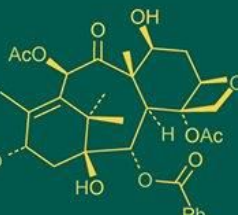
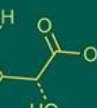
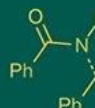


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Evaluation of guava (*Psidium guajava* L.) genotypes based on leaf traits

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Abstract

An investigation was carried out with forty seedling guava genotypes to evaluate morphological variability based on eleven specific leaf parameters. Results revealed that 26 genotypes were predominantly spreading attitude of branches while 14 were erect attitude of branches. Regarding stem colour of young shoot noted green with red streaks was most common in 39 genotypes while only NG-17 recorded dark red stem colour of young shoot. Substantial variation was observed in leaf shape with 21 genotypes have oblong leaf shape and 19 trullate leaf shape. Pubescence on lower side of leaf was primarily sparse and dense in 9 genotypes. Variation was also recorded in leaf tip shape (22 genotypes-acute and 18 genotypes-obtuse) and leaf base shape where most rounded or obtuse while NG-36 uniquely showed a cordate shape. For leaf colour, 39 genotypes were green group and NG-17 was greyed red purple group. Certain traits were uniform across all genotypes including the absence of leaf twisting, absence of leaf variegation, presence of anthocyanin coloration of young leaf and inflorescence: predominant number of flower upto two. This study identifies key morphological markers and superior genotypes essential for future breeding and selection programs.

Keywords: Guava, genotypes and leaf

Introduction

Guava is a member of myrtaceae family with a somatic chromosome number of $2n = 22$. It is tropical fruit crop in India. Guava is the fourth most important fruit crop in India after mango, banana and citrus (Ray, 2002) ^[1]. Often hailed as the "Apple of Tropics" and Poor Man's Apple". It is highly valued for hardy nature, prolific productivity and exceptional nutritional profile particularly high vitamin C content. Guava is a perennial, evergreen, shallow rooted shrub or small tree and branching close to the ground and often producing suckers from the base of trunk. The leaves are opposite to each other and are evergreen, leathery and short petiole. The shape of leaves is irregular ranging from oval to elliptical and are 7 to 15 cm long and 3 to 5 cm wide. Flowers are born as clusters on the leaf axils with 4 to 5 white petals and 2 to 5 cm diameter (Manica *et al.*, 2000) ^[2]. Red fleshed guava varieties are gaining importance due to their demand in processing industry because of their soft pulp with natural sweetness and higher pulp contain. The increasing in demand for red pulp variety is owing to the consumer preference for RTS, nectar, jam and jellies with natural colour regarding antioxidant properties of red pigmentation (Khoo *et al.*, 2019) ^[3]. In any crop improvement programme, the characterization of germplasm is a fundamental prerequisite for assessing genetic diversity. Morphological characterization remains the first and most essential steps in identifying superior genotypes. Among various traits, leaf and growth parameters are frequently used as reliable descriptors because they are easily observable and reflect the genetic makeup of the plant. However, a comprehensive understanding of streamline breeding efforts. The present investigation was undertaking to evaluate the morphological variability across forty guava genotypes based on eleven key parameters. This study aims to identify distinct morphological markers and promising genotypes that can be utilized for future breeding and selection programs to enhance yield and quality in guava.

Materials and Methods

The present investigation was conducted during 2024-2025 at the Regional Horticultural Research Station, ASPEE College of Horticulture, Navsari Agricultural University, Navsari, Gujarat. The research was conducted using a Randomized Block Design featuring two replications of forty seedling guava genotypes and genotypes designated as NG-1 to NG-40 where NG represents Navsari Guava. The selected seedling plant were two year of age and established

with spacing of 3 x 2 m. All genotypes were maintained under uniform cultural practices to ensure standard physiological development across all genotypes. All the observation were recorded as per the Protection of Plant Varieties and Farmers' Rights Authority (PPV & FRA), Government of India, New Delhi. Total five leaf samples were taken randomly from all direction from each individual tree from completely developed leaf of current season growth.

Table 1: Explanation of table of characteristics

Sr. No.	Characteristics	States
1	Attitude of branches	Erect/Spreading/Drooping
2	Stem colour of young shoot	Green/Green with red streaks/Dark red
3	Leaf shape	Round/Trullate/Oblong
4	Leaf twisting	Absent/Present
5	Leaf variegation	Absent/Present
6	Anthocyanin coloration of young leaf	Absent/Present
7	Leaf colour	Green group/Greyed red purple
8	Pubescence on lower side of leaf	Sparse/Dense
9	Leaf tip (apex) shape	Acute/Obtuse/Rounded
10	Leaf base shape	Obtuse/Rounded/Cordate
11	Inflorescence: predominant number of flower	Up to two/More than two

Results and Discussion

Attitude of branches

Among the 40 genotypes, predominantly spreading types branches were observed in twenty six genotypes and remaining fourteen genotypes (NG-12, NG-17, NG-18, NG-19, NG-20, NG-21, NG-22, NG-23, NG-24, NG-26, NG-28, NG-29, NG-37 and NG-39) had an erect growth habit (Table 2). The spreading growth habit of guava plant was noticed by Nagar *et al.* (2018) ^[6], Pandey *et al.* (2022) ^[5] and Singh *et al.* (2023) ^[4] in guava. The erect growth habits of guava were noticed by Nagar *et al.* (2018) ^[6] and Singh *et al.* (2023) ^[4] in guava.

Stem colour of young shoot

Most common stem colour of young shoot was found green with read streaks in thirty nine genotypes and one genotype (NG-17) had dark red stem colour of young shoot (Table 2). These results were also supported by Pandey *et al.* (1997) ^[10] and Nagar *et al.* (2018) ^[6].



Photo 1: Variation in stem colour of young shoot of guava genotypes

Leaf shape

Out of 40 genotypes, twenty one had oblong leaf shape and nineteen (NG-1, NG-3, NG-4, NG-6, NG-7, NG-11, NG-16, NG-17, NG-18, NG-19, NG-20, NG-22, NG-24, NG-27, NG-29, NG-30, NG-34, NG-35 and NG-38) exhibited trullate leaf shape. The variation observed in the study might

be due to the specific genotypic and phenotypic varietal features among the genotypes (Pandey *et al.*, 1997) ^[10]. The present finding agreement with Nagar *et al.* (2018) ^[6], Methela *et al.* (2019) ^[7], Sohi *et al.* (2019) ^[8], Nikhil *et al.* (2021) ^[9] and Pandey *et al.* (2022) ^[5] in guava.



Trullate

Oblong

Photo 2: Variation in leaf shape of guava genotypes

Leaf twisting

Leaf twisting was observed absent in all the genotypes evaluated under the present investigation (Table 2). None of the 40 genotypes exhibited any degree of twisting in leaf lamina and all were recorded as having normal orientation of leaf lamina. The variation observed in the study might be due to the specific genotypic and phenotypic features among the genotypes.

Leaf variegation

Leaf variegation was recorded and is presented in Table 2. Leaf variegation was absent in all the genotypes evaluated under the present study. None of the 40 genotypes exhibited any form of variegation on the leaf surface and all were observed to have uniform green leaves without any patches.

Anthocyanin coloration of young leaf

The anthocyanin coloration of young leaf from the genotypes observed during the course of investigation were noted and presented in the Table 2. All the 40 genotypes exhibited present of anthocyanin coloration on the young

emerging leaves. These results are in accordance with the Pandey *et al.* (2016) and Pandey *et al.* (2022) ^[5] in guava. Similar results of were also recorded by Kherwar and Usha (2017) ^[12], Nagar *et al.* (2018) ^[6] and Paras *et al.* (2022) ^[13].



Green group

Greyed red purple

Photo 3: Variation in leaf colour of guava genotypes

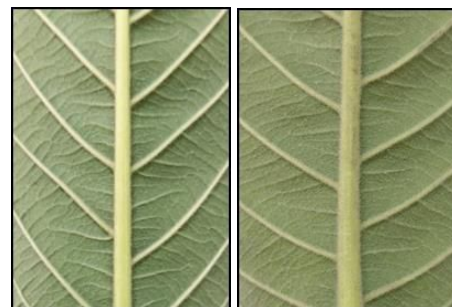
Leaf colour

Leaf colour was recorded and is presented in Table 2. The green leaf colour group was predominant among the genotypes evaluated under the present investigation. Among the 40 genotypes, thirty nine genotypes revealed green leaf colour, whereas only one genotype (NG-17) had greyed red purple leaf colour. Similar results of were also recorded by Singh *et al.* (2023) ^[4].

Pubescence on lower side of leaf

Among the 40 genotypes, predominantly sparse were observed in thirty one genotypes and remaining nine genotypes (NG-2, NG-16, NG-19, NG-21, NG-27, NG-29,

NG-35, NG-37 and NG-39) had dense pubescence on the lower surface of the leaf (Table 2). Nagar *et al.* (2018) ^[6] reported sparse and dense pubescence on the lower surface of the leaf in guava. These results are in accordance with the Ehleringer and Bjorkman (1978) ^[14], Kumar *et al.* (2012) ^[15] and Santos *et al.* (2012) ^[16].



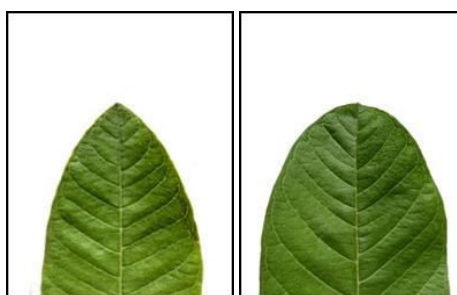
Sparse

Dense

Photo 4: Variation in pubescence on lower side of leaf of guava

Leaf tip (apex) shape

Among the 40 genotypes, acute types were observed in twenty-two genotypes and remaining eighteen genotypes (NG-2, NG-8, NG-9, NG-12, NG-13, NG-14, NG-15, NG-21, NG-23, NG-25, NG-26, NG-28, NG-32, NG-33, NG-36, NG-37, NG-39 and NG-40) had obtuse types of leaf tip shape (Table 2). The present finding agreement with Nagar *et al.* (2018) ^[6], Methela *et al.* (2019) ^[7], Sohi *et al.* (2019) ^[8], Nikhil *et al.* (2021) ^[9] and Pandey *et al.* (2022) ^[5] in guava.



Acute

Obtuse

Photo 4: Variation in leaf tip shape of guava genotypes

Leaf base shape

Among the 40 genotypes, only one genotype (NG-36) showed a cordate leaf base shape while seventeen genotypes (NG-3, NG-6, NG-7, NG-16, NG-19, NG-20, NG-22, NG-24, NG-27, NG-29, NG-30, NG-31, NG-34, NG-35, NG-38,

NG-39 and NG-40) possessed an obtuse leaf base shape. The remaining twenty-two genotypes had rounded leaf base shape. The results are in agreement with Nagar *et al.* (2018) ^[6], Methela *et al.* (2019) ^[7], Sohi *et al.* (2019) ^[8], Nikhil *et al.* (2021) ^[9] and Pandey *et al.* (2022) ^[5] in guava.



Obtuse

Rounded

Cordate

Photo 5: Variation in leaf base shape of guava genotypes

Inflorescence: predominant number of flower

The predominant number of flowers per inflorescence was recorded and presented in Table 2. The results revealed that all genotypes evaluated under the present study produced up to two flowers per inflorescence.

Conclusion

An analysis of leaf morphological parameters revealed that the out of 11 different leaf morphological characters study, only four were common across all genotypes *i.e.*, absent in leaf twisting, absence of leaf variegation, present of anthocyanin coloration of leaf and up to two predominant number of flower per inflorescence. A spreading types branches, green with red streaks of stem colour of young shoot and green leaf colour group were the most prevalent traits observed across the 40 genotypes. Substantial diversity was observed in pubescence on lower side of leaf, leaf shape, leaf tip (apex) shape and leaf base shape.

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