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Assessment of brinjal genotype for flowering, quality and yield traits under eastern Vidarbha conditions

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Abstract
The present study entitled "Assessment of Brinjal Genotype for Flowering, Quality and Yield Traits under Eastern Vidarbha Conditions" was carried out during 2024-25 at the Horticulture Section, College of Agriculture, Nagpur. The experiment was conducted in a randomized block design with three replications, comprising thirteen local brinjal genotypes and one standard check (AKLB-9). Considerable variation was observed among genotypes for flowering, fruit quality, and yield parameters. Days to initiation of first flowering ranged from 35.36 days in LBG-1 to 44.58 days in LBG-6, while LBG-1 also recorded the earliest 50% flowering (48.53 days). Quality traits revealed significant diversity, with fruit length varying from 5.77 cm (LBG-6) to 8.02 cm (AKLB-9), fruit diameter from 4.31 cm (LBG-6) to 5.67 cm (LBG-10), and fruit weight from 45.26 g (LBG-6) to 86.05 g (LBG-10). Genotype LBG-2 exhibited the highest seed count per fruit (1840.85). Yield performance indicated LBG-10 (354.06 q ha^{-1}) as the most productive, closely followed by LBG-1 (312.34 q ha^{-1}) and LBG-11 (305.16 q ha^{-1}), whereas LBG-6 produced the lowest yield (92.58 q ha^{-1}). The results underline the existence of substantial genetic variability, with LBG-10 and LBG-1 emerging as promising genotypes for enhancing brinjal production and profitability under the agro-climatic conditions of Eastern Vidarbha.

Keywords: *Solanum melongena* L., brinjal genotypes, eastern Vidarbha, flowering behavior, fruit set, yield and yield attributing characters, summer cultivation

Introduction

Brinjal (*Solanum melongena* L.), commonly referred to as eggplant, is a major vegetable crop within the Solanaceae family and is widely grown across tropical and subtropical climates. India is regarded as the primary center of origin for brinjal, while China represents a secondary center (Sharma and Banyal, 2016) [1]. The crop is cultivated throughout the year in most parts of India, excluding high-altitude regions, owing to its broad adaptability and nutritional value. In India, brinjal covers nearly 0.73 million hectares, yielding approximately 12.80 million tonnes annually, with an average productivity of 17.06 tonnes per hectare (Sharma and Banyal, 2016) [1]. In Maharashtra, about 5% of the nation's brinjal production is contributed, particularly from districts such as Nagpur, Jalgaon, and Aurangabad.

A notable landrace known as summer brinjal, or "Bhatai," is predominantly cultivated in Eastern Vidarbha and adjoining parts of Madhya Pradesh and Maharashtra. This regional variety is appreciated for its dense texture, subtle flavor, and suitability for traditional dishes such as *bharli vangi* and *bharta*. It performs well in dryland conditions, particularly on loamy to sandy soils with moderate irrigation, and demonstrates tolerance to pest pressure and environmental stress.

Beyond its culinary uses, brinjal also holds therapeutic value. Certain varieties, especially those with white fruits, have been associated with liver support, cholesterol reduction, and blood sugar regulation (Dokane *et al.*, 2016) [2]. Traditionally, when prepared with sesame oil, it has been used to relieve toothaches (Chadha, 1993) [3]. Moreover, in rural communities, the plant serves as a source of fuel, and in Ayurveda, it is recognized for its cardio-tonic and aphrodisiac qualities (Chadha, 1993) [3].

Given its dual significance, economic and medicinal enhancing brinjal productivity through the identification and cultivation of superior genotypes is essential. Key yield-contributing traits include plant height, canopy spread, number of primary branches, flowering patterns, and fruit set (Kumar *et al.*, 2011) [4]. Evaluating local genotypes under region-specific agro-climatic conditions is crucial for selecting suitable varieties and promoting sustainable agricultural practices that support food security.

Brinjal is a valuable source of nutrients, including proteins, vitamins, and essential minerals. Its role in traditional medicine for managing diabetes, liver disorders, and heart health underscores its broader importance. Agronomic traits such as plant architecture and reproductive efficiency are vital for maximizing yield. With increasing challenges from climate variability, it becomes imperative to assess the performance of regional genotypes. Thus, the current study focuses on evaluating the growth and flowering traits of various summer brinjal genotypes under the agro-climatic conditions of Eastern Vidarbha, with the objective of identifying promising lines for future cultivation and crop enhancement.

Materials and Methods

Experimental details

Sr. No.	Parameter	Details
1	Name of crop	Brinjal
2	Botanical name	*Solanum melongena* L.
3	Family	Solanaceae
4	Year of experiment	2024–2025
5	Experimental design	RBD (Randomized Block Design)
6	Number of treatments	14 genotypes (13 local genotypes + 1 standard check)
7	Number of replications	03
8	Total number of plots	42
9	Transplanting time	December–2024
10	Spacing	60 cm × 45 cm
11	Plot size – Gross area	544.32 m²
12	Plot size – Net area	323.82 m²
13	Plant population per plot	30
14	Layout	Ridges and furrows

Treatment Details

List of genotypes and check used in the study

Treatment	Genotype	Source
T_1	LBG-1	Somalwada (Lakhani)
T_2	LBG-2	Mendha
T_3	LBG-3	Lakhori
T_4	LBG-4	Khedepar
T_5	LBG-5	Pohara
T_6	LBG-6	Rengepar
T_7	LBG-7	Salebhata
T_8	LBG-8	Gadegaon
T_9	LBG-9	Virshi (Sakoli)
T_{10}	LBG-10	Kinhi
T_{11}	LBG-11	Keshalwada
T_{12}	LBG-12	Gunthara
T_{13}	LBG-13	Morgoan
T_{14}	AKLB-9 (Check)	Department of Vegetable Science, Dr. PDKV, Akola

Flowering parameters

Days to initiation of first flowering

Variation in days to first flowering ranged from 35.36 to 44.58 days, with an overall mean of 40.61 days (Table 1; Figure 1). The earliest flowering was observed in genotype LBG-1 (35.36 days), followed by LBG-10 (36.29 days) and LBG-8 (39.35 days), while LBG-6 recorded the latest flowering at 44.58 days.

The observed variation in days to flowering initiation among the genotypes may be attributed to differences in their genetic makeup and its interaction with environmental factors, which collectively influence early, mid, or late flowering behavior. These findings are in agreement with the results reported by Magar (2014) [5], and Haldavanekar (2015) [6].

Days to 50% flowering

Data on days to 50% flowering among brinjal genotypes are presented in Table 1 and Figure 2. The number of days ranged from 48.53 in genotype LBG-1 to 57.74 in LBG-6, with a mean of 53.82 days. LBG-1 reached 50% flowering earliest, while LBG-6 took the longest. This variation may be attributed to genotypic differences and their interaction with environmental conditions. Similar findings have been reported by Mishra *et al.* (2008) [7], Dahatonde *et al.* (2010) [8].

Quality parameters

Fruit length

Data on fruit length across fourteen brinjal genotypes are presented in Table 2 and illustrated in Figure 3. Fruit length showed significant variation among genotypes, ranging from 5.77 cm in LBG-6 to 8.02 cm in AKLB-9, with an overall mean of 7.22 cm. The longest fruit was recorded in AKLB-9 (8.02 cm), which was statistically at par with LBG-10 (7.77 cm) and LBG-1 (7.64 cm). In contrast, LBG-6 produced the shortest fruits (5.77 cm). Since fruit length is a genetically controlled trait, its variation is primarily attributed to genotypic differences. Moreover, fruit length is positively associated with fruit weight. The results were in agreement with the findings of Bhambure (2016) [9] in brinjal.

Fruit diameter data for fourteen brinjal genotypes are presented in Table 2 and depicted in Figure 4. A significant variation was observed, with fruit diameter ranging from 4.31 cm to 5.67 cm and a mean value of 4.94 cm. The highest fruit diameter was recorded in genotype LBG-10 (5.67 cm), which was statistically comparable to LBG-1 (5.39 cm), whereas the lowest diameter was observed in LBG-6 (4.31 cm).

Number of seeds fruit^{-1}

Data on the number of seeds per fruit for fourteen brinjal genotypes are presented in Table 3 and illustrated in Figure 5. A significant variation was observed, with seed count per fruit ranging from 1376.67 to 1840.85, and a mean value of 1627.23. The highest number of seeds per fruit was recorded in genotype LBG-2 (1840.85), while the lowest was observed in genotype AKLB-9 (1376.67).

Weight of brinjal genotypes

Data presented in Table 3 and Figure 6 reveal significant variation in fruit weight among the brinjal genotypes. Fruit weight ranged from 45.26 g in LBG-6 to 86.05 g in LBG-10, with an overall mean of 67.40 g. Genotype LBG-10 recorded the highest fruit weight (86.05 g), which was significantly superior to all other genotypes and statistically at par with LBG-1 (81.13 g). In contrast, the lowest fruit weight was observed in LBG-6 (45.26 g). Fruit weight is a key yield-contributing trait in brinjal, and its variation is largely influenced by the genetic constitution of the genotype and its interaction with environmental factors. The results were in agreement with the findings of Haldavanekar (2015) [6] in brinjal.

Yield Parameters

Fruit yield plant^{-1}

Fruit yield per plant is a critical trait as it directly determines overall crop productivity. As shown in Table 4 and Figure 7, the number of fruits per plant varied significantly among the brinjal genotypes, ranging from 0.46 to 1.76, with a mean of 1.11. The highest fruit yield per plant was recorded in genotype LBG-10 (1.76), which was statistically at par with LBG-1 (1.55), and both outperformed the remaining genotypes. The lowest fruit yield per plant was observed in LBG-6 (0.46). The results were in agreement with the findings of Magar (2014) [5] in brinjal.

Fruit yield plot^{-1}

The data observed for yield per plot for different brinjal genotypes under study is presented in Table 4 and Figure 8. The fruit yield per plot of brinjal genotype was in the range of LBG-6 (11.52 Kg) to LBG-10 (44.05 Kg) with average mean of fruit yield per plot 27.91 Kg. The highest fruit yield per plot was observed in LBG-10 (44.05 Kg) which was found at par with genotype LBG-1 (38.86 kg) and LBG-11(37.96). Whereas, lowest fruit yield per plot in genotype LBG-6 (11.52 Kg).

Yield hectare^{-1}

Table 4 and Figure 9 present the data on yield per hectare across fourteen different brinjal genotypes. Among them, genotype LBG-10 recorded the highest yield at 354.06 quintals per hectare, whereas genotype LBG-6 showed the lowest yield at 92.58 quintals per hectare. The observed differences in yield are attributed to the genetic makeup of the genotypes as well as their interaction with environmental factors. The results were in agreement with the findings of Gogoi *et al*. (2018) [10] in brinjal.

Table 1: Flowering behavior of brinjal genotypes

Treat. No.	Genotypes	Days: Initiation of first flowering	Days: 50% Flowering
T_1	LBG - 1	35.36	48.53
T_2	LBG - 2	41.35	54.52
T_3	LBG - 3	41.73	54.90
T_4	LBG - 4	40.50	53.67
T_5	LBG - 5	40.08	53.91
T_6	LBG - 6	44.58	57.74
T_7	LBG - 7	42.65	55.82
T_8	LBG - 8	39.35	52.51
T_9	LBG - 9	41.79	54.96
T_{10}	LBG - 10	36.29	49.46
T_{11}	LBG - 11	39.97	53.13
T_{12}	LBG - 12	40.65	53.82
T_{13}	LBG - 13	40.83	54.00
T_{14}	AKLB-9 (Check)	43.47	56.63
	F test	Sig	Sig
	SE (m) ±	1.56	1.54
	CD at 5%	4.54	4.48

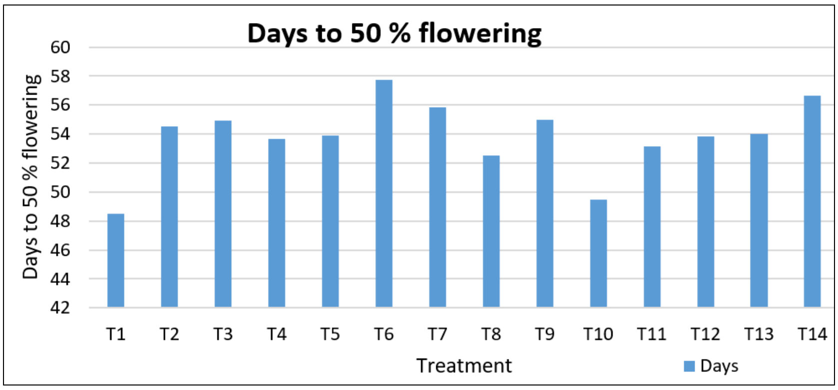

Fig 1: Days to Initiation of first flowering of brinjal genotypes

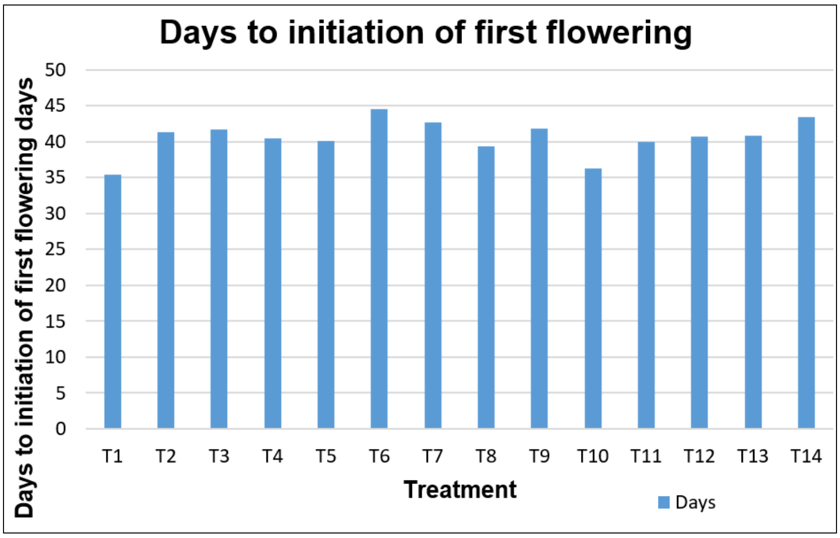

Fig 2: Days to 50% flowering of brinjal genotypes

Table 2: Fruit length and Fruit diameter of brinjal genotypes

Treat. No.	Genotypes	Fruit Length (cm)	Fruit Diameter (cm)
T_1	LBG - 1	7.64	5.39
T_2	LBG - 2	7.23	5.23
T_3	LBG - 3	7.07	5.27
T_4	LBG - 4	7.33	4.74
T_5	LBG - 5	7.03	5.32
T_6	LBG - 6	5.77	4.31
T_7	LBG - 7	7.37	4.33
T_8	LBG - 8	7.53	5.25
T_9	LBG - 9	7.26	5.20
T_{10}	LBG - 10	7.77	5.67
T_{11}	LBG - 11	7.53	4.72
T_{12}	LBG - 12	7.20	4.87
T_{13}	LBG - 13	6.37	4.66
T_{14}	AKLB-9 (Check)	8.02	4.33
	F test	Sig	Sig
	SE (m) ±	0.13	0.11
	CD at 5%	0.39	0.33

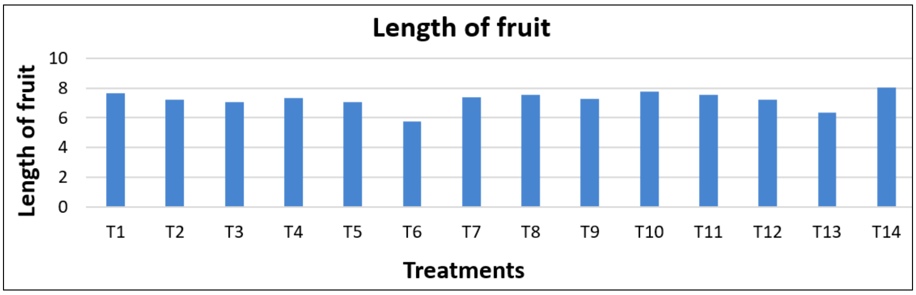

Fig 3: Length of fruit of brinjal genotypes

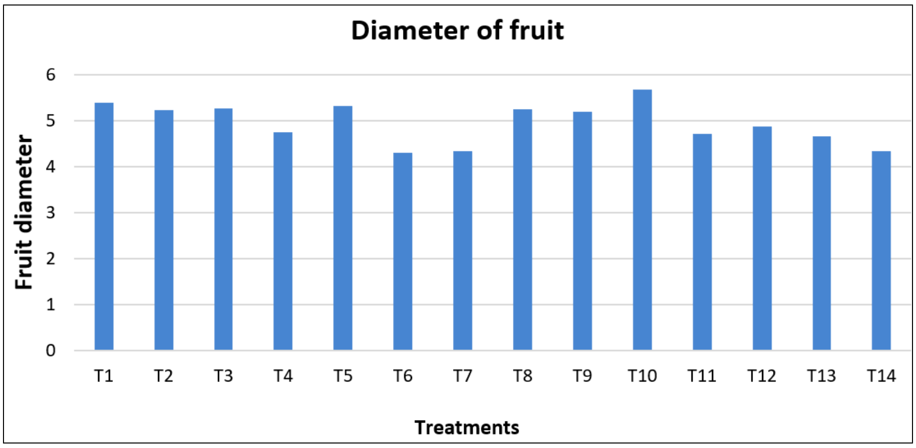

Fig 4: Fruit diameter of brinjal genotypes

Treat. No.	Genotypes	Yield $plant^{-1}$ (kg)	Yield $plot^{-1}$ (kg)	Yield $hectare^{-1}$ (q)
T_1	LBG - 1	1.55	38.86	312.34
T_2	LBG - 2	1.16	28.95	232.71
T_3	LBG - 3	1.05	26.16	210.30
T_4	LBG - 4	1.20	30.04	241.48
T_5	LBG - 5	0.97	24.34	195.63
T_6	LBG - 6	0.46	11.52	92.58
T_7	LBG - 7	0.54	13.51	108.61
T_8	LBG - 8	1.25	31.36	252.11
T_9	LBG - 9	0.86	21.50	172.83
T_{10}	LBG - 10	1.76	44.05	354.06
T_{11}	LBG - 11	1.51	37.96	305.16
T_{12}	LBG - 12	1.00	24.96	200.62
T_{13}	LBG - 13	0.94	23.45	188.49
T_{14}	AKLB-9 (Check)	1.37	34.21	274.99
	F test	Sig	Sig	Sig
	SE (m) ±	0.08	2.12	17.03
	CD at 5%	0.25	6.16	49.51

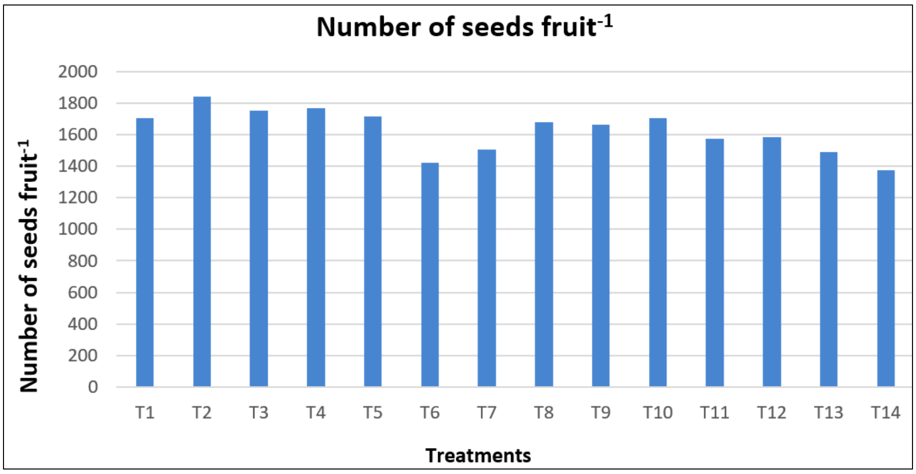

Fig 5: Number of seeds fruit^{-1} of brinjal genotype

Table 3: Weight and number of seeds fruit^{-1} of brinjal genotypes

Treat. No.	Genotypes	Fruit weight (g)	Number of seeds fruit^{-1}
T_1	LBG - 1	81.13	1705.04
T_2	LBG - 2	72.08	1840.85
T_3	LBG - 3	68.67	1750.40
T_4	LBG - 4	74.56	1770.45
T_5	LBG - 5	74.29	1715.52
T_6	LBG - 6	45.26	1419.47
T_7	LBG - 7	47.07	1506.51
T_8	LBG - 8	63.71	1677.31
T_9	LBG - 9	64.33	1662.51
T_{10}	LBG - 10	86.05	1704.11
T_{11}	LBG - 11	79.34	1575.07
T_{12}	LBG - 12	59.46	1585.28
T_{13}	LBG - 13	55.51	1492.05
T_{14}	AKLB-9 (Check)	72.18	1376.67
	F test	Sig	Sig
	SE (m) ±	1.80	68.22
	CD at 5%	5.22	198.32

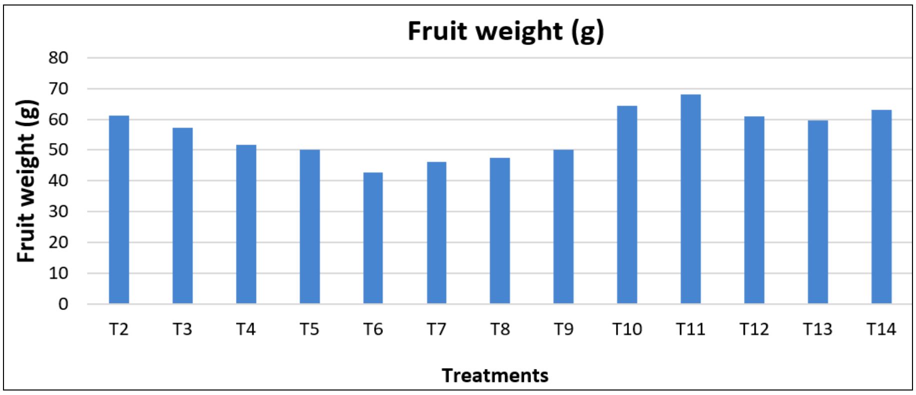

Fig 6: Weight of fruit of brinjal genotype

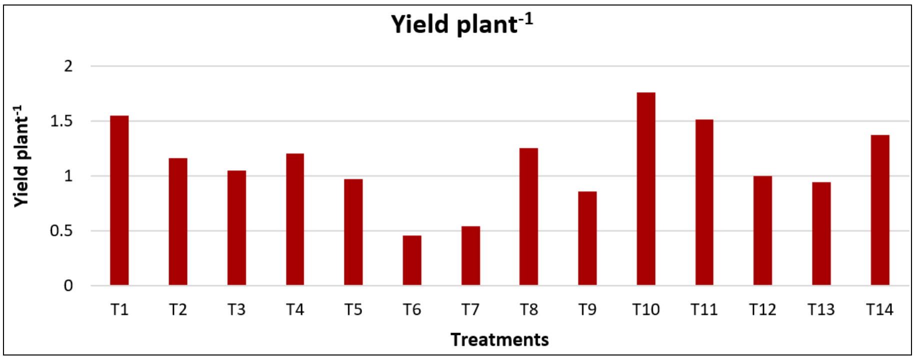

Fig 7: Yield plant^{-1} of brinjal genotypes

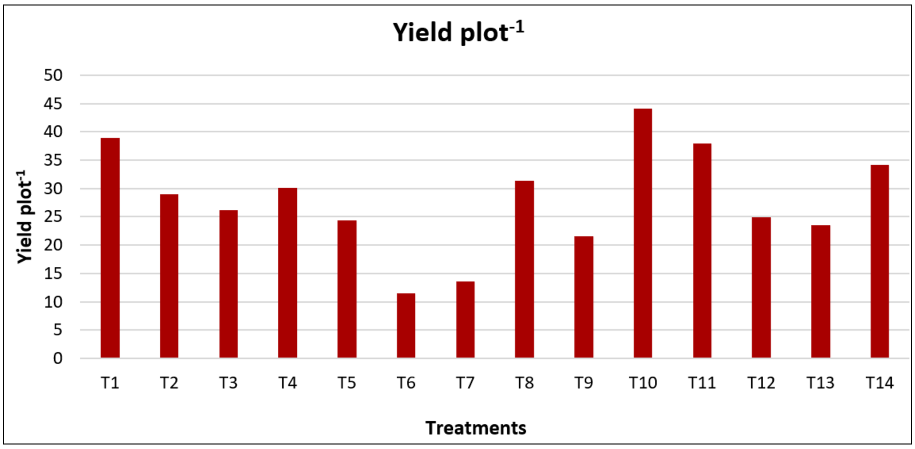

Fig 8: Yield plot^{-1} of brinjal genotypes

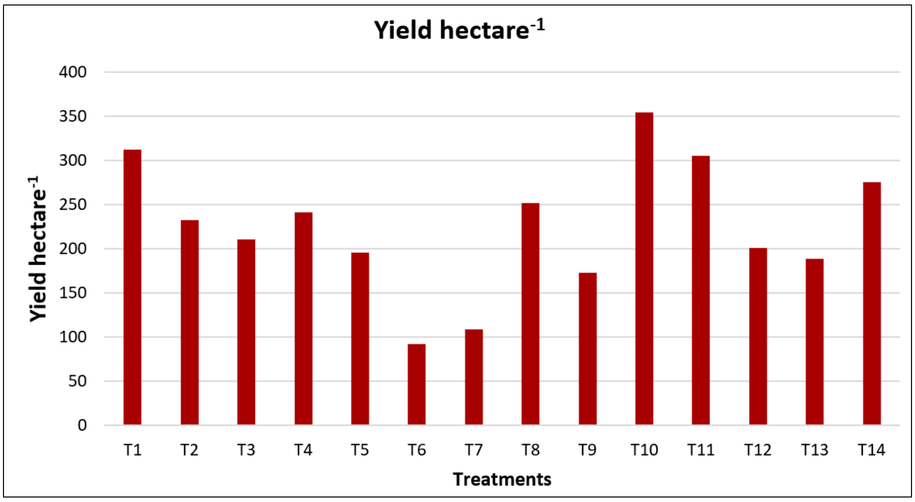

Fig 9: Yield hectare^{-1} of brinjal genotypes

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Conclusion
The evaluation of fourteen brinjal genotypes under the agro-climatic conditions of Eastern Vidarbha revealed significant genetic variability in flowering, fruit quality, and yield traits, indicating the scope for selection and improvement. Early flowering genotypes such as LBG-1 demonstrated earliness in both initiation and attainment of 50% flowering, which is advantageous for farmers seeking early harvests and better market returns. Yield-attributing traits such as fruit weight, fruit diameter, and fruit set had a direct influence on productivity, with LBG-10 consistently excelling across these parameters. Its superior yield potential of 354.06 q ha^{-1}, combined with favorable fruit quality attributes, makes it highly suitable for commercial cultivation. Similarly, LBG-1 also exhibited high productivity (312.34 q ha^{-1}) and early flowering, establishing its potential as another promising line. In contrast, LBG-6 performed poorly across all traits and is not recommended for cultivation. The findings suggest that genotypes LBG-10 and LBG-1 can be prioritized for both cultivation and breeding programs to enhance brinjal production and sustainability in Eastern Vidarbha.

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