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Research Article

Studies on Physical Attributes of Guava (*Psidium guajava* L.) Genotypes in Awadh Region

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ABSTRACT

Guava (Psidium guajava L.), a prominent fruit in tropical and subtropical regions, exhibits significant variability in physical attributes across different genotypes. This study aimed to evaluate the physical characteristics of eight guava genotypes (Lalit, Shweta, CISHG-1, CISHG-31, Allahabad Safeda, L-49, Taiwan, and VNR Bihi) in the Awadh region. The attributes assessed included fruit length, breadth, weight, volume, and specific gravity. Results indicated substantial variations among the genotypes. The longest fruits were observed in Taiwan (9.88 cm), while Shweta had the shortest (6.17 cm). Taiwan also exhibited the greatest breadth (9.29 cm) and weight (465 g), whereas L-49 had the smallest breadth (6.24 cm) and weight (141 g). Fruit volume ranged from 139 ml in L-49 to 462 ml in Taiwan. Specific gravity varied from 1.005% in VNR Bihi to 1.030% in Shweta, indicating differences in fruit density. These findings highlight the genetic diversity among guava genotypes and underscore the potential for selecting specific genotypes based on desired physical attributes for cultivation and market preferences. This study provides valuable insights into guava breeding programs aimed at improving fruit quality and marketability.

Keywords: *Psidium guajava; Physical attrbutes, Fruit morphology; Awadh region.*

INTRODUCTION

Guava (*Psidium guajava* L.) is a nourishing fruit that thrives in tropical and subtropical regions across the globe (Rani and David, 2021). In addition to containing many beneficial chemicals and minerals like calcium, iron, and phosphorus, guava fruits are rich in vitamin C, surpassing the levels found in common fruits like oranges and lemons by four to eight times (Gekonge, 2021). Guava fruit is rich in vitamin A and B, as well as the minerals iron, calcium, and phosphorus (Hussain et al., 2021). The fruit is often consumed in its raw state and is commonly sliced and incorporated into salads or desserts (Mini et al., 2021).

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Guava juice and guava nectar are widely consumed drinks, whereas guava syrup is commonly utilized to enhance the taste of pastries (Kumar et al., 2022). Green guavas can serve as a pectin source, while small and overripe fruits are employed to provide ascorbic acid for different food and beverage products. The foliage and outer layer of the tree have a significant concentration of tannins (Omayio et al., 2019).

Guava, with its abundance in minerals, vitamins A and C, and edible seeds that are high in dietary fibre, omega-3 and omega-6 polyunsaturated fatty acids, and other nutrients, is also known as the "apple of the tropics" and the "super fruit" (Nimisha et al., 2013). Guava competes with other major fruit crops with high yields and cheap input costs. India, China, Indonesia, South Africa, Florida, Hawaii, Egypt, Yemen, Brazil, Mexico, Colombia, West Indies, Cuba, Venezuela, New Zealand, Philippines, Vietnam, and Thailand are among the countries where guava fruit is commercially significant. These countries also value its year-round availability, rich nutritional and medicinal value, reasonable price, ease of handling, and appeal to consumers. Guava is India's fourth most significant fruit crop, following Mango, Banana, and Citrus. In India, the commercial cultivation of this crop spans around 290,000 hectares, resulting in an annual yield of 4,539,000 tonnes (Horticultural Statistics at a Glance, 2019-20). Indian production of guava in the year 2021-22 (top 10 states) is presented in Figure 1 (National Horticulture Board, GOI). Allahabad is famous for the production of the best quality guava in India as well as in the world.

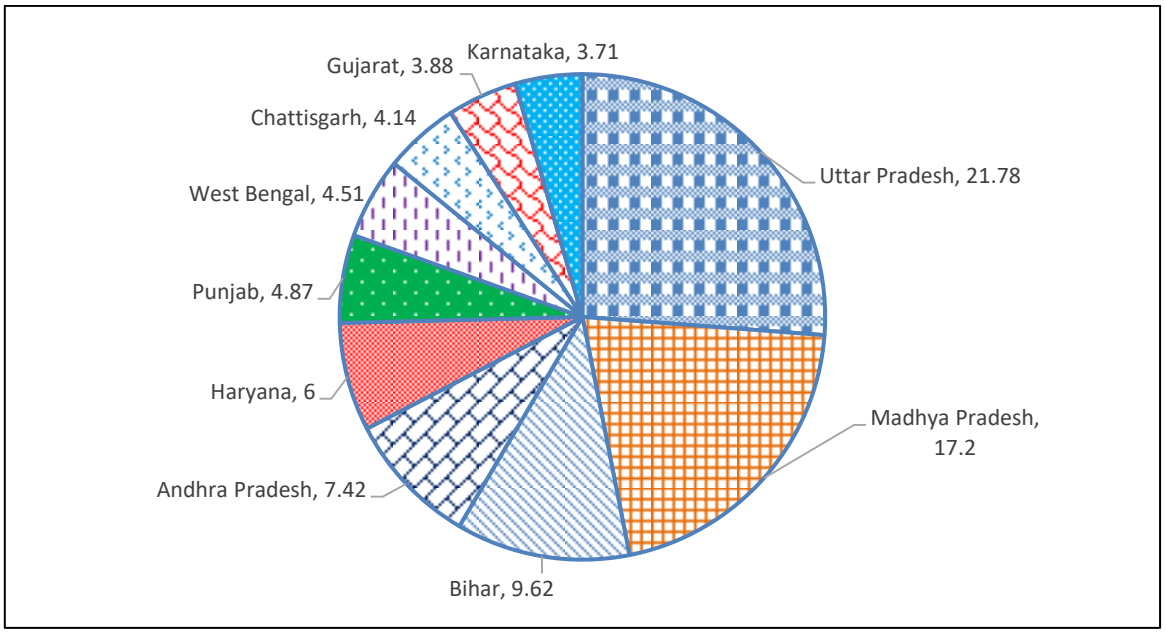

Figure 1 Top 10 states of India producing guava (%)

The chemical makeup of guava fruits is subject to variations influenced by factors such as variety, ripeness, and environmental circumstances. In general, guava fruit has a moisture content ranging from 74% to 87%, an ash content of 0.5% to 1%, a fat content of 0.4% to 0.7%, a protein content of 0.8% to 1.5%, and a pectin content of 0.5% to 1.8%. Additionally, guava fruit contains various vitamins (such as vitamin C, vitamin A, and vitamin B) and minerals (including calcium, iron, potassium, and salt) (Sridhar et al., 2017). Guava fruit is rich in bioactive chemicals, which contribute to its numerous health advantages. Furthermore, guava has a significant amount (about 50% of the fruit) of dietary fibre, which enhances its health-promoting properties. Prior research has demonstrated that various cultivars have an

impact on the phytochemical composition of fruits (Vani et al., 2020).

This research paper comprehensively analyses the physical attributes of various guava genotypes cultivated in the Awadh region, which is crucial for several reasons. Firstly, understanding the morphological differences among guava genotypes helps identify and select the best cultivars for specific purposes, such as fresh consumption or processing into value-added products. This knowledge can significantly enhance the efficiency and profitability of guava cultivation by matching genotypes to market demands and environmental conditions. Secondly, the study highlights the genetic diversity within the guava species, which is essential for breeding programs aimed at improving fruit quality, yield, and resistance to environmental stresses. By providing detailed measurements of fruit length, breadth, weight, volume, and specific gravity, the research offers valuable data that can guide both growers and researchers in making informed decisions about guava cultivation and improvement. Furthermore, this paper addresses the need for reliable verification of cultivars and accurate knowledge of genetic diversity, which are vital for maintaining the sustainability and productivity of guava orchards. The findings from this research contribute to the broader goal of enhancing guava's economic and nutritional value, thereby supporting the agricultural sector and benefiting consumers with better-quality fruits.

MATERIALS AND METHODS

The present investigation entailed gathering eight guava (*Psidium guajava* L.) varieties/genotypes from the Awadh region. The fruits of six guava genotypes were obtained from the Central Institute for Subtropical Horticulture, located in Rehmankhera P.O. Kakori, Lucknow, Uttar Pradesh. Additionally, two guava genotypes were obtained from a progressive farmer named R.S. Verma in Sultanpur, Uttar Pradesh. The sample consisted of sixteen (16) fruits that were healthy, uniform in size, and free from pests, illnesses, and blemishes (Plate 1). These fruits were selected randomly from the trees of each cultivar in each direction. The fruits were harvested and assessed at the Department of Horticulture, School of Agricultural Sciences & Technology, Babasaheb Bhimrao Ambedkar University (A Central University), Vidya Vihar, Rae Bareli Road, Lucknow, in mid-December (U.P). Lucknow is situated at a longitude of 80° 57′ 0″ E and a latitude of 26° 51′ 0″ N. It has an elevation of approximately 123 metres (404 ft.) above the average sea level. The present study assessed eight guava genotypes: T1 (Lalit), T2 (Shweta), T3 (CISHG-1), T4 (CISHG-31), T5 (Allahabad Safeda), T6 (L-49), T7 (Taiwan), and T8 (VNR Bihi). Measurements were taken for fruit length (cm), fruit breadth (cm), volume (ml), weight (gm), specific gravity (Plate 2). The collected data underwent statistical analysis.

Plate 1 Samples selected for the study

Plate 2 Measurement of physical parameters

RESULT AND DISCUSSION

The study evaluated eight genotypes of guava (*Psidium guajava* L.) in the Awadh region, focusing on their physical attributes, including length, breadth, weight, volume, and specific gravity. The results are summarized in the Table 1.

The length of guava fruits varied significantly among the genotypes. The longest fruits were recorded in T7 (Taiwan), with an average length of 9.88 cm, followed by T8 (VNR Bihi) at 8.89 cm. The shortest fruits were observed in T2 (Shweta) with an average length of 6.17 cm (Figure 2). This indicates a substantial variation in fruit length among the different genotypes, which could be attributed to genetic differences. Similarly, the breadth of the fruits showed significant variation. T7 (Taiwan) exhibited the highest breadth at 9.29 cm, while T6 (L-49) had the smallest breadth at 6.24 cm. The difference in breadth among the genotypes suggests potential differences in fruit morphology and growth patterns. Fruit weight ranged from 141 g in T6 (L-49) to 465 g in T7 (Taiwan). T7 (Taiwan) had significantly heavier fruits compared to other genotypes, followed by T8 (VNR Bihi) at 387 g. This significant difference in weight indicates the potential for selecting specific genotypes for markets preferring larger fruits.

The volume of the fruits also varied significantly, with T7 (Taiwan) showing the highest volume at 462 ml, closely followed by T8 (VNR Bihi) at 385 ml. The lowest volume was recorded in T6 (L-49) at 139 ml. The correlation between volume and weight is evident, as larger and heavier fruits also had higher volumes. The specific gravity, which is an indicator of fruit density, ranged from 1.005% in T8 (VNR Bihi) to 1.030% in T2 (Shweta). The higher specific gravity in T2 (Shweta) suggests denser fruit tissue compared to the other genotypes. However, T7 (Taiwan) and T8 (VNR Bihi) had lower specific gravity, indicating less dense but larger fruits.

Table 1 Important physical parameters of guava

Genotypes	Length (cm)	Breadth (cm)	Weight (gm)	Volume (ml)	Specific gravity (%)
T_1 (Lalit)	6.50	7.13	179	175	1.022
T_2 (Shweta)	6.17	6.98	170	165	1.030
T_3 (CISHG-1)	6.73	6.65	155	151	1.026
T_4 (CISHG-31)	6.37	6.47	151	149	1.013
T_5 (Allahabad Safeda)	6.98	7.69	237	232	1.021
T_6 (L-49)	6.38	6.24	141	139	1.014
T_7 (Taiwan)	9.88	9.29	465	462	1.006
T_8 (VNR Bihi)	8.89	8.52	387	385	1.005
SEm±	0.010	0.008	0.178	0.193	0.001
CD at 5%	0.583	0.472	2.056	2.250	0.164

The significant variations in physical attributes among the different guava genotypes suggest that specific genotypes can be selected based on desired traits for cultivation and market preferences. For instance, T7 (Taiwan) and T8 (VNR Bihi) are suitable for markets demanding larger fruits, while T2 (Shweta) and T3 (CISHG-1) might be preferred for their higher density and potentially better shelf life. In a similar line of work, Chatterjee et al. (1992) studied three important guava cultivars and found that Sardar guava has the longest fruit length (5.55 cm), followed by Allahabad Safeda (5.49 cm) and Red-Fleshed (4.35 cm). Allahabad Safeda also had the largest fruit weight (87.52g), followed by Sardar (74.58g) and Red Fleshed (50.25g). In another study, Kumar et al. (2006) found that cv. Allahabad Safeda had the longest fruit (7.7 cm), cv. L-49 had the longest breadth, weight, and volume (7.8 cm, 235.50 g, and 239.60 ml, respectively), and Allahabad Safeda (7.2 cm, 210 g, and 215.17 ml). Guava fruits had a specific gravity of 0.99 to 9.96. The variations observed also highlight the importance of genotype selection in guava breeding programs. Breeding strategies could focus on combining desirable traits such as fruit size, weight, and specific gravity to develop superior guava cultivars that cater to specific market needs and consumer preferences.

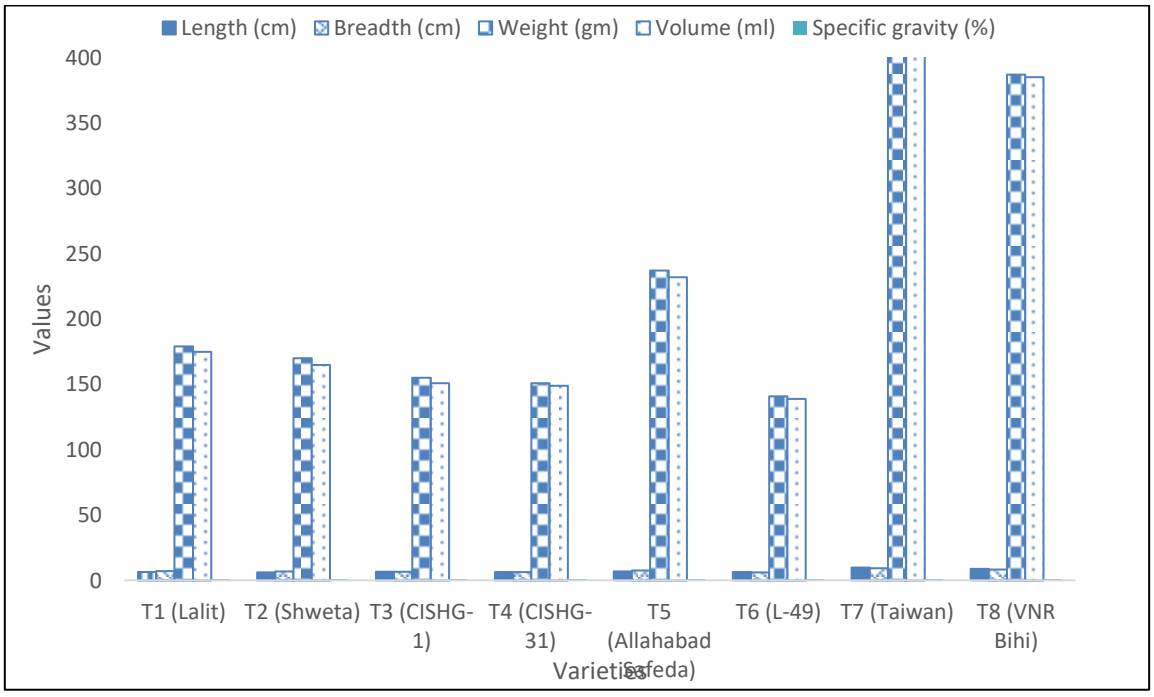

Figure 2 Physical parameters of Guava

CONCLUSION

This study on the physical attributes of eight guava (*Psidium guajava* L.) genotypes in the Awadh region reveals significant variability in fruit length, breadth, weight, volume, and specific gravity among the genotypes, with the Taiwan genotype (T7) exhibiting the largest fruits, making it suitable for markets preferring larger guavas. Conversely, genotypes like Shweta (T2) and CISHG-1 (T3) demonstrated higher specific gravity, indicating denser fruit tissue advantageous for shelf life and processing. These findings highlight the genetic diversity among guava genotypes, essential for breeding programs aimed at improving fruit quality, yield, and adaptability to environmental stresses. By providing detailed morphological data, this research aids in selecting guava cultivars that meet specific market demands, enhancing the efficiency and profitability of guava cultivation and supporting the agricultural sector with high-quality, nutritionally beneficial fruits.

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Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could appear to influence the work reported in this paper.

Author's contribution

Saurabh Verma: Writing-original draft, Methodology, Investigation, Data curation, Conceptualization. **Ravi Shankar Verma:** Methodology, Formal analysis, Investigation, Writing-original draft. **Bipin Kumar:** Writing: Review and editing. **Manish Yadav:** Writing: Review and editing

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