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A COMPREHENSIVE REVIEW ON PASSIFLORA EDULIS

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ABSTRACT

The genus *Passiflora* includes more than 500 species distributed mainly in tropical and subtropical regions. Among them, *Passiflora edulis*, commonly known as Passion fruit, belongs to the family Passifloraceae and is widely cultivated for its nutritional and medicinal properties. Various parts of *Passiflora edulis* such as leaves, fruits, seeds, and peel contain numerous phytochemical constituents including flavonoids, alkaloids, phenolic compounds, carotenoids, glycosides, and vitamins. These bioactive compounds contribute to a broad spectrum of pharmacological activities such as antioxidant, antidiabetic, antihypertensive, anti-inflammatory, antimicrobial, hepatoprotective, anxiolytic, and anticancer activities. Traditionally, the plant has been used for the treatment of insomnia, anxiety, gastrointestinal disorders, hypertension, and diabetes. This review focuses on the taxonomy, vernacular names, phytochemical constituents, traditional uses, and pharmacological activities of different parts of *Passiflora edulis* using various solvent extracts such as ethanol, methanol, aqueous, and petroleum ether extracts.

KEYWORDS: Passiflora edulis, Passifloraceae, Passion fruit, phytochemicals, pharmacological activities.

INTRODUCTION

Medicinal plants have played a vital role in traditional healthcare systems for centuries. Increasing awareness about the adverse effects of synthetic drugs has led to growing interest

in herbal medicines and plant-based therapies. Plants contain numerous bioactive compounds that provide therapeutic benefits and serve as potential sources for new drug development.[1]

Passiflora edulis Sims, commonly known as Passion fruit, is a tropical vine belonging to the family Passifloraceae. The plant is native to South America, particularly Brazil, Paraguay, and Argentina, and is now cultivated worldwide in tropical and subtropical regions.[2]

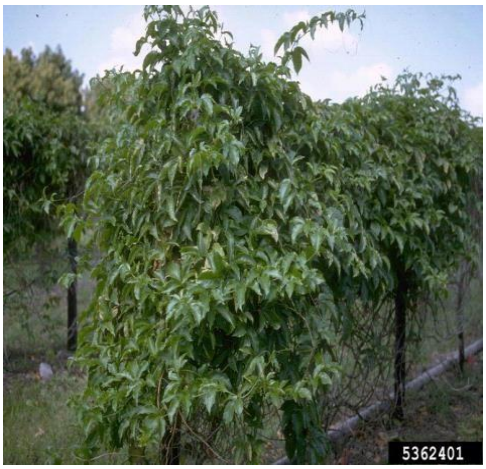
The plant produces edible fruits rich in vitamins, minerals, antioxidants, and dietary fibers. Besides its nutritional value, *Passiflora edulis* has significant medicinal importance in traditional medicine. Various parts of the plant including leaves, fruits, seeds, and peel are used for the treatment of insomnia, anxiety, hypertension, asthma, digestive disorders, and diabetes.[3]

Phytochemical studies have revealed the presence of important compounds such as flavonoids (vitexin, isovitexin), alkaloids, carotenoids, polyphenols, tannins, and cyanogenic glycosides in *Passiflora edulis*. These constituents are responsible for the plant's diverse pharmacological activities including antioxidant, anti-inflammatory, antidiabetic, antimicrobial, and anticancer effects.[4]

Due to its wide range of therapeutic applications and bioactive compounds, *Passiflora edulis* has gained significant attention in pharmaceutical, nutraceutical, and food industries. This review highlights the taxonomy, phytochemical composition, traditional uses, and pharmacological properties of *Passiflora edulis*.



***Passiflora edulis* fruit**



***Passiflora edulis* tree**



***Passiflora edulis* flower**



***Passiflora edulis* seeds**

TRADITIONAL USES[3,5]

Different parts of *Passiflora edulis* have been traditionally used in various systems of medicine for the treatment of several health conditions. The plant is well known for its calming, digestive, and cardioprotective properties.

Leaves: The leaves are widely used in traditional medicine as sedative and anxiolytic agents. Infusions or decoctions prepared from the leaves are commonly used to treat insomnia, anxiety, nervousness, and restlessness. They are also believed to have mild analgesic and antispasmodic effects.

Seeds: The seeds of *Passiflora edulis* are rich in edible oil containing essential fatty acids such as linoleic acid. Traditionally, seed extracts and oils have been used for maintaining cardiovascular health and supporting healthy cholesterol levels.

Peel: The fruit peel is traditionally used for its high dietary fiber and pectin content. It has been used in herbal remedies to help reduce cholesterol levels, regulate blood glucose, and improve gastrointestinal health**.**

MEDICINAL ACTIVITIES

1. Antioxidant activity
2. Antidiabetic activity
3. Anti-inflammatory activity
4. Antimicrobial Activity
5. Anxiolytic and sedative activity
6. Hepatoprotective activity

7. Cardioprotective activity
8. Anticancer activity
9. Hypolipidemic activity
10. Antihypertensive activity
11. Gastroprotective activity
12. Neuroprotective activity
13. Anti-asthmatic activity
14. Wound healing activity
15. Immunomudulatory Activity

ANTIOXIDANT ACTIVITY[6]

The antioxidant activity of *Passiflora edulis* is mainly due to the presence of polyphenols, flavonoids, vitamin C, and carotenoids. These compounds help protect the body from oxidative stress caused by free radicals. Free radicals are unstable molecules that can damage cells and contribute to aging and several diseases such as cancer, diabetes, and cardiovascular disorders. Studies have shown that extracts obtained from the fruit pulp, peel, and leaves of *Passiflora edulis* demonstrate strong free radical scavenging activity in assays such as DPPH and FRAP. The high antioxidant capacity of passion fruit is particularly attributed to flavonoids like vitexin and isovitexin. These compounds neutralize reactive oxygen species and help maintain cellular balance. Due to its strong antioxidant potential, *Passiflora edulis* is considered beneficial in preventing oxidative damage and supporting overall health.[6]

ANTIDIABETIC ACTIVITY[7]

Several studies have reported the antidiabetic potential of *Passiflora edulis*, especially the peel extract which is rich in dietary fiber and polyphenolic compounds. The peel contains a large amount of pectin, a soluble fiber that helps regulate blood sugar levels. When consumed, pectin slows down the absorption of glucose in the intestine, which prevents sudden increases in blood glucose levels. Experimental studies conducted on diabetic animals have shown that administration of *Passiflora edulis* peel extract significantly reduces blood glucose levels and improves insulin sensitivity. Additionally, the plant extracts help regulate lipid metabolism and reduce oxidative stress associated with diabetes. The presence of flavonoids and phenolic compounds also contributes to improved pancreatic function and better glucose utilization in the body. These findings suggest that *Passiflora edulis* could serve as a natural therapeutic agent for managing diabetes and its related complications.[7]

ANTI-INFLAMMATORY ACTIVITY[8]

Inflammation is a protective response of the body to infection or injury, but chronic inflammation can lead to various diseases including arthritis, cardiovascular disorders, and metabolic syndrome. Extracts of *Passiflora edulis* have demonstrated significant anti-inflammatory properties in several experimental studies. The anti-inflammatory activity is mainly attributed to flavonoids and phenolic compounds present in the plant. These compounds inhibit the production of inflammatory mediators such as prostaglandins, cytokines, and nitric oxide. By reducing these inflammatory substances, the plant extracts help decrease swelling, pain, and tissue damage. Research has shown that passion fruit peel extract can significantly reduce inflammatory responses in experimental animal models. Due to its natural anti-inflammatory properties, *Passiflora edulis* may be useful in the management of inflammatory diseases and conditions.[8]

ANTIMICROBIAL ACTIVITY[9]

The antimicrobial activity of *Passiflora edulis* has been widely studied against various pathogenic microorganisms. Extracts from the leaves, fruits, and peel have shown inhibitory effects against several bacteria and fungi. Studies have reported that methanolic and ethanolic extracts of *Passiflora edulis* exhibit antibacterial activity against microorganisms such as *Escherichia coli*, *Staphylococcus aureus*, *Salmonella typhi*, and *Pseudomonas aeruginosa*. The antimicrobial activity is mainly attributed to the presence of phenolic compounds, flavonoids, and alkaloids. These compounds interfere with the growth and metabolism of microorganisms, leading to inhibition of bacterial multiplication. Additionally, passion fruit extracts have also shown antifungal activity against certain fungal species. Due to these properties, *Passiflora edulis* has potential applications in the development of natural antimicrobial agents for treating infections.[9]

ANXIOLYTIC AND SEDATIVE ACTIVITY[10]

One of the most well-known medicinal uses of *Passiflora edulis* is its anxiolytic and sedative activity. Traditionally, the leaves of passion fruit have been used to treat insomnia, anxiety, and nervous disorders. Scientific studies have confirmed that extracts of *Passiflora edulis* contain flavonoids and alkaloids that influence the central nervous system. These compounds interact with gamma-aminobutyric acid (GABA) receptors in the brain, which play an important role in regulating mood and relaxation. By enhancing the activity of GABA, passion fruit extracts help reduce anxiety, promote calmness, and improve sleep quality.

Experimental studies in animals have shown that administration of *Passiflora edulis* leaf extract produces significant sedative and anxiolytic effects without causing severe side effects. Because of these properties, the plant is widely used in herbal medicines for managing stress and sleep disorders.[10]

HEPATOPROTECTIVE ACTIVITY[11]

The hepatoprotective activity of *Passiflora edulis* refers to its ability to protect the liver from damage caused by toxins, drugs, or oxidative stress. The liver is an important organ responsible for detoxification, metabolism, and digestion. Damage to liver cells can result in serious health problems. Studies have shown that extracts from passion fruit peel and pulp contain strong antioxidants such as polyphenols and flavonoids, which help protect liver cells from oxidative injury. Experimental models of chemically induced liver damage have demonstrated that treatment with *Passiflora edulis* extract significantly reduces liver enzyme levels and improves liver function. The extracts also enhance the activity of antioxidant enzymes such as superoxide dismutase and catalase, which help neutralize harmful free radicals. These findings suggest that *Passiflora edulis* may play an important role in preventing liver diseases and maintaining liver health.[11]

CARDIOPROTECTIVE ACTIVITY[12]

Cardiovascular diseases are among the leading causes of death worldwide. Research indicates that *Passiflora edulis* possesses cardioprotective properties due to its rich content of antioxidants, dietary fibers, and bioactive compounds. The peel of passion fruit is particularly rich in pectin, which helps reduce cholesterol levels in the blood. Lower cholesterol levels decrease the risk of plaque formation in blood vessels and improve overall heart health. Additionally, flavonoids present in the plant help improve blood circulation and reduce oxidative stress associated with cardiovascular diseases. Experimental studies have shown that regular consumption of passion fruit extracts can reduce total cholesterol, triglycerides, and low-density lipoprotein (LDL) levels while increasing high-density lipoprotein (HDL) levels. These effects contribute to improved cardiovascular function and reduced risk of heart disease.[12]

ANTICANCER ACTIVITY[13]

Recent studies suggest that *Passiflora edulis* possesses promising anticancer properties due to the presence of bioactive compounds such as flavonoids, polyphenols, carotenoids, and alkaloids.

These phytochemicals play an important role in preventing the growth and spread of cancer cells. Research has shown that extracts obtained from the peel and seeds of passion fruit exhibit cytotoxic activity against several cancer cell lines. The polyphenolic compounds present in the fruit are capable of inducing apoptosis, which is a natural process that causes the programmed death of abnormal cells. Additionally, the antioxidant properties of these compounds help reduce oxidative stress, which is one of the major causes of DNA damage and tumor development.

Experimental studies have also indicated that passion fruit extracts may inhibit the proliferation of cancer cells and suppress tumor growth. Therefore, *Passiflora edulis* is considered a potential natural source of anticancer agents and may contribute to the development of new therapeutic drugs for cancer treatment.[13]

HYPOLIPIDEMIC ACTIVITY[14]

Hyperlipidemia, which refers to high levels of lipids in the blood, is a major risk factor for cardiovascular diseases such as heart attack and stroke. *Passiflora edulis*, particularly the peel of the fruit, has shown significant hypolipidemic activity. The peel contains a high amount of soluble fiber, mainly pectin, which helps reduce the absorption of cholesterol in the intestine. Studies have demonstrated that administration of passion fruit peel extract can significantly reduce levels of total cholesterol, triglycerides, and low-density lipoprotein (LDL) while increasing high-density lipoprotein (HDL) levels in experimental animals. These effects are beneficial in preventing the formation of fatty deposits in blood vessels. In addition, the antioxidant compounds present in the plant help reduce oxidative damage to lipids and improve overall lipid metabolism. Due to these properties, *Passiflora edulis* may serve as a natural remedy for controlling lipid levels and reducing the risk of cardiovascular diseases.[14]

ANTIHYPERTENSIVE ACTIVITY[15]

Hypertension, or high blood pressure, is a common health problem that can lead to serious complications such as heart disease, stroke, and kidney damage. *Passiflora edulis* has been reported to possess antihypertensive properties due to the presence of potassium, flavonoids, and other bioactive compounds. Potassium helps regulate blood pressure by balancing the effects of sodium in the body and promoting relaxation of blood vessel walls. Additionally, flavonoids present in passion fruit help improve blood circulation and reduce vascular resistance.

Experimental studies have shown that extracts of *Passiflora edulis* can reduce systolic and diastolic blood pressure in animal models. The plant also exhibits mild sedative effects that help reduce stress, which is another contributing factor to high blood pressure. Therefore, consumption of passion fruit or its extracts may help in maintaining healthy blood pressure levels and preventing hypertension-related complications.[15]

GASTROPROTECTIVE ACTIVITY[16]

The gastroprotective activity of *Passiflora edulis* refers to its ability to protect the stomach lining from damage caused by excessive acid production, stress, or harmful substances. Studies have indicated that extracts from the fruit and leaves of passion fruit can reduce gastric ulcer formation and protect the gastric mucosa. The presence of flavonoids, phenolic compounds, and antioxidants helps strengthen the protective mucus layer in the stomach and reduce inflammation. These compounds also decrease the secretion of gastric acid and prevent oxidative damage to the stomach tissues. Experimental research conducted on animal models has demonstrated that treatment with passion fruit extract significantly reduces ulcer index and promotes healing of gastric lesions. Due to these protective effects, *Passiflora edulis* may be useful in the prevention and treatment of gastric ulcers and other gastrointestinal disorders.[16]

NEUROPROTECTIVE ACTIVITY[17]

The neuroprotective properties of *Passiflora edulis* are mainly associated with its antioxidant and anti-inflammatory compounds. The brain is highly sensitive to oxidative stress, which can lead to neurodegenerative diseases such as Alzheimer’s disease and Parkinson’s disease. The flavonoids and polyphenols present in passion fruit help protect nerve cells from oxidative damage and improve neuronal function. These compounds also reduce inflammation in the nervous system and support healthy brain activity. Studies have suggested that extracts of *Passiflora edulis* may improve cognitive function, enhance memory, and protect neurons from degeneration.

Additionally, the sedative and anxiolytic effects of the plant help regulate neurotransmitter activity in the brain. Therefore, *Passiflora edulis* may play a beneficial role in maintaining brain health and preventing neurological disorders.[17]

ANTI-ASTHMATIC ACTIVITY[18]

Asthma is a chronic respiratory condition characterized by inflammation and narrowing of the airways. Research has indicated that *Passiflora edulis* possesses anti-asthmatic properties due to the presence of flavonoids and antioxidants. These compounds help reduce inflammation in the respiratory tract and improve airflow in the lungs. Studies have shown that extracts from passion fruit peel can significantly decrease airway inflammation and reduce symptoms such as wheezing and shortness of breath. The antioxidant components also protect lung tissues from oxidative damage caused by environmental pollutants and allergens. In addition, the plant's mild relaxing effect on smooth muscles may help reduce bronchial constriction. Because of these properties, *Passiflora edulis* has been considered a potential natural remedy for managing asthma and other respiratory conditions.[18]

WOUND HEALING ACTIVITY[19]

The wound healing activity of *Passiflora edulis* is mainly attributed to its antioxidant, antimicrobial, and anti-inflammatory properties. When applied to wounds, the plant extracts help reduce microbial infection, decrease inflammation, and promote the regeneration of damaged tissues. The presence of polyphenols and flavonoids enhances collagen synthesis, which is essential for the formation of new skin tissue during the healing process. Experimental studies have shown that treatment with passion fruit extract accelerates wound contraction and increases the rate of epithelialization. The antimicrobial properties of the plant also help prevent infection at the wound site, which further supports faster healing. These findings suggest that *Passiflora edulis* extracts may be useful in the development of natural wound healing formulations.[19]

IMMUNOMODULATORY ACTIVITY[20]

The immunomodulatory activity of *Passiflora edulis* refers to its ability to regulate and strengthen the immune system. The plant contains several bioactive compounds including flavonoids, vitamins, and polyphenols that help enhance immune response. These compounds stimulate the activity of immune cells such as macrophages and lymphocytes, which play a crucial role in defending the body against infections and diseases. In addition, the antioxidant properties of passion fruit help protect immune cells from oxidative damage. Studies have indicated that consumption of *Passiflora edulis* extracts can improve the body's natural defence mechanisms and increase resistance to infections. Therefore, the plant may be beneficial in supporting overall immune health and preventing various illnesses.[20]

CONCLUSION

This review highlights the significant medicinal value and pharmacological potential of *Passiflora edulis*. The plant is rich in various bioactive compounds such as flavonoids, alkaloids, phenolic compounds, carotenoids, and dietary fibres that contribute to its wide range of therapeutic activities. Scientific studies have confirmed that different parts of the plant, including the leaves, fruits, seeds, and peel, exhibit important pharmacological properties such as antioxidant, antidiabetic, anti-inflammatory, antimicrobial, antihypertensive, hepatoprotective, cardioprotective, anxiolytic, and anticancer activities.

The presence of these bioactive constituents supports the traditional use of *Passiflora edulis* in the treatment of several health conditions. In addition to its medicinal benefits, passion fruit also possesses high nutritional value, making it an important functional food. Considering its diverse biological activities and therapeutic potential, *Passiflora edulis* can be considered a promising source for the development of new herbal medicines and nutraceutical products. However, further detailed experimental and clinical studies are required to better understand its mechanisms of action and to establish its safety and efficacy for wider pharmaceutical applications.

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