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QUALITY AND SEED CONTENT OF PINK AND WHITE FLESHED WINTER GROWN GUAVA CULTIVARS: A COMPREHENSIVE STUDY

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ABSTRACT

Guava is a tropical fruit well known for its wide range of nutritional benefits and ability to thrive in a diverse climatic conditions. Cultivar specific differences in physico-chemical quality, seed content, and biochemical properties affect storage life and consumer acceptance. The quality parameters and seed traits of four winter season grown guava cultivars *i.e.,* Hisar Safeda, Shweta, Lalit, and Punjab Pink are examined in this study. Results revealed that the white and pink fleshed varieties differed significantly in terms of total soluble solids (TSS), acidity, ascorbic acid, sugar:acid, antioxidant activity, pectin content, and Pectin Methylesterase (PME) activity. Among the cultivars, Shweta recorded the highest ascorbic acid (142.51 mg/100 g FW), antioxidant activity (11.19 µmol Trolox/g FW), and superior sweetness (TSS: 12.61°Brix) among the cultivars, while Lalit had the highest seed percentage and total phenols. The findings offer valuable insights on choosing varieties for processing as well as fresh consumption.
Keywords: Physico- chemical, Pectin Methylesterase, White and Pink flesh, Winter season.

Introduction

Guava (*Psidium guajava* L.*)*, a commercially important fruit crop in tropical and subtropical regions, is valued for its flavor, nutritional content, and health advantages (Fischer and Melgarejo, 2021). Due to its ease of availability and health benefits, it is often referred as the "poor man's apple". On account of wider adaptability, tolerance to various stresses and high productivity coupled with low input requirements and excellent nutritive value on cheaper rate, the demand of this fruit remains high (George and Thangasamy, 2025). In addition to being a strong source of pectin, total phenols, and antioxidants, it has four times higher amount of vitamin C found in oranges (Gangappa *et al*., 2022). Besides to being consumed fresh, guava is processed to make jams, jellies, juices and other value added products. Guava cultivar diversity, especially between pink and white fleshed varieties, often results in significant variations in fruit quality, which impacts processing suitability, shelf stability, and market preference (Dubey *et al*., 2016). In India, the winter months offer the best growing conditions for guava fruit, which typically yields superior quality fruit due to the cooler temperatures and reduced pest incidence.

Understanding these distinctions is important for both consumers and the processing industry (Jain *et al*., 2025). Although guava quality has been described in several studies during different seasons, there are limited comprehensive comparisons between cultivars

with white and pink flesh that concentrate on both biochemical and seed characteristics under winter conditions. This study aims to bridge this narrow gap by examining four guava cultivars Hisar Safeda, Shweta (white), and Lalit, Punjab Pink (pink) for their physico-chemical quality, antioxidant potential, firmness, seed percentage, and associated enzymatic activity.

Materials and Methods

Fruit material

Fruits of Hisar Safeda, Shweta, Lalit, and Punjab Pink guava cultivars were harvested at full maturity during winter season from orchard of Division of Fruits and Horticultural Technology, IARI, New Delhi-12 and transferred to laboratory of Division of Food Science and Postharvest Technology, IARI, New Delhi. Guava fruits of uniform size were sorted, washed and were utilized for the execution of this present research work.

Fruit sampling

Ten fruits from 5 different plants of each cultivar were randomly selected and used to analyze the fruit firmness. Later, to analyze physico-chemical parameters and enzyme activity, pulp from those fruits of each plant from 4 different cultivars was extracted (Fig. 1) and homogenized separately to carry out further analysis.

Observations recorded

Physico-Chemical parameters

Fruit firmness in the guava was measured by using a texture analyzer (model: TA+Di, Stable micro systems, UK) using` compression test as given by Jha *et al*. (2010). Maximum force in the force deformation curve was taken as firmness and is expressed in terms of Newton (N). Quality attributes, including total soluble solids (°Brix), total sugars (%), titratable acidity (%), and ascorbic acid (mg/100 g), were determined using the standard methods of analysis (AOAC, 1995) by using homogenized fruit pulp. Further, TSS and titratable acidity were used to calculate sugar:acid ratio by using following formula (Badal and Tripathi, 2021).

$$Sugar{:}Acid = \frac{Total\ Soluble\ solids\ (TSS)}{Titratable\ Acidity\ (TA)}$$

Total phenols were estimated according to procedure given by Singleton and Rossi (1965) and expressed as mg of gallic acid equivalents (GAE), and antioxidant capacity/ Cupric Reducing Antioxidant Capacity (CUPRAC) is estimated and expressed as µmol Trolox/g fresh fruit pulp (Apak *et al*., 2004). Pectin content of guava fruits was estimated by the gravimetric method as described by Ranganna *et al*. (2007), expressed as % calcium pectate. Pectin methyl esterase (PME) activity in guava fruits was estimated by the method standardized by Hagerman and Austin (1986) and expressed as µmol galacturonic acid /min/ gfresh pulp of guava fruit.

Seed percentage

One-kilogram of over-ripe guava fruits from 5 different plants of each cultivar were collected from the orchard. The seeds from each replication were extracted separately and seed percentage was calculated by using following formula (Sahoo *et al*., 2017).

$$\text{Seed percentage} = \frac{\text{Weight of seed present in sample}}{\text{Weight of the whole fruit)}} \times 100$$

Statistical analysis

The data recorded were subjected to ANOVA in Randomized Block Design (RBD). Analysis was done with 5% level of significance (p=0.05) using online statistical software GRAPES (Gopinath *et al*., 2021).

Results

Physico-Chemical Quality Attributes

These guava cultivars showed the significant variation in case of quality parameters (Table 1). Shweta a white fleshed guava variety exhibited the highest TSS (12.61°Brix) and total sugars (9.23%), making it the sweetest cultivar tested. In contrast, pink fleshed variety Punjab Pink recorded the lowest TSS (10.61°Brix) and sugar content (7.61%). Acidity ranged from 0.36% (lowest) in Shweta to 0.57% (highest) in Punjab Pink. Ascorbic acid content was highest in Shweta (142.51 mg/100g Fresh Weight (FW)) and whereas Hisar Safeda had the lowest (130.07 mg/100g FW). Sugar acid ratios varied significantly, with Shweta again leading (34.77), indicating better taste quality. With 187.23 mg GAE/100 g FW, Lalit had the highest total phenolic content, followed by Shweta with 184.53 mg GAE/100 g FW. Whereas peak antioxidant activity was recorded in Shweta (11.19 µmol Trolox/g FW), followed by Lalit (9.36 µmol Trolox/g FW). Punjab Pink had the lowest antioxidant activity of 8.12 µmol Trolox/g FW and Hisar Safeda recorded the lowest total phenols of 179.26 mg GAE/100g FW. Fruit firmness had showed a significant variation among the white and pink fleshed varieties. It was highest in Lalit (21.08 N) and Shweta (20.79 N), indicating better fruit texture in white cultivars. Punjab Pink was the softest (18.10 N).

Pectin and Pectin Methylesterase Activity

Hisar Safeda had the highest pectin content (1.07%), indicating superior gelling properties, while Punjab Pink had the lowest (0.92%) (Fig.2). Pectin Methylesterase (PME) activity was also significantly higher in Hisar Safeda (0.0085 µmol/min/g FW), implying active cell wall modification. Lalit and Punjab Pink exhibited lower PME activity (0.0066 and 0.0069 µmol/min/g FW, respectively), correlating with lower pectin breakdown.

Seed Percentage

Seed content among these guava varieties varied significantly (Fig. 3). Lalit recorded the highest seed percentage (2.34%), followed by Punjab Pink (2.14%). Shweta and Hisar Safeda had comparatively lower seed percentages (1.98% and 1.63%, respectively), making them more desirable for table consumption and processing.

Discussion

The winter season plays a crucial role in enhancing guava fruit quality by representing metabolic activity and promoting accumulation of sugars and antioxidants (Usman *et al*., 2021). Among the white fleshed cultivars, Shweta outperformed Hisar Safeda in terms of sweetness, ascorbic acid content, and antioxidant properties, which is in line with the findings of Sahoo *et al*. (2017). Shweta has an excellent sugar:acid ratio, which makes it ideal for both fresh consumption and potential processing applications (Dolkar *et al*., 2017). The pink fleshed cultivar Lalit demonstrated superior fruit firmness and total phenolic content, which made it a viable option for processing and extended shelf life. However, consumers' choice for table use may be impacted by its increased seed proportion (Rajan *et al*., 2008). On the other hand, despite having a lower quality score in some areas, Punjab Pink had moderate firmness and acceptable seed content, making it a balanced option.

The PME enzyme activity further explain textural variance (Sachin *et al*., 2022) among these guava cultivars. Higher PME activity and pectin content in Hisar Safeda suggest an active demethylation of pectin, possibly related to better mouthfeel. Shweta, with its good pectin content and low PME activity, may retain firmness for longer duration, which is a desirable attribute in processed guava products. The seed content, which is often overlooked, has a big impact on consumer acceptance. Shweta and Hisar Safeda had lower seed content, giving them a competitive advantage in consumer markets where fresh fruit consumption is a priority.

Conclusion

This study presents a comparative assessment of winter grown white and pink fleshed guava cultivars, highlighting significant differences in quality, antioxidant capacity, enzymatic activity, and seed percentage. Shweta emerged as the better performing cultivar with superior sweetness, nutritional value, and reasonable seed content, suitable for both fresh use and processing. Lalit and Punjab Pink, despite of having higher seed content, shown promise for their firmness and antioxidant richness. The findings validate cultivar specific recommendations for fresh market and processing suitability.

Table 1: Physico-chemical quality of guava cultivars grown in winter season

Pulp colour	Cultivars	TSS (°Brix)	Total sugar (%)	Acidity (%)	Ascorbic acid (mg/100g FW)	Sugar: Acid	Total phenols (mg GAE/100g FW)	Antioxidant activity (µmol Trolox/g FW)	Fruit firmness (N)
Pink	Hisar Safeda	11.33b±0.17	8.50b±0.19	0.52b±0.004	130.07c±0.55	21.66b±0.26	179.26d±0.27	9.32b±0.27	19.18b±0.11
	Shweta	12.61a±0.14	9.23a±0.04	0.36c±0.003	142.51a±1.30	34.77a±0.42	184.53b±0.23	11.19a±0.29	20.79a±0.57
White	Lalit	11.38b±0.02	8.47b±0.23	0.56a±0.020	131.03c±0.97	20.41c±0.77	187.23a±0.15	9.36b±0.13	21.08a±0.22
	Punjab Pink	10.61c±0.28	7.61c±0.11	0.57a±0.005	138.66b±0.49	18.67d±0.35	183.80c±0.30	8.12c±0.03	18.10c±0.43

The mean values are presented with DMRT ranking followed ± standard error means

Fig. 1 : White and pink fleshed guava cultivars grown in winter season

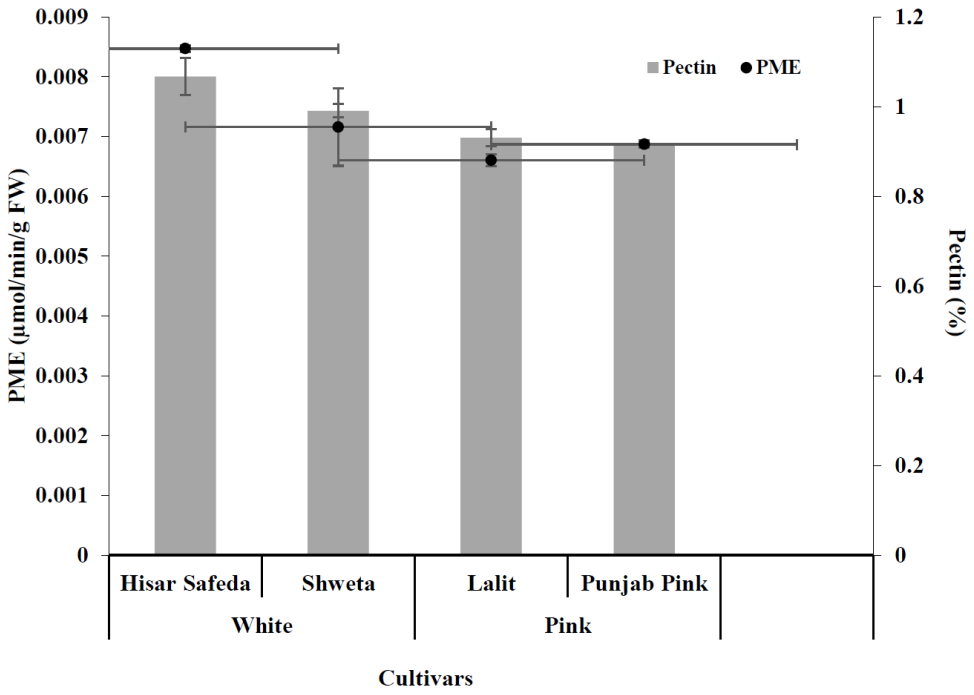

Fig. 2 : Pectin and PME content of different guava cultivars grown in winter season

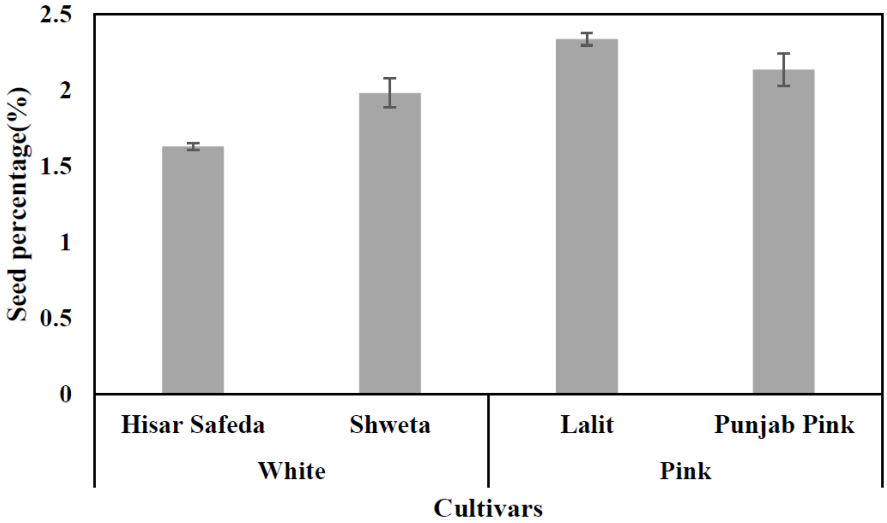

Fig. 3 : Seed percentage of guava cultivars during winter season

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