

# Phytochemical Analysis and Anti-Cancer Properties of Annona Squamosa Seed Extract

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## ABSTRACT

*Annona squamosa*, commonly known as sugar apple or custard apple, has a long history in traditional medicine for treating various ailments, including cancer. Recent research has focused on exploring the potential of *Annona squamosa* in cancer treatment, revealing the presence of bioactive compounds like alkaloids, acetogenins, flavonoids, and phenols that possess anti-cancer properties. Both laboratory and animal studies have shown encouraging outcomes, such as the inhibition of tumor growth, induction of apoptosis in cancer cells, and enhancement of the cytotoxic effects of chemotherapy drugs. Additionally, *Annona squamosa* exhibits antioxidant, anti-inflammatory, and immunomodulatory effects, which could potentially mitigate the side effects associated with cancer treatment. However, further investigation is necessary to determine the optimal dosage and administration method for maximum efficacy, as well as to establish its safety and effectiveness in human subjects. With its promising therapeutic potential, *Annona squamosa* presents itself as a valuable natural product for cancer treatment, warranting continued exploration as an alternative or complementary therapy to conventional cancer treatments.

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## I. INTRODUCTION

Traditional medicine has employed *Annona squamosa*, also known as sugar apple, sitaphal, or custard apple, to cure a number of illnesses, including cancer. *Annona squamosa* is known to contain bioactive substances that have been discovered to have anti-cancer potential, according to recent studies. Extracts from *Annona squamosa* inhibit angiogenesis, cause apoptosis in cancer cells, and increase the cytotoxicity of chemotherapeutic medicines. Additionally, *Annona squamosa* has anti-inflammatory, immunomodulatory, and antioxidant properties that can lessen the negative effects of cancer treatment and enhance the quality of life for cancer patients. This review paper focuses on the properties and chemical composition of *Annona squamosa* seeds as well as potential future developments in the field of *Annona squamosa* seed use in cancer treatment.



Fig.1.1 *Annona squamosa* fruit



Fig.1.2 *Annona squamosa* seed

## PHYTOCHEMICAL ANALYSIS OF ANNONA SQUAMOSA SEEDS

*Annona squamosa*, commonly known as sugar apple, sitaphal or custard apple. It has been traditionally used in various forms of alternative medicine for the treatment of various diseases in Ayurveda and Unani, including cancer. In recent years, numerous studies have been conducted to evaluate the potential of *Annona squamosa* in cancer treatment.

*Annona squamosa* has been found to possess various bioactive compounds such as alkaloids, acetogenins, flavonoids, and phenols which have been shown to have anti-cancer properties. Acetogenins, in particular, have been extensively studied for their cytotoxic effects on cancer cells.

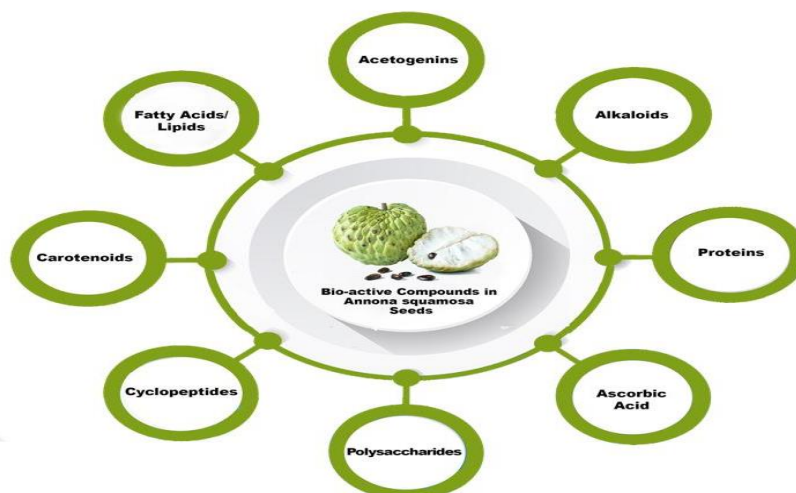


Fig.1.3 Phytochemicals in *Annona squamosa*

Phytochemical analysis of *Annona squamosa* seed extract has uncovered a diverse array of bioactive compounds that hold promise for therapeutic applications. Acetogenins, predominantly present in Annonaceae plants like *Annona squamosa*, exhibit notable cytotoxic, anticancer, and pesticidal effects. Unique to Annonaceae plants, annonaceous acetogenin derivatives have shown cytotoxic activity against various cancer cell lines. Flavonoids, such as quercetin and kaempferol, discovered in *Annona squamosa* seeds, display antioxidant, anti-inflammatory, and potential anticancer properties. Additionally, the seed extract contains tannins, which are common polyphenolic compounds in plants and possess antioxidant, antimicrobial, and anticancer properties. Alkaloids, nitrogen-containing compounds, have also been detected in the seeds and are being explored for their potential anticancer effects.

Test for	Test Performed	Pet. Ether Extract	Ethanol Extract
Alkaloid	Draggendorff's test	-	+
	Hager's test	-	+
Cardiac glycoside	Keller Kiliani test	-	+
	Raymond's test	-	+
	Baljet's test	-	+
Saponin glycoside	Foam test	+	+
Steroid	Salkowski test	+	+
	Liebermann-Buchardt test	+	+
Tannin	Ferric chloride test	+	-
	Gelatin test	+	-

Table 1.1 Phytochemical screening of extracts of *Annona squamosa* seed.

(<https://d3i71xaburhd42.cloudfront.net/39c38a20fd5381504757509199ed861c931836b7/6-Table1-1.png>)

#### ANTICANCER ABILITY

*Annona squamosa* seed extracts have been found in in-vitro experiments to be able to stop the growth of several cancer cell lines, including breast, prostate, colon, liver, and lung cancer cells. Animal models used in in vivo research have also produced encouraging outcomes in terms of lowering tumour growth and raising survival rates.

Additionally, it has been discovered that *Annona squamosa* extracts contain anti-angiogenic properties, which may aid in preventing the development of new blood vessels necessary for tumour growth. They have also

been demonstrated to cause cancer cells to undergo apoptosis, or programmed cell death, which is a key mechanism for halting the growth and spread of cancer cells. The potential of *Annona squamosa* extracts in combination with chemotherapy medications for the treatment of cancer has also been looked into in a number of research. These studies have demonstrated that the combination of chemotherapy medications and *Annona squamosa* extracts can augment the cytotoxic effects of the chemotherapy treatments, resulting in an increase in cancer cell death.

*Annona squamosa* has been discovered to have antioxidant, anti-inflammatory, and immunomodulatory benefits in addition to its anti-cancer capabilities. These additional effects may help lessen the side effects of cancer treatment and enhance the general quality of life for cancer patients.

## II. CONCLUSION

The majority of the research done so far suggests that *Annona squamosa* extracts offer a lot of promise for treating cancer. Bioactive substances such as acetogenins, annonaceous acetogenin derivatives, flavonoids (quercetin and kaempferol), tannins, and alkaloids have been discovered through phytochemical investigation of *Annona squamosa* seed extract. Cytotoxic, anticancer, antioxidant, anti-inflammatory, antibacterial, and pesticidal activities have been shown for these substances. More research is required to ascertain the precise anti-cancer effects and mechanisms of action, the ideal dosage, duration, and method of administration for maximum effectiveness, the assessment of *Annona squamosa* seeds in combination with other natural products or conventional cancer treatments, and clinical human trials to establish its safety and efficacy in humans, among other things.

*Annona squamosa* has been demonstrated to have a variety of anti-cancer characteristics, making it a viable natural remedy for the treatment of cancer. Further research is necessary to see whether it can be used to treat cancer, and it may present a promising substitute for or addition to existing cancer therapies.

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