

Original Research Article

<https://doi.org/10.20546/ijcmas.2019.811.195>

Performance of Brinjal (*Solanum melongena* L.) Parents and Hybrids for Yield and Yield Attributing Characters under Chhattisgarh Condition

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ABSTRACT

A field experiment was conducted during rainy season 2016-17 in Randomized Complete Block Design with three replication at the Department of Vegetable Science, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh. The experimental material consists of six lines (*viz.*, IGB-17, IGB-54, IGB-55, IGB-62, IGB-88 and IGB-92) and four testers namely Pant Rituraj, Pant Samrat, Kashi Taru and IBWL) and Line x Tester mating design was followed in this study. The resultant 24 hybrids were evaluated for fourteen yield and yield contributing traits in brinjal. In the present study, parents and hybrids differed significantly among themselves for growth characters. The cross IGB-92 x PS recorded the highest plant height, while the highest yielding crosses *viz.*, IGB-17 x PR, IGB-17 x KT, IGB-92 x PS, IGB-92 x PR, IGB-62 x IBWL, IGB-88 x IBWL had relatively medium plant height with more number of primary branches. The crosses, IGB-17 x PR, IGB-17 x KT, IGB-92 x PS, IGB-92 x PR, IGB-62 x IBWL, IGB-88 x IBWL showed superior *per se* performance, therefore, recommended for generation advancement and selection of desirable progeny lines useful for Chhattisgarh plains.

Keywords

Brinjal, *per se*,
Parents, Hybrids
and yield

Article Info

Accepted:
12 October 2019
Available Online:
10 November 2019

Introduction

Brinjal (*Solanum melongena* L. $2n = 24$), one of the important vegetable crops, belongs to the family Solanaceae and an important vegetable crop and is grown throughout the year. However, it is widely cultivated in both temperate and tropical regions of the globe

mainly for its immature fruits as vegetable (Rai *et al.*, 1995), but in the temperate regions it is cultivated mainly during warm season. Based upon its highest production potential and availability of the produce to consumers, it is also termed as poor man's vegetable and due to its versatility use in Indian food, brinjal is often described as the "King of vegetables".

In India it is commercially cultivated in Odisha, Bihar, Karnataka, West Bengal, Andhra Pradesh, Maharashtra and Uttar Pradesh.

India is the second major producer of brinjal in the world after China. In India, eggplant occupies an area of 6.63 lakh hectares with an annual production of 125.15 lakh metric tonnes and the productivity stands at 18.8 metric tonnes per hectare. In Chhattisgarh, it is grown over an area of 0.35 lakh hectares with an annual production of 6.67 lakh metric tonnes and a productivity of 19.05 metric tonnes per hectare (Anon. 2016). The reasons attributed are, use of low yielding cultivars grown for local preferences and the problem of insect pests *viz.*, fruit and shoot borer, jassids, epilachna beetles and diseases like damping off, phomopsis blight, little leaf and bacterial wilt.

The possible exploitation of hybrid vigour in brinjal has been taken up at several research centres. However, very little systematic attention has been paid by plant breeders to study performance of brinjal varieties/hybrids for yield and its components in Chhattisgarh condition. Keeping this in view, the present investigation was undertaken to study the performance of hybrids in Chhattisgarh condition.

Materials and Methods

The present investigation was carried out in the Department of Vegetable Science, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh during 2015-2017. The parents and the hybrids were evaluated during rainy season 2016-17. The experimental material consists of six lines (*viz.*, IGB-17, IGB-54, IGB-55, IGB-62, IGB-88 and IGB-92) and four testers namely Pant Rituraj, Pant Samrat, Kashi Taru and IBWL) and Line x Tester mating design was followed in this study.

Thus a total of 24 hybrids were synthesized by making crosses between lines and the testers during January 2016 in crossing block. The twenty four crosses (F_1 's along with their parents (six lines and four testers) were grown in Randomized Block Design and replicated with three replications during *kharif* season 2016-17. In each replication each genotype was grown in a four rows and five columns plot with a spacing of 75 cm x 60 cm, row-to-row spacing and plant-to-plant spacing respectively. The recommended package of practices was followed to raise a successful crop and necessary prophylactic plant protection measures were carried out to safeguard the crop from pests and diseases.

Results and Discussion

The per se performance of parents and hybrids for fourteen quantitative characters are presented for growth and yield parameters. The observation on five plant basis for selected parents (six lines and four testers) and their hybrids for fruit yield and its component characters were used for calculating the mean performances. The mean sum of squares due to hybrids and parents *vs.* hybrids were highly significant for all the characters except for plant spread (cm). The mean performances of genotypes are presented character wise and described as below.

Plant height (cm)

Genotypes differed significantly among themselves for plant height exhibited a range of 36.23 cm (IGB-88 x IBWL) to 99.67 cm (Pant Samrat) with a grand mean 63.26 cm. The average of lines for plant height was 56.87 cm with line IGB-92 recording highest height of 65.77 cm and line IGB-62 showed lowest height of 51.37 cm. Among testers, Pant Samrat (99.67 cm) was found maximum plant height and Pant Rituraj (59.67 cm) showed minimum height with an average of

76.46 cm. Mean of plant height for the crosses varied from 36.23 cm (IGB-88 x IBWL) to 77.37 cm (IGB-92 x PS) with overall crosses mean of 56.46 cm. Maximum mean height among crosses was noted in IGB-92 x PS (77.37 cm) followed by IGB-17 x PR (76.17 cm) and IGB-92 x KT (70.1 cm).

Plant spread (cm)

Among parents and their crosses, the mean value of plant spread (cm) ranged from 41.27 cm (IGB-88 x PR) to 88.4 cm (IGB-17 x IBWL) with an overall mean 60.00cm. The lines IGB-55 (65.63 cm) recorded the highest mean value for plant spread, whereas, both IGB-62 and IGB-88 (54.6 cm) showed the lowest mean value. In the testers, Pant Rituraj recorded maximum mean value of (66.3 cm) and IBWL recorded minimum value (52.0 cm) with an overall testers mean of 59.11 cm.

Mean of plant spread for the crosses varied from 41.27 cm (IGB-88 x PR) to 88.4 cm (IGB-17 x IBWL) with an overall crosses mean of 61.69 cm. Maximum mean height among crosses was noted in IGB-17 x IBWL (88.4 cm) followed by IGB-88 x IBWL (75.4 cm) and IGB-92 x KT (73.2 cm).

Number of primary branches per plant

The mean values of number of primary branches per plant varied from 7.1 (IGB-88 x PS) to 15.7 (IBWL) with a grand mean of 9.35. The line IGB-55 (7.03) recorded less number of primary branches per plant, whereas more number of primary branches per plant was recorded in IGB-54 (11.23) followed by IGB-92 (9.03). The tester IBWL (15.7) recorded more number of primary branches per plant and less number of primary branches per plant record in Pant Samrat (11.83). Crosses mean for this trait ranged from 7.1 (IGB-88 x PS) to 11.83 (IGB-92 x PS) with an overall average of 9.21. Maximum number of primary branches per

plant among crosses was shown by IGB-92 x PS (11.83), which is followed by IGB-17 x PR (11.53) and IGB-62 x IBWL (11.47). The increased branching in hybrids was in accordance with the findings of Sao (2006) and Chaitnya (2015).

Days to 50 per cent flowering

The mean values for number of days taken to 50 per cent flowering were in between 30.77 (IGB-54 x PR) to 55.13 (IGB-92) days with a general mean 41.91 days. The line IGB-54 took only 40.37 days to reach 50 percent flowering stage followed by IGB-88 (40.77 days) and the genotype IGB-92 was found to be most late (55.13 days).

The tester IBWL found less number days (41.7 days) to reach 50 percent flowering stage whereas, Pant Samrat took 43.27 days to reach 50 percent flowering stage.

Mean values for Days to 50 per cent flowering among the hybrids varied from 30.77 (IGB-54 x PR) to 48.43 (IGB-92 x PR) days with an average value of 38.28 days. Six hybrids, IGB-54 x KT (32.1), IGB-55 x PR (32.2), IGB-55 x PS (33.3), IGB-17 x IBWL (34.2), IGB-55 x IBWL (34.37) and IGB-88 x PR (34.7) were significantly on par with hybrid IGB-54 x PR for Days to 50 per cent flowering.

Days to first fruit harvest

Days to first fruit harvest ranged from 53.63 (Pant Rituraj) to 81.43 (IGB-92) days with an overall mean of 65.23 days. Among lines, minimum number of days taken for first fruit harvest (59.87 days) was recorded in IGB-88 whereas, maximum number of days (81.43days) for first fruit harvesting was recorded in IGB-92. Among testers, Pant Rituraj was took lesser number of days taken for first fruit harvest (53.63 days) and Pant Samrat took most days for first fruit harvest.

Among the hybrids, days to first fruit harvest varied from 54.17 (IGB-88 x KT) to 73.83 (IGB-62 x PS) days with an overall mean 61.64 days.

Number of clusters per plant

The range for number of clusters per plant among all varied from 5.17 (IBG-92) to 22.53 (IGB-17 x PR) with a grand mean 11.85. Among lines, this trait ranged from 5.17 (IBG-92) to 10.87 (IGB-54), whereas, tester ranged from 9.97 (Pant Rituraj) to 21.0 (IBWL).

In crosses, it varied from 6.9 (IGB-55 x PR) to 22.53 (IGB-17 x PR), which is followed by IGB-17 x KT (19.07), IGB-17 x PS (18.87), IGB-62 x KT (17.4) and IGB-92 x PS (15.47) with an overall average of 12.26.

Number of fruits per plant

Number of fruits per plant ranged from 5.43 (Pant Rituraj) to 21.77 (IGB-92 x PS) with overall mean of 10.78. The average number of fruits per plant for lines was 6.3 with line IGB-88 recorded minimum value and line IGB-17 recorded maximum value of 12.1. Tester Pant Rituraj (5.43) recorded minimum value and IBWL (15.37) showed maximum value with average value 10.97.

Maximum number of fruits per plant was observed for IGB-92 x PS (21.77) which is followed by IGB-17 x KT (17.2), IGB-17 x PS (16.67), IGB-17 x PR (16.67), IGB-17 x IBWL (15.33) and IGB-62 x IBWL (14.97) with an overall average mean of 11.45.

Fruit length (cm)

On an average, fruit length for parents and their hybrids exhibited a range from 5.9 cm (IGB-88) to 34.17 cm (IGB-17 x Kashi Taru) with an overall mean of 15.59 cm. The average fruit length for lines was 10.33 cm

with line IGB-88 recording minimum length of 5.9 cm and line IGB-17 showed maximum length of 17.23 cm. Tester Kashi Taru (20.43 cm) showed maximum fruit length, while Pant Rituraj (12.3cm) recorded minimum fruit length with overall testers mean of 16.40 cm.

Fruit length ranged from 9.17 to 34.17 cm with an overall mean 18.42 cm. Maximum fruit length was observed in crosses IGB-17 x KT (34.17 cm) followed by IGB-92 x PS (26.57 cm), IGB-17 x IBWL (25.67 cm) and IGB-62 x PS (25.07 cm), whereas, minimum fruit length was observed in crosses IGB-88 x PR (9.17 cm).

Fruit girth (cm)

Fruit girth ranged from 10.93 cm (IBWL) to 29.8 cm (IGB-54 x PR) with overall mean of 19.04 cm. The line IGB-92 (26.96 cm) had maximum fruit girth while, IGB-62 (12.13 cm) had minimum girth as compared to lines mean of 18.45 cm.

The overall mean for tester was 15.21 cm, with Pant Rituraj (26.67 cm) showing maximum fruit girth and IBWL (10.93 cm) had the smallest mean value for this trait.

Among the crosses, this trait varied from 13.51 cm (IGB-62 x PS) to 29.8 cm (IGB-54 x PR), which was followed IGB-17 x PR (28.9 cm), IGB-92 x PR (27.05 cm) and IGB-55 x PR (26.87 cm).

Average fruit weight (g)

Fruit weight for parents and hybrids ranged from 52.67 g (IGB-88) to 387.67 g (IGB-17 x PR) with an average 138.9 g. Whereas, IGB-88 showed minimum fruit weight of 52.67 g and maximum mean value of IGB-92 (142.67 g) (Table 1).

Table.1 Mean performance of parents (Lines and Testers) and hybrids in brinjal during *kharif*, 2016-17 at Raipur

Genotypes	Plant height (cm)	Plant spread (cm)	No. of primary branches	Days to 50% flowering	Days to first harvest	No of cluster per plant	No. of fruits per plant	Fruit length (cm)	Fruit girth (cm)	Average fruit weight (g)	Pericarp thickness (mm)	No. of fruits per plant per picking	Fruit yield per plant (kg)	Fruit yield per hectare (q)
LINES														
IGB-17	58.1	60.9	8.5	46.63	68.6	9.3	12.1	17.23	15.67	93	4.0	7.1	2.43	334.3
IGB-54	52.83	57.37	11.23	40.37	65.03	10.87	9.8	6.9	18.94	68.67	5.0	5.4	1.77	250.4
IGB-55	60	65.63	7.03	41.33	66.43	7.37	8.2	6.8	17.23	101	7.3	2.87	1.03	147.5
IGB-62	51.37	54.6	7.5	45.9	76.93	6.37	8.07	10.7	12.13	72	4.3	5.2	1.60	215.9
IGB-88	53.17	54.6	7.77	40.77	59.87	8.53	6.3	5.9	19.75	52.67	3.7	5.03	1.43	197.5
IGB-92	65.77	62.13	9.03	55.13	81.43	5.17	10.97	14.4	26.96	142.67	8.7	2.8	1.63	230.3
Mean of lines	56.87	59.22	8.51	45.02	69.72	7.93	9.94	10.33	18.45	88.33	5.5	4.73	1.65	229.3
TESTERS														
Pant Rituraj	59.67	66.3	12.7	42.43	53.63	9.97	5.43	12.3	26.67	124.67	10	7.2	2.4	326.0
Pant Samrat	99.67	56.3	11.83	43.27	58.23	17.2	14.63	19.87	11.26	99.67	5.3	7.47	1.63	230.4
Kashi Taru	78.67	61.83	12	42.4	57.57	13.37	8.47	20.43	11.97	92	5.3	9.87	1.37	190.1
IBWL	67.83	52	15.7	41.7	55.57	21	15.37	13	10.93	68.33	4.7	12.73	1.90	260.0
Mean of testers	76.46	59.11	13.06	42.45	56.25	15.38	10.97	16.40	15.21	96.17	6.3	9.32	1.83	251.7
CROSSES														
IGB-17 X PR	76.17	49.57	11.53	39.43	56.93	22.53	16.67	20.93	28.9	387.67	10.7	15	3.93	536.2
IGB-17 X PS	68.0	68.6	10.83	37.4	63.53	18.87	16.67	24.73	19.24	321.33	9.0	10.53	2.97	422.1
IGB-17 X KT	58.33	60.9	8.5	43.53	62.07	19.07	17.2	34.17	16.4	286.67	7.0	11.77	3.53	468.9
IGB-17 X IBWL	68.0	88.4	9.87	34.2	64.97	14.8	15.33	25.67	18.25	163.33	5.7	11.47	2.93	420.4
IGB-54 X PR	58.23	59.73	7.37	30.77	65.57	11.77	10.33	11.33	29.8	240	10.0	9.13	2.63	340.3
IGB-54 X PS	57.87	56.97	8.33	34.93	61.3	11	9.97	15.6	19.33	145.3	7.0	7.7	1.33	189.7
IGB-54 X KT	52.97	57.73	8.23	32.1	57.5	7.57	12.5	16.6	22.6	190.0	7.0	8.33	1.63	227.8
IGB-54 X	43.17	62.73	8.63	37.5	59.9	11.77	7.37	21.23	19.1	130.0	5.7	5.93	1.27	173.9

IBWL														
IGB-55 X PR	52.57	65.7	7.3	32.2	59.53	6.9	12.3	9.67	26.87	180.0	5.3	7.2	1.07	148.4
IGB-55 X PS	43.73	64.5	7.27	33.3	59.37	11.63	6.9	13.37	20.95	153.33	8.0	5.63	1.30	175.7
IGB-55 X KT	51.47	47.07	10.77	35.57	61.57	8.43	9.3	15.9	16.28	148.67	6.0	1.93	0.97	132.3
IGB-55 X IBWL	52.53	49.23	8.53	34.37	66.27	7.47	7.47	11.43	14.03	103.0	5.0	9.37	1.43	212.3
IGB-62 X PR	53.53	63.4	9.33	50.7	73.2	9.1	5.53	12.57	16.03	130.0	3.3	2.2	1.2	178.8
IGB-62 X PS	62.2	56.7	9.57	41.77	73.83	15.07	9.93	25.07	13.51	176.67	4.3	10.67	2.6	368.9
IGB-62 X KT	66.87	60	8.55	37.5	66.9	17.4	11.43	21.2	15.53	183.33	6.0	9.93	1.8	253.1
IGB-62 X IBWL	56.2	66.97	11.47	38.87	66.2	13.07	14.97	28	15.77	156.67	4.7	12.13	2.43	335.0
IGB-88 X PR	55.87	41.27	7.47	34.7	57.43	8.0	7.1	9.17	18.88	96.3	6.0	5.07	0.83	121.6
IGB-88 X PS	36.57	51.53	7.1	38.9	57.93	8.77	8.4	15.67	19.5	149.0	5.0	5.8	0.97	127.6
IGB-88 X KT	49.07	72.3	8.33	35.43	54.17	8.5	6.17	14.8	28.3	184	8.3	7.23	1.6	221.4
IGB-88 X IBWL	36.23	75.4	10.93	38.2	62.03	9.33	14.93	15	16.96	121.33	6.3	11.03	3.07	435.5
IGB-92 X PR	47.07	68.87	9.23	48.43	55.83	13.47	9.80	18.07	27.05	335.33	11.3	10.67	3.3	468.1
IGB-92 X PS	77.37	66.4	11.83	42.73	60.2	15.47	21.77	26.57	21.28	201.33	7.3	14.1	3.23	456.4
IGB-92 X KT	70.1	73.2	10.5	45.7	57.1	11.77	15.2	18.33	19.25	166	4.3	10.13	2.43	342.1
IGB-92 X IBWL	60.9	53.33	10.1	40.7	56.2	12.5	12.97	17.1	19.61	122.67	5.3	10.63	2.37	334.0
Mean of hybrids	56.46	61.69	9.21	38.28	61.64	12.26	11.45	18.42	20.13	186.33	6.6	9.03	2.12	295.5
Grand mean	63.26	60.00	9.35	41.91	65.23	11.85	10.78	15.59	19.04	138.9	6.45	7.8	1.92	254.33
CD at 5%	7.61	11.77	3.05	4.67	7.71	4.08	3.82	3.79	3.85	51.38	0.18	2.87	0.21	2.24

Tester IBWL (68.63 g) had minimum and Pant Samrat (124.67) had maximum fruit weight with an average fruit weight for lines and testers were 88.33 g and 96.17 g, respectively. Fruit weight was ranged from 96.3 to 387.67 g with an overall mean 186.33 gm. maximum average fruit weight was observed in cross IGB-17 x PR (387.67 g) followed by IGB-92 x PR (335.33 g), IGB-17 x PS (321.33g) and IGB-17 x KT (286.67 g), whereas, minimum fruit weight was observed in cross IGB-88 x PR (96.3).

Pericarp thickness (mm)

Pericarp thickness of fruits ranges from 3.7 mm (IGB-88) to 11.3 mm (IGB-92 X Pant Rituraj) with an overall mean of 6.45 mm. Among the lines, IGB-92 (8.7 mm) had highest mean value, whereas, IBWL (4.7 mm) recorded the lowest mean value with an overall tester mean of 9.32 mm. The cross performance ranged from 3.3 mm (IGB-62 x PR) to 11.3 mm (IGB-92 x PR) followed by IGB-17 x PR (10.7 mm), IGB-54 x PR (10.0 mm) with an overall mean 6.6 mm.

Number of fruits per plant per picking

Among all parents and their hybrids, number of fruits per plant per picking ranged from 2.8 (IGB-92) to 12.73 (IBWL) with a parental average 7.8. Among the lines, maximum number of fruits per plant per picking was observed in IGB-17 (7.1) and minimum number of fruits per plant per picking was found in IGB-92 (2.8) whereas, among testers, more number of fruits per plant per picking was found in IBWL (12.73) and less number of fruits per plant per picking was found in Pant Rituraj (7.2) with a mean of testers 9.32.

Number of fruits per plant per picking ranged from 1.93 to 15.0 with an overall mean 9.03. The cross, IGB-17 x PR found maximum number of fruits per plant per picking (15.0)

followed by IGB-92 x PS (14.1), IGB-62 x IBWL (12.13) and minimum number of fruits per plant per picking found in IGB-55 x KT (1.93).

Fruit yield per plant (kg)

Fruit yield per plant for all genotypes ranged from 0.97 kg to 3.93 kg with an overall average of 1.92 kg. The lowest fruit yield was recorded by IGB-55 (1.03 kg) while, the highest mean for IGB-17(2.43 kg) in comparison to lines mean is 1.65 kg. Among the testers, highest mean value for fruit yield per plant was noted in Pant Rituraj (2.4 kg). While, the lowest mean was recorded in Kashi Taru (1.37 kg) with an overall tester mean of 1.83 kg.

Fruit yield per plant ranged from 0.97 kg to 3.93 kg with an overall mean 2.12. Maximum fruit yield per plant was observed in the cross IGB-17 x PR (3.93 kg) followed by IGB-17 x KT (3.53 kg), IGB-92 x PR (3.3 kg), IGB-92 x PS (3.23 kg) and IGB-88 x IBWL (3.07 kg), whereas, minimum fruit yield per plant was observed in the cross IGB-88 x PR (0.83 kg), IGB-55 x KT (0.97 kg) and IGB-88 x PS (0.97 kg).

Fruit yield per hectare (q)

Fruit yield per hectare ranged from 121.6 q to 536.2 q with an overall mean 254.3 q. The lowest fruit yield was recorded by IGB-55 (147.5 q) while, the highest mean for IGB-17(334.3 q) in comparison to lines is 229.3 q. Among the testers, highest mean value for fruit yield per hectare was noted in Pant Rituraj (326.0 q).While, the lowest mean value was recorded in Kashi Taru (190.1 q) with an overall tester mean of 251.7 q. Maximum fruit yield per hectare was observed in the cross IGB-17 x PR (536.2 q) followed by IGB-17 x KT (468.9 q), IGB-92 x PR (468.1 q), IGB-92 x PS (456.4 q) and IGB-88

x IBWL (435.5 q), whereas, minimum fruit yield per plant was observed in the cross IGB-88 x PR (121.6 q), IGB-88 x PS (127.6 q) and IGB-55 x KT (132.3 q).

Plant height and number of primary branches are important growth parameters from production point of view. Genotypes having medium height and more number of branches give more yields in brinjal. In the present study, parents and hybrids differed significantly among themselves for growth characters. The cross IGB-92 x PS recorded the highest plant height, while the highest yielding crosses viz., IGB-17 x PR, IGB-17 x KT, IGB-92 x PS, IGB-92 x PR, IGB-62 x IBWL, IGB-88 x IBWL had relatively medium plant height with more number of primary branches. These results are in line with finding of Suresh *et al.*, (2012), Rajasekhar (2014) and Sivakumar *et al.*, (2016). The genotype IGB-92 x PS had more number of cluster per plant and more number of fruits per plant. Fruit length, fruit girth and fruit weight were important yield attributing characters. Maximum fruit length was recorded in IGB-17 X KT, while fruit girth was noticed in IGB-54 x PR. The genotype IGB-17 x PR and IGB-92 x PR were on par with each other for average fruit weight and were treated as superior for this trait. Similar differential response for yield and yield attributes in different genotypes of brinjal was reported by Rameshbabu and Patil (2008), Prabhu *et al.*, (2009), Suresh *et al.*, (2012), Rajasekhar (2014) and Shivkumar *et al.* (2016). The crosses, IGB-17 x PR, IGB-17 x KT, IGB-92 x PS, IGB-92 x PR, IGB-62 x IBWL, IGB-88 x IBWL showed superior *per se* performance, therefore, recommended for generation advancement and selection of desirable progeny lines useful for Chhattisgarh plains. These hybrids will be tested for their repeatability for their verification for yield and its attributing traits. The above results are in agreement with the findings of Shafeeq *et al.*,

(2007), Murthy *et al.*, (2011), Rameshkumar *et al.*, (2012) and Rajasekhar (2014).

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How to cite this article:

Sasmita Priyadarsini Dash, Jitendra Singh, Dhananjaya Sharma, Padmakshi Thakur and Anurag Das Mohapatra. 2019. Performance of Brinjal (*Solanum melongena* L.) Parents and Hybrids for Yield and Yield Attributing Characters under Chhattisgarh Condition. *Int.J.Curr.Microbiol.App.Sci*. 8(11): 1677-1685. doi: <https://doi.org/10.20546/ijcmas.2019.811.195>