

Original Research Article

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## Yield and Quality Based Phenotypic Evaluation of Germplasm of Brinjal (*Solanum melongena* L.) Under Semi-Arid Conditions

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### ABSTRACT

A field investigation as carried out with 35 genotypes of brinjal at Department of Vegetable Science, SKLTSHU, Rajendranagar, Hyderabad during *Rabi*, 2017-18. The RBD ANOVA revealed highly significant differences among the genotypes for all the traits indicating the presence of sufficient variability in the experimental material. Selection of suitable parents is an important criterion for success of crop improvement program. Mean performance of germplasm under study showed that the IC-136148 recorded the highest plant height (104.19 cm), number of fruits per plant (26.33), average fruit weight (0.19 kg), fruit yield per plant (3.07 kg) and total phenol content (59.23 mg/100g). The genotype IC-136546 recorded the highest number of branches per plant and IC-136237 for days to first flowering (36.55 days) and days to 50 percent flowering (37.67 days) were also reported. The genotype, IC-136096 recorded the highest number of flower clusters per plant (24.27). The highest number of fruits per cluster of 2.50 and days to last harvest (157.67) was recorded by the genotype IC-136231. The genotype IC-136311 recorded less number of days for first harvest (51.67days), IC-136196 for fruit length (16.90 cm) and IC-136184 registered highest values for fruit width (6.49 cm). The highest ascorbic acid content of 7.44 mg/100g was recorded with the genotype IC-136176. The genotype, IC-136309 in 12.93 percent was found to be tolerant to shoot and fruit borer infestation. The germplasm identified in the present study can be suitable utilized for varietal release and as parents in breeding programmes for further improvement of the traits.

#### Keywords

Eggplant [*Solanum melongena* L.], field investigation

#### Article Info

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### Introduction

Brinjal or Aubergine or Eggplant [*Solanum melongena* L. (2n=2x=24)] belongs to the family Solanaceae which is one of the most

important commercial vegetable crops in the world, especially in the tropics and subtropics (Kalloo, 2002). The brinjal is of much importance in the warm areas of Far East, being grown extensively in India, and other

Asian countries like Bangladesh, Pakistan, and Philippines. The cultivated brinjal is of Indian origin and has been in cultivation for long time. Now, India is considered as centre of origin and diversity of brinjal (Vavilov, 1951; Isshiki *et al.*, 1994).

Brinjal is rich source of Anthocyanins, Vitamin-C and phenolic compounds, which are powerful antioxidants (Vinson *et al.*, 1998). It quite high in nutritive value as compared with tomato (Choudhary, 1976), it is an important source of carbohydrate (4.0g), protein (1.4g), fibre (1.3g), vitamin A (124 IU), phosphorus (47 mg), potassium (2.0mg) and iron (0.3mg) Besides that, it contains alkaloid solanine in roots and leaves (Dhankhar and Singh, 1984). Dry fruits are reported to contain goitrogenic principles. Bitterness in brinjal is due to the presence of glycoalkaloids. The peel of brinjal has significant amounts of anthocyanin with antioxidant activity and protects against cancer, ageing, inflammation and neurological diseases (Hanur, 2011). Being the centre of origin, India has accumulated with wide range of variability in this crop but still India is the second largest producer of brinjal after China with an area and production of 0.71 million hectare and 13.5 million tonnes, respectively (NHB, 2015). Therefore collection and evaluation of genotypes is a pre-requisite for genetic improvement of the crop. Keeping the above in view, the present investigation was carried out to study the phenotypic performance of brinjal germplasm.

## Materials and Methods

The study was carried out at the PG Research Block, Department of Vegetable Science, Sri Konda Laxman Telangana State Horticultural University, Rajendranagar, Hyderabad during *rabi*, 2017-18. The experiment was laid out with thirty five genotypes of brinjal in Randomized Block Design (RBD) with three

replications. The genotypes tested consisted of the lines collected from different localities over states by NBPGR. The seeds of 35 genotypes were sown in nursery. Twenty six days old seedlings were transplanted to the main field. In each replication, each genotype was grown in a three row plot accommodating 21 plants with row-to-row spacing of 60 cm and plant-to-plant spacing of 45 cm. The recommended package of practices was followed. Necessary plant protection measures were carried out uniformly to safe guard the germplasm lines. List of brinjal genotypes used in the experiment are presented in Table 1. Five randomly chosen plants in each replication of each entry were labelled and used for recording the observations for the growth parameters.

The data on fourteen quantitative, two qualitative and three pest & disease incidence characters were recorded on five competitive and randomly selected plants in each genotype and in each replication *i.e.*, plant height (cm), number of branches per plant, number of flower clusters per plant, number of flowers per cluster, number of fruits per cluster, number of fruits per plant, days to first flowering, days to 50% flowering, days to first harvest, days to last harvest, fruit length (cm), fruit width (cm), average fruit weight (kg), fruit yield per plant (kg), ascorbic acid content (mg/100g), total phenol content (mg/100g), shoot and fruit borer infestation (%), cumulative wilt incidence (%) and little leaf incidence (%). The obtained data were subjected to RBD ANOVA following Panse and Sukhatme, 1985.

## Results and Discussion

The analysis of variance (Table 2) revealed the significant differences among the genotypes for all the traits. Mean performance of all 36 brinjal genotypes were given in Table 3.

**Table.1** List of genotypes evaluated along with their sources

S.No	IC No.	Source	S.No	IC No.	Source
1	IC-136237	NBPGR, Regional station, Hyderabad.	19	IC-135997	NBPGR, Regional station, Hyderabad.
2	IC-136297	NBPGR, Regional station, Hyderabad.	20	IC-136300	NBPGR, Regional station, Hyderabad.
3	IC-136307	NBPGR, Regional station, Hyderabad.	21	IC-136248	NBPGR, Regional station, Hyderabad.
4	IC-136177	NBPGR, Regional station, Hyderabad.	22	IC-212426	NBPGR, Regional station, Hyderabad.
5	IC-90178	NBPGR, Regional station, Hyderabad.	23	IC-136309	NBPGR, Regional station, Hyderabad.
6	IC-136188	NBPGR, Regional station, Hyderabad.	24	IC-136260	NBPGR, Regional station, Hyderabad.
7	IC-136196	NBPGR, Regional station, Hyderabad.	25	IC-136231	NBPGR, Regional station, Hyderabad.
8	IC-136308	NBPGR, Regional station, Hyderabad.	26	IC-136296	NBPGR, Regional station, Hyderabad.
9	IC-136290	NBPGR, Regional station, Hyderabad.	27	IC-136096	NBPGR, Regional station, Hyderabad.
10	IC-136311	NBPGR, Regional station, Hyderabad.	28	IC-136184	NBPGR, Regional station, Hyderabad.
11	IC-136546	NBPGR, Regional station, Hyderabad.	29	IC-136311	NBPGR, Regional station, Hyderabad.
12	IC-144520	NBPGR, Regional station, Hyderabad.	30	IC-136455	NBPGR, Regional station, Hyderabad.
13	IC-136093	NBPGR, Regional station, Hyderabad.	31	IC-136148	NBPGR, Regional station, Hyderabad.
14	IC-136306	NBPGR, Regional station, Hyderabad.	32	IC-154517	NBPGR, Regional station, Hyderabad.
15	IC-136450	NBPGR, Regional station, Hyderabad.	33	Shyamala (C)	Agricultural Research Institute, Hyderabad
16	IC-203589	NBPGR, Regional station, Hyderabad.	34	Bhagyamathi (C)	Agricultural Research Institute, Hyderabad
17	IC-136176	NBPGR, Regional station, Hyderabad.	35	Gulabi (C)	Agricultural Research Institute, Hyderabad
18	IC-345333	NBPGR, Regional station, Hyderabad.			

No: Accession number IC: Indigenous Collection; C: Check variety

**Table.2** ANOVA for yield and yield attributes in brinjal

S. No	Character	Mean sum of squares		
		Replications (df =2)	Treatments (df=34)	Error (df = 68)
1	Plant height (cm)	3.36	69.52***	11.71
2	No. of branches per plant	0.24	2.88**	0.45
3	Days to first flowering	0.32	51.06**	1.07
4	Days to 50 percent flowering	11.26	48.02**	5.79
5	Number of flower clusters per plant	1.46	15.56**	1.44
6	Number of flowers per cluster	0.016	0.46**	0.05
7	Number of fruits per cluster	2.98	0.37**	0.05
8	Number of fruits per plant	0.61	29.3**	0.79
9	Days to first harvest	5.06	91.74**	5.77
10	Days to last harvest	0.80	84.68**	8.52
11	Fruit length (cm)	4.36	19.66**	1.14
12	Fruit width (cm)	0.35	1.82**	0.20
13	Average fruit weight (kg)	0.01	0.002**	0.00
14	Fruit yield per plant (kg)	0.001	0.52**	0.03
15	Ascorbic acid content (mg/100g)	0.14	1.99**	0.16
16	Total phenol content (mg/100g)	8.37	147.34**	36.12
17	Shoot and fruit borer infestation (%)	4.96	23.81**	2.28
18	Cumulative wilt incidence (%)	0.00	0.00	0.00
19	Little leaf incidence (%)	0.00	0.00	0.00

\* Significant at P = 0.05 level

\*\* Significant at P = 0.01 level

**Table.3** Mean performance of yield and associated characters in thirty five genotypes of brinjal

S. No.	Genotype	Plant height (cm)	No. of branches per plant	Days to first flowering	Days to 50 % flowering	No. of flower clusters per plant	No. of flowers per cluster	No. of fruits per cluster	No. of fruits per plant	Days to first harvest	Days to last harvest	Fruit length (cm)	Fruit width (cm)	Fruit weight (kg)	Fruit yield per plant (kg)	Ascorbic content (mg/100g)	Total phenol content (mg/100g)	Shoot & fruit borer infestation(%)	Cumulative wilt incidence(%)	Little leaf incidence (%)
1	IC-136237	89.2	14.00	36.90	37.67	17.07	3.44	1.72	18.39	63.33	146.00	10.62	4.88	0.10	2.08	5.67	52.53	19.07	0.00	0.00
2	IC-136297	90.37	14.50	37.83	39.33	15.88	3.84	1.70	16.87	56.67	144.67	9.13	5.35	0.14	1.80	7.23	30.12	15.90	0.00	0.00
3	IC-136307	86.20	14.34	38.67	41.33	19.21	3.42	2.23	21.63	53.33	137.33	11.50	5.30	0.08	2.27	5.85	53.20	17.17	0.00	0.00
4	IC-136117	88.51	12.40	44.90	47.33	20.30	3.38	1.40	20.40	61.67	143.00	16.20	4.73	0.12	2.03	6.90	26.83	16.60	0.00	0.00
5	IC-90178	88.87	12.73	44.93	49.67	15.99	3.52	1.90	21.21	62.33	141.00	10.50	6.48	0.13	2.10	5.73	46.83	14.47	0.00	0.00
6	IC-136188	89.56	12.83	43.33	48.33	16.33	3.98	2.13	24.49	59.00	151.67	9.23	4.67	0.08	2.57	5.13	54.67	15.67	0.00	0.00
7	IC-136196	90.77	13.31	43.10	47.00	15.70	3.29	1.65	19.53	60.00	146.33	16.90	5.17	0.14	1.93	6.68	46.23	18.17	0.00	0.00
8	IC-136308	90.24	14.33	41.90	45.33	17.52	3.77	1.77	15.33	55.00	149.67	8.16	5.70	0.11	1.60	6.43	40.93	20.33	0.00	0.00
9	IC-136290	85.90	14.47	43.63	46.67	16.78	3.23	2.10	16.95	61.00	150.00	15.02	4.87	0.14	1.81	6.10	37.65	17.47	0.00	0.00
10	IC-136311	83.63	14.38	40.53	45.00	17.24	3.00	2.43	25.08	72.00	153.67	11.63	5.37	0.06	2.50	5.43	51.73	12.57	0.00	0.00
11	IC-136546	93.64	15.00	37.69	43.00	19.17	4.21	1.70	17.52	55.00	142.33	10.67	5.70	0.10	1.77	5.93	42.87	15.90	0.00	0.00
12	IC-144520	94.83	14.30	38.40	42.67	17.96	3.93	2.08	23.62	62.00	149.00	12.17	4.57	0.11	1.90	7.33	38.51	13.83	0.00	0.00
13	IC-136093	95.90	14.55	43.13	47.00	17.00	3.40	1.17	15.73	51.67	132.33	14.18	6.13	0.13	1.53	5.53	52.13	24.37	0.00	0.00
14	IC-136306	91.23	13.82	45.13	48.00	19.21	3.26	2.03	16.27	53.33	149.67	10.90	5.77	0.12	2.40	6.90	42.63	23.17	0.00	0.00
15	IC-136450	92.61	13.42	40.67	44.67	14.73	4.26	2.07	23.75	66.00	150.33	12.66	4.78	0.10	1.97	6.40	42.83	21.23	0.00	0.00
16	IC-203589	89.46	12.55	40.40	44.00	17.66	3.96	1.97	20.09	55.67	141.00	15.07	6.20	0.15	2.06	7.28	54.67	17.17	0.00	0.00
17	IC-136176	90.64	13.31	40.00	44.67	20.00	4.15	1.47	18.00	52.00	149.00	11.78	4.73	0.12	1.87	7.44	43.90	14.87	0.00	0.00
18	IC-345333	87.65	13.20	38.31	43.33	18.55	3.03	2.03	21.34	65.00	144.33	10.98	4.49	0.09	2.00	6.07	49.73	17.14	0.00	0.00
19	IC-135997	94.19	12.39	40.62	49.00	15.99	3.33	2.47	24.37	64.00	140.00	15.30	6.28	0.15	2.74	6.40	49.21	14.57	0.00	0.00
20	IC-136300	96.45	12.55	48.83	48.00	22.23	4.27	1.83	19.84	67.67	148.67	9.47	5.19	0.10	1.73	6.96	46.94	16.30	0.00	0.00

**Table.3** (Contd....)

S. No.	Genotype	Plant height (cm)	No. of branches per plant	Days to first flowering	Days to 50 % flowering	No. of flower clusters per plant	No. of flowers per cluster	No. of fruits per cluster	No. of fruits per plant	Days to first harvest	Days to last harvest	Fruit length (cm)	Fruit width (cm)	Fruit weight (kg)	Fruit yield per plant (kg)	Ascorbic acid (mg/ 100g)	Total phenol content (mg/ 100g)	Shoot & fruit borer infestation (%)	Cumulative wilt incidence (%)	Little leaf incidence (%)
21	IC-136248	100.40	12.24	43.33	47.33	17.92	3.27	1.10	17.54	55.33	143.33	14.38	4.06	0.12	2.30	6.27	40.79	13.78	0.00	0.00
22	IC-212426	101.36	12.55	39.77	41.33	18.70	4.22	1.85	22.37	62.33	147.00	9.80	3.87	0.09	2.77	4.93	55.00	14.89	0.00	0.00
23	IC-136309	100.11	13.15	38.07	40.67	15.77	3.99	2.03	21.49	68.33	148.33	11.47	3.17	0.03	2.47	6.73	40.80	12.93	0.00	0.00
24	IC-136260	95.33	12.97	44.30	50.67	23.93	3.53	1.89	20.85	65.33	145.67	15.84	5.40	0.14	2.63	6.20	50.90	13.55	0.00	0.00
25	IC-136231	98.85	12.48	46.47	49.33	16.22	4.06	2.50	25.52	70.00	157.67	16.57	6.21	0.15	2.97	5.34	48.97	13.83	0.00	0.00
26	IC-136296	94.06	10.99	49.73	53.33	15.66	3.90	1.23	21.10	61.67	142.67	12.10	4.90	0.11	1.60	6.93	43.93	20.28	0.00	0.00
27	IC-136096	92.06	11.35	51.03	54.33	24.27	3.66	1.67	20.85	60.67	145.00	11.65	5.06	0.09	1.74	5.50	49.88	19.00	0.00	0.00
28	IC-136184	92.30	12.27	54.67	57.67	18.27	4.17	2.23	26.27	67.00	152.67	14.57	6.49	0.16	2.90	6.60	44.87	14.30	0.00	0.00
29	IC-136251	99.9	12.93	44.63	47.67	15.59	3.43	1.50	21.60	53.33	143.33	8.50	5.19	0.11	1.87	4.30	51.07	14.15	0.00	0.00
30	IC-136455	99.6	14.50	40.78	42.67	18.09	3.17	1.83	21.50	54.67	139.33	10.83	5.03	0.10	2.07	5.40	41.80	15.30	0.00	0.00
31	IC-136148	104.19	12.85	48.13	50.67	18.88	3.45	2.13	26.33	68.33	154.33	11.23	5.87	0.19	3.07	5.77	59.23	18.30	0.00	0.00
32	IC-154517	94.17	12.67	43.47	48.33	18.18	4.07	2.10	20.33	59.33	149.00	12.45	4.45	0.10	1.77	4.24	51.00	18.18	0.00	0.00
33	Shyamala	94.77	12.29	45.17	50.00	17.07	3.47	2.01	23.71	61.33	152.33	8.39	4.27	0.09	1.93	5.27	49.20	14.60	0.00	0.00
34	Bhagyamathi	94.8	12.27	44.65	50.33	21.03	3.27	2.32	26.20	64.67	150.00	8.30	4.03	0.07	1.87	6.21	54.27	16.88	0.00	0.00
35	Gulabi	103.46	14.15	43.10	47.00	20.03	3.03	1.83	22.81	62.33	151.33	9.39	4.76	0.09	1.90	6.45	51.77	17.23	0.00	0.00
<b>Grand Mean</b>		93.35	13.20	43.02	46.75	18.11	3.65	1.89	21.08	60.87	146.62	11.92	5.10	0.11	2.12	6.10	46.79	16.66	0.00	0.00
<b>SEm ±</b>		1.97	0.38	0.59	1.38	0.69	0.13	0.13	0.51	1.38	1.68	0.31	0.25	0.01	0.10	0.23	3.46	0.87	0.00	0.00
<b>CV (%)</b>		3.66	5.08	2.40	5.14	6.64	6.47	12.73	4.22	3.94	1.99	8.96	8.75	14.05	8.41	6.55	12.84	9.07	0.00	0.00
<b>CD (P=0.05)</b>		5.57	1.09	1.68	3.92	1.96	0.38	0.39	1.44	3.91	4.75	1.74	0.72	0.02	0.29	0.65	9.79	2.46	0.00	0.00
<b>SE(d)</b>		2.79	0.54	0.84	1.96	0.98	0.19	0.19	0.72	1.96	2.38	0.87	0.36	0.01	0.14	0.32	4.90	1.23	0.00	0.00

Among the thirty five genotypes, IC-136148 (104.19 cm) showed maximum plant height, followed by IC-212426 (101.36 cm) and IC-136248 (100.4) which was at par, while the minimum plant height (83.63 cm) was observed in IC-136311. The genotype IC-136546 (15.00) recorded more number of branches per plant followed by IC-136093 (14.55) and IC-136297 (14.50) which was at par, whereas less number of branches per plant was recorded in IC-136296 (10.99).

Earliest flowering (36.55 days) was recorded in IC-136237 followed by IC-136546 (37.69 days), which was at par, while delayed flowering was recorded in IC-135184 (54.33 days). The genotype IC-136237 has taken only 37.67 days to reach 50 percent flowering stage, while IC-136184 was found to be late (57.67 days) among all the genotypes. The genotype IC-136096 recorded more number of flower clusters per plant followed by IC-136260 (23.93), which was at par, whereas less number of flower clusters per plant was recorded in IC-136450.

The genotype IC-136300 recorded more number of flowers per cluster followed by IC-136450 (4.26) and IC-212426 (4.22) which was at par, whereas less number of flowers per cluster was recorded in IC-136311. The genotype IC-136231 recorded more number of fruits per cluster, followed by IC-135997 (2.47), IC-136311 (2.43) and Bhagyamati (2.32) which was at par, whereas less number of fruits per cluster was recorded in IC-136248. The more number of fruits per plant was recorded in IC-136148 (26.33) followed by IC-136184 (26.27), Bhagyamati (26.20) and IC-136231 (25.52) and less number of fruits per plant was observed in IC-136308 (15.33). Among the genotypes, less number of days taken for first harvest (51.67 days) was recorded in IC-136311, while more number of days (72.00) for first harvest was recorded in IC-136311. The genotype IC-136231

recorded maximum number of days for last harvest (157.67 days), whereas minimum number of days for last harvest was observed in IC-136093 (132.33 days).

Among the genotypes, highest fruit length (16.90 cm) was recorded in IC-136196, followed by IC-136231 (16.57 cm) which was on par and the genotype IC-136308 showed lowest fruit length 8.16 cm for this trait. Genotype IC-136309 showed lowest value of 3.17 cm and the genotype IC-136184 exhibited highest mean value of 6.49 cm for fruit width.

The highest fruit weight of 0.19 kg was recorded in IC-136148 followed by IC-136184 (0.16 kg) and IC-136231 (0.15 kg) and the lowest was observed in IC-136309 (0.03 kg). The genotype IC-136148 recorded the highest yield per plant (3.07 kg) followed by IC-136231 (2.97 kg), IC-136184 (2.90 kg), IC-135997 (2.74) and IC-136260 (2.63), which was at par, while the lowest yield was recorded in IC-136093 (1.53 kg).

Ascorbic acid content varied from 5.77 mg /100g IC-136148 to 7.44 mg /100g and IC-136176 with a general mean of 6.10 mg /100 g. Total phenol content varied from 26.83 mg/100g (IC-136177) to 59.23 mg/100g (IC-136148) with a general mean of 46.79 mg/100g. The lowest shoot and fruit borer infestation was observed in IC-136311 (12.57 %) followed by IC-136309 (12.93 %), IC-136260 (13.55 %) and IC-136248 (13.78 %). In any selection programme, the mean performance of the genotypes for individual character serves as an important criterion for discarding the undesirable types. This indicates that germplasm studies may act as a potential source and offer scope for selection of high yielding genotypes with desirable horticultural attributes. Hence the present study, thrown a light on the potential of germplasm to act as genetic resources.



In conclusion, based on the genetic studies, the genotypes five genotypes *i.e.* IC-136148, IC-212426, IC-136237, IC-136184 and IC-136231 have been identified as promising genotypes with particular reference to the characters *viz.*, plant height, days to first flowering, days to 50% flowering, days to last harvest, fruit length, fruit width, shoot and fruit borer infestation, average fruit weight, fruit yield per plant and ascorbic acid. Hence, these genotypes after multi location trials can be released for commercial cultivation. The genotype IC-136309 with tolerance to fruit and shoot borer infestation can be utilized in breeding programmes to develop high yielding coupled with resistant or used for developing hybrid varieties. IC-136176 for ascorbic acid, IC-136237 (Early flowering), IC-136196 (fruit length) possessed positive genes and hence, these germplasm can be used for pedigree breeding for further improvement.

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