

# Overview on Guava Leaves

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**Abstract:** *The guava (Psidium guajava L.) is a significant tropical fruit found in regions such as India, Indonesia, Pakistan, Bangladesh, and South America. It belongs to the Myrtaceae family. Health benefits of guava plant leaves attributes to a variety of phytochemical they contain such as quercetin, avicularin, apigenin, guaijavarin, kaempferol, hyperin, myrecetin, gallic acid, catechin, epicatechin, chlorogenic acid, epigallocatechin gallate, and caffeic acid. Guava leaves boast a rich content of both organic and inorganic compounds, including various secondary metabolites. Leaves containing compounds mostly serve as effective fungi static or bacteriostatic agents. Guava leaves extracts have undergone scrutiny for their adverse biological activities, encompassing antidiabetic, anticancer, antioxidant, antimicrobial, lipid-lowering, and hepato-protection effects. The extract from guava leaves serves medicinal purposes, addressing conditions like cough, diarrhea, oral ulcers, and swollen gums wounds. Quercetin, identified as the primary antioxidant in guava leaves, is pivotal for its spasmolytic activity. The purpose of the review is to consolidate all the information available on the phytochemical and pharmacological activities and nutritional profile of guava leaves considering the phytochemical profile and positive effects of guava leaves, there is potential for their incorporation on ingredients in the formulation of functional foods and pharmaceuticals.*

**Keywords:** Essential oils, Polysaccharide's, Psidium guajava, Anti-inflammatory, Anti-oxidant, Medicinal.

## I. INTRODUCTION

Plants serve as a primary natural reservoir for numerous bioactive compounds. Throughout ancient times, various plant preparations have been employed in folk medicine to cure several diseases. Currently, industries such as cosmetics, Pharmaceuticals, nutraceuticals are increasingly focusing on both plant preparations and pure phytochemicals.

Leaves as the largest accumulators of bioactive compounds among all plant organs, particularly secondary metabolites, have garnered attention in recent studies. The investigations highlight the phytochemical profiles and biological activities found in leaf extracts from various cultivated plants [1]. Despite being often regarded as agriculture waste, plant leaves emerge as valuable source of high-value nutra-pharmaceutical compounds.

The guava (*Psidium guajava* L.) tree, belongs to the Myrtaceae family, is a distinctive and traditional plant cultivated for its varied medicinal and nutritional benefits. Various parts of the guava tree i.e., roots, leave, bark, stem, and fruits, have been utilized across many countries to treat health issues such as stomachache, diabetes, diarrhea, and other ailments. Guava leaves contain phenolic compound like quercetin and other flavonoids, and ferulic, caffeic, and other Gallic acids which are responsible to provide health benefits related to blood sugar modulation, qualifying them as food for specified health use (FOSHU)[2]. Guava leaves finds a broad application due to their anti plasmodic, cough sedative, anti-inflammatory, anti-diarrheic, antihypertensive, antiobesity, and antidiabetic properties [3].

The aim of this review is to explore the nutritional and bioactive compounds found in leaves. It seeks to unravel the molecular basis underlying their pharmacological and medicinal properties is relation to human health, nutrition, and their roles as a complimentary medicine.



Fig: - 1[4]

## II. MATERIALS AND METHODS

### 2.1 PLANT PROFILE

#### MORPHOLOGY

Guava leaves exhibit an oblong to oval shape, measuring an average of 7-15 cm in length and 3-5 cm in width. Arranged oppositely on the stem, which short petioles connecting them, the leaves emerge from the same point. This deep green leaves have a wide and leathery surface, featuring faint white veins and occasional light brown patches. When crushed, they emit an aromatic scent reminiscent of the guava fruit growing on a small tree with wide spreading branches, the guava leaves complement the tree's copper-colored, flaking bark, revealing a green base.



Fig: - 2

**SYNONYMS:-**

**SCIENTIFIC NAME:-**Psidii guajavae folium

**COOMON NAME:** - Guava, Lemmon guava, Mpera (Kiswahili), Mubera (Kiruyu), Mupeera (Luganda)

**BIOLOGICAL SOURCE:**

**GEOGRAPHICAL SOURCE:** - Guava tree is thought to originate from Mexico, Central America, Caribbean, later expanding to tropical and subtropical areas in the America's, Australia, Asia. Presently, Guava trees are cultivated in various countries including area, Nigeria, the Philippines, Brazil, China and Mexico

**FAMILY:** - Myrtaceae

**CHEMICAL CONSTITUENTS:** Essential oil is present in leaves which contain alpha-pinene, limonene, beta-pinene, isopropyl alcohol, menthol, terpenel acetate, caryophyllene, and longicyclene and beta bisaboline, Olinoleic acid is also found in guava leaves [5]. The leaves have high content of lemonel about 42.1 % caryophyllene about 21.3%. Leaves of the guava have a lot of volatile compounds [6].

**TAXONOMICAL CLASSIFICATION:**



Fig: - 3

- Part used : - leaves
- Kingdom : - Plantae
- Order : - Myrtales
- Family : - Myrtaceae
- Subfamily : - Myrtoideae
- Genus : - Psidium
- Phylum : - Trachrophyta
- Class : - Magnoliopsida
- Species : - Psidium guajava

**MORPHOLOGY:-**

**MACROSCOPY:-**

Macroscopic Characters of Guava leaf

FEATURES	GUAVA LEAVES
COLOR	Dull green
ODOUR	Aromatic
TASTE	Slightly bitter
SHAPE	Ovate

<b>OUTER SURFACE</b>	<b>Smooth</b>
<b>INNER SURFACE</b>	<b>Slightly downy</b>

TABLE: - 1 [7]

**MICROSCOPY:-**

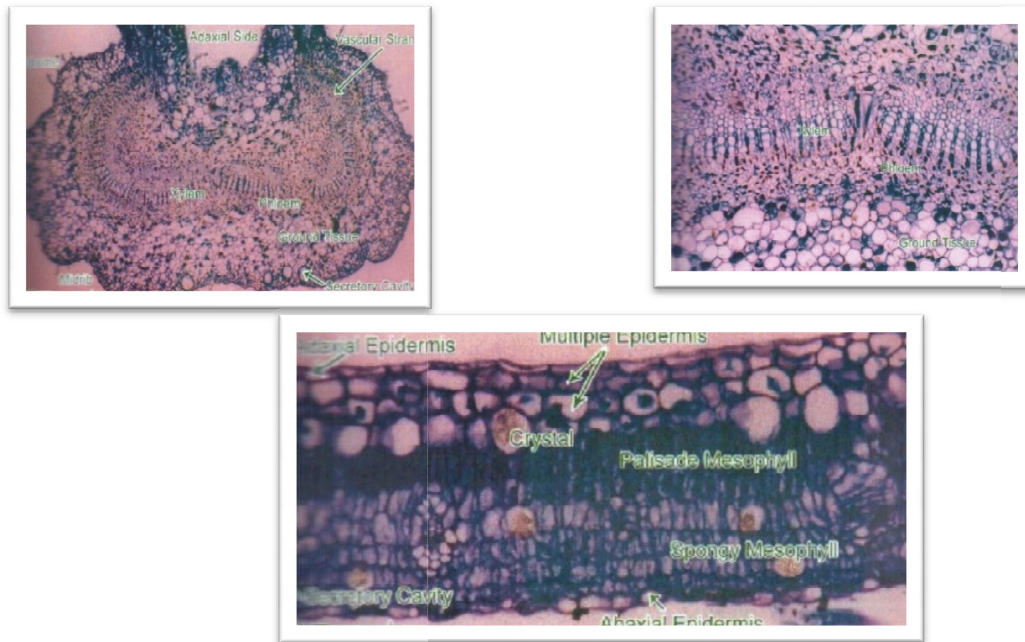


FIG 4:- T.S THROUGH MIDRIB 5:- T.S OF LAMINA [8]

The tissue systems revealed in the transverse sections (T.S) of the leaf through the midrib are as follows:-

Shape: - leaves exhibit a dorsiventral structure with a prominent midrib, measuring 1.4 mm in thickness the adoxial side is broadly concave featuring wavy shallow ridges, ferrous and a lamina oriented vertically.

Vascular bundle: - wide, thin, and deeply bowl shaped

Xylem: - thin walled angular in outline arranged in short parallel lines (1.9mm in the horizontal plane 150 um thick)

Phloem elements: -Occur at the end of the xylem lines, forming small nests.

Lateral vein: - elliptical collateralvesicular bundle with the parenchymatous bundle sheath.

Epidermis: - thickness 230um, smooth and even.

Adaxial epidermis: - the thin with narrow tubular cells.

Sub dermal layer: - dilated, squarish or rectangular cells without tannins, forming a four layered structure.

Calcium oxalate druses: - frequently observe in the dilated cells of the adaxial epidermis

Ground tissue:-

Parenchymatous: - thin walled, less compact and less tanniferous.

Secretory cavities are more frequent in the adaxial part

Mesophyll:-

Palisade zone:-one or two layer, consisting of shirt, cylindrical compact cells.

Spongy parenchyma: - 5 layers of vertically compact cells, displaying a stratified arrangement.

Dilated cells: - contains calcium oxalate druses in both palisade and spongy parenchyma cells.

**POWDER MICROSCOPY:-**

Secretory cavities, parenchymal cells, fragment of palisade mesophyll with the analysis revealed parasitic stomata, calcium oxalate druses, druses, as well as xylem and phloem cells and fibers in the dried leaf powder [9].

**NUTRITIONAL VALUE: -**

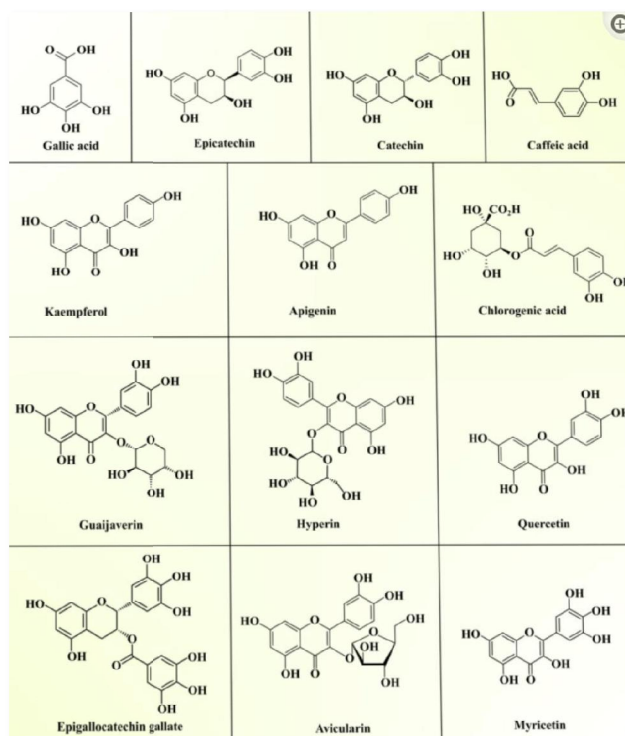
Guava leaves have many anti-inflammatory properties and also contain vitamin C, vitamin antioxidants, and tannins [10].

**Nutritional profile of guava**

COMPOUNDS	COMPOSITION	REFERNCE
<b>ELEMENTS AND ASCORBIC ACID</b>		
Potassium	1.11%	[11]
Phosphorus	0.23%	
Nitrogen	1.02%	
Ascorbic acid	142.55mg/100g	
<b>Carbohydrates/ Phenols/ Sulfates</b>		
Fucose	1.44%	[12]
Rhamnose	3.88%	
Arabinose	22.6%	
Galactose	29.41%	
Glucose	33.79%	
Mannose	0.59%	
Xylose	7.71%	
Phenol	15.28%	
Sulfate	18.58%	
Carbohydrate	48.13%	
Sulfate polysaccharide	66.71%	
<b>Protien</b>		
Association of official analytical chemists (AOAC)method	22.98 + 0.036% [dry weight (DW) basis ]	[13]
AOAC method	9.73%	[14]
Lowery's method	16.8 mg/100g	[15]
Ninhydrin method	8.0 mg/100g	

Table :-2

**PHYTOCHEMISTRY :-**





**PHYTOCHEMICAL PROFILE:-**

**CHEMICAL COMPOSITION:-**

**PROXIMATE COMPOSITION :-**

Guava leaves indeed boast a diverse range of health-promoting nutrients and bioactive compounds, including 82.47%moisture, 3.64%ash, 0.62%fat, 18.53%protien, 12.74% carbohydrate, 103 mg ascorbic acid, and 1717mg gallic acid equivalent total phenolic compounds. These compounds contributes to the potential health benefits associate with the consumption or use of guava leaves [16].

**PROTIENS :-**

Guava leaves contains 9.73% proteins [17]. Amino acids come together and forms a proteins, essential biomolecules crucial for cell structure. Proteins contribute significantly to growth, maintenance, enzyme regulation, cell signaling, and act as biocatalyst [18]. The increasing demand for nutritionally dense food, especially protein, has led to a growing interest in plant based nutrients. There is significant push towards discovering sustainable and nutritionally rich food sources [19]. Thomas et al. [20] highlighted 16.8 mg of proteins and 8 mg of amino acids per 100 mg in guava leaves using lowery's and ninhydrin methods, respectively. Jassal et al. [21] highlighted guava leaves as a promising and sustainable dietary source, citing their richness in proteins, carbohydrates, and dietary fibers.

**III. MINERALS AND VITAMINS**

Rich in minerals like calcium, potassium, sulfur, sodium, iron, boron, magnesium, manganese, as well as vitamin C and vitamin, guava leaves stand out as a valuable option for human nutrition in which high concentration of Mg, S, Na, Mn and B make them an excellent choice not only for human consumption but also as animal feed, helping prevent micronutrient deficiencies [22]. Vitamin C and vitamin B concentrations in guava laves were measured at 103.0 and 14.80mg per 100g DW, respectively. Incorporating calcium and phosphorous rich guava leaves into ones diet lowers the risk of deficiency- related diseases such ashypocalcaemia, and osteoporosis. Guava leaves elevatedvitamin C content contributes to enhanced immune system function and the maintenance of healthy blood vessels. Meanwhile, vitamin B plays a crucial role in improving blood circulation, promoting nerve relaxation and stimulating cognitive function[23].

**ESSENTIAL OIL PROFILE:-**

Guava leaves are a rich source of essential oils

COMPOUNDS	COMPOSITION	REFERENCE
<b>ESSENTIAL OIL COMPONENTS</b>		
<b>Alpha-Pinene</b>	1.53%	[24]
<b>Benz aldehyde</b>	0.83%	
<b>P-cymene</b>	0.52%	
<b>Limonene</b>	54.7%	
<b>1,8-cineolw</b>	32.14%	
<b>Beta-cis-Ocimene</b>	0.28%	
<b>Y-Terpinene</b>	0.38%	
<b>Alpha-Terpinoel</b>	1.79%	
<b>Beta-caryophyllene</b>	2.91%	
<b>Alpha-Humulene</b>	077%	
<b>Total identified constituents</b>	95.85%	
<b>Caryohyllene</b>		[25]
<b>Copaene</b>		
<b>Nerolidol</b>		
<b>Eugenol</b>		
<b>Emetine</b>	-	

Isoeugenol		
Limonene		

Table :- 3

**APPLICATIONS:-**

Guava leaves most commonly used in tea, capsules, pastes, and essential oils. Traditionally, the medicinal benefits of young leaves are preferred, available in various forms at health stores. Specialty tea stores offer dried guava leaves ready for use, where they can be crushed and boiled to prepare medicinal tea.

**PHARMACOLOGY:-**

**ANTIDIABETIC ACTIVITY :-**

Diabetic is a prevent chronic ailment affecting approximately 10% of the global population, involving a metabolic disorder related to blood glucose. It manifests as hyperglycemia, attributed to inadequate insulin secretion in type 1 diabetes or cells inability to respond to insulin in type 2 diabetes [26, 27]. Ethno medicine for managing diabetes commonly involves the extensive utilization of Guava leaves [28]. Guava leaves potential benefits to ethno medicine for diabetes management. Guajaverin has been observed to inhibit the activity of dipeptidyl-peptidase IV, a key enzyme in blood glucose homeostasis [29].

**ANTIOXIDANT ACTIVITY :-**

The antioxidant properties of Guava leaves can be attributed to the presence of various compounds, including gallic acid, pyro-catechol, taxifolin, ellagic acid, ferulic acid, and several others[30]. The protective impact of guava leaves polysaccharide against hydrogen-included oxidative stress involves inhibiting reactive oxygen species (ROS) formation, decreasing lipid peroxidation, and preventing cell death [31].

**ANTIMICROBIAL ACTIVITY :-**

The antimicrobial properties of Guava leaves are attributed to a variety of organic and inorganic antioxidants, as well as anti-inflammatory compounds [32]. Guava leaves essential oils demonstrate potent antimicrobial effects against *Pseudomonas aeruginosa*, *Escherichia coli*, *Streptococcus faecalis*, *Staphylococcus aureus*, and *Bacillus subtilis* [33].

**USES:-**

In eastern medicine, guava leaves have a historical application as a remedy for diarrhea and alleviating symptoms of food poisoning. In China and India, they are utilized to mitigate coughs and support digestion. Beyond oral applications, guava leaves are externally employed in Brazil and Mexico to alleviate symptoms of skin and body wounds.

Menstrual Cramps (dysmenorrhea):- Guava leaf extract may offer a slight reduction in menstrual cramps.  
Knee pain: - in individuals experiencing knee pain, the consumption of guava leaf extract may result in a minor reduction in both pain and stiffness.

- Cancer
- High cholesterol
- Heart diseases
- Ulcerative colitis
- Skin infections
- Obesity
- Cough[34]

Guava leaves are healthy for hairs: - hair fall, often linked to an unhealthy scalp, can be addressed with guava leaves due to their anti-inflammatory, antimicrobial, and antioxidant properties. These leaves are effective against scalp issues and dandruff. Moreover, their richness in vitamin B and C contributes to nourishing the scalp and promoting hair growth [35].

**SIDE EFFECTS:-**

**SKIN APPLICATION :-**

Guava leaf extract is deemed possibly safe when applied to the skin or used as an oral rinse. However, it may lead to skin irritation in certain individuals.

**ECZEMA CONCERNS :-**

For individuals dealing with eczema, caution is advised when using guava leaf extract. The extract may exacerbate eczema symptoms, given its chemical composition that can potentially cause the skin irritation. If you have eczema, use guava leaf extract with care[36].

**IV. CONCLUSION**

Guava leaves are recognized for their abundance of natural compounds, easily accessible and documented for potential health benefits. Guava leaves serve as a direct source of nutrients due to their rich content of minerals, proteins, and vitamins. The bioactive chemical compounds within Guava leaves enhance and stabilize various physiological functions. Guava leaves encompass secondary metabolites like flavonoids, triterpenoids, sesquiterpenoids, glycosides, alkaloids, and phenolic compounds, serving as immune stimulators and modulators for diseases. Guava leaves oil exhibit antioxidant, antimicrobial, and ant proliferative activity. As a plant derived ingredient, guava leaves may mitigate drug resistance and find applications and a functional food ingredient, meeting high demand. These distinctive characteristics position Guava leaves as a valuable plant component in medicinal research and an affordable ingredient in food products, showcasing diverse pharmaceutical and medicinal profiles.

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