

REVIEW ON MEDICINAL PROPERTIES OF *Psidium guajava* L. (A PRELIMINARY STUDY)**Ranathunga K. R. S. P. K.¹, Sakunthala H.S², Gunarathna B.W.A.S³**¹Undergraduate (BAMS) Gampaha Wickramarachchi University of Indigenous Medicine, Yakkala, Sri Lanka²Department of Dravyaguna Vignana Gampaha Wickramarachchi University of Indigenous Medicine, Yakkala, Sri Lanka³Graduate (BAMS) Department of Dravyaguna Vignana Gampaha Wickramarachchi University of Indigenous Medicine, Yakkala, Sri Lanka**Corresponding Author:** piyumali.ranathunga@gmail.com<https://doi.org/10.46607/iamj2910052022>**(Published Online: May 2022)****Open Access**

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Article Received: 01/05//2022 - **Peer Reviewed:** 01/05/2022 - **Accepted for Publication:** 02/05/2022**ABSTRACT**

A vast majority of plants have bioactive constituents that can overcome the pathogen's resistance. Guava (*Psidium guajava* L, family Myrtaceae) is an important food crop and important medicinal plant commonly used in both Sri Lankan and Indian traditional medical systems. Commonly known due to its food and nutritional values throughout the world. Mostly available in tropical and subtropical countries, the medicinal properties of guava fruit, leaf, and other parts of the plant are also well known in the traditional system of medicine. Hence, the objective of this study was to collect data about the medicinal value, ethnomedicinal uses scientifically validated biological activities, important phytochemicals, and Ayurveda properties, through authentic traditional texts, Ayurveda texts, scientific journals, and other authentic texts regarding medicinal plants and survey by using standard questionnaires. A Survey of the literature revealed that *Psidium guajava* L. was a good source of health-promoting and contained secondary metabolites like Flavonoids, Tannins, glycosides, terpenoids, etc. The medicinal plant *Psidium guajava* L was reported to possess various pharmacological properties like antioxidant, anti-inflammatory, antimicrobial, anticough,

antidiarrheal, antidiabetic, antihyperlipidemic, cardioprotective, antimutagenic, and hepatoprotective effects. Moreover, this review would help provide easy access to the antimicrobial work performed on *Psidium guajava* L. and to develop new drugs against infectious pathogens.

Keywords: *Psidium guajava* L., Ayurveda, ethnomedicine, medicinal plant

INTRODUCTION

According to the world health organization, herbal medicine is a practice that includes herbs, herbal materials, herbal preparations, and finished herbal products, which contain as active ingredients parts of plants, or other plant materials or combinations. Herbs are derived from plant parts such as leaves, stems, flowers, roots, and seeds (1, 2). Plants were used as medicines to treat various diseases since ancient times. Various medicinal Formulations made from plant materials have been used in traditional, complementary, and alternative medicine. Ethnomedicine, which refers to the study of traditional medical practice, is an integral part of the culture and the interpretation of health by indigenous populations in many parts of the world (3).

Guava (*Psidium guajava* L.) is a very common plant in the world. Most people use it as only fruit. But many researchers have proved that *Psidium guajava* L. has many therapeutic actions *Psidium guajava* L. (family: Myrtaceae) is a medicinal plant, which has been used for centuries in Sri Lankan Traditional Medicine as well as in the Ayurveda medical system. The prime objective of this literature review is to identify the most valuable therapeutic actions, traditional uses, and phytochemistry of the *Psidium guajava* L.

Botanical Evaluation of *Psidium guajava* L.

Psidium guajava L. (Guava) is a small evergreen plant. It is a member of the Myrtaceae family that belongs to the genus *Psidium*. The genus *Psidium* includes about 150 species (4). *Psidium guajava* L. is well known by the common name Guava in English, *goyaveandgoyavier* in French, *guyabaorgoejaab* in Dutch, *guayabo* in Spanish, *posh* and *erandi* in Mexico and America, *jambubatu* in Malaya, *jamba*, *goaachchi*, *amarood*, *sapari*, *safari* in Hindi, *pera* in

Sinhala, *koyyo* in Tamil, *amrud* in Urdu, *peruka*, and *paravata* in Sanskrit (5,6).

Guava term has derived from *Arawak guayabo*, via Spanish (7). The northern part of South America, Mexico, Central America, and the Caribbean are the native counties of the *Psidium guajava* L. However, the guava plant can now be found in all the tropical counties and also some subtropical counties (8). Guava is a shrubby or small tree. It usually grows up to 1-6m in height. But occasionally can reach 10m in tall. The older stems covered light reddish brown, smooth bark that peels off in flakes. Younger stems are greenish in color (7). *P. guajava* contained a shallow root system. The trunk is 20cm in diameter and slender (6). Guava leaves grow in pairs, opposite each other. Prominent central veins and pairs of lateral veins can be seen in each leaf. The flowers are white in color and have four or five petals. The fruit is either rounded, pyriform-pear shaped or ovoid berry-egg shaped, fleshy. The mature fruits are green to yellowish in color. Seeds are yellowish kidney-shaped. (7). there are two most common types of guavas: the white - *P. guajava* var. *pyrifera* and red - *P. guajava* var. *pomifera* (9).

Table 1: Taxonomical classification of *guava*.

Taxonomical classification		References
Kingdom	Plantae	(7)
Subkingdom	Tracheobionta	(10)
Division	Magnolioph	
Class	Magnoliopsida	
Subclass	Rosidae	
Order	Myrtales	
Family	Myrtaceae	
Subfamily	Myrtoide	
Genus	<i>Psidium</i>	
Species	<i>Guajava</i>	

Study design

Data for the study were collected using relevant authentic texts as well as scientific journal articles. Authentic texts that were used for the study were prominent texts used in Ayurveda medicine and Sri Lankan indigenous medicine. Published studies reporting details regarding the biological activities, phytochemistry, and ethnomedicinal uses of *Psidium guajava* L. Primary data were collected from 15 registered Ayurvedic physicians (traditional/ Diploma/ Graduated) and 9 knowledgeable Persons by using Standard structured questionnaires about Sri Lankan varieties of *Psidium guajava* L. Secondary data were collected from authentic texts including *Charaka Samhita*, *Susruta Samhita*, *Ashtanga Hridaya Samhita*, *Ayurveda pharmacopeia*, scientific journal articles and texts related to Sri Lankan traditional medicine. The existing literature supporting the efficacy of guava had been gathered from several electronic databases, including PubMed, Google Scholar and Science direct.

Phytochemistry of *Psidium guajava* L.

Guava contains a broad spectrum of phytochemicals including minerals, enzymes, proteins, sesquiterpenoid alcohols, triterpenoid acids, alkaloids, glycosides, steroids, flavonoids, tannins, saponins. Guava is very rich in antioxidants and vitamins and also high in lutein, zeaxanthine, and lycopene. The guava leaves contain several chemical constituents such as 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, nerolidiol, 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(11). The fruit of *P. guajava* contains vitamins A and C, and some minerals like iron, calcium, and phosphorus. Manganese exists in this plant in combination with phosphoric, oxalic, and malic acids. The fruit is also rich in phytochemicals such as saponins (combined with oleanolic acid, morin-3-O- α -L-lyxopyranoside, and morin-3-O- α -L-arabopyranoside), flavonoids

(guaijavarin and quercetin). In the headspace, the reported major constituents were: hexanal, (E)-2-hexenal, (E, E)-2,4-hexadienal, (Z)-3-hexenal, (Z)-2-hexenal, (Z)-3-hexenyl acetate and phenol, while β -caryophyllene, nerolidol, 3-phenylpropylacetate and caryophyllene oxide were the major volatile constituents present in the hydro-distilled essential oil. The fruit also contains pentane-2-thiol. The leaves of *P. guajava* contain an essential oil rich in cineol, tannins, triterpenes, and flavonoids(12).

Pharmacological actions of *Psidium guajava* L.

Antioxidant activity

Recent findings revealed that *P. guajava* is an excellent source of antioxidant phytochemicals. The methanolic extract of leaves revealed high antioxidant activity. The active principles are quercetin, quercetin-3-O-glucopyranoside, morin, ascorbic acid, carotenoids, and polyphenolics. (12)

Psidium guajava is a tropical fruit, widely consumed fresh and also processed (beverages, syrup, ice cream, and jams). Jimenez-Escrig et al. 30 evaluated the pulp and peel fractions, and both showed high content of dietary fiber and extractable polyphenols. The antioxidant activity of polyphenol compounds was studied, by free radical 2, 2- diphenyl-1-picrylhydrazyl (DPPH) scavenging, ferric reducing/antioxidant power (FRAP) assay, and inhibition of copper-catalyzed in vitro human low-density lipoprotein (LDL) oxidation. All fractions tested showed a remarkable antioxidant capacity, and this activity was correlated with the corresponding total phenolic content. A 1-g (dry matter) portion of peel contained DPPH activity, FRAP activity, and inhibition of copper-induced in vitro LDL oxidation, equivalent to 43 mg, 116 mg, and 176 mg of Trolox, respectively. These results indicate that *Psidium guajava* could be a suitable source of natural antioxidants. Peel and pulp could also be used to obtain antioxidant dietary fiber (AODF), a new item that combines in a single natural product the properties of dietary fiber and antioxidant compounds(13).

Antimicrobial Activity

Different extracts of *Psidium guajava* L. leaves were tested for their antibacterial potential against *Staphylococcus aureus*, *Streptococcus mutans*, *Pseudomonas aeruginosa*, *Salmonella enteritidis*, *Bacillus cereus*, *Proteus* spp., *Shigella* spp. and *Escherichia coli*, the causal agent of intestinal infections in humans. (14)

The methanol root extract consists of quercetin and was found to be fungicidal (Gupta, Chahal, and Arora, 2014). Qa'dan et al researched to evaluate "The antimicrobial activities of *Psidium guajava* and *Juglans regia* leaf extracts to acne-developing organisms". The purpose of this study was to show the in vitro inhibitory impact of *Psidium guajava* and *Juglans regia* leaf extracts on *Propionibacterium acnes* (*P. acnes*), the major producer of acne lesions, and other organisms isolated from acne lesions. The antibacterial properties of *Psidium guajava* and *Juglans regia* leaf extracts were compared to tea tree oil (TTO), doxycycline, and clindamycin medications using the disk diffusion method (zone of inhibition). They have concluded that it can be inferred that *Psidium guajava* and *Juglans regia* leaf extracts may be useful in the treatment of acne, especially since they are anti-inflammatory (15).

In another study, aqueous and methanol extracts of the leaves are found to be effective inhibitors of growth spore formation, and enterotoxin production of *Clostridium prefringens* type A. The bark tincture showed fungicidal activity at different concentrations but exhibited only fungistatic properties in the case of *Candida albicans*. The in vitro antibacterial activity of *Psidium guajava* L. leaf extract on *Staphylococcus aureus* was possibly due to the protein degrading activity of the extracts. The active flavonoid compound –guajaverin extracted from leaves is reported to have high potential antiplaque activity (14). The aqueous extracts were more potent in inhibiting the growth of pathogenic *Proteus mirabilis*, *Streptococcus pyogenes*, *Escherichia coli*, *Staphylococcus aureus*, and *Pseudomonas aeruginosa* than the organic extracts. The gram-negative bacteria were less susceptible to the effects of the crude drugs (14).

The *Psidium guajava* L. leaf extracts have trypanocidal activity which may be attributed mainly due to the broad antimicrobial property of the flavonoids and the iron-chelating property of tannins. Four antibacterial compounds were isolated from the leaves of *Psidium guajava* and the flavonoids extracted from guava leaves were found to be active against the several strains of spoilage and food-borne pathogenic bacteria (14).

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* spp was observed. The aqueous extracts of *P. guajava* leave, 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*. The aqueous, alcohol and chloroform extracts of leaves were effective against *Aeromonas hydrophila*, *Shigella* spp and *Vibrio* spp, *Staphylococcus aureus*, *Sarcinalutea*, and *Mycobacterium phlei*. The antimicrobial activity of *P. guajava* is attributed to guajaverine, psydiolic acid, and the flavonoid compound guajaverin. The essential oil γ -terpinene and γ -pinene displayed antimicrobial activity against *Propionibacterium acnes* (12).

Anti-diarrheal activity

The leaves of *P. guajava* L. are traditionally used as an antidiarrheal medicine. This activity is explained through spasmolytic, antibacterial, and anti amoebic effects, and phytochemicals such as flavonoids and tannins have been reported to exhibit the antidiarrheal activity through denaturing protein hence forming interaction protein-tannates which reduce the intestinal mucosa permeability. Additionally, the calcium-antagonist properties of the biologically active compound namely quercetin explain the spasmolytic effect of this popular herbal remedy (12).

Antidiabetic activity

In China, guava leaves are peeled and taken on an empty stomach against diabetes. A study was conducted by Medicinal Research Laboratory, Allahabad on mice which proved that guava fruits and leaves

have the power to lower blood sugar levels when the fruit was taken without skin. Several authors have studied the inhibition of intestinal glycosides by the effects of *Psidium guajava* leaves related to postprandial hyperglycemia, suggesting a breakthrough in the treatment of Diabetes (type II). Furthermore, the high fiber in guava slows down the absorption of glucose from the gut which thereby prevents the brisk rise in blood sugar level right after a meal. In one experiment, people who drank guava tea after eating white rice; had far less blood glucose rise than people who drank plain water as a control. In addition, Guava (both fruit and leaves) seems to lower fasting sugars as well. Based on a study, of people with Type 2 diabetes, those who drank guava leaf decoction with every meal for 3 months had lower fasting blood glucose levels than before the experiment (16).

Beidokhti et al researched "Evaluation of the antidiabetic potential of *Psidium guajava* L. (Myrtaceae) using assays for α -glucosidase, α -amylase, muscle glucose uptake, liver glucose production, and triglyceride accumulation in adipocytes". The inhibitory activities against yeast α -glucosidase and porcine α -amylase were determined using a dilution series of ethanolic extracts of *P. guajava* L. leaves and bark. *P. guajava* L. bark extract was found to be an effective α -amylase inhibitor. Furthermore, *P. guajava* L. leaf extract increased glucose absorption in muscle cells, while both leaf and bark extracts increased triglyceride content in cultured adipocytes. Leaf and bark extracts from *P. guajava* L. could theoretically be used to treat type 2 diabetes (17).

Shen et al conducted research to evaluate the "Effect of guava (*Psidium guajava* Linn.) leaf soluble solids on glucose metabolism in type 2 diabetic rats". This study looked at the effects of guava (*Psidium guajava* L.) leaf aqueous and ethanol soluble solid extracts on hypoglycemia and glucose metabolism in type 2 diabetic rats. In diabetic rats, acute and long-term feeding studies revealed a considerable drop in blood sugar levels. The investigations supported the anti-hyperglycemic impact of guava leaf extract as well as the health function of guava leaves in the prevention of type 2 diabetes (18).

Ethnomedicinal indications of *Psidium guajava* L.

Various ethnomedicinal uses of *Psidium guajava* L. as gathered as mentioned in numerous articles and books related to Sri Lankan Traditional Medicine and Ayurveda medicine. Traditionally, preparations of the leaves have been used in folk medicine in several countries, mainly as an anti-diarrheal remedy. Moreover, other several uses have been described elsewhere on all continents, except Europe. Depending upon the illness, the application of the remedy is either oral or topical. The consumption of decoction, infusion, and boiled preparations is the most common way to overcome several disorders, such as rheumatism, diarrhea, diabetes mellitus, and cough, in India, China, Pakistan, and Bangladesh, while in Southeast Asia the decoction is used as a gargle for mouth ulcers and as anti-bactericidal in Nigeria. For skin and wound applications, a poultice is externally used in Mexico, Brazil, the Philippines, and Nigeria. In addition, chewing stick is used for oral care in Nigeria. Depending upon the illness, the application of the remedy is either oral or topical.

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In China, guava leaves are peeled and taken on an empty stomach against diabetes. The alkaline nature of Guava leaves gives a very good response against hyperacidity of the stomach. Still today, it has also been found that in most the villages, Guava tea is prepared by adding 10-15 numbers of young Guava leaves, boiled in 3- 4 cups of water, and the warm concoction was made to drink to get rid of acidity.

From time immemorial, Guava leaves have been used extensively on the wound in the history of mankind. Guava leaves were made into a paste by grinding with little water or oil and the same was applied to the wound surface by ancient people of India and China.

In Latin America, Central and West Africa, and South East Asia, the leaves are also used in the form of decoction as a gargle for sore throats, laryngitis, and swelling of the mouth, and it is used externally for skin ulcers, vaginal irritation, and discharge(14). Therapeutic indications were found in most of the Ayurveda authentic texts and Sri Lankan traditional medical texts. According to the traditional medical text, *Patyaksha Cikitsa Hevat Athdutu Wedakam* had mentioned that leaf juice of guava with bee honey can be used for Mushrooms toxic and squeezed juice of Chopped and build guava with bee honey can be used for Manioc (*Manihot esculenta*) toxic (19). Also, fresh juice of guava leaves (*Psidium guajava L.*) can be administrated for Cannabis toxic, Guava leaf porridge (*Kanda*) with bee honey can be used for Opium toxic (19)

According to the traditional medical texts “Traditional Lifestyles of Sri Lanka Popular Remedies” has been mentioned that *guava (Psidium guajava L.)* leaves paste individually / with turmeric and cool water / with *Aralu piti* can be applied for *aluham (Sidma kushta)* condition (20).

In traditional medical texts, *Ath Beheth* has mentioned that guava (*Psidium guajava L.*) paste with cool water can be applied for *Aluham (Sidma kushta)* condition (21).

The data gathered from qualified traditional and Ayurveda physicians in Sri Lanka revealed that most of them used guava for *Aluham (Sidma kushta)* disease condition. Remedies include, Guava leaves grinding with turmeric and applying to the affected area before bath, Guava leaves grind with lemon juice and apply to the affected area before bath, leaves grind with water and applying the paste on the affected area before bath, the dry guava leaves powder to apply on the affected area. The second most prominent disease condition was *madhumeha* (Diabetes). for that guava decoction could be used, Guava leaves should be soaked in a glass of water and kept for 1 night and it can be drink in the morning. The fruit of guava consider a *Pathya* diet for diabetes and is also known as a good source for gain vitamin c. In traditional medicine, guava leaves were the most common

part of usage. There are many applications such as for *charma roga* (eczema or rashes due to allergies) and bleeding conditions leave paste could be applied to the affected area. For Dandruff conditions, a Paste of guava leaves with *Veralu* leaves (*Elaeocarpus serratus*) could apply to the scalp before bath. Paste of Grind guava leaves with *Maduruthala (Ocimum tenuiflorum)* *Beheth anoda (Abutilon Indicum L)* could be applied for the wound healing process. Guava leaves could be added to *vata shamana thawili pottali* (fomentation) for edematous conditions.

Guava leaves with fresh coriander decoction used for *Amlapitta* Porridge (*kanda*) of guava *Panchangaya* also used for the same disease condition. Porridge (*kanda*) of guava Leaves is used to enhance platelet count.

Boiled decoction of guava leaves with coriander was used for fever and for Gum disorders boiled guava bark and leaves could be used as *Kavalagraha* (gargle).

Ayurveda properties of *Psidium guajava L.*

Data were gathered from authentic ayurvedic texts such as *Charaka Samhita, Susruta Samhita, Ashtanga Hrdaya Samhita*, and *Ayurveda pharmacopeia III* (Table 2).

DISCUSSION

According to the total analysis of primary data *Psidium guajava L.* was commonly used for *Aluham (sidma kushta)* condition with a percentage of 58%. 29% were used for *madumeha* ((diabetes), and 17% were used for dandruff conditions. 13% used as vitamin C source and *vishahara*(detoxication) drug According to the analysis of primary and secondary data considering the usage of a plant part, 73% used guava laves .19% used guava fruit and 5% used root bark.

Psidium guajava L. has been in use for centuries in traditional medical systems. In this study, an attempt was made to collect and analyze available information on phytochemistry, ethnomedicinal uses, and biological activities of the *Psidium guajava L.*, and to explore the Ayurveda and traditional medical aspect,

especially in Sri Lanka with the related biological activities.

Data of the study revealed that traditionally *Psidium guajava* L., widely used for treating a number of diseases rather than a specific disease, has shown to possess a range of different biological activities. In this regard, ethnomedicine applications of *Psidium guajava* L. leaves have been verified by several research over the last decade against many disorders, demonstrating its potential in the treatment of the most common worldwide diseases. According to the traditional and Ayurveda literature most prominently leaves of guava are used for treating skin infections. In addition, the effects of the leaves have been related to individual compounds such as quercetin, catechin, vescalagin, gallic acid, pentaoxide, hyperoside, isoquercitrin, and guaijaverin. (3). The data gathered from the survey revealed that in traditional medicine mostly guava laves had been used for fungal infections in the skin.

Psidium guajava L. can be used as an alternative antibacterial agent to treat various bacterial infections. Despite many important bioactive phytochemicals present in *Psidium guajava* L., Different pharmacological and phytochemical studies about *Psidium guajava* L. indicate that this plant has significant antibacterial potential as it is rich in bioactive constituents. (26) Results of the study show that guava (*Psidium guajava* L) has Antioxidant, Anti-diabetic, Antibacterial, Anti-diarrheal, Analgesic & anti-inflammatory, Anticancer, Antihypertensive, Antifungal, Antipyretic and high nutritional value (27).

CONCLUSION

Psidium guajava L. is one of the most useful and important medicinal plants used in traditional medicines to treat various diseases. In this study, it is concluded that *Psidium guajava* L. contained many important bioactive phytochemicals and these were very important to treat various kinds of diseases also this plant contains the most efficient, antimicrobial agents and can be used for the synthesis of various antimicrobial drugs against pathogens. Therefore, it is im-

portant to reveal the detailed mechanism behind traditional remedies and phytochemical and therapeutic activities of *Psidium guajava* L.

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Table 2: Ayurveda properties of *Psidium guajava* L. according to authentic texts

Reference	Rasa	Guna	Virya	Dosha	Other
(22)	1)Madura 2)Amla	Guru Guru	Sheeta Ushna	-	Two varieties of <i>paraavata</i> fruits, one is sweet and cooling, and the other is sour and hot. It must be known to be <i>guru</i> and curative of anorexia and excess of digestive fire.
(23)	1)Madura 2)Amla	Guru Guru	Sheeta Ushna	-	<i>Paalevata</i> /guava fruit is of two types. Viz. one having <i>Madura rasa</i> contain <i>sheeta virya</i> whereas other having <i>amla rasa</i> contains <i>ushna virya</i> . Both are having <i>guru guna</i> and are useful to increase the taste perception as well as to cure the diseases caused due to the excessive digestive fire.
(25)	Madura	-	-	Vata Shamaka	The fruit known as the <i>paraavata</i> is sweet and relishing, and it destroys the <i>vayu</i> and a voracious appetite.
(24)	Madura, Kashaya	Guru, Snigda	Sheeta Vipaka - Madura	Tridosha shamaka	<i>Rochana, Vishtamba, Stambana</i> properties

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