



A Complete Review on *Psidium guajava* Linn (Medicinal Plant)

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ABSTRACT

Psidium guajava is an essential food crop and medicinal plant that is commonly used in foods and folk medicines around the world and is available in tropical and subtropical countries. It contains important phytoconstituents such as tannins, triterpenes, flavonoid: quercetin, pentacyclic triterpenoid: guajanoic acid, saponins, carotenoids, lectins, leucocyanidin, ellagic acid, amritoside, beta-sitosterol, uvaol, oleanolic acid and ursolic acid. This analysis is an attempt to compile all the information published on its ethanobotanical, phytochemical and pharmacological activities, considering the immense medicinal significance of the plant. In view of the immense medicinal importance of the plant, this study is an effort to compile all the knowledge reported on its ethanobotanical, phytochemical and pharmacological activities. Many pharmacological studies have demonstrated the ability of this plant to exhibit antioxidant, hepatoprotective, anti-allergy, antimicrobial, antigenotoxic, antiplasmodial, cytotoxic, antispasmodic, cardioactive, anticough, antidiabetic, antiinflammatory and antinociceptive activities, supporting its traditional uses. Suggesting a wide range of clinical applications for the treatment of infantile rotaviral enteritis, diarrhoea and diabetes.

Keywords: Ethanobotany, myrtaceae, pharmacology, physicochemical, phytochemical, *Psidium guajava*.

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INTRODUCTION

Psidium guajava L is a fruit-bearing tree commonly known as guava, which belongs to the family Myrtaceae. The French call it *goyaveor goyavier*; the Dutch, *guyaba, goeajaaba*; the Surinamese, *guave orgoejaba*; and the Portuguese, *goiabaor goaibeira*. Hawaiians call it guava or *kuawa*. In Guam, it is *abas*. In Malaya, it is generally known either as guava or *jambu batu*. Guava grows up to 1500 m in height in almost all of India and is grown commercially in almost all states, with an approximate total area of 50,000 hectares. Uttar Pradesh, Bihar, Maharashtra, Assam, West Bengal and Andhra Pradesh are important guava-growing states in India. The cultivated varieties grow at a height of about 10 m and produce fruit within four years.¹

Wild trees are well branched, rising up to 20 m long. By its distinctive thin, smooth, copper-colored bark, which reveals a greenish layer underneath, the tree can be easily recognized. Guava trees have spread widely in the tropics because they grow, multiply easily and bear fruits rapidly in a variety of soils. Birds and monkeys love the fruits, dispersing seeds of guava and causing spontaneous dumps of guava saplings to grow in the rainforest.¹

The guava tree's leaves and bark have a long history of medicinal use. In India, guava leaf and bark decoction is used to treat diarrhea, dysentery, vomiting and sore throats, and to monitor menstrual cycles. Leaf decoction is used by the Amazon tribes for mouth sores, bleeding gums, as a vaginal discharge shower and to tighten and tone up vaginal walls during labor. Guava is grown all over the tropics. The fruit is eaten commercially, raw or used in the manufacture of jams, jellies, pastes and juice. The Dutch Pharmacopoeia's Guava leaves are official. Guavas are fat and cholesterol-free. They are also an excellent source of alcohol, potassium and vitamin A.¹

Chemical composition contains Flavonoids, Triterpenoids, Steroids, Carbohydrates, Oils, Lipids, Glycosides, Alkaloids, Tannins and Saponins. Used as Antioxidant, Antibacterial activity, Anti-inflammatory activity, Anticancer activity. Herbal medicine has both medical and economic value. While herbal medicines have advantages, industrialized and developing countries have increased their protection, effectiveness, quality and importance. Herbal medicines enhance patient compliance by preventing the common side effects of allopathic medicines. It is no wonder that one-fourth of the world's population, i.e. 1.42 billion, relies on conventional medicines for the treatment of different diseases. Since time immemorial, medicinal plants have been a significant source of treatment for human diseases.²

About three-quarters of the world's population relies primarily on herbal medicines obtained from fruits and plants. For medicinal purposes, 30 percent of the plant species are used. The worldwide demand for plant-derived drugs can be valued at Rs. 200,000 crores. India's



contribution is less than Rs. 2000 crores at present. Raw drug exports from India gradually increased by 26% from Rs. 130 crores in 1991-92 to Rs. 165 crores in 1994-95. Annual raw material production from medicinal and aromatic plants is worth approximately Rs. 200 crores. This is likely to hit 1150 US dollars by the year 2000 and 5 trillion US dollars by 2050. Plant drugs have been shown to be in developed countries such as the United States, 25% of total drugs are accounted for, while the contribution is above 80% in fast developing countries such as China and India. Consequently, the economic In India, the significance of medicinal plants is much more than restoring the earth. These countries account for two thirds of the plants used in the modern medicine system, and the indigenous medicine systems have rural population health care systems .³The regulation of the immune response by the use of medicinal plant products as a potential therapeutic measure has become an active topic of scientific research .⁴



Figure 1: Leaves of *Psidium guajava*

Synonyms:

Psidium cujavillus burm.; *Psidium pomiferum* L.; *Psidium pumilum* Vahl; *Psidium pyriferum* Linn.⁵

Common Names: Guava (Egypt, USA, latin America, Asia, Africa), guyaba (Cuba), guayaba (Guatemala, Nicaragua, Paraguay), amrood (India).⁶

Family- Myrtaceae

Table 1: Scientific classification

Kingdom	Plantae
Clade	Angiosperms
Clade	Eudicots
Clade	Rosids
Order	Myrtales
Family	Myrtaceae
Genus	<i>Psidium</i>
Species	<i>Psidium guajava</i>

Table 2: Nutrient value of guava fruit

Nutrients	Content
Moisture	2.8-5.5g
Crude fiber	0.9-1.0g
Protein	0.1-0.5mg
Fat	0.43-0.7mg
Ash	9.5-10mg
Carbohydrate	9.1-17mg
Calcium	17.8-30mg
Phosphorous	0.30-0.70mg
Iron	200-400 I.U.
Carotene (vitamin A)	0.046mg
Thiamin	0.03-0.04mg
Riboflavin	0.6-1.068mg
Niacin	40 I.U.
Vitamin	36-50mg

Phytochemistry and functional components:

The important constituents of guava are vitamins, tannins, phenolic compounds, flavonoids, essential oils, sesquiterpene alcohols and triterpenoid acids. Leaves contain phenolic compounds, isoflavonoids, gallic acid, catechin, epicatechin, rutin, naringenin, kaempferol having hepatoprotective, antioxidant, anti-inflammatory, antispasmodic, anticancer, antimicrobial, anti-hyperglycemic, analgesic actions. The leaf contains two important flavonoids quercetin known for its spasmolytic, antioxidant, antimicrobial, anti-inflammatory actions and guaijaverin known for its antibacterial action. Pulp contains ascorbic acid, carotenoids (lycopenes, carotene) possessing antioxidant, anti-hyperglycemic, anti-neoplastic. The seed contains glycosides, carotenoids, phenolic compounds having antimicrobial actions.⁷

Ethanobotanics:

P. guajava has a long history of common usage, of which modern research has validated a good proportion. Ethno-medicinal applications include leaf crushing and the application of the extract to the infectious site of wounds, boils, skin and soft tissue. There is an astringent stem, bark and root-bark. Unripe fruit is indigestible and induces feverish vomiting. The leaves are astringent, and the fruit is laxative. Locally, decoction of the leaves is of great benefit for the prolapsus ani of ache upsets and vertigo in infants. *P. guajava* leaf is a phyto therapy medication used as an anti-inflammatory treatment to treat gastrointestinal and respiratory disorders. It has also been reported for its anti-amoebic and anti-malarial effects. Guava fruit paste and cheese in Florida, the West Indies and parts of South America are popular dishes. *P. guajava* Linn, a herb. It has an ethano medical history because it has different operations, especially functionally against hyperglycemia.⁸

Medical significance of guava:

Guajava Psidium L. As a result of its pharmacological activities, it is consumed not only as food but also as traditional medicine in subtropical regions all over the world. Almost all over the world, medicinal plants have a very important role in medical systems. Such findings are expressed in conventional wisdom. It is well known that guava is also used in many parts of the world.

A lot of diseases such as diarrhea-reducing fever, dysentery, gastroenteritis, hypertension, diabetes, caries, pain relief and wounds are healed in the country. Countries with a long tradition of using medicinal plants, such as Mexico, Africa, Asia, and Central America, still use guava at high levels. It is also used as food and in the preparation of food items because of its medicinal uses. Guava contains high amounts of organic and inorganic compounds such as secondary metabolites such as antioxidants, polyphenols, antiviral compounds and anti-inflammatory compounds. It is also used in house building and toy making. There are several compounds in Guava that have anti-cancerous activities. They have a higher number of minerals and vitamins. Phenolic compounds such as flavonoids have an important role in the guava as well. Important antioxidants are lycopene and flavonoids. They help to cure cancerous cells and help to prevent premature aging of the skin. Myocardium inotropism can be caused by Guava. Guava Skin Extract can regulate diabetes levels after 21 days of treatment.⁹

Biological Activity and Clinical Research:

Modern-day researchers have been guided to study guava extracts by the long history of guava use. In various clinical trials, its conventional usage against diarrhea, gastroenteritis and other digestive problems has been validated. In a report that included 17 medicinal Thai plants, Guava leaf demonstrated anti-proliferative activity, which was 4.37 times more than vincristine, on anti-proliferative effects on human mouth epidermal carcinoma and murine leukemia cells using MIT assays. It was shown that bark and leaf extracts had an in vitro toxic action against various bacteria. Gallo catechin isolated from the guava leaf methanol extract demonstrated anti-mutagenic activity against E. Coli. Guava extracts of water and chloroform were successful in activating Salmonella typhimurium mutagenicity. Compared to tea tree oil (TTO), doxycycline and clindamycin antibiotics, the antimicrobial activities of P. guajava and leaf extracts, calculated by the disk diffusion method (inhibition zone), were compared. P. guajava leaf extracts have been shown to be helpful in treating acne, especially those that have anti-inflammatory activities. The active β flavonoid compound extracted from leaves quercetin-3-O- α -L-arabinopyranoside (guajaverin) - has a high potential for anti-plaque activity by inhibiting Streptococcus mutants formation. In a study performed by the disc diffusion system, Guava leaf extract inhibited the growth of Streptococcus aureus.¹⁰

Chemical composition:**Fruit**

Vitamin C, vitamin A, iron, calcium, Manganese, phosphoric, oxalic and mallic acids, saponins combined with oleanolic acid. Morin-3-O- α -L-lyxopyranoside and morin-3-O- α -L-arabopyranoside, flavonoids, guajaverin, Quercetin. Essential oil contains hexanal, -2-hexenal, 2,4-hexadienal, 3-hexenal, 2-hexenal, 3-hexenyl acetate and phenol, while β -caryophyllene, nerolidol, 3-phenylpropyl acetate, caryophyllene oxide, pentane-2-thiol, 3-penten-2-ol and 2-butenyl acetate, 3-hydroxy-2-butano-3-methyl-1-butanol, 2,3-butenediol, 3-methylbutanoic acid, (Z)-3-hexen-1-ol, 6-methyl-5-hepten-2-one, limonene, octanol, ethyl octanoate (pink guava fruit).¹¹

Leaves

α -pinene, β -pinene, limonene, menthol, terpenyl acetate, isopropyl alcohol, longicyclene, caryophyllene, β -bisabolene, caryophyllene oxide, β -copanene, farnesene, humulene, selinene, cardinene and curcumene, mallic acids, nerolidol, β -sitosterol, ursolic, crategolic, and guayavolic acids, cineol, quercetin, 3-L-4-4-arabinofuranoside (avicularin) and its 3-L-4-pyranoside (Essential oil), resin, tannin, eugenol, caryophyllene (1a α , 4a α -, 7 α -, 7a β -, 7b α -)]-decahydro-1H-cycloprop[e] azulene, Guajavolide (2 α -,3 β -,6 β -,23-tetrahydroyurs-12-en-28,20 β -olide; 1) and guavenoic acid (2 α -,3 β -,6 β -,23-tetrahydroyurs-12,20(30)-dien-28-oic acid, triterpenes oleanolic acid, triterpenoids, flavinone-2'-ene, prenil, dihydro benzophenanthridine and cryptonine.¹¹

Bark

Polyphenols, resin and crystals of calcium oxalate.¹²



Figure 2: Bark

Root

Tannin, leucocyanidin, sterols, gallic acid, carbohydrates, salts, tannic acid.

Seed

Proteins, starch, oils, phenolic, flavonoid compounds, flavones glycoside, quercetin-3-O- β -D-(2''-Ogalloylglucoside)-4'-O-vinylpropionate.



Figure 3: Fruit

Twigs

Calcium, magnesium, phosphorous, potassium, sodium, fluoride, copper, iron, zinc, manganese, and lead.

Pharmacological actions of *Psidium guajava* L leaf:

Antibacterial activity

The aqueous and organic extracts of *P. guajava* leaves revealed antibacterial activity against *Staphylococcus aureus*, *Proteus* spp., and *Shigella* spp. While no activity against *Citrobacter* spp, *Alcaligenes fecalis*, and *Aspergillus spawns* observed.¹³ The aqueous extracts of *P. guajava* leaves, roots and stem bark were active against the gram-positive bacteria *Bacillus subtilis* and virtually inactive against the gram-negative bacteria *Escherichia coli* and *Pseudomonas aeruginosa*.¹⁴ The aqueous, alcohol and chloroform extracts of leaves were effective against *Aeromonas hydrophila*, *Shigella spp* and *Vibrio spp*, *Staphylococcus aureus*, *Sarcina lutea* and *Mycobacterium phlei*. The antimicrobial activity of *P. guajava* is attributed to guajaverine, psydolic acid and the flavonoid compound guaijaverin. Antimicrobial activity against *Propionibacterium acne* was demonstrated by the essential oils γ -terpinene and γ -pinene.¹⁵

Anti-inflammatory activity

A significant anti-inflammatory activity is provided by the essential oil, the aqueous, the alcoholic, the methanolic and the ethyl acetate extracts. Meanwhile, benzophenone glycosides, sesquiterpenes, and leaf distilled flavonoids are claimed as allergy inhibitors.¹⁶

Anti cough action

Guava leaf has long been used to treat diseases such as cough and lung diseases in Bolivia and Egypt. The aqueous extract decreased the frequency of capsaicin aerosol-induced cough within 10 minutes after the extract was administered intra peritoneal. More than 5 g/kg was the LD50 of guava leaf extract.¹⁷ These findings indicated that the extract of guava leaf is recommended as a cough remedy.²⁰ Meanwhile a recent study conducted on the Egyptian plant showed that the alcoholic extract (in a dose starting from 4 μ g/ml), the aqueous extract (from 8 μ g/ml), the ethyl acetate extract (from 6 μ g/ml), the essential oil (16 μ g/ml) as well as quercetin (30 μ g/ml) produces a significant drop in contractile microlax response of isolated guinea pig trachea treated with histamine (2 μ g/ml), acetyl choline (1 μ g/ml) or serotonin (1 μ g/ml). This study concluded that both the extracts and the essential oil are

safe for use as an anti-cough medication with regard to their effect on isolated trachea, their relaxant smooth muscle and their anti-inflammatory effects. As tested on an isolated rabbit heart, large doses can inhibit ventricular contraction of the heart¹⁸ In addition, the high percentage of basic oil (0.46 percent) and essential oil (0.46 percent) In cough treatment, its wide antimicrobial activity can be beneficial.¹²

Anti-oxidant activity

Recent studies have shown that *P. guajava* is an excellent source of antioxidant phytochemical. High antioxidant activity was shown by the methanolic and extract of leaves.¹⁸ The active principles are quercetin, quercetin-3-O-glucopyranoside, Morin, ascorbic acid, carotenoids, and polyphenolics.¹²

Anti-diabetic activity

The ethanolic stem bark extract in alloxan-induced hyperglycemic rats displayed statistically significant hypoglycemic activity but was devoid of significant hypoglycemic effect in normal and normal glucose loaded rats (OGTT). The water extract demonstrated statistically significant hypoglycemic activity at an oral dose of 250 mg/kg in both acute and sub-acute studies.¹⁰

Anti-microbial activity

Aqueous bark and methanolic and extracts of *Psidium guajava* were found to possess anti-bacterial activity. Four antibacterial compounds have been found isolated from guava leaves. The minimum inhibition concentrations of morin-3-O-alpha-L-lyxopyranoside and morin-3-O-alpha-L-arabopyranoside were 200 microg/ml each for *Salmonella enteritidis* and 250 microg/ml and 300 microg/ml respectively for *Bacillus cereus*. Hot water extract and *Psidium guajava* methanol extract showed high activity against *Arthriniunsacchari* and *Chaetomium funicolastrains*.¹⁰

Anti-diarrheal activity

The *P. guajava* L. leaves. This activity is explained by spasmolytic, antibacterial and anti-amoebic effects, and phytochemical such as flavonoids and tannins have been documented to exhibit anti-diarrheal activity by denaturing protein, thereby producing protein-tannate interactions that decrease the permeability of the intestinal mucosa⁽¹⁹⁾. In addition, the calcium-antagonist properties of quercetin, the biologically active drug, clarify the spasmolytic effect of this popular herbal remedy.¹⁰

Antiulcer activity

P. guajava possesses acid secretion inhibitory effect of antiulcer activity in the aspirin-induced gastric ulcer model mediated by prostaglandins.¹²

Spermatoprotective activity

Extracts of *Psidium guajava* Linn's leaves. They have beneficial effects on the development and quality of sperm O, and may thus boost the sperm parameters of infertile

males with Nono obstructive azoospermia and oligospermia.¹⁰

CONCLUSION

Ethno medicine applications of *Psidium guajava* L. in this regard. Over the past decade, leaves have been verified in many studies against several illnesses, demonstrating their potential in the treatment of the most prevalent diseases worldwide. Furthermore, individual compounds such as quercetin, catechin, gallic acid, peltatoside, hyperoside, isoquercetin, and guaijaverin were associated with the effects of the leaves. The skin contains a significant number of fruit phytochemical that are rich in vitamins (A & C), iron, phosphorus, calcium and minerals. The phenolic compounds in guava help to heal cancer cells and prevent premature aging of the skin. Many bacteriostatic and fungi static agents and major oxidants are found in the leaves. It can be very effective for the prevention and treatment of different diseases due to the following biological activities.

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