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Growth, Flowering and Yield Variability among Guava (*Psidium guajava* L.) Genotypes under Nagpur Conditions

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Abstract

Guava (*Psidium guajava* L.) is an important tropical and subtropical fruit crop of India, exhibiting considerable variability in growth, flowering and yield attributes. The present investigation was conducted during 2025–26 at the Centre of Excellence for Citrus, College of Agriculture, Nagpur, Maharashtra, to evaluate 24 guava genotypes, including L-49 as a check, for growth, flowering and yield characteristics. The study involved 11-year-old trees planted at 6 m × 2 m spacing and maintained as a non-replicated genotype evaluation. Considerable variation was observed among genotypes for plant height, canopy spread, leaf area, stem girth, flowering time, number of flowers and fruits plant⁻¹, days to fruit set, days to harvest and yield. Plant height ranged from 3.04 to 4.92 m, while canopy spread varied from 4.73 to 6.77 m (East-West) and 2.81 to 4.35 m (North-South). NG-3 recorded the highest number of flowers and fruits plant⁻¹. L-49 recorded the highest yield (15.98 kg plant⁻¹), followed by NG-12 (15.91 kg plant⁻¹). The results demonstrated substantial phenotypic variability among the evaluated guava genotypes.

Keywords: *Psidium guajava*, growth, flowering, yield, variability

Introduction

Guava (*Psidium guajava* L.), belonging to the family Myrtaceae, is an important fruit crop widely cultivated in tropical and subtropical regions. In India, guava occupies a significant position among commercially cultivated fruit crops due to its adaptability to diverse agro-climatic conditions, hardy nature and potential for economic production (Mitra *et al.*, 2008; Kumari *et al.*, 2018) ^[5, 4]. The growth, flowering and yield performance of guava are influenced by both genotype and environmental conditions. Considerable genetic variability exists among guava genotypes for vegetative growth, canopy architecture, flowering behaviour, fruiting and yield attributes. Kumari *et al.* (2018) ^[4] reported substantial diversity among *Psidium* accessions, highlighting the importance of systematic characterization and evaluation of guava germplasm. Singh and Ashutosh (2018) ^[9] observed significant variation in plant height, trunk girth, canopy spread, fruit number and yield among guava genotypes under Chhattisgarh conditions. Similarly, Singh *et al.* (2024) ^[7] reported wide variability in morphological and flowering traits among guava genotypes under Jabalpur conditions. Koti *et al.* (2026) ^[3] also documented differences in floral morphology and flowering behaviour among guava genotypes. Genotype evaluation under specific agro-climatic conditions is essential for identifying promising material with desirable growth, flowering and yield characteristics. However, information on the comparative performance of diverse guava genotypes under Nagpur conditions is relatively limited. Therefore, the present investigation was undertaken to evaluate different guava genotypes under Nagpur conditions with respect to growth, flowering and yield characteristics and to identify promising genotypes based on their field performance.

Materials and Methods

The investigation was conducted during 2025–26 at the Centre of Excellence for Citrus (CEC), College of Agriculture, Nagpur, Maharashtra. The experimental site is located in the Nagpur region of central India. The study was conducted under the existing orchard conditions of the experimental farm. A total of 24 guava genotypes were evaluated.

The genotypes comprised NG-1 to NG-23, along with Lucknow-49 (L-49), which was maintained as the check variety. The trees were approximately 11 years old and had been planted during 2014–15. The planting geometry was 6 × 2 m. The evaluation was conducted as a non-replicated genotype trial. Plant height was measured using a measuring tape and expressed in metres. Canopy spread was recorded in the East-West and North-South directions using a measuring tape and expressed in metres. Representative leaves were selected from the central portion of shoots and their dimensions were recorded. Leaf area was expressed in cm². Stem girth was measured using a measuring tape at a point above 25 cm from ground level and expressed in cm. Days to flowering were recorded based on the period required for the onset of flowering in the respective

genotype. The total number of flowers produced per plant was recorded for each genotype. Flowers were counted on representative branches and expressed as number of flowers branch⁻¹. The number of petals was recorded from representative flowers and expressed as petals flower⁻¹.

The number of days required from flowering to fruit set was recorded for each genotype. The number of days from fruit set to harvesting was recorded for each genotype. The total number of harvested fruits from each genotype was recorded and expressed as fruits plant⁻¹. Yield was recorded by weighing the harvested fruits from each plant and expressed in kg plant⁻¹.

Results and Discussion

Table 1: Growth parameters as influenced by different guava genotypes

Genotypes	Plant height (m)	Plant spread E-W (m)	Plant spread N-S (m)	Leaf area (cm ²)	Stem girth (cm)
NG-1	4.08	5.04	3.24	68.40	55.00
NG-2	3.04	5.84	3.43	74.20	90.00
NG-3	4.07	4.73	3.22	65.10	62.00
NG-4	4.10	4.99	2.81	62.30	105.00
NG-5	4.13	5.18	3.42	72.80	70.00
NG-6	4.18	5.77	3.17	75.90	84.00
NG-7	3.94	5.46	3.30	71.20	54.00
NG-8	4.52	5.71	3.81	79.80	71.00
NG-9	3.15	5.09	3.28	67.40	59.00
NG-10	3.09	5.29	3.52	70.10	52.00
NG-11	3.38	4.83	3.40	66.80	60.00
NG-12	3.93	5.08	3.20	73.10	61.00
NG-13	3.86	5.29	3.17	75.20	81.00
NG-14	3.69	5.27	3.49	72.90	41.00
NG-15	3.40	5.18	3.86	73.50	99.00
NG-16	4.07	5.16	3.37	74.30	48.00
NG-17	4.51	5.66	3.52	78.90	73.00
NG-18	4.92	6.77	4.35	88.50	76.00
NG-19	4.81	6.30	3.37	82.40	77.00
NG-20	3.91	5.22	3.49	73.00	52.00
NG-21	3.61	5.79	3.18	74.60	51.00
NG-22	4.25	6.08	3.80	80.20	49.00
NG-23	4.15	6.33	3.63	81.60	90.00
L-49	4.17	5.04	3.99	76.48	67.20
GM	3.96	5.46	3.46	74.11	67.8
Range	3.04-4.92	4.73-6.77	2.81-4.35	62.30-88.50	41-105
SD	0.5	0.52	3.33	5.96	17.18
C.V.	12.56	9.5	9.4	8.04	25.34
SE	0.1	0.11	0.07	1.22	3.51
Variance	0.25	0.27	0.11	35.51	295.29

Growth parameters

Plant height

Plant height ranged from 3.04 to 4.92 m among the evaluated genotypes. The maximum plant height was recorded in NG-18 (4.92 m), followed by NG-19 (4.81 m) and NG-8 (4.52 m). The minimum plant height was observed in NG-2 (3.04 m), followed by NG-10 (3.09 m) and NG-9 (3.15 m). The check variety L-49 recorded a plant height of 4.17 m, while the grand mean was 3.96 m.

The considerable variation in plant height suggests differences in inherent vegetative vigour among the genotypes. Similar variability has been documented by Bhalekar and Chalak (2017) ^[7], who reported plant height ranging from 3.61 to 4.42 m among guava cultivars under Pune conditions. Singh and Ashutosh (2018) ^[9] also observed substantial differences among 18 guava genotypes, with plant height reaching 4.43 m. These values are broadly

comparable with the present findings and support the existence of substantial genotypic variability for plant stature.

Canopy spread in East-West direction

East-West canopy spread ranged from 4.73 to 6.77 m. The maximum spread was recorded in NG-18 (6.77 m), followed by NG-23 (6.33 m) and NG-19 (6.30 m). The minimum East-West spread was recorded in NG-3 (4.73 m). L-49 recorded 5.04 m, compared with the grand mean of 5.46 m. The observed variability indicates differences in branching pattern, shoot development and genotype-specific canopy architecture. Bhalekar and Chalak (2017) ^[1] reported East-West canopy spread ranging from 4.59 to 6.06 m under Pune conditions, whereas Singh and Ashutosh (2018) ^[9] recorded a maximum East-West spread of 7.84 m among guava genotypes under Chhattisgarh conditions. Thus, the

magnitude of variation observed in the present study is consistent with earlier reports.

Canopy spread in North-South direction

North-South canopy spread varied from 2.81 to 4.35 m. The maximum spread was observed in NG-18 (4.35 m), followed by NG-15 (3.86 m). The minimum spread was recorded in NG-4 (2.81 m). L-49 recorded 3.99 m. Differences in canopy spread between genotypes reflect variability in branch orientation, shoot development and canopy architecture. Similar variation in North-South and East-West spread has been reported among guava genotypes by Singh *et al.* (2024)^[7]. The present observations therefore indicate that canopy architecture is strongly genotype dependent.

Leaf area

Leaf area ranged from 62.30 to 88.50 cm². The maximum leaf area was recorded in NG-18 (88.50 cm²), followed by NG-19 (82.40 cm²). The minimum leaf area was recorded in NG-4 (62.30 cm²), followed by NG-3 (65.10 cm²). L-49 recorded 76.48 cm². The variability in leaf area indicates differences in leaf morphology and vegetative development. Variation in leaf characteristics among guava genotypes has

also been reported in earlier studies. The larger leaf area of NG-18, together with its greater height and canopy spread, indicates an overall vigorous vegetative phenotype. Nevertheless, leaf area should be interpreted primarily as a morphological characteristic rather than as a direct predictor of yield.

Stem girth

Stem girth exhibited the widest variation among the growth traits and ranged from 41.00 to 105.00 cm. The maximum stem girth was recorded in NG-4 (105.00 cm), followed by NG-15 (99.00 cm). The minimum stem girth was recorded in NG-14 (41.00 cm), followed by NG-16 (48.00 cm). L-49 recorded 67.20 cm. The marked variation in stem girth demonstrates differences in trunk development and vegetative vigour. Bhalekar and Chalak (2017)^[1] recorded maximum stem girth of 61.00 cm under Pune conditions, while Singh and Ashutosh (2018)^[9] recorded a maximum trunk girth of 55.44 cm among guava genotypes under Chhattisgarh conditions. The comparatively greater stem girth recorded in the present study may be associated with the advanced age of the trees and genotype-specific growth characteristics.

Table 2: Flower parameters as influenced by different guava genotypes

Genotypes	Days to flowering	flowers plant ⁻¹	Flowers branch ⁻¹	Petals flower ⁻¹	Days to fruit set	Days to harvest	Fruits plant ⁻¹	Yield plant ⁻¹ (kg)
NG-1	42.00	97	5.00	5.10	6.2	124	58	10.76
NG-2	38.00	106	5.40	5.20	5.8	120	67	12.87
NG-3	45.00	111	5.80	5.00	7	128	71	13.35
NG-4	41.00	98	4.80	5.00	6.5	125	59	11.71
NG-5	39.00	95	5.10	5.30	5.9	121	58	12.65
NG-6	44.00	98	4.50	5.00	6.8	130	59	11.61
NG-7	40.00	93	4.40	5.20	6.1	122	56	13.25
NG-8	42.00	109	4.80	5.10	6.3	126	66	13.75
NG-9	39.00	94	4.30	5.30	5.8	119	54	12.67
NG-10	46.00	95	4.50	5.40	7.2	134	53	12.65
NG-11	36.00	101	4.60	5.00	5.2	115	59	14.37
NG-12	48.00	103	4.60	5.00	7.5	138	65	15.91
NG-13	45.00	87	4.30	5.10	6.9	135	50	13.09
NG-14	37.00	101	4.40	5.40	5.5	118	59	13.65
NG-15	38.00	91	4.40	5.50	5.6	117	51	12.38
NG-16	43.00	99	4.70	5.20	6.4	127	55	12.42
NG-17	41.00	103	5.00	5.10	6.2	124	62	12.29
NG-18	40.00	101	4.80	5.30	6	123	59	12.14
NG-19	41.00	102	4.60	5.20	6.3	125	60	12.61
NG-20	39.00	108	4.80	5.30	5.7	120	63	12.47
NG-21	37.00	110	4.50	5.20	5.4	116	65	12.64
NG-22	41.00	110	4.70	5.10	6.2	124	65	12.71
NG-23	44.00	101	5.00	5.20	6.7	131	63	11.41
L-49	41.00	101	4.58	5.58	6.16	122.2	65	15.98
GM	41.12	100.58	4.73	5.2	6.22	124.34	60.08	12.89
Range	36-48	87-111	4.30-5.80	5-5.58	5.20-7.50	115-138	50-71	10.76-15.98
SD	3.08	6.34	0.35	0.16	0.58	6.02	5.31	1.22
C.V.	7.5	6.30	7.5	3.12	9.34	4.84	8.83	9.46
SE	0.63	1.29	0.07	0.03	0.12	1.23	1.08	0.25
Variance	9.51	40.17	0.13	0.03	0.33	36.28	28.17	1.49

Flower parameters

Days to flowering: Days to flowering ranged from 36 to 48 days. The earliest flowering was recorded in NG-11 (36 days), followed by NG-14 and NG-21 (37 days each). The maximum duration to flowering was recorded in NG-12 (48 days), followed by NG-10 (46 days). L-49 recorded 41 days. Variation in flowering time may arise from differences in

genetic constitution and genotype × environment interaction. Singh *et al.* (2024)^[7], while evaluating 33 guava genotypes under Jabalpur conditions, also reported substantial differences in flowering behaviour and flowering duration. Their study emphasized that flowering time and duration varied among genotypes and were influenced by

both varietal characteristics and prevailing environmental conditions.

Number of flowers plant⁻¹

The number of flowers plant⁻¹ ranged from 87 to 111. The maximum number was recorded in NG-3 (111), followed by NG-21 (110). The minimum number was recorded in NG-13 (87), followed by NG-15 (91). L-49 produced 101 flowers plant⁻¹.

The substantial variation in flower production reflects differences in reproductive potential and flowering habit. Singh *et al.* (2024) [7] reported considerable variation in floral buds and open flowers among 33 guava genotypes at Jabalpur, supporting the present observation of genotype-dependent reproductive variability. Recent work by Koti *et al.* (2026) [3] has similarly documented variation in floral morphology and flowering behaviour among guava genotypes.

Number of flowers branch⁻¹

Flowers branch⁻¹ varied from 4.30 to 5.80. The maximum number was recorded in NG-3 (5.80), followed by NG-2 (5.40), whereas the minimum was observed in NG-9 (4.30). L-49 recorded 4.58 flowers branch⁻¹ and the grand mean was 4.73.

The observed differences indicate genotype-specific variation in reproductive shoot behaviour and floral initiation. Singh *et al.* (2024) [7] reported significant diversity in floral buds and open flowers per shoot among guava genotypes under Jabalpur conditions. Koti *et al.* (2026) [3] also reported genotypic differences in floral traits and flowering behaviour.

Number of petals flower⁻¹

The number of petals flower⁻¹ exhibited relatively narrow variation, ranging from 5.00 to 5.58. The maximum value was recorded in L-49 (5.58), followed by NG-15 (5.50). The minimum value of 5.00 was recorded in NG-1, NG-3, NG-4, NG-6, NG-11 and NG-12. The grand mean was 5.20 petals flower⁻¹.

Compared with the other flowering traits, the comparatively narrow range suggests that petal number was relatively stable among the evaluated genotypes. Nevertheless, floral morphological variability has been reported in guava germplasm. Koti *et al.* (2026) [3] observed significant differences in floral morphology, including petal number, among different guava genotypes. The present observations therefore support the existence of some genotype-related variation in floral structure, although the magnitude was comparatively small.

Yield parameters

Days to fruit set

Days to fruit set ranged from 5.20 to 7.50 days. The earliest fruit set was recorded in NG-11 (5.20 days), followed by NG-14 (5.50 days). The maximum duration was recorded in NG-12 (7.50 days), followed by NG-10 (7.20 days). L-49 recorded 6.16 days. Differences in the time required for fruit set may be associated with genotype-specific flowering behaviour, reproductive biology and environmental interaction. Bose *et al.* (2019) [2] reported considerable differences in fruit-set behaviour among guava genotypes, demonstrating that reproductive efficiency can vary substantially among genotypes.

Days to harvest

The period from fruit set to harvesting ranged from 115 to 138 days. The earliest harvest was recorded in NG-11 (115 days), followed by NG-21 (116 days). The maximum duration was recorded in NG-12 (138 days), followed by NG-13 (135 days). L-49 required 122.20 days.

The observed variability demonstrates differences in fruit development and maturity behaviour among genotypes. Bose *et al.* (2019) [2] also reported considerable variation in fruit maturation period among guava genotypes. The longer duration recorded by NG-12 indicates a late-maturing behaviour, whereas NG-11 represents an early-maturing genotype under the conditions of the present study.

Number of fruits plant⁻¹

The number of fruits plant⁻¹ ranged from 50 to 71 fruits. The maximum number was recorded in NG-3 (71 fruits), followed by NG-2 (67) and NG-8 (66). NG-12, NG-21 and NG-22 each produced 65 fruits plant⁻¹. The minimum number was recorded in NG-13 (50 fruits), followed by NG-15 (51) and NG-10 (53). L-49 produced 65 fruits plant⁻¹, while the grand mean was 60.08 fruits plant⁻¹.

The observed variability is consistent with earlier genotype evaluation studies. Singh and Ashutosh (2018) [9] reported fruit number ranging from 55 to 121 fruits tree⁻¹ among 18 guava genotypes under Chhattisgarh conditions. Such differences among studies may be associated with genotype, tree age, environmental conditions, management practices and cropping conditions.

Yield plant⁻¹

Yield plant⁻¹ ranged from 10.76 to 15.98 kg. The maximum yield was recorded in L-49 (15.98 kg plant⁻¹), followed by NG-12 (15.91 kg plant⁻¹). Other relatively higher-yielding genotypes included NG-8 (13.75 kg) ANDNG-14 (13.65 kg). The minimum yield was recorded in NG-1 (10.76 kg plant⁻¹), followed by NG-4 (11.71 kg).

The substantial variation in yield among genotypes demonstrates differences in overall productive potential. Singh and Ashutosh (2018) [9] similarly reported considerable variability in yield among 18 guava genotypes under Chhattisgarh conditions, with the highest genotype yielding 21.32 kg tree⁻¹.

Conclusion

The evaluation of 24 guava genotypes under Nagpur conditions revealed substantial variability in growth, flowering and yield attributes. NG-18 exhibited superior vegetative vigour, NG-3 showed prolific flowering and the highest fruit number, while NG-11 showed early flowering and harvesting behaviour. L-49 check recorded the highest yield of 15.98 kg plant⁻¹, closely followed by the NG-12.

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