

An Overview on Cultivation, Propagation and Therapeutic Benefits of *Passiflora Foetida* Linn

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ABSTRACT:

Passiflora foetida, commonly known as stinking Passion Flower, is a plant species with a rich history of traditional use. All plant parts of *Passiflora foetida* consist of beneficial components. The components have been extracted from the leaves, stems, seeds, resins, and fruits. The stems of *Passiflora foetida* contain a significant amount of cellulose. The leaves and fruits of *Passiflora foetida* possess considerable nutritional worth that they are utilized as herbal tea, tablets, and nutritional powders. It has a diverse chemical composition and wide range of biologically active components that determine its diverse pharmacological properties. This review aims to summarize its cultivation, propagation and therapeutic benefits. The studies highlight the importance of *Passiflora foetida* for its therapeutic values.

Keywords: *Passiflora foetida*, Cultivation, Therapeutic uses.

I. INTRODUCTION:

The *Passiflora* genus, a part of the *passifloraceae* family, encompasses the passion fruit. It is recognized as the largest and mostly distributed genus of tropical flora. Passion fruit holds significant importance as a fruit crop in various tropical and subtropical regions, owing to its delectable fruits, decorative appeal, and

1. Domain: Eukaryota
2. Kingdom: Plantae
3. Phylum: Spermatophyta
4. Subphylum: Angiospermae
5. Class: Dicotyledone
6. Order: Violales
7. Family: Passifloraceae
8. Genus: Passiflora
9. Species: *Passiflora foetida*

Origin: Native to southern USA, Mexico, Central America, Caribbean and South America.

Distribution: Found in numerous tropical countries across Africa and Asia. The fruits are hardly edible

medicinal benefits. It features stunning purple-blue flowers that exude a delightful aroma^[1]. The genus also includes certain species noted for their ornamental value and beneficial medicinal properties such as being antioxidant^[2], gastro protective^[3], antimicrobial^[4], anti-inflammatory^[5], anxiolytic^[6], anti-epileptic and analgesic^[7], hepato-protective, sedative, anti-depressant, anti-diabetic and anti-fungal effect^[8].



Fig 1: *Passiflora foetida*

DESCRIPTION OF PLANT: ^[10]

Botanical Description:

i. Common name: Passion flower, Mossy Passion flower, Love in a mist, Stinking Passion flower, Wild Passion fruit. [Australian tropical rainforest plants-online edition].

ii. Taxonomy:

however, in Malaysia and east Africa it is used as cover crop.

Habitat: Stinking passion flower is commonly found growing in roadsides, disturbed areas, waste grounds and along water courses.

Morphological characters of *Passiflora foetida* plant parts:

Stem: A delicate vine that does not surpass a stem diameter of 2cm.

Leaves: Leaf blades featuring three lobes, measuring roughly 6-10 × 5.59 cm, possess margins bordered with glandular hairs. Petioles, approximately 2-4cm in length, have a flat appearance on the upper side, decorated with

glandular hairs along each edge. Both the upper and lower surfaces of the leaf blades are coated in pale-colored upright hairs and dispersed stalked glands with yellow tips. Stipules are relatively large, measuring about 5-15mm in length. They are foliaceous with fringed margins adorned with glandular hairs. Tendrils are simple, unbranched, and axillary. Leaves give off a disagreeable scent when they are crushed.

Flowers: The blossoms are generally about 3-5cm in diameter. Each blossom is upheld by three finely divided fimbriate bracts that are about 1-2cm in length. Pedicels are roughly 1.5cm long. The corona shifts from white to purple, displaying a variety of delicate thread-like structures. The ovary rests on a gynophore. The staminal filaments measure about 5mm in length, with the anthers reaching up to 6mm in length. The ovary has a slight hairiness and is around 3mm long, positioned on a gynophore that is roughly 4-5mm in length. Styles measure approximately 7mm in length, ending in a globose stigma. Ovules are plentiful.

Fruits: Fleshy opened fruits emit a unique scent. Fruits come in either an ellipsoid shape or a roughly globular form, measuring about 17×15mm. They are completely surrounded by three large (40× 30 mm) bracts that have fringed edges, which are connected to the tip of a stalk measuring

approximately 4.5–5cm in length. Seeds, numbering around 20-25 per fruit, are flattened, with dimensions of about 4-5×3mm, featuring a pitted texture on the surface of the testa. Each seed is situated within a translucent aril, coated in sweet mucilage. The embryo measures three millimeters in length and is white, while the cotyledons are orbicular and approximately 1.5 to 2 millimeters across. They are considerably longer and wider than the radicle.

Seedlings: Cotyledons are elliptical, measuring about 9.5-12 × 7-9mm, with a truncate to obtuse tip and an obtuse base. The midrib branches significantly below the tip. The petioles are roughly 6-7mm long. The first set of leaves has an ovate to cordate form, with sparsely serrated edges and lengthy petioles. Stipules, numbering four to five, have glandular tips. At the tenth leaf stage: the leaf blade is cordate, featuring an acuminate and mucronate tip, along with a cordate base, where the lobes might occasionally overlap. Edges are finely serrated or bristly, accommodating about 30-35 trichomes on each side. Stipules are fimbriate, with each lobe being about 3-4mm in length and ending in a bulge or gland. Both upper and lower surfaces of the leaf blade, particularly the lower side, as well as the petiole, are coated with glandular hairs. The duration for seed germination is 29 days.



Fig 2: Leaves, stem and fruit of *Passiflora foetida*



Fig 3: Seeds of *Passiflora foetida*



Fig 4: Flower of *Passiflora foetida*

CULTIVATION:

Water: There are numerous genera and variations of stinking passion flower. However, most of them are sensitive to cold temperatures. It is advisable to bring them inside if the temperature in your garden drops below ten degrees Celsius during winter. The plant thrives when given consistent watering and cannot tolerate dry conditions. It needs 2.5 – 4.5cm of water per week.

Sunlight: To thrive and bloom effectively, a pungent passion flower needs ample sunlight. A minimum of four hours of direct sunshine, complemented with some midday shade, is considered ideal. To ensure sufficient growth in

colder regions or indoor settings, ensure exposure to at least six hours of direct sunlight.

Soil: Stinking passion flower does not have a particular preference when it comes to soil type. However, it does need a constant level of humidity and soil that drains well, which can sometimes pose a challenge. For an improved sewage and humidity control effect, consider incorporating organic compost into the soil. The plant thrives in soil that is gently acidic, with a pH range of 5.0 – 6.0.

Propagation: Take a 10–15cm long cutting to propagate your stinking passion flower. Detach the lower leaf, immerse it in the growth hormone, and carefully insert it into a pot filled with moist soil. Cover with polycarbonate and place in the shade until the roots have developed. This typically requires about a month, on average.

Planting: The drinking passionflower may be sown as a small plant or cultivated from seed. This process may span over a month, and it is essential to wait until the seedlings have developed two sets of leaves before transplanting them. Planting is most effective in the spring or autumn while the soil is still warm. Select a sunny location in your garden that is sheltered from strong winds, and

remember to water the plants thoroughly after planting.

Pruning: The stinking passion flower is climber that does not necessitate pruning to develop, but it will produce a fuller plant if you do. It is most effective in the late winter or the early spring. Flowers do not require deadheading; eliminate any killed plant parts and cut to improve shape. To avoid the transmission of diseases, use clean, pointed pliers and always sanitize your tools.

Reaping: The fruit is typically harvested from mid-summer to early autumn. It is best to choose the fruit when it has reached a doughy texture and displays a rich yellow, red, or purple hue, depending on the specific variety.

Fertilizer: The pungent passion flower is known for its insatiable appetite. By using quality fertilizers on a regular basis, your plants will benefit greatly and reward you with beautiful blossoms. Use top-notch general purpose fertilizer with a balanced ratio of nitrogen, phosphorous, and potassium. Start fertilizing in spring when new shoots start to appear, and keep doing it very six days until autumn.

Table 1: Parameters for cultivation of *Passiflora foetida*

Water	Moderate
Soil	Acidic soil
Temperature	16 degrees centigrade
Sunlight	Plenty
Blooming time	More than 1 month

PHYTOCHEMICAL CONSTITUENTS:

Table 2: Phytoconstituents of *Passiflora foetida* and their uses with pharmacological action^(8,23)

Constituents	Pharmacological action	Uses
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Flavonoids	Inhibition of pepsin level and activity and increase gastric mucosa	
Quercetin	Increase gastric mucus and protects from helicobacter pylori	Antiulcer ^(3, 12, 13, 14)
Apigenin	Ameliorating ulcerative colitis through protecting intestinal barrier and also regulate the gut micro biota	
Malic acid	Activates antioxidant enzymes[catalase, ascorbate peroxidase and super oxide dismutase]	Antioxidant ^(2, 12, 16, 17, 18, 19, 20,21,22)
Citric acid	Scavenging reactive oxygen species.	
Constituents	Pharmacological action	Uses
Ethonolic extract of Passiflora foetida	Inhibition of Alpha-amylase and Alpha-glucosidase enzymes	Anti-diabetic ^(21,24)
Cycloartane triterpenoid saponins	Sedative action	Anti-depressant ⁽²⁵⁾
Methanolic extract of Passiflora foetida	Anti-cholinesterase activity	Treatment of Alzheimer's disease ^(2,26)
Flavonoids • Apigenin & Luteolin [most potent] • Chrysoeriol • Tricin Alkaloids • Harmane • Harmine	Inhibition of nitric oxide synthesis in macrophage cell line Suppression of NF-Kb signaling	Anti-inflammatory ^(5,15,21,27,28)
Tannins & Flavonoids	Affects the biofilms of bacteria	Anti-microbial ^(4,22)
Ethyl-acetate and methanolic extracts of Passiflora foetida	Control hyperpigmentation problems	Anti-tyrosinase ⁽²⁶⁾
Flavonoids • Rutin • Quercetin • Luteolin • Hesperidin	Anti-nociceptive activity	Analgesic ^(7,27)

• Bioflavonoids		
Methanol extracts from passiflora foetida leaves	Inhibit convulsions in dose dependent manner	Epileptic ⁽⁷⁾
Ethanol extracts of Passiflora foetida	decrease total cholesterol, triglycerides, low-density lipoprotein , and very low-density lipoprotein.	Anti-dyslipidemic ⁽²⁹⁾
Aqueous extract of Passiflora foetida (AEPF)	Passiflora foetida may have similar hepatoprotective effects to silymarin, possibly because of its saponins, phenols, and flavonoids content.	Hepatoprotective ⁽³⁰⁾

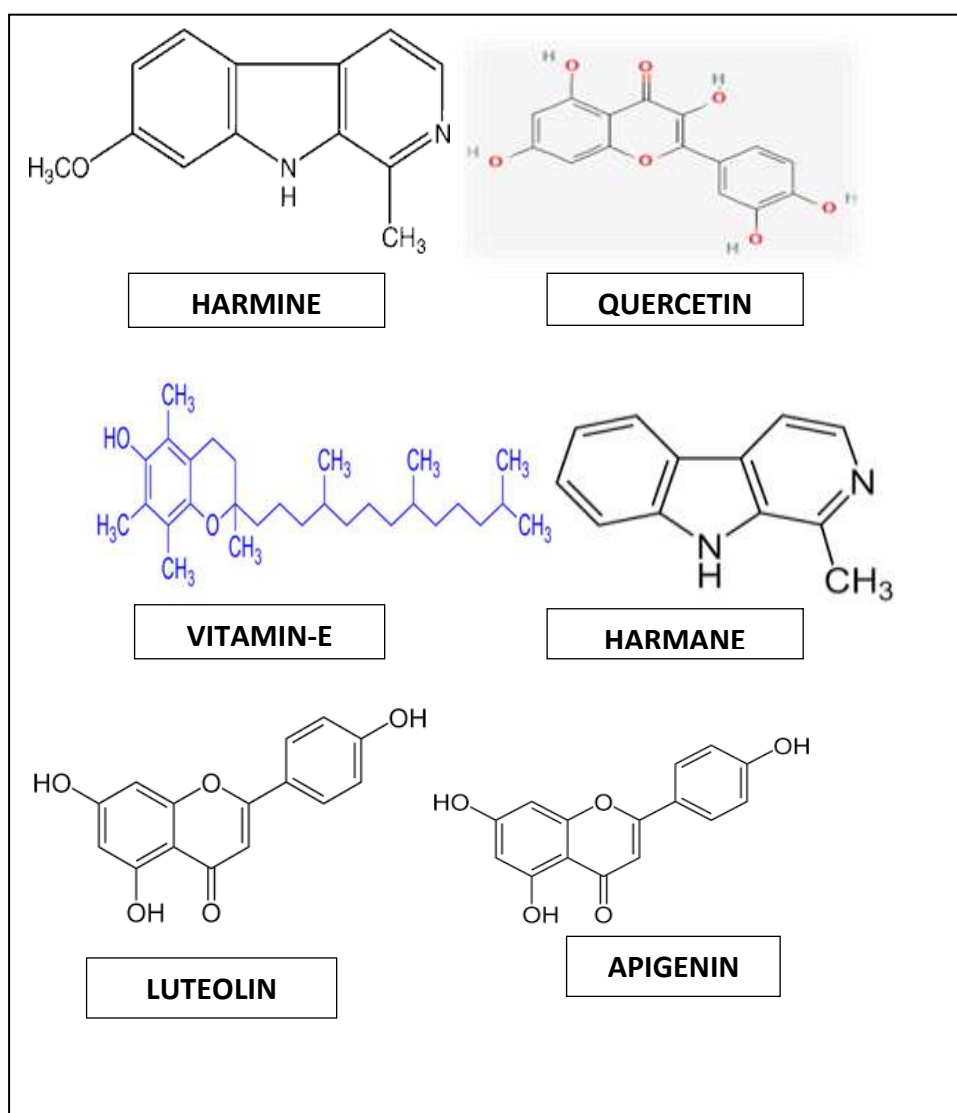


Fig 5: Structures of few important chemical constituents in Passiflora foetida.

PHARMACOLOGICAL ACTIVITIES:**Antioxidant activity:** ^(2, 12, 16, 17, 18, 19, 20, 21, 22)

The *Passiflora foetida* plant's leaves exhibit a remarkable level of antioxidant activity, which is determined through assessing the total phenol and total flavonoid content. The leaves' 80% ethanol extract exhibits higher total phenolic content and total flavonoid content compared to the stem and fruit. The fruit peel of the *Passiflora foetida* plant is known for its outstanding antioxidant properties. Among the column chromatography fractions, FMetPF6 stands out for its remarkable antioxidant activity. It demonstrated a notable percent inhibition of 41.85±1.96 at a concentration of 25µg/mL (DPPH), and an impressive percent antioxidant activity of 26.03±0.84 at a concentration of 9µg/mL (FRAP). The leaves of *Passiflora foetida* show significant promise as antioxidants, with both their extract and fractions exhibiting antioxidant properties. The FMetPF6 demonstrates superior activity when compared to other extracts and fractions.

Antilucer activity: ^(3, 12, 13, 14)

A study demonstrated that using an ethanolic extract of the entire *Passiflora foetida* plant could lessen the intensity of gastric ulcers in rats. The extract not only raised gastric pH levels but also lowered lipid peroxidation while boosting reduced glutathione levels.

Antimicrobial activity: ^(4, 22)

Herbal medications rich in tannins hinder pathogens using a variety of methods. Therefore, certain herbal remedies that were tested could potentially be suitable for treating local infections caused by multi-resistant biofilm-forming pathogens. Some of the tested drugs are being reported for the first time regarding their anti-biofilm activity, total tannin, and flavonoid content. Plants and medications abundant in tannins and flavonoids have been historically shown to influence bacterial biofilms.

Antidiabetic activity: ^(21, 24)

The aqueous and ethanolic extracts of *Passiflora foetida* L. can also significantly reduce the levels of serum glutamate oxaloacetate transaminase (SGOT), serum glutamate pyruvate transaminase (SGPT), urea and creatine in diabetic conditions.

Antidepressant activity: ⁽²⁵⁾

The harmaline alkaloids found in *Passiflora foetida* act as reversible monoamine

oxidase inhibitors and, similar to other beta-carboline compounds, bind to 5-hydroxy tryptamine (HT) receptors. Monoamine oxidase (MAO) plays a role in the breakdown of catecholamines, serotonin, and other naturally occurring amines in the central nervous system. Suppressing this enzyme leads to a decrease in metabolism, resulting in an upsurge in biogenic amines levels. Additionally, the flavonoid elements of MEPPF may interact with adrenergic and serotonergic systems to facilitate the antidepressant properties of MEPPF.

Anti-Alzheimer's activity: ^(2,26)

A hexane extract of *Passiflora foetida* has the potential to act as a strong inhibitor of AChE. Cholinesterase inhibitors play a vital role in treating Alzheimer's disease, with prior research also noting the acetyl cholinesterase inhibition brought about by *Passiflora foetida* extract.

Analgesic activity: ^(7,27)

In previous studies *Passiflora foetida* methanol extract showed significant analgesic effects, with its highest activity observed. Analgesics exert their effects either on the peripheral or central nervous system. Its analgesic activity was evaluated using Eddy's hot plate method. The results revealed a dose-dependent antiepileptic effect.

Antiepileptic activity: ⁽⁷⁾

In previous studies the antiepileptic activity of the methanol extract from *Passiflora foetida* leaves was assessed through Maximum electric shock-induced convulsions and pentylenetetrazol-induced convulsions. The extract derived from *Passiflora foetida* has shown potential effectiveness in treating generalized tonic seizures and absence seizures. Comprehensive EEG (Electroencephalogram) discharge studies for various types of seizures should investigate the impact of an imbalance between excitatory and inhibitory influences in the brain when examining *Passiflora foetida* extracts.

Anti-inflammatory activity: ^(5,15,21,28)

In previous studies the chemical components of *Passiflora foetida*, i.e flavonoids showed inhibition of nitric oxide synthesis in macrophage cell line and harmaline alkaloids showed the suppression of NF-Kb signaling.

Antidyslipidemic activity: ⁽²⁹⁾

Passiflora foetida leaves were assessed in a prior study for their potential to combat dyslipidemia in diabetic rats induced by dextrose. The ethanol extracts were assessed for their antidyslipidemia activity in comparison to the standard drugs Glipizide, Sitagliptin, and Vildagliptin. Both the ethanol extract and the standard drugs were found to decrease total cholesterol, triglycerides, low-density lipoprotein (LDL), and very low-density lipoprotein (VLDL).

Antityrosinase activity: ⁽²⁶⁾

In a prior study, methanol and water extracts of Passiflora foetida were evaluated against various strains of dermatophytes, such as Tricophyton and Aethroderma species, known to contribute to skin conditions like hyperpigmentation. Both samples successfully prevented the growth of fungi, further enhancing their known ability to inhibit tyrosinase activity, which is essential in treating hyperpigmentation.

Hepatoprotective activity: ⁽³⁰⁾

A prior research looked into the potential hepatoprotective benefits of the aqueous extract of Passiflora foetida (AEPF) in a study that used albino rats with paracetamol-induced liver damage as the animal model. The pretreatment of rats with silymarin and AEPF significantly reduced or suppressed the biochemical and histopathological adverse effects caused by PCM in a dose-dependent manner. The data suggest that Passiflora foetida may have similar hepatoprotective effects to silymarin, possibly because of its saponins, phenols, and flavonoids content.

II. DISCUSSION AND CONCLUSION:

Passiflora species have been significantly valued for their extensive array of bioactive compounds and therapeutic characteristics. This review provides detailed information regarding the plant Passiflora foetida. Review of Passiflora foetida L. is a type of is renowned for its therapeutic benefits. All the sections of Passiflora (fruit, leaves, and stems) possess the bioactive constituents. knowledge compilation, which would outline different facets concerning the plant. The ethno pharmacological significance of Passiflora foetida L. not just in India but around the globe has been extensively validated by contemporary research. Bioactive constituents of Passiflora foetida exhibit medicinal properties including antioxidant, gastro protective, antimicrobial, anti-

inflammatory, anxiolytic, anti-epileptic and analgesic, hepato-protective, sedative, anti-depressant, anti-diabetic, and anti-fungal effects. This review summarized the detail information about Passiflora foetida L. including its cultivation, maintenance and therapeutic benefits.

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