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Studies on evaluation of per se performance and combining ability in bhendi (*Abelmoschus Eesculentus* (L.) Moench.) through Line x tester analysis

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ABSTRACT
A field experiment consisting of eight lines, five testers and their 40 crosses of bhendi were evaluated for mean values and combining ability effects through line × tester mating method was carried out in Plant Breeding Farm, Department of Genetics and PlantBreeding, Annamalai University, Annamalainagar, Tamilnadu during 2021. The data was observed for eleven yield and yield contributing traits. For per se performance the line IC 104 obtained highest mean values for the traits number of branches per plant, fruit length, average fruit weight, number of fruits per plant, 100 seed weight and fruit yield per plant, line IC 107 obtained highest mean values for the trait days to 50 per cent flowering, fruit girth and number of seeds per fruit, line IC 3052 obtained highest mean value for trait plant height at maturity, line IC 3024 obtained highest mean for trait internodal length and for testers, Arka Anamika obtained highest mean values for the traits plant height at maturity, number of branches per plant, fruit length, average fruit weight, number of fruits per plant, number of seeds per fruit, 100 seed weight and fruit yield per plant, Varsha Uphar obtained highest mean value for the trait internodal length and fruit girth. The line IC 104 has high gca effects for characters days to 50 per cent flowering, plant height, number of branches per plant, fruit length, fruit girth, number of fruits per plant, average fruit weight, number of seeds per plant, 100 seed weight and fruit yield per plant and line IC 3023 for the character internodal length. In tester Arka Anamika has high gca effects for characters plant height at maturity, fruit length, fruit girth, internodal length, number of fruits per plant, average fruit weight, number of seeds per fruit, and fruit yield per plant and tester Arka Abhay for days to 50 per cent flowering, number of branches per plant and 100 seed weight. The hybrid IC 104 × Arka Anamika was identified as the highyielder and most promising specificcombiner followed by IC 107 × Arka Anamika, IC 3052 × Arka Abhay and IC 3025 × Arka Abhay. Gene action based on specific combining ability variance indicate the non-additive type of gene action the best parent and these four crosses can be utilized in breeding programme for the improvement of yield and yield contributing traits.
Key words: *Bhendi, per se performance, combining ability, gca, sca, L × T analysis.*

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INTRODUCTION

India is the world's largest producer of okra with over 60% of the global production. India produces approximately 6 million tonnes of okra per year. The approximate nutrient content of okra per 100 grams: calories - 33 kcal, carbohydrates - 7.5 grams, fiber - 3.2 grams, protein- 2 grams, fat- 0.1 grams, vitamin C- 23 milligrams (38% of the recommended daily intake), vitamin K- 31.3 mg (39% of the recommended daily intake), folate- 60 mg (15% of the recommended daily intake), potassium- 299 mg (9% of the recommended daily intake), magnesium- 57 mg (14% of the recommended daily intake), additionally, okra contains small amounts of other vitamins and minerals such as vitamin A, vitamin B6, calcium, and iron [2]. In addition to its nutritional value, okra is thought to offer potential health well-being, due to its significant fiber content [3].

The possibility of generating new plant varieties from existing populations through the utilization of innovative breeding methods is a viable option. In the context of okra, the primary purpose revolve around producing varieties that yield high-quality crops, exhibit strong resistance to pests and diseases, and have increased overall productivity. Therefore, implementing a hybridization program stands as a valuable approach to address this critical aspiration within this sector.

The information about combining ability is substantial, helping plant breeders in hybridization programme and providing valuable information regarding cross combinations to be exploited commercially. Therefore, presentinvestigation on okra was undertaken with specific objective to evaluate the mean performance of parental lines along with their F_1 hybrids and to estimate combining abilityfor fruit yield and its component traits in bhendi.

MATERIAL AND METHODS

Eight lines *viz.*, IC 3024, IC 3025, IC 104, IC 107, IC 3052, IC 3023, IC 128, IC 3004 werecrossed with five tester's *viz.*, Arka Anamika, Punjab 7, Varsha Uphar, Arka Abhay, and Parbhani Kranti in a line × tester design. The experimental materials consisting of 53 entries including 13 parents (8 lines and 5 testers) and their 40 crosses were raised in a RBD with three replications during June 2021 to August 2021 at the Plant Breeding Farm, Department of Genetics and Plant Breeding, Annamalai University, Annamalainagar, Tamilnadu. Observations on eleven characters *viz.,* days to 50 per cent flowering, plant height at maturity, number of branches per plant, fruit length, fruit girth, internodal length, number of fruits per plant, average fruit weight, number of seeds per fruit, 100 seed weight and fruit yield per plant were recorded on randomly selected five plants of parents and F_1 hybrids. Recommended cultural practiceswere followed. The recorded data is analysed by using statistical software "TNAUSTAT" [7]. The data were analyzedfor combining ability following Kempthorne [5]. The statistical analysis for experimental design was given by method of Panse and Sukhatme [8].

RESULT AND DISCUSSION

Analysis of variance

Analysis of variance revealed that the mean squares due to genotypes were significant for all the characters, which indicated the considerable amount of variability among genotypes for various characters. **(Yogini, D., and Saravanan, K. R., 2020)[18].** The mean squares due to genotypes were further partitioned into parents, hybrids and L×T. The differences between parents were highly significant for all the characters days to 50 per cent flowering, plant height at maturity, number of branches per plant, fruit length, fruit girth, internodal length, number of fruits per plant, average fruit weight, number of seeds per fruit, 100 seed weight and fruit yield per plant. The mean squares due to hybrids were found highly significant for all the characters. L×T comparison was found significant for all the characters implying that there is ample genetic variability for yield and yield component traits as a result of crossing thirteen diverse okra genotypes in a Line × Tester mating design. (Table 1).

Per se performance

Mean data obtained on yield and yield component traits of 13 parents along with their 40 hybridswere presented inTable 2. Significant differences were detected among the parentsand hybrids with respect to all the characters studied.

The general mean performance for **Days to 50% flowering** was 44.90 days for lines, 41.86 days for testers and 42.38 days for F_1 hybrid. Among the parents, IC 107 (39.42 days) gave early flowering followed by IC 104 (40.53 days) while late flowering was observed in IC 128 (48.84 days) among the lines and Punjab 7 (39.42 days) gave early flowering in testers. In case of hybrids cross combination IC 104 × Arka Anamika (34.24 days) found early flowering followed by IC 104 × Punjab 7 (35.21 days) while IC 3024 × Arka Abhay (48.82 days) exhibited late flowering.

Among the parents, the **Plant height at maturity** for lines ranged from IC 3052 (94.76 cm) to IC 3004 (127.45 cm) and among the testers, it ranged from Arka Anamika (102.74 cm) to Parbhani Kranti (121.43 cm). The minimum mean valuewasrecorded by the hybrid IC 3052 × Arka Anamika (98.13 cm) followed by IC 107 × Arka Anamika (98.22 cm) maximum was recorded by IC 3023 × Parbhani Kranti (125.86). The general mean was 110.43 cm for lines, 111.52 cm for testers and 109.53 cm for F_1 hybrid respectively.

For **Number of branches** the general mean was 2.70 registered for lines, 3.31 for testers and 3.81 for the F_1 crosses. The maximum value for this trait was recorded in genotype IC 107 (3.93) followed by IC 104 (3.43) whereas minimum value was found in IC 3023 (2.18) for lines and for testers genotype Arka Anamika (4.06) recorded maximum value. Among the hybrids, maximum value was observed in cross combination IC 107 × Arka Anamika (4.73) followed by IC 104 × Arka Anamika (4.67) while least value was exhibited in IC 3004 × Varsha Uphar (3.12) and IC 3004 × Varsha Uphar (3.12).

In **Fruit length** the general mean was 13.23 cm, 15.45 cm and 15.93 cm for lines testers and F_1 hybrid, respectively. The mean values of lines ranged from IC 3024 (11.65 cm) to IC 104 (14.56 cm) and for testers mean values ranged from Parbhani Kranti (14.39 cm) to Arka Anamika (16.22 cm), mean values of crosses ranged from IC 3024 × Arka Abhay (13.65cm) to IC 104 × Arka Anamika (17.98 cm), The

highest mean value of cross combinations were recorded in IC 104 × Arka Anamika (17.98 cm), followed by IC 107 × Arka Anamika (17.54 cm), IC 3025 × Arka Abhay (17.32 cm), IC 3052 × Arka Abhay (17.32 cm). In case of **Fruit girth** ranged from to IC 3024 (4.26 cm) to IC 107 (5.36 cm) among the lines and Arka Anamika (4.36 cm) to Varsha Uphar (5.02 cm)among the testers. The highest mean valueof hybrids recorded in IC 104 × Arka Anamika (6.52 cm) followed by IC 3052 × Arka Abhay (6.47 cm), IC 107 × Arka Anamika (6.35 cm) and the minimum values was recorded in IC 128 × Parbhani Kranti (4.15 cm). The general mean was registered 4.80 for lines, 4.68 for testers and 5.15 for the F_1 crosses.

The **Internodal length** ranged from IC 3052 (4.93cm) to IC 3024 (6.09 cm) among the lines and in testers minimum value was observed in Punjab 7 (5.67 cm) whereas maximum mean value observed in Varsha Uphar (6.23cm). The mean value of hybrids ranged from IC 3023 × Arka Abhay (4.72) to IC 3024 × Arka Abhay (7.44 cm). The general mean value recorded for lines was 5.48 cm, for testers was 5.96 cm and for F_1 hybrid was 5.87 cm.

The **Number of fruits per plant** ranged from IC 3004 (17.39) to IC 104 (19.34) among the lines and Punjab 7 (18.23) to Arka Anamika (19.98) among the testers. In line the maximum number of fruits per plant observed in IC 104 (19.34) followed by IC 107 (18.97), IC 3025 (18.72) and for testers maximum number of fruits per plant observed in Arka Anamika (19.98) followed by Varsha Uphar (19.95) and minimum found in Punjab 7 (18.23). In the crosses evaluated, the combination of IC 104 × Arka Anamika (28.23) yielded the highest value, with the second-highest value recorded for the cross between IC 107 × Arka Anamika (27.47). The lowest value was found in cross combination of IC 3024 × Arka Abhay (18.32). The general mean registered for lines (18.82), testers (19.52) and for hybrids (21.09) respectively.

While **Average Fruit weight** showed general mean value of 18.44 for lines, 19.35 for testers and 21.12 for F_1 hybrid. Higher mean value on average fruit weight was recorded in lines were IC 104 (19.67 gm) followed by IC 3052 (19.54 gm) while least value was observed in IC 3023 (17.65 gm). Higher mean value on average fruit weight was recorded in testers were Arka Anamika (20.25 gm) followed by Varsha Uphar (19.84 gm) while least value was observed in Parbhani Kranti (19.04 gm). Among hybrids, cross combination IC 104 × Arka Anamika (27.16 gm) recorded maximum average fruit weight proceeded by IC 107 × Arka Anamika (26.53gm) whereas IC 104 × Parbhani Kranti (18.64 gm) showed least value for this trait.

The general mean performance for **Number of seeds per fruit** was 46.92 for lines, was 49.64 for testers and 51.09 for F_1 hybrids. From the lines, IC 107 (55.18) gave highest number of seeds per fruit followed by IC 104 (52.32) whereas least value showed in IC 3004 (39.74). From the testers, Arka Anamika (53.42) gave highest number of seeds per fruit followed by Varsha Uphar (52.65) whereas least value showed in Parbhani Kranti (46.23). In case of hybrids, cross combination IC 104 × Arka Anamika (64.37) found highest number of seeds per fruit followed by IC 107 × Arka Anamika (63.78) while IC 3052 × Punjab 7 (30.52) obtained least number of seeds per fruit.

In the trait **100 seedweight** general mean value was 5.13 g for lines, 6.23 g testers and 6.54 g for F_1 hybrid respectively. The maximum 100 seed weight was recorded in IC 104 (5.96 g) followed by IC 107 (5.74 g) and minimum found in IC 3004 (4.48) for lines and The maximum 100 seed weight was recorded in Arka Anamika (6.92 g) followed by Arka Abhay (6.23 g) and minimum found in Punjab 7 (5.92 g) for testers. Among the hybrids, maximum value was noted in cross combination IC 104 × Arka Anamika (9.83 g) followed by IC 107 × Arka Anamika (9.52 g) while least value was observed in IC 3023 × Parbhani Kranti (4.15 g).

Fruit yield per plant ranged from IC 3004 (317.09 gm) to IC 104 (380.41 gm) and Punjab 7 (348.55 gm) to Arka Anamika (486.59 gm) among lines and testers, respectively. Among the hybrids, the mean values of fruit yield per plant ranged from IC 3024 × Arka Anamika (443.76 gm) to IC 104 × Arka Anamika (647.56 gm). The general mean value was 364.39 for lines, 403.83 for testers and 533.27 for F_1 hybrid respectively. It is concluded thatbased on the mean performance of all of the twelve characters, IC 104 × Arka Anamika, IC 107 × Arka Anamika, IC 3052 × Arka Abhay and IC 3025 × Arka Abhay were found superior hybrids. Similar results were also reported by **Siva Ranjani *et al.*** [13]**,** Janarthanan *et al.* [4], **Vennila *et al*.** [16]**,** Arjun Lal Ola *et al.* [2], Kumar *et al.* [5], Vani *et al.* [15].

Combining ability effects

Finding superior parents and specific cross combinations that can be used for various breeding goals is made easier with knowledge of combining ability the *gca* effect and *sca* effects were estimated for a total of eleven characters. Tables 3 and 4 present the findings of the estimates of general and specific combining ability effects for yield and yield contributing traits.

For the trait Days to 50 per cent flowering for the lines, the genotypes IC 104 (-5.49), IC 107 (-2.03) followed by IC 3025 (-1.0) showed minimum and significantly negative *gca* effect and for the testers, the genotypes Arka Abhay (-1.02), Arka Anamika (-0.78) showed minimum significantly negative *gca* effect in the desired

direction. The hybrids IC 107 × Parbhani Kranti, IC 107 × Varsha Uphar, IC 3052 × Arka Abhay, IC 3024 × Parbhani Kranti, IC 3025 × Punjab 7, IC 3023 × Punjab 7, IC 104 × Punjab 7, IC 128 × Parbhani Kranti, IC 3024 × Varsha Uphar, IC 107 × Arka Anamika, IC 104 × Arka Anamika, IC 3004 × Punjab 7, IC 3052 × Arka Anamika, IC 3004 × Arka Abhay, IC 128 × Arka Abhay, IC 3025 × Arka Abhay, IC 3052 × Varsha Uphar, IC 3025 × Parbhani Kranti, IC 104 × Varsha Uphar show negative *sca* effects. The minimum significant negative *sca* effect was showed in the hybrid IC 107 × Parbhani Kranti (-5.21), IC 107 × Varsha Uphar (-4.66) followed by IC 3052 × Arka Abhay (-3.71). Among the hybrids 14 crosses were negatively significant.

The *gca* for plant height at maturity were found to be minimum and negatively significant in lines IC 104 (-7.13) followed by IC 3052 (-6.15) and in the tester Arka Anamika (-4.77). The hybrids IC 3052 × Punjab 7, IC 104 × Punjab 7, IC 104 × Varsha Uphar, IC 3024 × Varsha Uphar, IC 3023 × Arka Anamika, IC 107 × Parbhani Kranti, IC 3025 × Varsha Uphar, IC 3024 × Arka Anamika, IC 3004 × Varsha Uphar, IC 3004 × Punjab 7, IC 107 × Arka Anamika, IC 3025 × Arka Anamika, IC 3052 × Arka Abhay, IC 107 × Varsha Uphar, IC 104 × Parbhani Kranti, IC 3052 × Arka Anamika, IC 3052 × Parbhani Kranti, IC 3025 × Parbhani Kranti, IC 128 × Arka Anamika, IC 128 × Parbhani Kranti, IC 3025 × Punjab 7 have showed negative *sca* effects. The minimum significant negative *sca* effect was showed in the hybrid IC 128 × Arka Abhay (-7.72), IC 3052 × Punjab 7 (-4.18). Among the hybrids 2 crosses were negatively significant.

The highest positive significant *gca* effect for number of branches per plant was recorded by lines *viz.,* IC 104 (0.42) followed by IC 107 (0.20) and tester Arka Abhay (0.25). The cross combinations IC 3024 × Varsha Uphar, IC 3025 × Arka Abhay, IC 107 × Arka Anamika, IC 3052 × Arka Abhay, IC 107 × Varsha Uphar, IC 3004 × Parbhani Kranti, IC 3024 × Parbhani Kranti, IC 3024 × Punjab 7, IC 3004 × Arka Abhay, IC 128 × Varsha Uphar, IC 3052 × Arka Anamika, IC 104 × Arka Anamika, IC 3023 × Arka Anamika, IC 3023 × Parbhani Kranti, IC 3052 × Punjab 7, IC 3004 × Punjab 7, IC 3025 × Arka Anamika, IC 3025 × Varsha Uphar, IC 128 × Punjab 7, IC 104 × Arka Abhay showing positive *sca* effects for Number of branches per plant. and the highest significant positive *sca* effect was showed in the hybrid IC 3024 × Varsha Uphar (0.50), IC 3025 × Arka Abhay (0.49) followed by IC 107 × Arka Anamika (0.49). Among the hybrids 17 crosses were positively significant.

The line *viz.,* IC 104 (0.72) followed by IC 107 (0.57) and tester Arka Anamika (0.82) recorded maximum and positive significant values for the trait Fruit length. The maximum significant positive *sca* effect was showed in the hybrid IC 3024 × Varsha Uphar (1.31), IC 128 × Punjab 7 (1.29) followed by IC 3052 × Arka Abhay (1.26). cross combinations showing positive *sca* effects for Fruit length were IC 107 × Parbhani Kranti, IC 104 × Punjab 7, IC 128 × Arka Anamika, IC 104 × Arka Anamika, IC 3023 × Parbhani Kranti, IC 3023 × Arka Abhay, IC 3004 × Arka Abhay, IC 107 × Arka Anamika, IC 3023 × Varsha Uphar, IC 3024 × Parbhani Kranti, IC 3052 × Arka Anamika, IC 3023 × Arka Anamika, IC 107 × Varsha Uphar, IC 3025 × Varsha Uphar, IC 104 × Arka Abhay. Among the hybrids 12 crosses were positively significant.

Positively significant and maximum *gca* effect was recorded by line IC 104 (0.53) followed by IC 3025 (0.46), tester Arka Anamika (0.37) for the trait Fruit girth. The cross combinations record positive *sca* effects were IC 3052 × Arka Abhay, IC 3024 × Varsha Uphar, IC 3004 × Punjab 7, IC 107 × Varsha Uphar, IC 107 × Arka Anamika, IC3023 × Punjab 7, IC 3025 × Parbhani Kranti, IC 3004 × Parbhani Kranti, IC 104 × Arka Anamika, IC 3024 × Punjab 7, IC 3025 × Arka Abhay, IC 104 × Arka Abhay, IC 128 × Punjab 7, IC 3052 × Arka Anamika, IC 128 × Arka Anamika, IC 3023 × Arka Anamika, IC 3025 × Varsha Uphar and the maximum significant positive *sca* effect was showed in the hybrid IC 3052 × Arka Abhay (1.08), IC 3024 × Varsha Uphar (1.07) followed by IC 3004 × Punjab 7 (0.81). Among the hybrids 16 crosses were positively significant.

For Internodal length the lowest negatively significant *gca* effect was observed in the lines IC 3023 (-0.67), IC 104 (-0.40) followed by IC 3004 (-0.36) and in the tester Arka Anamika (-0.27), Punjab 7 (-0.09). The cross combinations IC 107 × Parbhani Kranti, IC 3052 × Arka Abhay, IC 3024 × Varsha Uphar, IC 3004 × Punjab 7, IC 107 × Varsha Uphar, IC 107 × Arka Anamika, IC 3023 × Punjab 7, IC 3025 × Parbhani Kranti, IC 3004 × Parbhani Kranti, IC 104 × Arka Anamika, IC 3024 × Punjab 7, IC 3025 × Arka Abhay, IC 104 × Arka Abhay, IC 128 × Punjab 7, IC 3052 × Arka Anamika, IC 128 × Arka Anamika, IC 3023 × Arka Anamika, IC 3025 × Varsha Uphar shows negative *sca* effects. The highest negatively significant *sca* effect was showed in the hybrid IC 107 × Parbhani Kranti (-0.94) followed by IC 3052 × Arka Abhay (-0.92). Among the hybrids 18 crosses were negatively significant.

The lines IC 104 (1.62) followed by IC 107 (0.75) and tester Arka Anamika (1.75) obtained highest positively significant *gca* values for the trait Number of fruits per plant. The cross combinations showing high *sca* effects were IC 3052 × Arka Abhay, IC 104 × Arka Anamika, IC 107 × Arka Anamika, IC 3024 × Varsha Uphar, IC 3025 × Arka Abhay the hybrid IC 3052 × Arka Abhay (4.34), IC 104 × Arka Anamika (3.54) obtained highest positively significant *sca* values for the trait. among the hybrids 14 crosses were positively significant.

For Average fruit weight the maximum positive and significant *gca* effect was found in the lines IC 104 (1.52) followed by IC 107 (0.75) , in the tester Arka Anamika (2.09) and The cross combinations showing positive *sca* effects for fruit weight were IC 3052 × Arka Abhay, IC 3024 × Varsha Uphar, IC 107 × Arka Anamika, IC 107 × Varsha Uphar, IC 104 × Arka Anamika, IC 3004 × Arka Abhay, IC 3023 × Punjab 7, IC 104 × Arka Abhay, IC 128 × Parbhani Kranti, IC 3004 × Punjab 7, IC 128 × Punjab 7, IC 3023 × Parbhani Kranti, IC 3052 × Arka Anamika, IC 3024 × Punjab 7, IC 104 × Varsha Uphar. The maximum significant positive *sca* effect was found in the hybrid IC 3025 × Parbhani Kranti (4.78), IC 3052 × Arka Abhay (3.71) followed by IC 3024 × Varsha Uphar (2.96). Among the hybrids 13 crosses were positively significant.

The significant maximum positive *gca* effect was recorded by lines *viz.,* IC 104 (4.91) followed by IC 3004 (3.90) and tester Arka Anamika (6.77) for the trait. Number of seeds per fruit and IC 3024 × Varsha Uphar, IC 3023 × Punjab 7, IC 3052 × Arka Abhay, IC 3004 × Punjab 7, IC 107 × Varsha Uphar, IC 104 × Punjab 7, IC 3025 × Arka Abhay, IC 3052 × Arka Anamika, IC 107 × Arka Anamika, IC 3004 × Parbhani Kranti, IC 3025 × Parbhani Kranti, IC 3023 × Arka Anamika, IC 128 × Punjab 7, IC 107 × Parbhani Kranti, IC 104 × Arka Abhay, IC 104 × Arka Anamika, IC 128 × Parbhani Kranti, IC 3004 × Arka Abhay, IC 3024 × Parbhani Kranti, IC 128 × Arka Anamika, IC 128 × Arka Abhay the cross shows positive *sca* effects. The the maximum significant positive *sca* effect was showed in the hybrid IC 3024 × Varsha Uphar (10.05), IC 3023 × Punjab 7 (9.27) followed by IC 3052 × Arka Abhay (9.18). Among the hybrids 16 crosses were positively significant.

100 seed weight recorded highest positive and significant *gca* effect for lines IC 104 (1.19) followed by IC 3025 (0.62), tester Arka Anamika (1.30) and the cross combinations IC 3052 × Arka Abhay, IC 3024 × Varsha Uphar, IC 3025 × Parbhani Kranti, IC 3023 × Punjab 7, IC 107 × Arka Anamika, IC 107 × Varsha Uphar, IC 3004 × Punjab 7, IC 3025 × Arka Abhay, IC 104 × Arka Anamika, IC 3004 × Parbhani Kranti, IC 107 × Parbhani Kranti, IC 3052 × Arka Anamika, IC 3004 × Arka Abhay, IC 104 Punjab 7, IC 128 × Punjab 7, IC 3024 × Punjab 7, IC 128 × Arka Anamika, IC 128 × Parbhani Kranti, IC 104 × Arka Abhay, IC 3023 × Arka Anamika exhibits positive *sca* effects. Highest significant positive *sca* effect was recorded in the hybrid IC 3052 × Arka Abhay (2.13), IC 3024 × Varsha Uphar (1.81) followed by IC 3025 × Parbhani Kranti (1.53). Among the hybrids 17 crosses were positively significant.

Fruit yield per plant recorded highest positive *gca* effect in lines *viz.,* IC 104 (41.65) followed by IC 3004 (37.90) and in tester Arka Anamika (43.34) and the cross combinations IC 3024 × Varsha Uphar, IC 3052 × Arka Abhay, IC 3023 × Punjab 7, IC 3025 × Parbhani Kranti, IC 107 × Varsha Uphar, IC 107 × Parbhani Kranti, IC 3004 × Punjab 7, IC 104 × Punjab 7, IC 107 × Arka Anamika, IC 104 × Arka Anamika, IC 3023 × Arka Anamika, IC 3052 × Arka Anamika, IC 128 × Arka Anamika, IC 3025 × Arka Abhay, IC 3004 × Parbhani Kranti, IC 104 × Arka Abhay, IC 128 × Parbhani Kranti, IC 3004 × Arka Abhay, IC 128 × Arka Abhay, IC 3024 × Punjab 7, IC 3023 × Arka Abhay, IC 3025 × Varsha Uphar, IC 3024 × Parbhani Kranti, IC 104 × Varsha Uphar exhibits positive *sca* effects. the maximum significant positive *sca* effect was recorded in the hybrid IC 3024 × Varsha Uphar (110.06), IC 3052 × Arka Abhay (69.99) followed by IC 3023 × Punjab 7 (53.84). Among the hybrids 16 crosses were positively significant.

In the present study none of the genotype exhibited significant *gca* effects for all the characters. However, The genotype identified as promising combiners were IC 104 for characters days to 50 per cent flowering, plant height, number of branches per plant, fruit length, fruit girth, number of fruits per plant, average fruit weight, number of seeds per plant, 100 seed weight and fruit yield per plant. The line IC 3023 for the character internodal length. In testers, Arka Anamika for the characters plant height, fruit length, fruit girth, internodal length, number of fruits per plant, average fruit weight, number of seeds per plant, 100 seed weight, fruit yield per plant and Arka Abhay for the characters days to 50 per cent flowering, internodal length. This indicate that parent showing high *gca* for fruit yield per plant, might have been because of their high *gca* for fruit length, fruit girth, no of fruits per plant, average fruit weight, number of seeds per plant, 100 seed weight. It is therefore suggested that these genotype may be used in improvement for earliness and yield traits in okra. The above are in conformity with the findings of **Abinaya** *et al.* [1], Suganthi *et al.* [14], Janarthanan *et al*. [4], **Siva Ranjani *et al*.** [12]**,** Yadav *et al.* [17].

The specific combining ability which represents the predominance of non-additive gene action is a major component that may be utilized in heterosis breeding programme. In the present study, none of the cross combination was found to have high *sca* for all the characters under study. IC 104 × Arka Anamika, IC 107 × Arka Anamika, IC 3052 × Arka Abhay and IC 3025 × Arka Abhay were found specific combiner. A similar study has also shown the exploitation of heterosis, indicating that non-additive types of gene action predominate in their performance. These results are in harmony with the findings of Pithiya *et al.* [10], Patel *et al.* [9] and Shinde *et al.* [11]. The observed high specific combining ability (*sca*) might be attributed to complementary gene interactions, which have the potential to be largely stabilized in subsequent generations. Consequently, these specific crosses can be considered for commercial utilization to harness hybrid vigor.

CONCLUSION

For *per se* performance the line IC 104 obtained highest mean values for the traits number of branches per plant, fruit length, average fruit weight, number of fruits per plant, 100 seed weight and fruit yield per plant, line IC 107 obtained highest mean values for the trait days to 50 per cent flowering, fruit girth and number of seeds per fruit, line IC 3052 obtained highest mean value for trait plant height at maturity, line IC 3024 obtained highest mean for trait internodal length and for testers, Arka Anamika obtained highest mean values for the traits plant height at maturity, number of branches per plant, fruit length, , average fruit weight, number of fruits per plant, number of seeds per fruit, 100 seed weight and fruit yield per plant, Varsha Uphar obtained highest mean value for the trait internodal length and fruit girth. The line IC 104 has high *gca* effects for characters days to 50 per cent flowering, plant height, number of branches per plant, fruit length, fruit girth, number of fruits per plant, average fruit weight, number of seeds per plant, 100 seed weight and fruit yield per plant and line IC 3023 for the character internodal length. In tester Arka Anamika has high *gca* effects for characters plant height at maturity, fruit length, fruit girth, internodal length, number of fruits per plant, average fruit weight, number of seeds per fruit, and fruit yield per plant and tester Arka Abhay for days to 50 per cent flowering, number of branches per plant and 100 seed weight.

From the above it is concluded that male parents Arka Anamika and Arka Abhay were identified as the best performing male parents in the current study. Among the lines, IC 104 and IC 107 were discovered to be the best general combiners when considering both their mean performance (*per se* performance) and their general combining ability (*gca*) effects. The top four crosses in terms of specific combining ability effects were IC 104 × Arka Anamika, IC 107 × Arka Anamika, IC 3052 × Arka Abhay, and IC 3025 × Arka Abhay. These particular crosses demonstrated superior specific combining ability effects and exhibited high individual performance in fruit yield compared to the other forty crosses evaluated. Therefore, these crosses hold significant potential for further utilization in heterosis breeding to develop hybrid okra varieties.

Table: 1. Analysis of variance for eleven characters

Source of variation	df	MSS										
		Days to 50 per cent flowering	Plant height at maturity	Number of branches per plant	Fruit Length	Fruit girth	Internodal length	Number of fruits per plant	Average fruit weight	Number of seeds per fruit	100 seed weight	Fruit yield per plant
Replication	2	2.78	15.13	0.01	0.05	0.01	0.02	0.70	0.19	0.40	0.01	114.90
Hybrid	39	48.37**	175.27**	0.64**	3.64**	1.65**	1.99**	19.65**	17.71**	232.75**	7.23**	11883.05**
Line	7	135.19**	608.56**	0.85**	4.88**	2.20**	4.79**	16.40**	1.36**	198.98**	9.79**	20680.81**
Tester	4	25.96**	479.46**	1.18**	10.35**	3.08**	0.15**	64.14**	1.54**	30.93**	26.80**	25020.40**
LXT	28	29.88**	23.50**	0.51**	2.37**	1.30**	1.47**	14.10**	14.95**	120.60**	3.79**	7806.85**
Error	104	1.15	7.55	0.01	0.12	0.02	0.02	0.25	0.25	1.75	28.50	114.42

****Significant at 1 percent level**
***Significant at 5 percent level**

Table :2. Mean performance of Parents and Hybrid for eleven Yield and Yield Components Traits

S.N.	Characters / Treatments	Days to 50 per cent flowering	Plant height at maturity	Number of branches per plant	Fruit length	Fruit girth	Internodal length	Number of fruits per plant	Average fruit weight	Number of seeds per fruit	100 seed weight	Fruit yield per plant
1.	IC 3024	48.42	112.13	2.41	11.65	4.26	6.09	18.71	18.53	41.97	4.84	346.69
2.	IC 3025	46.33	105.47	2.44	13.52	4.34	5.64	18.94	18.72	50.64	5.29	354.56
3.	IC 104	40.53	103.38	3.43	14.56	5.18	5.23	19.67	19.34	52.32	5.96	380.41
4.	IC 107	37.93	98.45	3.93	14.34	5.36	5.14	19.32	18.97	55.18	5.74	366.52
5.	IC 3052	42.47	94.76	2.63	12.27	5.24	4.93	19.54	18.65	43.16	5.45	364.42
6.	IC 3023	47.87	124.55	2.18	13.23	4.69	5.52	17.65	18.39	49.97	4.57	324.58
7.	IC 128	48.84	117.24	2.33	12.49	4.58	5.85	18.49	17.52	42.40	4.69	323.94
8.	IC 3004	46.86	127.45	2.24	13.78	4.72	5.43	18.23	17.39	39.74	4.48	317.09
9.	Arka Anamika	41.76	102.74	4.06	16.22	4.36	6.11	20.25	19.98	53.42	6.92	486.59
10.	Punjab 7	39.42	116.64	2.55	14.82	4.42	5.67	19.12	18.23	47.38	5.92	348.55
11.	Varsha Uphar	45.12	109.93	3.32	15.64	5.02	6.23	19.84	19.95	52.65	6.11	443.79
12.	Arka Abhay	39.47	106.87	3.89	16.17	4.64	5.98	19.33	19.42	48.57	6.23	375.38
13.	Parbhani Kranti	43.57	121.43	2.76	14.39	4.98	5.82	19.04	19.16	46.23	5.98	364.82
14.	IC 3024 × Arka Anamika	48.43	105.46	3.45	15.54	4.24	6.08	21.93	21.97	48.91	6.72	443.76
15.	IC 3024 × Punjab 7	47.33	116.24	4.03	15.58	4.67	7.24	19.65	20.23	39.23	5.31	449.68
16.	IC 3024 × Varsha Uphar	43.56	109.76	4.35	16.83	5.98	5.82	23.69	24.54	61.82	8.24	596.27
17.	IC 3024 × Arka Abhay	48.82	107.58	3.56	13.65	4.33	7.44	18.32	21.63	48.36	5.72	446.77
18.	IC 3024 × Parbhani Kranti	45.13	117.72	4.12	14.67	4.23	6.25	18.92	18.77	41.22	4.82	445.75
19.	IC 3025 × Arka Anamika	41.76	101.32	4.15	16.69	5.91	5.67	22.36	22.43	58.56	7.87	591.93
20.	IC 3025 × Punjab 7	39.45	110.45	3.34	13.93	4.17	5.01	19.78	19.12	40.13	4.37	484.58
21.	IC 3025 × Varsha Uphar	43.57	105.63	3.77	16.58	5.86	5.39	21.42	20.55	55.82	7.12	582.45
22.	IC 3025 × Arka Abhay	39.38	104.87	4.52	17.32	6.17	6.53	25.54	19.78	62.53	8.75	602.54
23.	IC 3025 × Parbhani Kranti	42.69	111.54	3.15	16.68	5.94	5.38	19.21	25.23	50.42	7.65	588.65
24.	IC 104 × Arka Anamika	34.24	101.34	4.67	17.98	6.52	5.29	28.23	27.16	64.37	9.83	647.56
25.	IC 104 × Punjab 7	35.21	103.78	3.97	16.55	4.65	4.98	21.65	19.86	54.46	6.94	576.34
26.	IC 104 × Varsha Uphar	36.43	100.35	4.08	16.64	5.83	5.43	19.61	23.19	58.24	7.49	585.76
27.	IC 104 × Arka Abhay	36.32	99.57	4.49	16.97	6.22	5.03	24.56	24.86	62.38	8.42	601.74
28.	IC 104 × Parbhani Kranti	42.27	106.94	3.97	15.13	5.17	6.62	18.98	18.64	40.56	5.94	463.21
29.	IC 107 × Arka Anamika	37.62	98.22	4.73	17.54	6.35	5.16	27.47	26.53	63.78	9.52	614.86
30.	IC 107 × Punjab 7	46.73	108.58	3.56	15.43	4.23	6.12	18.54	18.76	39.21	4.56	463.55
31.	IC 107 × Varsha Uphar	35.37	103.43	4.43	16.85	6.28	5.49	23.82	24.79	62.18	8.39	598.43
32.	IC 107 × Arka Abhay	45.43	101.12	3.63	16.36	4.88	6.36	19.81	18.82	48.73	5.82	466.83
33.	IC 107 × Parbhani Kranti	36.61	107.41	3.74	16.31	4.85	4.86	19.58	20.45	48.16	6.39	552.32
34.	IC 3052 × Arka Anamika	40.53	98.13	4.27	16.76	5.95	5.46	22.49	23.42	61.65	7.98	595.62
35.	IC 3052 × Punjab 7	45.36	102.91	3.78	14.87	4.72	6.79	19.14	18.96	30.52	4.72	472.54
36.	IC 3052 × Varsha Uphar	41.62	109.18	3.12	15.75	4.35	6.92	19.97	18.96	53.65	5.38	496.45
37.	IC 3052 × Arka Abhay	38.11	98.56	4.56	17.32	6.47	5.54	26.84	25.47	63.12	8.98	607.24
38.	IC 3052 × Parbhani Kranti	48.57	108.12	3.42	14.32	4.67	6.87	18.98	18.85	41.72	4.21	457.36
39.	IC 3023 × Arka Anamika	43.18	111.87	4.03	16.62	5.49	5.12	21.82	20.72	57.39	7.25	584.37
40.	IC 3023 × Punjab 7	41.14	123.68	3.15	13.86	5.12	4.77	19.53	19.93	48.88	6.13	534.65
41.	IC 3023 × Varsha Uphar	45.21	115.59	3.42	16.14	4.92	4.83	20.34	19.46	48.63	6.17	454.81
42.	IC 3023 × Arka Abhay	39.24	114.28	4.77	16.27	4.73	4.72	19.45	19.92	43.52	5.88	526.38
43.	IC 3023 × Parbhani Kranti	46.53	125.86	3.63	15.43	4.34	6.56	18.98	19.57	36.28	4.15	461.38
44.	IC 128 × Arka Anamika	45.06	107.93	3.67	16.44	5.28	6.86	20.63	20.21	53.92	6.74	564.74
45.	IC 128 × Punjab 7	47.53	119.98	3.34	15.77	4.59	6.45	18.73	19.14	42.72	4.36	458.93
46.	IC 128 × Varsha Uphar	46.21	117.29	3.78	14.45	4.56	6.24	19.75	18.83	45.85	4.97	468.62
47.	IC 128 × Arka Abhay	43.27	100.83	3.74	14.86	4.78	6.84	18.98	19.95	50.79	5.53	512.54
48.	IC 128 × Parbhani Kranti	44.74	117.78	3.13	13.98	4.15	7.03	18.98	19.89	41.12	4.31	476.43
49.	IC 3004 × Arka Anamika	42.04	113.81	3.31	16.48	4.43	5.16	20.52	20.48	54.35	6.82	569.26
50.	IC 3004 × Punjab 7	41.48	120.23	3.54	16.51	5.42	4.87	20.73	20.52	54.93	6.88	573.88
51.	IC 3004 × Varsha Uphar	44.52	116.65	3.12	16.37	5.19	6.95	20.92	19.87	53.43	6.65	561.46
52.	IC 3004 × Arka Abhay	40.36	115.69	4.21	16.74	4.88	5.61	23.42	23.56	59.79	7.92	593.38
53.	IC 3004 × Parbhani Kranti	44.31	121.37	3.88	15.14	5.37	4.95	20.38	19.73	52.45	6.52	557.86
GM for lines		44.91	110.43	2.70	13.23	4.80	5.48	18.44	18.82	46.92	5.13	364.39
GM for testers		41.87	111.52	3.32	15.45	4.68	5.96	19.35	19.51	49.65	6.23	403.83
GM for hybrids		42.38	109.53	3.81	15.93	5.15	5.87	21.12	21.09	51.09	6.54	533.27

Table : 3. General combining ability (*gca*) effects for eleven Yield and Yield Components Traits

S.N	Parents	Characters / Treatments	Days to 50 per cent Flowering	Plantheight at maturity	Number ofbranches per plant	Fruit Length	Fruit girth	Internodal length	Number of fruits per plant	Averge fruit weight	Number ofseeds per fruit	100 seed weight	Fruityield per plant
1.	L_1	IC 3024	4.27**	1.83*	0.09**	-0.68**	-0.46**	0.70**	-0.59**	0.31*	-3.19**	-0.37**	-56.83**
2.	L_2	IC 3025	-1.01**	-2.76**	-0.03	0.31**	0.46**	-0.27**	0.57**	0.30*	2.40**	0.62**	36.76**
3.	L_3	IC 104	-5.49**	-7.13**	0.42**	0.72**	0.53**	-0.40**	1.52**	1.62**	4.91**	1.19**	41.65**
4.	L_4	IC 107	-2.03**	-5.77**	0.20**	0.57**	0.17**	-0.27**	0.75**	0.75**	1.32**	0.40**	5.93
5.	L_5	IC 3052	0.45	-6.15**	0.02	-0.13	0.08*	0.45**	0.39**	0.01	-0.96**	-0.28**	-7.43*
6.	L_6	IC 3023	0.68**	8.73**	-0.21**	-0.27**	-0.23**	-0.67**	-1.07**	-1.20**	-4.15**	-0.62**	-20.95**
7.	L_7	IC 128	2.98**	3.24**	-0.28**	-0.83**	-0.48**	0.82**	-1.68**	-1.51**	-4.22**	-1.35**	-37.02**
8.	L_8	IC 3004	0.16	8.02**	-0.20**	0.32**	-0.09*	-0.36**	0.10	-0.29*	3.90**	0.42**	37.90**
9.	T_1	Arka Anamika	-0.78**	-4.77**	0.22**	0.82**	0.37**	-0.27**	2.09**	1.75**	6.77**	1.30**	43.34**
10.	T_2	Punjab 7	0.64**	3.71**	-0.23**	-0.62**	-0.45**	-0.09**	-1.37**	-1.55**	-7.33**	-1.13**	-31.50**
11.	T_3	Varsha Uphar	-0.32	0.21	-0.06**	0.27**	0.22**	0.02	0.10	0.16	3.86**	0.27**	9.76**
12.	T4	Arka Abhay	-1.02**	-4.21**	0.25**	0.25**	0.16**	0.14**	1.02**	0.63**	3.81**	0.59**	11.41**
13.	T_5	Parbhani Kranti	1.47**	5.07**	-0.18**	-0.73**	0.16**	0.20**	-1.84**	-0.98**	-7.1**	-1.04**	-32.90**

**Significant at 1 percent level
*Significant at 5 percent level

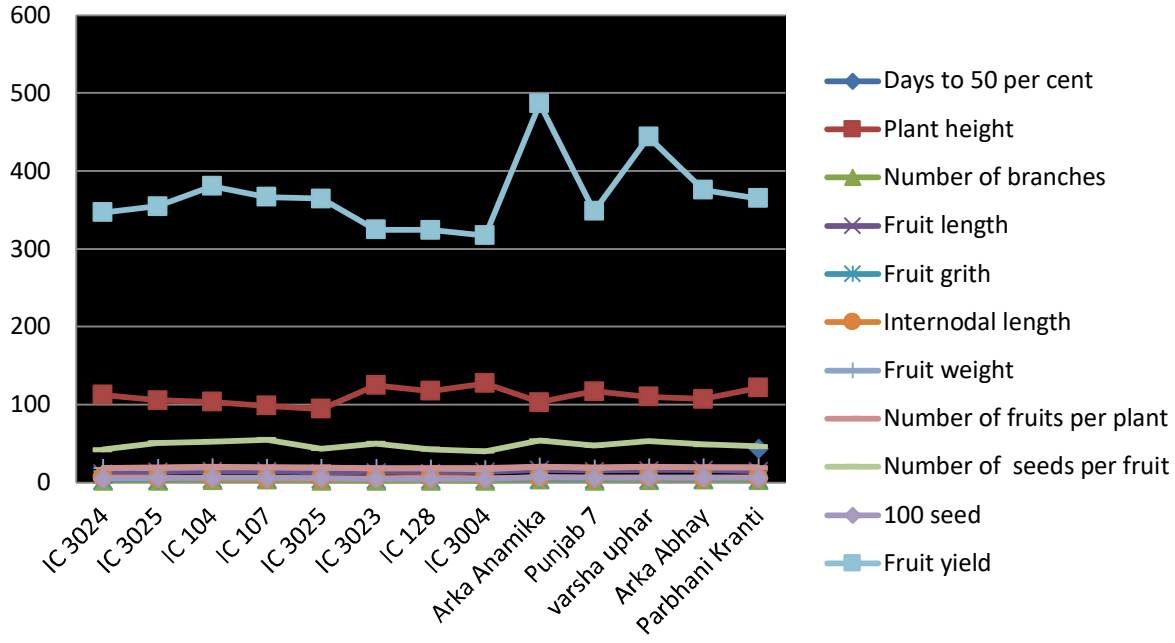
Table : 4. Specific combining ability (*sca*) effects of line × tester hybrids for eleven Yield and Yield Components Traits

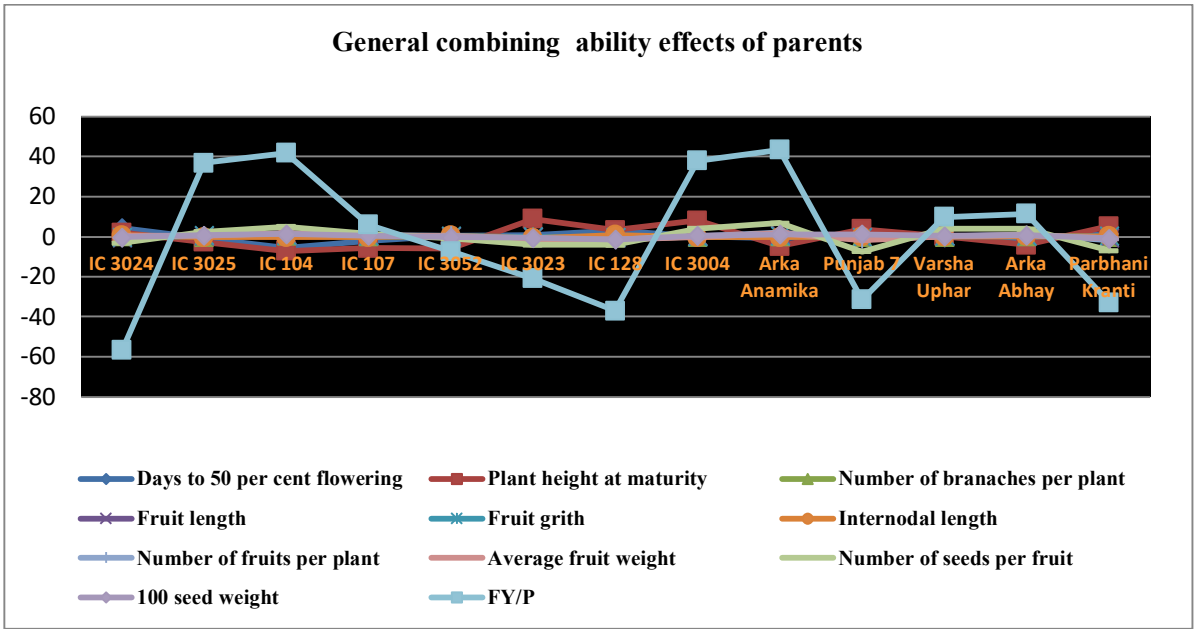
S.N	Crosses	Charactaers / Treatments	Days to 50 per cent flowering	Plantheight at maturity	Number of branches per plant	FruitLength	Fruitgirth	Internodallength	Numberoffruits per plant	Averge fruitweight	Numberofseeds per fruit	100 Seed weight	Fruityield per plant
1.	**L1×T1**	IC 3024 × Arka Anamika	2.55**	-1.13	-0.67**	-0.54*	-0.82**	-0.22**	-0.66*	-1.21**	-5.77**	-0.75**	-75.93**
2.	**L1×T2**	IC 3024 × Punjab 7	0.03	1.18	0.35**	0.95**	0.43**	0.76**	0.52	0.36	-1.34	0.27*	4.74
3.	**L1×T3**	IC 3024 × Varsha Uphar	-2.07**	-1.8	0.50**	1.31**	1.07**	-0.76**	3.09**	2.96**	10.05**	1.81**	110.06**
4.	**L1×T4**	IC 3024 × Arka Abhay	3.18**	0.44	-0.59**	-1.86**	-0.52**	0.73**	-3.21**	-0.43	-3.35**	-1.03**	-41.08**
5.	**L1×T5**	IC 3024 × Parbhani Kranti	-3.00**	1.3	0.40**	0.14	-0.15	-0.51**	0.26	-1.68**	0.41	-0.31**	2.21
6.	**L2×T1**	IC 3025 × Arka Anamika	1.17*	-0.68	0.14*	-0.37	-0.07	0.34**	-1.39**	-0.74*	-1.70*	-0.59**	-21.34**
7.	**L2×T₂**	IC 3025 × Punjab 7	-2.56**	-0.02	-0.22**	-1.69**	-0.99**	-0.50**	-0.51	-0.75*	-6.03**	-1.65**	-53.95**
8.	**L2×T3**	IC 3025 × Varsha Uphar	2.52**	-1.34	0.04	0.07	0.03	-0.22**	-0.34	-1.03**	-1.53	-0.30**	2.66
9.	**L2×T4**	IC 3025 × Arka Abhay	-0.97	2.32	0.49**	0.83**	0.40**	0.79**	2.86**	-2.27**	5.23**	1.01**	21.10**
10.	**L2×T5**	IC 3025 × Parbhani Kranti	-0.15	-0.29	-0.45**	1.17**	0.64**	-0.41**	-0.61*	4.78**	4.03**	1.53**	51.52**
11.	**L3×T1**	IC 104 × Arka Anamika	-1.88**	3.71*	0.21**	0.50*	0.47**	0.09	3.54**	2.67**	1.60*	0.80**	29.40**
12.	**L3×T2**	IC 104 × Punjab 7	-2.33**	-2.32	-0.04	0.52*	-0.58**	-0.40**	0.42	-1.33**	5.79**	0.34**	32.92**
13.	**L₃×T3**	IC 104 × Varsha Uphar	-0.14	-2.25	-0.1	-0.28	-0.07	-0.06	-3.09**	0.29	-1.62*	-0.50**	1.08
14.	**L3×T4**	IC 104 × Arka Abhay	0.44	1.39	0.01	0.06	0.38**	-0.58**	0.93**	1.49**	2.57**	0.11	15.41*
15.	**L3×T5**	IC 104 × Parbhani Kranti	3.90**	-0.52	-0.08	-0.80**	-0.20*	0.95**	-1.79**	-3.12**	-8.34**	-0.75**	-78.81**
16.	**L4×T1**	IC 107 × Arka Anamika	-1.96**	-0.77	0.49**	0.22	0.66**	-0.17*	3.53**	2.91**	4.59**	1.28**	32.42**
17.	**L4×T2**	IC 107 × Punjab 7	5.73**	1.12	-0.23**	-0.45*	-0.64**	0.61**	-1.93**	-1.56**	-5.87**	-1.25**	-44.14**
18.	**L4×T3**	IC 107 × Varsha Uphar	-4.66**	-0.53	0.47**	0.08	0.74**	-0.12	1.88**	2.77**	5.91**	1.19**	49.47**
19.	**L4×T4**	IC 107 × Arka Abhay	6.10**	1.58	-0.63**	-0.39	-0.60**	0.62**	-3.06**	-3.68**	-7.49**	-1.71**	-83.77**
20.	**L4×T5**	IC 107 × Parbhani Kranti	-5.21**	-1.41	-0.09	0.54**	-0.16	-0.94**	-0.42	-0.44	2.85**	0.49**	46.02**
21.	**L5×T1**	IC 3052 × Arka Anamika	-1.53**	-0.48	0.22**	0.13	0.34**	-0.59**	-1.08**	0.54	4.75**	0.42**	26.54**

22.	**L5×T2**	IC 3052 × Punjab 7	1.88**	-4.18**	0.18**	-0.31	-0.06	0.56**	-0.97**	-0.62*	-12.27**	-0.41**	-21.80**
23.	**L5×T3**	IC 3052 × Varsha Uphar	-0.9	5.59**	-0.65**	-0.32	-1.11**	0.59**	-1.62**	-2.33**	-0.34	-1.14**	-39.15**
24.	**L5×T4**	IC 3052 × Arka Abhay	-3.71**	-0.61	0.48**	1.26**	1.08**	-0.92**	4.34**	3.71**	9.18**	2.13**	69.99**
25.	**L5×T5**	IC 3052 × Parbhani Kranti	4.26**	-0.33	-0.23**	-0.76**	-0.25**	0.36**	-0.66*	-1.31**	-1.31	-1.01**	-35.58**
26.	**L6×T1**	IC 3023 × Arka Anamika	0.9	-1.62	0.21**	0.13	0.20*	0.19**	-0.29	-0.95**	3.68**	0.03	28.81**
27.	**L6×T2**	IC 3023 × Punjab 7	-2.56**	1.72	-0.22**	-1.18**	0.65**	-0.34**	0.88**	1.56**	9.27**	1.34**	53.84**
28.	**L6×T3**	IC 3023 × Varsha Uphar	2.47**	2.87	-0.12*	0.21	-0.22**	-0.39**	0.22	-0.61*	-2.17**	-0.01	-67.27**
29.	**L6×T4**	IC 3023 × Arka Abhay	2.80**	0.24	-0.08	0.35	-0.35**	-0.62**	-1.60**	-0.63*	-7.23**	-0.63**	2.66
30.	**L6×T5**	IC 3023 × Parbhani Kranti	2.00**	2.54	0.21**	0.49*	-0.27**	1.16**	0.80**	0.63*	-3.56**	-0.73**	-18.04**
31.	**L7×T1**	IC 128 × Arka Anamika	0.47	-0.07	-0.08	0.52*	0.23**	0.44**	-0.88**	-1.14**	0.27	0.25*	25.25**
32.	**L7×T2**	IC 128 × Punjab 7	1.52**	3.51*	0.03	1.29**	0.37**	-0.15	0.69*	1.09**	3.17**	0.31**	-5.82
33.	**L7×T3**	IC 128 × Varsha Uphar	1.17*	4.32**	0.30**	-0.92**	-0.34**	-0.46**	0.24	-0.93**	-4.89**	-0.48**	-37.39**
34.	**L7×T4**	IC 128 × Arka Abhay	-1.07	-7.72**	-0.04	-0.49*	-0.05	0.01	-1.46**	-0.28	0.1	-0.24*	4.88
35.	**L7×T5**	IC 128 × Parbhani Kranti	-2.09**	-0.05	-0.22**	-0.39	-0.21*	0.15	1.41**	1.26**	1.34	0.16	13.08
36.	**L8×T1**	IC 3004 × Arka Anamika	0.27	1.03	-0.52**	-0.59**	-1.00**	-0.08	-2.76**	-2.10**	-7.41**	-1.44**	-45.15**
37.	**L8×T2**	IC 3004 × Punjab 7	-1.71**	-1.03	0.15*	0.88**	0.81**	-0.55**	0.91**	1.24**	7.28**	1.05**	34.22**
38.	**L8×T3**	IC 3004 × Varsha Uphar	2.30**	-1.11	-0.44**	-0.15	-0.09	1.43**	-0.37	-1.12**	-5.42	-0.57**	-19.47**
39.	**L8×T4**	IC 3004 × Arka Abhay	-1.16*	2.35	0.35**	0.24	-0.34**	-0.04	1.20**	2.10**	0.99	0.37**	10.81
40.	**L8×T5**	IC 3004 × Parbhani Kranti	0.3	1.25	0.45**	-0.38	0.62**	-0.76**	1.03**	-0.12	4.56**	0.60**	19.59**

**Significant at 1 percent level
*Significant at 5 percent level

Graphical representation of Per se performance of parents





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