International Journal of Advanced Science and Research
ISSN: 2455-4227, Impact Factor: RJIF 5.12
www.allsciencejournal.com
Volume 2; Issue 3; May 2017; Page No. 16-21

Biochemical and mineral analysis of the undervalued leaves – *Psidium guajava* L.

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Abstract

There are wide varieties of plants which are naturally available in our environment and its nutritional values are still unknown to us. *Psidium guajava* is one such plant; its nutrient values are still unknown. So the present study deals with the biochemical and nutritive analysis of *Psidium guajava* L. The leaves of *Psidium guajava* were collected from Kannur District, Kerala. The leaves were shade dried and powered. The macronutrients and micronutrients were analysed by following standard methods. Thebiochemical studies reveals that the presence of carbohydrate, protein, starch and amino acid in very less amount. It is also estimated that guava leaves are the good source of vitamins such as Vitamin C and Vitamin B, Minerals such as Calcium, Magnesium, Phosphorus and Iron. The results of comparison between the guava leaf and fruit based on concentration of micronutrients reveals that the leaf has more concentration in Vitamin B, Calcium, Magnesium, Phosphorus and Iron, but the concentration of Vitamin C and Potassium were higher in fruit. Hence the study reveals that *Psidium guajava* leaves rich in nutrients and can be added in our day to day life.

Keywords: *Psidium guajava*, RDA value, Malnutrition, Biochemical analysis

Introduction

Population is a dynamic phenomenon. Any increase or decrease in its size has a major impact on socio economic development of that country. India, with 1.34 billion people, is the second most populous country in the world. Over population leads to global, financial and food crisis and it opens a path tomalnutrition. Malnutrition is the condition that develops when the body does not get the right amount of Vitamins**,** Minerals and other Nutrientsit needs to maintain healthy tissues and organ function. There were 793 million undernourished people in the world in 2015. The growth of global food production has so far been equal to population growth. When the global financial and economic crisis hit, a large number of developing countries were still reeling from the economic and social impacts of the earlier global food crisis. The impact of the food crisis is likely to be much more severe among women and children. In rural areas where access to markets is limited, diets often lack variety and are low in fruits and vegetables. This can put a harness to the malnutrition of our country. There are wide varieties of plants which are naturally available in our environment; various parts of these plants have nutritional values which are still unknown to us. If it consumed properly, malnutrition could be controlled up to an extent. One of such nutritionally fit and commonly available plant is *Psidium guajava* (Guava) belongs to the family Myrtaceae. It is widely used as a folk medicine. So the present study aimed to explore the biochemical, Vitamin and Mineral composition of the undervalued leaf – *Psidium guajava*. L

Materials and Methods

Collection of Plant Materials

The *Psidium guajava* leaves were collected from Alakode (Plate1) Kannur district, Kerala during the month of December. The collected leaves were washed in running tap water and distilled water. The leaves were spread on newspaper to remove the excess water and then shade dried, powdered and stored in air tight container for further analysis.

Fig 1: Study Area

Habit and Dried leaves of *Psidium guajava.* L

Psidium guajava- Habit Dried leaves

Fig 2: Plant Description

Taxonomic Position

Psidium guajava.L (Plate 2) belongs to the family Myrtaceae. The binomial name is *Psidium guajava.* Common names of guava are Yellow Guava, Lemon Guava, Pera (Malayalam), Koyya (Tamil), Gojaba. It is originated from an area thought to extend from Mexico or Central America and was distributed throughout tropical America and Caribbeanregion. Guavas are now cultivated in many tropical and subtropical countries.

Psidium guajava is a large dicotyledonous shrub, or small evergreen tree, generally 3-10 m height and have many branches. Guava leaves contain high levels of Vitamin C, Iron, Calcium, and phosphorous. All parts of *Psidium guajava* have so much nutritional values and it is widely used in folklore medicine.

Biochemical Analysis

The following parameters such as Carbohydrate - Anthrone method, Starch – Anthrone method, Protein - Lowry's method, Amino acid - Ninhydrin method, Vitamins – AACC methods. (1976) [1], Minerals – AOAC method (1975) were analysed in the laboratory.

Review of Literature

Naviton Rogero S Anches *et al.* (2005) [7] evaluated the antibacterial activities of aqueous and ethanol: water extracts from leaves, roots and stem bark of *Psidium guajava*. The aqueous extracts of *Psidium guajava* leaves, roots and stem bark were active against the gram-positive bacteria *Staphylococcus aureus* and *Bacillus subtilis* and virtually inactive against the gram-negative bacteria Escherichia coli and *Pseudomonas aeruginosa*. The ethanol: water extracts showed higher antimicrobial activity as compared to aqueous extracts.

Taura *et al.* (2014) [9] conducted research on Antibacterial activity of *Psidium guajava* in clinical isolates. The leaf extracts were subjected to phytochemical screening in order to detect the presence of secondary metabolites. The extracts were further tested for antibacterial activity against clinical isolates of *Klebsiella pneumonia*, *Escherichia coli*, *Salmonella* sp, *Pseudomonas aeruginosa* and *Staphylococcus aureus.* The results of phytochemical screening indicated the presence of alkaloids, tannins, reducing sugars, saponins and glycosides in all the three extracts. The result of antibacterial activity indicated that only *Salmonella* sp. and *Pseudomonas aeruginosa* were sensitive to all the extracts.

Nisha Kumari *et al.* (2013) [8] reviewed the phytochemical, biochemical, nutritive, and medicinal values of *Psidium guajava* in the topic: *Psidium guajava* A fruit or medicine - An over view.

Anas *et al.* (2008) [2] evaluated the antibacterial activity of aqueous and organic extracts of *Psidium guajava* leaves against multi drug resistant (MDR) clinical isolates of *Straphylococcus aureus* strains collected from hospitals in Northern (Malabar region) Kerala.

Result

Biochemical, vitamins and mineral analysis was done, the values were tabulated and represented in chart and it is compared with RDA value.

The result of biochemical analysis (Table 1, Fig 3) showed the presence of Carbohydrate (7mg/100g), Starch (6.3mg/100g), Protein (16.8mg/100g) Aminoacid (8mg/100g) in least amount. The plant (Table 1 and Fig 4, 5) showed the presence of high concentration of Vitamin C as 103.0mg/100g, Vitamin B as 14.80mg/100g and minerals such as Calcium (1660.0mg/100g), Iron (13.50mg/100g), Magnesium (440.0mg/100g), Potassium (1602.0mg/100g) and Phosphorus (360mg/100g) that are typically hard to obtain from plant food.

When compared with micronutrients present in fruits and leaves (Table 2 Fig 6), the leaves shows high amount of Vitamin B (14.80mg/100g), Calcium (1660.0mg/100g), Iron (13.50mg/100g), Magnesium (440.0mg/100g) and Phosphorus (1602.0mg/100g).

When compared with Recommended Dietary Allowance (Table 3,4 Fig 7) the plant showed high amount of Vitamin C(103.0mg/100g), Vitamin B (14.80mg/100g), Calcium, (1660.0mg/100g) Iron (13.50mg/100g), Magnesium (440.0mg/100g) and Phosphorus (1602.0mg/100g).

Table 1: Composition of nutrients present in the leaves of *Psidium guajava.* L

S. No	Nutrients	Concentration(mg/100g)
1	Carbohydrate	7
2	Starch	6.3
3	Protein	16.8
4	Amino acid	8
5	Vitamin C	103.0
6	Vitamin B	14.80
7	Calcium	1660.0
8	Iron	13.50
9	Magnesium	440.0
10	Phosphorus	360
11	Potassium	1602

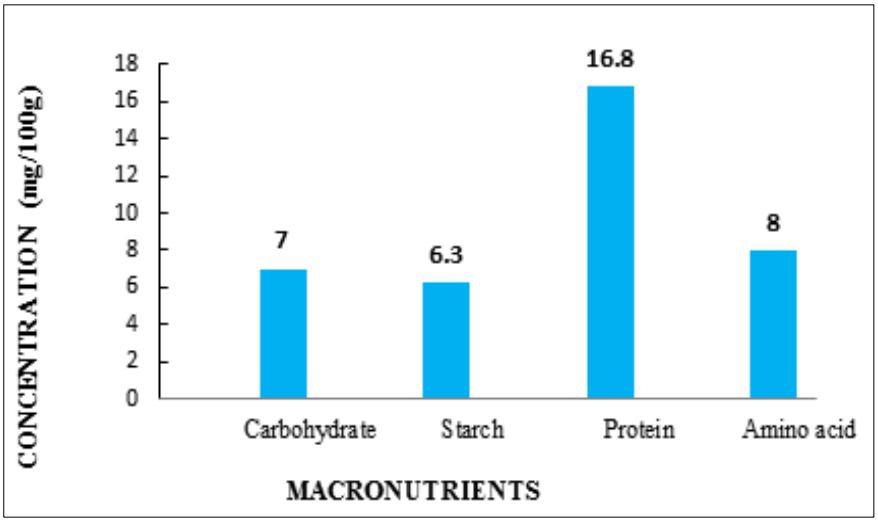

Fig 3: Concentration of macronutrients present in the leaves of *Psidium guajava.* L

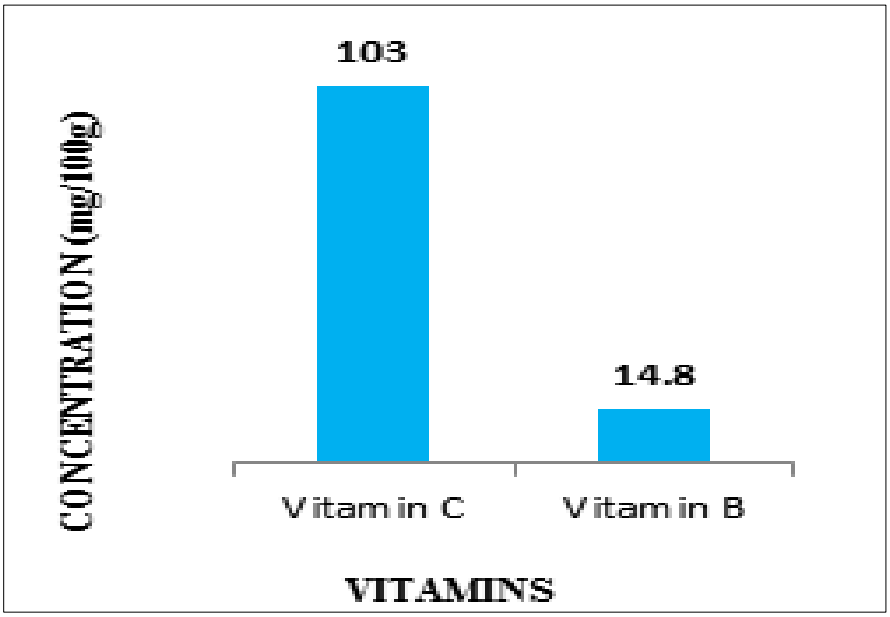

Fig 4: Concentration of vitamins present in the leaves of *Psidium guajava*. L

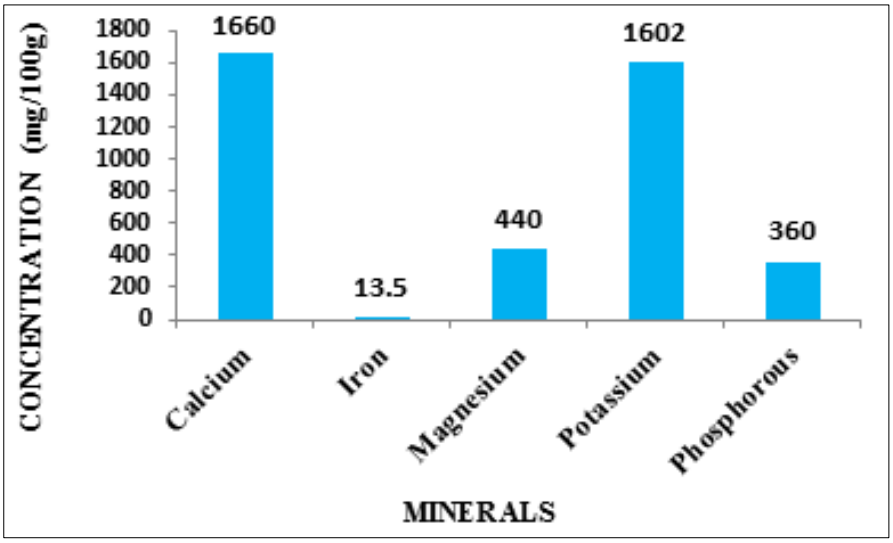

Fig 5: Concentration of minerals present in the leaves of *Psidium guajava.* L

Table 2: Comparison of micronutrients present in leaves and fruits of *Psidium guajava.* L

S. No	Micronutrients	Concentration of micronutrients present in *Psidium guajava* (mg/100g).	
		Leaves	Fruits
1	Vitamin C	103.0	228.3
2	Vitamin B	14.80	0.067
3	Calcium	1660.0	18
4	Iron	13.50	0.26
5	Magnesium	440.0	22
6	Phosphorus	1602.0	40
7	Potassium	360.0	417

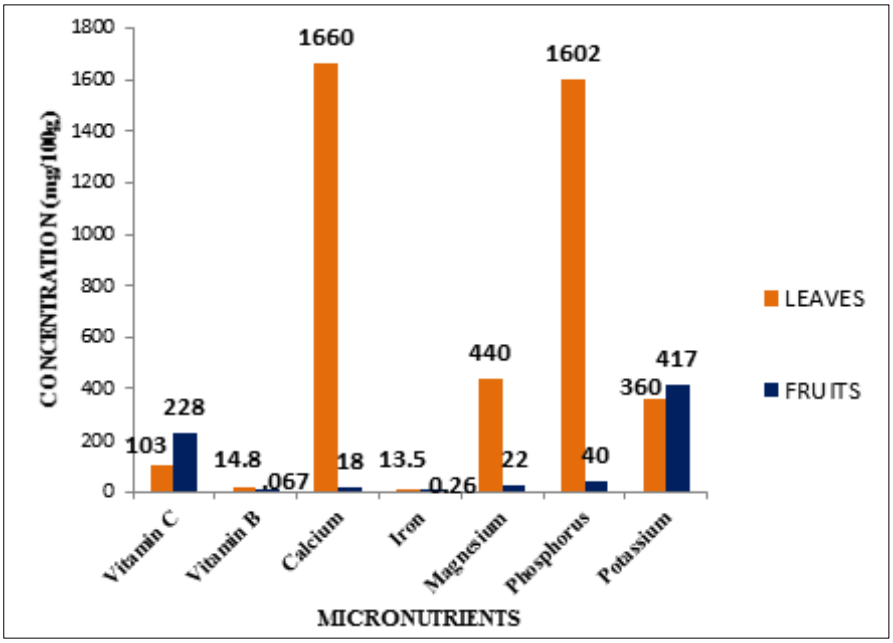

Fig 6: Comparison of the concentration of micronutrients present in the Leaves and fruits of *Psidium guajava.* L

Table 3: Comparison of nutrients present in the leaves of *Psidium guajava* with RDA values.

S. No	Nutrients	Composition of nutrients present in the leaves of *Psidium guajava* (mg/100g)	Recommended Daily Allowances			
			(1-3years) Infants and children	Older children	Adult man and women	Pregnant women and lactating mother
1	Carbohydrate	7	95g	130g	130g	210g
2	Protein	16.8	11.0g	19g	56g	71g
3	Amino acid	8	714mg	214mg	84mg	-
4	Vitamin -C	103.0	15mg	45mg	90mg	115mg
5	Vitamin – B	14.80	0.5mg	0.9mg	1.3mg	1.4mg
6	Calcium	1660.0	500mg	1300mg	1000mg	1000mg
7	Iron	13.50	7mg	8mg	8mg	27mg
8	Magnesium	440.0	80mg	240mg	400mg	360mg
9	Phosphorous	1602.0	460mg	1250mg	700mg	700mg
10	Potassium	360.0	3000mg	4500mg	4700mg	4700mg

Table 4: Suggested nutrients from the leaves of *Psidium guajava.* L

S. No	Nutrients	Concentration (mg/100g)	RDA Values (mg/100mg/Day)
1	Vitamin C	103	90
2	Vitamin B	14.0	1.3
3	Calcium	1660	1000
4	Iron	13.5	8
5	Magnesium	440	400
6	Phosphorus	1602.0	700

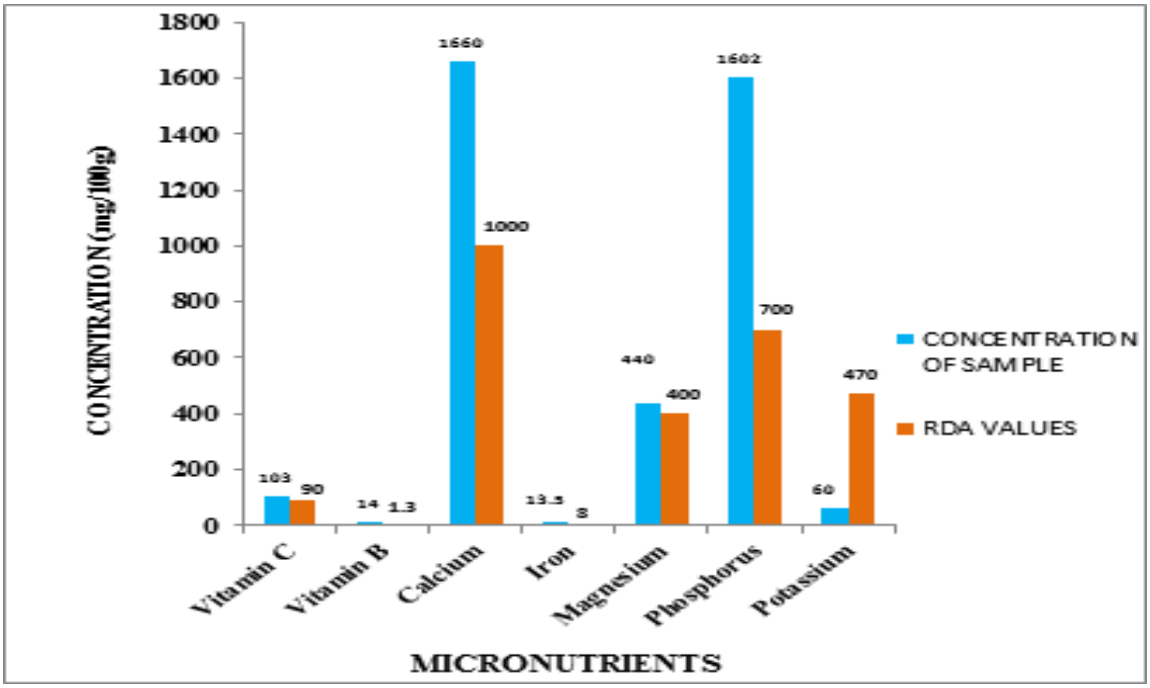

Fig 7: Suggested nutrients from the leaves of *Psidium guajava.* L

Conclusion

Psidium guajava is a tropical and subtropical tree. Its leaves are not commonly taken as food but yet it has a high nutritional profile. The leaves of *Psidium guajava* were collected from Kannur District, Kerala. The leaves were shade dried and powered. The macronutrients and micronutrients were analysed by standard methods. The biochemical studies revels that the concentration of Carbohydrate, Protein, Starch and Amino Acid present in the sample is very less amount than their RDA value. It is also estimated that guava leaves are the good source of vitamins such as Vitamin C and Vitamin B, Minerals such as Calcium, Magnesium, Phosphorus and Iron. The results of comparison between the guava leaf and guava fruit based on concentration of micronutrients reveals that, the leaves has more concentration in Vitamin B, Calcium, Magnesium, Phosphorus and Iron. But the concentration of Vitamin C and Potassium were higher in fruit. So we can conclude the leaves are rich in nutrients than fruit. The intake of guava can help to decrease blood pressure and blood lipid. This is due to its high Vitamin C and soluble fibre content. Due to high Vitamin C content, guava leaves plays an important role in improving our immunity and keeps the small blood vessels healthy. Guava leaves contain Vitamin B complex which helps in improving blood circulation to the brain, stimulating cognitive function and relaxing the nerve. Due to the high concentration of calcium and phosphorus, guava leaves can consume against diseases such as osteoporosis, hypocalcemia, hypophosphatemia etc.

Nowadays guava leaves widely used in hair growth. It is rich in vitamin B and C which nourish the follicles and aid hair growth. The vitamin C helps to boost collagen activity. Thus helps hair grow out faster and healthier. This study shows that guava leaves are rich in iron content. The decoction of iron content in these leaves is very helpful in relieving cough and cold as it helps get rid of mucus. It also disinfects the respiratory tract, throat and lungs. The medicinal properties of guava leaves still remain in the shadows in the eyes of common man. Though it is cheaply and easily available right in our surroundings, we do not make any use out of it. Guava leaves possess nutritional content in high quantities and also there is relevant medicinal properties imparted by it. Out of the several uses of guava leaves, the latest research revealed as guava leaves could be used to control hair fall and it could be used to prepare tea that lower cholesterol levels and diabetics. The merits attributed to guava leaves are so high that it must be made part of our diet.

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