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Review on Antioxidant Property of Psidium Guajava

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Abstract: *The major concept of the present investigation is to look at the consequences of a number of characteristics on the manufacturing process of guava (Psidium guajava) extract from leaves, total polyphenol material, and an antioxidant property. Young leaves had maximum activity, according to a study on leaf maturity.It also ameliorated the damage to the Arteria Hepatica , renal organ of the diabetic mice and markedly boosted the all over antioxidant property and the action of the enzyme superoxide dismutase (SOD).Therefore, guava leaf polysaccharides may be investigated it as a possible Anti- diabetic and Antioxidant activity .The outcomes showed that oxidised intermediate reduction and free radical scavenging were the mechanisms by which guava leaf extracts exerted their antioxidant effect.The protective antioxidant capacity was extensively decreased by the amount of phenolic compounds of the leaves of guava component throughout decreasing reactions that occur.*

Keywords: Total polyphenol material, Antioxidant activity , Ameliorated , Superoxide dismutase (SOD), Polysaccharides.

I. INTRODUCTION

One of individuals of the Myrtaceae family of plants with medicinal properties is the guava fruit, or the species Psidium guajava L. Widespread in many aboriginal medical systems, Guava is a popular Ayurvedic medicinal herb. In India, it is accessible to everyone.The leaves as well as the bark of the Psidium Guajava tree have long been used for therapeutic purposes, and these uses keep happening to continue to this day." [1]

Atoms or molecules which have one unpaired electron, which makes them very reactive, are known as Free radicals.Oxidative stress is caused by free radicals like hydroxyl, superoxide anions, hydrogen peroxide, peroxynitrite, and nitric oxide. The biological macromolecules, including proteins, lipids, and DNA, sustain damage due to oxidative stress. Anaemia, arthritic pain, inflammation, diabetes mellitus, neurological illnesses, atherosclerosis, and carcinogenesis are among the several diseases that are brought on by damage to cells . During metabolic processes, our bodies naturally manufacture small amounts of oxidants. The body may eliminate microorganisms with the help of this regulated oxidant production. The human body is harmed by the overproduction of oxidants. [2]

The bioactive and therapeutic qualities of guava leaves are mostly affected by the occurrence of an unusual assortment of biologically active polyphenolic compounds, which includes gallic, ferulic, and caffeic acids, quercetin as well as other flavonoids.

Atoms or molecules with unpaired electrons, or free radicals, are very reactive. When our bodies break down food or are exposed to environmental factors like smoke and radiation, free radicals are created.

Oxidative stress is caused by free radicals such nitric oxide, hydrogen peroxide, hydroxyl, superoxide anions, and peroxynitrite. the oxidative stress that destroys proteins, lipids, and DNA, among other macromolecules in cells. Numerous disorders, including anaemia, arthritic pain, inflammation, diabetes mellitus, neurodegenerative illnesses, atherosclerosis, and carcinogenesis, are brought on by cellular damage . Our bodies naturally manufacture a small quantity of oxidants during metabolic processes. The body may eliminate microorganisms by using the controlled generation of oxidants. The body is harmed by the overproduction of oxidants.Apart from the fruit, studies have found that the leaves of guava might possess some possible health benefits for health. These include the ability to lower blood pressure, alleviate diarrhoea, prevent cancer, and ease digestive issues.Furthermore, it assists in decreasing body mass

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index, improves the complexion tonicity, it treats respiratory illnesses, constipation, and bowel movements.The health advantages of guava and its leaves are discussed in this review.

The protective mechanism includes both enzymatic and nonenzymatic antioxidants, including glutathione peroxidases, catalase, ascorbic acid, tocopherol, superoxide dismutase, and glutathione reductase. The leaves span between 5 and 15 centimetres and are hard and dark. The flowers have five petals and many stems. The leaf juice of Psidium Guajava have been used to treat toothaches, mouth ulcers, swollen gums, and external application of this juice has been shown to accelerate wound healing.[3]

Fig :- The whole Guava tree

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Fig :- the leaves of Guava tree

Fig:- the Guava Fruit

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Taxonomical classification :-
Kingdom: Plantae.
Phylum: Magnoliophyta.
Class: Magnoliopsida.
Subclass: Rosidae.
Order: Myrtales.
Family: Myrtaceae.
Genus: Psidium.
Species: Psidium guajava[4]

Vernacular Name:-
English :- Yellow guava
French :- Goyavier, Goyave
Portuguese :- .Araçá-goiaba, Araçá-guaçu
Spanish :- Guayaba, Guayabo, Guayaba manzana
Afrikaans :- Koejawel
Dutch :- Guave
German :- Echte Guava
Hausa :- Gweba
Indonesian :- Jambu batu, jambu biji
Italian :- Uaiava
Javanese :- Jambu klutuk
Kinyarwanda :- Amapera
Kiswahili :- Mpera
Nahuatl :- Xālxocotl
Tagalog :- Bayabas
Turkish :- Elma guava [5]

Common Name :-
Assamese: Madhuri aam.
Bengali: Peyara
Gujarati: jaamkal, jamrukh
Hindi: Amrood
Kannada:Perale,Seebe, Seebi
Konkani: Pairr
Malayalam: Pera
Manipuri: Pungton
marathi:, Perunjaam, Tupkel
Nepali: amba, bihi
Tamil:Sigappu koyya
Tangkhul: Pungdonrong
Telugu: Goyyapandu
Urdu: Amrud
Mizo: Kawlthei [6]

Description:-
Tree:-The guava grows quickly, becoming a coniferous shrubbery or miniature plant that reaches a length of three to ten metres. A small, branched tree or shrub that can grow to a height of 7–10 m is the guava (Psidium guajava L.). The

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root structure is only visible on the surface. After growing to a diameter of around 20 cm, the trunk becomes hard and woody, and it has a distinctive smooth, pale, mottled bark that peels off in thin flakes[7]

Stem:- After expanding to a circumference of approximately twenty cm, the central part becomes rigid and dense, whereas it has a characteristic smooth, pale, patterned bark that peeled off in small pieces.Guavas have suckers spreading from the ground of the shrub and inadequate, overhanging arms. The peeling process off in thin fragments, the seamless, brownish-red bark surrounds a narrow stump approximately twenty centimetres in circumference. Adolescents make up immature branches.

The effortless, light brownish-red bark of the more mature stems peels off in flakes. As a consequence, branches can sometimes look mottled due to the recently exposed bark's slightly greenish-brown hue. The younger stems are partially quadrangular in shape (quadrangular), unkempt (translucent), and bluish-green in colour.[8]

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Leaves:- The dark green, elliptical, oval guava leaves (Psidium guajava.) can be recognized by their obtuse-style apex. Alongside from one another, the leaves grow in pairs. The leaf cutting edge is moderately glandular and interspersed on the lower facial features, smooth on the upper, and elongated to rectangular in shape, approximately 5–15 cm lengthy by 3–7 cm breadth.

Issues with digestion can be addressed using the leaves of guava, the pulp, and kernels. as well as to enhance the platelets in the blood for individuals who are experiencing dengue-related infections.[9]

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Flowers:- A white flowers, which have a circumference of roughly 3 centimetres, can be presented individually or in groupings of between two and three at the axils of newly sprouting transverse shooters.[9]

Fruits:- The fruit is a 500 g berry that is fleshy and pyriform or ovoid in shape. It has yellow-to orange-coloured skin. The meat may have the following colorations: red ,pink ,white, or yellow , it may also be juicy, aromatic, acidy to sugary and juicy . Small, rigid fibrous structures called stones cells as well as or the sclerosis, can be found in the fruit's mesocarp that measure 0.1 mm in length and can damage processing machinery.There are many different kinds of spores on the inside of the fruit, and the seeds are somewhere between three to five millimetres in diameter.[10]

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Cultivation:-The main objective of guava cultivation is to cultivate fruit that is palatable, which can be ingested raw or transformed into a variety of dishes like chips, paste, jam, jelly, condiments, syrup, and so on. In countless tropical nations, it can be produced in backyard greenhouses or plantations. In India, guava has been introduced into a system of agroforestry, whereas it is extensively planted throughout Africa . The wood of guavas is beneficial for making tools, fences, and firewood . It also makes a good source of charcoal. Guava fruit can be problematic to handle, and in the state of Florida in the 1980s, cull fruit rates were high—roughly 40%. . In accordance with Azevêdo et al. (2011), 25% of the waste products generated during guava manufacturing are suitable for nourishing.The guavas are peeled and fed by means of a pulper to eliminate all of the seeds and fibrous connective tissue, then the remainder of the fruit is compelled to pass through a finishing machine to remove the hardened stone cells in order to manufacture the guava a purée. The residual material of the above procedure includes fibrous tissues, stone cells, and a mixture of seeds . You can make fodder out of guava leaves. According to Orwa et al. (2009), guava bouquets are scented and a good place to find the nectar for honeybees. [11]

Collection :- Although it has since spread extensively throughout the subtropics as well as the tropics, the plant that produces guavas may have developed in tropical Asia or the United States. It was originally colonised in the West Caribbean and the older parts of the Tropical regions. A wide variety of environmental conditions are suitable for guava growth.It is regarded as to be an invasive species by a number of nations, notably those located on the area known as the Pacific Islands and the western part of the globe.The fruit guava prosper best, according to Orwa et al. (2009), in open places that include shrub/savannah zones of transition or locations that are regularly perturbed. In some regions, it can cause dense thickets with over one hundred trees per hectare of land, which might result in livestock withdrawal and degradation of the soil. Information on guava produce around the world as of right now are unavailable.Approximately three million people t of guavas were produced in India in 2012 and 2013. As per Tiwari (2013), the leading producers of mango and guava were India (21 million t), China (4 million t), Kenya (2.7 million t), Thailand (2.6 million t), and Indonesia (2.3 million t).

The guava shrub is extraordinarily adaptable. Although it is capable of being found in the tropics from sea level to 1500–2000 metres beyond it, it grows optimally below 800-1000 metres beyond sea level. The fruit guava appreciates climates with an average yearly temperature of between 23 and 28 degrees Celsius, whereas they might develop around temperatures as high as 15 to 45 degrees. It flourishes most successfully in situations where the nighttime temperatures

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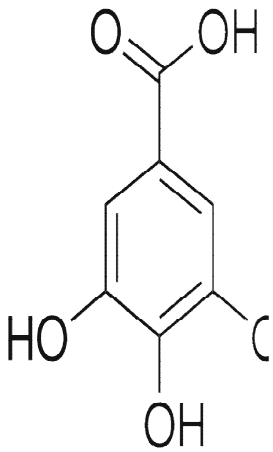
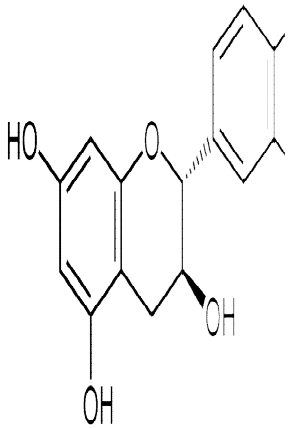
in the winter drop as low as 10°C. Dormant trees have not been damaged by light frosts. The fruit guava grows in regions that have 1000–2000 millimetres of rain seasonally.

A throughout the year advantageous geographic distribution of moisture needs to occur for the development of high-quality fruits. However, because the fruit ripens and fractures split from rain, it loses sweetness. Guava is one of the tropical fruit varieties that stands up to drought the best. As long as the soil has some drainage, it is possible to thrive in a range of soil types. Guavas are adaptable in both corrosive and gloomy circumstances.[12]

Chemical constituents:- Leaves from guavas are mainly made up of phenolic chemicals which include catechin , rutin ,caryophyllene oxide , gallic acid, naringenin, kaempferol,, p-selinene, quercetin and others as well.A number of inquiries have established its therapeutic properties, which include antioxidant , anti-inflammatory , antimicrobial, antidiabetic, antitumor, anticancer , hepatoprotective antidiarrheal, cytotoxic , dental plaque, antiglycative, and numerous other activities.

Table no. 1 :- structures of chemical constituents

 **Gallic acid**	 **Catechin**

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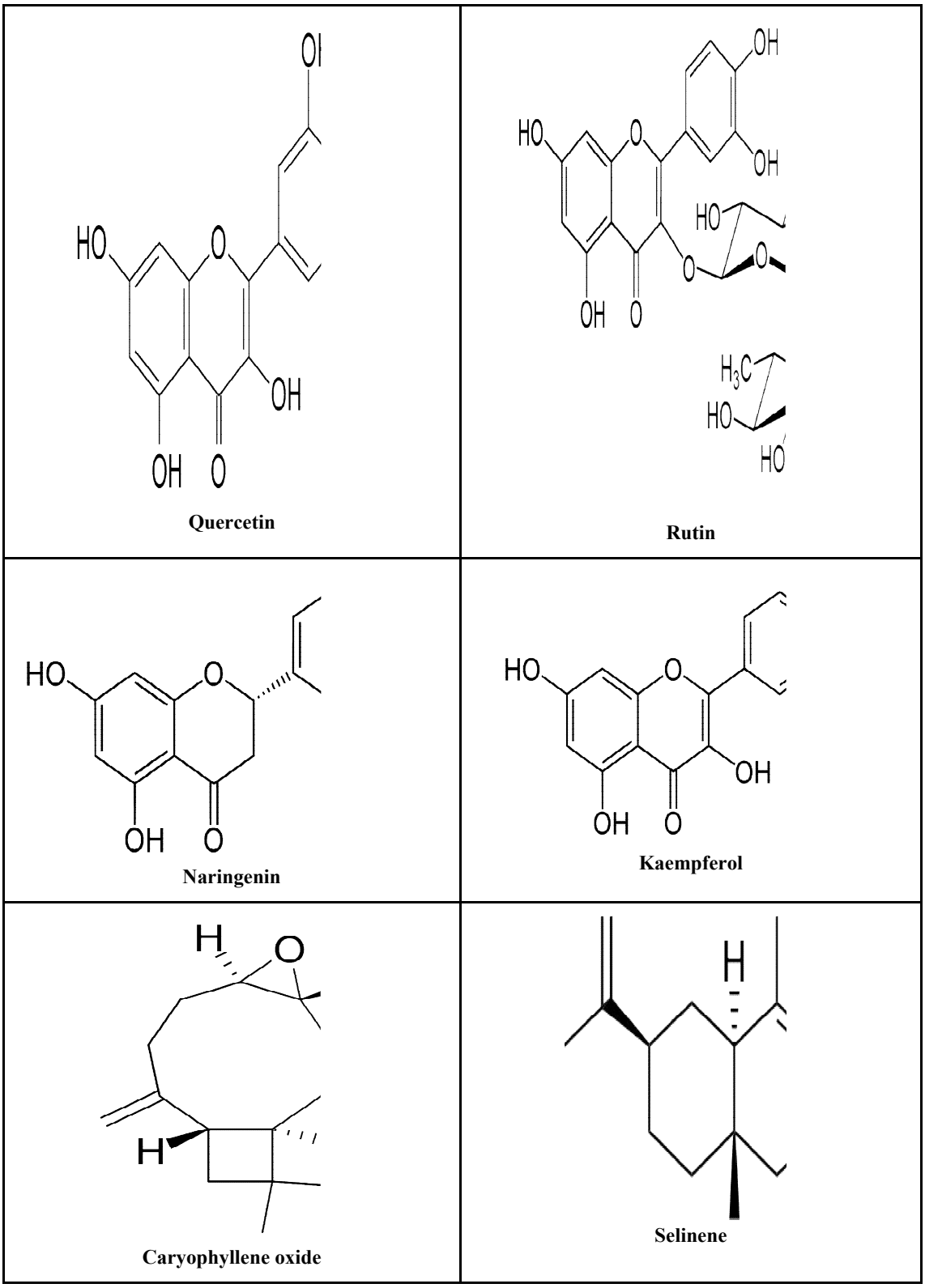

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Antioxidant compounds found in Guava leaves :-The naturally occurring substances that come from the plant include,, tannins, saponins, steroids, vitamin C, amino acids , flavonoids, terpenoids , etc. The pharmacological characteristics of these molecules, which include antidiabetic, antioxidant, and hepatoprotective activities, are intriguing to researchers . By inhibiting the scavenging of radicals, antioxidant chemicals help the human body fight against the infection and degeneration of illnesses.

Mechanism of antioxidant property of Guava leaves :-

The leaves of guava contain phenolic chemicals that may have an enormous effect on the effectiveness of antioxidants. This can be explained due to their ability to reduce deteriorated intermediary substances in the chain reaction that occurs. It has been discovered that the foliage of guavas includes a broad spectrum of phenolic compounds that can be consumed.

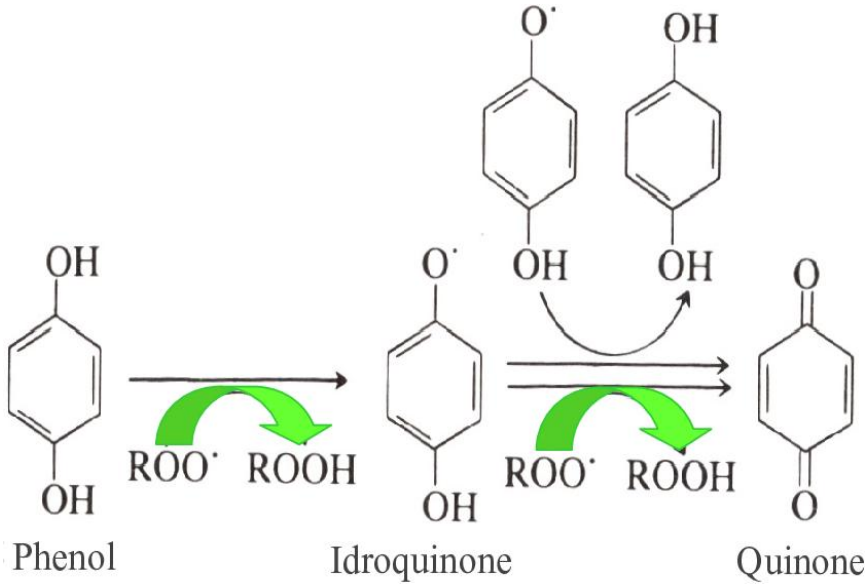

Fig :- mechanism of antioxidant property of phenolic compounds (guava leaves)

Extraction process:-

To make jelly, guava leaf extract, 1.5 g pectin, 28 g sugar and 2 ml lemon juice are used. In addition to evaluation of antioxidant and antibacterial properties, affinity analysis, nutritional analysis, and data analysis were performed on guava leaf products extract jelly (GJ) and control jelly (CJ, no extract). The results show that GJ contains calories (120.6 kcal), protein (3.0 g / 100 g), vitamin C (6.15 mg / 100 g) and vitamin B3 in addition to carbohydrates (45.78 g / 100 g). It showed that it contained (2.90 mg).). / 100 grams). 100 grams). G). Additionally, texture testing of CJ and GJ showed that both jellies had similar properties; This showed that the texture of the jelly was not affected by the addition of guava leaf extract. In tests against different bacteria, the anti-bacterial properties of GJ ranged from 11.4 to 13.6 mm. GJ showed 42.38% and 33.45% antioxidant activity for DPPH and hydroxyl radicals, respectively. The antioxidant activity of the aqueous extract was verified by mass spectroscopy analysis to contain esculin, quercetin, gallocatechin, 3-caffeoylquinic acid, gallic acid, citric acid, and ellagic acid.[13]

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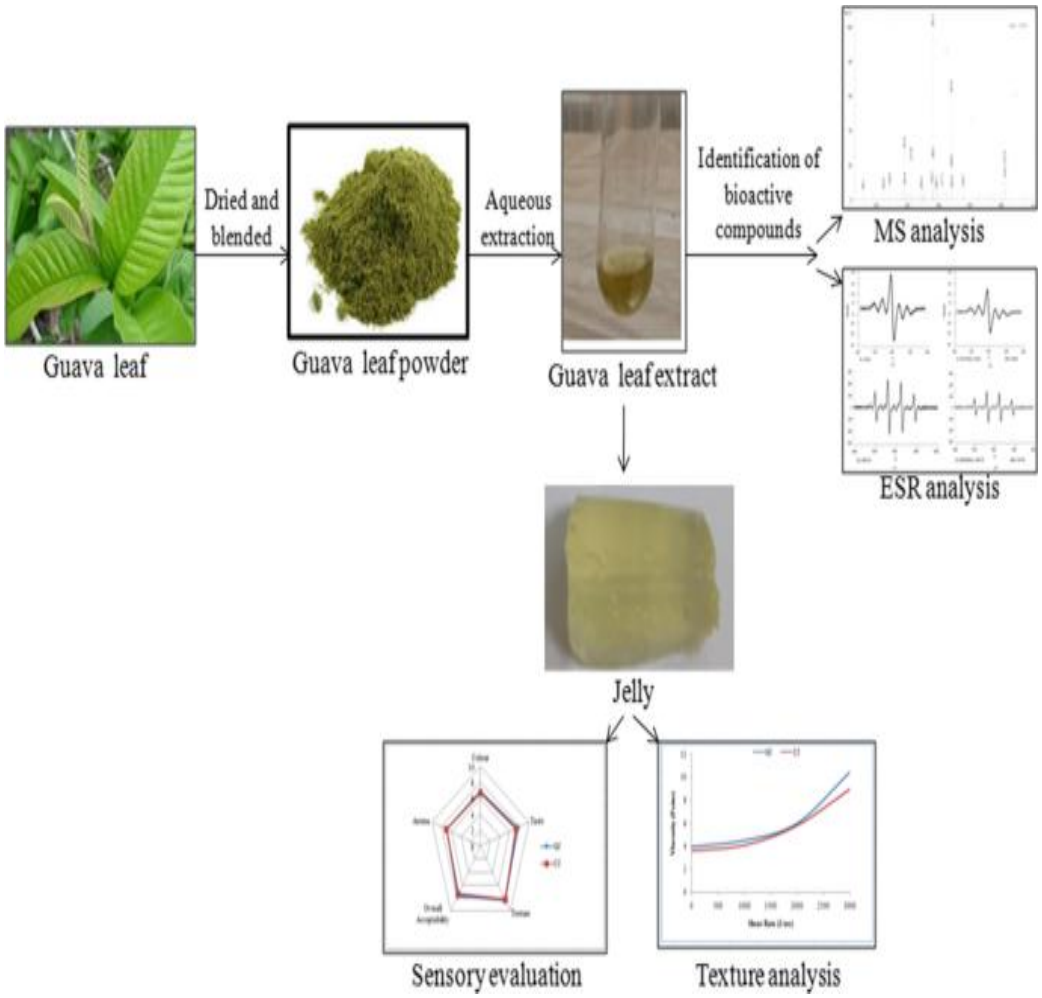

Antioxidant activity of psidium guajava

Total phenolic content and antioxidant activity of guava leaves in aqueous and ethanolic extracts were found by Qian et al. Total phenolic content was determined by spectrophotometric analysis according to the Folin-Ciocalteu method. The antioxidant activity of the extract was measured by measuring DPPH at 515 nm. According to research, the higher the concentration of the extract, the greater its ability to eliminate free radicals. Standard ascorbic acid was used to compare the results. The results of the study showed that the ethanol extract had higher activity compared to the water extract.

Hui-Yin Chen and Gow-Chin Yen compared the antioxidant and free radical scavenging properties of guava leaves and dried guava fruit extract. Linoleic acid oxidation is inhibited by 94.4-96.2% at a concentration of 100 lg/ml. The results showed that the activity of ABTS and superoxide anions increased as the leaf extract content increased. The blockchain-reactive ability of linoleic acid may be responsible for its antioxidant activity. By eliminating free radicals with DPPH, they were able to isolate active compounds from the methanolic leaves of guava and demonstrate its antioxidant capacity in vitro. Three compounds identified in guava leaf extract showed the highest antioxidant activity. The IC50 values for the elimination effects of quercetin, quercetin-3-o-glucopyranoside, and morin were 1.20 ± 0.02, 3.58 ± 0.05, and 5.41 ± 0.20, respectively.

Two different types of fruits were analysed for their antioxidant content and activity; This decision is based on the binding of the fruit extract to Fe(II) ions,

reducing Fe(III) to Fe(II). Capacity utilisation. The results were compared with similar tests on many other fruits from the region, including oranges and bananas, star fruit, grapes, sweet fruit and apples. Studies have shown that guava fruit

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is high in antioxidants. It has more antioxidant potential than other fruits such as oranges.Its potential as a secondary antioxidant is lower, though. When guava fruit is kept in storage at 4 °C, it grows increasingly in the content of ascorbic acid.

Fruit that hasn't been peeled has higher levels of ascorbic acid and total phenol than fruit that has. Although it was proposed that bananas are a potent secondary antioxidant, their primary antioxidant power is not as great as that of oranges.

Because of their ability to fight against various diseases and complications, guava extracts have opened up new therapeutic avenues. Additional research is necessary to determine the precise mechanism underlying guava's antioxidant and other pharmacological properties .[14]

Other pharmacological activities of guava leaf extracts on biological cell:-

1] Periodontitis:-

Plaque from the teeth is the main contributory factor of periodontists; if not addressed, it can eventually give rise to gum inflammation and periodontitis. Among the most common bacteria that cause periodontitis are Aggregatibacter Actinomyce Temcomitans, the bacteria Porphyromonas gingivalis, This type of bacteria Nucleatum, and Prevotella Intermediary concentration. Guavas demonstrate a substantial amount of a substance known as which has been shown to have outstanding antibacterial effect against several infections. By rupturing cell membranes and withdrawing vital nitrogen and amino acids through the formation of irreversible complexes with microbes that are protein-susceptible, quercetin may contribute to periodontal disease. Extract from guava fights bacterial infections in the mouth without disrupting the oral cavity's state of equilibrium It also prevents bacteria from bonding to the oral cavity, stopping epidemics from proliferating.

It is usually haemorrhage from the gums, is the second most common problem pertaining to the buccal cavity. The previously high vitamin C content of guavas—guavas are thought to have up to four times the amount of vitamin C found in oranges—makes them an attractive treatment for a condition known as It can also be used to cure discomfort in the teeth.and ulcers due to its drying properties. You can effectively relieve dental care discomfort by chomping on leaves.[15]

1] Antitumor/Anticancer Activity:-

Carcinoma is an intricate medical condition that can be associated with a process known as which is a consequence of a worldwide reduction in the proliferation of cells. Reactive oxygen species, also known as overproduction can be brought about by a variety of internal and external triggers. Among the possibility effects of this include the appearance of cancerous growths, chromosomal breakdown and transformation, DNA the cross-linking, the breakdown of nucleic acids deterioration, interference with cell membrane integrity caused by the oxidation of lipids, and single- or double-strand breaks in DNA or RNA.

The following compounds have been treated as found in good concentrations in the Guava leaves extract , flavonoids , sesquiterpenes, tannins , triterpenoids , volatile oils, and another material known as be glycosides.[16]]

2] Antidiabetic Activity:-

One in ten people internationally suffer from glucose in the blood metabolic disorder (BDM), predominantly associated with hyperglycemia. Diabetes is a serious chronic disease.

This state is either characterised by inadequate insulin release from β-cells of According to the International Diabetes Federation (IDF), there will be 693 million people with diabetes worldwide by 2045.type 2 diabetes, which is caused by cells' incompetence to respond to release insulin, or pancreatic islets (type 1 diabetes) . There were 5 million deaths from diabetes mellitus in 2017 Extended periods of high blood sugar result in elevated reactive oxygen species (ROS) generation and dyslipidemia, which can cause substantial issues and damage to cells .For the treatment of diabetes, GLs have been used significantly in cultural medicine . Studies have reported the possible antidiabetic effects of GLs. The flavonoids guaiacin and Avicalin in GL extracts were associated with significant improvement in hepatocyte morphology and islet β-cell function in diabetic rats. Although avicalin prevents intracellular lipid accumulation by

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blocking glucose uptake by GLUT-4 in vitro and does not cause any damage to 3T3-L1 adipocytes, guaiacol reduces the activity of the blood sugar homeostasis enzyme dipeptidyl peptide Enzyme IV.[17]

3] Antimicrobial Activity:-

Qualitative analysis of aqueous and organic extracts of guava leaves showed the presence of phenolic acids, flavonoids, terpenoids, glycosides and saponins. These compounds have a favourable correlation with antibacterial activity. TOF-ESI/MS-HPLC.The presence of kaempferol, morin, quercetin, rutin, isoquercitrin, Avicularin, gallic acid, and chlorogenic acid was confirmed by analysis of fermented Fungal cell membrane thiab fungal cell marker glucosamine are both inhibited by these chemicals. Comparably, the water-soluble tannins found in green leafy vegetables (GLs) function as bacteriostatic agents through modes of action that include inhibiting extracellular enzymes, preventing oxidative phosphorylation, and withholding substratum. Antibiotic-resistant clinical isolates of Staphylococcus aureus have been shown to be inhibited by them .

Antimicrobials developed from bioactive chemicals derived from plants show great promise. This drug can prevent and inhibit biofilm formation by inhibiting the growth, disintegration and disintegration of the walls of microbial cells. It also inhibits DNA transcription and replication, the synthesis of adenosine triphosphate (ATP) and inhibits bacterial toxins and reagents. oxygen. type (ROS).

GL is thought to have anti-inflammatory properties because it contains many organic and inorganic antioxidants and anti-inflammatory drugs. Pseudomonas aeruginosa, E. coli, Streptococcus faecalis, Staphylococcus aureus, and Bacillus subtilis are all susceptible to the powerful antimicrobial properties of GL essential oil.Their antiproliferative and antioxidant properties are also demonstrated by studies.Aqueous and organ qualitative analysis. [18]

4] Antidiarrheal Activity:-

One of the leading causes of death in children is diarrhea.New medications with fewer adverse consequences on the body's other organs have been searched after. Attention has been paid in poor countries to committing to discovering novel phytonutrients obtained from therapeutic plants in order to create new medications with little adverse effects . To treat this disease, the pharmaceutical industry is primarily focused on developing new medications with therapeutic promise.

There are many treatments for diarrhoea in the form of synthetic drugs that have many negative effects on the body, including the production of vomiting, constipation, diarrhoea and bronchospasm.[19]

5] Antihypertensive activity:-

The treatment of hypertension, hyperlipidemia, and heart disease can greatly benefit from the antihypertensive and hypolipidemic properties of guava. Additionally, it includes some quantity of potassium, which aids in blood pressure regulation by relaxing blood vessels. It's been discovered that It can reduce blood pressure, diabetes and blood fat due to the fibre and potassium in the fruit. Additionally, guava has high pectin content, which can reduce blood lipids and delay food absorption, reducing the risk of heart disease[19]. Due to its less potassium content, guava leaves can lower cholesterol and control blood pressure, thus improving the heart. and stroke prevention. Quercetin has been linked to reduced deaths from heart disease and a reduced risk of stroke. Hypertension and hyperlipidemia.

Many stomach pain medications contain synthetic chemicals that can have many harmful effects on the body, such as asthma symptoms, cell formation, constipation, indigestion and nausea.[20]

6] Antacid activity:-

Since guava leaves are alkaline, they are an excellent counterbalance to stomach hyperacidity. Additionally, it has been discovered that most villages still make guava tea by boiling ten to fifteen young guava leaves in three to four cups of water. The warm mixture is then consumed to reduce acidity. When it came to antacid and ulcer-healing properties in vitro, the methanolic extract outperformed all other extract solvents. It has been discovered that the flavonoids and saponins in guava leaves and fruit work well to prevent stomach ulcers caused by acidity. [21]

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II. CONCLUSION

The well-known tropical tree Psidium guajava, or guava, is cultivated for its fruit in tropical climates. Its leaves have been demonstrated to have antioxidant properties and It can treat stomach disease, stomach pain, high blood pressure, diabetes, tooth decay, pain, cough, mouth ulcers, improve joint movements, and reduce liver damage caused by inflammation. Its fruit is rich in calcium, phosphorus, iron, vitamins A and C, and its peel contains many phytochemicals. Leaves contain important oxidants as well as bacteriostatic and bacteriostatic properties. The ethyl acetate extract of the plant contains quercetin, which inhibits thymus production and disease. Guava leaves have antibacterial, anti-inflammatory, anti-plaque, anti-nociceptive and anti-mutagenic properties. Due to these biological activities, it is effective in the treatment and prevention of diseases. The widespread use of allopathic medicine in the treatment and prevention of diseases has led to the emergence of drug resistance. Besides being cheap, effective and safe, herbs can also be used to treat and prevent diseases.

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