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# Cashewnut and Cashew Apple – A Potential Drug and Medicine

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## Abstract

Cashewnut is a versatile crop possess different medicinal properties. Nuts are used for several medicinal purposes and have great importance related to health as well as apples are used for fresh consumption, making pickles, preserves, chutneys and fermented and non-fermented beverages. Cashew apple juice has health benefits such as relief from chronic dysentery, sore throat, bone demineralization, rheumatism, neuralgia, boosts energy, facilitates the flexibility of blood vessels, good for weight loss due to presence of sugars, tannins, phenols, amino acids, ascorbic acid, minerals and fibre. Cashewnut shell liquid contains a mixture of products including anacardic acid, cardanol, cardol and 2-methylcardol. Cashew apple and nuts can be utilized commercially for processing however its potential is still demeaned in Indian economy.

## 1. Introduction

Cashew (*Anacardium occidentale* L.) is an important plantation crop which is native to Brazil. It is one of the most well-known species that belongs to the Anacardiaceae family. Cashew is grown in India, Brazil, Vietnam, Tanzania, Mozambique, Sri Lanka, Indonesia and other tropical Asian countries such as the Philippines, Thailand and African countries such as Kenya and Nigeria. At present, it is grown extensively in more than 28 countries around the world (Nag et al., 2016). Every part of cashew has some important medicinal properties. Cashew kernel contains proteins, carbohydrates, vitamins, and fats which help gain energy. Cashew nuts are used for many purposes like blood sugar, weight loss, cancer, cold and flu, aging, urinary disorders, digestive disorders, and bone relaxation (Iqbal et al., 2021).

The cashew apple is processed into many value enhanced products like cashew apple fruit drinks, confectionery, juice, jelly, jam, syrup, chutney and beverage which provides consumers with vitamins A and C (Oyeyinka et al., 2019).

Cashew apple (Figure 1) is the fruit of cashew tree. It is red or orange



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in colour. These are rich in vitamin C, so can be used for diseases that can be developed due to the deficiency of vitamin C, like for skin. These contain sugars, tannins, phenols, amino acids, ascorbic acid, minerals and fibre. Cashew apple gives an anti-scorbutic property. Hence the juice of this apple can be used as diuretic, for the treatment of renal diseases, and for cholera. Cashew apple juice can be used for pharyngitis and chronic dysentery. The brandy of cashew apple can be used to relieve the pain in Neuralgia and rheumatism (Rani and Prasad, 2017).



Figure 1: Cashew apple

Cashewnut shell liquid (CNSL), an extract from cashewnut shell, has a wide range of functional products. This is a caustic, viscous, dark liquid, and is a natural source of saturated and unsaturated long-chain phenols (anacardic acids, cardanol and cardols) (Figure 2).

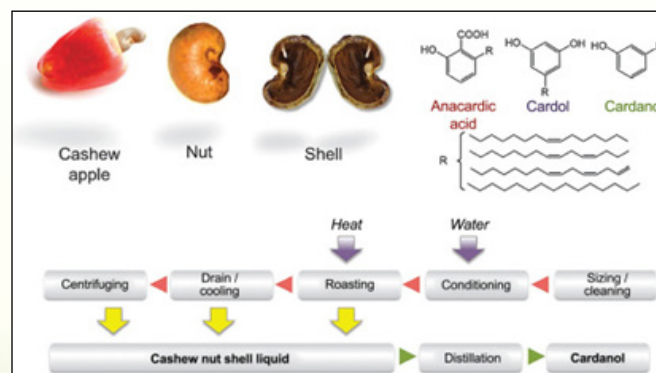


Figure 2: Extraction of cardanol from Cashewnut shell liquid

## 2. Composition

Botanically, cashew apple is the peduncle of the fruit. The juice is astringent due to presence of tannins which has got innumerable medicinal properties. Cashew apple

is a valuable source of minerals and vitamins and more fructose, the honey sugar. Indeed, cashew apple juice is reported to contain 5 times as much vitamin C as in citrus juice (Akinwale, 2000).

Cashew apple contains 0.2% protein, 0.2% mineral matter, 0.1% fats, 11.6% carbohydrates, 0.01% phosphorus and 0.2 mg 100 g<sup>-1</sup> iron. It also contains 261.5 mg 100 g<sup>-1</sup> ascorbic acid (Chempakam, 1983). Cashew apple juice is a good source of water-soluble vitamins viz., ascorbic acid, riboflavin and thiamine.

## 3. Nutritional Properties

### 3.1. Cashew shell nutritional properties

The oil extracted from cashew shell is anti-bacterial and also can heal wound known as traditional medicine anciently used by the travellers. Also, it is used for treating ulcer and tooth abscesses beside as a condition of leprosy and psoriasis. It also has other properties which can be used for treating cancer and myocardial infection (Berry et al., 2011).

### 3.2. Cashew apple nutritional properties

Glucose in the cashew apple acts as an instant energy supplier whereas fructose in the cashew apple regulates the insulin and stabilizes the blood sugar level. The calcium in the cashew apple helps in joints and bone wellness. The copper consisting in cashew apple helps in flexibility of blood vessel and increasing in oxygen carrying capacity (Dendena and Stefano, 2014). Cashew apple is also known for its antioxidant property and oral cleanser, it maintains oral freshness, strengthen the gum and overall dental health. The fresh and fermented product of cashew apple helps to prevent macular degeneration, muscle cramp and insomnia in old age (Mukunthan et al., 2012).

## 4. Therapeutic Value

Traditionally, cashew apples are used to cure a number of chronic diseases. Multiple reports have described their health benefits on gastrointestinal infections, antimicrobial activity, improvement in lactose metabolism, reduction in serum cholesterol, immune system stimulation, antimutagenic properties, anticarcinogenic properties, anti-diarrheal properties, improvement in inflammatory bowel disease and suppression of *Helicobacter pylori* infection by addition of selected strains to food products.

### 4.1. Antimicrobial and antibacterial activity

The cashew apple is used for stomach and intestine

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ailments such as ulcer and gastrointestinal problems. The anacardic acid in cashew apple has an acute lethal action on *Helicobacter pylori* – peptic ulcer causing bacteria and reduces infection. Cashew apple juice potentially reduces the activity of *Salmonella typhimurium* which causes liver ailments. Soaking fresh meet in cashew apple juice drastically reduce the spoilage caused by *Escherichia coli* and *Salmonella aureus* (Preethi et al., 2019).

### 4.2. Antioxidant activity

The cashew apple has high ascorbic acid and phenols content. Thus, cashew apple is considered a good source of antioxidant compounds (Brito et al., 2007)

### 4.3. Anti-proliferation properties

It is also said to have anti-cancerous properties. Various forms of antioxidants in cashew apple acts on the tumor cell and prohibit their proliferation rate. The volatile components isolated from cashew apple exhibited a lethal effect on growth and survival of certain microorganisms of genus Bacillus (*B. subtilis* and *B. ammoniagenes*), Salmonella (*S. aureus*, *S. cerevisiae* and *S. mutans*), Escherichia (*E. coli* and *E. aerogenes*), Pseudomonas (*P. acnes*, *P. aeruginosa*, *P. vulgaris*, *P. chrysogenum* and *P. ovule*), *Trichophyton mentagrophytes* and *Calathea utilis*. Volatile compounds pertaining to inhibitory action against microorganisms are car-3-ene, limonene, furfural, benzaldehyde, nonanal, 2-methylpentan-1-ol, a-terpinene and 8-caryophyllene (Preethi et al., 2019).

### 4.4. Anti-nutritional factors

Cashew apple contains a countable amount of anti-nutritional substance like cyan glycosides (20.65 to 26.61 mg HCN 100 g<sup>-1</sup>) and oxalic acid (1.2 to 1.7%). Hence, excess consumption may cause an adverse effect on humans. The symptoms of cutaneous manifestation has occurred in women having IgE-mediated anaphylactic reactions due to the residual effect of cardol and anacardic acid (Preethi et al., 2019).

## 5. Health Benefits of Cashew Apple

The cashew apple is a fleshy fruit containing 65 to 80% moisture which can be extracted as minerals, sugars, polyphenols and tannins rich juice. Cashew apple juice and their by-products have potential medicinal value for treatment against various ailments and also can be used as refreshment drink (Preethi et al., 2019).

### 5.1. Reliefs chronic dysentery, sore throat and bone demineralization

Cashew apple juice is consumed freshly to get better

relief against chronic dysentery, sore throat and bone demineralization.

### 5.2. Relief from rheumatism and neuralgia

Owing to the unique astringent property, the external rubbing of fresh or distilled cashew apple juice is reported to provide relief from rheumatism and neuralgia.

### 5.3. Boosts your energy

Cashew apple can be very well used as an energy booster to revitalize the body because of high calorific value.

### 5.4. Act as instant energy supplier

Fructose in cashew apple regulates the insulin and stabilizes the blood sugar, whereas glucose in cashew apple acts as an instant energy supplier.

### 5.5. Facilitates the flexibility of blood vessels

The copper in cashew apple facilitates the flexibility of blood vessels and augments the oxygen-carrying capacity.

### 5.6. Good for bones and joint

The calcium present in cashew apple helps in bone and joint wellness. The fresh and fermented beverage helps to prevent muscle cramp, macular degeneration and insomnia in old age.

### 5.7. Good for oral hygiene

Cashew apple is known as a potent antioxidant and oral cleanser. It helps to strengthen the gums, maintain oral freshness and overall dental health.

### 5.8. Contains Ascorbic acid

According to the Indian Council of Medical Research, the average requirement of vitamin C for Indians ranges from 40 to 80 mg, and this can be fulfilled by consuming 100 ml of cashew apple juice.

### 5.9. Good for weight loss

The fibre rich cashew apple increases the level of fat oxidation in adipose tissue and cholesterol hence recommended at a moderate level for those looking for weight reduction.

## 6. Pharmaceutical Uses of Cashew Nut Shell Liquid

Cashewnut shell liquid contains a mixture of products including anacardic acid, cardanol, cardol, and 2-methylcardol, which contain different functional groups, the aromatic ring, the hydroxyl group, the carboxylic acid and the double bonds in the alkyl chain. For this reason, CNSL has versatile applications, and it

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can be used for a wide range of chemical modifications to produce useful monomer precursors. Although there is a large number of applications of CNSL and its components, anacardic acid and cardanol, there are very few examples of the transformation of CNSL and its components into small value-added molecules.

Cardanol from CNSL extracted from cashew nut shells was successfully converted into various useful pharmaceutical drugs, such as norfenefrine, *rac*-phenylephrine, etilefrine and fenopropene (Figure 3). 3-Vinylphenol, the key intermediate for the synthesis of these drugs, was synthesised from cardanol by ethenolysis to 3-non-8-enylphenol followed by isomerising ethenolysis (Yiping et al., 2019).



**Figure 3: Synthesis of pharmaceutical drugs from cardanol derived from CNSL**

### 6.1. Synthesis of norfenefrine

Norfenefrine, is an adrenergic agent used as a sympathomimetic drug, which is pharmaceutically active in its racemic form. Norfenefrine, plays a role as a minor neurotransmitter in the brain and regulates blood pressure in acute hypotensive states.

### 6.2. Synthesis of metaraminol

Metaraminol, which is used in the prevention and treatment of hypertension, has very similar structure as norfenefrine. It is active in its enantiopure form.

### 6.3. Synthesis of racemic phenylephrine

Phenylephrine which has a similar structure to that of norfenefrine, is a sympathomimetic, vasoconstrictor, mydriatic and cardiotoxic agent. It can be used as decongestant, pupil dilator, vasopressor and in the treatment of haemorrhoids and priapism, to dilate the pupil or to increase the blood pressure, it is active as the L-isomer.

### 6.4. Synthesis of etilefrine

Etilefrine is a cardiac stimulant and is used as an anti-hypotensive. Etilefrine is pharmaceutically active in its racemic form. Etilefrine can increase cardiac output,

stroke volume, venous return and blood pressure by intravenous infusion. It is also an analeptic and sympathomimetic agent.

### 6.5. Synthesis of fenopropene

Another drug, which contains a meta-hydroxy phenyl group similar to CNSL, is fenopropene, which is a nonsteroidal anti-inflammatory drug (NSAID) and is marketed in USA as Nalfon, which is also pharmaceutically active in its racemic form.

## 7. Conclusion

The by-products of cashew such as cashew apple and cashew nut shell liquid possesses various nutritional and pharmaceutical properties. Health benefits of cashew apple are due to presence of antioxidant, antimicrobial, antitumor, antimutagenic properties which is responsible for reducing the risk of various diseases. Presence of different chemicals in cashew nut shell liquid leads to production of different medicines. Therefore, cashew apple and Cashewnut shell liquid (CNSL) can be used in traditional medicines and modern drugs.

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