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Studies of different guava cultivars (*Psidium guajava* L.) for nutritional and livelihood security suited to degraded soils

■ RASHMI SHUKLA AND Y. K. SHUKLA¹

Members of the Research Forum

Associated Authors:

¹Krishi Vigyan Kendra, KHANDWA
(M.P.) INDIA

ABSTRACT : Guava trees are well adapted to a wide range of soil types including sands, loams, rock-based soils, muck degraded soils. A soil pH of 4.5 to 7 is ideal but plants do well in high pH soils (7-8.5) if supplied with chelated iron materials. Guava trees produced by air-layering or cuttings generally have a shallow root system with most roots within 12 to 18 inches (30-45 cm) of the soil surface. Three varieties, viz., Lucknow -49, Allahabad safeda and Apple guava are of immense commercial importance but the physico-chemical studies of these varieties have not been taken up by any previous workers who have described various guava varieties. The present studies, therefore, provides a details information on physico-chemical characteristics of the varieties collected from the guava orchards of the fruits Research farm, Imalia, JNKVV, Jabalpur (M.P.). An investigation was carried out to evaluate the physical character *i.e.* weight, size length, diameter and specific gravity. Guava variety Allahabad safeda was found to top the list in relation to all the parameters and observed maximum values and proved significantly superior over both the varieties Lucknow-49 and Apple guava, respectively. Chemical composition of the fruits of Lucknow-49 showed superior with respect to pH, acidity, ascorbic acid, pectin, fibre, total soluble solid, total sugar, reducing and non-reducing sugars compared to Allahabad safeda and Apple guava. The above findings clearly indicate that the variety Lucknow-49 is to be the best variety with respect quality constituents required for making various guava processed products for nutritional and livelihood security.

KEY WORDS : Processed products, Physical parameter, Chemical composition, Reducing sugar, Non-reducing sugar

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Author for correspondence :

RASHMI SHUKLA

Krishi Vigyan Kendra, KHANDWA
(M.P.) INDIA

Email : rashmishukla_khw@
rediffmail.com

Guava (*Psidium guajava* L.) is a most important fruit of the world. It has been cultivated in India, since early 17th century and gradually became a crop of commercial significance. In terms of area and production, it is the fourth most important fruit crop of India after mango, banana and citrus. At present, it occupies nearly 1.12 lakh hectare of land with production of 12.04 lakh tons and productivity 10.77 tons fruits/

hectare/year in India (DAC, 2007). Guava is grown practically in all the states of the country and excels to most other fruit crops in productivity, hardness and adoptability. In India, guavas are grown in Uttar Pradesh, Bihar, Madhya Pradesh and Maharashtra in large scale. In Madhya Pradesh, guava occupies about 6921 hectares area with the production of 138420 tons of guava fruit per year (Horticulture Statistics of M.P. 1998-99).

Guava is the poor man's fruit or apple of tropics. The guava tree is a medium sized shrub about 9 meters high. This tree yields a very good crop with little attention. It has profuse bearing of fruits every year and fetched handsome returns without use of much input. In Madhya Pradesh guava is harvested in two crop seasons one in rainy season and other in winter season. The fresh guava fruits are available in the market through out the year. The qualities of winter season fruit crops are better than that of rainy season fruits. The mature fruits of winter season crop can be stored upto 6 to 9 days under ambient conditions, while those of rainy season could be stored upto 2 to 4 days depending upon the variety. The guava varieties which are mainly grown in central India are Allahabad Safeda, Lucknow-49 and Apple guava. These varieties have immense commercial importance due to yellowish white colour, sweet taste with mild flavour pulp quality. The present studies highlight the suitabilities of different guava cultivars in relation to their physico-chemical properties for making processed products.

RESEARCH METHODS

Fresh and ripened fruits of guava cultivars *viz.*, Lucknow-49, Allahabad safeda and Apple guava were collected from the guava orchards of Fruit Research Farm, Imalia, J.N. Krishi Vishwa Vidyalaya, Jabalpur (M.P.) for present investigation. Three treatments were replicated five times in order to minimize the error. Data in relation to the characteristics of guava fruits were analyzed statistically as per procedure of simple Randomized Block Design.

The specific gravity of guava fruits was measured by following the water displacement method as described by Dhillon *et al.* (1987). The average length and diameter of five fruits was measured with the help of Vernier's calipers. The length of fruits was measured from the tip to bottom of fruits, while measured nearly at the middle of fruits. The average weight of fruits of each variety was recorded using electronic balance.

The pH of the guava fruit was determined by using

pH meter (Elico, India). The pH meter was standardization using 7 and 9 pH buffer solution before use. Titrable acidity content in guava fruit and cheese were determined by simple acid-alkaline titration method as described in AOAC (1992). Total soluble solids in fruit pulp and guava cheese were determined using hand refractometer (0-32° Brix Erma make) as described by Rangana (1997). Content in pectin fruit was estimated according to the procedure as described by Rangana (1997). The crude fibre content in guava fruit and cheese was determined by AOAC (1992) procedure, described as under : Ascorbic acid in guava fruit and cheese was estimated according to procedure as describe by Rangana (1997). The reducing and non-reducing sugars in the sample were determined by using Hane's ferricyanide method as described by according to lane and Eynon (1923).

RESEARCH FINDINGS AND DISCUSSION

The findings of the present study as well as relevant discussion have been presented under following heads :

Physical properties of guava fruits :

The physical properties *viz.*, fruit weight, fruit length, diameter and specific gravity of guava cheese were recorded before processing. The results reveal that guava varieties have significant difference with respect to physical characters *i.e.* weight, size and specific gravity (Table 1). The variety Allahabad safeda exhibited maximum values of weight (220.0 g), length (7.17 cm), diameter (7.16 cm) and specific gravity (1.23%) were recorded and proved significantly superior over both the varieties Lucknow-49 and Apple guava, respectively. However, both the varieties, Lucknow-49 and Apple guava were found to be statistically at par to each other in all the physical parameters.

The result shows that the Allahabad safeda variety recorded the maximum length and diameter as compared to Lucknow-49 and Apple guava. The variation in fruit size of varieties is mainly due to the genetic

Table 1 : Physical properties of guava fruits

Varieties	Weight (g)	Length (cm)	Diameter (cm)	Specific gravity (%)
Lucknow-49	146.50	6.05	7.01	1.03
Allahabad safeda	220.00	7.17	7.16	1.23
Apple guava	138.90	6.06	6.63	1.00
S.E.±	21.90	0.18	0.16	0.03
C.D. (P=0.05)	66.20	0.55	0.51	0.10

characteristics of the variety.

The present findings are supported with the findings of Singh (1988) and Baramanray (1992) who reported that the variation in size of fruit may be due to the number and size of seeds exit in the fruit. More number and size of seeds ultimately increase the fruit size. The study of Nagtode (2007) also reveals that number and size of fruits are closely correlated and depends upon the source and sinks levels on ship of plants. Similarity, the fruits of Allahabad safeda possessed the maximum weight and specific gravity (220g and 1.23%) followed by Lucknow-49 (146.5g and 1.03%) and Apple guava (138.9g and 1.00%). The above findings are in close according with the findings of Mehato (2006) who observed 1.19 per cent specific gravity of Lucknow-49 guava fruits at ripening stage.

Dubey *et al.* (2009) also reported that the Allahabad safeda possessed the higher fruit weight, ranging from 205 to 215 g as compared to other varieties. Kalloo *et al.* (2005) also emphasize the importance of Allahabad safeda and Lucknow-49 with respect to fruits size and yield.

Chemical composition of guava fruits :

The guava varieties used for preparation of cheese were evaluated for ascorbic acid, pectin, fibre, acidity and pH. Analysis of data reveals that acidity of the fruit was found to be varied significantly with respect to varietie (Table 2). However, pH did not effect significantly. The maximum per cent of acidity (0.43%) was recorded in variety Lucknow-49 closely followed by Allahabad safeda.

Value of pH of the guava fruit observed to be 4.23, 4.16 and 4.13 for the Lucknow-49; Allahabad safeda and Apple guava cultivars, respectively, which shows non significant difference for each other.

The different varieties of guava chemically analyzed for ascorbic acid, pectin and fibre content before the preparation of cheese indicates that the statistical analysis

showed significant difference within the varieties for all the constituents under studies.

The ascorbic acid content ranged from 236.32 – 246.51 mg/100 g. The maximum ascorbic acid content was observed in Lucknow-49 (246.51 mg/100 g) followed by Allahabad safeda (244.87 mg/100 g) and both were significantly higher over Apple guava but found statistically at par to each other. The pectin content was observed in the range of 1.08-1.23 per cent for different varieties. Maximum pectin content of 1.23 per cent was observed for variety Lucknow-49 followed by Allahabad safeda (1.18%) and both were found significantly superior over to Apple guava but statistically at par with each other.

The fibre content, varied from 4.22-4.90 per cent under different varieties of guava. Maximum fibre content was observed with Variety Lucknow-49 (4.90%) followed by Apple guava (4.84%) and proved significantly superior over Allahabad safeda. These findings are in close conformity with the findings of Khattak *et al.* (1990) and Kalloo *et al.* (2005).

The findings of total soluble solids, reducing, non reducing and total sugar are presented in Table 2. Statistical analysis of variance showed significant difference amongst the varieties for total soluble solids, reducing sugar, non- reducing sugar and total sugar content of guava fruit.

Total soluble solids recorded in the range of 12.76 – 13.32 per cent for different varieties of guava. Maximum value was observed for Lucknow-49 (13.32%) which was significantly higher over to Apple guava (12.76%) but statistically at par with Allahabad safeda (13.04%).

Reducing sugar, non-reducing sugar and total sugar were observed in the range of 4.00-4.30, 3.07-3.50 and 7.70-8.22 per cent, respectively for different varieties of guava. The variety Lucknow-49 recorded the maximum content of non-reducing and total sugar and proved significantly superior over Apple guava but

Varieties	Acidity (%)	pH	Ascorbic acid (mg/100 g)	Pectin (%)	Fibre (%)	TSS (%)	Reducing sugar (%)	Non reducing sugar (%)	Total sugar (%)
Lucknow-49	0.31	4.23	246.51	1.23	4.90	13.32	4.30	3.50	8.22
Allahabad safeda	0.36	4.16	244.87	1.18	4.22	13.04	4.11	3.27	8.05
Apple guava	0.43	4.13	236.32	1.08	4.84	12.76	4.00	3.07	7.70
S.E. _±	0.03	0.08	2.57	0.02	0.15	0.15	0.15	0.13	0.13
C.D. (P=0.05)	0.09	NS	7.92	0.07	0.33	0.42	NS	0.40	0.39

NS= Non-significant

statistically at par to Allahabad safeda. The above finding shows that the variety Lucknow-49 is the best with respect to quality constituents required for making cheese.

The chemical composition of the fruits of different varieties showed significant variations the varieties. The fruits of Lucknow-49 showed superiority with respect to pH, ascorbic acid, pectin, fibre, total soluble solid, total sugar, reducing sugar and non-reducing sugar as compared to Allahabad safeda and Apple guava.

The variation in the chemical constituents among the varieties may be due to the variation in the heredity characters as well as the agro climatic situations like temperature, humidity, soil type, supply of nutrients and water, at growth and development of fruits. Similar results have also been reported by Chatterjee *et al.* (1992). They reported higher percentage of total soluble solid (8.45 %) and acidity (0.52 %) in Lucknow- 49 as compared to red flashed cultivars. Whereas, findings reported by Kurmi (1992) differ from the present result that the Allahabad safeda was excellent in quality rating as it contains 13.33 per cent total soluble solids and 258.8 mg/100 g ascorbic acid. Among these varieties fruits of possessed the significantly higher content of total sugar, reducing and non-reducing sugar over Apple guava but at par to Allahabad safeda. The above findings are in the support of the findings of Pandey *et al.* (1997) who stated that the size and weight of different varieties were positively associated with each other for total soluble solids, reducing, non-reducing and total sugars.

The findings of Agrawal *et al.* (2002) clearly indicated that the varieties are quite different in chemical composition and fruits contents of total soluble solids and ascorbic acid changed with the change of climatic conditions and stage of fruit picking. The fruits of variety Lucknow - 49 and Allahabad safeda were found to be statistically at par to each other in term of ascorbic acid content whereas Lucknow 49 proved to be superior over Allahabad safeda and Apple guava with respect to pectin and fibre.

Conclusion :

Different guava varieties were significantly different with respect to physical characters *i.e.* weight, size and specific gravity. Variety Allahabad safeda top the list in all the parameters and observed maximum values of fruit weight (220.0g), length 17cm), fruit diameter (7.16 cm) and specific gravity (1.23%) were recorded and proved

significantly superior over both the varieties Lucknow-49 and Apple guava, respectively

Chemical composition of the fruits of different varieties showed significant variations among them for various fruits. The fruits of Lucknow-49 showed superior with respect to pH, acidity, ascorbic acid, pectin, fibre, total soluble solid, total sugar, reducing sugar and non-reducing sugar as compared to Allahabad safeda and Apple guava. The above findings showed that the variety Lucknow-49 is to be the best among the varieties with respect quality constituents required for making various processed products.

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