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Review Article

A DETAIL STORY ABOUT PHYTOCONSTITUENTS AND CLINCIAL USES OF *NARIKELA* (COCONUT, *COCOS NUCIFERA*): DRUG REVIEW

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ABSTRACT

The Arecaceae plant species *Cocos nucifera* (L.), known as the "coconut tree," is the most widely distributed fruit tree in nature. Minerals, plants, and animals have traditionally been the primary suppliers of medications, and people have employed medicinal plants therapeutically throughout history. In ancient writings, Ayurveda describes the usage of *Narikela* (*Cocos nucifera* Linn., Arecaceae) for the treatment of several diseases. Lauric acid, capric acid and caprylic acid are some of the most important fatty acids found in coconut. There are only two main sources of lauric acid in the human diet: coconut and human breast milk. In addition to having antibacterial and antiprotozoal properties, lauric acid also strengthens the immune system and has an anti-inflammatory effect. This article covers the broad aspect of properties and therapeutic actions of different useful parts of coconut tree.

INTRODUCTION

In Ayurveda, the drugs that are used come from different origins like plant, animal, metal, and mineral origin, in which the drugs that are originated from plants are mostly used. The plants and/or plants-based products have been used for a long time and are easily accessible. *Narikela* is one of the classical drugs in Ayurveda. It is botanically known as *Cocos nucifera* Linn. *Narikela* is mentioned in *Brihatraiya, Laghutraiya* and *Nighantus.*

Coconut is also known as "*Kalpa vriksha*". The meaning of "*Kalpa vriksha*" is the tree that fulfills every need. Each and every part of the coconut tree is useful in one way or the other that's why the coconut tree is known as *Kalpa vriksha* on earth.[1] "Coco" and "nucifera" are Portuguese words that mean "a mask" and "nut bearing" respectively, and from this coconut got its name.[2]

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An Egyptian monk named Cosmos indicopleus, initially mentioned coconut in 545AD. In "Topographia Christiana," Cosmos describes the coconut as "the great nut of India." [3]

Narikela has been mentioned in classical texts for the management of different diseases. The main indications include *Mutraroga* (urinary disorders), *Shoola* (pain), *Vajikarana* (aphrodisiac), *Charma roga* (skin diseases), *Mutrakruchcha* (dysuria), *Prameha* (increased frequency of urine).

Historical Significance

There is a saying that coconut was created by Rishi Vishwamitra through his spiritual strength and then he decided to produce a human child from its fruit. But Vishwamitra gave up this idea due to strongly oppose from Lord Bramha and Vishnu, Lord Vishnu was pleased by this sacrifice of Vishwamitra and said "the fruit out of which that you have planned to create a '*Nar*' (or the human being) we should pay regard to it hence we name it "*Narikela*" and the fruit will be known as the greatest fruit in the world. One who will eat this fruit daily will be as intelligent as you and this fruit will be the cure of the diseased." [4]

Taxonomy [5]

Kingdom Plantae- Plants
Subkingdom Tracheobionta- Vascular Plants
Superdivision Spermatophyta- Seed plants
Division Magnoliophyta- Flowering plants
Class Liliopsida- Monocotyledons
Subclass- Arecales
Family- Arecaceae- Palm family
Genus - cocos L.- Coconut palm
Species- Cocos nucifera L.- coconut palm

MATERIAL AND METHODS

Vernacular Names of *Narikela* [6]

English- Coconut tree, coconut, coconut palm
Hindi- Nariyal, Narel, Gari, Giri
Bengali- Dab, Narikel, Narival, Daav
Gujrathi- Nariel, Narieara
Kannada- Tengu, Thenpinna, Tengina
Marathi- Naral, Narula, Mad, Varala
Punjabi- Narel, Khopa

Classification of *Narikela* by Nighantus in different Vargas and Ganas [7-10]

- *Amraphaladi varga: Bhavaprakash Nighantu*
- *Aushadhi varga: Kaiyadeva Nighantu*
- *Phala varga: Charak samhita, A.H., A.S., Madanpala Nighantu*
- *Vanoushadhi varga: Amarakosam*
- *Hareethakyadi varga: Priya Nighantu*
- *Amraadi varga: Dhanvantari Nighantu, Raja Nighantu*

Varieties [11-12]

1. Various *Nighantu* literatures have classified the *Narikela* on the basis of its maturity. The types are:
   a. *Baala*- This stage of fruit contains only water.
   b. *Madhyama*- This stage of fruit contains soft milky kernels with less water.
   c. *Pakva*- This stage of fruit does not contain water and much hard kernel.
2. Based on properties, in Raj Nighantu two varieties are mentioned- (A) *Narikela* (B) *Madhu Narikela*.

Nutritional Value of Coconut

International life sciences Institute, ILSI North America, Technical committee on food components for health promotion has described the term "functional food" in 1999 as a food that "provides a health benefit over and beyond the basic nutrients". Coconut oil was entitled as "functional food" in the same year.

Many modern scientists and researches by the CDC, food and nutrition science organizations and university studies have well documented compelling health-giving properties of coconut fats. Dr. Enig has said this about coconut as a functional food- "Coconut has fatty acids that provide both energy (nutrients) and raw materials for antimicrobial fatty acids and monoglycerides (functional components) when it is eaten."[13]

Coconut oil extracted from the dried kernel contains about 65% to 75% oil. The tender coconut water is a magnificent natural soft drink. The calorie value of tender coconut water is 17.4/100g. Coconut water contains nicotinic acid B3 (0.64ug/mL), pantothenic acid B5 (0.52ug/ml), biotin (0.02ug/mL), riboflavin B2 (<0.01ug/mL), folic acid (0.003ug/mL), trace amounts of pyridoxine (B6) and thiamine (B1). Other than these it also contains sugar, sugar alcohols, vit. C, folic acid, free amino acids, phytohormones (auxtin1, 3-diphenylurea, cytokinin), enzymes such as acid phosphatase, catalase, diastase, peroxidase, RNA polymerase and growth promoting factors.[14]

Coconut water is also a very good source of electrolytes. It is very rich in inorganic ions such as K (290mg%), Na (42mg%), Ca (44mg%), Mg (10mg%), P (9.2mg%) etc. Proteins and fats that are present in coconut contain nutritional and healing properties which deliver a great deal of benefits to the human body. Coconut has been selected as one of a select group of healing foods due to its many benefits.[15]

Phytoconstituents in Coconut oil [16-17]

The benefits of coconut oil have been mentioned in various researches. Coconut oil contains lauric acid, capric acid and caprylic acid which is said to have natural healing power and protection against viruses, fungi and infections. Phytoconstituents of coconut are discussed in detail below and their pharmacological actions shown in fig.1.

The saturated fatty acids in coconut oil is lauric acid (C12:0) 47%-56%, myristic acid (C14:0) 15%-19%, caprylic acid (C8:0) 6%-9%, capric acid (C10:0) 5%-7%, palmitic acid (C16:0) 8%-11%, stearic acid (C18:0) 2%-4%, oleic acid (C18:1) which is monounsaturated fatty acid is 5%-7% and linoleic acid (C18:2) which is polyunsaturated fatty acid is 1%-3%.[18]

Lauric Acid

Lauric acid is comparatively rare saturated fatty acid in nature. In the human diet there are only two major sources of it i.e., coconut and human breast milk. Lauric acid is most abundant in coconut oil making up 46% to 54% of the total lipids in coconut oil depending upon soil, region, and cultivation practices. Lauric acid has antibacterial, antiviral, and antiprotozoal activities, also it is very beneficial to the human body as it improves immune system, protects the liver and its anti-inflammatory response.

Study conducted at the university of Iceland in the early 1990's identified the medium chain fatty acid lipids (MCFA, between 8 and 12 chains) have antiviral and antibacterial benefits. Lauric acid gets converted into monolaurin in the human body. Monolaurin kills viruses like HIV, Cytomegalovirus and many bacteria (H.Pylori) and even protozoa like giardia lamblia. The antiviral action of the monolaurin is solubilizing the lipids and phospholipids in the envelope of the virus causing collapse of the virus envelope. The monoglyceride monolaurin protects the infant from getting infections.[19]

Capric Acid (Decanoic Acid)

Capric acid is 10-chain saturated fatty acid and its accompanying monoglycerides monocaprin present in coconut oil is at a stage of 5% to 7% of total fatty acid. In research conducted at the University of Iceland, capric acid was found to be very effective at eliminating three different strains of candida albicans. The article published in 2001 states: - "With a quick inactivation time, numerous fatty acids and their 1-monoglycerides were examined for Candida albicans susceptibility to, and after being exposed to capric acid, ultrathin slices were examined by transmission electron microscopy (TEM). The outcomes demonstrate that the three strains of C. albicans studied are all killed most quickly and effectively by capric acid, a 10-carbon saturated fatty acid, leaving the cytoplasm disordered and contracted as a result of a disturbed or disintegrating plasma membrane.". This study is a direct proof that fatty acids in coconut have the capacity to protect against C.albicans.

Caprylic Acid (Octanoic Acid)

Caprylic acid is a medium chain fatty acid. Caprylic acid has been shown to reduce cholesterol. It is also effective against bacterial infections. Monocaprylin, the triglyceride of caprylic acid, has shown to be effective against bovine mastitis in dairy cows, and mainly in strep infections. Monoglycerides present in the fatty acids of coconut oil have the ability to break down and inactivate pathogenic organisms. According to the Center for Research on Lauric oils, the structure of the lipids determines its action e.g., monoglycerides, free fatty acids. The diglycerides and triglycerides are inactive but the monoglycerides are active. Lauric acid has proven to have greater antiviral activity than either Caprylic acid (C-8), Capric acid (C-10) or myristic acid (C-14) for these viruses".[20]

Clinical uses of Coconut (Fig.2)

Coconut oil is abundant in MCT (Medium chain triglycerides) which could help our brains function much better. Caprylic acid which is a medium chain triglyceride crosses the blood brain barrier. It has been found to have anticonvulsant activity. This strongly indicates that coconut oil has neuro-protective effects on the human brain.[21]

Coconut water can be used to neutralize toxins brought on by food poisoning. It is also very beneficial for people who suffer from diarrhea due to its high electrolyte content, which speeds up the return of electrolytes lost due to diarrhea. Coconut water can also be consumed to prevent dehydration and can be used to treat food poisoning.

Coconut in Pregnancy

Coconut oil provides good fats that are crucial for the mother and the developing fetus, helping to boost immunity, improve brain development, and affect the quality of breast milk. It can be utilized to meet the nutritional needs of pregnant women as well as the fetus. (Ripari et al., 2020; Ibrahim et al., 2022)

Research has been done on the effect of consuming coconut oil throughout pregnancy on a woman's ability to deliver a flexible baby. Traditionally, to ensure a comfortable delivery, people still frequently use coconut oil throughout pregnancy.

According to research, 35 respondents (87.5%) of the 40 respondents who gave birth consumed occult oil. Of the 35 respondents, 34 (97.1%) had a flexible or soft condition during delivery, while one (2.9%) had a rigid condition. This will have a substantial impact on labour and delivery, and it may shorten the first stage of labour, lessen mother tiredness, shorten the second stage of labour and lessen the likelihood of postpartum hemorrhage, which may cause maternal mortality.

Lowering the frequency of cephalohematoma and hypoxia in newborns, both of which can cause infant death. According to the above description, the authors are confident that pregnant women who consistently consume coconut oil in the last few months of pregnancy can contribute to a decrease in both the maternal mortality rate (MMR) and infant mortality rate (IMR).[22]

Striae gravidarum is one of the changes that a pregnant woman experience. Due to stretching and weight growth during pregnancy, a kind of skin scarring known as striae gravidarum develops. Striae gravidarum affects over 90% of pregnant women, especially during the latter trimester. While some striae gravidarum vanish over time, others are permanent (susilawati, Julia 2017).

The fatty acid composition of virgin coconut oil, particularly the lauric and oleic acids, softens the skin. From the research it can be concluded that there is effectiveness after using coconut oil, aloe vera and whiting to prevent the occurrence of striae gravidarum in third trimester pregnant women.[23]

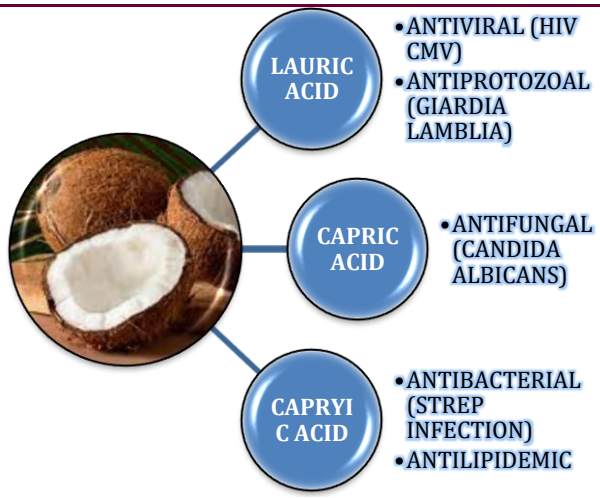

Fig.1 Phytoconstituents in coconut

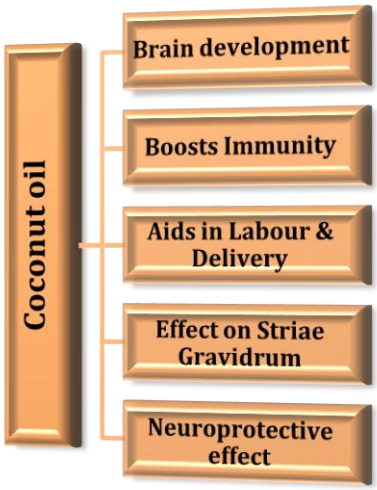

Fig. 2 Uses of Coconut oil

CONCLUSION

Cocos nucifera is a widely dispersed plant that has various pharmacological effects. *Cocos nucifera* is found throughout India. In Ayurveda, pharmacological properties of *Narikela* have been mentioned i.e., *Madhura rasa*, *Madhura vipaka* and *Sheeta rasa*. Various parts of *Narikela* like its fruit, fruit milk, tender coconut water is used as a main ingredient in several Ayurvedic formulations. The adaptable coconut tree is a source of several chemical compounds, which oversee the tree's different actions. Modern medical research has recently validated a number of the health advantages of various coconut products. Therefore, in-depth research is required to maximize their therapeutic efficacy in the treatment of illnesses. It is necessary to do further research on C. nucifera in order to uncover hidden potential for usage in therapeutic settings that can benefit humanity.

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