



Beneficial aspects of the unexplored custard apple (*Annona squamosa*) fruit

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Since ancient times, fruits have become important for human nutrition due to their nutrients and potential health beneficial effects. *Annona* fruits (Family, *Annonaceae*) are of the world's best tasting fruits, due to the sweet, creamy flesh and fragrant flavor when fully ripe. Out of 125 species of genus *Annona*, only 5 species, namely the custard apple (*Annona squamosa*), cherimoya (*Annona cherimola*), soursop (*Annona muricata*), bullock's heart (*Annona reticulata*) and atemoya (*Annona cherimola* × *Annona squamosa* hybrid) are of major commercial importance. The genus *Annona* is also considered as economically important crop worldwide. Custard apple (*Annona squamosa*), alternatively also called sweetsop or sugar apple is known as sitaphal or sharifa in India and *Fruta do conde* in Portuguese. It is the most developed edible tropical fruit of the genus *Annona* which have more vitamin C content than an orange (Pandey *et al.*, 2014). The fruit tissue is fragrant, sugary and white to bright yellow, with the surface similar kind of custard; the flavour is viewed as the best among fruits in the family. Natural products are partitioned into 20-38 fragments, each for the most part containing a hard, gleaming earthy dark, seed, enmeshed in the substance, albeit a few trees deliver a seedless organic product. The fruits are for the most part eaten crisp, or used in juice making for refreshments or ice, and are a decent wellspring of iron, calcium, and phosphorus (NRCS, 2008).

Taxonomic classification:

Kingdom	: Plantae
Sub Kingdom	: Tracheobionta
Super division	: Spermatophyta
Division	: Magnoliophyta
Class	: Magnoliophyta
Order	: Magnoliales

Family	: Annonaceae
Genus	: <i>Annona</i>
Species	: <i>Annona squamosa</i>

Distribution : Custard apple (*A. squamosa*), originating from West Indies and Central America is believed to have spread to Mexico, South America and subsequently reached Asia and Africa. This fruit is highly appreciated, and commercial cultivation is wide-spread in North-eastern (area under cultivation 94 %) and South-eastern Brazil.



However, Brazil is also considered the second largest producer of custard apple (*A. squamosa*) after Mexico. In India, it was brought by the Portuguese during the 17th century and is widely grown in high rainfall regions under an area of 42 ha. At present, the species is very popular in the Deccan plateau, being grown and marketed in the states of Andhra Pradesh, Bihar, Madhya Pradesh, Maharashtra, Uttar Pradesh, Tamil Nadu, Assam, Karnataka and Orissa.

Proximate fruit composition: The nutrient composition of the fruits of *A. Squamosa* is presented in Table 1. Custard apple is sweet, delicious, and creamy with a not too bad flavour and having citric and malic acids as the principal acids. The pulp of custard apple is believed to be rich in minerals (calcium, magnesium, phosphorus and potassium) and vitamins (thiamine, riboflavin, Vitamin B6, Vitamin K1 and Vitamin C) and also a potential source of dietary fibre (cellulose, hemi-cellulose, lignin and pectic substances). High nutritive value of the *A. Squamosa* is due the high levels of the sugar which are basically the after effect of starch hydrolysis, the most essential being glucose, fructose and sucrose. *A. squamosa* seed contains a good amount of oil which contains predominant amount of MUFA (39.72%) followed by 31.56 per cent of PUFA and 24.07 per cent saturated fatty acids, thus, can be

Table 1: Proximate composition of 100 g of edible pulp of custard apple (*Annona squamosa*) fruits (Pareek *et al.*, 2011)

Components	Values
Energy (calories)	75
Water (g)	75.8±2.8
Proteins (g)	1.85±0.05
Lipids (g)	0.35±0.15
Carbohydrates (g)	18.7
Fibre (g)	2.55±0.35
Total acidity (mg of citric acid)	0.01-0.44
Ash (g)	0.95±0.15
Calcium (mg)	24
Phosphorus (mg)	26
Iron (mg)	1.0
Vitamins	
Vitamin B1 (mg)	0.07
Vitamin B12 (mg)	0.12
Vitamin B5 (mg)	0.7
Ascorbic acid (mg)	30
Vitamin A (mg)	Traces
Thiamine (mg)	0.1-0.13
Riboflavin (mg)	0.086-0.175
Niacin (mg)	0.53-1.2
Pyridoxine	0.09

exploited for various industrial purposes. However, the major fatty acids present in the custard apple seed oil are oleic acid (39.72 %), linoleic acid (29.13 %), palmitic acid (17.79 %) and stearic acid (4.29 %). In addition, leaves, roots and barks of the *A. squamosa* have been considered as potential source of medicinally important compounds.

Plant phytonutrients: Custard apple contains a considerable amount of polyphenolic compounds. Few researches have reported the presence of flavanols like catechin, epicatechin and procyanidins in custard apple pulp. These compounds are antioxidants and help to prevent diseases associated with oxidative stress, such as cancer, atherosclerosis and neurodegenerative diseases. The various chemical constituents isolated from leaves, stems and roots of the plant include anonaine, aporphine, coryeline, isocorydine, norcorydine and glaucine. Diterpenes discovered in the *A. squamosa* have counter-HIV rule and the counter platelet total movement. However, some lignans and hydroxyl ketones were also

found in the plant. Ethyl extracts of the *A. squamosa* are believed to contain squamocenin, annotemoyin, reticulatin-2, squamocin-I, squamocin-B, squamocin, motrilin, squamostatin-D, squamostatin-E, cherimolin-1 and cherimolin-2. Acetogenins, which are unique to the family Annonaceae are long chain fatty acids found in the custard apple with anti-cancer and anti-hypertensive properties. Finding the above-mentioned chemical constituents in this plant reinforces the plant being used for different therapeutic qualities.

Value addition and economic value: *A. squamosa* is a popular seasonal fruit and occupy a promising position in today's fruit market due to high demand by the processing industries. The fruits are usually consumed as dessert fruit. Further, the fruit of *A. squamosa* is eaten fresh and is a rich source of carbohydrates, vitamins and proteins. The fruit is also utilized commercially as a flavoring for ice-cream and can also be made into sherbet and the pulp, after removing the seeds, is passed through a strainer or homogenized to make a delicious and refreshing drink. It is also used as an agroforestry species, as a source of food and for honeybee cultivation. In some countries, *A. squamosa* is planted in parks as a shade and as ornamental tree due to its attractive fruit colour.

The wood of *A. squamosa* is used for fuel wood. The leaves, bark, roots, seeds and fruit of *A. squamosa* have various important medicinal uses. The green fruit and seed have effective vermifugal and insecticidal properties and are used as astringents in diarrhea and dysentery. The seeds contain 45 per cent of yellow non-drying oil which is an irritant poison for lice. Crushed leaves are applied as an effective cure for ulcers and malignant sores. A poultice from fresh leaves is used for dyspepsia and when mixed with oil is used for diseases of the scalp. Crushed fresh leaves are applied to the nasal area in cases of fainting spells. A decoction of roots is used as a drastic purgative. The astringent bark, leaves, unripe fruit and seed can be used as a source of the alkaloid anonaine.

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