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Research Article

**ANNONA SQUAMOSA: A BRIEF STUDY ON
PHYTOCHEMICAL AND MEDICINAL PROPERTIES****Nanthana Unni R.P*¹, Mrs. A.S. Athira², Dr. R. Xavier Arulappa³**¹*Student, Seventh Semester B. Pharm, Sree Krishna College of Pharmacy and Research Centre, Parasaala, Thiruvananthapuram, Kerala, India – 695502.²Assistant Professor, Department of Pharmaceutical Chemistry, Sree Krishna College of Pharmacy and Research Centre, Parasaala, Thiruvananthapuram, Kerala, India – 695502.³HOD and Professor, Department of Pharmaceutical Chemistry, Sree Krishna College of Pharmacy and Research Centre, Parasaala, Thiruvananthapuram, Kerala, India – 695502.**Abstract:**

Annona squamosa, sometimes known as the sugar apple, is a tropical fruit popular for its sweet flavor and nutritional value. This study provides a brief overview of the phytochemical profile and therapeutic characteristics. Phytochemical studies show that A. squamosa contains a number of bioactive chemicals, including alkaloids, flavonoids, saponins, and tannins, which are responsible for its pharmacological properties. The fruit and its derivatives have been shown to have substantial therapeutic benefits, including antidiabetic actions that may help manage blood glucose levels and increase insulin sensitivity. Additionally, A. squamosa has anticancer capabilities by inhibiting tumor cell proliferation and inducing apoptosis. Its anti-inflammatory and antibacterial properties add to its medicinal promise, with studies demonstrating efficacy against a variety of infections and inflammatory disorders. The evidence supports A. squamosa's traditional use in treating a variety of diseases, while more research is needed to understand its mechanisms of action and optimize therapeutic applications. This study stresses the importance of conducting more comprehensive clinical trials to establish A. squamosa's health benefits and safety in medical practice.

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INTRODUCTION:

Annona squamosa L. (Annonaceae), also known as “custard apple,” is a tropical, endemic species of the West Indies, South and Central America, Ecuador, Peru, Brazil, India, Mexico, Bahamas, Bermuda, and Egypt. In India, as reported by the Indian Council of Agricultural Research (ICAR), *Annona squamosa* is extensively cultivated in various states (Maharashtra, Gujarat, Madhya Pradesh, Chhattisgarh, Assam, Uttar Pradesh, Bihar, Rajasthan, Andhra Pradesh, and Tamil Nadu). *Annona squamosa* is known for its edible fruits, and the tree grows as a small sapling, rising from 3 m and reaching up to 8 m, with large, randomly spread branches having brownish or light brownish

bark with thin leaves ⁽¹⁾. *Annona squamosa* has been utilized as a natural medicine and in various other food applications. Extracts from *Annona squamosa* leaves (ASLs) have been studied for their biological activities, including anticancer, antidiabetic, antioxidant, antimicrobial, anti-obesity, lipid-lowering, and hepatoprotective functions. The fruit is spherical-conical, 5–10 centimeters in diameter and 6–10 cm long, and weighing 100–240 grams, with a thick rind composed of knobby segments. The colour is typically pale green through blue-green, with a deep pink blush in certain varieties, and typically has a bloom. ⁽²⁾

**SYNONYMS:**

Alphonsea forskahlii, Annona asiatica, Alphonsea cinerea, Xylopia frutescens, Guanabanus squamosus, Annona glabra ⁽³⁾

VERNACULAR NAMES

SL.NO	LANGUAGE	VERNACULAR NAME
1	English	Custard apple, Sugar apple
2	Tamil	Cintamaram, Nilampuccitta, Seetha pazham
3	Hindi	Sharifa , Sitaphal
4	Kannada	Sitapala, Sitaphala
5	Manipuri	Sitaphal
6	Sanskrit	Agrimakhya, Atripya, Gandhagatra, Krishnabija,
7	Telugu	Ganda gathram, Seethapandu,, Sitaphalamu

(4)

SYSTEMIC CLASSIFICATION

KINGDOM	Plantae
DIVISION	Magnoliophyta
CLASS	Magnoliopsida
SUBCLASS	Magnoliidae
ORDER	Magnoliales
FAMILY	Annonaceae
SUBFAMILY	Maloideae
TRIBE	Abrae
GENUS	Annona. L
SPECIES	<i>Annona squamosa</i> L

(4)

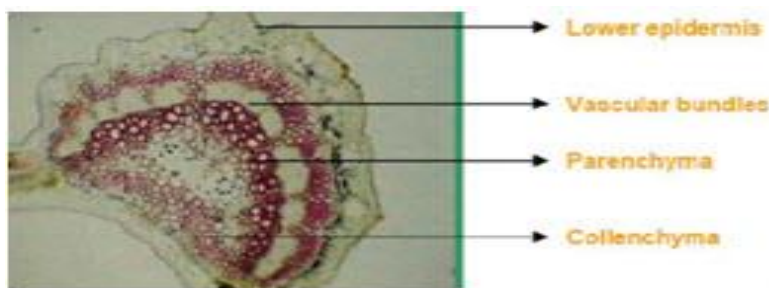
BOTANICAL DESCRIPTION:

Leaves:	Leaves are oblong –lanceolate, 10-15 cm long and 3-5 cm wide, alternately arranged on short petioles, young leaves are slightly hairy, solitary and clustered crystals occur in epidermal cells.
Flower:	Flower is 2-4 cm long and contains three degenerated sepals and six petals. The six petals are arranged into two whorls with three each and the petals of the inner whorl are degenerated into small scales or completely disappear
Stem:	Irregular branches with thin gray bark contain N Nitrosoxylopin, roemerolidine and duguevalline antimalarial alkaloid
Fruit:	Trees start to bear fruit when 3–4-year-old. In India fruits are produced in July-august. Sugar apple, as the name says it all, is sweet as sugar. It is usually conical in shape but sometimes, it may be almost round.
Seeds:	Seeds are black or dark brown in colour. There are 30-40 seeds in an average fruit.
Root:	Branched tap root

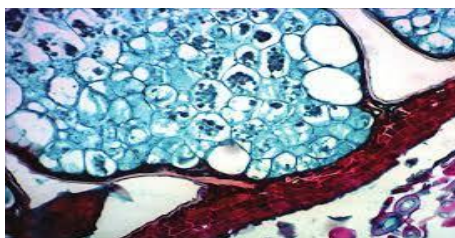
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MICROSCOPIC FEATURE:

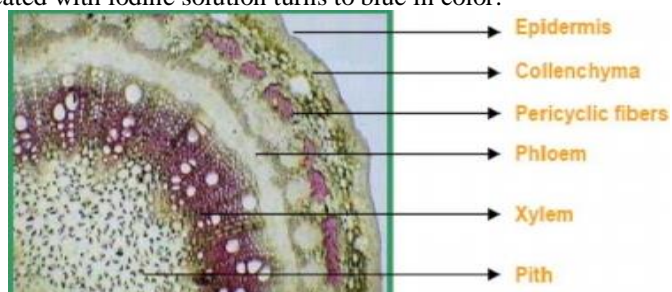
MICROSCOPY OF LEAF: *Annona squamosa* leaf is dorsiventral. Single layer of palisade cells are present below upper epidermis. Paracytic types of stomata found in lower epidermis. Mesophyll contains 3-4 layers of spongy parenchyma with many intercellular spaces. The midrib portion shows collenchyma below epidermis on both surfaces. In between collenchymatous and vascular bundle there are parenchymatous cells. The vascular bundle composed of lignified phloem & xylem arranged in collateral-open type. Sclerides are present below collenchymatous cells of upper epidermis. ^[5]



MICROSCOPY OF SEED: The endosperm was cellular and ruminate, occupied most of the seed and was the main reserve tissue. The ruminations were separated from each other by inclusions or transverse folds of the outer and inner integuments. Spiniforms were more or less flattened and fimbriated. Structures presumed to be oleiferous idioblasts were observed in the ruminations ends, close to the edge of the seed, where cells were irregularly arranged and of different size and shape than the bulky cells present in most endospermic tissue. These residues might correspond to the nucellus.^[5]

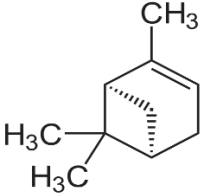
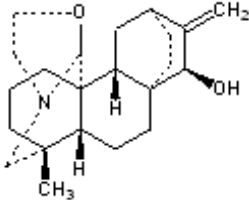


MICROSCOPY OF STEM: Cross section of stem shows that collenchymatous cells are present under epidermis, followed by pericyclic fibers, phloem (food conducting vessels), xylem (water conducting vessels) & parenchymatous cells. Xylem is surrounded by pith & starch grains which consists of lignified stone cells. Oval shaped starch grains are present which when treated with iodine solution turns to blue in color.^[5]



CHEMICAL CONSTITUENTS:

SL.NO	CHEMICAL CONSTITUTION	STRUCTURE
1	Proanthocyanidin	
2	germacrene D	

3	α-Pinene	
4	Atisine	

[6]

TRADITIONAL USES:

- ✓ anti-inflammatory
- ✓ anti-parasitic
- ✓ anti-cancer
- ✓ diarrhea
- ✓ dysentery
- ✓ Fever
- ✓ used as ingredients in cosmetics and skincare products. They are believed to have moisturizing and skin-rejuvenating properties.^[7]

PREPARATION OF EXTRACTS**Experimental Process Solvent Extraction with Methanol- Extraction with Methanol for 1:3 Feed to Solvent Ratio**

Custard apple seed oil is extracted by crushing the seeds of the custard apple. Traditionally seeds are extracted from seed casing and dried in sun. Once the dried seeds are crushed to extract the oil. Oil extracted from custard apple seeds can be used as pesticide against a number of common pests like white mealy bug, aphid, termite, etc. The oil extracted from custard apple seeds contain acetogenin a group of powerful respiratory inhibiting toxic components, which is responsible to act as a bio-pesticide.

Raw Materials and Chemicals

1. Custard Apple Seed Powder
2. Methanol/Acetone

Apparatus

1. Simple Distillation Assembly
2. Round Bottom Flask/Beaker with heating mantle for extraction
3. Separating Funnel for separation of two phases
4. Soxhlet Apparatus
5. Digital Thermometer and Measuring Cylinder.^[8,9]

Procedure

1. Take 100 gm custard apple seed dried in oven or sunlight to remove the moisture.
2. Make powder of seed for increase yield of extraction.
3. As per literatures extracted oil act as biopesticide having B. P. range 190-195 °C.
4. Select solvent B.P. up to 100 °C. so, it can easily separate from seed oil.
5. Take cotton cloth or filter paper and keep seed powder in cloth or filter paper.
6. Gas chromatography or filter paper in Soxhlet apparatus contains seed powder
7. Take 300 ml of the methanol as solvent in round bottom flask of Soxhlet.
8. The mixture was then heated at 60-65°C. (B.P. solvent) for 2-4 hrs.
9. After extraction removal of round bottom flask from Soxhlet apparatus.
10. Oil (B.P. 92-95°C) to be separated from the solvent using simple distillation.
11. Separation of oil and solvent by simple distillation at temperature 60-65 °C.
12. Calculate % yield and % recovery of oil.^[10,11]

PHYTOCHEMICAL ANALYSIS^[12,13]**Detection of alkaloids:****a) Wagner's test :**

Prepare custard apple extract and add Wagner reagent to it. Check for any colour changes or precipitation. Reddish-brown or brown precipitate suggests the presence of alkaloids.

b) Dragendorff test:

Prepare custard apple extract and add the Dragendorff reagent to it. Check for any orange or reddish-brown precipitate. The

presence of precipitate indicates the potential existence of alkaloids.

Detection for free alkaloids :

a) Mayer's test:

Mix custard apple extract with gelatin solution. and heat the mixture. Look for a white or cream-colored precipitate

Test for Phenol :

Ferric chloride test :

To 1 ml of the extract, 3 ml of distilled water was added followed by few drops of 10 percent aqueous ferric chloride solution. Formation of green colour indicates the presence of phenols.

Test for Flavonoids

Shinoda test :

To 2 ml of the extract, 1 ml of 1 percent ammonia solution was added. Appearance of yellow colour indicates the presence of flavonoids.

Test for Tannins

Ferric chloride test :

To 1 ml of the extract, 1 ml of 0.008 M potassium ferricyanide was added and then 1 ml of 0.02 M ferric chloride containing 0.1 N HCl was added. Appearance of blue-black colour indicates the presence of tannins.

Test for Saponins :

Foam test 2 ml of crude extract was mixed with 5 ml of distilled water in a test tube and it was shaken vigorously. Add some drops of olive oil. The formation of stable foam is taken as an indication for the presence of saponins.

Test for Triterpenoids :

To 1.5 ml of extract, 1 ml of Liberman-Buchard reagent (acetic anhydride + concentrated sulphuric acid) was added. Blue green colour formation indicated the presence of triterpenoids.

Test for acids :

1 ml of extract was treated with sodium bicarbonate solution. Formation of effervescence indicates the presence of acids.

MEDICINAL PROPERTIES ^[14,15]

ANTIBACTERIAL ACTIVITY

The leaves of *Annona squamosa* Linn have reported to have antibacterial properties. Studies have shown the high potency of antibacterial action of the plant.

ANTIDIABETIC ACTIVITY

Recent studies have reported that the root extracts of *A. squamosa* have reported anti-diabetic effects in streptozotocin (STZ) induced diabetes mellitus and insulin deficiency lead to increased glucose level .

ANTIOXIDANT ACTIVITY

Results from previous studies showed that polar extracts were found to be better free radical scavengers compared with those less polar. The leaves extracts of the two parts showed high flavonoid content.

ANTI-TUMOR ACTIVITY

The plant *Annona squamosa* Linn traditionally known as Custard apple possesses potent bioactive principals in all its parts. *Annona squamosa* seed extract has shown, in previous studies, significant anti-tumor activities against human hepatoma cells in vitro and in vivo, indicating a potential for developing the extract as a novel anti-liver cancer drug. Aqueous extracts of *Annona squamosa* seeds possess significant antitumor activity in vivo against AD-5 tumor.

ANTIMALARIAL ACTIVITY

In the recent studies on *Annona squamosa* all compounds showed moderate activity against a chloroquine-sensitive strain and a chloroquine-resistant strain of *Plasmodium falcifarum*

ANTHELMINTIC ACTIVITY

The anthelmintic activities of the *Annona squamosa* and its leaf extract have been studied using various models. The hexane, ethyl acetate, ethanolic extracts of the crude drug at different concentrations were tested which involve determination of paralysis time and death time.

ANTI- GENOTOXIC EFFECT

Studies on the genotoxicity potential of *Annona squamosa* have shown that the plant extract treatment significantly altered serum enzyme levels in oxidative stress conditions.

CONCLUSION:

The botanical description, traditional uses of *Annona squamosa* L pharmacognostical studies of leaf, phytochemistry and pharmacology studies of various parts of *Annona squamosa* (Annonaceae), a medicinal plant found in central and southern Europe, western Asia and the very frequently in southern Mexico, Bahamas and Bermuda, and occasionally in southern Florida and also found in India *A. squamosa* plants grow well in the lowlands and the tropics. The leaves of *A. squamosa* is a type of plant that is still rarely used. *A. squamosa* has a lot of benefits for humans such as for health functions based on the previous

studies that have shown that their leaves have high nutritive value. A variety of phytochemical such as terpenoids, flavonoids, quinones, volatile oil, and others have been reported to be present in this plant. It exhibits several pharmacological activities Anti-cancer, Anti-inflammatory, Hepatoprotective, Antidiabetic and Antihyperglycemic, Antioxidants, Analgesic and other Pharmacological activity. It is potentially an important medicinal plant for mankind

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