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Phytochemical Composition and Medicinal Properties of *Psidium guajava, Artocarpus heteorphyllus, Anona muricata* and *Passiflora edulis*: A Critical Review

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ABSTRACT

Artocarpus heterophyllus Lam, a part of the Moraceae family, is known by distinctive names in different districts over the globe. The jackfruit tree's significant alleviating impacts have made it a well-known choice for characteristic cures. Its bioactive compounds, counting lignans, flavones, and saponins, contribute to its momentous therapeutic properties, which incorporate anti-cancer, anti-ulcer, anti-hypertensive, and anti-aging impacts. As a result, the jackfruit tree holds awesome importance in conventional medication and characteristic mending hones. Guanabana, soursop, graviola, or Brazilian paw paw, scientifically known as *A. muricata*, is a plant native to Central America but can be found in abundance across Southeast Asia, South America, and the African rainforest.. This plant has appeared various advantageous properties counting anticancer, antiulcer, antidiabetic, antiprotozoal, antidiarrhea, antibacterial, antiviral, antihypertensive, and wound mending impacts. *Psidium guajava* includes a wealthy history of restorative employments, with all parts of the tree being esteemed for their helpful properties. From the takes off to the natural products, each component of *Psidium guajava* has been utilized for different wellbeing benefits throughout a long time. Its restorative centrality includes to the by and large significance of this tropical tree totally different societies and conventional hones. Energy natural products, which have a place to the sort Passiflora, comprise of around 450 species. Among them, *Passiflora edulis* is the foremost well-known and commonly utilized. Later thinks about have too highlighted its anti-inflammatory potential, especially within the frame of tea made from the imbued clears out. *Passiflora alata* and *P. edulis* have both found applications in various pharmaceutical arrangements and are broadly utilized within the nourishment industry. The anti-oxidant substances present in P. Edulis have sparked a growing interest in this plant. Even though it is important, no audit of this species has been included in the logical writing up to this point. The notable and recent literature on the botany, traditional uses, phytochemistry, pharmacological effects, and harmfulness of this ponder plant is surveyed and summarized here. This overview may prove beneficial for subsequent research aimed at misusing the beneficial attributes of this priceless, curative species.

ARTICLE DETAILS

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I. INTRODUCTION

Enthusiasm naturals, classified under the class Passiflora, comprise an enormous assemblage of about 450 species. Of these various species, *Passiflora edulis* is the most significant and most widely used. This particular species has attained widespread ubiquity, not only for its tasty pulp, but also for the native implants obtained from its offshoots. Subsequent logical research has added to its potential as an anti-inflammatory agent, especially when used in the form of tea from the steeped offshoots. Both *Passiflora alata* and *P.*

edulis have found different applications in various pharmaceutical arrangements and have been widely used in the food industry. The proximity of antioxidant compounds in *P. edulis* has created a wave of interest in this plant among analysts and professionals alike. Progressive studies have effectively distinguished various phenolic compounds found in the inflorescences of different Passiflora species, such as orientin 2"-O-rhamnoside, luteolin 7-O-(2-rhamnosylglucoside), and offshoots of apigenin and luteolin. The recognizable detection and understanding of these compounds are an extraordinary guarantee for the promotion of human well-being. Therefore, further research and investigation in this area is essential to fully explore the potential benefits offered by these Passiflora species and their constituents. The antioxidant properties of these polyphenols allow them to successfully neutralize or quench oxidants and, in this way, reduce oxidative pressure. The search for common sources of cancer-preventive agents is currently a prevailing inclination among analysts and researchers. Oxidative pressure occurs when there is an imbalance between the defense mechanisms and the occurrence of free radicals in living organisms. To combat this, living organisms employ both endogenous (internal) and exogenous (external) antioxidant defense mechanisms to guard against the destructive effects of receptive oxygen and nitrogen species. These protective mechanisms can be divided into enzymatic systems such as catalase (CAT), glutathione peroxidase (GPx) and superoxide dismutase (Turf) and non-enzymatic systems containing thiol (GSH), vitamins, minerals and polyphenols. In a broad-based study, it's suggested that the leaf extracts of *P. edulis* show antioxidant activity against oxidative damage to proteins under both in vitro (research facility) and ex vivo (outside a living organism) conditions, highlighting their potential as promising characteristic cancer preventive agents with novel properties. [24]. Native to Mexico, Cuba, Central America and certain areas of India, Annona muricata, commonly known as soursop, is an evergreen tree that can produce beautiful flowers. This particular tree has gained substantial notoriety because it is regularly respected as a miraculous substance, mainly due to its unusual ability to fight cancer naturally, surpassing the effectiveness of chemotherapy by 10,000 times. Taking advantage of these surprising claims, extracts of this amazing plant have been carefully extracted and skillfully used in various concentrations to fight verbal pathogens and act as an exceptional antibacterial agent [XXII]. Guanabana, soursop, graviola or Brazilian paw paw are all terms used to describe *A. muricata*, a botanical example native to the districts of Central America. This particular species is widespread in Southeast Asian areas, South America and the vast African rainforests. The Annona variety comprises an enormous collection of 70 distinctive species, with *Annona muricata* being the best known and most widespread. It is worth noting that there are several other critical species within this genus, which include *A. bonplandiana Kunth, A. cearensis Thorn. Rodr., A. macrocarpa Werckle, A. muricata var. borinquensis Spirits, and Guanabanus muricatus* [XIII]. The different classifications attributed to this plant species illustrate the changing topographic distribution and social importance it has across different land masses. *A. muricata* is deeply rooted in the rich biodiversity of Central America and has become a conspicuous botanical in Southeast Asia, South America and the African rainforests, attracting the attention of scientists and horticulturists alike. The Annona variety, with its 70 different species, offers botanists and researchers a stimulating field of activity to solve the mysteries surrounding these surprising plants and their unique characteristics. Among these captivating species, *A. muricata* is the most widespread and most sought-after due to its various conventional therapeutic applications and potentially useful properties. Outstanding representatives of the Annona species such as *A. bonplandiana Kunth, A. cearensis Thorn. Rodr., A. macrocarpa Werckle, A. muricata var. borinquensis* Spirits and Guanabanus muricatus M. Gómez have also gained recognition in professional circles and contribute to the ever-growing body of information on these fascinating plant species [23]. Ethnobotanical research has shown that *A. muricata* is used in conventional medicinal herbs to combat bacterial and parasitic contamination. This plant is also known for its many properties, including its anthelmintic, antihypertensive, anti-inflammatory and anti-cancer effects. It is also known for its analgesic properties and is a successful remedy for relieving pain. In addition, *A. muricata* has proven its effectiveness in treating a variety of ailments such as fever, respiratory and skin diseases, diabetes and internal and external parasitic infestations. In some tropical regions south of the Sahara, particularly in Uganda, all parts of the plant are used extensively to treat prevalent health problems, including intestinal diseases, stomach problems, parasitic infestations, diabetes and cancer. *Artocarpus heterophyllus Lam*, part of the Moraceae family, is known by various names in different regions of the world. This flexible tree, known as jaqueira in Portuguese, jackfruit tree in English, jacquier in French, kapiak in Papua Modern Guinea and uto ni India in Fiji, has its origins in the West Indies, Malaysia, East Africa, Southeast Asia, the Caribbean, Florida, Australia, Puerto Rico and the Pacific Islands. The jackfruit tree is valued not only for its delicious fruit, but also for its remarkable therapeutic properties. In the field of conventional medicine, every part of this amazing tree is skillfully used to solve a variety of health problems. It is used to treat aggravations, malaria, kidney stones, ulcers, foul wounds, diarrhea, fever, asthma, infirmity and dermatitis. The significant soothing effects of jackfruit tree have been established.

I. Botany

Psidium guajava

i. Botanical Name

Its botanical name is *Psidium guajava*.

ii. Subsp

Guaiava pyriformis Gaertn, Guajava pumila (Vahl) Kuntze, Guajava pyrifera (L.) Kuntze, Myrtus guajava (L.) Kuntze, Myrtus guajava var. Pyrifera (L.) Kuntze, Psidium angustifolium Lam, Psidium aromaticum Blanco, Psidium cujavillus Burm. F, Psidium cujavus L, Psidium fragrans Macfad, Psidium guajava var. Cujavillum (Burm.f.) Krug & Urb, Psidium guajava var. minorMattos, Psidium igatemyense Barb. Rodr., Psidium intermedium Zipp. ex Blume, Psidium pomiferum L, Psidium pomiferum var. Sapidissimum (Jacq.) DC, Psidium prostratum O. Ber. Psidium pumilum Vahl, Psidium pumilum var. Guadalupense DC, Psidium pyriferum L, Psidium pyriferum var. Glabrum Benth, Psidium sapidissimum Jacq, Psidium vulgare Rich, Syzygium ellipticum K. Schum. & Lauterb. [XXVI]

iii. Common names

The guava, also known as the common guava, yellow guava, lemon guava, or apple guava.

iv. Botanical Description and Distribution

This petite tree or shrub possesses superficial roots and can ascend to a towering altitude of 10 meters. It typically diverges from its foundation and frequently generates offspring. The peel of this flora is sleek and exhibits an array of hues ranging from verdant to russet. It gracefully sloughs off in delicate flakes. The youthful branches of this vegetation are quadrilateral and furrowed, encapsulating a downy texture. The leaves are symmetrically aligned and possess secretory properties. The slender stalk, which binds the leaf to the stem, measures between 3 to 10 millimeters in length. The leaf's blade is oval to elongated in structure, measuring 5 to 15 centimeters in length and 3 to 7 centimeters in width. The upper surface of the leaf is unblemished and hairless, while the underside is adorned with a fine, downy texture. The veins of the leaf are strikingly prominent when observed from beneath [13].

Passiflora edulis

i. Botanical Name

Its botanical name is *Passiflora edulis*

ii. Subsp

Passiflora edulis var. Verrucifera (Lindl.), Passiflora edulis forma edulis), Passiflora verrucifera (Lindl), P. Edulis Sims (a); P. Alata Curtis (b); P. Setacea D.C. (c); P. Ligularis A. Juss. (d); P. Nitida Kunth (e); P. Cincinnata Mast. (f); P. Tripartita (Juss.) Poir. (g); P. Maliformis L. (h); P. Edulis Sims f. Edulis (i); P. Quadrangularis L. (j); Ornamental hybrid P. Setacea x P. Coccinea cv. BRS Estrela do Cerrado (ok); Ornamental hybrid P. Edulis x P. Incarnata cv. BRS Céu do Cerrado-BRS CC (l). Photos: Fábio Faleiro, Ana Maria Costa, Embrapa Cerrados[VI].

iii. Common names

It is also known as passion fruit, grenadelle, grenadine, passionflower, purple granadilla, or purple passion fruit.

iv. Botanical description

To moist environments, such as forests, forests, forest edges, forest gaps, and coastal areas located in the forest, it exhibits its resistance and transformation Crystals emanating from the leaf axils of this perennial vine show, at their inception these vines exhibit a variety of bright and beautiful colors ranging from deep red to bright yellow on *Passiflora Edulis* does not cease there, for it is presented in two main varieties, namely, those with the yellow fruits of *P. edulis f. edulis* and the yellow fruit varieties, each with a distinctive and interesting character. While most passionflowers are generally characterized by their vines growing climbing or prostrate and having stems that help them travel upwards, it is interesting to note that many passion flower species can also be found as trees or seedlings, and reflects the diversity of these plant wonders in addition, Passiflora edulis can exhibit herbaceous and woody characteristics, making it very attractive. Averaging about 6 cm in length and weighing between 60 and 90 g, *Passiflora edulis* presents itself as a striking specimen It is important to emphasize that the yellow-fruited varieties usually lie hard vines and larger fruits have eaten compared to the yellow-bearing counterpart It has been mainly focused on the yellow passion fruits, which are 6-12 cm long and 4-7 cm in diameter, distinguished by their bright yellow colour. The fruit, which is botanically classified as a pepo, possesses a distinctively round or oval shape and has the potential to manifest either a vibrant yellow hue or a deep, dark purple coloration when it reaches the peak of its ripening process. Furthermore, the interior of this fruit is characterized by a lusciously juicy consistency that is dominated by an abundance of seeds, thus contributing to its unparalleled and distinctively unique texture [IX].

Artrocarpus heterophyllus lam

I. Botanical Name

Its botanical name is *Artocarpus heterophyllus Lam*

II. Subsp

Artocarpus brasiliensis Orteg, Artocarpus integer auct, Artocarpus integrifolius auct, Artocarpus maximus Blanco, Artocarpus nanca Noronha, Artocarpus philippensis Lam.

III. Common names

It is commonly known as the jackfruit.

IV. Botanical description

The tree described is a medium-sized evergreen tree that can reach heights of up to 20 to 30 meters and have a diameter of 80 to 200 centimeters. When any part of the tree is injured, it exudes a sticky, white latex. The bark of the tree is rough and can have a somewhat scaly texture, ranging in colour from dark grey to greyish-brown. In its younger years, the tree has a dense, conical crown, but as it matures, the crown becomes more rounded or spreading. The new shoots, twigs, and leaves of the tree are typically smooth, but occasionally they may have short hairs and feel rough to the touch. The stipules of the tree are ovate-acute in shape, measuring 1.5 to 8 centimeters in length and 0.5 to 3 centimeters in width.

These stipules are deciduous and leave annular scars on the twigs when they fall off. The leaves of the tree are thin and leathery, with an obovate-elliptic to elliptic shape. They measure between 5 to 25 centimeters in length and 3.5 to 12 centimeters in width. The leaves are broadest at or above the middle and have a cuneate base. The margin of the leaves is either entirely smooth or, in young plants, may have 1 to 2 pairs of lobes. The apex of the leaves is rounded or blunt with a short, pointed tip. The upper surface of the leaves is dark green and shiny, while the underside is dull pale green. The petiole, which connects the leaf to the stem, is 1.5 to 4 centimeters long and has a shallow groove on the upper side. It may also have sparse hairs. The fruit of this particular plant is shaped like a barrel or a pear, with dimensions ranging from 30 to 100 centimeters in length and 25 to 50 centimeters in width. It is characterized by short pyramidal protuberances or warts on its surface. The stalk of the fruit measures approximately 5 to 10 centimeters in length and 1 to 1.5 centimeters in thickness. The outer layer of the fruit, known as the rind, is about 1 centimeter thick. The rind, along with the central core or receptacle, cannot be separated from the fleshy perianths that surround the seeds. These perianths can be described as waxy, firm, or soft, and have a beautiful golden yellow color. Inside the fruit, there are numerous seeds that are oblong-ellipsoid in shape, measuring 2 to 4 centimeters in length and 1.5 to 2.5 centimeters in width. These seeds are enclosed by horny endocarps and subgelatinous exocarps, providing them with protection. The testa, or the outer covering of the seed, is thin and leathery. The embryo of the seed consists of a ventral radicle and fleshy, unequal cotyledons. The endosperm, which is the nutrient-rich tissue surrounding the embryo, is either very small or absent altogether [XXVIII]

Anona muricata

I. Botanical Name

Its biological name is *Anonna muricata*

II. Subsp

Annonamuricatavar.borinquensis, Guanabanus muricatus (L) M. Gomez, Annona bonplandiana Kunth, Annona ceraensis Barb. Rodr, Annona muricata f. mirabilis R. E. Fr., Annona muricata var, borinquensis Morales ex Urb [XXXII]

III. Common names

Its common name is known as soursop

IV. Botanical description

The *A. muricata* tree can grow up to 10 meters in height and has a dense, spreading crown. Its trunk is usually short and irregularly shaped, with a diameter of about 20-30 cm. The tree's bark is smooth and grayish-brown in color. Its roots are shallow and widely spread, allowing it to absorb nutrients efficiently from the soil. The flowers of *A. muricata* are large, solitary, and have a yellowish-green color. They are pollinated by beetles and other insects, as they do not produce nectar. The tree is also capable of self-pollination, which contributes to its high fruit production. The fruit of *A. muricata* is highly valued for its delicious taste and nutritional benefits. It is typically harvested when it reaches maturity, which is indicated by a slight softening of the skin. The fruit can weigh up to 2.5 kg and has a white, fibrous flesh that is rich in vitamins, minerals, and antioxidants. It is often used to make juices, smoothies, ice creams, and other desserts. In addition to its culinary uses, *A. muricata* has been traditionally used for its medicinal properties. Various parts of the tree, including the leaves, bark, and roots, are believed to have therapeutic effects. It has been used in traditional medicine to treat various ailments, such as fever, diarrhea, parasites, and even cancer. However, more scientific research is needed to validate these claims. The cultivation of *A. muricata* has gained popularity in recent years due to its economic potential [15]. It is grown commercially in many countries, including Brazil, Colombia, Mexico, and Malaysia. The tree's high fruit yield, combined with its ability to adapt to different climates, makes it a profitable crop for farmers. However, the cultivation of *A. muricata* also faces challenges. The tree is susceptible to various pests and diseases, such as fruit flies, anthracnose, and root rot. Proper pest and disease management practices are necessary to ensure a healthy crop. Additionally, the demand for *A. muricata* has led to concerns about overharvesting and unsustainable practices. Efforts are being made to promote sustainable cultivation methods and conserve the genetic diversity of this valuable plant species. In conclusion, *A. Muricata*, a multipurpose plant with culinary, medicinal, and cultural significance, is also referred to as guanabana, soursop, graviola, or Brazilian paw paw. its broad availability and distinct flavor [XIII].

Figure 1: *Psidium guajava* also known as guava

Figure 2: *Passiflora edulis* also known as passionfruit

Figure 3: *Artocarpus heterophyllus* also known as jackfruit

Figure 4: *Anonna muricata* also known as soursop

A. BENEFITS

Psidium guajava

Guava is a popular fruit tree for home gardens because it is durable, produces a lot of fruit, has a long growing season, and is nutritious. In India, it is grown on plantations or incorporated into agroforestry systems, while in Africa it is widely planted. However, the fruit's limited shelf life and susceptibility to fruit flies restrict its potential in larger commercial markets. Nevertheless, there are opportunities for expanding the processed fruit market, especially in Southeast Asia. It is consumed raw or used in various culinary preparations such as stews, shortcakes, and pies. The pulp is turned into jam, jelly, juice, and honey. The jam has a deep colour, clear texture, and retains the unique musky flavour of the fruit. The paste, also known as guava cheese, is made by evaporating the pulp with sugar and enjoyed as a sweet delicacy. The fruit can be preserved in cans, and its juice and nectar can also be preserved using this method. Guava

powder is a valuable source of vitamin C and pectin. In some Asian countries, guava leaves have medicinal properties and are used for cooking, colouring, and tanning. The strong wood of the guava tree is used for indoor applications such as handles, carpentry, and turnery. It is also used for building timbers, woodware, and carvings. The guava tree's flowers attract bees and contribute to honey production [13]

B. *Passiflora edulis*

P. edulis is a plant with a variety of medicinal uses, including as a sedative, anti-asthma and anti-inflammatory. *P. edulis* leaves are commonly used to treat insomnia and are known to induce a deep and refreshing sleep with no side effects. Moreover, it is used in medicine to treat warts, ulcers and ulcers. *P. edulis* is a plant with a variety of medicinal uses, including sedative, anti-asthmatic, and antiemetic properties. *P. edulis* leaves are commonly used to treat insomnia and are known to induce a deep and refreshing sleep with no side effects. Moreover, it is used in traditional medicine to treat boils, wounds and ulcers [XXXIV]

C. *Artocarpus heterophyllus*

The leaves of the jackfruit tree can be used to treat fever, boils, wounds, and skin diseases. The young fruits have a pungent, drying, and digestive effect. When ripe, the fruits are sweet, cooling, and have a laxative effect. They are also believed to have aphrodisiac properties and can be used as a brain tonic. The seeds have diuretic properties but can also cause constipation. The wood of the tree can help with nerve-related issues, diabetes, and can act as a sedative. The latex from the tree is useful for eye and throat problems and has antibacterial properties. The ash from the leaves can be used to treat ulcers. The dried latex contains compounds that have androgenic effects. When mixed with vinegar, the latex can promote healing for abscesses, snakebites, and swollen glands. The root of the tree can be used to treat skin diseases and asthma. An extract of the root can help with fever and diarrhea. The bark can be used as a poultice, and heated leaves can be applied to wounds. The wood has sedative properties, and the pith is believed to be an abortifacient. Latex from the tree can also be used as an anti-inflammatory agent [XXV].

D. *Anonna muricata*

P. edulis is a plant with a variety of medicinal uses, including as a sedative, anti-asthma and anti-inflammatory. *P. edulis* leaves are commonly used to treat insomnia and are known to induce a deep and refreshing sleep with no side effects. Moreover, it is used in medicine to treat warts, ulcers and ulcers. *P. edulis* is a plant with a variety of medicinal uses, including sedative, anti-asthmatic, and antiemetic properties. *P. edulis* leaves are commonly used to treat insomnia and are known to induce a deep and refreshing sleep with no side effects. Moreover, it is used in traditional medicine to treat boils, wounds and ulcers [XXXIV]

II. PHENOLIC COMPOUND

A. *Psidium guajava*

Catechin comprising of (+)-catechin (2R,3S) and (−)-catechin (2S,3R), caffeic acid, gallic acid, naringenin, naringin, quercetin, rosmarinic acid, rutin [XXXI].

B. *Passiflora edulis*

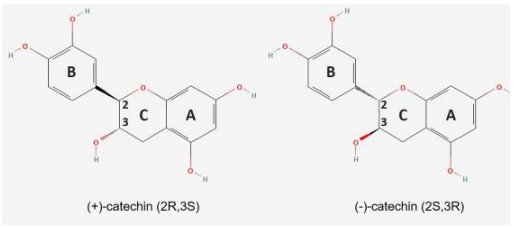
Caffeic acid, gallic acid, ferulic acid, coumaric acid, L-DOPA, quercetin, rosmarinic acid, narigin, naringenin, rutin, resveratrol [XIV]

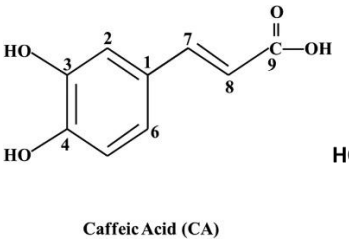
C. *Artrocarpus heterophyllus,*

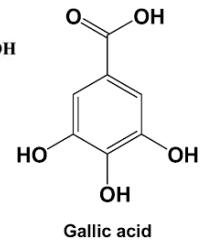
Ferulic, p-coumaric acids, kaempferol, quercetin, and rutin, reticuline, kaempferol 3-O-rutinoside, coreximine, quercetin-3-o-glucoside [XXX]

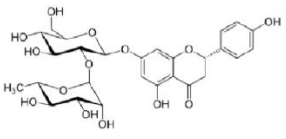
D. *Anonna muricata*

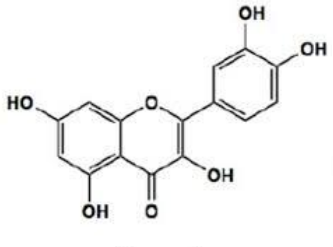
Chlorogenic acid, quercetin, kaempferol, gallic acid, ferulic acid, tannic acid, catechin, rutin and myricetin [XXIX]

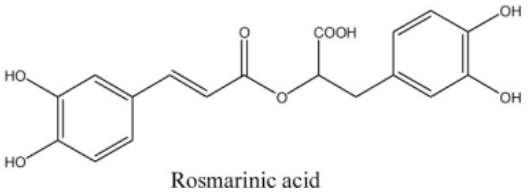












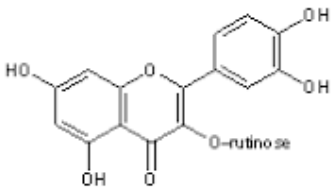
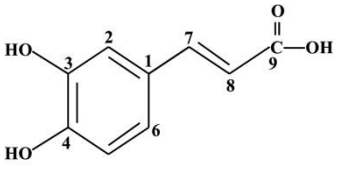
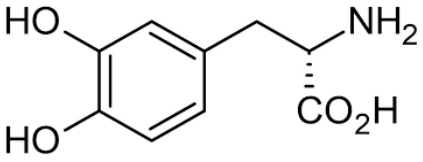


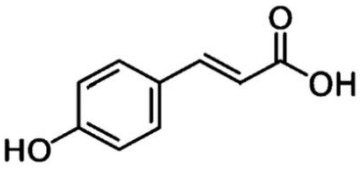
Figure 5: Phenolic compound of *Psidium guajava*: All chemical structures were acquired from Ruksiriwanich et al. (2022)



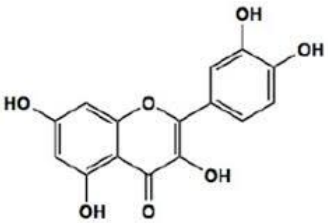
Caffeic Acid (CA)



resveratrol

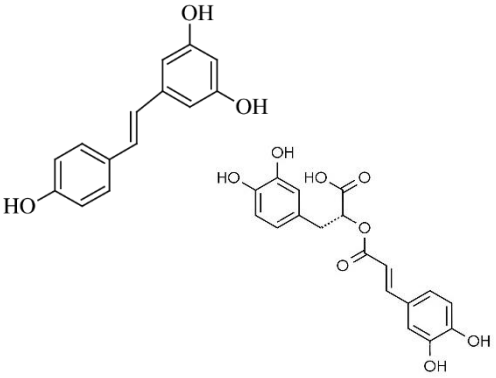


p-Coumaric acid

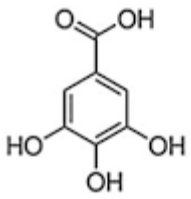


Quercetin

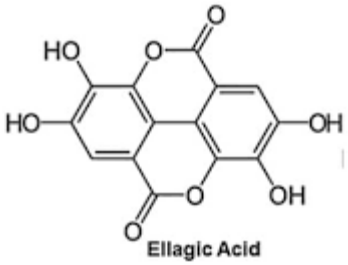
L-DOPA



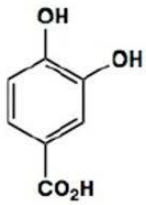
rosmarinic acid



Gallic Acid

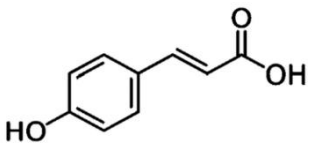


Ellagic Acid

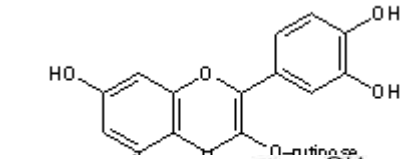


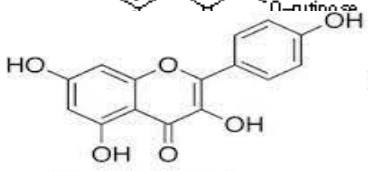
Protocatechuic acid

Figure 6: Phenolic compound of *Passiflora edulis*: All chemical structures were acquired from Lin et al. (2016)

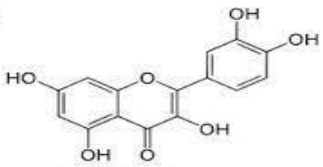


p-Coumaric acid

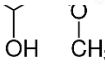




Kaempferol



Quercetin



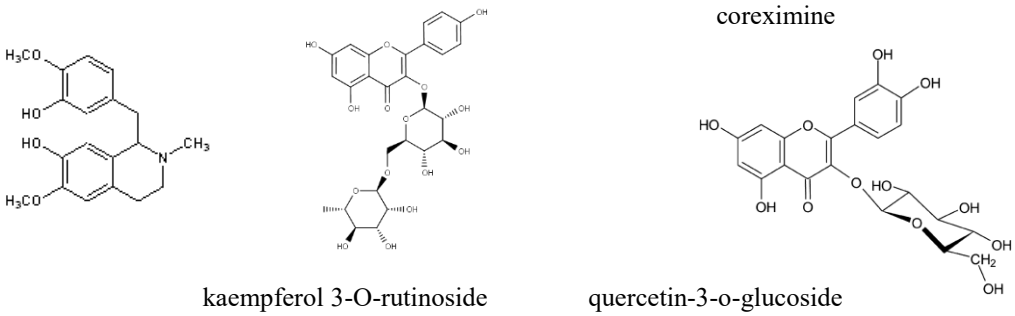


Figure 7: Phenolic compound of *A. muricta*. All chemical structures were acquired from Rubio-Melgarejo et al. (2020), Gyesi et al. (2019b)

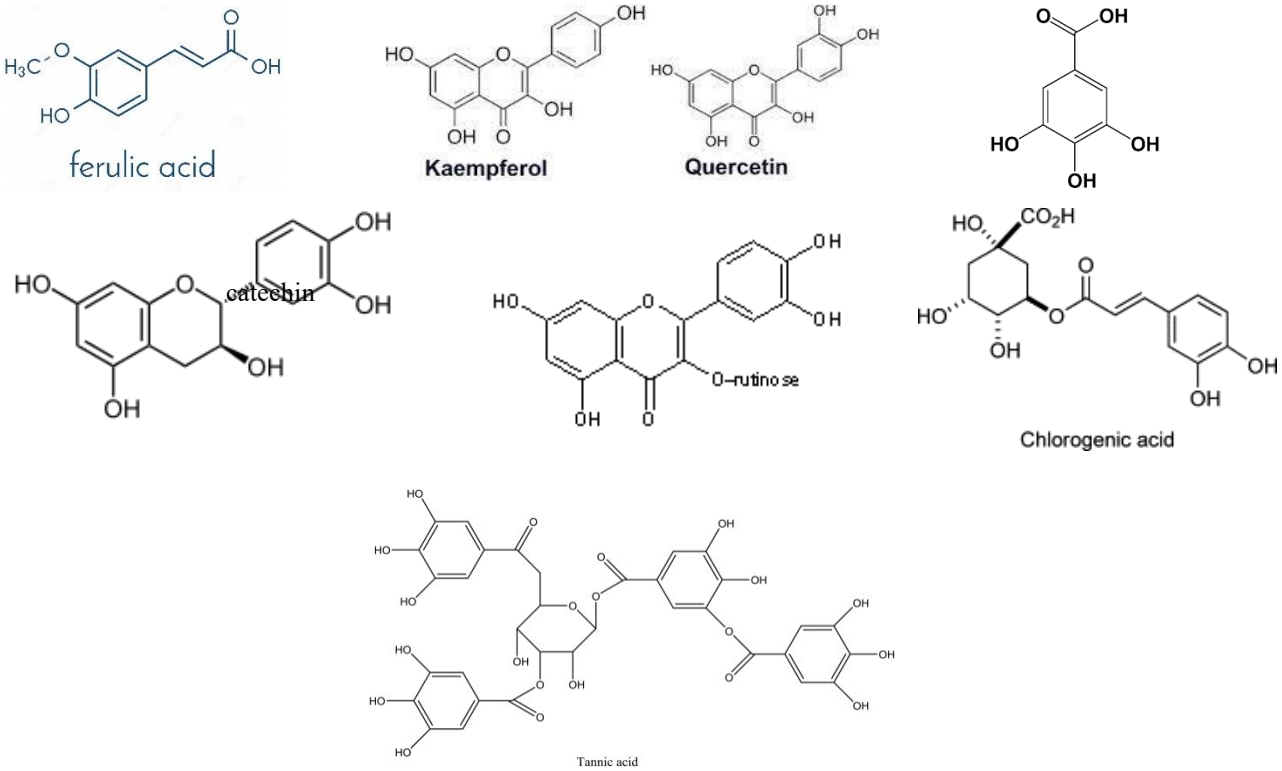


Figure 8: Phenolic compound of *Artocarpus heterophyllus.* All chemical structures were acquired from Rebai and Amri (2018), Orzol et al. (2023)

III. PHARMALOGICAL PROPERTIES

A. *Psidium guajava*

Anticancer/Antitumor Activity: Guava leaf extracts include terpenoids and flavonoids, which have been shown to have anti-tumor properties via stimulating the immune system, limiting tumour cell proliferation, and reducing the formation of new blood vessels. Numerous studies have demonstrated that guava leaf extracts can inhibit the development of many types of cancer cells. Guava leaf extract contains β-caryophyllene, which has been shown to inhibit colorectal cancer growth by interacting with HIF-1α. Guajadial, another chemical found in guava leaf extract, has been demonstrated to have antiestrogenic and apoptotic actions on breast cancer cells. Guava leaf extracts have also been shown to block genes implicated in lung cancer signalling pathways. Several active components, including daidzein, ursolic acid, apigenin, genistein, and quercetin, have been identified in guava leaf extract.

Antimicrobial Activity: The healthcare sector is experiencing problems from emerging strains of antibiotic-resistant microbes, which are increasing global death rates. These pathogens, including staphylococci, rubella, salmonella, bacilli, Escherichia coli, Clostridium, and pseudomonas, cause systemic illnesses and food poisoning. However, guava leaves contain bioactive chemicals that have been demonstrated to hinder the growth and development of these microbes. These chemicals, including phenolic acids, flavonoids, terpenoids, glycosides, and saponins, have antibacterial, antioxidant, and antiproliferative properties. Guava leaves also contain tannins with antibacterial characteristics, making them a promising option to battle microbial illnesses and drug resistance.

Antioxidant properties: Numerous studies have established the importance of antioxidant compounds derived from GLs in mitigating the damaging results of free radicals. These compounds have been shown to act as mild antioxidants, with vital oils extracted from GLs showing an IC50 fee of approximately 460.37 ± 1.33 μg/mL in a DPPH assay. Other analyses have discovered that GL extract possesses the potential to reduce linoleic acid oxidation and scavenge peroxyl radicals. Additionally, there's a right away correlation among the potency of antioxidants, their capacity to scavenge unfastened radicals, and the phenolic content material present in GL extract. The protective consequences of GL polysaccharides have also been investigated, mainly in zebrafish fashions. Researchers found that GL polysaccharides exert a defensive impact in opposition to oxidative pressure brought about by hydrogen peroxide. This protective impact is completed with the aid of inhibiting the formation of reactive oxygen species (ROS), lowering lipid peroxidation, and stopping mobile dying. These findings highlight the potential of GL polysaccharides as a natural defense towards oxidative strain-associated harm. Furthermore, GL extracts had been shown to possess a extensive variety of bioactive compounds, including seven major flavonoids: quercetin, hesperetin, kaempferol, quercitrin, rutin, catchin, and apigenin. Additionally, different bioactive compounds which include kaempfertin, isoquinoline, and corilaginoline alkaloids were recognized. These compounds play a essential role within the antioxidant properties of GLs, similarly emphasizing their ability therapeutic applications in combating oxidative stress-related ailments. 4. Overall, the antioxidant homes of GLs and their bioactive compounds hold extraordinary promise in minimizing the damaging effects of free radicals. Through their capability to scavenge unfastened radicals, lessen oxidative pressure, and shield towards mobile damage, GLs have the capacity to contribute to the prevention and treatment of numerous inflammatory illnesses, ischemic sicknesses, neurological disorders, hemochromatosis, emphysema, obtained immunodeficiency syndrome, and different ailments related to oxidative stress.

Passiflora edulis

Anti-inflammatory: The aqueous extract, butanol, and aqueous residue fractions of *P. edulis* leaves showed significant anti-inflammatory properties in vivo. Administered intraperitoneally at doses ranging from 100 to 1000 mg/kg, the aqueous leaf extracts of *P. edulis* exhibited notable anti-inflammatory effects in a mouse model of carrageenan-induced pleuritis. Systemic administration of *P. edulis* demonstrated substantial anti-inflammatory effects in an acute inflammatory model induced by intrathoracic carrageenan injection, including reduced leukocyte influx into the pleural cavity and suppression of myeloperoxidase, nitric oxide, TNFα, and IL-1α levels. *P. edulis* extract inhibited leukocytes in bradykinin, histamine, and substance P-induced pleurisy, showing comparable or lower white blood cell counts, myeloperoxidase, and nitric oxide levels compared to dexamethasone during early stages of carrageenan-induced inflammation in mice. These findings suggest that *P. edulis* could be a valuable source for developing new therapeutic candidates with anti-inflammatory activity similar to dexamethasone, as evidenced by its superior ability to suppress TNFα and IL-1α levels. The results not only highlight the effectiveness of *P. edulis* extract but also its potential as a promising alternative to current anti-inflammatory medications, offering new avenues for combating inflammation and its complications by leveraging the unique composition of *P. edulis* extracts [XIII].

Antioxidant: The healthcare industry is currently facing challenges due to the emergence of new pathogenic strains and antibiotic-resistant microorganisms, which are impacting international mortality charges drastically. Systemic microbial infections and food poisoning caused by diverse pathogens like staphylococci, rubella, salmonella, bacilli, Escherichia coli, clostridium, and pseudomonas are many of the main causes of difficulty. Guava leaves, containing plant bioactive compounds, have shown promise as an antimicrobial agent with the aid of inhibiting microbial cell wall development, mobile lysis, biofilm formation, DNA replication, transcription, ATP production, and bacterial toxin release.The compounds found in guava leaves, along with phenolic acids, flavonoids, terpenoids, glycosides, and saponins, make contributions to antibacterial, antioxidant, and antiproliferative effects. Qualitative analysis of guava leaf extract has discovered the presence of compounds like gallic acid, chlorogenic acid, rutin, isoquercitrin, avicularin, quercitrin, kaempferol, morin, and quercetin, which inhibit fungal cellular membranes and boom.Water-soluble tannins in guava leaves also show off antibacterial properties, making them a capability opportunity in fighting microbial infections and antibiotic resistance[V].

Antitumor: Aqueous-alcoholic extracts of *Passiflora edulis* leaves were reported to possess potent antioxidant activity which was quantified by in-vitro and ex-vivo analytical methods filtered are positively correlated. These compounds are able to protect against free radicals caused by iron and glucose which cause cell death and protein damage. Also, the leaf extract showed scavenging activity against various reactive oxidants, indicating that strong antioxidative effects were obtained at high concentrations of the extract, but the hydroxyl radicals observed oxidative effect results showed, anti-factors one of the most abundant oxidants in nature If the leaves are used of *Passiflora edulis* as form can be, and has a potential contribution to the prevention of diseases where oxidative stress is involved. Many scientists are working to identify the mechanisms underlying its oxidant properties, and its extracts could be useful in treating diabetes and brain conditions on the one hand, researchers are discovering that the role of Passiflora edulis use against

tumors is so effective that it can kill specific lab-grown cancer cells. The ethanolic extract of Passiflora contains high levels of polyphenols and polysaccharides, which can also inhibit the activity of some enzymes involved in tumor cell growth This phase highlighted the great potential of animal-based research, together effectively inhibiting tumor growth and increasing life expectancy. Oil is to be valued mainly for its fatty acid content, which is attributed to its health-giving properties. This compound has also been shown to inhibit the growth of other cancer cells [V].

C. *Artocarpus heterophyllus*

Anti-inflammatory: The leaves and roots of this tree have long been utilised for medicinal reasons. The researchers wanted to see if phenolic compounds isolated from Artocarpus heterophyllus fruits have anti-inflammatory properties. Three phenolic compounds were found using spectroscopic techniques and compared to existing literature: artocarpesin, norartocarpetin, and oxyresveratrol. The researchers next assessed these chemicals' anti-inflammatory effectiveness by looking at how they inhibited the generation of proinflammatory mediators in murine macrophage cells. The findings showed that artocarpesin efficiently reduced the generation of nitric oxide and prostaglandin E2, which are known to contribute to inflammation. This shows that artocarpesin may have potential as a therapy for inflammation-related illnesses [37]

Antioxidant: The antioxidant properties of prenylflavones derived from *Artocarpus heterophyllus Lam*. Several compounds, including artocarpine, artocarpetin, artocarpetin A, and cycloheterophyllin diacetate and peracetate, were found to have no impact on iron-induced lipid peroxidation in rat brain homogenate. Additionally, these compounds did not scavenge the stable free radical 1, 1-diphenyl-2picrylhydrazyl. In contrast, cycloheterophyllin, artonins A, and artonins B exhibited inhibitory effects on iron-induced lipid peroxidation in rat brain homogenate and demonstrated scavenging activity against 1, 1-diphenyl-2picrylhydrazyl. Furthermore, these compounds were able to scavenge peroxyl radicals and hydroxyl radicals generated by 2, 2'-azobis (2amidinopropane) dihydrochloride and the Fe3+-ascorbateEDTA-H2O2 system, respectively. However, they did not inhibit xanthine oxidase activity or scavenge superoxide anion, hydrogen peroxide, carbon radical, or peroxyl radicals derived from 2,2'-azobis(2,4-dimethylvaleronitrile) in hexane. Notably, cycloheterophyllin and artonins A and B demonstrated inhibitory effects on copper-catalyzed oxidation of human low-density lipoprotein, as evidenced by fluorescence intensity, thiobarbituric acid-reactive substance and conjugated-diene formations, and electrophoretic mobility. In conclusion, cycloheterophyllin and artonins A and B exhibit potent antioxidant activity against lipid peroxidation when biomembranes are exposed to oxygen radicals [37].

Antifungal: Overall, the focus on the identification and characterization of two novel chitin-binding lectins derived from the seeds of the Artocarpus genus. The purification process involved several chromatographic techniques, and both lectins were found to be approximately 14 kDa in size and comprised of three chains interconnected by disulfide bonds. The amino acid sequences of these lectins showed homology to each other but not to any other known plant chitin-binding proteins, making their classification challenging. Further analysis revealed their structural properties, including a secondary structure content consisting of beta-sheet and unordered elements. The thermal stability of these lectins was investigated, and it was found that they remained structurally intact up to a temperature of 80 degrees Celsius. However, below a pH of 6, noticeable structural changes were observed. Additionally, both lectins demonstrated inhibitory effects on the growth of Fusarium moniliforme and Saccharomyces cerevisiae, indicating their potential as antifungal agents. They also exhibited hemagglutination activity against human and rabbit erythrocytes, suggesting their ability to bind to and agglutinate red blood cells. To distinguish between the two lectins, they were given specific names: jackin, derived from jackfruit, and frutackin. These findings contribute to the expanding knowledge of chitin-binding lectins and highlight the unique characteristics and potential applications of these lectins derived from the Artocarpus genus [16]

Melanin inhibitor: The researchers conducted a study on a collection of polyphenols called prenylated flavones, specifically compounds 1-8, which were extracted from the wood of *Artocarpus heterophyllus*. Initially, these compounds were believed to have no impact on tyrosinase activity, an enzyme involved in melanin biosynthesis. However, the researchers made a groundbreaking discovery when they found that these compounds actually acted as effective inhibitors of melanin production in B16 melanoma cells. Furthermore, the compounds demonstrated minimal toxicity, making them potentially safe for use in therapeutic applications. To further investigate the mechanism behind this inhibition, the researchers sought to understand the relationship between the structure of these compounds and their inhibitory activity. They compared the prenylated flavones with similar compounds that lacked prenyl side chains. Through a series of experiments, they were able to determine that the presence of both prenyl and hydroxyl (OH) groups, as well as the specific substitution pattern, were crucial factors in inhibiting melanin biosynthesis in B16 melanoma cells. This study provides valuable insights into the structural requirements for inhibiting melanin production and offers potential avenues for the development of novel melanin inhibitors. The findings highlight the importance of prenyl and OH groups in the design of effective compounds and pave the way for further research in this field. Ultimately,

this research may contribute to the development of new therapeutic strategies for conditions related to melanin

D. *Anonna muricata*

Healing: A. Muricata is known for its ability to heal wounds, as shown via each visual and microscopic examinations. Using an ointment containing A. Muricata ethyl acetate extract led to increased antioxidants and reduced ranges of MDA in wound tissues. Additionally, extracts from A. Muricata bark and leaves also demonstrated wound healing while in comparison to untreated wounds. [X].

Antiviral: Extracts from *A. muricata* have been reported to have antiviral activity including inhibition of HIV-I and herpes simplex virus replication. These effects can be attributed to the presence of rutin and other phenolic compounds. In addition, several acetogenins found in *A. muricata*, such as cis-annonacin, showed promising inhibitory activity against SARS-CoV-2 spike proteins in computational models This suggests that acetogenin can be synthesized as a substance against SARS-CoV-2, in the laboratory Further studies should also be conducted in animal experiments [XLI]

Antibacterial: Extracts of *A. muricata* have shown antibacterial activity against both Gram-positive and Gram-negative bacteria, outperforming the standard antibiotic streptomycin. However, the effectiveness of the extracts can be influenced by the solvent used for extraction [8]. Combining *A. muricata* ethanolic extract with antibiotics has been found to reduce the potential of multidrug-resistant *E. coli* and *Staphylococcus aureus* strains. The bioactive compounds in *A. muricata,* such as alkaloids, target bacterial membranes, leading to broad-spectrum antibacterial effects [X].

Anticancer: Extracts from distinctive parts of *A. muricata* have shown anticancer hobby thru specific mechanisms. For instance, extracts from fruits, stems, seeds and shoots have been observed to inhibit matrix metalloproteinases (MMPs) related to most cancers improvement Extracts from leaves, shoots and roots degrade MMPs, produce reactive oxygen species (ROS), and cell cycle Taken has been shown to inhibit the growth of leukemia cells Herbal extracts have prompted apoptosis in lung, colon and breast cancer cell lines. Compounds isolated from A. Muricata along with anomuricin E and anonacin also showed high antioxidant interest. In addition, A. Muricata has been said to modulate antioxidant enzyme activity, inclusive of increasing the expression of superoxide dismutase-1 (SOD1), which allows shield cells from damage [XLI].

CONCLUSION

Recent years have visible a surge in scientific research that specialize in *Anonna muricata, Passiflora. Edulis, Artocarpus heterophyllus* and *Psidium guajava* due to their said beneficial pharmaceutical houses together with being antidiabetic, anti-inflammatory, antiphotoaging, antioxidant, and antibacterial agents. Phytochemical studies have confirmed the traditional makes use of these plant life, however there may be a pressing need to delve deeper into the chemical and bioactive components liable for those particular properties. It is important to discover and examine the foremost bioactive metabolites found in this plant life to recognize their bioactivities and decide the mechanisms of action, in the long run paving the manner for ability business applications and further enhancing our expertise of their healing capacity.

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