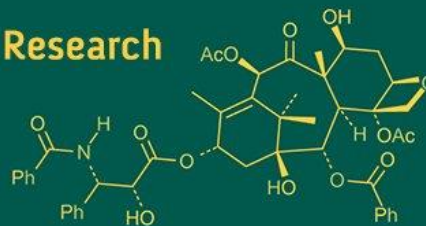


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Phenotypic evaluation of Brinjal (*Solanum melongena* L.) F₁ hybrids for growth and yield traits

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Abstract

Brinjal (*Solanum melongena* L.) is an important vegetable crop with considerable genetic variability for growth and yield traits. The present investigation was carried out to evaluate the per se performance of brinjal hybrids developed through a half diallel mating design. Six diverse parental lines were crossed in a half diallel (excluding reciprocals) to generate 15 F₁ hybrids, which, along with the parents and two commercial checks, were evaluated in a Randomized Complete Block Design with three replications during Summer 2026 under the central dry zone of Karnataka. Analysis of variance revealed significant differences among the genotypes for all the traits studied, indicating substantial genetic variability. The hybrid Melavanki local-2 × Ramadurg local exhibited superior performance for number of primary branches (5.33), earliness (38.67 days), number of fruits per plant (20.67), average fruit weight (96.00 g), fruit yield per plant (1.98 kg) and fruit yield per hectare (36.75 t ha⁻¹). Melavanki local-1 × Malapur local and Ramadurg local × Rampura local also performed well for major yield-contributing traits. These promising hybrids could be utilized in future brinjal breeding programmes for yield improvement.

Keywords: Brinjal, half diallel, per se performance, F₁ hybrids

Introduction

Brinjal (*Solanum melongena* L.) is one of the most important vegetable crops belonging to the family Solanaceae with a chromosome number of 2n = 24. India is considered the primary centre of origin and diversity of brinjal (Vavilov, 1931; Bhaduri, 1951) [15, 5]. The crop is widely cultivated in tropical and subtropical regions for its immature edible fruits because of its wide adaptability, economic importance, and high consumer preference (Rai *et al.*, 1995) [11].

India is the world's second-largest producer of brinjal after China. The crop occupies an area of approximately 6.63 lakh ha with an annual production of 125.15 lakh tonnes and an average productivity of 18.8 t ha⁻¹ (Anon., 2016) [2]. Despite its importance, the productivity of brinjal remains below its potential due to the cultivation of traditional low-yielding varieties, narrow genetic base, and substantial yield losses caused by insect pests and diseases. Therefore, the development and identification of high-yielding genotypes have become essential to meet the increasing demand for vegetables.

Brinjal exhibits considerable genetic variability for growth, earliness, and yield-related traits such as plant height, number of primary branches, flowering behaviour, fruit number, fruit weight, and fruit yield. Evaluation of diverse parental lines and their hybrids for these traits provides valuable information for identifying superior genotypes with enhanced yield potential and desirable agronomic performance. Assessment of per se performance is an important step in selecting promising parents and hybrids for crop improvement programmes.

Therefore, the present investigation was undertaken to evaluate the per se performance of brinjal parents and their hybrids for growth, earliness, and yield-contributing traits under the central dry zone of Karnataka

Materials and Methods

The present investigation was conducted at the Department of Vegetable Science, College of Horticulture, Hiriya, Karnataka, India during 2025-2026.

The experimental site is located at 13°57'32" N latitude and 76°37'38" E longitude, at an altitude of 606 m above mean sea level. The experimental field had sandy loam soil with a pH ranging from 7.0 to 8.0.

The experimental material comprised six genetically diverse brinjal genotypes, namely Melavanki local-1 (P₁), Melavanki local-2 (P₂), Malapur local (P₃), Ramadurg local (P₄), Jamakhandi local (P₅) and Rampura local (P₆). These parental lines were crossed in a half-diallel mating design (excluding reciprocals) to develop 15 F₁ hybrids. The hybrids, along with the six parents and two commercial checks (Mahy Super-10 and Arka Anand), were evaluated during Summer 2026.

The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications. Seedlings were transplanted on raised beds at a spacing of 90 × 60 cm with a plot size of 3.6 × 6.0 m. All recommended agronomic and plant protection practices were followed uniformly throughout the crop growth period.

Observations were recorded from five randomly selected plants in each treatment of every replication for plant height at harvest (cm), number of primary branches per plant, days to 50% flowering, number of fruits per plant, average fruit weight (g), fruit yield per plant (kg), and fruit yield per hectare (t ha⁻¹). The mean values of the recorded observations were subjected to analysis of variance (ANOVA) for the Randomized Complete Block Design to determine the significance of differences among the genotypes.

Results and Discussion

Analysis of variance revealed significant differences among the genotypes for all the seven traits studied (Table 1), indicating the presence of substantial genetic variability. The mean squares due to parents and hybrids were significant for most of the traits. These results indicate sufficient variability for effective selection of superior brinjal genotypes.

Table 1: ANOVA for Seven various characters in brinjal

Sl. No	Characters	Replication	Genotypes	Parents	Hybrid	Parent vs Hybrid	Error
	DF	2	21	5	14	1	42
1	Plant height (cm)	14.08	74.40**	50.77*	83.81**	88.44*	15.25
2	Number of primary branches per plant	0.07	1.84**	2.60**	1.63**	1.52**	0.10
3	Days to 50% flowering	30.86	67.70**	63.17**	73.81**	18.21	14.21
4	Number of fruits per plant	0.75	25.86**	6.62**	20.79**	218.97**	1.53
5	Average fruit weight (g)	1.71	237.93**	285.53**	247.11**	2.13	2.15
6	Fruit yield per plant (kg)	0.01	0.29**	0.04*	0.29**	1.79**	0.01
7	Fruit yield per ha (t ha ⁻¹)	2.16	103.46**	15.90**	100.78**	674.87**	4.21

Plant height at harvest exhibited considerable variation among the evaluated genotypes (Table 2). Among the parents, plant height ranged from 41.00 cm (Jamakhandi local) to 52.67 cm (Rampura local), while among the hybrids it ranged from 42.33 cm (Melavanki local-2 × Jamakhandi local) to 59.33 cm (Ramadurg local × Rampura local), followed by Melavanki local-1 × Malapur local (57.41 cm) and Melavanki local-1 × Rampura local (56.32 cm). These findings are in agreement with those of Rajashree *et al.* (2023) [12], Chaurasia *et al.* (2019) [6] and Anvesh *et al.* (2024) [4]. The number of primary branches per plant ranged from 2.66 to 5.00 among the parents and from 3.00 to 5.33 among the hybrids (Table 1). Ramadurg local produced the highest number of branches (5.00), whereas Rampura local recorded the lowest (2.66). Among the hybrids, Melavanki local-2 × Ramadurg local (5.33) was superior, followed by Ramadurg local × Rampura local (5.00). The enhanced branching observed in these hybrids may be due to favourable gene interactions resulting in increased vegetative growth and a greater number of reproductive sites. Similar findings were reported by Rajashree *et al.* (2023) [12] and Chaurasia *et al.* (2019) [6].

The evaluated genotypes showed marked differences in days to 50 percent flowering (Table 2). Among the parents, days to 50 percent flowering ranged from 43.67 days (Ramadurg local) to 55.00 days (Rampura local). Among the hybrids, the earliest flowering was recorded in Melavanki local-2 × Ramadurg local (38.67 days), followed by Ramadurg local × Rampura local (41.66 days), whereas the latest flowering was observed in Melavanki local-1 × Rampura local (57.33

days). These results are in confirmation with Chaurasia *et al.* (2019) [6] and Phor *et al.* (2022) [9].

The number of fruits per plant differed considerably among the evaluated genotypes (Table 2). Among the parents, the number of fruits per plant ranged from 10.33 (Rampura local) to 13.67 (Ramadurg local), whereas among the hybrids it ranged from 11.66 (Malapur local × Rampura local) to 20.67 (Melavanki local-2 × Ramadurg local), followed by Ramadurg local × Rampura local (19.33) and Melavanki local-1 × Malapur local (18.33). The remarkable increase in fruit number observed in these hybrids indicates favourable genetic complementation, resulting in improved flowering, fruit set and fruit retention. These findings are in conformity with those of Reddy and Patel (2014) [13], Ansari (2017) [3], Pramila *et al.* (2017) [10] and Akiyonde *et al.* (2018) [1].

Average fruit weight varied from 69.00 to 97.00 g among the parents and from 65.66 to 96.00 g among the hybrids. Rampura local produced the heaviest fruits (97.00 g), while Malapur local recorded the lowest average fruit weight (69.00 g). Among the hybrids, Melavanki local-2 × Ramadurg local (96.00 g) produced the heaviest fruits, followed by Melavanki local-1 × Malapur local (95.00 g) and Ramadurg local × Rampura local (89.34 g). The increased average fruit weight observed in these hybrids may be attributed to efficient translocation and accumulation of photosynthates in developing fruits. These results are in agreement with the findings of Mallikarjun (2002) [8].

Table 2: Per se performance of 23 genotypes (6 parents, 15 F₁ hybrids, 2 checks) in brinjal

Sl. No.	Parents and crosses	Plant height	Number of primary branches per plant	Days to 50% flowering	Number of fruits per plant	Average fruit weight (g)	Fruit yield per plant (kg)	Fruit yield per hectare (t ha ⁻¹)
1	Melavanki local-1 (P ₁)	47.33	3.33	45.33	13.00	72.50	0.94	17.45
2	Melavanki local-2 (P ₂)	47.00	3.67	47.00	10.65	82.49	0.88	16.27
3	Malapur local (P ₃)	50.33	3.00	53.67	13.43	69.00	0.90	15.16
4	Ramadurg local (P ₄)	44.67	5.00	43.67	13.67	81.33	1.11	20.60
5	Jamakhandi local (P ₅)	41.00	4.67	50.33	11.22	78.67	0.80	14.35
6	Rampura local (P ₆)	52.67	2.66	55.00	10.33	97.00	1.00	18.56
7	Melavanki local-1 × Melavanki local-2	45.38	4.00	47.33	16.20	78.33	1.27	23.60
8	Melavanki local-1 × Malapur local	57.41	4.67	43.33	18.33	95.00	1.74	32.24
9	Melavanki local-1 × Ramadurg local	47.67	3.33	48.67	16.92	71.83	1.22	22.53
10	Melavanki local-1 × Jamakhandi local	46.67	4.67	47.67	13.50	65.66	0.89	16.41
11	Melavanki local-1 × Rampura local	56.32	3.33	57.33	14.53	88.17	1.28	23.72
12	Melavanki local-2 × Malapur local	52.10	3.33	51.33	18.17	71.16	1.29	23.95
13	Melavanki local-2 × Ramadurg local	46.67	5.33	38.67	20.67	96.00	1.98	36.75
14	Melavanki local-2 × Jamakhandi local	42.33	3.33	52.67	17.64	80.16	1.41	26.19
15	Melavanki local-2 × Rampura local	55.00	4.33	54.66	12.44	82.00	1.02	18.90
16	Malapur local × Ramadurg local	50.33	3.66	48.33	16.26	74.07	1.20	22.31
17	Malapur local × Jamakhandi local	44.00	4.67	44.00	13.04	70.50	0.92	17.03
18	Malapur local × Rampur local	50.00	3.00	50.00	11.66	85.17	0.99	18.39
19	Ramadurg local × Jamakhandi local	43.96	3.67	49.00	17.29	78.00	1.35	24.97
20	Ramadurg local × Rampura local	59.33	5.00	41.66	19.33	89.34	1.73	31.98
21	Jamakhandi local × Rampura local	49.67	4.67	45.00	16.67	83.17	1.39	25.68
22	Mahy Super-10(check)	45.00	3.33	52.67	15.00	74.33	1.12	20.65
23	Arka Anand(check)	46.33	2.33	53.33	16.46	88.17	1.45	26.87
	S. Em±	2.25	0.19	2.18	0.71	0.85	0.06	1.18
	CD @ 5%	6.43	0.53	6.21	2.04	2.42	0.18	3.38

Fruit yield per plant and fruit yield per hectare showed substantial variation among the evaluated genotypes (Table 2). Among the parents, fruit yield per plant ranged from 0.80 kg (Jamakhandi local) to 1.11 kg (Ramadurg local), whereas among the hybrids it ranged from 0.89 kg (Melavanki local-1 × Jamakhandi local) to 1.98 kg (Melavanki local-2 × Ramadurg local), followed by Melavanki local-1 × Malapur local (1.74 kg) and Ramadurg local × Rampura local (1.73 kg). The superior fruit yield per plant observed in these hybrids may be attributed to the cumulative influence of higher fruit number and fruit weight. Similarly, fruit yield per hectare ranged from 14.35 t ha⁻¹ (Jamakhandi local) to 20.60 t ha⁻¹ (Ramadurg local) among the parents, while among the hybrids it ranged from 16.41 t ha⁻¹ (Melavanki local-1 × Jamakhandi local) to 36.75 t ha⁻¹ (Melavanki local-2 × Ramadurg local), followed by Melavanki local-1 × Malapur local (32.24 t ha⁻¹) and Ramadurg local × Rampura local (31.98 t ha⁻¹). These findings are in agreement with those of Shanmugapriya *et al.* (2009) [14] and Hussain *et al.* (2017) [7].

Conclusion

The present study revealed considerable variability among the evaluated brinjal genotypes for growth and yield traits. Based on per se performance, the hybrids Melavanki local-2 × Ramadurg local, Melavanki local-1 × Malapur local and Ramadurg local × Rampura local were identified as the most promising for yield and yield-contributing traits and may be utilized in future brinjal improvement programmes.

References

- Akiyonde ET, Justina BO, Porbeni K, Ojo O, Pitan AO, Olufolaji V, *et al.* Estimation of heterosis of yield and yield-related traits in the African eggplant (*Solanum aethiopicum*) hybrids. *J Plant Breed Genet.* 2018;6(2):39-45.
- Anonymous. Indian Horticulture Database. Gurgaon: National Horticulture Board; 2016.
- Ansari AM. Heterosis studies for growth, yield and its component characters in brinjal (*Solanum melongena* L.). *J Pharmacog Phytochem.* 2017;6(4):1920-1929.
- Anvesh S, Delvadiya IR, Farooq F, Abhilash PV. Elucidation of nature of gene action and estimation of combining ability effects for fruit yield and its component traits and resistance to fruit and shoot borer in brinjal (*Solanum melongena* L.). *J Appl Nat Sci.* 2024;16(2).
- Bhaduri PN. Inter-relationship of non-tuberiferous species of *Solanum* with some consideration on the origin of brinjal (*S. melongena* L.). *Indian J Genet Plant Breed.* 1951;11:75-82.
- Chaurasia N, Sarmah P, Barua N, Sarma D, Barman H, Barua P. Heterotic effect of some intra-specific crosses of brinjal (*Solanum melongena* L.) for yield and yield attributes. *Int J Curr Microbiol Appl Sci.* 2019;8(12):2913-2923.
- Hussain K, Khan SH, Kouser P, Mukhdoomi MI, Nazir B, Afroza PK, *et al.* Combining ability analysis in brinjal (*Solanum melongena* L.). *Int J Curr Microbiol Appl Sci.* 2017;6(7):1645-1655.
- Mallikarjun SB. Heterosis and combining ability in round fruited brinjal (*Solanum melongena* L.) [M.Sc. (Agri.) thesis]. Dharwad: University of Agricultural Sciences; 2002.
- Phor SK, Mittal S, Kumar S, Dhankhar SK, Yadav R. Effect of heterosis on growth, earliness and yield characters of brinjal (*Solanum melongena* L.). *J Agric Res Technol.* 2022;47(Special Issue 1):114-120.
- Pramila ML, Kushwaha, Yamuna PS. Studies on heterosis in brinjal (*Solanum melongena* L.). *Int J Curr Microbiol Appl Sci.* 2017;6(11):641-651.

11. Rai M, Gupta PN, Agarwal RC. Catalogue on eggplant (*Solanum melongena* L.) germplasm. Part I. New Delhi: National Bureau of Plant Genetic Resources, Pusa Campus; 1995. p. 1-3.
12. Rajashree K, Kamble CS, Tirakannanavar S, Gasti VD, Nishani S, Koulagi S, *et al.* Heterosis studies for growth, flower and yield characters in brinjal (*Solanum melongena* L.). Biol Forum Int J. 2023;15(11):13-20.
13. Reddy EEP, Patel AI. Heterosis studies for yield and yield attributing characters in brinjal (*Solanum melongena* L.). J Recent Adv Agric. 2014;2(2):175-180.
14. Shanmugapriya P, Ramya K, Senthilkumar N. Studies on combining ability and heterosis for yield and growth parameters in brinjal (*Solanum melongena* L.). Crop Improv. 2009;36(1):68-72.
15. Vavilov NI. The role of central Asia in the origin of cultivated plants. Bull Appl Bot Genet Plant Breed. 1931;26(3):3-44.