

**REVIEW ARTICLE PSIDIUM GUAJAVA (GUAVA) IN SHORT INFORMATION ON
THE PHYTOCHEMICAL AND PHYTOCONSTITUENT AND THEIR
PHARMACOLOGICAL ACTION**

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ABSTRACT

The well-known tropical tree *Psidium guajava*, also known as guava, is extensively grown for its fruit. It is a member of the family Myrtaceae, class Magnoliopsida, and phylum Magnoliophyta. *Psidium guajava* Linn, or guava, is the biological source of this fruit. Guava's chemical makeup is high in minerals, such as vitamins A and C, which are 36 times more abundant in guavas than in oranges of the same sample weight. Alkaloids are confirmed by phytochemical investigations of guava leaf extracts. The precise kinds and concentrations of alkaloids in guava, as well as their possible roles in health advantages, require further investigation. Guava employs phytoconstituents, which are employed to make all parts of the plant and produce clinical purposes. Every plant portion that is utilised in guava GS, HPLC, MS, FTIR, NMR, and DSC is a phytoconstituent that is used to generate clinical purposes. Guava has been explored for its anti-inflammatory, antioxidant, antidiarrheal, antidiabetic, antibacterial, anticancer, and antimicrobial properties, among other pharmacological actions to treat various disorders.

KEYWORDS: *Psidium Guajava* (Guava), Myrtaceae Family, Tropical Region.**INTRODUCTION**

Psidium guajava (common name guava) is a popular tropical tree that is widely cultivated for its fruit. It belongs to the phylum Magnoliophyta, class Magnoliopsida, and family Myrtaceae.^[1] In indigenous medicinal practices, various parts of guava are used to treat a variety of human ailments, including wounds, ulcers, intestinal problems, and cholera. Pharmacological studies have shown that the bark, seeds, peel, pulp, fruits, and leaves of guava have antibacterial, hypoglycemic, anti-inflammatory, antipyretic, antispasmodic, and central nervous system depressant properties. This tropical plant, which belongs to the family Myrtaceae, is widely distributed in the nepalese terai, interior terai, and mountainous regions. It is highly valued for its medicinal qualities and economic viability and is one of the major fruit crops grown in these regions.^[2] Organic and aqueous extracts of guava leaves have been tested and found to have antibacterial, antifungal, antidiarrheal, antiplasmodial, antitussive, anti-inflammatory, antipyretic, analgesic, immunomodulatory, antispasmodic, ulcerative, nephroprotective, hepatoprotective, and hypoglycemic properties. Extensive studies have shown that oral administration of aqueous and ethanolic extracts of guava leaves to albino rats is safe up to doses of 100 to 500 and 2000 mg/kg,

respectively, without any signs of toxicity or mortality.^[3]

The leaf of the guava plant is particularly rich in bioactive compounds such as polyphenols, including quercetin and various flavonoids, as well as ferulic acid, caffeic acid, and gallic acid. These compounds exert potent antioxidant effects and demonstrate stimulant activity. Guava harbours a wide range of different compounds with antioxidant properties and phytochemicals are present, including polysaccharides, essential oils, minerals, vitamins, enzymes, triterpenoid acids, alkaloids, steroids, glycosides, tannins, flavonoids, and saponins. These compounds play a vital role in providing the plant with numerous health benefits, including its antioxidant, anti-inflammatory, and potentially anticarcinogenic properties. Known as an incredible reservoir of phytochemical and antioxidant nutrients, guava includes compounds such as ascorbic acid, carotenoids, antioxidant-rich dietary fibre, and polyphenols.^[4] Guava has been valued since ancient times for its medicinal properties. Moreover, pharmacological research has revealed that this plant has a greater potential than just being a source of fruit. Its abundant nutritional and phytochemical composition gives it favourable properties against various chronic diseases.^[5]

Biological/Botanical Sources

Psidium guava is a member of the Myrtaceae family. It is a small tree growing to about 10 m tall with characteristically thin, smooth, irregular, flaky bark. Guava trees generally have widely spreading branches.^[6] It is cultivated or grows naturally throughout tropical and subtropical regions of the world. It is a small to medium-sized perennial plant that can produce a rapid yield. Except for rare cultivars that may have rough skin, the fruit is round or oval and has smooth skin. More than 3,800 species and at least 133 genera make up the Myrtaceae family. Includes the tropical fruit guava (*Psidium guava* L.), originally from central America. The fruit's seed is small and hard, and the fruit's flesh is white or pink with a distinctive flavor. South Africa, India, Hawaii, Colombia, Puerto Rico, Jamaica, Brazil, and Israel are the major producers of guava products. The parts of the common guava tree that are in season include the bark, leaves, shoots, branches, and fruits (ripe, budding, and ripe stages).^[2]

Chemical composition

Guava fruit contains vitamin A, C, iron, phosphorus and calcium. Ascorbic acid and citric acid are the main components of guava that play an important role in antimutagenic activity.^[1] Instant Composition – Guava leaves (GL) are a rich source of various micronutrients and macronutrients beneficial for health, as well as bioactive compounds. They contain carbohydrates, 103 mg ascorbic acid and 1717 mg gallic acid equivalents (GAE)/g total phenolic compounds.^[5] Guava is rich in minerals, including vitamins A and C, which are present in quantities 36 times greater than those found in oranges of the same sample weight.

It also has antioxidant properties. In addition, it is rich in fiber, iron, calcium and vitamins B1, B2 and B6. The most distinctive feature of red guava is that it has the highest concentration of lycopene, second only to tomatoes which have the highest content and twice as much as papaya. Red guava contains aromatic components, namely: hydrocarbons (α-pinene, β-caryophyllene), alcohols (hexanol, terpineol, cis-3-hexenol) and esters (ethyl acetate, cis-hexenyl acetate). Guava has its own unique taste. Strawberry guava, *Psidium cattleianum* Sabine, is often considered to have a stronger taste than the common guava, *Psidium guajava*.^[2] Polysaccharides are macromolecules ubiquitous in nature. They consist of long polymer chains, themselves composed of monosaccharide units. These polysaccharides exhibit diverse physicochemical, biological, and pharmacological properties, such as antioxidant, anti-inflammatory, antidiabetic, immunomodulatory, and antitumor activities.^[5]

Phytochemistry

The study reported the presence of 72 phenolic compounds in guava leaves using the polyphenol content (gallic acid and catechin) in *Psidium guajava* leaves measured by highperformance liquid chromatography

(HPLC). This study showed the presence of condensed tannins (catechins) and hydrolyzable tannins (gallic acid) in *P. Guajava* leaves. Guava leaves were analyzed by gas chromatography-mass spectrometry (GC-MS) and confirmed the presence of carotenoids, flavonoids, alkaloids, polyphenols, saponins, tannins, glycosides and sterols.^[6] Guava leaves contain a wide range of identified compounds, including fatty acids, essential oils, terpenoids, phenolic compounds, carbohydrates, glycosides, alkaloids, saponins, sterols and other compounds. Guava leaves contain a remarkable abundance of essential oils, which contain compounds such as α-pinene, β-myrcene, o-. Cymene, dl-limonene, β-ocimene, humulene, terpinene, linalool, α-terpineol, α-terpinolene, heptasiloxane, neointermedeol, α-calcarin, eicosanoid, 2-carene, copalene, γ-muurolene, aromandendrene, β-bisabolene, cis-calamine, naphthalene and epicubenol. These compounds were identified by gas chromatography-mass spectrometry (GC-MS) analysis.^[4] Essential Oil Profile – GL (Glycyrrhiza) is a rich source of essential oils. The main ingredients of GL essential oil include 1,8-cineole and trans caryophyllene. 50 compounds were identified in GL essential oil using gas chromatography (GC) and gas chromatography/mass spectrometry (GC-MS), where β-caryophyllene, α-pinene and 1,8-cineole were found to be the major ones. GL essential oil from the Philippines was found to contain a different profile, with limonene, α-pinene, β-caryophyllene and longicyclene as the major compounds.^[5] The Available information indicates the presence of alkaloids in the leaves and fruit of guava. Phytochemical analyses of guava leaf extracts confirm the existence of alkaloids. In addition, a review article reports the presence of alkaloids in guava. However, the exact categories of alkaloids found in guavas and their potential health benefits have not been detailed in the research results. More research is needed to fully determine the specific types and amounts of alkaloids in guava, as well as their potential contributions to health benefits.^[4]

Guava Phytoconstituents

Guava is a major center for essential phytoconstituents that have been shown to produce various clinical uses. From every part of the plant. Various characterization techniques used for guava oil.

1. Gas Chromatography – Identification and quantification of Fatty Acids, Essential Oils and Other Volatile Compounds in Guava Oil.
2. High Performance Liquid Chromatography (HPLC) – Analysis of non-volatile components.
3. Mass Spectrometry (MS) – Determination of molecular structure and fragmentation pattern.
4. Fourier Transform Infrared Spectroscopy (FTIR) – Determination of the presence of functional groups and the chemical composition of guava oil.
5. Nuclear Magnetic Resonance Spectroscopy (NMR) – Characterization of the presence of other compounds in guava oil.

6. Differential Scanning Calorimetry (DSC) – Determination of melting point, solidification and thermal behaviour of guava oil.
7. Rheology – Evaluation of viscosity and flow characteristics of guava oil.
8. Sensory evaluation – Subjective evaluation of sensory attributes of guava oil for quality control and consumer preference studies.^[2]

Pharmacological Action

The pharmacological action of the plant *Psidium guajava* have a variety of pharmacological activity.

Anti-inflammatory activity

The ethyl acetate extract has the ability to minimize the antigen. It can stop the release of beta-hexosaminidase with histamine RBL-2H3 cells. Guava extract in ethyl acetate can stop bacterial infection and thymus production. It can enhance mRNA expression. Thus as an anti-inflammatory agent.^[1] The aim of this study was to investigate the antiinflammatory activity of an ethanolic extract of *p.guajava* (guava) leaves in vitro and in vivo.^[7] Phenol is an important compound present in guava and is believed to have antiallergic and anti-inflammatory activity.^[1]

Antioxidant Activity

The oxidation reaction can produce free radicals that damage cells by causing various chain reactions. Free radicals that damage cells cause cancer and many other diseases. Antioxidants stop free radicals and stop chain reactions. Free radical damage is responsible for many disorders in humans, such as nervous disorders, inflammation, and viral infections. When medications are metabolized in the body, free radicals are produced. Polyphenols are mainly flavonoids and are present mainly in the form of glycosides and esters. Free ellagic acid and the glycosides apigenin and myricetin are present in guava. Guava extracts in water and organic solvents contain a large amount of antioxidants that can stop the oxidation reaction.^[1] The method was applied to the discovery and identification of the most potent anti-radical compound in the extract of the antioxidant-active plant (*Psidium guajava*).^[9] An extremely high total phenolic content of 575.3 \pm 15.5 and 511.6 \pm 6.2 mg GAE/g dry matter was obtained (for ethanolic extracts of guava leaves and ethanolic extracts in water, respectively). The activity was assessed by the decrease in absorbance resulting from the color change of DPPH (2,2-diphenyl-1-picrylhydrazyl) from purple to yellow. The higher the concentration of the sample used, the stronger the free radical scavenging effect. Antioxidant efficacy (AE) has been found to be a more suitable parameter for antioxidant selection than the widely used EC (50).^[10] *Psidium guajava* SDE showed significant antioxidant activity; therefore, it has high potential as an active phytopharmaceutical ingredient.^[11]

Antidiarrheal activity

Guava leaves contain quercetin-3-arabinoside and quercetin which can be isolated from the leaves. Its leaves contain a compound which has an action similar to that of morphine. Quercetin found in guava leaves is believed to be responsible for its antispasmodic activity. Guava exhibits high cytotoxicity. Guava can be used to treat diarrhea caused by *E. Coli* or *S. Aureus*. Ethanol and aqueous extracts of *psidium guajava* at a concentration of 80 g/ml in an organ bath, presented discomfort of more than 70% of the reduction induced by acetylcholine and/or KCl solution of the isolated guinea pig ileum. Locomotor coordination can be improved by ethyl acetate extract of guava fruit. It is very common even in developed countries.^[1] It can be concluded that guava extracts are a treatment option possible for diarrhea caused by *E. Coli* or toxins produced by *S. Aureus*, due to its quick healing action, its easy availability in tropical countries and its low cost per the consumer.^[12] Although the exact mechanism of the antidiarrheal activity of APE cannot be determined, the results of this study indicate that APE (acute pulmonary embolism) has antidiarrheal activity. This finding supports the use of african yam as a complementary natural medicine for the treatment, management and/or control of diarrhea in some rural communities in southern africa.^[13]

Antidiabetic Activity

The objective of this study is to investigate the in vitro phytochemical and antidiabetic activity of the methanolic extract of *psidium guava* leaves. The ethanol extract of the stem bark showed statistically significant hypoglycemic activity.^[15] The result and showed that ethanolic bark extract showed statistically significant hypoglycemic activity in alloxan-induced hyperglycemic rats, but lacked significant hypoglycemic effect in normal rats and glucose load (OGTT- oral glucose tolerance test).^[16] The leaf "*P. Guajava L*" of the Myrtaceae family has a long history of medicinal uses in egypt and around the world as a treatment for hypertension, obesity and diabetes control. When several plants are tested, *P. Guajava* leaves suppress plasma sugar levels in alloxan-induced diabetic rats during the glucose tolerance test (GTT).^[20]

Antibacterial Activity

Previous studies on the in vitro and in vivo antibacterial activity of guava extracts have raised hopes for the potential for the development of medicinal compounds for human use. This study provides preliminary information on the use of guava extracts to control bacterial diseases in pigs. The extracts were tested for their antibacterial activity against pathogenic bacteria in pigs, namely *Streptococcus suis*, *Pasteurella multocida*, *Escherichia coli* and *Salmonella typhimurium*.^[17] Alkaloids and Flavonoids are phenolic structures containing a carbonyl moiety with an extracellular and soluble protein and a bacterial cell wall demonstrate antibacterial action through these structures. Guava

leaves are rich in flavonoids, especially quercetin, which is responsible for antibacterial activity.^[19]

Anticancer Activity

The extract is an acetone concentrate (250 ug/ml) that showed 35.5% inhibition against HT-29 cell growth. It reduced both prostate-specific antigen (PSA) levels and tumor size in a mouse xenograft tumor model.^[14] Several studies have demonstrated the anticancer activity of *P. Guajava* leaves. It has been previously reported that the methanol extract of guajava leaves has a cytotoxic effect on Hela cells. Guava contains secondary plant metabolites including several polyphenols with intrinsic antioxidant, anti-inflammatory and antiviral properties. Several components of guava have been hypothesized to have anti-cancer effects in vitro, and the most reported are ascorbic acid (vitamin C), flavonoids (apigenin) and lycopene.^[18]

Antimicrobial Activity

Methanolic extracts of leaves and bark of *Psidium guajava* have high antimicrobial activity. Guava showed has high antimicrobial activity. Guava leaf extract doses can reduce cough due to its antitussive activity. Water, chloroform and methanolic extract of leaves can reduce the growth of various bacteria.^[1] Antimicrobial activity of The alcoholic extracts of guava (*Psidium guajava*) were compared with those of pineapple (*Ananas comosus*) and apple (*Malus pumila*). Eight bacterial strains, including.

Pseudomonas aeruginosa, *Klebsiella*, *Enterococcus faecalis*, *Shigella flexneri*, *Enterobacter cloacae*, *Enterotoxigenic E.coli* (ETEC), *Enterococcus faecalis* (EAEC) and *Staphylococcus aureus* were used for antimicrobial evaluations.^[20] It is very clear that aqueous and methanolic extracts of guava leaves inhibit bacterial growth and can produce a significant zone of inhibition. Methanol and aqueous extracts show a maximum MIC (minimum inhibitory concentration) while ethanol extract shows minimal antifungal activity. Guava leaves, seeds, skin, and pulp exhibit high anti-microbial action.^[1]

CONCLUSION

Psidium guajava is a well known tropical tree grown in tropic areas for fruit. In terms of human health advantages, it has been shown to be useful against certain disorders such as wounds, bowel difficulties, cholera, gastroenteritis, diabetes mellitus, cough, caries and oral ulcers. The chemical composition present in guava is used as a different therapeutic action or biological action. In which various pharmacological action to possesses in disease anti-inflammatory, antioxidant, antidiarrhoea, antidiabetic, antibacterial, anticancer and anti microbial. The guava is used in the prevention and treatment of diseases.

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