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## *Per se* Performance of Hybrids and Parents for Yield and Quality in Brinjal (*Solanum melongena* L.)

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### Abstract

A field experiment at Horticulture College and Research Institute, Tamil Nadu Agricultural University was conducted to study the mean performance of parents and hybrids through diallel analysis for genetic improvement in Brinjal suitable for Theni district of Tamil Nadu. The resultant thirty crosses along with six parents were evaluated for twenty three quantitative, yield, yield attributing and qualitative characters. The replication mean sum of squares due to parents and hybrids were non-significant for all the characters studied that reveals that there is no environmental error in controlling these characters. The treatment sum of squares due to parents and hybrids for all the characters studied were highly significant indicating the presence of significant variation among the characters. Based on the mean performance of thirty hybrids studied four hybrids viz., P3 x P4 (1.90 kg), P4 x P6 (1.60 kg), P5 x P6 (1.54 kg), P6 x P4 (1.70 kg) were identified as promising cross combination for recording high *per se* performance for most of the yield attributing traits including fruit yield per plant. These hybrids may be subjected to further trials across the district for crop improvement.

**Keywords:** Brinjal, *per se* performance, yield, hybrid

### 1. Introduction

Brinjal (*Solanum melongena* L) eggplant or aubergine, belongs to the family Solanaceae with a diploid chromosome number of  $2n=2x=24$ . It is one of the predominant and popular vegetable grown almost in all parts of India and can be grown throughout the year. It is adapted to different agro-climatic regions except at high altitudes. It is known by different names like begun (Bengali), ringna (Gujarathi), baingan (Hindi), badane (Kannada), waangum (Kashmiri), vange (Marathi), baigan (Oriya), Vashuthana (Malayalam), Kathiri (Tamil), venkaya (Telugu) and peethabhala (Sanskrit). A large number of cultivars differing in size, shape and colour of fruits are grown in India. Immature fruits are used in curries and a variety of dishes are prepared out of brinjal. Fruits are moderate sources of vitamins and minerals like phosphorous, calcium and iron and nutritive value varies from variety to variety.

Brinjal as a vegetable is used in various ways such as baking, barbecuing, frying or pickling. They can also be pureed, flavoured and used as a dip or chutney as in Mediterranean and Indian cuisines. In Indian cuisine, they are used in curries and even made into soufflés. The cut fruits are typically soaked in cold salted water before cooking to avoid discoloration and to remove its mild bitterness (Ware, 2015) <sup>[18]</sup>.

There are three main botanical varieties under the species *S. melongena* based on fruit shape and colour (Chowdhury and Talukdar, 1996) <sup>[2]</sup>. The common brinjal seems to be large, round or egg-shaped fruited forms grouped under *S. melongena* var. *esculentum*. The long, slender types are categorized under *S. melongena* var. *serpentinum* and the dwarf brinjal plants are included under *S. melongena* var. *depressum*. In India it is cultivated over an area of 0.69 million ha with an annual production of 12.40 million tonnes. The production of brinjal in Tamil Nadu is around 19,110 tonnes in an area of 14,760 hectare with the productivity of 13.29 metric tonnes per hectare. There is lot of cultivars available for cultivation based on the consumer preference particularly for colour, size and shape of the fruit and yield. However it is not possible to one common cultivar to suit different localities and local preferences. It becomes imperative to characterize the genotypes having better acceptance and wide adaptability. The breeding of eggplant was relied upon mass selection and pure line selection from land races for the development of improved varieties. The crop exhibiting diversity for plant type, fruit colour, fruit shape, fruit size, yield and other quality traits offers wider scope for improvement through heterosis breeding (Ravali *et.al.* 2017) <sup>[12]</sup>.

The estimation of heterosis for yield and its component traits would be useful to identify the best hybrid combination for exploitation of superior hybrids.

The exploitation of hybrid vigour has become a potential tool for improvement in eggplant (Bavage *et al.*, 2005 and Dharwad *et al.*, 2011) <sup>[1, 5]</sup>. The selection of parents is the important step in heterosis breeding which could combine well and produce desirable hybrids. Several research workers reported the importance of genetic diversity in crops (Rajasekhar reddy *et al.*, 2017, Triveni *et al.*, 2017 <sup>[17]</sup>, Pidigam *et al.*, 2019 <sup>[10]</sup> and Srivatsava *et al.*, 2019) With this perception, the present investigation was carried out with the objective of studying the performance of hybrids and parents for yield and quality suitable to Theni district, Tamil Nadu, India.

### Materials and Methods

The present investigation was carried out in the Department of Vegetable Crops, Horticultural College and Research Institute, Periyakulam, Tamil Nadu during 2018 - 2020. The geographical indication of the study was 10°12' Latitude and

77°58' Longitude. The soil type of the experimental plot was clayey loam with medium fertility.

The materials for the study were chosen from the brinjal germplasm and among them, six promising superior genotypes were selected as parents based on their performance and consumer preference in Theni district, Tamil Nadu. The superior six parents were utilized in crossing programme by adopting the 'Full Diallel' mating design during 2018-19. In the present investigation, five local land races namely Odavai Pachai Kathiri (P<sub>1</sub>), Gobhi Pachai Kathiri (P<sub>2</sub>), Kothampatti Kathiri (P<sub>3</sub>), Dharmapuri Oodha Kathiri (P<sub>4</sub>), Poiyur Purple Kathiri (P<sub>5</sub>) and one variety CO 2 (P<sub>6</sub>) were taken and crosses were made in all possible combinations. The description of the parents are detailed in Table 1. Thus a total of thirty combinations and their six parents were evaluated for various quantitative and qualitative traits on their *per se* performance.

**Table 1:** Source and Plant characters of parents

S. No.	Code No.	Variety/Genotypes	Description	Source
1	P <sub>1</sub>	Odavai Pachai Kathiri	Medium tall plants with upright growth, green colour fruits. Resistance to shoot and fruit borer. Duration of 160 days with an average yield 37 t/ha.	Dindigul
2	P <sub>2</sub>	Gobhi Pachai Kathiri	Medium tall plants with upright growth, green colour fruits. Duration of 155 days with an average yield 30 t/ha.	Erode
3	P <sub>3</sub>	Kothampatti Kathiri	Medium tall plants with upright growth, purple with white stripes fruits. Duration of 135 days with an average yield of 26 t/ha.	Salem
4	P <sub>4</sub>	Dharmapuri oodha Kathiri	Medium tall plants with upright growth, purple with white stripes fruits. Duration of 158 days with an average yield of 30 t/ha.	Dharmapuri
5	P <sub>5</sub>	Poiyur purple Kathiri	Plants medium tall, erect, dark purple fruits in clusters. Duration of 130 days with an average yield 30 t/ha.	Nagapattinam
6	P <sub>6</sub>	CO2	Pure line selection from local variety called varikkathiri in the village Negamam of Pollachi taluk, Coimbatore district. Plants are compact with dark purple streaks fruits. Duration of 150 days with average yield 35 t/ha.	Horticultural College and Research Institute, Coimbatore

Thirty hybrids along with six parents were raised during 2019-2020 in a Randomized Block Design with two replications. The observations were recorded on five randomly selected plants under each replication. The recommended package of practices were followed and appropriate prophylactic measures were adopted for pest and disease management.

The six selected parents were crossed in a full diallel design to develop thirty F<sub>1</sub> hybrids. The observations recorded for quantitative and qualitative characters for parents and hybrids were subjected to statistical analysis for twenty three traits *viz.*, plant height (cm), plant spread (cm), number of primary branches per plant, number of secondary branches per plant, days to first flowering, days to 50 % flowering, number of flowers per cluster, days to first harvest, days to last harvest, number of fruits per plant, fruit length (cm), fruit width (cm), calyx length (cm), fruit weight (g), number of seeds per fruit, 1000 seed weight (g), percent of shoot borer incidence (%), percent of fruit borer incidence by weight and number (%),

fruit yield per plant (kg), ascorbic acid content (mg/100 g), total phenols (mg/100 g) and solasodine (mg/100 g). *Per se* performance were evaluated for parents and hybrids following Panse and Sukatme, 1957 ANOVA for twenty three yield and yield contributing traits.

### Results

The results of the investigation on the *per se* performance are discussed below. The replication mean sum of squares due to parents and hybrids were non-significant for all the characters studied that reveals that there is no environmental error in controlling these characters. The treatment sum of squares due to parents and hybrids for all the characters studied were highly significant indicating the presence of significant variation among the characters (Table 2). The results are in corroboration with Ravali *et al.*, (2017) <sup>[12]</sup>, Rajasekhar reddy *et al.*, (2017), Triveni *et al.*, (2017) <sup>[17]</sup>, Pidigam *et al.*, (2019) <sup>[10]</sup> and Srivatsava *et al.*, (2019).

**Table 2:** Analysis of Variance of Randomized Block Design for various traits

Sl. No.	Traits	Mean Squares		
		Replication	Treatment	Error
1	Plant height	0.140	43.34**	0.430
2	Plant spread	0.002	123.44**	0.400
3	Number of Primary branches per plant	0.018	3.84**	0.070
4	Number of Secondary branches per plant	0.470	5.37**	0.070
5	Days to first flowering	1.250	25.25**	1.530
6	Days to 50 per cent flowering	0.160	9.59**	0.280

7	Number of flowers per cluster	0.140	1.99**	0.020
8	Fruit width	0.007	1.10**	0.007
9	Fruit length	0.660	12.15**	0.030
10	Calyx length	0.002	0.66**	0.002
11	Fruit weight	0.310	5113.32**	0.450
12	Percentage of Shoot borer incidence	0.290	34.83**	0.070
13	Percentage of Fruit borer incidence by weight	0.058	219.90**	0.053
14	Percentage of Fruit borer incidence by number	0.260	226.55**	0.08
15	Number of Seeds per fruit	214.03	145651.78**	79.84
16	Thousand seed weight	0.015	1.68**	0.004
17	Days to First Picking	1.590	7.10**	0.240
18	Days to final picking	3.270	107.82**	0.410
19	Number of fruits per plant	0.045	20.69**	0.110
20	Fruit yield per plant	0.002	0.024**	0.002
21	Ascorbic Acid	0.015	5.30**	0.006
22	Total Phenols	0.015	145.48**	0.002
23	Solasodine	0.0004	0.0001**	0.0006

Among the parents, the maximum and minimum values for the trait plant height were observed in P<sub>3</sub> (91.82 cm) and P<sub>6</sub> (76.90 cm) respectively. Among the hybrids, P<sub>3</sub> x P<sub>4</sub> and P<sub>5</sub> x P<sub>3</sub> recorded the highest value of (91.00 cm) followed by P<sub>3</sub> x P<sub>2</sub> (90.85cm) while it was minimum in P<sub>6</sub> x P<sub>1</sub> (75.95 cm). Three parents and fifteen hybrids were found significantly superior over the grand mean (85.79 cm) (Table 3 and 4). The results are in closed conformity with the earlier reports of Roy *et al.*, (2009) [15].

The maximum value for plant spread was observed in P<sub>2</sub> of 96.97 cm and minimum value of 71.22 cm in P<sub>5</sub>. Among the hybrids, the highest value was recorded in the cross P<sub>2</sub> x P<sub>5</sub> (94.25 cm) while the lowest value was observed in the cross P<sub>5</sub> x P<sub>2</sub> (70.75 cm). Four parents and sixteen hybrids recorded higher values over the grand mean (82.69 cm) (Table 3 and 4).

The parent P<sub>4</sub> was recorded to produce highest number of primary branches per plant (7.50) whereas the lowest was recorded in P<sub>5</sub> (4.50). Among the hybrids, the maximum number of primary branches was observed in the cross P<sub>3</sub> x P<sub>2</sub> (8.55) and the minimum number of primary branches in P<sub>5</sub> x P<sub>1</sub> (4.10). Significantly higher values over grand mean (6.50) for number of primary branches per plant were recorded in three parents and sixteen hybrids (Table 3 and 4).

Among the parents, the highest and the lowest number of secondary branches per plant were observed in P<sub>1</sub> (12.10) and P<sub>5</sub> (7.50) respectively. Among the hybrids, the cross P<sub>1</sub> x P<sub>4</sub> recorded maximum value of 12.45 and minimum number of secondary branches in the cross P<sub>5</sub> x P<sub>1</sub> (7.30). Whereas, three parents and twelve hybrids recorded higher values over the grand mean (10.59) (Table 4 and 5). Similar type of results was reported by Roy *et al.*, (2009) [15] and Kalaiyarsi *et al.*, (2017) [7].

The mean value recorded for days to first flowering was 48.28 days (Table 3 and 4), P<sub>1</sub> was the earliest flowering genotype

(43.50 days) among the parents followed by P<sub>3</sub> (44.0 days). While the hybrid combination P<sub>1</sub> x P<sub>3</sub> was recorded the earliest flowering (42.75 days) followed by P<sub>3</sub> x P<sub>4</sub> (43 days) and the late flowering was noted in P<sub>6</sub> x P<sub>4</sub> (54.50 days). One parent and nine hybrids recorded higher values over the grand mean (48.28 days).

The parent P<sub>1</sub> (51.20 days) followed by P<sub>5</sub> (52.90 days) was observed to be earliest 50% flowering and the late flowering was noted in the parent P<sub>6</sub> (56.50 days). Among the hybrids, the cross P<sub>5</sub> x P<sub>1</sub> (51.65 days) recorded earlier 50% flowering and the late 50% flowering was noted in the cross P<sub>6</sub> x P<sub>5</sub>. Two parents and ten hybrids recorded higher values over the grand mean (54.06 days) (Table 4 and 5). These findings are consonance with the earlier findings of Raghu *et al.*, (2012) [11], Ravali *et al.*, (2017) [12], Pegam *et al.*, (2019) and Srivatsava *et al.*, (2019).

Among the parents, the maximum and minimum number of flowers per clusters was observed in P<sub>1</sub> (3.30) and P<sub>4</sub> (1.20) respectively. Among the hybrids, the cross combination P<sub>5</sub> x P<sub>6</sub> (3.70) observed the maximum and minimum value was recorded in the cross P<sub>4</sub> x P<sub>1</sub> (1.05) for this trait. Three parents and fifteen hybrids recorded significant higher values over the grand mean (2.35) (Table 3 and 4).

P<sub>1</sub> recorded earliest harvesting parent (62.60 days) while P<sub>3</sub> (69.80 days) was late harvesting parent. Among the hybrids, the cross P<sub>1</sub> x P<sub>2</sub> (62.70 days) recorded earliest and P<sub>3</sub> x P<sub>2</sub> (70.50 days) was late. One parent and seven hybrids recorded higher value than grand mean (66.96 days) (Table 3 and 4).

Among the parents, P<sub>1</sub> (149.30 days) had maximum days to harvest while minimum day to harvest was P<sub>3</sub> (129.10 days). Among the hybrids, maximum days to final picking was recorded in the cross P<sub>1</sub> x P<sub>2</sub> (146.70 days) while minimum P<sub>3</sub> x P<sub>6</sub> (126.35 days). Four parents and twenty hybrids recorded superior over the grand mean (138.68 days) (Table 3 and 4).

**Table 3:** Mean Performance of Parents for Quantitative traits in Brinjal

Parents	Plant height (cm)	Plant spread (cm)	No. of primary branches per plant	No. of secondary branches per plant	Days to first flowering	Days to 50 % flowering	No. of flowers per cluster	Days to first harvest	Days to last harvest
P 1	84.80	72.75	5.05	12.10**	43.50	51.20	3.30**	62.60	149.30**
P 2	90.14**	96.97**	5.88	11.30*	50.00	56.20**	1.40	67.40	146.70**
P 3	91.82**	87.27**	7.50**	9.90	44.60	53.60	1.60	59.80**	129.10
P 4	85.40	86.75**	7.40**	11.70**	47.30	53.60	1.20	65.60	146.00**
P 5	90.20**	71.22	4.50	7.50	50.20	52.90	3.20**	65.70	130.00
P 6	76.90	83.22	7.20*	10.70	52.20**	56.50**	3.20**	66.80	146.00**
Range	91.82-75.95	96.97-70.75	8.55-4.10	12.45-7.30	54.50-42.75	57.43-51.65	3.70-1.00	70.50-	149.30-

								62.60	126.35
SEd	0.66	0.63	0.27	0.27	1.24	0.54	0.16	0.50	0.64
CV	0.77	0.77	4.15	2.53	2.50	0.99	0.93	0.74	0.46
CD (0.05)	1.35	1.29	0.55	0.54	2.51	1.09	0.33	1.00	1.31
CD (0.01)	1.81	1.72	0.74	0.73	3.37	1.46	0.44	1.35	1.75
Parental mean	85.79	82.69	6.5	10.59	48.28	54.06	2.35	66.96	138.68

\*, \*\* Significance at 5 and 1 percent respectively

**Table 4:** Mean Performance of Hybrids for Quantitative traits in Brinjal

Hybrids	Plant height (cm)	Plant spread (cm)	No. of primary branches	No. of secondary branches	Days to first flowering	Days to 50 % flowering	No. of flowers per cluster	Days to first harvest	Days to last harvest
P1 x P2	84.40	73.70	5.45	12.25**	43.00	51.00	3.10**	62.70	141.50**
P1 x P3	84.05	74.50	5.75	12.05**	42.75	51.75	3.30**	64.60	142.60**
P1 x P4	84.35	75.75	5.60	12.45**	44.75	51.80	3.55**	63.60	141.75**
P1 x P5	85.00	72.15	6.05	12.35**	45.00	51.70	3.35**	64.25	142.25**
P1 x P6	82.35	76.45	5.65	12.10**	46.00	52.00	1.25	66.10	142.80**
P2 x P1	88.75**	93.70**	5.90	11.25*	48.50	56.15**	1.25	67.85	143.45**
P2 x P3	89.60**	96.70**	6.35	11.35**	50.00	56.90**	1.35	58.10*	142.95**
P2 x P4	87.75**	93.65**	5.70	11.00	49.50	57.00**	1.75	67.05	140.40*
P2 x P5	87.90**	94.25**	6.05	10.95	50.50	57.25**	1.60	67.05	141.75**
P2 x P6	89.25	93.50**	6.15	10.65	50.50	57.40**	1.50	67.70	141.75**
P3 x P1	90.00**	90.80**	7.90**	9.50	44.00	52.65	1.60	69.50**	128.25
P3 x P2	90.85**	87.65**	8.55**	9.80	43.50	52.10	1.70	70.50**	127.10
P3 x P4	91.00**	88.25**	8.30**	10.05	43.00	53.75	1.60	69.10**	126.50
P3 x P5	89.20**	87.50**	7.90**	10.10	45.50	52.05	1.60	69.50**	128.75
P3 x P6	88.00**	87.50**	8.10**	10.30	44.25	53.50	1.50	68.80**	126.35
P4 x P1	85.75	85.95**	8.15**	12.25**	46.75	53.00	1.05	65.75	144.00**
P4 x P2	85.75	85.10**	7.90**	11.95**	46.25	53.00	1.10	65.95	143.23**
P4 x P3	84.90	85.25**	7.70**	12.05**	47.25	53.90	1.30	65.80	144.11**
P4 x P5	85.95	86.75**	7.95**	11.90**	48.00	53.25	1.50	66.75	146.85**
P4 x P6	86.35	86.00**	8.00**	12.10**	46.00	53.75	1.40	66.55	147.10**
P5 x P1	88.25**	71.00	4.10	7.30	50.75	51.65	3.30**	66.80	133.10
P5 x P2	88.75**	70.75	4.25	7.45	51.75**	52.10	3.40**	66.75	131.75
P5 x P3	91.00**	71.75	4.20	7.45	51.00*	52.15	3.50**	67.50	131.25
P5 x P4	88.25**	72.25	4.25	7.35	52.00**	52.75	3.45**	67.20	129.30
P5 x P6	87.35*	72.75	4.30	7.45	54.00**	52.25	3.70**	69.55**	128.25
P6 x P1	75.95	82.00	7.10*	10.65	52.75**	57.00**	3.10**	67.40	142.00**
P6 x P2	76.25	85.60	7.40**	10.70	51.75**	57.30**	3.50**	66.45	141.85**
P6 x P3	76.65	83.20	7.35**	11.00	52.75**	56.85**	3.35**	66.95	143.75**
P6 x P4	77.25	82.25	7.55**	11.10	54.50**	57.00**	3.65**	67.70	142.85**
P6 x P5	78.20	81.75	7.05*	11.40**	53.00**	57.43**	3.40**	68.50*	139.85**
Range	91.82-75.95	96.97-70.75	8.55-4.10	12.45-7.30	54.50-42.75	57.43-51.65	3.70-1.00	70.50-62.60	149.30-126.35
SEd	0.66	0.63	0.27	0.27	1.24	0.54	0.16	0.50	0.64
CV	0.77	0.77	4.15	2.53	2.50	0.99	0.93	0.74	0.46
CD (0.05)	1.35	1.29	0.55	0.54	2.51	1.09	0.33	1.00	1.31
CD (0.01)	1.81	1.72	0.74	0.73	3.37	1.46	0.44	1.35	1.95
Hybrid mean	85.79	82.69	6.5	10.59	48.28	54.06	2.35	66.96	138.68

\*, \*\* Significance at 5 and 1 percent respectively

The parents, P<sub>4</sub> (29.40) followed P<sub>5</sub> (26.90) was recorded highest number of fruits per plant and lowest was in P<sub>3</sub> (19.70). Among the hybrids, P<sub>4</sub> x P<sub>2</sub> (29.15) noted maximum number of fruits while the cross P<sub>3</sub> x P<sub>2</sub> (19.05) observed minimum value for this character. Two parents and twelve hybrids recorded higher values than grand mean (23.58) (Table 5 and 6). The present results are in agreement with earlier findings of Das *et al.*, (2009) [4] and Rani *et al.*, (2019). The parent P<sub>4</sub> recorded the highest fruit width of 4.63 cm and the lowest fruit width of 2.51 cm was noted in P<sub>5</sub>. Among the hybrids, the cross P<sub>4</sub> x P<sub>2</sub> (4.64 cm) observed the maximum value while the minimum value was observed in the cross P<sub>5</sub> x P<sub>3</sub> (2.30 cm) presented in the (Table 5 and 6). Totally five parents and twenty hybrids found to record significantly higher fruit width over grand mean (3.89 cm).

Among the parents, the highest and lowest values were observed in P<sub>1</sub> (13.30 cm) and P<sub>2</sub> (5.85 cm) respectively. The parents P<sub>1</sub>, P<sub>3</sub>, P<sub>4</sub>, and P<sub>5</sub> recorded significant higher mean value (10.76 cm). In the hybrids, the cross P<sub>1</sub> x P<sub>5</sub> (13.15 cm) was maximum whereas P<sub>2</sub> x P<sub>4</sub> (5.35 cm) recorded minimum value for the trait fruit length. Four parents and seventeen hybrids recorded higher values over the grand mean (10.76 cm) (Table 5 and 6).

The parent P<sub>3</sub> observed the maximum calyx length of 5.07 cm and P<sub>6</sub> (3.24 cm) noted minimum value for this trait. Among the hybrids, the cross P<sub>3</sub> x P<sub>4</sub> (5.10 cm) observed the highest value, while the lowest was recorded in P<sub>6</sub> x P<sub>2</sub> (10.70 cm) for this trait and three parents and fifteen hybrids recorded higher values over the grand mean (4.02 cm) (Table 5 and 6).

Among the parents, the minimum and maximum fruit weight

was observed in P<sub>6</sub> (28.48 g) and P<sub>3</sub> (177.05 g) respectively. Among the hybrids, the cross combination P<sub>3</sub> x P<sub>4</sub> was noted highest value of 175.48 g and lowest value was recorded in the cross P<sub>6</sub> x P<sub>5</sub> (27.06 g). Two parents and ten hybrids recorded significant higher values over the grand mean (71.58 cm) (Table 5 and 6).

The parent P<sub>1</sub> (12.27%) observed minimum shoot borer incidence and the maximum was noted in P<sub>4</sub> (24.98%). Among the hybrids, the cross P<sub>1</sub> x P<sub>6</sub> (11.51%) recorded lowest shoot borer incidence and the highest infestation was observed in P<sub>4</sub> x P<sub>2</sub> (24.43%). Four parents and eighteen hybrids showed superior values than grand mean (20.55 %) (Table 5 and 6).

Among the parents, the highest and lowest fruit borer incidence by weight was recorded in P<sub>5</sub> (41.51%) and P<sub>1</sub> (15.05%). Among the hybrids, the cross P<sub>5</sub> x P<sub>6</sub> (43.16%) was maximum whereas minimum incidence was observed in the cross Odavai P<sub>1</sub> x P<sub>2</sub> (15.12%) and four parents and twenty hybrids exhibited higher values over the grand mean (29.40 %) (Table 5 and 6).

Among the parents, the maximum and minimum fruit borer incidence by number was recorded in P<sub>5</sub> (44.79%) and P<sub>1</sub> (17.25%) respectively. Among the hybrids, the cross combination P<sub>5</sub> x P<sub>3</sub> (45.37%) recorded maximum value and minimum value was observed in the cross P<sub>1</sub> x P<sub>4</sub> (16.77%) for this trait. Significantly higher values over grand mean (33.05 %) for percentage of fruit borer incidence by number

were recorded in four parents and twenty hybrids (Table 5 and 6).

The parent P<sub>4</sub> (1627.10) had maximum number of seeds per fruit whereas minimum number of seeds was observed in P<sub>2</sub> (791.50). Among the hybrids, the cross P<sub>4</sub> x P<sub>3</sub> (1630.05%) was recorded highest and P<sub>2</sub> x P<sub>4</sub> (768.75%) observed lowest number of seeds per fruit. Three parents and fourteen hybrids showed significant higher values over the grand mean (1230.50) (Table 5 and 6)

Among the parents, the 1000 seed weight was the highest in P<sub>3</sub> (4.41 g). The highest value for this trait was recorded in the cross P<sub>3</sub> x P<sub>6</sub> (4.70 g) and lowest value in P<sub>1</sub> x P<sub>2</sub> (2.18 g) was recorded among the hybrids for this character. Significantly higher values over grand mean (3.23 g) for 1000 seed weight were recorded in two parents and eleven hybrids (Table 5 and 6).

Among the parents, the maximum and minimum fruit yield per plant was observed in P<sub>1</sub> (1.95 kg) and P<sub>5</sub> (1.52 kg). The parents P<sub>1</sub> and P<sub>3</sub> exhibited higher significant mean values (1.64 kg). Among the hybrid, the cross P<sub>1</sub> x P<sub>5</sub> (1.90 kg) was recorded highest and three hybrids observed the lowest yield P<sub>2</sub> x P<sub>1</sub>, P<sub>2</sub> x P<sub>6</sub>, P<sub>5</sub> x P<sub>1</sub> (1.53 kg). Significantly higher values over grand mean (1.64 kg) for fruit yield per plant were recorded in two parents and five hybrids (Table 5 and 6). These findings are in agreement with the earlier reports of Kumar *et al.*, (2013) and Rani *et al.*, (2018) [8, 14].

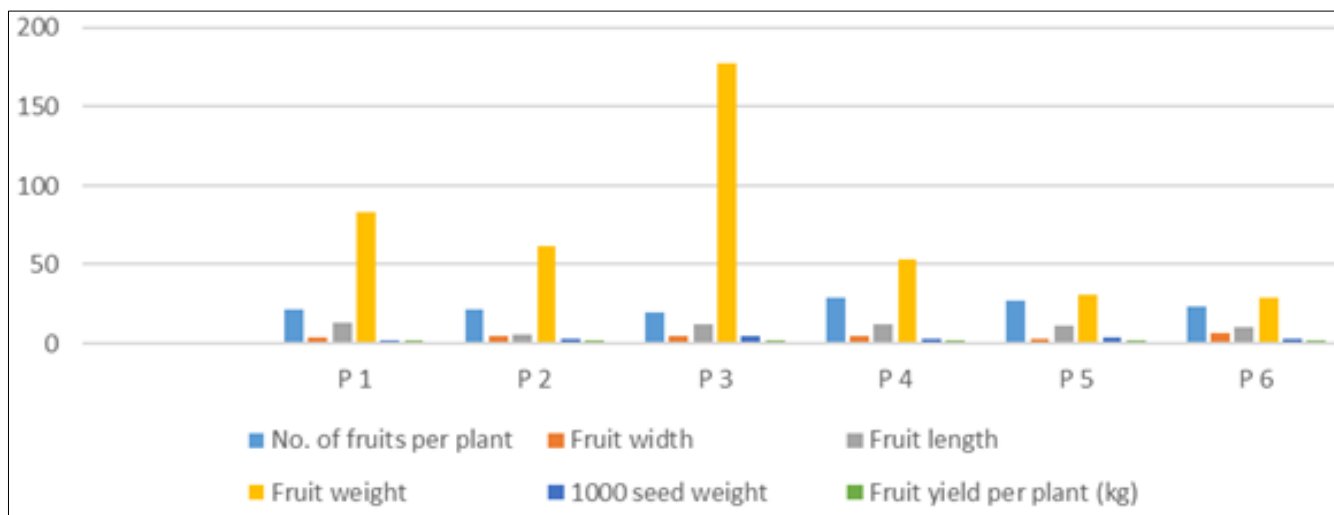


Fig 1: Mean Performance of Parents for Yield in Brinjal

Table 5: Mean Performance of Parents for Yield and Yield attributes in Brinjal

Parents	No. of fruits per plant	Fruit width (cm)	Fruit length (cm)	Calyx length (cm)	Fruit weight (g)	% Shoot borer incidence	Fruit borer incidence by weight	Fruit borer incidence by number	No. of seeds per fruit	1000 seed weight (g)	Fruit yield per plant (kg)
P 1	21.60	3.99**	13.30**	4.27**	83.31**	12.27	15.05	17.25	1046.20	2.19	1.95**
P 2	21.50	4.23**	5.85	3.85	61.94	23.12**	32.20**	39.98**	791.50	2.49	1.53
P 3	19.70	4.50**	11.70**	5.07**	177.05**	19.08	32.95**	34.79**	1234.20	4.41**	1.75*
P 4	29.40**	4.63**	12.50**	3.56	53.11	24.98**	37.85**	41.40**	1627.10**	2.49	1.56
P 5	26.90**	2.51	11.45**	4.25**	31.08	22.52**	41.51**	44.79**	1439.90**	4.17**	1.52
P 6	23.70	6.94*	10.24	3.24	28.48	21.83**	15.24	20.11	1278.00**	3.19	1.61
Range	29.40-19.05	4.64-2.30	13.30-5.35	5.10-3.20	177.05-27.06	24.98-11.51	43.16-15.05	45.37-16.77	1630.05-758.75	4.70-2.18	1.95-1.52
SEd	0.34	0.03	0.18	0.04	0.67	0.27	0.23	0.28	8.94	0.07	0.05
CV	1.46	0.70	1.67	1.02	0.94	1.30	0.79	0.86	0.73	2.10	2.89
CD (0.05)	0.70	0.05	0.37	0.08	1.37	0.54	0.47	0.58	18.14	0.14	0.10
CD (0.01)	0.94	0.07	0.49	0.11	1.83	0.73	0.63	0.77	24.34	0.19	0.13
Parental mean	23.58	3.89	10.76	4.02	71.58	20.55	29.40	33.05	1230.50	3.23	1.64

\*, \*\* Significance at 5 and 1 percent respectively

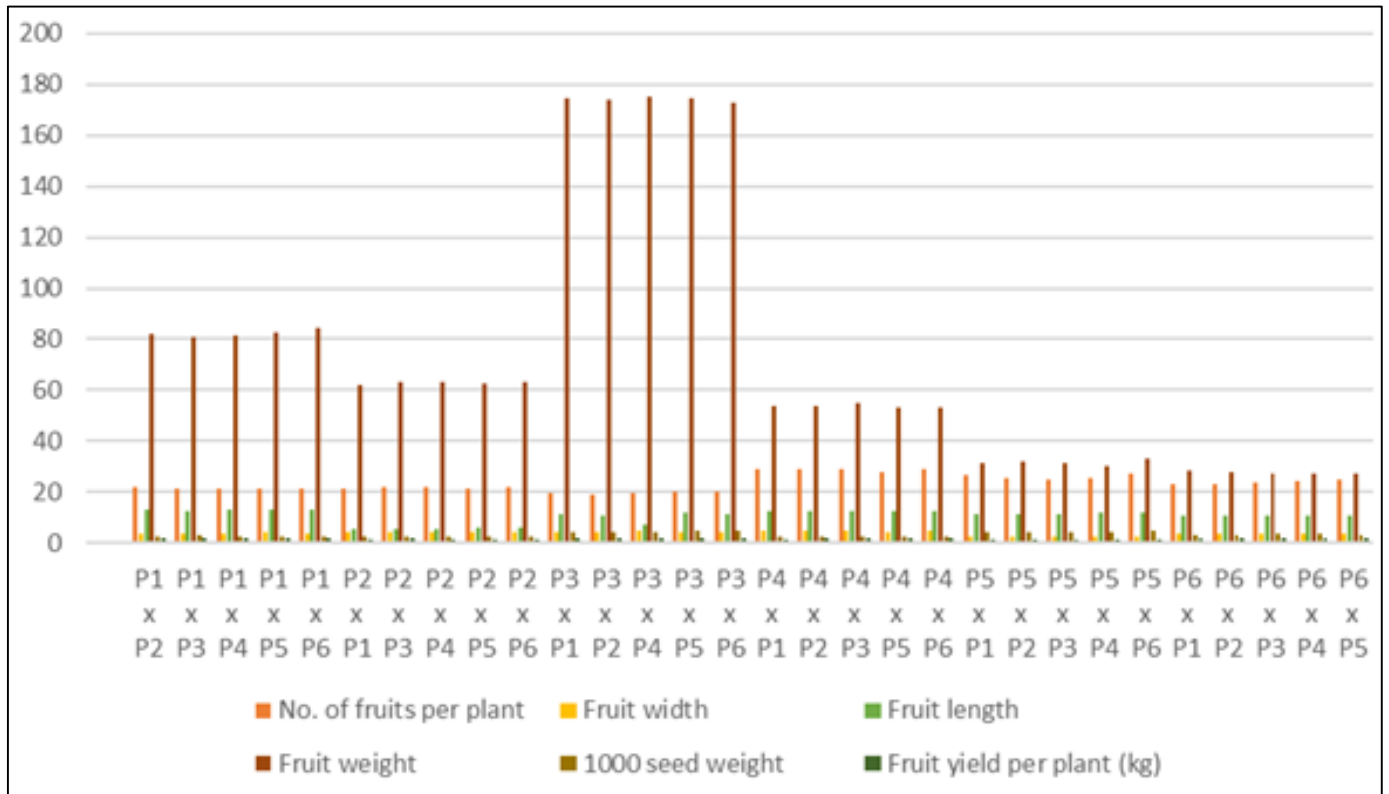


Fig 2: Mean Performance of hybrids for Yield in Brinjal

Table 6: Mean Performance of Hybrids for Yield and Yield attributes in Brinjal

Hybrids	No. of fruits per plant	Fruit width (cm)	Fruit length (cm)	Calyx length (cm)	Fruit weight (g)	% Shoot borer incidence	Fruit borer incidence by weight	Fruit borer incidence by number	No. of seeds per fruit	1000 seed weight (g)	Fruit yield per plant (kg)
P1 x P2	21.80	3.87**	13.05**	4.22**	81.95**	12.09	15.12	16.91	1050.71	2.18	1.76*
P1 x P3	21.50	3.73**	12.65**	4.20**	80.85**	12.41	15.21	17.47	1020.85	2.80	1.79**
P1 x P4	21.05	3.85**	13.1**	4.24**	81.70**	11.84	15.65	16.77	1055.17	2.42	1.82**
P1 x P5	21.30	3.98**	13.15**	4.24**	82.88**	12.52	15.95	17.41	1040.60	2.23	1.70
P1 x P6	21.35	3.81**	12.8**	4.26**	84.38**	11.51	15.80	17.09	1068.90	2.40	1.75
P2 x P1	21.50	4.26**	5.55	3.88	61.75	23.74**	32.15**	39.36**	785.90	2.39	1.53*
P2 x P3	22.00	4.26**	5.50	3.79	62.88	22.89**	32.22**	39.63**	773.18	2.40	1.57
P2 x P4	22.15	4.27**	5.35	3.78	63.10	23.73**	31.87**	38.84**	758.75	2.41	1.54
P2 x P5	21.15	4.18**	5.80	3.77	62.38	23.81**	31.16**	38.05**	791.85	2.52	1.54
P2 x P6	21.80	4.28**	5.70	3.83	63.13	22.78**	31.39**	38.36**	785.70	2.57	1.53
P3 x P1	19.30	4.48**	11.00	5.00**	174.53**	18.82	33.95**	34.32**	1235.05	4.20**	1.70
P3 x P2	19.05	4.50**	10.90	5.05**	174.21**	19.12	33.35**	34.58**	1232.00	4.38**	1.64
P3 x P4	19.65	4.55**	7.30**	5.10**	175.48**	18.88	33.10**	34.37**	1237.28	4.41**	1.90**
P3 x P5	20.00	4.28**	11.70**	4.99**	174.58**	19.58	33.78**	34.15**	1238.08	4.56**	1.70
P3 x P6	20.10	4.35**	11.15	4.96**	172.95**	19.85	33.99**	34.95**	1245.43	4.70**	1.72
P4 x P1	29.10**	4.63**	12.40**	3.56	53.86	24.08**	37.87**	41.72**	1622.15**	2.39	1.56
P4 x P2	29.15**	4.64**	12.50**	3.53	53.72	24.43**	37.75**	41.88**	1625.93**	2.43	1.57
P4 x P3	28.80**	4.59**	12.70**	3.58	54.63	24.03**	37.63**	41.44**	1630.05**	2.46	1.60
P4 x P5	28.00**	4.49**	12.55**	3.51	53.33	23.07**	37.00**	41.92**	1617.88**	2.37	1.61
P4 x P6	29.25**	4.53**	12.50**	3.56	53.28	24.20**	37.17**	41.97**	1590.20**	2.46	1.60
P5 x P1	26.40**	2.50	11.10	4.28**	31.11	22.52**	41.33**	45.13**	1444.05**	4.49**	1.53
P5 x P2	25.15**	2.36	11.30**	4.26**	31.88	22.50**	42.40**	45.11**	1443.68**	4.43**	1.54
P5 x P3	24.85**	2.30	11.50**	4.18**	31.43	22.14**	42.45**	45.37**	1436.95**	4.40**	1.56
P5 x P4	25.55**	2.35	11.70**	4.24**	30.05	22.98**	42.19**	45.10**	1399.75**	4.17**	1.56
P5 x P6	27.30**	2.34	11.85**	4.29**	33.13	24.29**	43.16**	45.08**	1392.57**	4.56**	1.54
P6 x P1	22.90	3.87	10.45	3.24	28.36	21.00	15.32	20.16	1275.58**	3.22	1.64
P6 x P2	23.15	3.84	10.50	3.20	27.75	21.05	15.54	21.02	1277.98**	3.23	1.66
P6 x P3	23.65	3.74	10.60	3.30	27.13	21.90**	15.95	21.09	1270.60**	3.38*	1.65
P6 x P4	24.35*	3.63	10.75	3.40	27.45	22.13**	15.56	21.04	1277.95**	3.46	1.70
P6 x P5	24.70**	3.75	10.95	3.29	27.06	22.07**	15.60	21.55	1230.2	3.18	1.60
Range	29.40-19.05	4.64-2.30	13.30-5.35	5.10-3.20	177.05-27.06	24.98-11.51	43.16-15.05	45.37-16.77	1630.05-758.75	4.70-2.18	1.95-1.52
SEd	0.34	0.03	0.18	0.04	0.67	0.27	0.23	0.28	8.94	0.07	0.05
CV	1.46	0.70	1.67	1.02	0.94	1.30	0.79	0.86	0.73	2.10	2.89
CD (0.05)	0.70	0.05	0.37	0.08	1.37	0.54	0.47	0.58	18.14	0.14	0.10
CD (0.01)	0.94	0.07	0.49	0.11	1.83	0.73	0.63	0.77	24.34	0.19	0.13
Grand mean	23.58	3.89	10.76	4.02	71.58	20.55	29.4	33.05	1230.5	3.23	1.64

\*, \*\* Significance at 5 and 1 percent respectively

Among the parents, the highest and lowest amount of ascorbic acid content was observed in P<sub>5</sub> (11.95 mg/ 100 g) and P<sub>2</sub> (7.70 mg/ 100 g). Among the hybrids, the cross P<sub>5</sub> x P<sub>3</sub> (12.01 mg/ 100 g) recorded maximum and minimum in P<sub>2</sub> x P<sub>4</sub> (7.60 mg/ 100 g) for this trait. Two parents and ten hybrids exhibited superior values than grand mean (9.64 mg/ 100 g) (Table 7 and 8).

The highest amount of phenol was recorded in P<sub>4</sub> (72.95 mg/ 100 g) while P<sub>1</sub> (54.02 mg/100 g) had lowest phenol content in parents. Among the hybrids, the two crosses observed

higher amount of phenol content P<sub>4</sub> x P<sub>3</sub> and P<sub>4</sub> x P<sub>6</sub> (73.03 mg/100 g) whereas lowest was in P<sub>6</sub> x P<sub>1</sub> (50.61 mg/100 g) and two parents and ten hybrids recorded higher significant values than grand mean (59.94 mg/ 100 g) (Table 7 and 8).

The highest amount of solasodine content was recorded in P<sub>4</sub> (0.036 mg/100g) and lowest in P<sub>5</sub> (0.016 mg/ 100 g). Among the hybrids, the cross P<sub>4</sub> x P<sub>5</sub> (0.039 mg/ 100g) was maximum and minimum in P<sub>6</sub> x P<sub>1</sub> (0.010 mg/100 g) for this trait and two parents and ten hybrids exhibited superior significant value over the grand mean (0.024 mg/100 g) (Table 7 and 8).

**Table 7:** Mean Performance of Parents for Quality traits in Brinjal

Parents	Ascorbic acid content (mg/100 g)	Total Phenol content (mg/100 g)	Solasodine content (mg/100 g)
P 1	8.40	54.02	0.019
P 2	7.70	69.98**	0.031**
P 3	8.85	58.64	0.021
P 4	9.30	72.95**	0.036**
P 5	11.95**	54.03	0.016
P 6	11.75**	50.77	0.014
Range	12.01-7.60	73.03-50.61	0.039-0.010
SEd	0.08	0.05	0.003
CV	0.82	0.09	10.57
CD (0.05)	0.16	0.11	0.005
CD (0.01)	0.22	0.15	0.007
Parental mean	9.64	59.94	0.024

\*, \*\* Significance at 5 and 1 percent respectively

**Table 8:** Mean Performance of Hybrids for Quality traits in Brinjal

Hybrids	Ascorbic acid content (mg/ 100 g)	Total Phenol content (mg/ 100 g)	Solasodine content (mg/ 100 g)
P1 x P2	8.18	53.96	0.016
P1 x P3	8.49	54.30	0.020
P1 x P4	8.50	53.30	0.023
P1 x P5	8.60	52.99	0.017
P1 x P6	8.29	52.87	0.022
P2 x P1	7.88	69.77**	0.030*
P2 x P3	7.76	69.70**	0.029*
P2 x P4	7.60	59.04**	0.033**
P2 x P5	7.88	69.86**	0.032**
P2 x P6	7.63	69.74**	0.028
P3 x P1	8.58	58.81	0.018
P3 x P2	8.80	57.88	0.024
P3 x P4	8.66	58.88	0.025
P3 x P5	8.63	58.98	0.022
P3 x P6	8.67	59.10	0.025
P4 x P1	9.37	72.80**	0.036**
P4 x P2	9.40	72.82**	0.037**
P4 x P3	9.39	73.03**	0.038**
P4 x P5	9.40	72.93**	0.039**
P4 x P6	9.60	73.03**	0.035**
P5 x P1	11.94**	54.02	0.015
P5 x P2	11.96**	53.93	0.021
P5 x P3	12.01**	52.98	0.017
P5 x P4	11.96**	53.99	0.019
P5 x P6	11.95**	54.04	0.023
P6 x P1	11.55**	50.61	0.010
P6 x P2	11.48**	51.09	0.013
P6 x P3	11.55**	51.09	0.020
P6 x P4	11.66**	50.99	0.017
P6 x P5	11.74**	51.07	0.024
Range	12.01-7.60	73.03-50.61	0.039-0.010
SEd	0.08	0.05	0.003
CV	0.82	0.09	10.57
CD (0.05)	0.16	0.11	0.005
CD (0.01)	0.22	0.15	0.007
Grand mean	9.64	59.94	0.024

\*, \*\* Significance at 5 and 1 percent respectively

## Conclusion

The success of any breeding programme depends on the identification of suitable parents and selection of proper breeding methodology for the improvement of a specific trait. The selection of parents with high *per se* performance would be of merit in producing better hybrids and hence the parents selected for crossing programme were evaluated based on their *per se* performance. Analysis of variance for yield and yield contributing characters indicated significant differences among the genotypes for all the traits studied.

In the present study, parent P<sub>3</sub> expressed desirable significant mean value for plant height, plant spread, number of primary branches per plant, fruit width, fruit length, calyx length, fruit weight and percentage of fruit borer incidence by weight, percentage of fruit borer incidence by number, 1000 seed weight, days to first picking and fruit yield per plant. The parent P<sub>4</sub> recorded favorable mean performance for plant spread, number of primary branches per plant, number of secondary branches per plant, fruit width, fruit length, percentage of shoot borer incidence and percentage of fruit borer incidence by weight, number of seeds per fruit, days to final picking, number of fruits per plant, total phenols and solasodine. The parent P<sub>1</sub> showed superior *per se* performance for number of secondary branches per plant, number of flowers per cluster, fruit length, calyx length, fruit weight, days to final picking and fruit yield per plant. The parent P<sub>6</sub> registered favorable mean performance for number of primary branches per plant, days to first flowering, number of flowers per cluster, percentage of shoot borer incidence, number of seeds per fruit, 1000 seed weight and days to final picking. Hence these four parents are best among six parents' studied and highly recommended for further breeding programmes.

Similar results were recorded by Chowdhury *et al.* (2010)<sup>[3]</sup> for plant height, days to 50 per cent flowering and days to first picking; Dahatonde *et al.* (2010)<sup>[6]</sup> for plant height, number of primary branches per plant, days to 50% flowering, fruit length and fruit yield per plant.

Among the hybrids P<sub>3</sub> x P<sub>4</sub> registered significantly favorable *per se* performance for eleven traits such as plant height, primary branches per plant, fruit width, calyx length, fruit weight, percentage of shoot borer incidence, percentage of fruit borer incidence by weight, percentage of fruit borer incidence by number, 1000 seed weight, days to first picking and fruit yield per plant in which eleven were yield attributing traits. The crosses P<sub>6</sub> x P<sub>4</sub>, P<sub>5</sub> x P<sub>6</sub> exhibited significant mean performance for days to first flowering, number of flowers per cluster, 50% flowering which were yield attributing traits. The cross P<sub>4</sub> x P<sub>6</sub> recorded two yield contributing characters (number of fruits per plant and days to final harvested). Based on the mean performance of thirty hybrids studied four hybrids *viz.*, P<sub>3</sub> x P<sub>4</sub>, P<sub>4</sub> x P<sub>6</sub>, P<sub>5</sub> x P<sub>6</sub>, P<sub>6</sub> x P<sub>4</sub> were identified as promising cross combination for recording high *per se* performance for most of the yield attributing traits including fruit yield per plant. These hybrids may be subjected to further trials across the district (Theni) for crop improvement.

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