

Psidium guajava It's Botanical Description, Phytochemistry, Pharmacological Activities and It's Role in Antiulcer Activity

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ABSTRACT

Psidium guajava L., commonly known as guava, is a widely distributed tropical and subtropical plant belonging to the family Myrtaceae. It has been traditionally used in folk medicine for the treatment of a variety of ailments, particularly gastrointestinal disorders. This plant has attracted considerable scientific interest due to its rich phytochemical profile and broad pharmacological properties. The present review aims to provide a comprehensive overview of the botanical characteristics, chemical constituents, pharmacological activities, and specifically the antiulcer potential of *Psidium guajava*. Botanically, *P. guajava* is a small tree or shrub characterized by oval leaves, white aromatic flowers, and edible fruits. Phytochemical investigations reveal the presence of a wide array of bioactive compounds such as flavonoids (quercetin, kaempferol), tannins, essential oils, saponins, and phenolic acids, especially concentrated in the leaves and fruits. These constituents contribute significantly to the plant's antioxidant, anti-inflammatory, antimicrobial, antidiabetic, hepatoprotective, and anticancer activities. One of the most promising pharmacological attributes of *P. guajava* is its antiulcer activity. Preclinical studies demonstrate that guava leaf extracts exert protective effects in various experimental ulcer models, including ethanol- and NSAID-induced ulcers. The underlying mechanisms involve antioxidant defense, inhibition of gastric acid secretion, enhancement of mucus production, and suppression of inflammatory mediators. Additionally, antimicrobial activity against *Helicobacter pylori*, a key pathogen in ulcerogenesis, further supports its antiulcer potential. Overall, *P. guajava* emerges as a valuable natural resource with multifaceted therapeutic potential. Its antiulcer effects are well-supported by traditional use and experimental evidence. Further clinical validation and standardization of formulations are warranted to facilitate its development as a complementary or alternative treatment for gastric ulcers.

Keywords- *Psidium guajava*, Phytochemistry, pharmacological activity, antiulcer activity.

I. INTRODUCTION

Medicinal plants, their use as therapeutic agents, go back to ancient civilizations and constitute the cornerstone of

traditional healthcare systems across the globe. Out of the many medicinal plants, *Psidium guajava* L. (guava), commonly known is one among the important plant which has been contributing for medicinal importance in ethnomedicine with its wide spectrum of therapeutic

properties. *P. guajava* is a tropical and subtropical plant of the family Myrtaceae which is native to Central America, but extensively cultivated nowadays in Asia, Africa and Latin America. Its economic value, nutritional content and medicinal application causes the popularity of it[1].

Traditionally, guava has been used for a variety of conditions, primarily ones that affect the gastrointestinal (GI) tract. Guava leaves, fruits, bark and roots have been used to folk remedies for diarrhoea, dysentery, stomach ache and ulcers. Due to this traditional wisdom, scientific investigation on its phytochemical constituents and pharmacological properties have confirmed many of the therapeutic claims made for the plant. In recent decades there is growing interest in herbal and natural remedies and *P. guajava* was selected as a subject of research due to its potential as a source of natural bioactive compounds which have a broad spectrum of potential health benefits[2].

P. guajava is a small tree or a large shrub botanically defined by characteristic elliptical leaves, white flowers and round or pear shaped fruits. Climatic conditions and soil types are very wide where the plant grows well and the plant is one of the most commonly cultivated fruit trees in tropics and warm south. Although used for centuries as a source of food, eaten fresh or in processed form (as juices, jams and jellies), the leaves of *Mirtus communis* have always been the most investigated in phytomedicine because of their high content of phenolic compounds, flavonoids and essential oils[3].

P. guajava is a reservoir of bioactive compounds, phytochemically. Quercetin, kaempferol and rutin, tannins (gallic and ellagic acids), essential oils (eucalyptol), saponins, alkaloids, carotenoids constitute the leaves which are rich in flavonoids. Besides, contains lycopene, beta carotene and other antioxidants along with being a rich source of dietary fiber and vitamin C. These compounds are responsible for the wide variety of the pharmacological actions of the plant such as antioxidant, antimicrobial, anti inflammatory, antidiabetic, hepatoprotective and anticancer[4-6].

Of all the pharmacological applications of *P. guajava* antiulcer activity is of great importance. Peptic ulcer disease is still one of the most common and recurring gastrointestinal disorder affecting the mucosa of the stomach and the small intestinal tract, caused by the over-activity or decrease of factors that provide protection to the mucosa (such as mucus secretion, bicarbonate, prostaglandins and adequate blood flow) in relation to the over-activity of aggressive factors triggered or not by *H. pylori* infection, NSAIDs and gastric acid and pepsin[7]. Standard ulcer pharmacological treatments such as proton pump inhibitors (PPIs), H₂ receptor antagonists and antibiotics, while effective, are also faced by these same burdens: side effects, drug resistance and reemergence of

symptoms. Following this, a renewal of interest in plant based therapy, that would give gastroprotection showing less side effects has been sparked[8].

In this respect, *P. guajava* has been introduced as a potential candidate for natural ulcer therapy. Resulting studies in guava leaf extracts have shown antiulcer activity in different animal models. These effects are largely believed to be due to flavonoids and tannins which are antioxidants and anti inflammatory. These compounds counteract reactive oxygen species (ROS) and reduce lipid peroxidation and also may modulate cytokine production. In addition, guava leaf extracts have the property of increasing the protective mucus barrier in the stomach, decreasing the gastric acid secretion and increasing the mucosal blood flow which are important in ulcer healing and prevention[9].

The antimicrobial activity of *P. guajava* on *H. pylori*, a Gramnegative bacterium linked strongly to the pathogenesis of peptic ulcers and gastric carcinoma makes it another notable aspect of the anti ulcer potential of the plant. According to studies, guava leaf extract inhibits the growth of *H. pylori* which is one of the main root causes of chronic gastritis and an ulcer recurrence. The antibacterial efficacy coupled with the gastroprotective mechanisms renders *P. guajava* as an effective multi functional agent in ulcer management[10].

Besides aforementioned antiulcer effects *P. guajava* exhibits a high safety margin in toxicological studies. Guava leaf extract showed not to cause any significant side effects in acute and subacute toxicity studies in animal models. Lastly, its non toxic nature and extensive traditional use makes it validly use in modern herbal formulations and nutraceutical products[11].

However, the use of *P. guajava* in clinical settings is limited despite its vast potential because of no standardized preparations, variable phytochemical content and lack of clinical investigations. Its therapeutic promise has been well documented in in vitro and in vivo studies and its further research might form the basis for development of novel, plant based antiulcer medications[12].

Psidium guajava is a medicinal plant of great therapeutic value for which its use in traditional medicine is widely validated and is being also validated by modern pharmacological research. The broad spectrum of biological activities are underpinned by its rich phytochemical composition and considerable antiulcer potential has been noted. The purpose of this review is to obtain a complete description of *P. guajava* showing its botanical description, phytochemical profile, pharmacological actions, but specially reviewing its mechanisms of action against gastric ulcers prevention and treatment. This work attempts to consolidate current findings to underscore the relevance of *P. guajava* for phytotherapeutic application and stimulates further investigation into *P. guajava's* clinical efficacy and safety[13-15].

II. PLANT PROFILE

2.1. Scientific classification

Table.1: Taxonomic classification of *Psidium guajava*

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

2.2. Botanical description

Guava (*Psidium guajava* L.) is a small tree or large evergreen shrub growing to 3–10 m in height. The bark of the plant has a smooth, thin bark which, in most cases, is copper brown and it peels in thin flakes, exposing greenish sub layer[16]. Leaves are ovate to elliptical, opposite, simple and 5 to 15 cm long. Prominent lateral veins characterize them and they give a characteristic aromatic scent when to crushed. The flowers of *P. guajava* are large about 2–3 cm in diameter, fragrant and bisexual with white colour. Singly or in small clusters, they are marked by many stamens. The fruit is a berry which takes shape ranging from round to pear like and has a green outer skin that turns yellow as the fruit ripens. The fruit flesh may be white, pink or red and is filled with many small, hard, yellowish seeds embedded in the pulp. Essential oils give the entire plant a fragrant odor and different parts include the leaves, bark and fruit are used medicinally and nutritiously[17].

2.3. Geographical distribution

Originating in the tropical regions of Central America, most especially southern Mexico and Central America, *Psidium guajava*, is believed to have first originated in Mexico. It is grown widely in tropical and subtropical areas throughout the world from its centre of origin. South America, Africa, South East Asia and the Indian subcontinent are countries where plant thrives. *P. guajava* is one of the most commonly grown fruit crops in India and is widespread in the states of Uttar Pradesh, Maharashtra, Bihar & Tamil Nadu; and is also widely grown in Brazil, the Philippines, Indonesia, China and Thailand owing to its adaptability to a wide range of climatic and soil conditions. Warm climates with moderate rainfall favor its growth and it can reach up to altitudes as high as 1500 metres. It is one of the most widely distributed and economically important fruit bearing trees in the world (often occurring both in wild and naturalized or in cultivated plantations)[18].

III. PHYTOCHEMISTRY

Guava, (*Psidium guajava* L.), has been known not only for its nutritive value but also for its rich storehouse of phytochemicals that give rise to a wide range of pharmacological actions. Its rich and diverse phytochemical compositions contribute to the plant's therapeutic potential and the potential also differed in the various parts (leaves, fruits, bark, roots) of the plant. Flavonoids, tannins, saponins, carotenoids, alkaloids, essential oils and phenolic acids have been found and they are biologically active compounds confirmed many studies. These constituents have pharmacological properties like antioxidant, anti inflammatory, antimicrobial, antidiabetic, anticancer and above all antiulcer[19].

3.1 Flavonoids

Phytochemicals, especially from *P. guajava* leaves have a dominant class which includes flavonoids. The most prominent flavonoid compound is quercetin which is a very powerful antioxidant with strong anti inflammatory and antimicrobial activity. Helicobacter pylori, gastric inflammation and mucosal protection are greatly dependent on Quercetin which is why it has an important role in antiulcer therapies. The other important flavonoids are kaempferol, rutin, morin and naringenin which act as free radical scavengers, enzyme inhibitors and vascular protectants. Apart from these, these compounds also have a synergistic action that amplifies the overall value of guava extracts in their pharmacological action[20].

3.2 Tannins

Guava leaves and bark contain high concentrations of astringent polyphenolic compounds (tannins). Of the two main types present in *P. guajava* is gallic acid and ellagic acid. The antidiarrheal and antimicrobial activities of the plant are due to these hydrolyzable tannins. Guava has the ability to precipitate proteins because of the presence of tannins and the ability to form a protective layer over gastric mucosa which is one of the important mechanisms of guava's antiulcer activity. They are also capable of binding and inhibiting the bacterial growth by means of binding to their viral proteins and enzymes specifically to gastrointestinal pathogens[21].

3.3 Saponins

Glycosidic compounds known for foaming characteristics and for the capacity to form complexes with cholesterol are called saponins. Saponins in *P. guajava* contribute its anti inflammatory and immunomodulatory activities. They have a role in prevention of gastric mucosal damage, mucus secretion and modulation of the immune response. Affecting intestinal permeability, saponins may also improve absorption of some nutrients and drugs[22].

3.4 Essential Oils and Volatile Compounds

Psidium guajava essential oils the major source of which is from leaves contain a large number of

volatile constituents: eucalyptol (1,8-cineole), caryophyllene, limonene, alpha-pinene and beta-bisabolene. They are strong antimicrobial, anti-inflammatory and antioxidant effect. For example, eucalyptol has been known to serve to reduce mucosal irritation and inflammation of gastrointestinal tract. The characteristic aroma of the plant is also due to the essential oils which may also perform as repellents to pests and pathogens[23].

3.5 Phenolic compounds

P. guajava were shown to contain wide distribution of phenolic compounds, like ferulic acid, caffeic acid, chlorogenic acid and protocatechuic acid, etc. This makes these compounds very good free radical scavengers. Phenolic acids possess a capacity to protect the gastric mucosa through reducing oxidative stress which is a major factor in ulcer formation. These compounds also have antimicrobial and anticancer properties and along with the rest of the guava, they add to guava's general health promoting properties.

3.6 Carotenoids

The pulp of the guava fruit contains carotenoids in particularly rich amounts; the most abundant carotenoids in the fruit were lycopene, beta-carotene and lutein. One such antioxidant is lycopene which is a known protector against diseases that are caused due to oxidative stress; this lycopene is responsible for the reddish coloration of some guava varieties. These compounds also help in immune function and may help in reducing inflammation in gastric mucosa. Beta carotene is also a provitamin A compound important to epithelial health and immune defense.

3.7 Alkaloids

Although lesser in quantity in *P. guajava* alkaloids, however contribute a lot to the pharmacological profile of *P. guajava*. Antimicrobial, antimalarial and analgesic activities have been demonstrated for these nitrogen containing compounds. The antiulcer and antispasmodic effects are partly indirect and are shown in some studies to be caused by alkaloids in guava possibly by modulating neural signaling and smooth muscle contraction in gastrointestinal tract.

3.8 Vitamins and Minerals

Vitamins and Minerals plays important roles in the cell metabolism of the body and this is one of the reasons that you need to add them to your diet. *Psidium guajava* also contain essential vitamins and minerals apart from secondary metabolites. A particularly rich source of vitamin C (ascorbic acid) and as such an important antioxidant and immunostimulant. Vitamin C is present 3–5 times more in a Guava fruit, than an orange. In addition, the plant supplies vitamin A, vitamin B complex, potassium, calcium, magnesium and phosphorus supporting general health and maintaining mucosal integrity.

3.9 Fiber and Pectin in Food

Besides being high in dietary fiber, particularly pectin, an soluble fiber, guava fruits are also known to improve digestive health. Pectin is a prebiotic which feeds good gut bacteria and can bind with toxins and cholesterol for their removal. The positive effects of this property could help explain the use of *P. guajava* in the treatment of constipation and dysbiosis-associated ulcers, since dysbiosis is another important factor involved in gastrointestinal regulation[24].

Phytochemistry of *Psidium guajava* is complex and diverse and encompassing a variety of bioactive compounds having multiple therapeutic effects. Active core pharmacological components are flavonoids, tannins, saponins, phenolic acids, essential oils and carotenoids. Antioxidant, antimicrobial, anti-inflammatory and gastroprotective effects are produced by these constituents singularly and synergistically. Guava's capability to modulate the oxidative stress, suppress *H. pylori* activity and enhance gastric mucosal defenses may turn guava into a promising natural agent in prevention and treatment of peptic ulcers. Further phytochemical exploration, in conjunction with more advanced pharmacological investigations of *Psidium guajava* will help provide the necessary platform for the development of standardized herbal preparations for herbal authentication and gaining safer and more effective therapies of gastrointestinal health[25].

IV. PHARMACOLOGICAL ACTIVITIES OF *PSIDIUM* *GUAJAVA*

Psidium guajava L. (guava), a tropical plant is widely known for its nutritional and medicinal values. Abundance of bioactive phytochemicals, like flavonoids, tannins, phenolic acids, carotenoids, essential oils and saponins in the different parts of the plant (i.e., leaves, fruits, bark and roots), contributes to its pharmacological activities. *P. guajava* has been used for centuries by Asia, Africa, Latin Americans to treat wide ranged ailments according to traditional Asian, African, Latin American medicine systems. Traditional uses of the plant are supported by recent pharmacological studies and clinical investigations and many as yet unexploited therapeutic applications have been revealed **Fig.1**. The important pharmacological activities of *P. guajava* are stressed with special reference to its relevance in modern medicine[26].

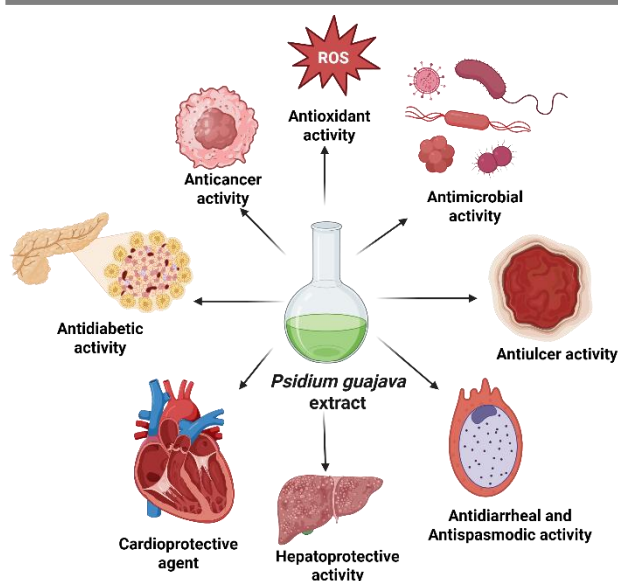


Fig.1: *Psidium guajava* extract pharmacological activities

4.1 Antioxidant Activity

The antioxidant activity is one of the Pharmacological properties of *Psidium guajava*. Reactive oxygen species (ROS) and free radicals are also responsible for cellular damage and are brought to play during the development of chronic diseases like cancer, cardiovascular conditions, diabetes and neurodegenerative states. *P. guajava* flavonoids (quercetin and kaempferol in particular), as well as the vitamin C, carotenoids (lycopene, for example) and phenolic acids act as powerful antioxidants. These compounds scavenge free radicals, prevent lipid peroxidation and stimulate antioxidant defense enzymes, e.g superoxide dismutase (SOD), catalase and glutathione peroxidase. Plant showed ability to alleviate oxidative stress in both *in vitro* and *in vivo* studies[27].

4.2 Anti-inflammatory Activity

Many acute and chronic diseases are due to inflammation such as arthritis, asthma, cardiovascular diseases, gastrointestinal disorders and many more. The extracts from *P. guajava* (especially the leaves and bark) have been found to have high anti inflammatory effects. Ellagic acid, quercetin and saponins inhibit certain pro-inflammatory cytokines (TNF- α , IL-1 β and IL-6) and suppresses the expression of some enzymes, COX 2 and iNOS. It does these by elimination helping to reduce inflammation and lower pain, thereby validating the traditional use of guava leaves in sore throat, wounds and rheumatic pain[28].

4.3 Antimicrobial activity

The use of *Psidium guajava* for the antimicrobial purpose is well documented. Showing broad spectrum anti bacterial, antifungal and antiviral activities. Leaf extracts in methanol and water show high power both against Gram positive Gram negative bacteria (*Escherichia coli*, *Staphylococcus aureus*, *Pseudomonas aeruginosa* and *Salmonella typhi*).

Flavonoids, tannins and essential oils (caryophyllene and eucalyptol) disrupt bacterial cell walls, inhibit microbial enzymes and affect microbial DNA replication and thus the activity is attributed to these substances. Antifungal activity of guava is also shown against *Candida albicans* and *Aspergillus* species. It also shows antiviral activity against the dengue virus confirming its traditional use in dengue fever[29].

4.4 Antidiarrheal and antispasmodic activity

Decoctions of guava leaf traditionally are used against diarrhea and dysentery. Scientific studies show that guava leaf extract reduces intestinal motility and fluid secretion which supports this effect. Astringent effects of tannins decrease intestinal secretions; flavonoids such as quercetin and rutin relax smooth muscles by modulating calcium channels and thereby reduce smooth muscle spasms. In addition, antimicrobial effects contribute to eradication of bacteria responsible for causing diarrhea, for instance *Shigella* and *E. coli*. Traditional use of guava in gastrointestinal infections and irritable bowel syndrome is validated by this[30].

4.5 Antidiabetic Activity

Green synthesis antibacterial, antifungal and antidiabetic activity of gold nanoparticles. The hypoglycemic and antidiabetic properties of guava are very prominent. Flavonoids and phenolic compounds inhibit enzymes like α -amylase and α -glucosidase which then mediates carbohydrate digestion in order to reduce postprandial glucose spikes. Guava leaf extracts also help improve insulin sensitivity and their ability to increase insulin dependent glucose uptake in the peripheral tissues. Chronic administration of guava extracts in animal studies improve glucose tolerance, decrease blood sugar levels and good lipid profiles. Guava fruits also contain dietary fiber which also aids in glycemic control by helping slow glucose absorption[31].

4.6 Hepatoprotective activity.

In various experimental models of liver damages induced by carbon tetrachloride, alcohol and paracetamol, *P. guajava* shows hepatoprotective effect. Quercetin, gallic acid and ellagic acid possess strong antioxidant property and prevent lipid peroxidation as well as restoring the liver biochemical indices (ALT, AST and ALP at the tested group). The activity of phase II phase II detoxifying enzymes is also increased by guava extracts to support liver detoxification processes. These properties indicate possible role of this compound in liver diseases management and liver health support[32].

4.7 Anticancer activity.

Several phytochemicals of *Psidium guajava* have chemopreventive and anticancer properties. Polyphenols such as quercetin, lycopene, etc. are show to cause tumor cells to undergo apoptosis (programmed cell death), inhibit angiogenesis (new blood vessel generation) and prevent the proliferation of tumor cells. Some studies have found that guava extracts fight off

breast, prostate, colon and cervix cancers. Modulation of signaling pathways such as PI3K/Akt, MAPK and NF- κ B is thought to be the anticancer effect. While most studies are preclinical, they support the possibility to develop guava based anticancer therapeutics.

4.8 Activity as a cardioprotective agent.

Antioxidant, anti inflammatory and lipid lowering properties of guava are largely responsible for the cardioprotective effect of guava. The regular intake of guava fruit or leaf extract has been shown to decrease total cholesterol, LDL and triglycerides and increase HDL. Guava potassium and dietary fiber help in blood pressure regulation. Additionally, flavonoids may attenuate oxidative stress in cardiac tissues and obstruct platelet aggregation which may collectively halt the development of atherosclerosis and myocardial infarction[33].

4.9 Antiulcer activity

Guava (*Psidium guajava*) possesses a promising use in the treatment and prevention of peptic ulcers. In particular, flavonoids like quercetin and kaempferol prevent *Helicobacter pylori* (a leading etiologic agent of gastric ulcers). The tannins provide a protective layer to the gastric mucosa protecting from irritation and further damage. Furthermore, there are anti-inflammatory and antioxidant activity that reduce the level of oxidative stress and inflammatory response of gastric tissues. Further, they also modulate gastric acid secretion and improve mucosal healing therefore they serve as a potent gastroprotective agent[34-36].

4.10 Antinociceptive and Analgesic Activity

In animal models, various methods of guava have been confirmed of its pain relieving properties. Flavonoids and alkaloids inhibit pain signals through different both central and peripheral mechanisms. They may also interact with opioid receptors and act as antiinflammatory agents to inhibit the production of inflammatory mediators (such as prostaglandins). Traditionally guava leaf extract is used to treat toothaches, menstrual cramps and joint pain.

4.11 Immunomodulatory activity

The intake of guava extract boosts immune response by increases of the proliferation of lymphocyte, phagocytic activity and production of cytokine. Polysaccharides and phenolic compounds contribute to the activation of macrophages and improve non specific immunity. The immunomodulatory potential explains why guava is used in fighting infections and boosting immunity in general[37].

4.12 Wound healing and skin protection

Guava leaf extract applied topically helps in the wound healing by increasing collagen synthesis, decrease in microbial load and enhancing the tissue regeneration. It also has antioxidant and anti inflammatory properties that protect from skin ageing and damage due to UV radiation and pollution[38].

V. ROLE OF PSIDIUM GUAJAVA IN ANTIULCER ACTIVITY

Guava (*Psidium guajava* L.) has attracted increased attention in recent years for its possible role in gastric ulcer prevention and treatment (a common gastrointestinal disorder involving mucosal erosion in the stomach or duodenum)[39]. The factors causing peptic ulcers are *Helicobacter pylori* infection, excessive gastric acid secretion, prolonged use of nonsteroidal anti inflammatory drugs (NSAIDs), alcohol, stress and oxidative damage. Management of ulcers with *P. guajava* is a time honored traditional medicine which is gaining support in the literature due to numerous pharmacological studies supporting its gastroprotective properties[40].

Mechanisms Underlying Antiulcer Effects

The antiulcer activity of *Psidium guajava* is primarily attributed to its abundant phytochemical content of flavonoids (quercetin and kaempferol), tannins (gallic acid and ellagic acid), phenolic compounds, saponins, and essential oils. These phytochemicals attribute to different mechanisms of healing and protection of gastric mucosa[41]:

Antioxidant Activity: Free radical-induced oxidative stress has a role in the pathogenesis as well as the retardation of healing of ulcers. The extremely high antioxidant activity of guava, contributed mainly by flavonoids and phenolic acids, scavenges ROS and thereby inhibits lipid peroxidation as well as cellular damage within the gastric mucosa. Antioxidant defense maintains mucosal integrity and enables healing of ulcers[42].

Anti-Helicobacter pylori Activity: *H. pylori* infection is the major etiology of peptic ulcer and chronic gastritis. Guava leaf extracts possessed potent antibacterial activity against *H. pylori* in vitro, primarily attributed to flavonoids and tannins. By inhibiting the growth and colonization of *H. pylori*, guava inhibits the bacillary mucosal inflammation and ulceration[43].

Cytoprotective Effects: The tannins present in guava have astringent actions that cause the development of a protective proteinaceous covering over the gastric mucosa. The physical barrier thereby protects the stomach lining from corrosive action of gastric acid and digestive enzymes, limiting irritation and injury to the tissue.

Modulation of Gastric Secretion: Guava extracts modulate gastric acid and mucus secretion, which is crucial for epithelial defense. Mucus secretion stimulation fortifies the mucosal barrier against acid and pepsin insult and also prevents ulcer development[44].

Anti-inflammatory Activity: Inflammation aggravates the mucosal injury and inhibits ulcer healing. Pro-inflammatory cytokines such as tumor necrosis factor- α (TNF- α) and interleukins, and enzymes such as cyclooxygenase-2 (COX-2) that participate in inflammatory reactions are blocked by flavonoids and

saponins in guava. This inhibits mucosal inflammation and encourages healing of the tissue[45].

VI. CONCLUSION

Guava (*Psidium guajava* L.) is a versatile medicinal plant with deep traditional use records and slowly accumulating scientific validation. Botanical attributes, along with a complex phytochemical profile make it important natural resource with multiple therapeutic potentials. The plant is widespread in tropical and subtropical areas and has been extensively studied for the diverse pharmacological activities attributable to its richly supplied bioactive compounds, e.g., flavonoids, tannins, phenolic acids, carotenoids and essential oils. Phytochemistry of *Psidium guajava* shows ample secondary metabolite reservoir producing various biological activities. Other wonders from the natural realm are flavonoids (quercetin and kaempferol), tannins and phenolic acids and to date, no human has been able to outsmart them; all of which are potent antioxidants, anti-inflammatories, antimicrobials and anticancers. The other compounds within these compounds also make the plant safety and efficacy for traditional medicine systems. Guava has a wide variety of pharmacological versatility being underpinned by its comprehensive phytochemical composition which substantiates the many disease models in which this fruit is employed. *Psidium guajava* has pharmacological activities; it exhibits significant antioxidant activity which is an important role in protecting from oxidative stress mediated damage, as a common pathway in many chronic diseases. Its anti inflammatory effects modulate immune response and decrease tissue damage in the mentioned inflammatory problems. It also has antimicrobial activity against a broad range of bacterial, fungal and viral pathogens extending its therapeutic application and it possesses antidiarrheal, antidiabetic, hepatoprotective, cardioprotective, anticancer and analgesic activities, thus signifying the plant's multiplicity of benefits to other systems. One of the most important antiulcer activity is that of *Psidium guajava* which have been confirmed by different experimental studies. Among gastrointestinal disorders, gastric ulcers are quite common which can be due to *Helicobacter pylori* infection, oxidative stress or over secretion of gastric acid. Exhibiting a multifaceted protective effect on gastric mucosa, free radicals neutralization and *H. pylori* inhibition and stimulating gastric healing and regulation of secretions also contribute to the activity of guava leaves extracts.

Tannins present give a protective barrier over the mucosa and flavonoids and other polyphenols give anti inflammatory and antioxidant actions that add to ulcer prevention and treatment. The results validate traditional use of guava to address digestive ailments and suggest a potential natural alternative or adjunct to conventional therapies. Although there is extensive

preclinical evidence for therapeutic potential of *Psidium guajava*, well controlled clinical studies are still necessary to verify standard dosage, safety parameters and efficacy in human populations. Integration of guava based preparations into contemporary pharmacotherapy would however need to overcome challenges in preparing standardized extract and formulating such preparations. Despite all this, *Psidium guajava* has an excellent safety profile plus it is affordable and beneficial in various ways; thus placing it as a possible candidate in phytomedicine.

Finally, *Psidium guajava* exhibits high medicinal value as a plant of rich phytochemical composition and many pharmacological activities. As an example of therapeutic potential of natural products in dealing with common serious health problems, its role in antiulcer therapy underlines that point. Further research regarding clinical validation and novel formulation strategies for guava will enable it to be joined into evidence based complementary and alternative medicine. The interest in plant based therapies has become very high and *Psidium guajava* is well positioned to contribute significantly to development of natural, safe and effective remedies for human ailments.

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