



PHARMACOGNOSTIC REVIEW ON *ANNONA SQUAMOSA* LINN

Prabhakar Singh Tiwari¹, Madhu Gupta², Surya Prakash Gupta^{3*}

ABSTRACT:

A. squamosa is an evergreen plant mainly located in tropical and subtropical regions. *Annona squamosa* is commonly known as custard apple and Sitaphal, belonging to Annonaceae. *Annona squamosa* L. (Annonaceae) is a fruit tree with a long history of traditional uses. This review deals with detailed Pharmacognostical study of plant. Researchers found that plant contains Alkaloids, Flavonoids, Carbohydrates, Tannins, Saponins and Steroids by performing the chemical test. *Annona squamosa* is commonly cultivated in tropical and subtropical regions. All parts of *Annona squamosa* including bark, leaf, and roots have proven biological activities such as antimicrobial, antifungal, anti-inflammatory, anticancer, antiulcer, antidiabetic, antidiarrheals, antiplatelet, antioxidant, and hepatoprotective, neuroprotective, especially on the leaves. Phytochemicals in *Annona squamosa* leaves include coumarins, tannins, cardiac glycosides, Flavonoids, carbohydrates, and saponins.

Key words: *Annona squamosa*, Pharmacological studies, Custard apple, sugar apple, Sitaphal

^{1,2,3*}Rajiv Gandhi Institute of Pharmacy Faculty of Pharmaceutical Science & Technology AKS University, Satna-485001 (MP)

***Corresponding Author:** Dr. Surya Prakash Gupta

Professor & Director, Rajiv Gandhi Institute of Pharmacy Faculty of Pharmaceutical Science & Technology AKS University Satna (MP)-India-485001, Email ID: suryatony@yahoo.co.in
Contact No: 07354967776

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INTRODUCTION

Annona squamosa is a small, semi- (or late) deciduous, much-branched shrub or small tree 3 to 8 metres (10 to 26 feet) tall similar to soursop (*Annona muricata*). It is a native of tropical climate in the Americas and West Indies, and Spanish traders aboard the Manila galleons docking in the Philippines brought it to Asia.^[4] The young leaves of *Annona squamosa* were used extensively due to its anti-diabetic activity by the tribal men who were living in and around the villages of Aligarh district which is located in the state of Uttar Pradesh, India and also by the people of Chotanagpur district which is located in the state of Bihar, India.^[5] *Annona squamosa* L. (custard apple) belongs to the family Annonaceae and is an important tropical fruit cultivated in the West Indies, South and Central America, Ecuador, Peru, Brazil, India, Mexico, the Bahamas, Bermuda, and Egypt.^[7]

The previous phytochemical investigations made on the plant have proved that they possess a wide variety of compounds like acetogenins which were responsible for anti-feedant, anti-malarial, cytotoxic and the immunosuppressive activities. Diterpenes which was isolated from the *Annona squamosa* possess the anti-HIV principle and the anti-platelet aggregation activity.^[6]

This review aims to provide a comprehensive summary of the botanical features, phytochemistry, and the traditional and medicinal uses of the Annonaceae family and, specifically, *Annona* species.

Plant Profile

Synonym:

- English: Custard apple, sugar apple, sweetsop
- Marathi: Sitaphal
- Hindi: Sitafal
- Bengali: Ata
- Malayalam: Aathap pazham, seetha pazham
- Telgu: Seetha phalam

Biological source: *Annona squamosa* is a small and well-branched tree belonging to Annonaceae^[5]

Taxonomical Classification

The plant kingdom Plantae, the division Magnoliophyta (angiosperms), the class Magnoliopsida (dicotyledons), the order Magnoliales, the family Annonaceae, and the genus *Annona*.^[9] So, its taxonomical classification would be:

Kingdom: Plantae

Division: Magnoliophyta (angiosperms)

Class: Magnoliopsida (dicotyledons)

Order: Magnoliales

Family: Annonaceae

Genus: *Annona*

Species: *squamosa*

Geographical source:

Annona squamosa, commonly known as sugar-apple or custard apple, is native to the tropical Americas and West Indies. It is believed to have originated in the Caribbean and Central America. Today, it is widely cultivated in tropical and subtropical regions around the world, including parts of Asia, Africa, and Oceania. is native to the tropical regions of the Caribbean, Central America, and parts of South America It thrives in warm climates with well-drained soil and ample sunlight.^[8]

Historical development of plant:

The history of *Annona squamosa*, also known as sugar-apple or sweetsop, is intertwined with the cultural and agricultural heritage of tropical regions where it is native. While precise historical records may be limited, the plant's significance can be traced through various cultural, botanical, and historical contexts:^[10]

Indigenous cultivation: *Annona squamosa* is believed to have originated in the Caribbean and Central America, where indigenous peoples cultivated it for centuries. Early civilizations such as the Mayans and the Aztecs likely appreciated the fruit for its flavor and nutritional value.

European Encounter: With the arrival of Europeans in the Americas, *Annona squamosa* attracted attention from explorers and botanists. Accounts from early European explorers, such as Christopher Columbus and Hernán Cortés, mention encountering and sampling various *Annona* species, likely including *Annona squamosa*.^[11]

Spread of new regions: As European colonial powers established trade routes and agricultural colonies, they introduced *Annona squamosa* to new regions around the world. The plant's adaptability to tropical and subtropical climates facilitated its spread to places like Africa, Asia, and the Pacific Islands.

Research and Conservation: Ongoing research into *Annona squamosa* focuses on its genetic diversity, agronomic practices, and potential medicinal properties. Conservation efforts aim to

preserve wild populations of the species and safeguard its genetic resources for future generations. ^[13]

Botanical characteristic:

Botanists and horticulturists began studying *Annona squamosa* more systematically in the 18th and 19th centuries. They documented its botanical characteristics, cultivation methods, and potential uses, contributing to its scientific understanding and cultivation practices. The tree typically reaches a height of 3 to 8 meters (10 to 26 feet) but can grow taller under favorable conditions. ^[16]

Its leaves are elliptical or ovate, glossy green, and alternate along the branches. They are typically 5 to 17 centimeters (2 to 7 inches) long. The flowers of *Annona squamosa* are small, fragrant, and pale green to yellow, often tinged with red or purple. They are solitary or grouped in clusters near the branch tips. The fruit is the most notable feature of the plant. It has a distinctive, knobby exterior and contains creamy, white flesh divided into segments. The flesh surrounds shiny, black seeds. ^[17,18]

Morphological Characters:

Tree: *Annona squamosa* typically grows as a small, deciduous tree reaching heights of 3 to 8 meters (10 to 26 feet).

Leaves: The leaves of *Annona squamosa* are simple, alternate, and oblong to elliptical in shape. They are glossy green on the upper surface and lighter green on the underside. ^[11]

Flowers: The flowers are fragrant and bisexual, meaning they have both male and female reproductive structures. They are typically greenish-yellow to pale yellow in color and have three outer fleshy petals and three smaller inner petals. ^[9]

Fruit: The fruit of *Annona squamosa* is the sugar-apple or custard apple. It is a compound fruit composed of many individual berries, each containing a single seed. The fruit is spherical or heart-shaped, with a knobby surface due to the protrusion of the individual berries. The skin of the fruit is greenish-yellow to brownish when ripe and is covered with small, scale-like protrusions. The flesh inside is white, creamy, and sweet, with a custard-like texture. ^[14] Each berry within the fruit contains a single black seed, which is somewhat flattened and shiny.

Root: The root system of *Annona squamosa* is typically shallow and spreading

Stems: The stems are usually slender and can be somewhat brittle

Microscopic Characters:

Microscopic examination of *Annona squamosa* can provide insights into its cellular structure, which can be useful for research, botanical studies, and quality control purposes. ^[3]

Leaf epidermis

Upper and lower epidermis: Thin, transparent layers of cells covering the leaf surface.

Stomata: Small pores present on the lower epidermis for gas exchange. They appear as tiny openings surrounded by guard cells.

Trichomes: Hair-like structures may be present on the leaf surface, though they are typically sparse in *Annona squamosa*. ^[2]

Leaf Cross Section:

Mesophyll: Palisade and spongy layers of cells between the upper and lower epidermis, responsible for photosynthesis.

Vascular Bundles: Xylem and phloem tissues arranged in vascular bundles for transport of water, nutrients, and sugars.

Flower Anatomy

Petals: Examination of floral parts such as petals, sepals, and reproductive structures like stamens and carpels.

Pollen: *Annona squamosa* produces pollen grains, which can be observed under a microscope for their size, shape, and characteristics

Fruit Anatomy

Fruit Peel: Outer layers of the fruit comprising the epidermis and sometimes hypodermis.

Parenchyma Cells: The bulk of the fruit flesh, consisting of parenchyma cells filled with cell sap.

Seeds: Examination of seeds, which typically have a protective seed coat and internal structures such as cotyledons and embryo.

Root Cross Section

Examination of root anatomy, including the epidermis, cortex, endodermis, pericycle, and vascular tissues^[4]

Stem Cross Section:

Observation of stem anatomy, including the epidermis, cortex, vascular bundles, and pith (if present).

Microscopic examination can also involve staining techniques to highlight specific structures or cellular components. Additionally, techniques such as scanning electron microscopy (SEM) or transmission electron microscopy (TEM) can provide higher magnification and resolution allowing for detailed examination of ultrastructural features.

Cultivation:

In the 20th and 21st centuries, *Annona squamosa* continued to be cultivated commercially in tropical and subtropical regions worldwide. Improved cultivation techniques, including selective breeding for desirable traits, have led to enhanced yields and quality of fruit.^[7]

Annona squamosa thrives in warm, tropical climates but can also grow in subtropical regions with mild winters. It prefers well-drained, fertile soil with a slightly acidic to neutral pH.

The tree requires full sun for optimal fruit production. Propagation is commonly done through seeds, although grafting onto suitable rootstocks can also be employed. It typically starts bearing fruit within two to four years of planting.^[9]

Phytoconstituents:

These phytoconstituents contribute to the plant's medicinal properties and potential health benefits.^[20] Here are some of the key phytoconstituents identified in *Annona squamosa*.

Alkaloids Annonaceous acetogenins are a class of natural compounds found in *Annona* species, including *Annona squamosa*. These acetogenins possess cytotoxic properties and have been studied for their potential anticancer activity.^[15]

Flavonoids Flavonoids are a group of polyphenolic compounds known for their antioxidant properties. They are present in various parts of *Annona squamosa* and contribute to its potential health benefits, including anti-inflammatory and antimicrobial activities.

Triterpenoids Triterpenoids are a class of compounds with diverse biological activities. They have been identified in *Annona squamosa* and may contribute to its pharmacological properties, such as anti-inflammatory, antidiabetic, and hepatoprotective effects.^[19]

Phenolic compounds *Annona squamosa* contains phenolic compounds such as phenolic acids and tannins, which contribute to its antioxidant activity and potential health benefits.

Essential oils The leaves and other parts of *Annona squamosa* contain essential oils composed of various volatile compounds. These essential oils have been studied for their antimicrobial, insecticidal, and antioxidant properties.

Saponins Saponins are glycosides with diverse biological activities, including antioxidant, antimicrobial, and anticancer effects. They have been identified in *Annona squamosa* and may contribute to its medicinal properties.

vitamins and minerals *Annona squamosa* is a good source of vitamins (such as vitamin C) and minerals (including potassium and magnesium), which contribute to its nutritional value and potential health benefits.^[22]

These phytoconstituents collectively contribute to the medicinal properties traditionally attributed to *Annona squamosa*, including its use in traditional medicine for various ailments. However, further research is needed to fully understand the mechanisms of action and potential therapeutic applications of these phytoconstituents.^[15]

Traditional Uses:

Nutritional content: The fruit of *Annona squamosa* is rich in essential nutrients, including vitamins (such as vitamin C, vitamin B6, and riboflavin), minerals (such as potassium, magnesium, and iron), and dietary fiber. It provides a good source of carbohydrates and is relatively low in fat.^[7]

Distinctive flavor and aroma: The creamy, white flesh of the sugar-apple has a unique flavor profile characterized by its sweetness with hints of banana, pineapple, and strawberry. It emits a highly aromatic fragrance, making it appealing to the senses.^[11]

Medicinal Uses:

Various parts of the *Annona squamosa* plant, including the fruit, leaves, seeds, and roots, have been used in traditional medicine systems for their potential medicinal properties. These include anti-inflammatory, antioxidant, antimicrobial, antiparasitic, and antidiabetic activities. Extracts from the plant have been studied for their potential in treating conditions such as diabetes, hypertension, gastrointestinal disorders, and skin ailments. [25]

Cultural significance:

Annona squamosa became integrated into the cultural and culinary traditions of many regions where it was introduced. It became a staple in tropical diets, featuring prominently in desserts, beverages, and traditional medicines. *Annona squamosa* has been cultivated for centuries for its delectable fruit, which is enjoyed fresh as well as used in various culinary preparations such as desserts, smoothies, and juices. [24]

The plant holds cultural significance in many tropical regions and is often associated with traditional medicinal uses. In addition to its culinary and medicinal value, *Annona squamosa* is appreciated for its ornamental qualities, making it a popular choice for tropical gardens and landscapes.

Challenges:

Despite its desirable qualities, *Annona squamosa* is susceptible to various pests and diseases, including fruit flies, mealybugs, scale insects, and fungal pathogens. Proper pest and disease management practices are essential for maintaining healthy trees and high yields.

Conclusion:

In conclusion, *Annona squamosa*, commonly known as sugar-apple or custard apple, represents a remarkable tropical fruit-bearing tree with significant cultural, culinary, and medicinal value. Its distinctive features, including glossy green leaves, fragrant flowers, and knobby fruits filled with creamy pulp and edible seeds, make it a notable component of tropical landscapes and gardens. Beyond its aesthetic appeal, *A. squamosa* holds a long-standing place in traditional medicine, with various parts of the plant utilized to address a range of health concerns. However, successful cultivation of *A. squamosa* requires careful attention to management practices due to its susceptibility to pests and diseases. Despite these challenges, the enduring popularity of sugar-apple attests to its enduring appeal and the importance of preserving

and harnessing botanical diversity. Overall, *Annona squamosa* serves as a testament to the rich biodiversity of tropical regions and the manifold ways in which plants contribute to human well-being and cultural heritage. Its continued cultivation and utilization highlight the ongoing importance of sustainable practices in safeguarding botanical resources for future generations.

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