

Performance Evaluation of Guava (*Psidium guajava* L.) Introductions in Arid Conditions of Western Rajasthan

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Abstract: The growth, yield and quality traits of seven varieties of guava (*Psidium guajava* L.) were evaluated during the winter season of 2015-16. Plant height was higher in red fleshed and L-49 but plant spread and stem diameter was higher in Allahabad Safeda and Sarbati. The highest yield was recorded in Allahabad Safeda followed by L-49. Flesh color was pink in Lalit, red in Red Fleshed whereas white in other varieties. The fruit weight ranged from 87.2 g to 152.0 g in Lalit and Sarbati, respectively. Fruit size and number of seeds/100 g fruit was maximum in Sarbati whereas, pulp thickness was maximum in Allahabad Safeda. The highest TSS was observed in MPUAT Sel. 1 whereas, acidity was highest in Lalit. Total sugar was highest in Red Fleshed but the pectin content was observed highest in L-49.

Key words: Guava, evaluation, fruit quality, arid conditions.

The guava (*Psidium guajava* L.) popularly known as poor man's apple, belongs to the family Myrtaceae, and is being cultivated in the tropical and sub tropical parts of India. Due to its high nutritive value, wide adaptability in diverse agro-climatic condition, early and prolific bearing with a good return, the crop has been gaining popularity as a commercial crop in Northern India. The fruit is a rich source of vitamin C, calcium, iron and pectin. Guava crop bears twice a year, i.e., during rainy season and winter season. The bearing behavior is related to the growth of plants in different vegetative flushes, which is in general guided by climatic conditions (Dubey *et al.*, 2000). The fruit has high demand for table purpose as well as in preservation industry for preparation of jelly and jam. The quality of the guava fruit is observed to be better in winter season (Patel *et al.*, 2011). Being hardy in nature guava can withstand adverse climatic conditions and grow under various soil types (Ghosh *et al.*, 2013; Dhaliwal and Dhillon, 2003). In Rajasthan the guava is commercially cultivated in Bundi, Chittorgarh, Dholpur, Kota, Tonk, Sawai Madhopur, Udaipur where the soil and climatic conditions are conducive for the crop (Anonymous, 2015). During 2014-15, guava was cultivated over 2457 ha with a total production of 23.75 MT and a productivity of 93.92 q ha⁻¹ in the state (Anonymous, 2015). However, there is a large area in western part of the Rajasthan

state having poor soil, low and erratic rainfall and availability of irrigation water is a problem thus affording a few fruit crops. Whether guava could be grown in such areas was the aim of this study. Keeping this in view air layered plants of seven varieties were introduced in 2012 and planted in square system at spacing of 5 m x 5 m under ring method of irrigation. The analysis of physical and biochemical attributes would serve as a tool for evaluation of guava cultivars suitable for the arid irrigated region of western Rajasthan.

Materials and Methods

Seven genetically diverse cultivars/genotypes viz. Allahabad Safeda, L-49, Lalit, Shweta, Sarbati, MPUAT Selection 1, and red fleshed were evaluated with respect to growth, yield and quality traits of fruit at the ICAR-Central Arid Zone Research Institute Jodhpur Rajasthan. Air layered plants introduced in 2012 from Maharana Pratap University of Agriculture and Technology Udaipur and planted at spacing of 5 m x 5 m in randomized block design, replicated thrice with two plants in each replication. Crop was regulated for *Mrig bahar* i.e. flowering in June-July and fruiting from November till February. Three uniform trees of each cultivars were selected from established orchard of guava for recording observations on growth in terms of plant height (m), stem diameter (cm) and mean plant spread (m). Average fruit weight (g) was calculated

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Table 1. Tree growth and yield of guava varieties/genotypes (3rd year of planting)

Hybrids/cultivars	Plant height (m)	Stem diameter (cm)	Plant spread (m)		Shoot length (cm)	Shoot dia. (mm)	Yield (kg tree ⁻¹)
			E x W	N x S			
Allahabad Safeda	2.02	5.35	3.40	3.50	91.70	10.40	10.20
L-49	2.10	5.34	3.08	2.87	80.30	9.30	8.60
Lalit	2.02	5.49	3.00	3.05	60.50	9.60	4.60
MPUAT Sel. 1	1.77	4.15	3.02	2.77	76.40	8.90	3.50
Sarbati	2.00	5.90	3.03	2.82	68.20	11.20	2.20
Red Fleshed	2.10	5.82	2.65	2.77	72.50	8.60	5.40
Shweta	1.38	4.81	1.98	2.47	63.80	9.50	2.90
Mean	1.91	5.26	2.88	2.89	73.34	9.64	5.34
CD (P = 0.05)	0.42	1.38	0.43	0.40	14.60	NS	1.20

by weighing the fruits in an electronic balance. The yield (kg tree⁻¹) was obtained through the number of fruits retained by the tree and the average fruit weight. The fruit length (mm) and fruit diameter (mm) were measured through a vernier calliper. The total soluble solids (TSS) were determined with Erma Hand Refractometer (0-32°Brix). The tritatable acidity (%) and ascorbic acid content were determined by method of AOAC (1980). The pectin content (%) and total sugar content (%) were estimated by the standard method described by Rangana (1994). The average data were subjected to statistical analysis as per the method outlined by Gomez and Gomez (1984). Least significant difference at 5% level was used for testing the significant differences.

Results and Discussion

There were wide variations among different guava varieties with respect to plant height,

stem diameter, plant spread, shoot length and diameter and yield per tree. (Table 1). Plant height ranged from 2.1 m in Red Fleshed and L-49 to 1.38 m in Shweta whereas, stem diameter was observed maximum in 'Sarbati' (5.90 cm). Further 'Allahabad Safeda' registered maximum (3.4 x 3.5 m) plant spread as East-West x North-South, shoot length (91.7 cm) and shoot diameter (10.4 mm), closely followed by 'Lalit' and L-49 (Table 1). The yield per tree varied significantly among the varieties ranging from 2.2 kg to 10.2 kg. Though the overall productivity of all the varieties are low since this was the first fruiting season, even though the highest productivity was recorded by Allahabad Safeda (10.2 kg tree⁻¹) which was followed by L-49 (8.6 kg tree⁻¹). Varietal character of genetic makeup of the plants or adaptability of varieties under different climatic conditions could be the possible reason for the wide variation with respect to growth and

Table 2. Performance evaluation of guava varieties/genotypes for quality related traits

Name of variety	Ripe rind color	Skin Surface	Flesh color	Seediness	No. of seed/ 100 g fruit	Seed texture
Allahabad Safeda	Greenish yellow	Smooth	White	Medium	176	Medium
L-49	Greenish yellow	Rough	White	High	163	Medium
Lalit	Saffron yellow with red blush	Rough	Pink	Medium	190	Soft
MPUAT Sel. 1	Red with yellow patch	Rough	White	Medium	168	Hard
Sarbati	Green	Rough	White	High	194	Hard
Red Fleshed	Green	Smooth	Red	Medium	152	Medium
Shweta	Creamy white	Smooth	White	Medium	128	Soft
Mean					168	
CD (P=0.05)					28.4	

Table 3. Physico-chemical characteristics of guava varieties/genotypes (3rd year of planting)

Varieties	Fruit weight (g)	Fruit length (cm)	Fruit breadth (cm)	Pulp thickness (mm)	TSS (°Brix)	Acidity (%)	Total sugars (%)
Allahabad Safeda	130.0	7.06	6.34	15.70	17.5	0.51	8.32
L-49	142.0	6.40	6.32	14.10	17.0	0.59	8.19
Lalit	90.0	5.50	5.56	12.40	18.5	0.69	8.30
MPUAT Sel. 1	87.2	5.26	5.43	11.10	20.4	0.52	7.26
Sarbati	152.0	7.21	7.04	13.80	18.0	0.53	6.79
Red Fleshed	99.7	6.51	5.37	14.00	16.5	0.49	10.16
Shweta	150.0	6.87	6.31	10.62	19.5	0.61	7.84
Mean	121.6	6.40	6.05	13.10	18.2	0.56	8.12
CD (P=0.05)	12.3	0.17	0.13	2.20	1.9	0.14	0.54

yield. The results of present findings are in agreement with Patel *et al.* (2011), Singh *et al.* (2013), Babu *et al.* (2007).

The quality characters (Table 2) revealed that the ripe rind colour change from green to greenish yellow in Allahabad Safeda and L-49, and creamy white in Shweta whereas, MPUAT Sel1 had red skin with yellow patch and Saffron yellow with red blush in Lalit. Sarbati and Red Fleshed had green rind even at ripening. Fruits of Allahabad Safeda, Red Fleshed and Shweta had smooth skin whereas remaining had rough surface. Flesh color was pink in Lalit, red in Red Fleshed whereas others were white fleshed. Number and texture of seed is an important character which substantiate the quality of guava fruit from consumer's point of view. The number of seeds/cut surface was lowest in Allahabad Safeda followed by

MPUAT Sel. 1. Based on the texture of seed, the varieties were grouped into soft, medium and hard textured. Lalit and Shweta were found to have soft textured seeds despite relatively high seediness. Comparatively less seeded variety MPUAT Sel. 1 had hard textured seed while others were categorized as medium textured seeds.

The different cultivars studied showed significant variation in their fruit weight, fruit size, pulp thickness and biochemical characteristics (Table 3). The maximum fruit weight was obtained in Sarbati (152 g) closely followed by Shweta (150 g) and L-49 (142 g) whereas, the minimum fruit weight was registered in MPUAT Sel 1 (87.2 g). Fruit length varied from 5.26 cm in MPUAT Sel 1 to 7.21 cm in Sarbati while fruit breadth was found maximum in Sarbati (7.04 cm) and minimum in

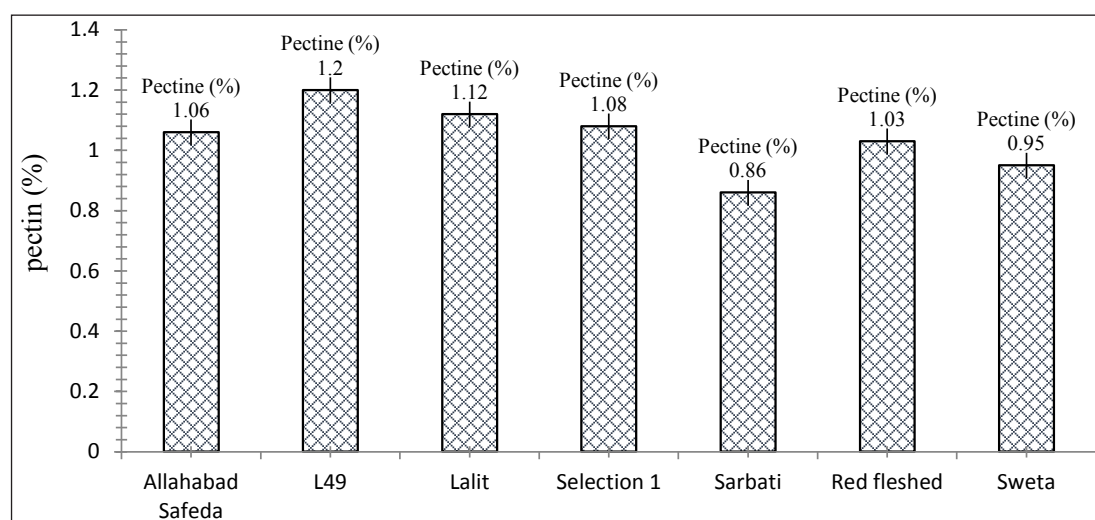


Fig. 1. Pectin content (%) in different guava varieties/genotypes.

Red Fleshed (5.37 cm) similarly pulp thickness was highest in Allahabad Safeda, L-49 and Red Fleshed.

There was a significant difference among the varieties with respect to biochemical characteristics of guava fruits (Table 3). Total soluble solids (TSS) was found to vary from 16.5 to 20.4°B with highest (20.4°B) in MPUAT Sel 1 followed by Shweta (19.5°B) and Lalit (18.5°B). Higher TSS content under mid arid conditions in these cultivars may be due to dry climate, the favorable temperature and humidity during the fruit growth period especially during night which might have influenced the retention of higher TSS in the ripe fruits. The titrable acidity was found to be in range from 0.49% in Red Fleshed to 0.69% in Lalit. An appreciable difference in the total sugars have been recorded which ranged from 6.79% in Sarbati to 10.16% in Red Fleshed.

Guava is one of the best natural sources of food grade pectin, which finds uses in various food product formulations as a thickening and gelling agent. The pectin content differed significantly among the varieties studied and ranged from 0.86% to 1.2% (Fig. 1). L-49 was on top of the list for pectin content (1.2%) closely followed by Lalit (1.12%). These variations may be due to the genetic make up of the cultivars and adaptation to climatic conditions.

In the present investigation, it was observed that physico-chemical characteristics of fruits differed due to genetic makeup and varied soil climatic condition which was also reported by Aulakh (2005), Babu *et al.* (2007), Singh (2003), Patel *et al.* (2007).

Based on the foregoing results, varieties emerging as the best in terms of yield is Allahabad Safeda followed by L-49 and in terms of quality traits viz. pulp content, color, TSS and pectin is Allahabad Safeda, Lalit, MPUAT Sel 1 and L-49, respectively. The above findings are preliminary and shall be confirmed in coming years.

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