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A Review of Passiflora Vitifolia the Promising Medicinal Plant and Diseases of Passiflora Species

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ABSTRACT:
The utilization of genuine ingredients with the production of medications given in modern medicine remains unparalleled, even while synthetic chemistry has advanced beyond expectations. *Passiflora vitifolia* is endemic to South America and flourishes in Kerala, India. *P. vitifolia* contains a wide range of bioactive compounds, including glycosidically bound volatiles, alkaloids, phenols, glycosyl flavonoids, and cyanogenic mixes, all of which have medicinal properties.
Passiflora vitifolia and its parts show antioxidant, vasodilator, Anti-inflammatory, In-vitro cytological, mild steel acid corrosion inhibitor, antimicrobial, anticancer, anti-hyperglycemic, In-vitro callogenesis, Antihypertensive, Analgesic, and Anti-tussive activity. Passion fruit woodiness, bacterial spot, root and collar rot, fusarium wilt, anthracnose, and scab are among the most significant diseases of viral, bacterial, or fungal etiologies that may be causing a reduction in the longevity and productivity of passion fruit plants. Fruit quality and productivity are negatively impacted by the prevalence of woody fruits on immature plants. Entire crops have been destroyed by fusariosis, collar rot, and root rot, which have caused irreparable wilting and plant death. *Passiflora vitifolia* which grows between zero and five hundred fifty meters above sea level. The flower has an axillary flower and is a solitary flower. *Passiflora vitifolia* Kunth is recognized by the tubular corona that forms on the leaf sinus and bracts, which is partly caused by the fusion of its components. A study was undertaken to look at the anti-diabetic and anti-inflammatory properties of juice extracted from this plant. The paper examines the plant's folkloric use in a variety of illnesses, as well as the numerous phytochemicals responsible for its pharmacological effects.

1. Introduction

Ayurveda [Ayu - Life, Veda - Knowledge, meaning - science of life] is India's traditional health care system and one of the oldest therapeutic systems for treating various disorders. India has a rich biodiversity and offers enormous potential and benefits in the growing field of herbal medicine. The overall number of medicinal plants is around 7500, with representatives from about 17,000 higher flowering plant species. The use of natural ingredients in the production of medicinal products used in modern medicine remains incomparable, even while synthetic chemistry has advanced beyond expectations. Unlike synthetic medications, natural drugs provide a complete cure for many ailments rather than just symptom treatment. Because of these conclusive facts, herbal drugs have been widely used all over the world. **(Kumar Duvey and Chowdhary 2016)**

The term "passiflora" is Latin in origin, and it was discovered in 1529 by Spanish explorers. The definition of the word "Passio" represents "Passion of chrits". The Passifloraceae is divided into two tribes: Passifloreae (14 genera, five in the New World and nine in the Old World) and Paropsieae (six genera, all Old World species in Africa and Madagascar). Passiflora taxonomy is based on different floral and vegetative components, resulting in a complicated taxonomic categorization into subgenera, sections, and series**(Muschner, Lorenz *et al*. 2003)**. While most passion flowers are herbaceous or woody vines that climb to other plants with tendrils,

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some are trees or shrubs **(Ocampo Pérez and Coppens d'Eeckenbrugge 2017)**.

The species has several distinguishing floral characteristics, including an androgynophore, a complicated corona made up of various filament concentric rows, a magnificent same-species variation in size, shape, and color, and a limen-operculum system that restricts access to the nectar holes. *P. vitifolia* ranges northwest from the Amazon forest and the Guiana region to southern Central America(Gentry 1981). In India, *Passiflora vitifolia* grows in all districts of Kerala and it is native to South America. Many bioactive substances, including glycosidically bound volatiles, alkaloids, phenols, glycosyl flavonoids, and cyanogenic mixtures **(Thilagavathi, Prithiba *et al.* 2019, Murillo, Jiménez *et al.* 2023)**, are present in *P. vitifolia* and have various therapeutic qualities.

1.1 Distribution

Passiflora species can be found throughout India in a variety of environments, including agricultural regions, grasslands, and forests. Gardens and parks are the most popular places to find imported species.

Description of the species known as *Passiflora vitifolia* Kunth's taxonomy **(Table 1)**

Table 1 - The *Passiflora vitifolia* taxonomical description

Kingdom	**Plantae**
Subkingdom	Tracheobionta
Super division	Spermatophyta
Division	Magnoliophyta
Class	Magnoliopsida
Subclass	Dilleniidae
Order	Violaes
Family	Passifloraceae
Genus	Passiflora l.
Species	*Passiflora vitiflolia*

Lowland forest borders and shrub-covered areas, Native to South America, Eastern Asia, Southern Asia, and New Guinea are the majority of Passiflora species. There are nine native species in the United States, the most northern of which is found in Ohio, while the remaining two are found in south Florida and west California. Passiflora species are very widely distributed in Australia and New Zealand **(Kaikade, Gurunani, *et al.* 2023, Murillo, Jiménez *et al.* 2023)**. Although species exist in the United States, Southeast Asia, and Oceania, most varieties of genera Passiflora can be discovered in Mexico, Central America, and South America.

Habitat: perpetual climber, Planting time: spring or autumn, Height: 1–11 meters. Self-pollination- No, vernacular Names- Passionflower, passion vine, maypop, and granadilla, Production - status Productive, decorative, and forest plant types Most are perpetual vines, but some are annuals or woody shrubs/trees. Flower Colors: Blue, Purple, Pink, White, and Red. The majority of native locations are situated in Southeast Asia, Oceania, North America, and Central and South America **(Bisht, Rana *et al.*)**.

1.2 Medicinal Properties

- Reducing anxiety and nervousness before surgery, heart failure, fibromyalgia, insomnia, anxiety, adjustment disorder, ADHD, and pain, and alleviating the impact of opioid withdrawal.
- It is also used to cure lesions and hemorrhoids on the skin.
- Passionflower extract is used as flavouring in meals and drinks. **(Nabavi and Silva 2018)**

1.3 Other Uses

- Passionflower tea.
- Passionflower tincture for Sleeping.
- Soothing passion flower herbal mix. **(Patel, Verma *et al.* 2009)**
- Passiflora is a fragrance in the food materials and beverage industry.
- Various species of Passiflora are used as decorative plants.

2. Pharmacognosy of plant *Passiflora vitifolia*

- The fruit of *P. vitifolia*, sometimes known as "fragrant passionflower," is what gives it its name. When the fruit first falls off the vine, it is highly tart; but, after a few weeks of maturing, it transforms into a sweet fruit similar to strawberries. The flower's delicate red and white filaments remain erect rather than spreading up against the long, lanceolate petals, which are bright crimson **(Sunarmi, S *et al.* 2021)**. *Passiflora vitifolia* Kunth distinguishes itself by the tubular corona

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that forms on the leaf sinus and bracts, which is largely created by the fusion of its parts.

- *Passiflora vitifolia* can be found at altitudes ranging from 0 to 550 meters above sea level, however, it fails to bear fruit. The flower is a solitary bloom with an axillary flower. It has brilliant red petals and a crimson radian, with lengths ranging from 7.5 to 9.0 mm. The pali are white and range in size from 3 to 7.5 mm. Bractea is oval, 3 to 4 cm long, with a flat base, elongated tip, glandular edge, pink color, and downy surface. The spherical flower stalk measures 8-9.5 cm in length and has a green, hairy surface. Petals with five sepals, polysepalous, imbricate-quinqunsialis, 4XL length, 4 - 5 cm x 1, 1.1 cm size, greenish-red outer surface color, deep red, downy hair, crown number of petals Ice is loose, cohlearis, and red, with a smooth outer and inner surface that resembles velvet and forms a loop. Stamens with five stamens, verstalis, separate filaments, androginophores, 1.5 - 2 cm filaments length, 1.9 cm anther length, three white corona circles of different lengths, The pistil type is parakarp, corresponding to Snow's declaration **(Sunarmi, Fitriyati, *et al*. 2021)**. The ovary has a diameter of 0.5 - 0.7 cm, a circular form, three carpelum, an infinite ovary, and a parietal placenta. Meanwhile, the style measures 1.58 centimeters long. The stigma is 0.4 to 0.5 cm in length, and the count of 3 has a funnel-like appearance. **(Figure 1)**

Fig.1- *Passiflora vitifolia* plant leaves and flower

2.1 Phytochemical studies

In leaves of the hydroethanolic extract of *P. vitifolia* were found flavones-O-triglycosides, flavones-8,7- di-C, O-glycosides, and flavones-C-glycosides**(Sakalem, Negri *et al*. 2012)**.

The seeds extracted from the ripe fruit of *P. vitifolia* were found to contain polyphenols, flavonoids, tannins, anthraquinone, terpenes, steroids, and alkaloids**(Rodríguez, Arteaga *et al*. 2021).**

Vitexin, epicatechin, (+)-catechin, vicenin II, and orientin were present in *P. vitifolia* **(Murillo, Jiménez, *et al*. 2023). (Figures 2 to 4)**

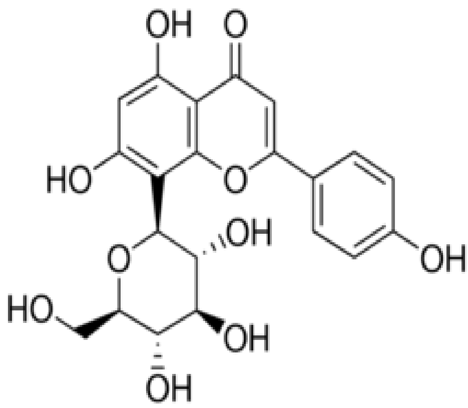

Fig.2 Structure of vitexin

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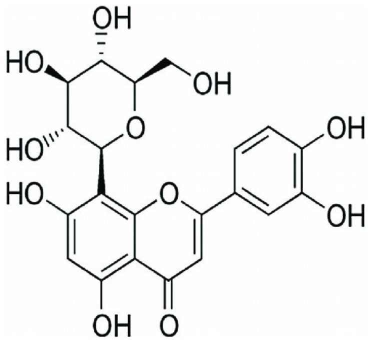

Fig.3 Structure of orientin

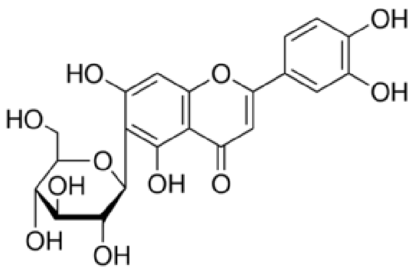

Fig.4 Structure of isoorientin

3. Pharmacology of *Passiflora vitifolia*

3.1. Antioxidant activity

The antioxidant property of the compounds present in the peel and seeds was measured using free radical diphenylpicrylhydrazyl (DPPH) **(Braca, Sortino *et al*. 2002)** and 2, 2'-azino-bis (3-ethylbenzothiazoline-6-sulphonic acid **(González, Marquina *et al*. 2008)** radical scavenging capacity (RSC) assays. In another set of experiments, antioxidant capacity (AC) was performed to evaluate the ferric reduction of antioxidant power (FRAP), according to Berker *et al*.**(Berker, Güçlü, *et al*. 2007)**. Microplate spectrophotometers (96 wells microplate UV-vis reader) were used to perform the aforementioned experiments. Different concentrations of blank (as a control) or Trolox standard solution (to create a standard curve) were added to each trial's well on the corresponding device. The concentration needed to inhibit viability by 50% was used to express all results (IC50 RSC or IC50 AC values).

3.2. Vasodilator effect

The purpose of this study was to assess the vasodilator potential of extracts made from the seeds of *Passiflora vitifolia* and *Passiflora edulis* f. edulis. To do this, the extracts were extracted by macerating the seed flour of the two species with 97% ethanol; UHPLC, qualitative and quantitative tests, and other methods were used to characterize the extracts. We assessed its cytotoxicity, potential for in vivo vasodilator action, and potential in vitro modes of action.

The extracts demonstrated a preventative effect of Health technology assessment (HTA), inhibited the contraction of angiotensin-II (AT-II), and showed relaxation of contracted aortic rings with phenylephrine and potassium chloride, which was partially reversed in the presence of L-NAME (hydrochloride). The extracts did not appear to be harmful. The findings show that certain Passifloras have the potential to be a source of extracts with anti-hypertensive properties; probable MAO include the production of nitrous oxide and the inhibition or antagonistic effects of angiotensin-II. **(Nabavi and Silva 2018)**

3.3. Anti-inflammatory activity

The current investigation begins the process of assessing *Passiflora vitifolia* leaves' potential anti-inflammatory properties. The plant's flavonoid content is thought to be the cause of its anti-inflammatory properties. In rats, anti-inflammatory action has long been known and well-examined. Quercetin, silymarin apigenin, daidzein, genistein, etc. are a few examples. Therefore, to solve this issue, new medications are needed. Fortunately, plants have a wealth of phytoconstituents that are both beneficial and low in side effects when compared to pharmaceuticals that are now on the market. Thus, this study provides some encouraging findings on the anti-inflammatory technique. **(Bisht, Rana *et al*.)**

3.4. In-vitro cytological studies

Cytogenetic examination of the callus was performed for both primary and 4-month-old callus cultures. The number of chromosomes varied greatly, although the majority of the cells were diploid (2n = 18). Polyploid cells, enucleated cells, binucleated cells, and chromosomal bridges were the most commonly seen chromosomal abnormalities. The content and quantities of media were discovered to alter chromosomal instability, implying that genetic changes may occur during callogenesis. **(Chandana, Kumar *et al*.)**

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3.5. Mild steel acid corrosion inhibitor activity

The current study focuses on the use of *Passiflora vitifolia* leaf extract as a corrosion hindrance for mild steel in 1M HCl solution. Mass loss measurements show a hindrance efficiency of 97.5% after 12 hours of immersion, while electrochemical tests show 89.8% protection efficiency at 0.6% inhibitor concentration. The adsorption of *Passiflora vitifolia* leaf extract onto the mild steel surface followed the Langmuir adsorption isotherm. The thermodynamic parameters were also calculated and discussed. Potentio-dynamic polarization indicated that *Passiflora vitifolia* leaf extract in 1M hydrochloric acid acted as a mixed-type hindrance. **(Thilagavathi, Prithiba, *et al*. 2019)**

3.6. Antimicrobial, antioxidant, anticancer activities

The current work reports the production of silver nanoparticles with the use of leaves extract from *Passiflora vitifolia* (P. vitifolia) as a capping and reducing agent. The AgNPs exhibited strong antioxidant activity against DPPH free radicals and considerable antibacterial efficiency against pathogenic microorganisms. Furthermore, with a significant IC_{50} value of 57.65µg/mL, silver nanoparticles demonstrated strong antineoplastic activity against the murine macrophage (RAW-264.7) cell line. After completing successful clinical studies, the produced AgNPs showed good antibacterial, antioxidant, and anticancer activity; as a result, they can be employed in a variety of biological applications. **(Basavarajappa, Kumar *et al*. 2022)**

3.7. Anti-hyperglycemic activity

The 3, 5-dinitrosalicylic acid (DNSA) method was used to conduct an in-vitro investigation on alpha-amylase inhibitory action (19). Phosphate buffer solution (1% w/v, pH 7.0) containing 6.9mM Nacl was mixed with 100 µl of *P. vitifolia* peel and seed extracts to yield a final concentration of (100–800 µg/ml). After dissolving 100 µl of the alpha-amylase enzyme solution in the buffer, the reaction was started and incubated for 10 minutes at 37°C. The reaction mixture was halted with a diluted ice bath (2.8 ml distilled water), and the absorbance was measured at 560 nm with a UV-visible spectrophotometer. Blank tubes for each conc. were created by replacing the enzyme solution with 100 µl of distilled water. A control, representing 100% of the enzyme activity, was made similar but without extract. **(Avila, Jiménez *et al*. 2021)**

3.8. In vitro callogenesis activity

For callogenesis using different plant parts (leaf, stem, flower bud, and tendril) of *Passiflora vitifolia* Kunth, an effective in vitro approach was developed. On Murashige and Skoog (MS) basal medium, auxin, and cytokinin at varying doses are added. The ability to induce callus was evaluated at various doses of auxin (0.6–4.0 mg/l), and cytokinin (0.5–2.5 mg/l). When growth regulators were added one at a time to Murashige and Skoog (MS) media, the explants of stems and tendrils developed hard white callus, whereas the explants of leaves and flower buds developed soft friable callus. Explants of leaves, stems, and flowers on MS media supplemented with auxin and cytokinin showed higher levels of callogenic potential. **(Chandana, NK *et al*. 2022)**

3.9. Antihypertensive activity

Because *P. vitifolia* includes flavonoids and a water-soluble component it has been identified as a mercury salt, and it has antihypertensive consequences ($C_{10}H_{22}O_8$ NHgC$_{12}$). There is a good likelihood that this load will increase (Murillo A and Rueda L 2013). Antihypertensive qualities have been reported for *P. incarnata*, a related species of *P. nepalensis*. Because *P. incarnata* includes flavonoids and a water-soluble component that has been identified as a mercury salt ($C_{10}H_{22}O_8$ NHgC$_{12}$), it has an antihypertensive impact. In traditional medicine, *P. nepalensis* is used to treat hypertension. **(Benson, Khachigian *et al*. 2008)**

3.10. Analgesic activity

Cupressus sempervirens and Passiflora species have similar analgesic properties. When *Passiflora subpeltata* Ortega is present, myeloperoxidase enzyme levels and neutrophil infiltration drop. *Passiflora subpeltata* Ortega regulates enzymatic antioxidants such as superoxide dismutase, catalase, glutathione, and lipid peroxidation. *Passiflora subpeltata* Ortega extracts reduced nitric oxide and tumour necrosis factor production. As a result, Ortega's *Passiflora subpeltata* can help with inflammatory bowel disease. **(Kanniah, Radhamani *et al*. 2020)**

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3.11. Antitussive activity

P. vitifolia leaves exhibited strong antitussive effects in mice exposed to sulfur dioxide, inducing coughing at a rate similar to that of codeine phosphate. **(Dhawan, Dhawan *et al*. 2003)**

3.12. Free and Glycosidic bound volatile oils

GC and GC-MS were used to evaluate the free volatile components of *Passiflora vitifolia* that were extracted using a liquid-liquid method. In the scent of this fruit, a total of twenty-four components were discovered for the first time. Methyl 3-hydroxyhexanoate, methyl hexanoate, methyl 5-hydroxyhexanoate, 4-hydroxy-4-methyl-2-pentanone, methyl butyrate, methyl 5-0x0-hexanoate, and methyl (E)-e-hexenoate were the main components in terms of quantity. Following the separation of the glycosidic fraction produced by Amberlite XAD-2 adsorption and methanol elution, bound aroma components were also detected by GC and GWS. The glycosidic fraction was then hydrolyzed using a commercial pectinase enzyme. Fifteen of the seventeen aglycones that were found were identified. These aglycones were primarily made up of substances with hydroxy esters and aromatic structures. **(Agudelo, Suárez *et al*. 1996)** (Table 2)

Table 2- Pharmacological Profile of *Passiflora vitifolia* Kunth

S. no.	Pharmacological Activity	Parts used	Extract	References
1	Antioxidant activity	Leaves, Stems And Tendrils	Ethanolic Extract	**(Murillo, Jiménez *et al*. 2023)**
2	Vasodilator effect	Ripe-fruit seeds	Ethanolic extract	**(Nabavi and Silva 2018)**
3	Anti-inflammatory activity	Leaves	Ethanolic extract	**(Bisht, Rana *et al.*)**
4	In-vitro cytological studies	Leaves	Callus formation	**(Chandana, Kumar *et al.*)**
5	Mild steel acid corrosion inhibitor	Leaves	Hydrochloric acid	**(Thilagavathi, Prithiba, *et al*. 2019)**
6	Antimicrobial, antioxidant, anticancer activities	Leaves	Silver nanoparticles	**(Basavarajappa, Kumar *et al*. 2022)**
7	Anti-hyperglycemic activity	Peel and seed	Ethanolic extract	**(Avila, Jiménez *et al*. 2021)**
8	In vitro callogenesis	leaves, stem, tendril, and flower buds	Callus formation	**(Chandana, NK *et al.* 2022)**
9	Antihypertensive activity	Seeds	Ethanolic extract	**(Murillo A and Rueda L 2013)**
10	Analgesic activity	Leaves	Ethanolic extract	**(Kaikade, Gurunani *et al*. 2023)**
11	Antitussive activity	Leaves	Ethanolic extract	**(Dhawan, Kumar *et al*. 2003)**
12	Free and Glycosidic bound volatile oils	Fruits	Pentane: dichloromethane (2:1)	**(Agudelo, Suárez *et al*. 1996)**

4. Diseases of passion flower plant

4.1. Diseases caused by viruses

4.1.1. Potyvirus diseases

Numerous reports of passion flower infections worldwide have been connected to viruses belonging to the genus Potyvirus. The Passion fruit woodiness virus (PWV) was the first potyvirus discovered to infect passion flowers in Australia. Potyviruses linked to woodiness disorders were later discovered in Nigeria, Taiwan, and Japan, though molecular research is still needed to better identify these viruses. **(Martini 1962, Chang 1992, Iwai, Yamashita *et al*. 2006)**

4.1.2. Cucumber mosaic virus (CMV)

Australia was the first place where this virus was linked to passion fruit woodiness. Early researchers who reported CMV in passion blossoms might have been dealing with coexisting infections. In California, CMV virions were detected in P. caerulea and P. alata-caerulea using electron microscopy, marking the sole instance of CMV being confirmed in passion flowers on their own. **(Magee 1948, Teakle[1], Gill *et al*. 1963, Taylor and Kimble 1964)**

4.1.3. Passiflora latent virus (PLV)

PLV has flexible, filamentous rods that are 600–700 x 11–12 nm in size and contain a S-RNA. The earliest reports of PLV infection in passiflora were made for P. caerulea and P. suberosa in germany in the 1960s. **(Brandes and Wetter 1963)**

4.1.4. Passion fruit yellow mosaic virus (PaYMV)

There have only been reports of PaYMV infection in Passiflora spp. in Brazil and Colombia. Plants that are infected display a distinct brilliant yellow mosaic, yellow net, and wrinkled leaves. PaYMV is a family of the Tymovirus genra. The isometric virus particles have a diameter of about 30 nm. **(Fischer and Rezende 2008)**

4.1.5. Passion fruit vein clearing virus

A virus infection that causes passion flower vein-clearing disease has been found in orchards throughout several Brazilian regions, leading to a notable reduction in production. Apart from the leaf vein-clearing symptom, certain plants have smaller leaves and fruits **(Kitajima, Chagas *et al*. 1986)**. Baciliform-like particles, typical of Rhabdo virus (Nucleorhabdo virus), measuring around 290 nm x 75 nm, were detected in the perinuclear region of the infected plant cell mass.

4.1.6. Purple granadilla mosaic virus (PGMV)

In Brazil, only P. edulis has been naturally infected with PGMV. The leaves of infected plants exhibit a moderate or line pattern mosaic that intensifies throughout the cool season and nearly vanishes during the summer. Plants with the infection produce smaller, deformed, and woody fruits. **(Chagas, Joazeiro *et al*. 1984)**

4.1.7. Passion fruit green spot virus (PGSV)

The virus was discovered in passion flower estates in São Paulo, Brazil, in the 1990s and has caused significant damage **(Kitajima, Rezende *et al*. 1997)**. Later, it was discovered to infect passion flower crops in other parts of the country **(Kitajima, Rezende *et al*. 2003)**. The illness is named after the green patches that appear on mature yellow fruits and range in size from 2 to 5 millimeters. These patches could have a core necrotic depression and be all green in color. Green areas show up as solitary patches along veins or on chlorotic, senescent leaves. On the stems, necrotic lesions are typical.

4.2. Disease caused by phytoplasma

4.2.1. Overshooting

Phytoplasma-induced passion flower overshooting appears to be a disease unique to Brazil. Although this disease was first reported in passion flower orchards in Pernambuco State in the 1980s **(Kitajima, Chagas, *et al*. 1986)**, subsequent outbreaks have always involved a small number of infected plants with no obvious damage. The disease is easily identified in the field by its characteristic tiny chlorotic leaves, short internodes, abundance of broom-like lateral shoots, and abnormal blooms.

4.3. Diseases caused by bacteria

Different regions of the world have reported various bacteria to be harmful to passion fruit plants. Leaf lesions and potential plant death are caused by *Xanthomonas axonopodis* pv. passiflorae; leaf spots are caused by *Pseudomonas syringae* pv. syringae, *P. syringae* pv. passiflorae, and *P. viridiflava*; tumors are caused by *Agrobacterium tumefaciens*, primarily in the collar region; soft rot is caused by *Erwinia carotovora* sub sp. carotovora; *Ralstonia solanacearum* causes a vascular wilt. **(Bradbury 1986)**

4.3.1. Bacterial Spot

It is the most serious bacterial disease of passiflora flowers because of its great susceptibility to economically important cultivars, the extensive damage it causes, and the difficulties of management. *Xanthomonas axonopodis* pv. passiflorae is rod-shaped, 0.6 x 2.0 µm, Gram-negative, and aerobic. It does not form spores or capsules and has a polar flagellum(Bradbury 1986). Its colonies in the culture medium are bright yellow, mucous, spherical, and convex; however, xanthomonads, a strain that does not produce yellow pigments, have previously been described **(Almeida, Malavolta Jr *et al*. 1994).** Its optimum temp. For growth is 27°C.

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4.3.2 Bacterial grease spot

This disease is quite prevalent in under-ripe fruits due to Pseudomonas syringae pv. passiflorae. It manifests as microscopic dark green patches that eventually turn into greasy necrotic lesions that are golden to brownish. These wounds are later covered in a hard crust that is home to a variety of microorganisms. On leaves, spots are rare. The disease causes large, necrotic lesions encircled by a chlorotic halo. **(Fischer and Rezende 2008)**

4.4. Diseases caused by fungi and funguslike organisms

From seedling to maturity, fungus-related illnesses affect passion fruit plants, harming their roots, stems, leaves, flowers, and fruits. Many fungi that damage field plants at the post-harvest stage result in large losses during fruit storage, transportation, and commercialization. Diseases that affect plants aboveground tissues include Alternaria spot, septoriosis, scab, and anthracnose. Soil microorganism-produced diseases, such as fungi wilt, collar rot, and crown rot, are the hardest to manage.

4.4.1. Collar rot

It is one of the primary diseases affecting Passiflora edulis (f. flavicarpa) in the majority of States that produce Brazil, causing persistent crop migration and a decline in productivity **(Ponte 1993, Fischer, Lourenço *et al*. 2005)**. It might also happen in other nations, according to the signs and the fungus that have been identified from afflicted plants. Fusarium species cause both collar rot and Fusarium wilt illnesses, which present similar signs and symptoms in passiflora flowers.

4.4.2. Phytophthora root and Crown rot

Both adult and nursery plants are affected by the illness. Mild chlorosis is one of the signs that are seen, followed by plant wilting, defoliation, and death. Root and collar rot causes the symptoms by exposing the cortical tissue of the plant. **(Cole, Hedges *et al*. 1992, Varón de Agudelo 1993)** The collar also contains bark cracks and plant intumescence. **(Souza Filho, Santos Filho *et al*. 1978)**

Crown rot has been linked to the following pathogens: *Passiflora nicotianae* (syn.: Passiflora parasitica) in Zimbabwe, South Africa, Malaysia, Taiwan, Australia, Venezuela, and Brazil, and *Phytophthora cinnamomi* in Australia and New Zealand **(van den Boom and Huller 1970, Young 1970, Lin and Chang 1985, Grech and Rijkenberg 1991, Gonzalez, Suarez, *et al*. 2000, Manicom, Ruggiero *et al*. 2003, Fischer, Lourenco *et al*. 2005)**.

4.4.3. Brown spot

The common signs of the brown spot agents are that Reddish-brown patches of 5 mm in diameter are caused on leaves by Alternaria passiforae. Spots typically enlarge—becoming circular and zonate—and reach a diameter of more than two cm when exposed to excessive humidity. Spores are more prevalent on the abaxial surface and can form a thin, black mass in the center of the lesion. **(Brien 1940, Holliday 1995)**

4.4.4. Flower rots (Rhizopus stolonifer)

The inside of the flower bud, particularly on the sepals and petals, has dark, wet stains as symptoms. Eventually, the entire flower bud becomes speckled, and sporangia and dark grey mycelia grow. The flower bud quickly withers away and turns rotten **(Manicom, Ruggiero *et al*. 2003)**. Flower rot generally happens in the summer, after extended rainstorms. According to Goes (1998), up to 63% of P. alata flowers were lost in Brazil. Fruit rot in passion fruit has also been reported to be caused by this disease.

4.4.5. Phomopsis rot (Phomopsis tersa)

Up to 40% of the production of *Passiflora edulis* and *Passiflora edulis (f. flavicarpa)* fruits might be damaged by this disease, which affects leaves, twigs, and notably fruits **(Sutton and Hodges 1990, Lutchmeah 1992)**. The surrounding tissue deteriorates and collapses around the stalk, turning brown two to three days after harvest. The lesion is covered with white mycelium that grows over the stalk. The fungus primarily penetrates fruits through the cut in the stem, though it can also get inside the fruit through wounds on the skin (Lutchmeah 1992). **(Table 3)**

Table 3- Various diseases and their causes of Passiflora species

Sr. No.	Disease Name	Plant Part	Causing agent	Symptoms	Management
1	Potyvirus	Leaves and Fruit	Potyvirus genus (Cowpea aphid-borne mosaic virus.)	Mosaic, rugosity, or distortion in the leaves woody or deformed fruits	Chemical transmission through Aphid vectors
2	Cucumber mosaic virus (CMV)	Leaves and Fruit	Cucumber mosaic virus	Yellow passion fruit leaves have bright yellow speckling	Planting and replanting PWV-free seedlings is the standard protocol for managing the illness.
3	Passiflora latent virus (PLV)	Leaves	Genus-Carlavirus	In milder climates, the virus produces a subtle, systemic foliar mosaic; older leaves become mottled.	Chemical transmission through Aphid vectors
4	Passion fruit yellow mosaic virus (PaYMV)	Leaves	Genus-Tymovirus.	Plants that are infected display a distinct brilliant yellow mosaic, yellow net, and wrinkled leaves.	Unknown
5	Passion fruit vein clearing virus	Leaves and Fruit	Rhabdovirus (Nucleorhabdovirus)	reduced size of leaves and fruit, vein-clearing symptom	The virus was not mechanically transmitted
6	Purple granadilla mosaic virus (PGMV)	Leaves and Fruit	Rhabdovirus (Nucleorhabdovirus)	mild leaf mosaic with a line design, Plants with the infection produce smaller, malformed, and woody fruits	The mosaic virus was not mechanically transmitted.
7	Passion fruit green spot virus (PGSV)	Leaves, stems, and Fruit	Rhabdovirus (Nucleorhabdovirus)	Necrotic lesions on the stems, solitary patches on senescent,	The virus is transmitted by *Brevipalpus phoenecis*

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				chlorotic leaves, or along the veins are all examples of green spots, measuring 3 to 5 mm in diameter, that appear on mature yellow fruits.	
8	Overshooting	Leaves, flowers, and fruit	Phytoplasma	Small chlorotic leaves, internode shortening, an abundance of lateral branches (like broom), and unusual blooms	using healthy seedlings and conducting routine inspections of plant nurseries
9	Bacterial spot	Leaves and Fruit	Xanthomonas axonopodis	Dark green and anasarcous lesions. Brownish lesions.	Quarternary ammonium and alcohol, cupric fungicides, or streptomycin sulfate
10	Bacterial grease spot	Leaves and Fruit	Pseudomonas syringae	golden to brownish greasy necrotic lesions, Spots are seldom found on leaves	Quarternary ammonium and alcohol, cupric fungicides, or streptomycin sulfate
11	Collar rot	Leaves and roots	Haematonectria haematococca	changing the color of the leaf to pale green, leaf wilt, defoliation of ween rows, a practice that presumably injured roots	Weekly applications of copper oxychloride decreased the amount of plants that had collar rot
12	Fusarium wilt	Leaves, stem, and Roots	Fusarium oxyporum	Yellowing of young leaves, the vascular system (V.S) becomes dark at the roots, collar, stems,	These symptoms can be controlled by using resistant rootstocks.

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				and twig areas of the plant.	
13	Phytophthora rot and Crown rot	Leaves, and roots	Phytophthora cinnamomi and P. nicotianae	mild chlorosis with subsequent wilting, defoliation, and death of the plant	Foliar blight should be controlled with recommended copper oxychloride pulverizations every seven to ten days.
14	Anthracnose	Stem and fruits	Glomerella cingulata (anamorph: Colletotrichum gloeosporioides).	Its fungus causes intense defoliation, twig wilt, and fruit rot.	Benzimidazole, cupric, dithiocarbamate, chlorothalonil, and tebuconazole are fungicides reported to be effective against anthracnose.
15	Scab (Cladosporium rot)	Leaves, flowers, and fruit	Cladosporium oxysporum, and C. herbarum	In leaves tiny circular spots, 2-5 mm in diameter, on fruits slightly sunken and dark tiny round spots, 6 mm in diameter	Fungicides quoted as efficient against anthracnose are benzimidazole, cupric, dithiocarbamate, chlorothalonil, and tebuconazole.
16	Septoria blotch (spot)	Leaves and fruits	Septoria fructigena	Leaves with light brown, slightly rounded necrotic patches that range in diameter from 5 to 9 mm. A disease's favorable environment can lead to twig wilting, plant mortality, and abscission of leaves and fruits.	Fungicides carbamate, benzimidazole, & Thiabendazole or thiophanate-methyl + chlorothalonil
17	Brown spot	Leaves and fruits	Alternaria passiflorae and A. alternate	Defoliation can be caused by smaller, 1–5 mm diameter spots on leaves that have chlorotic haloes.	Compared to using susceptible clones treated with fungicides, the application of more tolerant hybrids to Alternaria spp. Allowed for a higher

				Usually stem lesions it produces destroy vines. Fruit spots have slimy, dark green edges.	commercial fruit production
18	Root-knot	Roots	Nematodes (Meloidogyne spp.)	A weak root system makes it more difficult for the plant to absorb nutrients and water.	Destroyed eggs and larvae of nematodes.

5. Conclusion

The current study focuses on the most recent evidence-based data about *Passiflora vitifolia's* phytochemical, pharmacological, and disease profile. It is established that this divine plant has numerous essential medicinal components that have the power to cultivate a variety of positive benefits. Numerous researches have clarified and demonstrated the rationale behind its application in conventional medicine.

We have compiled several pharmacological activities in this article, including antioxidant, vasodilator, Anti-inflammatory, In-vitro cytological, mild steel acid corrosion inhibitor, antimicrobial, anticancer, anti-hyperglycemic, In-vitro callogenesis, Antihypertensive, Analgesic, and Anti-tussive activity of *Passifolia vitifolia*. Numerous illnesses brought on by nematodes, prokaryotes, fungi, and viruses can seriously harm passion fruit trees. Certain viruses can spread swiftly, and if they find a suitable environment and sensitive tissues, they could end up being a crop-limiting factor. They shorten the lifespan of plants and lower fruit yield, both in terms of quantity and quality.

The authors anticipate that by sharing this article's knowledge about the Passiflora plant and its traditional uses, it may be possible to identify and isolate the active chemicals responsible for the pharmacological effects that have been covered in the literature thus far. The plant's traditional and non-clinical uses could potentially be used in clinical settings as an alternate treatment for some of the illnesses covered below.

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