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A review on medicinal properties of *Psidium guajava*

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Abstract

Nature has endowed Guava with many nutritional and medicinal properties. The fruits are 4-12 cm long with round or oval shape depending on the species (red, strawberry, and off-white). The tree, which belongs to the family, *Myrtaceae* is chiefly grown in countries with tropical and subtropical climate. The pink variety of guava (when dissected) has the maximum medicinal values. Fruits as well as leaves has many health benefits viz, anti diarrhoeal, antihypertensive, antilipedemic, anticancer etc.

Keywords: Medicinal properties of *Psidium guajava*

1. Introduction

Nature has blessed Guava or *Psidium guajava* with many essential nutrients. Historically, Guava is said to be cultivated in South Africa for commercial purpose and has been brought to country India by the Portuguese. As a fruit, Guava is very common in Asian countries but occupies a greater space in western countries mainly because of its medicinal properties. It is a small tree belonging to family *Myrtaceae* [2]. The tree can be cultivated in any soil provided the climate is tropical or subtropical. India is the largest producer of Guava as on date followed by neighbouring country China [1]. Guava fruits are usually 4 to 12 centimetres (1.6 to 4.7 in) long, round or oval depending on the species. The fruit is basically green in colour which turns to yellow once it is ripened. The most commonly available guava in the market is apple guava [3]. Table no.1 shows the botanical classification of *Psidium guajava*.

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	Psidium guajava

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

Apart from the fruit, guava leaves posses potential health benefits as well, some of which are; it help in preventing cancer, regulating blood pressure, treating diarrhoea, solving bowel problems to mention a few. It also helps in loosing weight, improves tonicity of skins, treats cough and cold, constipation, dysentery, and scurvy [4]. The common types of guava around the world includes apple guava, cherry guava, and strawberry guava. Mostly eaten raw in the ripened or semi-ripened form or consumes in the form of juices. This popular fruit is a factory of nutrients which can be very well depicted from table number 1. This review describes potential health benefits of Guava and its leaves

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Table 2

Nutritional Value Per 100 G Of Guava Fruit	
Energy	285 kJ (68 kcal)
Carbohydrates	14.32 g
Sugars	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

Source: www.wikipedia.com

Laxatives

Guava, both fruits and leaves contain sufficient amount of dietary fiber that forms the base for the treatment of constipation. Newer tender leaves are particularly rich in fiber and roughage which is crucial for the prevention and treatment of constipation and hemorrhoids. It has been said that, 100 gram of guava fruit contains as much as 36 g of dietary fibres^[5]. Apart, Guava seeds are powerful laxatives also and help in chronic constipation and cleansing the bowel. The fruit is one of the richest sources of dietary fiber and Vitamin C which in comparison to other fruits is quite high and just 1 guava fulfills about 12% of daily recommended intake of fiber, which makes it extremely beneficial for keeping digestive health at ease^[6].

Problems Associated With Oral Cavity

Dental plaques is the main cause of periodontitis as plaques when left unattended without any care ultimately leads to gingivitis and periodontitis^[6]. Some of the common pathogen responsible for periodontitis are *Aggregatibacter actinomyces temcomitans*, *Porphyromonas gingivalis*, *Fusobacterium nucleatum* and *Prevotella intermedia*^[7]. Guava contains good concentration of quercetin which has been shown to exhibit incredible antibacterial activity against such pathogens. The possible mechanism of Quercetin in periodontitis could be due to cell membrane disruption and inactivation of crucial protein by forming irreversible complexes with the protein in susceptible microbes^[8]. Guava extract without disturbing the oral cavity homeostatis acts against oral plagues. It also prevents adherence of bacteria to the oral cavity thus discouraging further development of plague as well^[9]. The second most common problem associated with buccal cavity is bleeding from gums (scurvy). Vitamin C content in guava is very high, it has been said that guava contains as high as 4 times more vitamin C than orange which makes it good candidate for treating scurvy. It can also be used in toothache and ulcers due to its astringent property. Leaves can be chewed directly to get instant relief from toothache^[10]. Bad

breath can also be controlled with guava leaves owing to folate content in the latter. Guava thus forms an excellent remedy for treating problems associated with oral cavity.

Antidiabetic

In China, guava leaves are peeled and taken in 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^[11]. Several authors have studied the inhibition of intestinal glycosidases 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 drank guava tea after eating white rices; had far less blood glucose rise than people who drank plain water as a control^[12]. In addition, Guava (both fruit and leaves) seems to lower fasting sugars as well. Based on a study, 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 experiment^[13].

Guava for Cold and Cough

Guava leaves have been found to be effective in curing cold and cough. Guava is rich source ascorbic acid and iron by virtue of which it reduces lungs congestion & mucous formation and at the same time keeps the respiratory tract free of any unfriendly pathogen. Reports claimed that these components in Guava act like a miracle in curing influenza^[4]. Fruit particularly the raw ones or decoction made from tender immature leaves is quite helpful in relieving cold and cough. It works by the disintegration of mucus polymers thereby loosening cough and reducing further mucus production, keep the respiratory tract, throat, and lungs free of microbes and inhibits existing microbial activity due to its astringent properties. Vitamin C is present in good concentration in Guava which has been found to be very effective in treating cold and cough associated with bacteria or virus. Roasted ripe guava is used as a home remedy against extreme cases of cough and cold and congestion in many villages of India. Another report suggested that Hydro extract of *Psidium guajava* leaves significantly lowered the coughing frequency which was induced by capsaicin aerosol compared to the control, within 15 min after administration of the extract^[15].

Antibacterial

Guava extracts exhibit antibacterial activity against both Gram-positive and Gram-negative bacteria. In vitro evaluation of the effects of aqueous mixture and water-soluble methanol extract from guava leaves and bark against multidrug-resistant *Vibrio cholera* and found to possess strong antibacterial activity^[16]. They concluded that this plant offers the potential for controlling epidemics of cholera. For treatment of infections in children's, villagers generally avoid market medicines and prefer natural remedies like guava leaves (young and tender ones) to be chewed and swallowed. Guava extract has been shown to be quite effective against *E. coli* which otherwise is resistant to most of the modern day antibiotics in the market. Guava leaves extract possess very good activity against the intestinal microbes, *Vibrio cholera*, causative organism for cholera^[17], hence the latter can be used in places where drug of choice are difficult to find.

Antimicrobial effect of essential oils and methanol, hexane, ethyl acetate extracts from guava leaves were conducted in which the extracts were tested against certain bacteria viz, *Staphylococcus aureus*, *Salmonella* spp. and *Escherichia coli*. Of all the bacteria tested the extract showed the maximum effect against *Staphylococcus aureus* and methanolic extract showed the greatest inhibition of bacterial growth.

Anticancer Activity

The antioxidant, Lycopene which is present abundantly in Guava plays a crucial role in preventing and fighting cancer. Amongst all, breast cancer and prostate cancer responds the best. Red flesh (when dissected) guava contains more lycopene as compared to the other varieties. Lycopene acts by scavenging the free radicals and also prevents further formation of free radicals. Many research stated that aqueous extract of guava budding leaves possess anti-prostate cancer activity in a cell line model and concluded they are promising anti-androgen-sensitive prostate cancer agent^[18]. In addition, Guava contains a good concentration of carotene as well which is known to prevent lung and oral cancers too.

Antihypertensive and Hypolipidemic

Guava is highly useful for the treatment of hypertension, hyperlipidemia and heart disease. It also contains some amount of potassium which helps to relax blood vessels and thus helps in controlling blood pressure. It has been found that consuming guava fruit on daily basis results in significant reduction in Blood pressure and blood lipids owing to higher potassium and fibers in the fruit. Moreover, Guava contains a high concentration of pectin which causes a significant reduction in the blood lipids by delaying absorption of the foods and thereby reduces the risk of cardiovascular illnesses¹⁹. Many authors had postulated that the gallic acid, catechins, epicatechins, rutin, naringenin and kaempferol in the leaves are responsible for the inhibition of the enzyme, pancreatic cholesterol esterase resulting in lower cholesterol in the blood. Catechins are important as a preventive therapy for hypercholesterolemia^[20]. Quercetin has been associated with decreased mortality from heart disease and decreased incidence of stroke associated with hypertension and hyperlipidemia^[21]. Guava improves heart health, prevents stroke by controlling high blood pressure and lowering cholesterol which is credited to the presence of a moderate quantity of potassium.

Gastrointestinal Problems

Quercetin and flavonoid content in guava leaves has been found to counteract many diseases originating in the gastrointestinal tract. *Psidium guajava* leaves are an example of the plant commonly used as popular medicine for a number of gastrointestinal upset^[22]. The alkalinity of fruits and leaves discourages the growth of pathogenic microbes responsible for gastroenteritis. Guava is beneficial in the treatment of diarrhea as the fruit inhibits microbial growth, releases excessive mucous from the intestine thereby helps to bind loose stools. Guava does contain many essential vitamins and minerals viz, carotenoids, vitamin C, and potassium which discourages GIT problems. The production of excess mucus in the large intestine can be successfully removed by chewing guava leaves in empty stomach. Drinking guava leaf tea in moderate quantity results in maintaining consistency of the stool. Guava leaf extract is used to get rid of gastrointestinal disorders because of its quercetin and flavonoids content^[23].

Antidiarrheal

Boiling 6-10 new tender guava leaves in a pot containing warm water and drinking the same in the empty stomach while being still warm has been found to be very effective in controlling diarrhea. Researchers stated that *P. guajava* leaves have a broad spectrum antimicrobial action (as anti-giardial and anti-rotaviral activity) that could be effectively used in controlling diarrhea or pathogenic origin. The antidiarrhoeal activity can be attributed to the presence of high flavonoids content in guava leaves^[24]. Among Children, Guava barks are also used to treat diarrhea owing to their astringent property. Tea made from guava leaves or its extract in a cup of warm water can help to empty the bowel easily. Journal of Smooth Muscle Research in 2008 published an article in which some researcher tested the effect of guava leaves on the peristalsis of bowel of rats and found the guava leaves extract was able to delay the onset of castor oil-induced diarrhea, decrease the frequency of defecation, and reduce the severity of diarrhea in the rats^[25].

Antacid and Ulcer Protectant Activity

The alkaline nature of Guava leaf gives very good response against hyperacidity of the stomach. Still today, it has also been found that in most of 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 is made to drink to get rid of acidity. Of all the extract solvent, the methanolic extract showed the maximum antacid and ulcer healing property in vitro^[26]. The flavonoids and saponins in the Guava fruit, as well as leaves, has been found to be an effective remedy in counteracting acidity and subsequent ulceration of the stomach. Methanolic extract of *Psidium guajava* leaves in doses: 500 and 1000 mg/kg body weight lead to significant decrease in ulcer index of ethanol-induced ulcer in the stomach of Wister rats^[27].

Wound Healing

From time immemorial, Guava leaves have been used extensively on 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. Tannins and flavonoids exhibit faster healing of experimental wound when a methanolic extract of guava leaves was applied locally twice daily. Many researchers have proved that ointment made from guava leaves can cure wound far faster than the market supplies. The leaves are washed, ground and extracted with oil to facilitate absorption a vehicle (mostly melted candle wax) is added to the extract. The final compound is then applied directly to the wound twice daily for 4 days^[28].

Anti-Allergy

Studies were carried out on methanol and aqueous extracts of *Psidium guajava* leaves and the result showed potent inhibition of histamine release from mast cells and blocked IL-10-mediated, *in vitro* induction of T regulatory (Tr) cells from CD4⁺ splenocytes of C57BL/6 in mice. The extracts also shifted the Th1/Th2 balance to a Th1 dominant status by directly attenuating Tr cell activity. Guava leaf extracts decreased the allergic reaction mediated via T cell in mice^[29]

Conclusion

The extensive use of allopathic drugs in the treatment and prevention of diseases has led to the rapid development of drug resistance. Drug resistance is one of the leading cause of

failure in drug therapy. Amongst all, drug resistance is frequently encountered during antimicrobial therapy. However, the development of resistance in case of natural therapy or Ayurvedic therapy is very rare which encouraged people to switch from allopathic to Ayurvedic therapy. However, the active ingredient is very difficult to extract from the crude natural compound which becomes a huge challenge for the researchers for which simplified method has to be developed. The use of natural therapy in the treatment and prevention of disease is not only safe, easily available but is economical as well. Presently, even physicians or practitioners are looking for alternative treatment of medicine for curing various diseases, so importance must be given to development of traditional herbal medicine from natural resources.

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