A REVIEW ON PHARMACOGNOSTIC AND PHARMACOLOGICAL STUDY OF THE *ANNONA SQUAMOSA* LINN.

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ABSTRACT

Natural drug products have a special place and role in pharmacotherapy. Within them, herbs have Been one of the important sources of medicinal products since the beginning of the human Civilization. Alterative medication and natural remedies have been used from ancient time for the treatment and wellbeing of human There is a growing demand for plant based medicines, health product, Pharmaceuticals, food supplements, cosmetics etc .In the present review, an attempt has been made to congregate the traditional, phytochemical and pharmacological studies done on The medicinal plant ***Annona squamosa*** *linn****,*** *(Family annonaceae).* ***Annona squamosa*** *Linn is commonly known as custard apple and Sitaphal.* ***Annona squamosa*** *is commonly cultivated In tropical and subtropical regions. Based on previous research, 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.*

KEYWORDS: ***Annona squamosa,*** *Pharmacological studies, Custard apple , sugar apple, Sitaphal.*

INTRODUCTION

In various native and traditional sources of herbs have been used for Treatments. Various parts of plants such as the leaves, Fruits, the barks, roots and even the seeds are being Used for prepration of medicine.[3]Annonaceae family has been listed as a diverse of aromatic trees, bushes or shrubs and climbers or lianas, which are predominantly found in the tropical and , with a limited number growing in temperate zones. In topical Asia, South and Central America, Australia and Africa, West Indies.[7] The genus name, **'Annona'** Is from the Latin word **'anon'**, meaning 'yearly produce', referring to the production of fruits of the various species in this genus. As Annona genus is widely available in India this genus has been selected for the study. The Bark, leaves, and roots of some species are used in folk medicines.[6] ***Annona squamosa*** Linn. Is commonly known as **custard apple** and **sugar apple,** the plant of **Annonaceae** family.[5] Leaves of custard apple plants have been studied for their Health benefits, which are attributed to a considerable diversity of phytochemicals. ***Annona squamosa*** leaves contain active substances Such as flavonoids, glycosides, phenolics, tannins, phytosterols, alkaloids, and saponins.[1] Extracts from ***Annona squamosa*** leaves (ASLs) have been studied for their biological activities, including anticancer, antidiabetic, a ntioxidant, antimicrobial, antiobesity,Lipid-

lowering, and hepatoprotective functions. [4] A.squamosa is well-known for its antidiabetic properties . Its seeds, bark and leaves possess various pharmacological properties,mainly anti-tumour properties [7]

In this review, we Summarize pharmacognostic and pharmacological properties of ***Annona squamosa* Linn**.

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]

Fig.-1 : Annona Squamosa plant

Geographical Distribution :

Annona Squamosa also branded as sugar apple or custard apple is is originated from West Indies and South America. It is commonly Cultivated in India .[5] It considered Endemic to tropical America but is widely distributed in tropical and Subtropical countries in Asia such as Malaysia, Laos, Thailand and Vietnam. In india it is scattered all over Rajasthan where they grow Wild in the Aravalli hill region.[8]

Taxonomic Classification :

Annona squamosa Linn

- **Kingdom :** Plantae
- **Subkingdom :** Tracheobionta
- **Super division :** Spermatophyta
- **Division :** Magnoliophyta
- **Class :** Magnoliopsida
- **Sub class :** Magnoliidae
- **Order :** Magnoliales
- **Family :** Annonaceae
- **Genus :** Annona L.
- **Species :** ***Annona squamosa***

TAXONOMICAL CHARACTERISATION AND DESCRIPTION

Annona Squamosa is one of the garden plant that comes From the Annonaceae family known as custard. [9] Apple tree does not Require much care and will do well if watered regularly, along with enough light for it to grow. It Grows well in hot dry climates and adjusts in any kind of soil, a job that is a little difficult for other Plants in its family. [6] The total area of cultivation has been the Indian Council of Agricultural Research (ICAR) as 40,000 ha . Its Tree grows as a small sapling from 3 m to 8 m, with large branches having brownish orLight brownish bark and it has thin leaves and is known for its edible fruit [7] ***Annona Squamosa*** leaves are green with a width of 3-5 Cm and a length of up to 15 cm, this plant dormancy Can be caused by fluctuations int light, or rainfall. ***Annona*** is also a type of plant with bisexual flowers with the groups of 2 to 4 and can Reach a length of about 2.5 cm.[1]Trees of ***Annona squamosa*** can flower in spring to early summer, but in areas with permanent humidity levels, ***Annona squamosa*** can flower throughout the year.

Leaves : Ovate to lanceolate shape, simple margin, lamina measures about 10×5 cm, they are Simple, alternated to spirally arrange with zig zag pattern. Sides some times are slightly unequal And the leaf edges are without teeth, inconspicuously hairy when young.[6]

Flower : Hermaphrodite, usually some what fragrant, solitary or in fascicles with 2 to 4 flowers, with three green sepals and six petals arranged in two containers. The flowers have several conglomerated and spirally arranged stamens below and around an upper globose shaped dome of numerous united carpels.[6] This are actinomorphic, protogynous, Pedicillate, spirocyclic, bracteates, and bisexual. [1]

Seed : ***Annona squamosa*** seeds are dark brown to black, with ovoid shape, numerous scattered over the white pulp. [6] And generally 30-40 seeds can be found in one fruit. ***Annona squamosa*** is a type of plant That classified as diploid with 2n-14 [9]

Fruit : A. squamosa begins to bear fruit when it is 3-4 years old. In India, usually ***Annona squamosa*** bear fruit around July-August. Custard apple has a sweet taste like sugar, their ripe fruit is indicated by the sweet aroma of the fruit. [1]

Stems : The stems of branches ***Annona squamosa*** are irregular in shape gray in color and contains compounds. Cylindrical with characteristic odour and bitter taste. Outer side thick cork cells are found upon maturation.[6]

MORPHOLOGICAL CHARACTERS

Annona Squamosa small tree with an open, 3-7 M in height, open crown or irregularly spreading branches bark light brown with visible leaf.[11]

Leaves are Sepals pointed, hairy, green, about 16 mm long, 3 outer Petals oblong, thick and rounded at the tips, fleshy, 1.6-2.5 cm long, 0.6 cm wide, yellow-green, slightly hairy, Inside light yellow and keeled with a purplish or Reddish spot at the thin, enlarged base. [13]

Flowers Greenish-yellow, fragrant, on slender hairy stalks, Produced singly or in short lateral clusters about 2.5 cm Long, 2-4 flowers [9]

Fruits are the Aggregate fruit formed from the numerous pistils of a Flower.Fruit is round, heart shaped, ovate or conical, 5-10 cm in diameter, with many round protuberances; Greenish-yellow when ripe, with a white, powdery Bloom. The pulp is white, edible and sweetly aromatic.In each carpel is embedded a seed, oblong, shiny and Smooth, blackish or dark brown, 1.3-1.6 cm long. [14]

Traditional Uses

Annonaceae species are famous in tropical regions and used traditionally across Tropical regions due to their widespread distribution. Various parts of the species are used Traditionally, including leaves, seeds, bark, fruit, stem, roots and twigs. [7]

Leaves: Decoction of leaves is used to treat dysentery and infections in urinary tract, cough and cold. Crushed leaves are applied to wounds for healings. [1]

Fruit: Fruits are normally eaten fresh. The pulp can be used as a flavouring in ice cream. Custard apple is high in fibers, which helps digestion, prevents constipation, and detoxifies our body. [3]

Seed: Custard apple seeds were mainly used to treat various digestive disorders and as an insecticidal agent. [8]

MEDICINAL VALUE

Annona Squamosa leaves, shoots, bark and roots have been reported to have medicinal properties. All the parts of this plant are useful in managing a variety of diseases. It is rich in fiber, minerals, vitamins and antioxidants that help boost immunity.[3]

Leaves : Custard apple leaves helps manage high blood pressure due to the presence of potassium and magnesium that promote the dilation of blood vessels that improves blood flow.

Custard apple leaves are also beneficial for the skin due to the presence of vitamin A and vitamin C that have antioxidant property. It might help prevent wrinkles, acne and maintain a healthy glowing skin. It is also considered to be good for hair problems such as lice infections. [9]

Seed: Powdered seeds are used to kill head-lice And fleas but care should be taken that the powder does Not come in contact with the eyes as this causes great Pain.[3]

Root – **bark** : Scrapings of root-bark are used For toothache.[7]

Fruit: health benefits like boosting the digestive system and immune system, promoting eye health, and controlling blood sugar levels Custard apple may be useful in managing thyroid. [9]

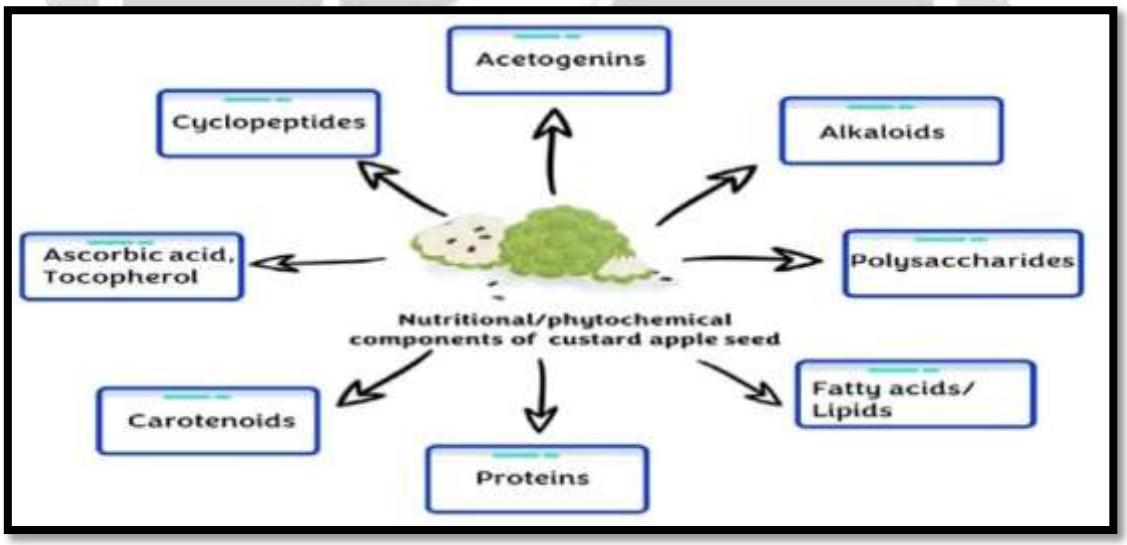

Fig. - 2 : chemical constituents of Annona Squamosa plant

CHEMICAL CONSTITUENTS

Annona squamosa linn consist of alkaloids, phenolic compounds, flavonoids, saponins, tannins, Phytosterols, carbohydrates, proteins and amino acids. It also contains fixed oils, fats, gum and mucilage.[8]

Leaves contain anonaine, borneol, Camphene, carvone, eugenol, geraniol, menthone, rutin and β- sitosterol, phenolics, annonaceous acetogenins, saponins.[4]

Fruits consist of 28% of sugar, iron, calcium, carotene, thiamine, ascorbic acid, acetogenins and cyclopeptides.

Root and Stem give Borneol, Car-3-ene, Farnesol, Geraniol and Limonene. [15]

Flower of squamosa contains important phytochemical compounds such as linalool, borneol, eugenol, farnesol, geraniol, tannins, phenolic compounds, polyphenols, annotemoyin-1, annotemoyin-2, squamocin and cholesteryl glucopyranoside, and flavonoids

PHARMACOLOGICAL ACTIVITY :

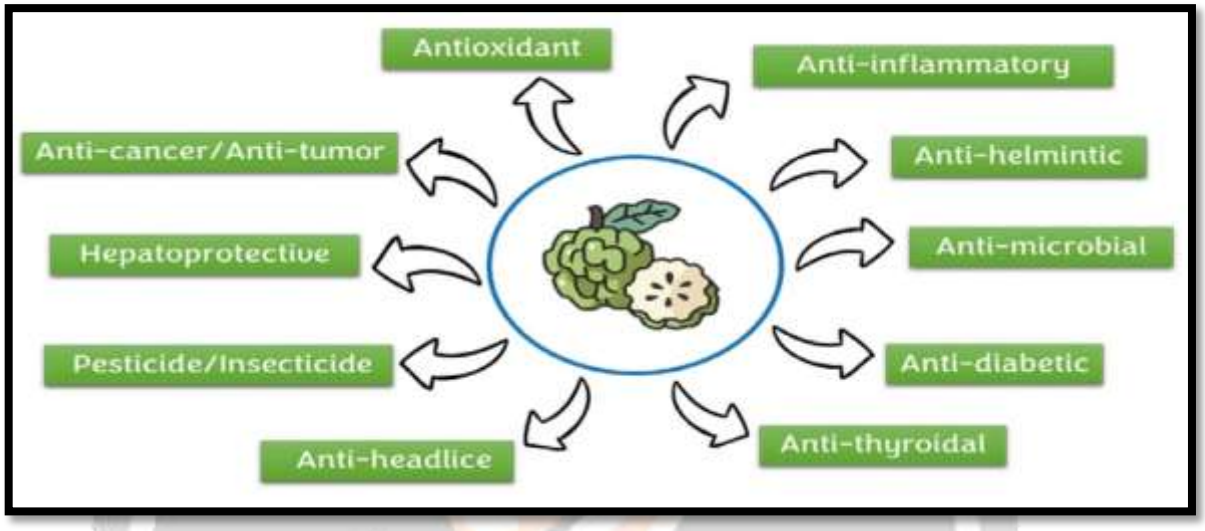

Fig.- 3 : Pharmacological properties of Annona Squamosa plant

Antioxidant – Activity :

Anti-oxidants are the compounds responsible for the protection of living organism from the damage caused by the abnormal production of reactive oxygen species concomitant lipid peroxidation, protein damages and others including DNA strand breaking etc.[2] The free radical scavenging potential of the leaves of ***Annona squamosa*** Linn was studied by using different antioxidant models of screening. [4] The ethanolic extract at 1000 microgm/ml showed maximum scavenging of the radical cation.[17]

Anti inflammatory activity :

Caryophyllene Oxide which was isolated from an unsaponified petroleum Ether extract from the bark of ***Annona squamosa*** was Studied for its analgesic and anti-inflammatory activity.[2] The extract reviled that it has Analgesic and anti inflammatory activity in dose dependent manner when compared to comparable with the reference standard drugs, pethidine sulfate and Indomethacin. [4]

Anti-Head lice effect :

The present study focused on the separation and Identification of the active compounds against head Lice from the hexane extract of Annona squamosa Linn.[2] Researcher used hexane seed extract and two major pure compounds for testing anti head lice activity and seven head lice collected from school girls. [17]

Antibacterial Activity :

The anti-bacterial and anti-fungal activities of the plant compounds such as Petroleum ether extract (PE), $CHCl_3$ extract (CE), EtOH extract (EE), annotemoyin-1, annotemoyin-2, squamocin and cholesteryl glucopyranoside showed maximum inhibition against the gram positive organisms.[2] The results of antibacterial activities obtained in the present study for each of the ***Annona squamosa*** L. extracts were correlated to their total phenolic contents .Positive correlations were obtained between the concentration of phenolic compounds in the different ***Annoma squamosa*** Linn. Extracts and inhibition of all of the tested bacteria. [16] The leaves of ***Annona squamosa*** Linn have reported to have antibacterial properties. Studies have shown the high potency of antibacterial action of the plan.[6]

Antidiabetic Activity :

Diabetes is an endocrine and metabolic disorder that is primarily characterised by Insulin deficiency, insulin resistance, and elevated levels of sugar in the blood. [4] The present work has detected the antidiabetic Activity of ***Annona squamosa*** root extract in STZ-Induced hyperglycemia in rats. STZ induced Diabetes mellitus and insulin deficiency lead to Increased blood glucose level. [6]

Anti microbial Activity:

The antimicrobial activity was evaluated using fourSo xtract. Agar diffusion method was selected to check antibacterial activity. [3] The plant extracts of petroleum ether, chloroform, methanol and water were tested for Antimicrobial activity. E. coli, Staphylococcus aureus, Pseudomonas aeruginosa and Bacillus Were used as standard strains.[5]

Anti-ulcer Activity :

Peptic ulcer is a disease that affects a Large population throughout the world and it is caused Mainly due to the development of gastric lesions, when there is a delicate balance between some of the gastro Protective and aggressive factors is being lost.[2] Researchers isolate twelve compounds from ***Annona squamosa*** twings and evaluated against Cold restraint, aspirin, alcohol-induced gastric ulcer and histamine-induced duodenal ulcer Models and confirmed through in vitro assay of $H^+ K^+$- ATPase activity and plasma gastrin Level.[5]

Anti Tumor :

The plant ***Annona squamosa*** Linn traditionally known as Custard apple possesses potent bioactive principals in all its parts. ***Annona squamosa*** seed extract have shown. [6] The effect of aqueous and organic Extracts from defatted seeds of ***Annona squamosa*** was studied on a rat histiocytic tumour cell line AK-5. [5] Both the extracts caused significant apoptoic Tumour cell death with enhance caspase-3 activity.[17]

Anti Cancer Activity :

The ability to evade apoptosis is a unique property of human cancers that can result in effective cancer progression and tumour formation. Leaves of ***Annona squamosa*** have a number of chemical compounds belonging to diverse groups, including phenolics, annonaceous acetogenins, saponins, flavonoids, alkaloids, glycosides, steroids, and terpenoids . A study was conducted to Investigate the in-vivo and in-vitro anti-breast cancer activity of ASL extracts . A. squamosa L. leaves extract was found to be an effective anticancer treatment.[4]

CONCLUSION

Indian literatures like Ayurveda and various ancient Literature have already mentioned herbal remediation For a number of human ailments. ***Annona squamosa*** Linn. a traditional medicinal Plant was investigated and showed that the phytochemical constituents and the bioactive compounds posses the medicinal properties which makes them to be a potential species in the Family of Annonaceae.

From the above review, preliminary phytochemical analysis of ***Annona squamosa*** linn extract Shows the presence of alkaloids, flavonoids, carbohydrates, proteins, saponins, tannins and Steroids.Few Novel chemical constituent isolated from the ***Annona Squamosa*** linn. anti –cancer , anti-HIV and Anti-diabetic(type 2 diabetic) properties too and Various pharmacological properties have been reported, including antidiabetic, hepatoprotective, anti-inflammatory, antiprotozoal, antitumor, antioxidant,antimicrobial and anticonvulsant activity.Annona Squamosa Linm. leaves as natural food preservative and to protect against Peroxidative damage in living systems related to aging and Carcinogenesis.

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