



Antidiabetic activity of *Psidium Guajava* leaf : An updated Review

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Abstract

Scientific studies have shown the potential role of plants in management of diabetes. *Psidium Guajava* (Family:-Myrtaceae) is one of the plants having potential nutritional and medicinal values. It grows in different regions of the world, particularly South America and Brazil. It has a long history of use as a hypoglycemic medication. In support of its traditional uses, numerous pharmacological studies have shown that this plant has antacid and ulcer protective, antioxidant, antihypertensive, anti-allergy, antibacterial, hypolipidemia, laxative, antispasmodic, anticough and cold, antidiabetic, anti-inflammatory properties. The variety of clinical management of infant rotaviral enteritis, diarrhoea, and hyperglycemia uses. In this type of review, it is focused on the favorable effect of *Psidium Guajava* on diabetes. Some studies of this plant *Psidium Guajava* are chemical components used in antihyperglycemic, hypolipidemic activity. The putative mechanism of this plant is glycemic effect and reducing carbohydrate or absorption from inhibiting small intestine and glycogenesis of liver. The production of this plant is intended for the food sector. Different pharmacological research has been carried out *in vitro* and *in vivo* settings. The key phyto-constituents for medicine have also been found. The many metabolites in good yield and some of them have beneficial biological properties, these metabolites primarily belong to the phenolic, flavonoid, carotenoid, terpenoid and triterpene families. The extracts and compounds of this plant, especially those derived from the leaves and fruits, are positive pharmacological characteristics.

Keywords: Diabetes Mellitus, Antidiabetic activity, *Psidium guajava*,

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1. Introduction

The lifestyle of the world's populations has changed significantly as a result of industrialization, increasing the risk of various ailments, including as long-term degenerative conditions like insulin resistance, diabetes, and dyslipidemia, cardiovascular disease and metabolic syndrome, which lower quality of life and raise the cost of hospitalizations,

medications and other public health measures [1,2].

According to studies, eating fruits, vegetables, and seeds can help reduce your chance of developing numerous diseases since they contain bioactive components. Numerous plants have been utilized for a variety of purposes, including lowering risk factors linked to the development of chronic illnesses [3–5]. South America is



home to the little medicinal tree Psidium guajava L. It is commonly referred to as "guava" (family Myrtaceae) It has a long history of being used as a medicinal herb to treat a number of ailments. The red (Psidium guajava var. pomifera) with white (Psidium guajava var. pyrifera) guavas are the two most popular types [6,7].

Although considered to be indigenous to Mexico [13], Psidium guajava is found throughout South America, Europe, Africa, and Asia. It consists of Anti-diarrhoeal, antibacterial, antimalarial and anti-diabetic effects. are the most common traditional uses. Gastroenteritis, diarrhoea, stomach, and antimicrobial colic harmful microorganisms are among the other documented uses. On the basis of archaeological findings. Since pre-Columbian times, it has been widely used and recognised in Peru. It improve in all of the world's tropical with subtropical

regions, adapting to a variety of environmental circumstances but preferring dry climes [14].

Its medicinal use has been documented in more indigenous medical systems in America than anywhere else. Diamox guajava Languages other than English that use the name Linn, family Myrtaceae include French (guave, goyave and goyavier), German (guave, Guavenbaum, Guayave), Japanese (banjiro), Portugal (goiaba, goiabeiro), and Brazil (arac 'a-goiaba, arac 'a-guac 'u, guai). [15]. To the best of the authors' awareness, no complete evaluation of the text on Psidium guajava antidiabetic properties has been done. The benefits of Psidium guajava and its chemical ingredients on diabetes are the topic of this review. The potential negative effects of Psidium guajava as well as the putative mechanisms involved in its anti-hyperglycemic action have been discussed.

2. The compounds in Psidium guava leaves , pulp, seed, skin or bark and their pharmacological effects

S.No..	Parts of plants	Compounds	Effects	Reference
1	Leaves	Phenolic compounds, gallic acid, catechin isoflavyonoids, ,epicatechin, kaemferol	Hepato-protection, anti-oxidant, anti-inflammatory , antispasmodic , anticancer	47
2	Pulp	Ascorbic acid, carotecoids (lycopene, beta-	Antioxidant , anti-hyperglycemic ,	48,52



		carotene, beta cryptoxanthin ,	anti-neoplastic	
3	Seed	Glycosids, phenolic compounds, ,carotenoids	Anti-microbial	49
4	Bark	Phenolic compounds	Strong anti- bacterial activity (Against multi – drug –registrant vibrio, cholera), stomachache and diarrhea	50
5	Skin	Phenolic compounds	Endothelial progenitor cells and improvement of their intestinal absorption	51,

3.0 Description of plants :-

3.1. Plants details

Psidium guajava, often known as the common guava, yellow guava, lemon guava, or apple guava, is a native of the Caribbean, South America, and Central America..

Family: - Myrtaceae

Comman name :-English – Guava

Hindi name- Amarudha

Sanskrit name :- Amrutam



Fig. No.3.1:- Plants *Psidium Guajava*

3.2 Effects of *Psidium Guajava* on glycemic control

In both kinds of diabetes, several investigations have demonstrated a negative connection between blood glucose management and the risk of micro vascular problems [13]. A few clinical preliminaries revealed 30-35% decrease in entanglements of diabetes by 1% decrease in HbA1c [16]. Not with standing insulin, a few oral hypoglycemic medications are accessible for the executives of blood sugar levels, such as insulin sensitizers, insulin secretagogues, α -glucosidase inhibitors, dipeptidyl peptidase-4 inhibitors, and increment agonists. However, the use of these drugs for clinical purposes is linked to a number of negative side effects, including lactic acidosis, fringe edoema, hypoglycemia, and stomach discomfort[5]. Table 1 summarises the research that looked at *P.Guajava* anti-diabetic

capabilities. The antihyperglycemic activity of watery and hydroalcoholic concentrates of *P.Guajava* has been shown in somewhere around eleven exploratory examinations in creature models and one clinical concentrate in T2D patients [17-28].

3.3Antihyperglycemic mechanisms of *Psidium Guajava* leaf

Expanded insulin discharge from beta cells, diminished sugar ingestion from the small digestive system, and expanded glucose take-up by tissues are ways of bringing down blood glucose. Gluconeogenesis inhibition and beta cell protection/regeneration though additional research is required to determine the exact mechanisms through which *Psidium Guajava* produces anti-hyperglycemic effects, The potential mechanisms are depicted in Figure 2. The source and *P.Gujava* 's leaves Reduce the activity of alpha-amylase (Fig. 2A) to prevent

carbohydrate hydrolysis in the small intestine [32,33]. Methanolic extract of the leaves has a stronger inhibitory impact on this enzyme than the root extract [33]. The inhibition of alpha-amylase slows starch retention in the small digestive system, bringing about lower postprandial glucose levels. level of glucose (PPBG).

Treatment with *P.guajava* organic product extricate smallest amount basal endogenous glucose formation [21]. The liver is a significant organ for the age of endogenous glucose and for blood glucose instruction. Fasting hyperglycemia is caused by an increase in hepatic glucose synthesis due to gluconeogenesis [34]. The articulation and movement of the chemicals glucose-6-phosphatase and phosphoenolpyruvate carboxykinase are basically likely for the speed of gluconeogenesis.

3.4 Effects of *Psidium Guajava* on diabetic dyslipidemia

In diabetic patients, dyslipidemia is one of the leading causes of early atherosclerosis. It's noticeable by an expansion in serum fatty oils and low-thickness lipoprotein (LDL) levels while a diminishing in high-thickness lipoprotein (HDL) levels (HDL). Anyway of management with existing hypolipidemic drugs (e.g statins, fibrates, bile corrosive restricting sequestrates), an impressive larger part of diabetic patients don't accomplish the suggested LDL level (under 100 mg/dL) [36]. These medicines can also cause a variety of side effects, including myopathy [37]. As a result, novel hypolipidemic medicines with fewer adverse effects are continuously being

sought after. Experimental research on diabetic mice have shown that .

3.5 Potential effects of *psidium guajava* on diabetic complications

Due to damage to small capillaries and arteries, T1D and T2D are related to microvascular and macrovascular disorders, respectively. Retinopathy, neuropathy, and nephropathy are the most frequent microvascular conditions. The main macrovascular consequences of diabetes are cardiovascular disease and cerebrovascular disease [41]. With standard clinical therapy, the odds of chronic sequelae in T1D are anticipated to be forty seven percent for retinopathy, seventeen percent for nephropathy, and fourteen percent for cardiovascular illness. There are less information on T2D, and the dangers contrast emphatically across Caucasian and Asian populaces. T1D and T2D are connected to microvascular or macrovascular illnesses, individually, because of harm to little vessels and veins. Hyperglycemia, dyslipidemia, irregularities in cell energy creation, intracellular sorbitol gathering, protein misfolding, oxidative pressure, and irritation are completely remembered to play a part in the improvement of diabetic issues. By decreasing the action of aldose reductase, the hydroalcoholic extract of *psidium guajava* reduces intracellular sorbitol accumulation [42]. Sorbitol accumulation causes osmotic and oxidative stress, both of which degrade proteins. The flavonoids items in *Psidium guajava* are believed to be answerable for its ideal impacts on aldose

reductase action and sorbitol levels [43]. Moreover, *C. spinosa* has been displayed to have cancer prevention agent and mitigating properties in different examinations [45]. Accordingly, it's sensible to accept that psidium guajava can help keep away from, delay, or ease diabetes issues. In diabetic rodents, Taghavi et al. found that a hydroalcoholic concentrate of *Psidium guajava* leaf can bring down creatinine levels and forestall kidney harm [18]. *Psidium guajava* leaves and its flavonoid rutin have additionally been displayed to safeguard kidneys from guajanoic corrosive and hexachlorobutadiene-actuated kidney injury [47].

4.0 Biochemical processes

Research on the helpful advantages of guava has been done logically since the 1940s. An outline of these investigations' outcomes The consequences of the examinations are displayed beneath.

4.1 Laxative

Guava, the two products of the soil contain adequate measure of nutritional character that frame the stand for the treatment of blockage. More current Fiber and cellulose, which are essential for the prevention and treatment of blockage and hemorrhoids, are especially abundant in delicate leaves. It has been said that, 100 gram of guava natural product contains as much as 36 g of dietary filaments [40]. Separated, Guava seeds are strong diuretics likewise and help in persistent blockage and purging the gut. The organic product is one of the most

extravagant wellsprings of dietary fiber a L-ascorbic acid which in contrast with different organic products is very high and only 1 guava satisfies around 12% of everyday suggested admission of fiber, which makes it very gainful for keeping stomach related wellbeing at ease[41].

4.2 Guava for Cold and Cough

Guava leaves have been viewed as compelling in relieving cold and hack. Guava is a great source of iron and ascorbic acid, which together reduce mucus production and lung blockage while also keeping the respiratory tract free of any unsavoury microorganisms. Reports guaranteed that these parts in Guava behave like a supernatural occurrence in restoring influenza [42].

4.3 Antibacterial

Guava removes display antibacterial action against both Gram positive(+) and Gram negative (-) microscopic organisms. The effects of fluid mixture and water-solvent methanol removal from guava leaves and bark on multidrug-safe *Vitriol cholera* were evaluated in vitro, and significant regions of strength for have action were discovered [43].

4.4 Antihypertensive and Hypolipidemic

Guava is profoundly valuable for the treatment of hypertension, hyperlipidemia and coronary illness. It additionally contains some measure of potassium which assists with loosening up veins and hence assists in controlling blood with forcing. It has been found that consuming guava natural product on everyday schedule results in huge decrease in Pulse and blood lipids

attributable to higher potassium and strands in the fruit.(44)

4.5 Antacid and Ulcer Protectant Activity

The basic idea of Guava leave gives generally excellent reaction against hyperacidity of the stomach. Still today, it has likewise been seen that as in the vast majority of the towns, Guava tea is ready by adding 10-15 quantities of youthful Guava leaves, bubbled in 3-4 cups of water and the warm mixture is made to drink to dispose of acidity. Of all the concentrate dissolvable, the methanolic extricate showed the most extreme acid neutralizer and ulcer recuperating property in vitro [45].

4.6 Anti-Allergy

Studies on methanol and watery concentrates of *Psidium guajava* leaves were completed, and the results showed a significant inhibition of receptor release from pole cells and a hindrance to the recruitment of T regulatory (Tr) cells from CD4+ splenocytes of C57BL/6 mice in vitro when IL-10 was present. The concentrates like to moved the Th1/Th2 stability to a Th1 predominant status by straight forwardly decrease Tr cell action. Guava leaf separates diminished the critically

susceptible response by means of Immune system microorganism in mice[46]

5.0 Phyto-chemical constituents of *psidium guajava*

The five constituents including one new pentacyclic triterpenoid guajanoic corrosive (1) and four known intensifies beta-sitosterol (2), uvaol (3), oleanolic corrosive (4), and ursolic corrosive (5) have been confined from the leaves of *Psidium guajava*. The original fixing 1 was identified as the corrosive 3beta-p-E-coumaroyloxy-2alpha-methoxyurs-12-en-28-oic compound by the use of 2D NMR techniques and synthetic modifications. The first time compound 3 from the *Psidium* class has been contained. Alkaloids are nitrogen-containing particles having a large number of organic applications. Capparisine, tetrahydroquinolin, and stachydrin are among those alkaloids identified from the stem or fruits of *Psidium guajava* [48]. In diabetic rats and clinical investigations, alkaloids from medicinal plants including *Aerva lanata* and *Lupinus mutabilis* were discovered to have a hypoglycemic effect[49]. This activity has been credited to an expansion in insulin emission as well as restraint of the a-glucosidase compound

6.0 Traditional/Ethnomedicinal uses

S. no.	Parts of plants	Countries	Uses	Reference
1	Roots	India and brazilians	Diabetes, GIT Problems, sore throat Skin problems, ulcers, and vaginal discharge	59



2	Leaves	Asian countries Indonesians South Africans	Diabetes and antioxidants Respiratory and GIT disorders Diabetes and hypertension	53,54,56
3	Bark	India	Gastrointestinal tract diseases, vomiting, stomach upsets, vertigo, mouth sores	57,58
4	Stem	West Indians	Febrifuge and antispasmodic baths.	55
5	Fruits	Brazilians	Tonic and laxative	55

7.0.Toxicity *Psidium guajava*

Not all medicinal plants are liberated from unwanted side effects. therefore, their protection especially for the fundamental organs (e.g., the liver and kidney) have to be tended to prior to starting clinical applications. The injury healing capacities of a *Psidium guajava* ethanolic leaf separate were examine utilizing the extraction wound representation. The injury recuperating rate in the refined water treated groups was 72% following 14 days, while the non-refined water treated group had an injury mending pace of 90 percent [39]. Intense toxicological examinations were directed on this plant material utilizing the accompanying techniques: mean deadly portion LD50 testing in Swiss mice and elective toxicology (intense harmful classes) testing in Wistar rodents. In an in vitro arrangement of transient substantial isolation enlistment examine in the

Aspergillus nidulans parasite and an in vivo evaluation of the dry medication in mouse bone marrow micronuclei acceptance test, we made the genotoxic of two concentrates, one of fluid kind and the other of henaxic type. Diabetic people who utilized *P.Guajava* natural product separate (400 mg three times each day) for a considerable length of time gave no indications of hepatotoxicity, nephrotoxicity, or opposite secondary effects [22]. To decide the advantages and disadvantages of *P.Guajava* for diabetic patients, all the more all around planned clinical preliminaries are required.

8.0 Conclusion

Medicinal plants are promising prospects for developing new diabetic treatments. *Psidium guajava* has shown to have enormous potential in the treatment of many pathological conditions including Diabetes. *P. Guajava* and its components



have been shown in a variety of pharmacological tests on animal models to have anti-diabetic capabilities, including antihyperglycemic and hypolipidemic actions. Further research is needed to discover the exact pathways through which *P.guajava* lowers blood glucose levels. However, the various pharmacological effects of guava extracts and extracted phytochemicals have only studied in *in vitro* with laboratory animals, but the conclusions gained may not be applicable to human situations.

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