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Studies on physical, chemical and mineral evaluation of guava (*Psidium Guajava* L.)

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Abstract
In this present investigation, study was carried out to determine physical and chemical composition of guava (*Psidium Guajava* L.). The fresh and ripe guavas were selected for evaluation of physical, chemical and mineral composition. Results obtained showed that color of guava was yellowish white or green, length was 8.53cm, diameter was 6.76 cm and weight was observed to be 166.43 g. Further chemical and mineral composition was reported and results showed that moisture content found to be 84.61 %, carbohydrate 12.16%, protein 2.3%, Fat 0.7 % and ascorbic acid content found to be 241.86 mg/100g. The other parameters such as acidity and pH of guava juice were indicated 0.35% and 3.9 respectively. The mineral composition of guava showed calcium 17.63mg, iron 0.24 mg and zinc 0.21 mg/100g respectively.

Keywords: Physical properties, guava, proximate composition, minerals

Introduction

Guava (*Psidium guajava* L.) is the most important fruit in 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)[4]. 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 commonly known for its food and nutritional values throughout the world. The medicinal properties of guava fruit, leaf and other parts of the plant are also well known in traditional system of medicine. Since, each part of guava tree possesses economic value; it is grown on commercial scale. Guava plant is considerable process has been achieved regarding the biological activity and medicinal application of guava and the fruit considered as" poor man apple of tropics". The guava plant parts are used for the development of various industrial and pharmaceutical products (Baby and Priya, 2011)

Guava (*Psidium guajava*) is a fruit that grows wild or in commercial groves throughout the tropics and subtropics. The variety of fruit dictates its shape (round, oval, or pearshaped), diameter (approximately 1–4 inches), and color (pink, white, yellow, salmon, or deep red color). Guava fruit, again depending on the variety, can be consumed fresh or more commonly processed as an ingredient in juice, jams, jellies, beverages, ice cream, or syrup. Nutritionally, guava fruit yields 68 calories per 100 grams, is a good source of fiber, and contains four times the vitamin C content of oranges. Most of the vitamin C is found in the fruit's skin that is usually not peeled before consumption (Mercadante *et al.*, 1999) [7].

Harvesting of guava is done from mid October to the end of January. Guava is a seasonal fruit and is highly perishable. It is normally consumed fresh as dessert fruit that is pleasantly sweet and refreshing in flavour. Short storage life (6-8 days) limits strategic selling of fresh guava fruit. Under these conditions guava growers fail to get attractive returns and nearly 2025% of produce goes as ravage (Nidhi and Prasad 2006) [8]. Various processed products are made from guava viz. jam, jelly, cheese, canned fruit segments, Ready to serve drink, nectar, squash, dried powder, ice cream, highly concentrated puree, candy, toffees, syrup, juice and concentrate (Jain and Asati, 2004) [6].

Guava is rich in tannins, phenols, triterpenes, flavonoids, essential oils, saponins, carotenoids, lectins, vitamins, fiber and fatty acids. Guava fruit is higher in vitamin C than citrus (80 mg of vitamin C in 100 g of fruit) and contains appreciable amounts of vitamin A as well. Guava fruits are also a good source of pectin - a dietary fiber. *Psidium guajava* or guava is very rich in antioxidants and vitamins and also high in lutein, zeaxanthine and lycopene (Tee *et al.*, 1997; Hobert and Tietze, 1998) [12, 5]. The flavonoids have demonstrated antibacterial activity. Quercetin is thought to contribute to the anti-diarrhea effect of guava; it is able to relax intestinal smooth muscle and inhibit bowel contractions.

Materials and Methods

The present investigation was carried out in Department of Food Engineering with collaboration of Department of Food Process Technology and Department of Food Chemistry and Nutrition, College of Food Technology, VNMKV, Parbhani during year 2018-19.

Materials

Raw materials fresh and ripe Guavas were obtained from local village market, Parbhani. The experiments were generally performed immediately after procurement.

Chemicals and glasswares

The chemicals of analytical grade and glasswares required during investigation were used in the department of Food Engineering.

Methods

Physico-chemical properties

Physical properties such asTSS, titrable acidity, pH, proximate analysis.

pH

The pH of guava was determined using digital pH meter. Twenty (20ml) of the juice was transferred into a beaker and the pH was determined after the meter was calibrated using standard buffer of pH 4.0 and 7.0, sufficient time was allowed for stabilization before readings were taken.

Total soluble solid (TSS)

The TSS content of juice was determined with the help of Erma hand refractometer of 0-32 range in duplicate (A.O.A.C., 2005) [2]. The sugar content percentage (soluble sugar) was read from the scale of the refractometer when held close to the eye.

Titratable acidity

The titratable acidity was determined by the procedure as reported by Ranganna (1986) [9].

Ascorbic acid

Ascorbic acid content will be determined as per AOAC (2004) [1] using dichlorophenol Indophenol dye.

Proximate composition of Guava

Proximate Analysis

Different chemical properties of samples were analysed for moisture content, ash, fat, protein and total carbohydrate. All the determinations were done in triplicate and the results were expressed as the average value.

Moisture content

Moisture content was determined adopting AOAC (2005) [2] method as following:

$$\% \text{ Moisture content} = \frac{\text{Loss in weight}}{\text{Weight of sample}} \times 100$$

Fat

AOAC (2005) [2] method using Soxhlet apparatus was used to determined crude fat content of the sample. The percent of crude fat was expressed as follows:

$$\% \text{ Crude Fat} = \frac{\text{Weight of dried ether soluble material}}{\text{Weight of sample}} \times 100$$

Protein

Protein content was determined using AOAC (2005) [2] method. Percentage of nitrogen and protein calculated by the following equation:

$$\% \text{ Nitrogen} = \frac{\text{TS - TB} \times \text{Normality of acid} \times 0.014}{\text{Weight of sample}} \times 100$$

Where, Ts = Titre volume of the sample (ml), TB = Titre volume of Blank (ml), 0.014= M eq. wt. of N_2.

% Protein = Nitrogen × 6.25

Total carbohydrate

Total carbohydrate content of the samples was determined as total carbohydrate by difference that is by subtracting the measured protein, fat, ash and moisture from 100 phenol sulphuric acid method as given by AOAC (2005) [2].

Ash

Drying the sample at 100 ^{0}C and charned over an electric heater. It was then ash in muffle furnace at 550 ^{0}C for 5 hrs. By AOAC (2005) [2]. It was calculated using the following formula:

$$\% \text{ Ash content} = \frac{AW}{IW} \times 100$$

Where, AW = Weight of Ash and IW= Initial weight of dry matter

Results and Discussion

Physical properties

The data pertaining to various physical properties like weight, length, colour, diameter, shape, specific gravity were determined and the average values are presented in table 1.

Table 1: Physical properties of Guava

Physical parameter	Average values
Weight	166.43 g
Length	8.53 cm
Diameter	6.76 cm
Shape	Oval and rounded
Colour	Yellowish white, green
Specific gravity	1.04 %

*Each value is average of three determinations

The physical properties of Guava were measured and results reported that weight was found to be 166.43 (g), length 8.53 cm, diameter 6.76 cm, specific gravity 1.04 % rounded and oval in shape and yellowish white and green in colour.

Chemical properties and mineral composition of Guava

The data pertaining to various chemical and mineral composition such as moisture, fat, carbohydrates, protein, ash and crude fibre were determined and results obtained are illustrated in Table. 2 and Table. 3

Table 2: Proximate composition of Guava

Nutrients	Average value
Moisture	84.61 %
Protein	2.3 ± 0.23 %
Fat	0.7 ± 0.11 %
Carbohydrate	12.16 ± 0.21 %
Crude fibre	4.8 ± 0.03 %
Ash	0.56 ± 0.13%

Results given in the table. 2 indicated that the moisture content was 84.61%, fat 0.7 %, protein 2.3 %, carbohydrates 12.16 %, crude fiber 4.8 %, and ash 0.56 %. The results found to be similar with Sato *et al.*, (2010) [11].

Table 3: Mineral composition of Guava

Minerals	Average value mg/100g
Calcium	17.63
Iron	0.24
zinc	0.21

The mineral composition of Guava were analyzed and results revealed that calcium was 17.63, iron was 0.24, zinc 0.21, (mg/100gm) respectively. Results reported are in close agreement with the data reported by Sato *et al.*, (2010) [11].

Table 4: Chemical properties of Guava

Chemical parameters	Average value
TSS (^{0}brix)	11.4
Titrable acidity (%)	0.35
pH	3.9
Ascorbic acid (mg/100g)	241.86

The chemical composition of guava were analyzed and results revealed that TSS was 11.4 ^{0}Brix, pH 3.9, acidity was o.35 %. The ascorbic acid content of Guava was observed to be 241.86 mg/100g respectively. The observations are in close accordance with findings reported by Rashmi S. and Shukla Y., (2017) [10].

Conclusion

In the present investigation it could be finally concluded that Guava is a good source of protein i.e. 2.3 %, carbohydrate i.e.12.16% and dietary fiber i.e. 4.8%. Guava is good source of calcium mineral i.e. 17.63 mg/100g. The Guava is excellent source of ascorbic acid i.e. 241.86 mg/100g which makes it potential source for exploration and value addition in food products in combination with various fruits.

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