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PsidiumGuajava Linn Review: A plant of multiple therapeutic properties

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ABSTRACT:-
Guava has a variety of nutritional and medicinal properties. Depending on the species, the fruits are circular or oval in shape and range in length from 4 to 12 cm (red, strawberry, and off-white). Myrtaceae is a family of tropical and subtropical plants that are primarily grown in tropical and subtropical regions. The pink variety of guava (when dissected) has the best medicinal value. Antidiarrhoeal, antihypertensive, antilipedemic, anticancer, and other health benefits can be found in both fruits and leaves.The discovery of new bioactive substances originating from ethnomedicine is gaining popularity these days. Guava (Psidiumguajava L.) leaf preparations have long been used to treat a variety of ailments.Pharmacological research in vitro and in vivo has been widely used to demonstrate the potential of leaf extracts for the co-treatment of a variety of ailments with high prevalence around the world, bolstering traditional medicine in cases such as diabetes, cardiovascular disease, cancer, and parasitic infections. Furthermore, the biological activity has been linked to the bioactive composition of the leaves, certain phytochemical subclasses, and even individual molecules. Guava leaves contain phenolic chemicals that have been linked to blood glucose regulation.The goal of this review was to consolidate results from in vitro and in vivo investigations on guava leaves conducted over the previous decade, linking the effects to therapeutic applications in order to focus future research on finding individual bioactive components. Some dietary uses (guava tea and aquaculture additional feed) are also mentioned, as well as clinical, in vitro, and in vivo outcomes.

KEYWORDS: Psidiumguajava therapeutic propertiesPsidiumguajava L. (guava) leaves, traditional medicine, in vitro, in vivo, phenolic compounds, pharmacology

I. INTRODUCTION:-

Nature has endowed many vital nutrients to Guava (Psidiumguajava) (1). Guava is thought to have originated in South Africa for economic purposes before being transported to India by the Portuguese (2). Guava is a popular fruit in Asian countries, but it has expanded its territory in Western countries due to its therapeutic advantages (3). It's a one-of-a-kind situation. It belongs to the Myrtaceae family and is a tiny tree (4). As long as the tree is maintained moist, it may be cultivated in any soil (5). Climates that are tropical or subtropical predominate. India is currently the world's leading guava producer (6). China, a neighbouring country, came in second. The size of guava fruits varies from 4 to 12 cm (1.6 to 4.7 in) It could be long, round, or oval, depending on the situation (7). Ethnomedicine, or the study of traditional medical practise, is an important aspect of indigenous communities' culture and perception of health in many regions of the world(8). Indian Ayurveda and traditional Chinese medicine, for example, are two of the most lasting folk remedies still practised today (9). These systems use therapies based on the utilisation of indigenous medications of natural origin(3) to increase health and improve quality of life. Given the widespread usage of plants as herbal remedies, a variety of methodologies are now being used to find new bioactive compounds (5). Guava (Psidiumguajava L.) is a tiny tree that belongs to the myrtle family (Myrtaceae) (7). Guava trees have been planted in many other places with tropical and subtropical climates, allowing production all over the world(4). They are native to tropical areas from southern Mexico to northern South America. Preparations of the leaves have traditionally been

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employed in folk medicine in a number of countries, primarily as an anti-diarrheal treatment (2). Furthermore, a variety of other uses have been described elsewhere on all continents, with the exception of Europe, which summarises the primary traditional uses of guava leaves in the major producing countries (6). The medicine is either taken orally or applied topically, depending on the disease (7). In India, China, Pakistan, and Bangladesh, decoction, infusion, and boiled preparations are the most prevalent treatments for rheumatism, diarrhoea, diabetes mellitus, and cough, while in Southeast Asia, decoction is used as a gargle for mouth ulcers and as an anti-bactericidal in Nigeria(3). Poultice is used externally for skin and wound applications in Mexico, Brazil, the Philippines, and Nigeria(4). Furthermore, in Nigeria, a chewing stick is used for oral hygiene (5).

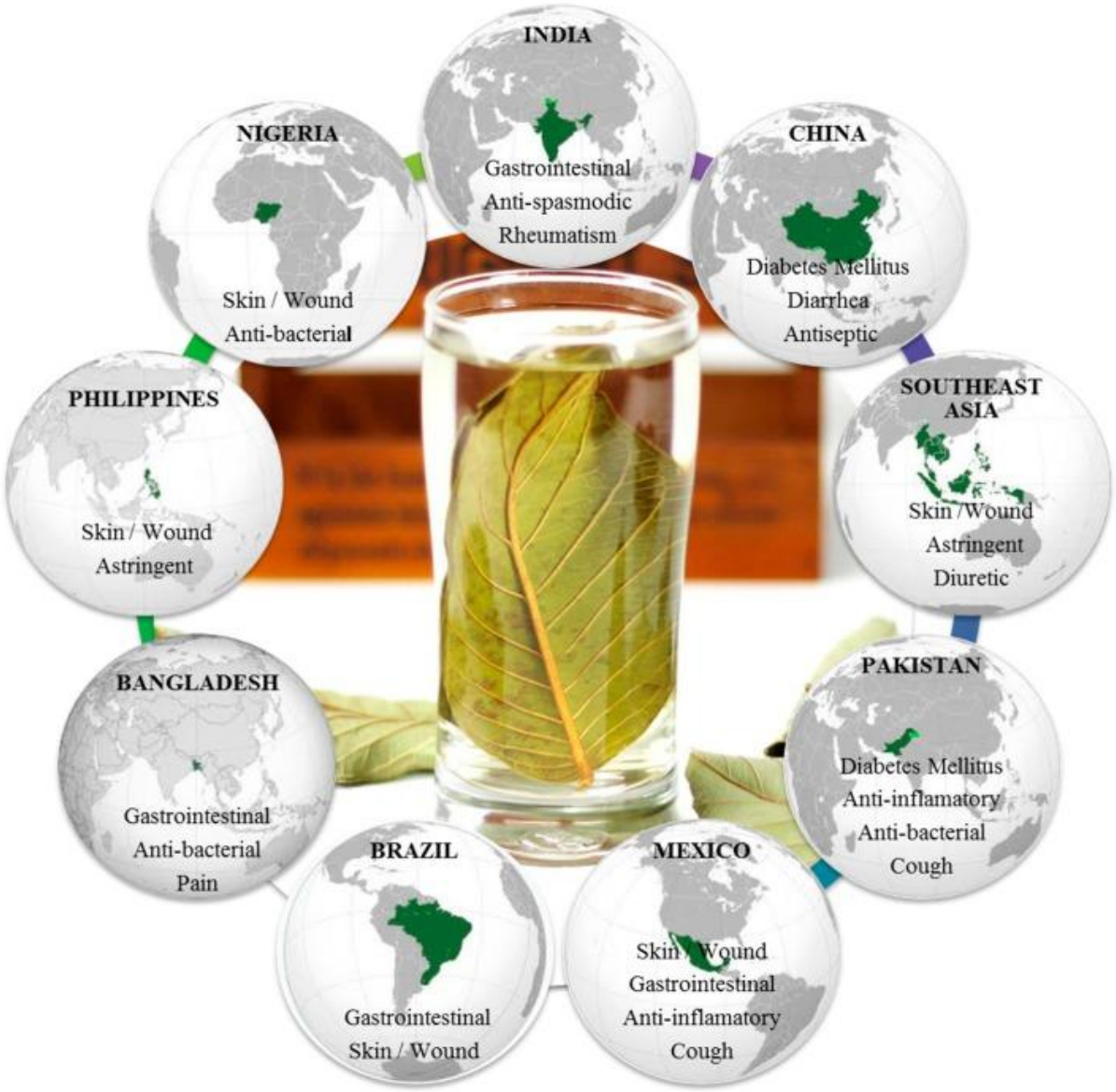

Figure 1
Main traditional uses of guava leaves in the principal producer countries.

Plants are currently attracting more attention for their chemical components of bioactive substances, their influence on a variety of ailments, and their application for human health as functional foods and/or nutraceuticals(6). Because guava leaf phenolic compounds have been claimed to be food for specified health use (FOSHU) because they have beneficial health effects related to the modulation of

blood–sugar level(7), guava leaves tea and some complementary guava products have been available in several shops in Japan as well as on the Internet in recent years. The goal of this review was to describe the biological activities examined in the last decade on P. guajava L. leaves in vitro and in vivo, and to relate them to the World Health Organization's international categorization of disorders. Furthermore, the positive effects of several guava leaf treatments have been investigated (7). A complete assessment of the literature from 2004 to 2016 was conducted for this purpose, while more recent research were also included (10). They were compiled using peer-reviewed publications, websites, books, and databases such as "Scopus," "Google Scholar," "PubMed," and "ScienceDirect" (6). Terms including "Psidiumguajava," "guava," "leaves," "in vitro," "in vivo," "clinical," "trial," "food application," and those connected to diseases like "bacteria," "cancer," "blood," "glycemia," and "oral," among others, were matched in the search to guarantee that relevant works were included (4). Only full works published in English, Spanish, and Portuguese were considered for inclusion (5).

Phytochemical Study:-

Botanical classification of Psidiumguajava.

Table 1

Botanical classification

Kingdom	**Plantae - Plants**
Subkingdom	**Tracheobionta Vascular plants**
Superdivision	**Spermatophyta Seed plants**
Division	**Magnoliophyta Flower plants**
Class	**Magnoliopsida Dicotyledonous**
Subclass	**Rosidae**
Order	**Myrtales**
Family	**Myrtaceae**
Subfamily	**Myrtoideae**
Tribe	**Myrteae**
Gender	**Psidium**
Species	**Psidiumguajava**

Source: https://www.botanical-online.com/english/guava_characteristics.h

Apart from the fruit, guava leaves provide a number of health benefits, including cancer prevention, blood pressure regulation, diarrhoea treatment, and gastrointestinal issues relief, to name a few(1). It also aids in weight loss, skin tonicity, and treatment.Cough and cold, constipation, diarrhoea, and scurvy are all symptoms of scurvy(2).The most prevalent guava varieties found in the United StatesApple guava, cherry guava, and strawberry guava are all available in the world. In the summer, it's mostly eaten uncooked(3).Consumes in ripened or semi-ripened form or as juices(4). This well-known fruit is a factory.Table 1 depicts the distribution of nutrients quite effectively(5). This review explainsGuava's possible health benefits and its leaves(1).

Table 2

Nutritional Value Per 100 G Of Guava Fruit

Energy	**285 kJ (68 kcal)**
Carbohydrates	**14.32 g**
Sugar	**8.92 g**
Dietary fiber	**5.4 g**
Fat	**0.95 g**
Protein	**2.55 g**
Vitamin A	**equiv. 31 µg**
beta-Carotene	**374 µg**
Thiamine (B1)	**0.067 mg**
Riboflavin (B2)	**0.04 mg**
Niacin (B3)	**1.084 mg**
Pantothenic acid	**0.451 mg**

Vitamin B6	**0.11 mg**
Folate (B9)	**49 µg**
Vitamin C	**228.3 mg**
Vitamin K	**2.2 µg**
Iron	**0.26 mg**
Magnesium	**22 mg**
Manganese	**0.15 mg**
Phosphorus	**40 mg**
Potassium	**417 mg**
Sodium	**2 mg**
Zinc	**0.23 mg**
Lycopene	**5204 µg**

Nutritional Information:-

Guava Fruit consists of 285 KJ energy, Carbohydrate, Sugar,DietaryFiber, Fat, Protein, Vitamin A, Beta Carotene, Thiamine(Vit-B1), Riboflavin (B2), Niacin(Vit-B3), Pantothenic Acid(Vit-B5), Vit-B6,Vit-B9, Vit-C, Vit-K, Iron, Magnesium, Manganese, Phosphorous, Potassium, Sodium, Zinc, Lycopene(6).

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Pharmacological Activity:-

1. Laxatives:-

Both the fruits and leaves of the guava tree contain enough dietary fibre to help with constipation(7). Fiber content is higher in newer tender leaves.Roughage is important for the prevention and treatment of disease(4).Constipation and haemorrhoids are both treated with this medication(1). As previously stated, the guava fruit contains 36 gram of dietary fibre per 100 gram fibres in the diet (6).Guava seeds, on the other hand, are a potent laxative(5).In addition, it aids in intestinal cleansing and chronic constipation(3).The fruit is high in dietary fibre and low in sugar(2).Vitamin C is abundant in this fruit, especially when compared to other fruits(5).One guava provides around 12% of the daily required amount of fibre intake, which contains a lot of fibre, which is great for diabetes individuals(6).

2. Problems associated with oral cavity:-

Plaques on the teeth are the main cause of periodontitis, as plaques that are left unattended lead to gingivitis and periodontitis(7).A few of the most common pathogens Aggregatibacteractinomyce, Fusobacteriumtemcomitans,
Porphyromonasgingivalis, Prevotella intermedia and nucleatum are the bacteria that cause periodontitis(1). Guava is high in antioxidants(5).Concentration of quercetin, which has been shown to have incredible antibacterial activity against such pathogens(8). Quercetin's probable mechanism in periodontitis could be related to cell membrane rupture and inactivation of important enzymes.by creating irreversible compounds with the protein in susceptible Microbes that are sensitive(7) . Extract of guava without damaging the Homeostasis of the mouth cavity protects against oral plagues(5). In addition, As a result, it prevents microorganisms from adhering to the mouth cavity thus preventing the epidemic from spreading farther and The second most prevalent concern with the buccal cavity is there gum bleeding (scurvy)(1). Guava's vitamin C concentration.is extremely high; in fact, guava has been said to contain as much as 4 times the amount of vitamin C than orange, making it a healthy candidate for scurvy treatment(6). Because of its astringent properties, it can also be used to treat toothaches and ulcers(1). To get immediate relief from toothache, the leaves are chewed directly(3). Due to the folate content in guava leaves, bad breath can also be controlled(8). As a result, guava is an excellent remedy for treating oral cavity problems(5).

Some Oral Cavity Related Problems:

Some of the most common diseases that impoact our oral health include

1. **Cavities(tooth decay),**
2. **Gum(Periodental) disease,**
3. **Oral Cancer**
   More than 40% of adults report having felt pain in their mouth within the last year, and more than 80% of people will have had at least one cavity by age 34(7)**.**

3. Antidiabetic activity:-

Guava leaves are peeled and consumed on an empty stomach in China to combat diabetes(1). The Medicinal Research Laboratory in Allahabad conducted a study on mice(5).

Guava fruits and leaves have been shown to have the ability to lower blood sugar levels when the fruit was eaten without the skin (9). The inhibition of intestinal motility the effects of Psidiumguajava leaves on glycosidaseshas been studied by a number of authors suggesting a breakthrough reated to postprandial hyperglycemia in the treatment for Diabetes (type II)(2). Moreover, the elevatedGuava fibre reduces the rate at which glucose is absorbed from the gut(1).As a result, the rapid rise in blood sugar levels is prevented after a meal is the best time to do it(5). Guava tea was consumed in one experiment after eating white rice, the blood glucose level rose much less than it did after eating brown rice, as a control group, people who drank only ordinary water(8). Guava (both the fruit and the leaves) also appears to lower fasting glucose(1). According to a study, patients with Type 2 diabetes, who for three months drank guava leaf decoction with every meal, their fasting blood glucose levels were lower than before the experiment(5).

4. Guava for cough & cold:-

Guava leaves have been discovered to be useful in the treatment of colds.as well as cough(3). Guava contains a lot of ascorbic acid and iron(5).As a result, it lowers mucus development and congestion in the lungs while also keeping the respiratory tract clear of any pathogen that isn't friendly(8). According to reports, Guava's components work like a miracle in the treatment of influenza(10). Fruit, especially raw fruit, or a decoction produced from tender young leaves, might help relieve colds and coughs(2). It acts by causing the polymers in mucus to disintegrate(6).Keep coughing to a minimum and mucus production to a minimum,clear of germs in the respiratory tract, throat, and lungs free of microbes(4). Due to its astringent properties, it limits existing microbial activity(7). Guava contains a high

quantity of vitamin C, which has been shown to be useful in curing colds and coughs caused by germs or viruses(5). Ripe roasted Guava is used as a natural treatment for severe cases of cough, cold, and congestion are common in many Indian communities(8). Psidium hydro extract, Coughing was greatly reduced according to another report when compared to the one caused by capsaicin aerosol control, within 15 minutes of extract delivery(10).

5. Antibacterial activity:-

Antibacterial activity has been found in guava extracts against both Gram-positive and Gram-negative bacteria(3). In vitro Evaluation of the effects of an aqueous mixture and a water soluble substance guava leaf and bark methanol extract against Vibrio cholerae was discovered to be multidrug-resistant and to have Antibacterial activity is considerable(4) . They came to the conclusion that this plant has the potential to control cholera epidemics(5). For this reason, Villagers usually avoid treating infections in youngsters by marketed medicines& prefer Natural cures such as guava are preferred over market pharmaceuticals to be chewed and swallowed leaves (young and sensitive ones)(7).Guava extract has been demonstrated to be effective against E. coli, which is resistant to the majority of contemporary antibiotics currently on the market(10). Guava leaf extract has a lot of health benefits against intestinal bacteria, Vibrio cholera, cholera causative organism(6).As a result, guava leaf extract can be used When it's difficult to find the medication of choice(1). The antibacterial efficacy of essential oils and methanol, hexane, and ethyl acetate extracts from guava leaves was investigated, with the extracts being tested against a variety of microorganisms, including Salmonella spp., Staphylococcus aureus, and Escherichia coli. The extract had the best results out of all the bacteria examined(1).Methanolic extract has an antibacterial action against Staphylococcus aureusshowed the most bacterial growth inhibition(2).

6. Anticancer activity:-

Lycopene, an antioxidant abundant in Guava, plays a critical function in cancer prevention and treatment(5).Breast cancer and prostate cancer are the two cancers that respond the most(4).The Red flesh (when dissected) Guava has a higher concentration of lycopene When compared to the other types(2). Lycopene affects the body in a variety of ways, scavenging free radicals and preventing additional production of free radicals(7). According to numerous studies, watery Guava budding leaves extract has anti-prostate cancer properties(6). They were tested in a cell line model and found to be promising prostate cancer agent that is anti-androgen sensitive(10). Guava also has a high content of carotene, which is believed to protect against lung and oral malignancies(4).

7. Antihypertensive & Hypolipidemic:-

Guava is highly useful for the treatment of hypertension,hyperlipidemia and heart disease(4). It also contains someamount of potassium which helps to relax blood vessels andthus helps in controlling blood pressure(4). It has been found thatconsuming guava fruit on daily basis results in significantreduction in Blood pressure and blood lipids owing to higherpotassium and fibers in the fruit(10). Guava enhances heart health and prevents stroke by decreasing cholesterol and managing excessive blood pressure, thanks to the presence of a moderate amount of potassium(3).

8. Antacid & ulcer protectant activity:-

Guava leaf's alkaline nature provides a powerful antidote to stomach hyperacidity(6). Guava tea is still brewed in most areas today, according to research by adding 10-15 fresh Guava leaves, cooked in 3 quarts of water(5). The warm concoction is ready to drink with 4 cups of water toget rid of the acidity in your body(3). The methanolic extract solvent had the best antacid and ulcer healing property in vitro(6). The flavonoids and saponins present in Guava fruit and leaves have been discovered to be useful in preventing acidity and its consequences(9).Stomach ulcers are a type of stomach ulcer(2). Psidiummethanolic extractdosages of guajava leaves: 500 and 1000 mg/kg body weightresulted in a significant reduction in the ulcer index of ethanol-induced ulcers in the stomach of wister rats(5).

9. Antiallergy:-

The results of studies on methanol and aqueous extracts of Psidiumguajava leaves showed that they inhibited histamine release from mast cells and prevented it(5).T regulatory (Tr) cells are induced in vitro by IL-10 from C57BL/6 mice's CD4+ splenocytes in mice(6). The extracts shifted the Th1/Th2 balance to a Th1 dominant status, byTr cell activity is immediately inhibited(3). Tr cell activity. Extracts of guava leavesreduced the allergic reactivity in mice mediated by T cells(7) .

- **Toxicity Regarding PsidiumGuajava:-**

Similarly, the methanol extract of the peel of its fruit has promising *in vitro* activities against MCF-7 cells of human breast cancer(6). The

methanolic bark extract of *P. guajava* revealed considerable cytotoxic activity against CEM/ADR5000 cells with a 50% inhibitory concentration (IC50) of 1.29 μg/mL, against HCT 116 cells (p53+/+) with an IC50 of 18.63 μg/mL, and against several other sensitive and resistant cells with IC50 values up to 62.64 μg/mL (towards MDA-MB-231 cells)(2).However, plants in addition to their effectiveness must be free of harmful side effects for the consumer because the main criterion for the selection of medicinal plants is above all safety(7). But the literature reveals that existing plant efficacy data are far more abundant than those for toxicity(3). In this regard, various literature offer insufficient information on the toxicological effects related to the use of *P. guajava* extracts(5). It is therefore imperative to obtain more toxicological data from this plant in order to ensure its safety vis-à-vis humans and especially for the developmeIn females, the liver appeared normal at doses 250 and 500 mg/kg b.w., but at the dose 1000 mg/kg, there was inflammation (infiltration of leucocytes).nt of new drugs(10).

II. CONCLUSION

The extensive use of allopathic drugs in the treatment andprevention of diseases has led to the rapid development ofdrug resistance. Drug resistance is one of the leading cause of failure in drug therapy. Amongst all, drug resistance isfrequently encountered during antimicrobial therapy.However, the development of resistance in case of naturaltherapy or Ayurvedic therapy is very rare which encouragedpeople to switch from allopathic to Ayurvedic therapy.However, the active ingredient is very difficult to extract fromthe crude natural compound which becomes a huge challengefor the researchers for which simplified method has to bedeveloped. The use of natural therapy in the treatment andprevention of disease is not only safe, easily available but iseconomical as well. Presently, even physicians or practionersare looking for alternative treatment of medicine for curingvarious diseases, so importance must be given to developmentof traditional herbal medicine from natural resources.The widespread use of allopathic medications for disease treatment and prevention has resulted in the rapid emergence of new diseases resistance to drugs One of the most common causes of cancer is drug resistance, Drug therapy has failed. Drug resistance is the most serious of them all.This is a common occurrence during antimicrobial therapy.However, in the event of a natural disaster, the building of resistance is important.Therapy or Ayurvedic therapy is quite uncommon, which is why it is advocated.Ayurvedic medicine should be used instead of allopathic medicine.However, extracting the active component is quite challenging.The crude natural substance that poses a significant issuefor the researchers that require a simplified wayconstructed. Natural therapy is not only safe and easy to obtain, but it is also cost effective in the treatment and prevention of disease. Physicians and other practitioners are now included in this category are looking for a different type of medicine to cure themnumerous disorders, hence development must be prioritised of natural resources for traditional herbal medicine.

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