plant stem girth, Pusa Purple Cluster×Arka Kusmakar for number of primary branches plant^{-1}, Arka Neelkanth×Arka Kusmakar for fruit length (cm), Arka Shirish×Arka Kusmakar for fruit diameter, Arka Neelkanth×Arka Kusmakar for average fruit weight, Arka Nidhi×Arka Shirish for number of flowers cluster^{-1} and cross Pusa Purple Cluster×Pant Samrat for number of fruits plant^{-1} and yield plant^{-1}.

1. Introduction

Brinjal (*Solanum melongena* L.) is an important year round widely consumed vegetable in tropical and subtropical regions of globe. It is a versatile crop adapted to different agro-climatic regions and can be grown throughout the year. Brinjal cultivated extensively in different parts of India and considered to be one of the most remunerative vegetables (Pramanik et al., 2012). In India, over an area of 0.72 mha with annual production of 13.44 mt (Anonymous, 2014) occupied by brinjal. Earlier, eggplant breeding was relied both on mass selection and pureline selection from the land races for the development of improved varieties. It is a fact that selection of parents on the basis of their performance does not necessarily lead to desired results. 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 as parents for hybridization and superior cross combinations through general combining ability (GCA) and specific combining ability (SCA) studies, respectively. Hence, present investigation was undertaken to study the combining ability in brinjal for horticultural traits.

2. Materials and Methods

The present experiment was carried out at Uttarakhand University of Horticulture and forestry, Bharsar, Uttarakhand (India). The experimental materials comprised of six genetically diverse homozygous brinjal lines namely, Arka Neelkanth, Pusa Purple Cluster, Arka Nidhi, Pant Samrat, Arka Kusmakar and Arka Shirish along with its 15 F_1 hybrids generated by half-diallel in all possible combinations excluding reciprocals. The seeds of 15 F_1 hybrids and six parents were sown for raising seedling and 30-days-old seedlings were transplanted in a randomized block design with three replications during *kharif* 2014−2015. All recommended agronomic practices were followed to raise a good crop. The observations were recorded on five randomly selected plants of parents and F1 in each replication for important horticultural traits i.e. days to

first flowering, days to 50% flowering, days to first harvesting, plant height (cm), plant stem girth (cm), number of primary branches plant^{-1}, fruit length (cm), fruit diameter (cm), average fruit weight (g), number of flowers cluster^{-1}, per cent fruit set, number of fruits plant^{-1} and yield plant^{-1} (kg). Mean data was subjected for analysis of gca and sca as per method given by Griffing (1956) (method 2 and model II).

3. Results and Discussion

Analysis of variance for GCA and SCA presented in Table 1

Table 1: Analysis of variance for combining ability of earliness and growth traits in Brinjal

SV	d.f	DFF	*DF	DFH	PH (cm)	PSG (cm)	NPBP
GCA	5	27.30*	23.86*	119.61*	617.93*	0.57*	0.40*
SCA	15	15.34*	16.77*	30.52*	220.56*	0.19*	0.23*
Error	40	0.96	0.47	3.05	6.38	0.02	0.01

SV: Source of variation; DFF: Days to first flowering; *DF: Days to 50% flowering; DFH: Days to first harvesting; PH: Plant Height; PSG: Plant stem girth; NPBP: Number of primary branches plant^{-1}; *: Significant at (p=0.05) level of significance

and 2 revealed that mean sum of squares of general and specific combining ability for various traits were highly significant.

3.1. General and specific combining ability effects

Estimates of general Specific combining ability combining ability for various traits have been presented in Table 3, 4 and Table 5, 6, respectively.

3.1.1. Days to first flowering

For days to first flowering the parents, Pusa Purple Cluster (-2.44) and Arka Nidhi (-1.78) were found good general combiners as they exhibited the significant negative GCA effects (Table 3). On the other hand, Arka Neelkanth (2.43), Pant Samrat (1.39) exhibited significant positive GCA effects indicated their poor general combining ability. Out of the total fifteen cross combinations, four crosses viz., Pusa Purple cluster×Pant Samrat (-7.31), Arka Neelkanth×Arka Shirish (-5.94), Arka Nidhi×Arka Shirish (-5.06), and Arka Nidhi×Arka Kusmakar (-4.85) exhibited significant negative SCA effects indicated their good specific combining ability (Table 5). Similar findings were also observed by Singh and Mourya (2005); Sao and Mehta (2010).

Table 2: Analysis of variance for combining ability of yield traits in Brinjal

SV	d.f	FL (cm)	FD (cm)	AFW (g)	NFC	PFS	NFP	YP (kg)
GCA	5	35.53*	0.57*	1026.30*	2.49*	351.88*	74.85*	0.15*
SCA	15	12.97*	0.12*	236.20*	0.72*	53.58*	19.25*	0.14*
Error	40	0.18	0.01	1.61	0.10	1.29	2.1	0.03

SV: Source of variation; FL: Fruit length; FD: Fruit diameter; AFW: Average fruit weight; NFC: No. of flowers cluster^{-1}; PFS: Percent fruit set; NFP: No. of fruits plant^{-1}; YP: Yield plant^{-1}; *: Significant at (p=0.05) level of significance

3.1.2. Days to 50% flowering

In case of this trait the parents, Pusa Purple Cluster (-2.11) and Arka Nidhi (-1.74) were found good general combiners as they exhibited the significant negative GCA effects (Table 3). On the other hand, Arka Neelkanth (2.35) and Pant Samrat (1.39) exhibited significant positive GCA effects indicated their poor general combining ability. Whereas cross combinations, Pusa Purple Cluster×Pant Samrat (-7.55), Arka Neelkanth×Arka Shirish (-6.34), Arka Nidhi×Arka Kusmakar (-5.26), Arka Nidhi×Arka Shirish (-4.92) and Pusa Purple Cluster×Arka Kusmakar (-3.55), exhibited significant negative SCA effects indicated their good specific combining ability (Table 5). Early flowering in hybrids has also been reported by Singh et al. (2003); Biswajit et al. (2004); Kumar et al. (2012); Raghvendra et al. (2014).

Table 3: Estimates of general combining ability (GCA) effects of parents for earliness and growth traits in Brinjal

Parameters → / Parents ↓	DFF	DF	DFH	PH (cm)	PSG (cm)	NPBP
Arka Neelkanth	2.43*	2.35*	4.13*	0.92	0.03	0.04
Pusa Purple Cluster	-2.44*	-2.11*	-4.54*	-1.87*	-0.04*	-0.01
Arka Nidhi	-1.78*	-1.74*	-3.25*	-7.25*	-0.05*	-0.41*
Pant Samrat	1.39*	1.39*	2.71*	2.77*	0.04*	0.09*
Arka Shirish	0.14	0.06	3.54*	15.11*	0.14*	0.27*
Arka Kusmakar	0.26	0.06	-2.58*	-9.67*	-0.10*	0.03
SE (gi)	0.31	0.22	0.58	0.82	0.01	0.04
SEd (gi-gj)	0.48	0.34	0.90	1.26	0.02	0.07
CD (gi-gj) (p=0.05)	0.99	0.71	1.87	2.62	0.04	0.15

DFF: Days to first flowering; DF: Days to 50% Flowering; DFH: Days to first harvesting; PH: Plant height; PSG: Plant stem girth; NPBP: Number of primary branches plant^{-1}; *: Significant at (p=0.05) level of significance

3.1.3. Days to first harvesting

For this trait Pusa Purple Cluster (-4.54), Arka Nidhi (-3.25) and Arka Kusmakar (-2.58) were found good general combiners while Arka Neelkanth (4.13), Arka Shirish (3.54) and Pant Samrat (2.71) exhibited significant positive GCA effects (Table 3) indicated their poor general combining ability. Significant negative SCA showed by five crosses (Table 5) and top four were Pusa Purple cluster×Pant Samrat (-11.07), Arka Nidhi×Arka Shirish (-5.20), Arka Neelkanth×Arka Kusmakar (-4.45) and Arka Nidhi×Arka Kusmakar (-4.41). These crosses involved the parents with good×poor, good×poor, poor×good and good×good, respectively GCA effects. Rai et al. (2005); Bisht et al. (2006); Abdul Majid Ansari1 and Singh (2014) reported similar results for days to first harvesting.

3.1.4. Plant height (cm)

Out of six lines, significant positive GCA effects for plant height were recorded in Arka Shirish (15.11) and Pant Samrat (2.77) indicated their good general combining ability (Table 3). The estimation of specific combining ability effects for plant height revealed that seven hybrid combinations viz., Pusa Purple Cluster×Arka Kusmakar (6.52), Arka Neelkanth×Pant Samrat (9.06), Pant Samrat×Arka Kusmakar (10.43), Pusa Purple Cluster×Arka Shirish (10.79), Arka Nidhi×Arka Shirish (11.36), Arka Nidhi×Arka Kusmakar (22.90) and Pusa Purple Cluster×Pant Samrat (23.72), exhibited significant positive values (Table 5), which indicated that these crosses were good specific cross combinations. Similar findings were also reported by Suneetha et al. (2008); Shanmugapriya et al. (2009); Pachiyappan et al. (2012).

3.1.5. Plant stem girth (cm)

Significant positive GCA effects for plant stem girth were exhibited by the parents Pant Samrat (0.04) and Arka Shirish (0.14), which indicated their good general combining ability (Table 3). Whereas three parents viz., Pusa Purple Cluster (-0.04), Arka Nidhi (-0.05) and Arka Kusmakar (-0.10) were found as poor general combiner due to its significant negative GCA effect for stem girth. The results of specific combining ability effects for stem girth (Table 5) revealed that six hybrid combinations exhibited significant positive values and top three were Pusa Purple Cluster×Arka Shirish (0.24), Arka Nidhi×Arka Kusmakar (0.16) and Pant Samrat×Arka Kusmakar (0.15). Similar results for this trait were also reported by Biswajit et al. (2004).

3.1.6. Number of primary branches plant^{-1}

Significant positive GCA effects for this trait were exhibited by two parents viz., Pant Samrat (0.09) and Arka Shirish (0.27), which indicated their good general combining ability (Table 3) Out of fifteen hybrid combinations, seven hybrids exhibited significant positive SCA values which indicated that these crosses were good specific cross combinations (Table 4 and 5) and top three crosses were Pusa Purple cluster×Arka Kusmakar (0.89), Arka Neelkanth×Pant Samrat (0.51) and Arka Neelkanth×Arka Shirish (0.42). The results of the present study for this trait were supported by the earlier findings of Kamalakkannan et al. (2007); Pachiyappan et al. (2012); Gharge et al. (2016).

3.1.7. Fruit length (cm)

Among all the parents, Arka Neelkanth (1.24), Arka Nidhi (1.31) and Arka Shirish (2.30) were exhibited significant positive GCA effects and which indicated their good general combining ability (Table 4). On other hand, Pant Samrat had non-significant GCA effects and was designated as average general combiner. Out of fifteen hybrid combinations, ten were found good specific cross combinations (Table 6) and the crosses, Arka Neelkanth×Arka Kusmakar (5.48), Arka Nidhi×Arka Kusmakar (3.66), Arka Neelkanth×Pant Samrat

Table 4: Estimates of general combining ability (GCA) effects of parents for yield traits in Brinjal

Parameters → / Parents ↓	FL	FD	AFW	NFC	PFS	NFP	YP (kg)
Arka Neelkanth	1.24*	-0.08*	1.47*	-0.65*	1.98*	-0.90*	0.02
Pusa Purple Cluster	-3.15*	-0.08*	-14.42*	0.13	8.54*	3.32*	-0.01
Arka Nidhi	1.31*	0.05*	5.33*	0.07	-2.46*	-2.03*	-0.03
Pant Samrat	0.22	0.17*	3.08*	0.78*	0.07	2.11*	0.26*
Arka Shirish	2.30*	0.27*	16.11*	-0.64*	-11.27*	-4.66*	-0.12*
Arka Kusmakar	-1.92*	-0.33*	-11.57*	0.31*	3.14*	2.16*	-0.11*
SE (gi)	0.14	0.01	0.41	0.11	0.37	0.30	0.02
SEd (gi-gj)	0.21	0.01	0.64	0.16	0.57	0.46	0.03
CD (gi-gj) (p=0.05)	0.44	0.02	1.33	0.33	1.19	0.96	0.06

FL: Fruit length (cm); FD: Fruit diameter (cm); AFW: Average Fruit weight (g); NFC: Number of flowers cluster^{-1}; PFS: Percent Fruit set; NFP: No. of fruits plant^{-1}; YP: Yield plant^{-1} (kg); *: Significant at (p=0.05) level of significance

Table 5: Estimates of specific combining ability effects of crosses for earliness and growth traits in Brinjal

Parameters → / Crosses ↓	Days to first flowering	Days to 50% flowering	Days to first harvesting	Plant height (cm)	Plant stem girth (cm)	No. of primary branches plant^{-1}
Arka Neelkanth×Pusa Purple cluster	2.98*	1.49*	5.85*	4.46	0.10*	-0.32*
Arka Neelkanth×Arka Nidhi	3.32*	2.79*	6.22*	1.34	-0.09*	-0.37*
Arka Neelkanth×Pant Samrat	0.48	-0.34	-0.41	9.06*	0.12*	0.51*
Arka Neelkanth×Arka Shirish	-5.94*	-6.34*	-4.24*	-1.56	0.05	0.42*
Arka Neelkanth×Arka Kusmakar	-1.06	1.66*	-4.45*	-7.98*	-0.22*	-0.46*
Pusa Purple Cluster×Arka Nidhi	-0.81	-0.76	1.55	4.39	-0.18*	-0.57*
Pusa Purple Cluster×Pant Samrat	-7.31*	-7.55*	-11.07*	23.72*	0.04	0.28*
Pusa Purple Cluster×Arka Shirish	4.27*	4.45*	-0.57	10.79*	0.24*	0.02
Pusa Purple Cluster×Arka Kusmakar	-0.85*	-3.55*	-0.11	6.52*	-0.09*	0.89*
Arka Nidhi×Pant Samrat	1.02	1.74*	6.64*	-7.39*	-0.12*	-0.45*
Arka Nidhi×Arka Shirish	-5.06*	-4.92*	-5.20*	11.36*	0.08*	0.33*
Arka Nidhi×Arka Kusmakar	-4.85*	-5.26*	-4.41*	22.90*	0.16*	0.29*
Pant Samrat×Arka Shirish	3.11*	2.95*	1.51	3.09	-0.01	0.35*
Pant Samrat×Arka Kusmakar	2.32*	1.95*	7.30*	10.43*	0.15*	-0.50*
Arka Shirish×Arka Kusmakar	4.90*	4.62*	7.14*	-4.55	-0.04	-0.58*
SE (sij)	0.86	0.61	1.59	2.24	0.04	0.12
Sed (sij-sik)	1.53	0.90	2.76	3.34	0.06	0.18
Sed (sij-skl)	1.37	0.84	2.20	3.09	0.05	0.16
CD (sij-sik)	3.18	1.87	5.74	6.95	0.12	0.37
CD (sij-skl)	2.84	1.75	4.57	6.43	0.10	0.33

*Significant at (p=0.05) level of significance

(3.04), Arka Neelkanth×Pusa Purple Cluster (2.91) and Arka Nidhi×Arka Shirish (2.76) were the top five combinations with involved the parents with good×poor, good×poor, good×average, good×poor and good×good GCA effects, respectively. These results find support from Aswani and Khandelwal (2005); Bisht et al. (2006); Shanmugapriya et al. (2009); Sharaf Uddin et al. (2015).

3.1.8. Fruit diameter (cm)

Data pertaining to estimates of GCA effects (Table 4) revealed that three parents viz., Arka Nidhi (0.05), Pant Samrat (0.17) and Arka Shirish (0.27) were found good general combiners while parents Arka Neelkanth (-0.08), Pusa Purple Cluster (-0.08) and Arka Kusmakar (-0.33) revealed significant negative GCA effects indicated their poor general combining ability. The estimation of specific combining ability effects for fruit diameter showed that seven hybrid combinations exhibited significant positive values, which indicated that these crosses were good specific cross combiners (Table 6). The crosses, Arka Shirish×Arka Kusmakar (0.36), Pusa Purple Cluster×Arka Nidhi (0.34), Pusa Purple Cluster×Pant Samrat (0.32), Arka Neelkanth×Pant Samrat (0.20) and Arka Nidhi×Arka Shirish (0.13) were the top five combinations which involved the parents with good×poor, poor×good, poor×good, poor×good and good×good GCA effects, respectively. The studies also corroborate with the findings of Bisht et al. (2006); Patel et al. (2013).

3.1.9. Average fruit weight (g)

The estimates of gca effects (Table 4) showed that parents, Arka Neelkanth (1.47), Pant Samrat (3.08), Arka Nidhi (5.33) and Arka Shirish (16.11) were good general combiners while, Pusa Purple Cluster (-14.42) and Arka Kusmakar (-11.57) poor general combiners for average fruit weight. The specific combining ability effects for this trait (Table 6) revealed that ten cross combinations were good specific combiners and the crosses, Arka Neelkanth×Arka Kusmakar (19.09), Arka Nidhi×Arka Kusmakar (14.44), Arka Neelkanth×Pant Samrat (13.79), Arka Nidhi×Arka Shirish (13.45) and Pusa Purple Cluster×Pant Samrat (6.86) were the top five best combinations and involved the parents with good×poor, good×poor, good×good, good×good and poor×good GCA effects, respectively. Earlier reports by Aswani and Khandelwal (2005); Patel et al. (2013); Raghvendra et al. (2014) support

Table 6: Estimates of specific combining ability effects of crosses for yield traits in Brinjal

Parameters → / Crosses ↓	Fruit length (cm)	Fruit diameter (cm)	Average Fruit weight (g)	No. of flowers cluster^{-1}	Percent fruit set	Number of fruits plant^{-1}	Yield plant^{-1} (kg)
Arka Neelkanth×Pusa Purple cluster	2.91*	-0.57*	4.68*	-0.69*	-2.82*	-4.11*	-0.21*
Arka Neelkanth×Arka Nidhi	0.76	0.02	6.73*	-0.97*	-8.64*	-4.80*	-0.39*
Arka Neelkanth×Pant Samrat	3.04*	0.20*	13.79*	0.85*	0.89	4.42*	0.66*
Arka Neelkanth×Arka Shirish	-4.67*	-0.47*	-32.33*	0.82*	-0.85	2.82*	-0.27*
Arka Neelkanth×Arka Kusmakar	5.48*	0.00	19.09*	-0.29	-0.30	-2.66*	0.20*
Pusa Purple Cluster×Arka Nidhi	1.48*	0.34*	5.25*	0.26	2.85*	-0.98	0.06
Pusa Purple Cluster×Pant Samrat	-0.24	0.32*	6.86*	0.43	12.63*	7.67*	0.71*
Pusa Purple Cluster×Arka Shirish	-2.68*	0.04	-14.73*	-0.95*	-2.37*	-3.07*	-0.32*
Pusa Purple Cluster×Arka Kusmakar	-1.68*	-0.16*	-5.38*	-0.15	7.25*	5.36*	0.14*
Arka Nidhi×Pant Samrat	1.06*	-0.27*	0.42	-0.73*	-2.78*	-3.84*	-0.32*
Arka Nidhi×Arka Shirish	2.76*	0.13*	13.45*	1.34*	0.48	3.95*	0.54*
Arka Nidhi×Arka Kusmakar	3.66*	0.12*	14.44*	-0.21	-5.78*	-1.95*	0.20*
Pant Samrat×Arka Shirish	1.88*	0.09*	6.29*	0.89*	-13.96*	-3.41*	-0.23*
Pant Samrat×Arka Kusmakar	1.42*	-0.19*	1.39	-0.22	-0.38	-2.66*	-0.08
Arka Shirish×Arka Kusmakar	2.02*	0.36*	6.46*	-1.23*	-2.21*	-4.66*	-0.14*
SE (sij)	0.38	0.02	1.13	0.29	1.01	0.82	0.06
Sed (sij-sik)	0.57	0.04	1.68	0.43	1.51	1.22	0.09
Sed (sij-skl)	0.53	0.03	1.56	0.40	1.40	1.13	0.08
CD (sij-sik)	1.19	0.08	3.49	0.89	3.14	2.54	0.19
CD (sij-skl)	1.10	0.06	3.24	0.83	2.91	2.35	0.17

*Significant at (p=0.05) level of significance

these findings.

3.1.10. Number of flowers cluster^{-1}

For number of flowers cluster^{-1}, two lines exhibited the significant positive GCA effects, and highest GCA effect recorded in parent Pant Samrat (0.78) (Table 4). While, two parents viz., Arka Neelkanth (-0.65) and Arka Shirish (-0.64) were found as poor general combiners. Among the fifteen cross combinations, four crosses were found as good specific cross combinations and top three crosses were, Arka Nidhi×Arka Shirish (1.34), Pant Samrat×Arka Shirish (0.89) and Arka Neelkanth×Pant Samrat (0.85) (Table 6). These crosses, involved the parents with average×poor, good×poor and poor×good GCA effects, respectively. Similar results had also been reported earlier by Nalini et al. (2011); Kumar et al. (2012); Raghvendra et al. (2014).

3.1.11. Per cent fruit set

Pusa Purple Cluster (8.54), Arka Kusmakar (3.14) and Arka Neelkanth (1.98) were found good general combiners for per cent fruit set. On the other hand, Arka Nidhi (-2.46) and Arka Shirish (-11.27) were assigned as poor general combiners due to their significant negative GCA effects (Table 4). Among fifteen cross combinations, three crosses viz., Pusa Purple Cluster×Pant Samrat (12.63), Pusa Purple Cluster×Arka Kusmakar (7.25) and Pusa Purple Cluster×Arka Nidhi (2.85) revealed significant positive SCA effects (Table 6), indicated their good specific combining ability. Kotur (2013) reported the similar results.

3.1.12. Number of fruits plant^{-1}

For number of fruits plant^{-1}, the parents Pusa Purple cluster (3.32), Arka Kusmakar (2.16) and Pant Samrat (2.11) exhibited the significant positive GCA effects, indicated that these were good general combiners (Table 4). While, three parents viz., Arka Neelkanth (-0.90), Arka Nidhi (-2.03) and Arka Shirish (-4.66) were found as poor general combiners due to their significant negative GCA effects. Out of the fifteen cross combinations, five crosses viz., Pusa Purple Cluster×Pant Samrat (7.67), Pusa Purple Cluster×Arka Kusmakar (5.36), Arka Neelkanth×Pant Samrat (4.42), Arka Nidhi×Arka Shirish (3.95) and Arka Neelkanth×Arka Shirish (2.82) were found as good specific cross combinations due to their significant positive SCA effects (Table 6). These crosses, involved the

parents with good×good, good×good, poor×good, poor×poor and poor×poor GCA effects, respectively. Similar results had also been reported earlier by Suneetha et al. (2008); Patel et al. (2013).

3.1.13. Yield plant^{-1} (kg)

The results of GCA and SCA effects for yield plant^{-1} have been presented in the Table 4 and Table 6, respectively. Among the parents, Pant Samrat (0.26) was found good general combiners due to their significant positive GCA effects. In contrast, Arka Shirish (-0.12) and Arka Kusmakar (-0.11) were designated as poor general combiners due to their significant negative GCA effects. Whereas, remaining three parents viz., Arka Neelkanth, Pusa Purple Cluster and Arka Nidhi had non-significant GCA effects and were assigned as average general combiners. Out of all cross combinations, six crosses viz., Pusa Purple Cluster×Pant Samrat (0.71), Arka Neelkanth×Pant Samrat (0.66), Arka Nidhi×Arka Shirish (0.54), Arka Nidhi×Arka Kusmakar (0.20), Arka Neelkanth×Arka Kusmakar (0.20) and Pusa Purple Cluster×Arka Kusmakar (0.14) revealed significant positive SCA effects, indicated their good specific combining ability and crosses, involved the parents with average×good, average×good, average×poor, average×poor, average×poor, and average×poor GCA effects, respectively. These results were also supported by Shanmugpriya et al. (2009); Pachiyappan et al. (2012); Deshmukh et al. (2015).

4. Conclusion

The parent Pusa Purple cluster emerged as good general combiner for earliness and number of fruits plant^{-1}; Arka Shirish for fruit length, fruit diameter and average fruit weight and Pant Samrat for number of flowers cluster^{-1} and yield plant^{-1}. Based on SCA effects Pusa Purple cluster×Pant Samrat better for earliness, per cent fruit set, number of fruits plant^{-1} and yield plant^{-1}.

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