Review Article

A review on chemical composition and pharmacological properties of Cocos nucifera (L.) oil and water

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Abstract: Cocos nucifera (L.) (Coconut) is a palm tree belonging to the family Arecaceae, a native to Philippines and Malaysia. It is considered as one of the most useful plants for humankind because of its nutritive value and economic importance. Cocos nucifera oil and water contents are rich in a variety of chemical constituents and posses varied potent therapeutic and pharmacological properties such as anti-microbial, anti-inflammatory, anti-oxidant, anti-malarial, anti-cardioprotective, anti-parasitical, analgesic activity, antineoplastic, cooling agent, etc. In this article, we review the chemical constituents and pharmacological properties of Cocos nucifera oil and water.

Key words: Cocos nucifera, Chemical composition and Pharmacological properties.

Introduction

Cocos nucifera (L.) is a member of the palm tree family Arecaceae. It is an important tree which provides food to millions of people especially in the tropical and subtropical regions of the world. The palm is more prevalent in Asia and is found to be present in the intertropical zone since prehistorical times. It is often called the "tree of life" because of its infinite potential uses (Brow et al., 2009; Ahuja et al., 2014; Shijna et al., 2016). The term coconut was derived from the 16th century Portuguese and Spanish Word “coco” meaning "head or skull". The term refers to the seed or the fruit which is a drupe. Water and oil of this plant possess high nutritional and medicinal value.

This review has made an attempt to include the important chemical constituents and various pharmacological properties present in the oil and water content of the plant.

Morphological features of Cocos nucifera fruit:

Cocos nucifera fruit is large in size and bears characteristic flavor and aroma. The fruit comprises of nutritional water and has three main layers: Exocarp (hard skin), Mesocarp (husk) and Endocarp (shell) (Yong et al., 2006; Shivashankar et al., 2017).

Chemical composition of Cocos nucifera water:

Cocos nucifera water comprises of 90 - 95% trace amounts of carbohydrates, fats, proteins, oils, vitamins and minerals (Yong et al., 2006; Tan et al., 2014). Nutrients from C. nucifera water are obtained from the seed apoplasm (Singla et al., 2011). Sweetness of the C. nucifera water is due to the sugars like Fructose, Glucose and Sucrose (Campbell-Falck et al., 2000; Tan et al., 2014). The water is rich in organic acids such as fatty acid, malic acid, succinic acid, citric acid, acetic acid and tartaric acid (DebMandal and Mandal, 2011). The water also contains a variety of inorganic ions. It is a well-known drink because of its high nutritional value and effective rehydration potential (Yong et al., 2006; Tan et al., 2014). The basic ion composition of the water can replenish the electrolytes of the human body excreted through sweat such as sodium, potassium, magnesium and calcium (Arora et al., 2011). C.nucifera water is rich in amino acids like alanine, cysteine, arginine, serine (Vigliar et al., 2006; DebMandal and Mandal, 2011; Tan et al., 2014). As the fruit matures it becomes rich in enzymes like peroxidase and polyphenol oxidase (DebMandal and Mandal, 2011).

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C. nucifera water contains water soluble vitamins in particular vitamins B- Biotin, Nicacin, Folic acid and Vitamins C (ascorbic acid) (Viglier et al., 2006; Yong et al., 2006; Shenkin, 2006). The water also possesses hormones like auxin, cytokinin, gibberellic acid and abscisic acid (Ge et al., 2006; Yong et al., 2006). N6 isopentenyladenine dehydro-zeatin, trans-zeatin, kinetin ortho-topolin, dihydro-zeatin, kinetin riboside, trans-zeatin riboside-5 monophosphate, O-glucoside, trans-zeatin O-glucoside are among the cytokinin compounds identified in C. nucifera water (Ge et al., 2005; Ge et al., 2006; Yong et al., 2006). A change in the pH value is observed in the water of Cocos nucifera when the fruit begins to mature (Jackson et al., 2004; Terdwongworakul et al., 2009; Tan et al., 2014).

**Chemical composition of Cocos nucifera oil:**
C. nucifera oil has rich nutritive value (Akubugwo et al., 2008; Kyari, 2008). Phenolic compounds of Cocos nucifera consists of tocotrienols, polyphenols and tocopherols. Triglyceride compounds that contain large amount of saturated medium chain fatty acids are also found to be present in the oil (Marina et al., 2009). Example of triglyceride compounds are palmitic acid and palmitoleic acid. Flavor components like Ethyl lactate, Phenylethyl alcohol are also found to be present in the oil (Chumbimuni-Torres and Kubota 2006; Borse et al., 2007). In C. nucifera, Lauric acid is the most abundant fatty acid. Other fatty acids that are found to be present are Capric acid, Caproic acid, Stearic acid, Palmitoleic acid, Palmitic acid, Oleic acid, Linoleic acid, Linolenic acid etc. (Oyi et al., 2010; Bouaid et al., 2010; Bello et al., 2015) It contained total higher phenolic compound (Massey, 2001; Akubugwo et al., 2008; Oyi et al., 2010)

**Pharmacological effect of Cocos nucifera water:**
Cocos nucifera water exhibits anti-microbial activity (Ricardo et al., 2004; Karadi et al., 2011; Arora et al., 2011). The antibacterial property is due to the presence of lauric acid. The water also exhibits antioxidant activity which is due to its rich content of Vitamin C, inorganic ions, phenolic compounds and flavonoids (Dey et al., 2005; Yong et al., 2006; Shenkin, 2006; Unagul et al., 2007; Tan et al., 2014). Antiparasitic activity is observed in this plant. The water is used to control gastrointestinal nematodes (Borse et al., 2007; Oliveira et al., 2008; Lima, et al., 2015). C. nucifera water protects against myocardial infarction and cardiovascular disorders (Scalbert et al., 2005; Burtis et al., 2008; Pattigadapa et al., 2011; Appaiah et al., 2015). According to the Malaysian folk medicine C. nucifera water has the potential to cure malaria (Borse et al., 2007; Al-Adhroey et al., 2011).

Cocos nucifera water has potential to therapeutic properties (Campbell-Falck et al., 2000; DebMandal and Mandal, 2011). The water also possesses anti-cancer properties (Nurulaini, 2006; Prabhu et al., 2011; Appaiah et al., 2015). Cytokinin kinetin which is present in C. nucifera water shows anti-thermotective activity (Vermeulen et al., 2002; Hsiao et al., 2003; Appaiah et al., 2015). Component of C. nucifera water such as polysaccharides, lectins, protein and peptides present in plant have been shown to stimulate the immune system (Tzianabos, 2000; Bafina and Mishra, 2005). Tender C. nucifera water has been used in coronary heart disease (Mandal et al., 2009; Pattigadapa et al., 2011; Appaiah et al., 2015). The water increases insulin level and helps in balancing of blood glycojen level (Bhagya et al., 2010; Pinto et al., 2015; Nidhi et al., 2017). It also found to be rich in active chemicals which control HIV infection (Nagata et al., 2011; Li Q et al., 2009). C. nucifera water and kernels are used to treat asthma, bronchitis, burns, constipation, dysentery and diarrhoea (Esquenazi et al., 2002). C. nucifera water is also good for treating anaemia and helps in the reduction of haemolytic anaemia (Ajayi and Arishe, 2015; Ajayi and Igwillo, 2016). The water has a capacity to dissolve kidney stones (Spencer, 2007; Aggarwal et al., 2017). The water also helps in reduction of the blood pressure and total cholesterol (Massey, 2001; Bhagya et al., 2010; Bandeira et al., 2017). The water is also effective as a potential hepatoprotective agent (Loki and Rajamohan, 2003; DebMandal M. and Mandal, 2011).

**Pharmacological effect of Cocos nucifera Oil:**
Numerous studies have shown that Cocos nucifera oil possesses powerful anti-inflammatory activity. It can be used effectively to treat inflammation associated with various wounds (Intahphuak et al., 2010; Dua et al., 2011; Manisha and Shyamapada, 2011). Many studies have also reported the antioxidant activity of C. nucifera oil. The presence of phenolic compounds in C. nucifera oil is mainly responsible for the antioxidant activity (Zakaria et al., 2011; Arunima and Rajamohan, 2011; Hanana et al., 2013; Otuechere et al., 2014).

C. nucifera oil also possesses powerful antimicrobial properties that have been revealed when tested on various strains of microorganisms (Esquenazi et al., 2002; Rajeev et al., 2011; Sia et al., 2013). Virgin C. nucifera oil possesses antiviral, antimicrobial and antiprotozoals properties (Bergsson et al., 2002; Deb-
Mandal and Mandal, 2011; Shilling et al., 2013). The effectiveness of C.nucifera oil is due to the active compound monolaurin, a monoglyceride, which is a product of lauric acid metabolisation (Srivastava and Durgaprasad, 2008; Oyi et al., 2010; Hristov et al., 2011). C.nucifera oil also possess vasorelaxant effect and antihypertensive activity (Bankar et al., 2011; Al-Adhroey et al., 2011; Singla et al., 2011).

Conclusion

Cocos nucifera (L.) is one of the most useful plants for the mankind. They are widely distributed in tropical regions of the world. This palm possesses many nutritional substances. Cocos nucifera water rich in sugar and protein content, organic and inorganic components, vitamins and enzymes and its oil contain diverse saturated fatty acid or unsaturated fatty acid. It possesses many medicinal and pharmacological properties. It has been exploited for its tremendous nutritional and pharmacological properties. Each and every part of the plant is used in some or the other way. Here in this paper only the usefulness of the water and oil has been discussed.

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