

Nutritional Composition and Health Benefits of Cashew Apple

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SUMMARY

Cashew (*Anacardium Occidentale*) has received both local and international recognition due to its expanding production capacity, trading, and nut utilization. The cashew apple, which forms about 90% of the total fruit weight, is left on the farmers' fields as agricultural waste owing to limited knowledge of its health benefits, a lack of technical know-how and processing equipment, and its high perishability and astringent taste. Cashew apple contains good amounts of vitamin C, sugars (fructose and sucrose), fibres, flavonoids, carotenoids, total polyphenols, volatile components, flavonols, amino acids, and minerals, such as potassium, magnesium, sodium, and iron, which are good for maintaining strong immunity, scavenging free radicals, neuropathic functioning, cardiac functioning, and maintenance of body and skin integrity. Cashew apple is associated with weight loss and is good for diabetic patients due to its high content of flavonoids (myricetin and quercetin). Consumption of cashew apple and its value-added products confer good health, and therapeutic effects in the management of diabetics and cardiovascular diseases, and also ensure food and nutrition security.

INTRODUCTION

Fruits are rich sources of minerals, phytochemicals, and fibres that can help mitigate the prevalence of non-communicable diseases (NCDs), promote healthy living, and ensure food security. Cashew apple contains good amounts of vitamin C, sugars (fructose and sucrose), fibres, flavonoids, carotenoids, total polyphenols, volatile components, flavonols, amino acids and minerals such as potassium, and has currently been given much attention.



The cashew apple is highly acidic with a pH value of 3.5–4.8 and contains about 85% moisture, which contributes largely to its high perishability, which occurs usually a day or two after harvesting of the nuts. The cashew apple can therefore serve as a good food source with potential utilization in refreshing drinks, smoothies, and juices. The fruit is rich in carbohydrates, mainly reducing sugars (glucose and fructose), that are readily absorbed by the body. The reduced sugar content of cashew apples on a wet basis is 10.5%. This makes it a good calorific option for use in fruit juices or meals for children and the elderly as a source of energy if the astringency is minimized. Its utilization in energy booster drinks for sportsmen will be a ground breaking intervention in the food and beverage industry.

Cashew apple contains protein (0.5–1.09%) although, in very minute quantities as established by Singh *et al.*, 2019. On a dry matter basis, the cashew apple was found to contain 61.21% of dietary fibre, of which 13.25% are soluble and 47.96% are insoluble, with appreciable potassium, phosphorus, sodium, magnesium, calcium, copper, zinc, iron, and phenolic contents. The cashew fibre is being used as a fat replacer in burgers, in cereal-based extrudates and cookies to increase fibre content and nutritional value. Thus, the use of this natural source of fibre from the cashew apple may confer health benefits to humans; however, studies have shown that the phytic acid and insoluble fibre content of the cashew apple might limit the bio-accessibility of the nutrient contents. An in vitro digestion of cashew apple juice and its fibre (pulp) showed that the juice is more highly bio-accessible than the fibre, even though the raw, undigested fibre had a higher copper content (12.20 mg/L) than the juice

(2.10 mg/L). The bio-accessibility was attributed to the phytic acid (0.25%) present in the fibre (peels and insoluble fibre). The ash content of the cashew apple (1–1.5%) is an indication of its high mineral content.

Cashew apple is a very rich source of vitamin C compared to most tropical fruits. The content of vitamin C (between 200–241 mg/100 g) in the cashew apple is about 3–5 times higher than citrus. Studies have revealed that the vitamin C content (241.13 mg/100 g) of the yellow cashew apple is generally higher than that (221.60 mg/100 g) of the red variety, while the latter has more amino acids and tannins than the former. The juice is a good source of vitamin C but not so with provitamin A. Thus, the cashew apple can be utilized as a source of Vitamin C in Africa, especially in Ghana, where the fruit is underutilized and usually left to rot. Cashew apple also has substantial quantities of B vitamins (thiamine, niacin, riboflavin, pantothenic acid, pyridoxine, and folate). The apple juice is a rich source of minerals and is high in potassium, magnesium, and phosphorus; but low in sodium, calcium, iron, copper with the least being zinc. The high mineral (potassium, magnesium, and phosphorus) content could be a good food source for incorporation into the DASH diet in the management of hypertension.

Concerning bioactive compounds, the cashew apple is a significant source of polyphenols and other organic acids like flavonoids, carotenoids, anacardic acid, and tannins. Carotenoids are the natural (red, orange, and yellow) pigments in plants, algae, and microorganisms, which play key roles in physiological and developmental functions in plants, animal health, and nutrition. Cashew apple contains about 2.9–136 mg/100 g carotenoids, mainly composed of cryptoxanthin, zeaxanthin, lutein, β -carotene, and α -carotene. Although various carotenoids are present in the fruit, the major ones in the juice are the β -cryptoxanthin and β -carotene. The amount of carotenoids in a cashew apple is dependent on the type; the red variety has a higher concentration than the yellow ones. Again, it has been reported that carotenoids and anthocyanins content are reduced with storage and processing. Irrespective of the fruit colour, the total carotenoid content of the juice is lower compared to the fibre (cashew apple pulp). The fibre is rich in carotenoids, mainly because the pigments are embedded in the tissues, but poor in vitamin C, which is water soluble. It has been reported that the cashew apple has higher carotenoid content than the aqueous extracts. Thus, consuming the apple is good enough to have a balance of all the nutrients.

Polyphenolic compounds, such as flavonoids (anthocyanins, myricetin, quercetin, Kaempferol) tannins, and phenolic acids (caffeic acid, coumaric acid, ferulic acid, and gallic acid) are prominent constituents of cashew apple. Tannins are polyphenols that have been classified as anti-nutrients due to their negative effect on nutrient absorption and bioavailability. They are classified as hydrolysable and condensed tannins (also known as proanthocyanidins). Apart from its negative effects, tannins have been shown to exhibit antioxidant, anti-tumour, anti-inflammatory, anthelmintic and antimicrobial properties. Tannins also contribute to the astringent taste of cashew apples, one of the key reasons for their low utilization. Tannins range between 0.01 and 197 mg/100 mL in cashew apples, depending on the processing, cultivar, and type (red, yellow, or other variants). Hydrolysable tannins were found to be present in higher concentrations in cashew apples and correlated with astringency compared to condensed tannins. Methods such as blanching, addition of gelatin, fermentation, removal of fruit skin, addition of tannase, hydrothermal processing, centrifugation and microfiltration, and natural coagulants (such as okra pod) have been identified as effective ways of reducing the tannin content to appreciable levels. Other organic acids like citric, malic, and acetic acid that mediate a lot of physiological functions are also in abundance in the cashew apple. The variations in the nutritional composition of the cashew apple are influenced by variety, soil quality, environmental conditions (climate), agronomic practices, maturity stage of the fruits, and processing conditions.

Health Benefits of Cashew Apple

The nutritious nature and high polyphenolic content have various implications for the use of the cashew apple in maintaining and promoting health. The significant amount of essential minerals found in cashew apples makes them a good choice for maintaining strong immunity, promoting proper fluid balance, nerve transmission and muscle contraction, and also for the management of micronutrient deficiencies. The high mineral content can aid bones, and cardiovascular health, and assist in metabolism, and bioactive pathways. Due to its high caloric content and amount of reduced sugars, the cashew fruit is and can be used as an instant energy booster. A cohort study discovered that cashew apple juice enhanced fat oxidation and proposed that it might increase endurance during exercise. The high vitamin C content of fresh juice promotes its usage in treating sore throat, maintaining good gum/oral health, serving as cofactors for enzyme and bioactive compounds activity, and as an antioxidant.

The fruit has various traditional and medicinal uses, due to its rich phytochemical profile. Thus, the cashew fruit has the potential to be used as a nutraceutical and pharmaceutical ingredient. Traditionally, cashew juice is used for the treatment of sore throats, colds, and coughs, and gastric disorders, including diarrhoea, dysentery, and ulcers. Pharmacological studies have demonstrated the ability of the anacardic acids in the fruit to protect against ulcers by inhibiting the growth of *Helicobacter pylori*. Hence, the cashew apple is gastroprotective. The significant amounts of polyphenolic compounds in the apple make it an excellent source of natural antioxidants, such as anthocyanins, flavonoids, flavones, carotenoids, gallic acid, protocatechuic acid, conjugate cinnamic acid, and free cinnamic acid. These compounds are very prominent in scavenging reactive oxygen species (ROS) and inhibiting free radical formation, thus preventing cardiovascular diseases and damage to cellular components. Pascal et al. also demonstrated the anti-radical scavenging activity of the cashew apple. Cashew apple is classified as a functional food ingredient due to its high carotenoid content, which is very potent in maintaining good health and acting as an antioxidant. Phytochemicals like flavonoids, tannins, and other acids have been found to contribute significantly to the anti-inflammatory, anti-microbial, and wound-healing properties of human cells upon consumption of cashew apples.

CONCLUSION

Cashew apple contains a high concentration of phytochemicals like flavonoids, anthocyanins, flavones, carotenoids, vitamin C, fibre, sugars, important minerals (calcium, magnesium, iron, potassium, phosphorus, sodium, copper), and organic acids, such as anacardic, gallic, protocatechuic, conjugate cinnamic, free cinnamic, and malic acids. These nutrients and phytochemicals in cashew apples are good for maintaining strong immunity and good eyesight, preventing cancer, managing obesity, ulcers as well as cardiovascular diseases. Consumption of cashew apples and their value-added products will thus offer numerous health benefits, and boost the cashew industry.

REFERENCES

- Singh, S.S, Abdullah, S, Pradhan, R.C. and Mishra, S. 2019. Physical, chemical, textural, and thermal properties of cashew apple fruit. *J Food Process Eng.* 42(5):e13094.
- Pascal, A.D.C, Virginie, G, Diane, B.F.T, Estelle, K.R, Félicien, A. and Valentin, W.D. 2018. Nutritional profile and chemical composition of juices of two cashew apple's varieties of Benin. *Chem J.* 4(4): 91–6.
- Akyereko, Y.G, Wireko-Manu, F.D, Alemawor, F. and Adzanyo M. 2022. Cashew apples in Ghana: Stakeholders' knowledge, perception, and utilization. *Int J Food Sci.* 1–10.
- Reina, L.J.C, Durán-Aranguren, D.D, Forero-Rojas, L.F, Tarapuez-Viveros, L.F, Durán-Sequeda, D. and Carazzone, C. 2022. Chemical composition and bioactive compounds of cashew (*Anacardium occidentale*) apple juice and bagasse from Colombian varieties. *Heliyon.* 8:09528.
- Yaw Gyau Akyereko, Georgina Benewaa Yeboah, Faustina Dufine Wireko Manu, Francis Alemawor, F.C. Mills Robertson and William Odoom. 2023. Nutritional value and health benefits of cashew apple. Review. JSFA Reports.