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Sapota Fruit Attributed Health Benefits and Its Food Applications: A Review

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Abstract

Sapota (*Manilkara zapota*) comes under family Sapotaceae and it is one of the significant fruit crops which is grown and developed in India. Sapota is rich in fibres, vitamins, calcium, phosphorous and iron, and polyphenolic compounds. It prevents constipation, cavities in tooth, viral infections and shows anti-bacterial properties and helps in prevention from cough and cold, helps in losing weight and act as a detoxifying agent. Recent investigations have been established its importance in cancer treatment as well as antimicrobial activity by developing silver nanoparticles. Therefore due to its nutritional significance sapota was part of many food formulations as probiotics, wine and many other food and dairy products. The present study envisages the nutritional significance of the fruit so that it may be potentially applied in food applications.

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Keywords

Sapota, Sapota powder, Therapeutic properties, Anti- bacterial

Introduction

Sapota (*Archras sapota L.*) is a tropical fruit also known as chikku, prickly pear, sapota plum or sapodilla comes under family sapotaceae and mostly cultivated in India. Species noted for sapota fruit are *Manilkara* (Sapodilla, sapota), *Chrysophyllum cainito*, *Pouteria*, and *Planchonia careya*.

Sapota (*Achras sapota* L. or *Manilkara zapota* L.) is one of the major fruit crops in India, Mexico, Guatemala and Venezuela. India is one of the biggest producers of sapota and the states that are largest contributors to sapota production are West Bengal, Karnataka, Tamil Nadu, Maharashtra, Andhra Pradesh, Haryana, Daman, Pondicherry. Sapota was cultivated in 97.3 Hactare land with 1175.9 MT in year 2018-19 (Maya *et al.*, 2003).

Sapota fruits contains carbohydrate (50.49 %), protein (0.7 g %), fat (1.1 %), fibre (2.6%), and minerals nutrient viz. calcium (28mg -100g), iron (2.0mg -100g), phosphorus (27mg -100g), ascorbic acid (6.0mg -100g). Apart from it sapota fruit is reported to contain phenolics e.g. gallic acid, catechins, chlorogenic acid, leucodelphinidin, leucocyanidin and leucopelargonidin, carotenoids, ascorbic acid, minerals (potassium, copper and iron) and vitamins A, C, folate and pantothenic acid etc (Kumar *et al.*, 2015). Sapota fruit is enriched with amino acids containing glutamic acid, glycine, alanine, methionine, phenylalanine, proline, hydroxyproline, threonine, taurine, tyrosine, serine, valine and phosphoethanolamine (Panda *et al.*, 2014).

The sapota fruit has a shorter shelf-life period and usually ripens after 8–10 days of harvesting and hence it undergoes post-harvest losses affecting food processing in the tropical countries like India (Moris *et al.*, 2014). The total loss of fruits in India is around 20–30% of the total fruit production (Madan *et al.*, 1993). The fruit requires immediate processing to reduce post harvest losses due to its perishable nature. Drying is one of the low cost and practicable technologies for processing of sapota fruits to convert into powder form that can be further utilized for value addition in food products with nutritious and delicately flavoured sufficiency (Sharma, 2014).

The taste of sapota raw fruits is astringent, while sweet in case of ripe fruits. It is mainly used as dessert fruits bedside many processed products are prepared from sapota namely Halwa, Juice, Milk Shake, Shrikhand, fruit Jam. Mature fruits are used for making mixed fruits jams and provide a valuable source of raw materials for manufacture of industrial glucose, protein and natural fruits jellies. They also are canned as slices (Gopalan *et al.*, 1985).

Many studies have been reported about fruits such as apple, apricot, banana, avocado, pomegranate and grapes. However the studies on sapota are limited. The present work was undertaken to study the various nutritional fact, cultivation and climatic condition, health benefits and its utilization in food products.

Sapota fruit

Nomneclature of sapota

The word sapote derived from the Spanish word *zapotilla*, meaning "small". The fruit, commonly known as sapodilla in the U.S., chiku (India), chicopote, chicozapote (Mexico), dilly (Bahamas), kauki (Southeast Asia), mespel (Virgin Islands), mispu, mispel, mispelboon (Surinam), muyozapot (Salvador), naseberry (British West Indies), nispero (Puerto Rico), sapatija, sapodilla plum, sapodille (Dutch West Indies), sapote (Cuba), sapoti or sapotilha (Brazil), sapotille, sapotillier (French West Indies), zapote, zapote chico, or zapotillo. The botanical name of the fruit *Manilkara* and *Achras* are commonly used as generic names (Mickelbert 1996).

Agronomic conditions for sapota cultivation

The soil for Sapota cultivation should be well-drained, deep and porous type. The trees can tolerate salt content in the soil. The soils suitable for Sapota cultivation are alluvium, sandy loam and black soil and the soil can tolerate salt content. The pH of the soil should be around 6 to 8. Sapota need warm and humid climate for growth. The Sapota trees can grow at an altitude of 1000 m. However the Coastal climate is desirable for Sapota cultivation. The minimum average temperature essential is about 10 to 38˚C and the annual rainfall should be in range of 1250-2500 mm. The Higher temperatures (above 43˚C) adversely lead to drop of flower (FICCI, 2019).

Health benefits of sapota

Sapota possesses anti-inflammatory properties, antidiarrheal, diuretic, antihyperglycemic, antibiotic and hypercholesteraemic, helping in blood pressure, constipation, blood pressure and stress relief.

Antioxidant properties

The antioxidant activities of the sapota juice with reference to its bioactive components, viz., gallic acid, catechin, ascorbic acid and ß-carotene. Sapota juice showed potential antioxidant activity against 1, 1-diphenyl-2- picrylhydrazyl free radicals and superoxide radicals. Kulkarni *et al.*, (2007) studied the inhibition of free radical-mediated lipid peroxidation by intaking of Sapota juice in a liposome model system.

Antimicrobial properties

Achras sapota showed antibacterial activity against various Gram positive and Gram negative bacteria. The methanolic extract of the stem bark showed significant anticandidal and antibacterial against two microbial candida species and seven aerobic bacteria (Kuete *et al.*, 2006). The silver nanoparticles obtained with sapota pomace extract showed good antibacterial properties against Gram-positive as well as Gram-negative microorganisms

Anti cancer effect

The aqueous extract of the P. sapota leaf was rich in phytochemicals, antioxidant activity and showed a significant anti-cancer activity against tested MCF-7 cell lines (Satya Prabhu *et al.*, 2018). The methanolic extracts of Sapota fruit (MESF) induces cytotoxicity that depends on dose manner in cancer cell lines. Cell cycle analysis suggested activation of apoptosis, without arresting cell cycle progression using sapota fruit with Annexin V-propidium iodide double-staining (Srivastava *et al*., 2014).

Anti-inflammatory properties

Ethanolic extract of sapota had studied to decrease IL-1β and IL-8 pro-inflammatory cytokines for the anti-inflammatory and anti-aging effect (Rhourri-Frih *et al.*, 2013).

Healthy bones

Sapota is enriched with valuable minerals calcium, phosphorus and iron help in increase the stamina to bones. The mineral like copper is vital for the strengthening of bones, connective tissues and muscles. The insufficiency of copper causes osteoporosis, muscle weakness, low strength, breakage, weak joints etc. The studies showed that the use of copper with manganese, zinc, calcium can be used to degeneration of bones in women.

Food applications

Das and De (2015) studied the various compounds in sapota fruit using gas chromatography mass spectroscopy (GCMS) and found 46 metabolites in the fruit out of which 11 sugars and sugar alcohols, 11 organic acids, 14 amino acids, 5 phenols, 4 fatty acids, 1 inorganic acid. The major contributor to these phenolic compounds is Arbutin, Benzoic acid, catechin, chlorogenic acid, gallic acid, orcinol, Quinic acid, resorcinol etc. Due to presence of various health promoting compounds sapota has potentially tried in many food products.

Sapota juices was used to formulate probiotic foods by *Lactobacillus plantarum* reported exhibit better health effect compared to raw juices. After probiotication, higher total phenolic content was observed in sapota juice (145 mg/ml). The probiotic juice was found sensory acceptable, acid and bile tolerant, antibacterial and antioxidant activity. The product was subjected to chemical analysis at an interval of 30 days during the storage period of four months. The chemical parameters *viz*., TSS, PH, total and reducing sugars increased whereas, the acidity and non-reducing sugar content decreased during storage and the product was free from microbial spoilage (Kumar *et al.*, 2015).

The best way to increase the shelf-life is through the process of dehydration of peeled sapota. The convective air drying of sapota pulp was carried out 60–65 % at the ambient temperature of 30 °C. Another drying method using heat pump drying operate at low relative humidity (typically 0–50 % RH) and variable temperature in the range from subzero to 50 °C. The pulp was frozen well below its freezing point (30 °C) before loading it in a drying chamber. The drying chamber was maintained at 40 °C using an electric heating device (Jangam *et al.*, 2008).

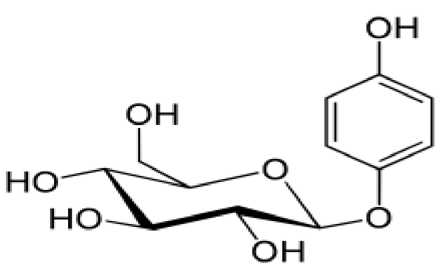
Table.1 Physical properties of Sapota

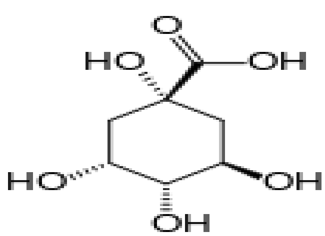
Properties	Range
Moisture content %	72-78
Length (mm)	44.08 to 60.19
Width (mm)	37 to 49.34
Thickness (mm)	41.06 to 52.91
Volume (cc)	20 to 70
Fruit weight (g)	41.15 to 74.99
Sphericity	0.842 to 0.990
Bulk density (g/cc)	0.341 to 0.414
True density(g/cc)	0.952 to 2.1095
Porosity(g/cc)	16.62 to 42.22

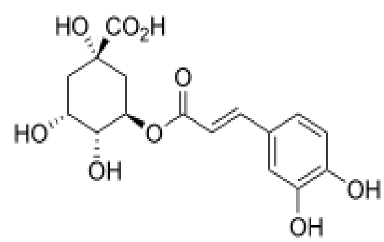
Source: Jadhav *et al.*, (2018)

Table.2 Some applications in food products

Juice	The enzyme clarified sapota juice and its concentrates shows Newtonian behaviour and the viscosity (η) obtained in the range 4.340-56.418 mPas. The activation energy (E_a) 5.218 to 25.439 KJ/mol depending upon concentration according to ahrenius equation	Kedarnath *et al.*, (2014)
Sapota blended with nectar and squash	Sapota used with jackfruit and avocado syrup containing 50 per cent juice, 1.50 per cent citric acid and 70°Brix was found to be sensory acceptable	Totad M., (2014)
Sapota wine	commercially acceptable wine was prepared sapota	Pawar *et al.*, (2011)
Srikhand	Shrikhand was prepared blended with varying levels of sapota pulp at the rate of quantity of chakka *i.e.* 5% , 10%, 15% and 20%.	Shambhakar *et al.*, (2011)
Edible coating of sapota	Pectin coated sapota fruits showed less change in weight loss, acidity, TSS, pH, colour, ascorbic acid and the firmness in comparison to control fruits. The shelf life of pectin coated sapota fruits were increased upto 11 days in comparison to 6th day for the control fruits	Menezes and Athmaselvi (2016)
Sapota leather	fruit leather prepared : 75% sapota, 10% soya milk powder and remaining 15% banana-papaya-mango). Drying characteristics and color change was studied.	Bharambhe *et al.*, 2009


Arbutin


Quinic acid


Chlorogenic acid

Conclusion and future trend given below:

Therapeutic properties of sapota are because of constituents as polyphenols, vitamins and minerals. It is a magnificent supplement valuable in the administration of numerous illnesses like aggravation, torment, loose bowels. Many research developments indicated its nutritional significance as well as have potential for treatment for harmful diseases like cancer. Now a day it has tremendously admitted for its food application by research scientists. These studies will enhance further its food applications.

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