Cocos nucifera (COCONUT) FRUIT: A REVIEW OF ITS MEDICAL PROPERTIES

Experiment Findings · March 2013

DOI: 10.13140/RG.2.2.21506.53446

1 author:

Victor Emojevwe
University of Medical Sciences, ondo city, Nigeria
31 PUBLICATIONS **76** CITATIONS

SEE PROFILE

Advances in Agriculture, Sciences and Engineering Research
http://www.ejournal.sedinst.com
© Science Education Development Institute, 2013 **Volume 3 (3) Mar.: 718 - 723, 2013**
Printed in Nigeria **ISSN: 2276 - 6723**

Cocos nucifera (COCONUT) FRUIT: A REVIEW OF ITS *MEDICAL PROPERTIES*

Emojevwe Victor
Department of Physiology, Faculty of Basic Medical Sciences, Delta State University, Abraka, Delta state, Nigeria. Email: emojevwevictor@gmail.com

ABSTRACT
Cocos nucifera (coconut) is a well-known plant used in the Indian and African system of medicine. Folklore medicine claims its uses in diabetes, diarrhea, cancer, etc. Research carried out using different *in vitro* and *in vivo* techniques of biological evaluation supports most of the claims. This review presents the medical properties of the fruit of the plant.

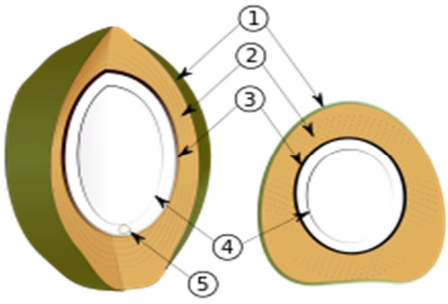
KEYWORDS: *Cocos nucifera*, Coconut Water, Coconut Oil, Coconut Husk

INTRODUCTION

This review emphasizes the traditional use and clinical potentials of *Cocos nucifera (coconut)*. Through, this review's author hopes to attract the attention of natural products researchers from different parts of the world to focus on the explored potential of *Cocos nucifera (coconut).* This review has been compiled using references from major database such as Chemical Abstracts, Medicinal and Aromatic Plants Abstracts, Pubmed, Duke's Phytochemical and Ethno botany database, United States Patent and Trademark Office (USPTO) Patent Full Text and Image database. The available information on *Cocos nucifera (coconut)* has been discussed in this review under sections. Some reports in which *Cocos nucifera (coconut)* have been used as a domestic remedy by common Men without prescription for the treatment of various ailments have been discussed in this review.

Cocos nucifera is a large palm, growing up to 30 meters (98 ft) tall, with pinnate leaves 4–6 meters (13–20 ft) long, and pinnae 60–90 cm long; old leaves break away cleanly, leaving the trunk smooth. Coconuts are generally classified into two general types: tall and dwarf [1, 2].

Found across much of the tropic and subtropic area, the coconut is known for its great versatility as seen in the many domestic, commercial, and industrial uses of its different parts. Coconuts are part of the daily diet of many people [3]. When young, the entire fruits are used as melons. When mature, only the seeds are used as nuts. Its endosperm is initially in its nuclear phase suspended within the coconut water. As development continues, cellular layers of endosperm deposit along the walls of the coconut, becoming the edible coconut "flesh. When dried, the coconut flesh is called copra [3]. The oil and milk derived from it are commonly used in cooking and frying; coconut oil is also widely used in soaps and cosmetics. The clear liquid coconut water within is a refreshing drink and can be processed to create alcohol. The husks and leaves can be used as material to make a variety of products for furnishing and decorating [4, 5]. It also has cultural and religious significance in many societies that use it. For the sake of clarity, let us try the description of the useful parts of the fruit from the external to the internal part:



THE COCONUT (Cocos nucifera) FRUIT

Coconut seed interior

Layers of the coconut fruit:
(1) Exocarp/Epicarp, (2) Mesocarp, (3) Endocarp, (4) Endosperm, (5) Embryo

Botanically, the coconut fruit is a drupe, not a true nut [6]. Like other fruits, it has three layers: exocarp, mesocarp, and endocarp. The exocarp and mesocarp make up the "husk" of the coconut. Coconuts sold in the shops of nontropical countries often have had the exocarp (outermost layer) removed. The mesocarp is composed of a fiber, called coir, which has many traditional and commercial uses. The shell has three germination pores (stoma) or "eyes" that are clearly visible on its outside surface once the husk is removed [7]. A full-sized coconut fruit weighs about 1.44 kilograms (3.2 lb). It takes around 6000 full-grown coconuts to produce a tonne of copra. [6]

Within the shell is a single seed. When the seed germinates, the root (radicle) of its embryo pushes out through one of the eyes of the shell. The outermost layer of the seed, the testa, adheres to the inside of the shell. In a mature coconut, a thick, albuminous endosperm adheres to the inside of the testa. This endosperm or "meat" is the white and fleshy edible part of the coconut. Although coconut meat contains less fat than many oilseeds and seeds such as almonds, it is noted for its high amount of medium-chain saturated fat [8]. About 90% of the fat found in coconut meat is saturated, a proportion exceeding that of foods such as lard, butter, and tallow. There has been some debate as to whether or not the saturated fat in coconuts is healthier than other forms of saturated fat (see coconut oil). Like most nut meats, coconut meat contains less sugar and more protein than popular fruits such as bananas, apples and oranges. It is relatively high in minerals such as iron, phosphorus and zinc [8, 9, and 10].

Husks and Shells
The husk and shells can be used for fuel and are a source of charcoal. Activated carbon manufactured from coconut shell is considered superior to those obtained from other sources, mainly because of small macropores structure which renders it more effective for the absorption of gas and vapor and for the removal of color, oxidants, impurities and odor of compounds [11].

A dried half coconut shell with husk can be used to buff floors. It is known as a *bunot* in the Philippines and simply a "coconut brush" in Jamaica. The fresh husk of a brown coconut may serve as a dish sponge or body sponge. *Tempurung* as the shell is called in the Malay language can be used as a soup bowl and—if fixed with a handle—a ladle. In India, coconut shells are also used as bowls and in the manufacture of various handicrafts, including buttons carved from dried shell. Coconut buttons are often used for Hawaiian aloha shirts. In Thailand, the coconut husk is used as a potting medium to produce healthy forest tree saplings. The process of husk extraction from the coir bypasses the retting process, using a custom-built coconut husk extractor designed by ASEAN-Canada Forest Tree Seed Centre (ACFTSC) in 1986. Fresh husks contain more *tannin* than old husks. Tannin produces negative effects on sapling growth [12]. In parts of South India, the shell and husk are burned for smoke to repel mosquitoes.

Nature and composition of coconut husk
The coconut husk is that 5-10 cm thick fibrous covering of the coconut fruit which envelops the hard shell structure of 3.5 mm thickness [13]. The external appearance of the husk varies from decidedly dull brown when fully ripe to bright green when immature. There are other varieties whose husks are golden yellow or yellow brown [14]. The husk is full of long, coarse fibers, all running in one direction. The fibers are embedded in a matrix of material called coir dust. Since husks are porous, they absorb or retain water ([15]). The maximum water holding capacity of the dust is reported to be 82.3% and an addition of 2% of the dust to sandy soil is claimed to increase the moisture holding capacity of the latter by 40%. The observations of Croucher and Martinez in 1935 [16] indicate that the coir dust ash is rich in sodium and potassium salts. The sodium chloride content of the ash decreases as the tree is grown further away from the sea. This also contains sodium oxide and sodium carbonate. The potassium oxide content is highest in ash produced at low temperatures and is also readily soluble in water [17].

Table 1: Chemical composition of coconut husk fiber (in percent of dry weight)

	FIBER		
	OLD NUT (%)	YOUNG NUT (%)	VERY YOUNG NUT (%)
Water soluble substances	26	29	38. 50
Pectin, others soluble in boiling water	14. 25	14. 85	15. 25
Hemicelluloses	8.5	8.15	9. 00
Lignin	29. 33	31. 64	20. 13
Cellulose	23. 87	19. 26	14. 39

Source: see [17 and 28]

Coconut Water

Coconut water serves as a suspension for the endosperm of the coconut during its nuclear phase of development. Later, the endosperm matures and deposits onto the coconut rind during the cellular phase. Coconut water contains sugar, dietary fiber, proteins, antioxidants, vitamins and minerals, and provides an isotonic electrolyte balance. It is consumed as a refreshing drink throughout the humid tropics, and is gaining popularity as a sports drink. Mature fruits have significantly less liquid than young immature coconuts, barring spoilage. Coconut water can be fermented to produce coconut vinegar [18]. The health benefits of the coconut water include: Boosting of the immune system, Detoxification and fighting of viruses and also help cleanse the digestive tract.

Coconut Milk

Coconut milk, not to be confused with coconut water, is obtained primarily by extracting juice by pressing the grated coconut's white kernel or by passing hot water or milk through grated coconut, which extracts the oil and aromatic compounds. It has a fat content around 17%. When refrigerated and left to set, coconut cream will rise to the top and separate from the milk. The milk can be used to produce virgin coconut oil by controlled heating and removal of the oil fraction [18].

Coconut Oil

Another by-product of the coconut that is rapidly growing in popularity is coconut oil. It contains fatty acids , Lauric, Caprylic, and Capric. Aside from its many non culinary uses, such as a hair conditioner or health supplement, it is frequently used as a cooking ingredient. It can be used in the same applications for which most other oils are used - pan frying and deep frying - but it can also be added directly to food, similar to the way one would add olive oil to bread or a salad. It is extracted from copra. It can promote weight loss by improving digestion. The Coconut Oil is notable for its anti microbial properties that fight of bacteria, viruses, and fungi, and has been used for medical purposes in tropical countries for centuries. Recent studies have even shown that the use of Coconut Oil helps the body and skin to heal and repair faster protecting it from deadly disease [17 and 18].

MEDICINAL PROPERTIES OF THE COCONUT FRUIT

Folklore medicine claims that *Cocos nucifera* (Coconut) is use in diabetes, diarrhoea, pneumonia etc. Research carried out using different *in vitro* and *in vivo* techniques of biological evaluation supports most of the claims. This review presents the medical properties of the different parts of the fruit of the plant.

Medicinal Properties of the Coconut husk

The husk is said to be the part of the coconut with little or no medical uses. But report shows that the tea from the husk fiber is widely used to treat several inflammatory disorders [19]. The hexane fraction of the coconut peel may contain novel anticancer compounds [20]. Some other reports have described below exposes us to the hypoglycaemic effects of the coconut husk.

[13], studied the hypoglycaemic effects of *Cocos nucifera* (Coconut) Husk extract on 20 alloxan-induced diabetic female rats randomly grouped into two (n=10). The extract was obtained by cooking the husk in boiling water for 45 minutes in a gas stove flame at a 100 degree Celsius and the fluid was filtered out and kept as the tea for the experiment. The control group was given 2 ml of 0.9% (normal) saline daily and group II was given 2

ml of the coconut husk tea only daily by Oro-gastric tube and random blood sugar was measured daily in the rats. At the end of the experiments the animals were sacrificed and the pancreas harvested and histopathological slides made. In the treated diabetic rats, blood glucose levels were significantly reduced ($p < 0.05$) on consumption of the *Cocos nucifera* (Coconut) Husk extract. The weight also reduced. The Histopathological study showed some regenerative ability in the rats that received the extracts (coconut husk tea). He therefore concluded that C*ocos nucifera (coconut) husk tea* have a significant hypoglycemic and anti-diabetic effects in alloxan-induced diabetes [13].

A comparative study was also done on the anti-diabetic effects of Cocos Nucifera (Coconut) husk and combination of Daonil and Mephomine on 21 alloxan-induced diabetic rats which were randomly grouped into three (n=7). Group I served as control while group II and III served as experimental groups. In the treated diabetic rats, blood glucose levels were significantly reduced ($p < 0.05$) on consumption of the extracts and the drugs with greatest effect exhibited by the Cocos Nucifera (Coconut) Husk extract. The Histopathological study showed same regenerative ability in the rats that received the extracts (coconut husk tea) and those that received Daonil and Metformine. They therefore concluded that the anti- diabetic effect of the coconut husk is comparable to that of the combination of Daonil and Metformine, and could serve as an effective adjunct in the management of diabetes mellitus [14].

Medicinal Properties of the Coconut Oil

In rats, virgin coconut oil reduced total cholesterol, triglycerides, phospholipids, LDL, and VLDL cholesterol levels and increased HDL cholesterol in serum and tissues [21]. It is also said to have anti microbial properties that protects you from bacteria and viruses, anti oxidants properties that helps prevent the skin from exposure to free radicals and prevent premature aging of the skin [22], Possess the nutrients necessary to maintain a well balance and nutritious diet. According to some studies, Coconut Oil has a great role on treating and preventing thyroid diseases, Promotes weight loss, Improves digestion, Hypoglycemic effects [21].

Coconut Oil detoxifies our skin by pulling out toxins that helps get rid of body acne. It's also great for dry skin in cold and dry season; helps reduce skin inflammation, skin rashes, fungal infections, and removing stretch marks. In some cases, you can even use Coconut Oil for a great lubricant for the body. Coconut Oil is definitely for your skin care needs improving the texture of the skin.

Coconut Oil is an excellent hair conditioner that softens your hair while strengthening it and conditions the scalp preventing dandruff. Many local hair specialists have been using it to treat hair for over ten years now and it has proven to be so potent [22].

It has been used for beauty routines; as a great eye makeup remover, removal of marks of aging, and even removal of acne. Coconut Oil is also good to be used on sunburns during upcoming hot summer.

Coconut Water

Aside from its popular use in the production of coco vinegar, coco wine, nata de coco, can be taken as a health and refreshing drink as it's a natural isotonic beverage that contains more potassium than the most sports and energy drinks sold commercially in the market. Coconut Water is sure to quench the thirst of anyone looking for a refreshing drink during the hot summer months.

Medicinal Properties of the Coconut Water

It mixes easily with blood, and was used during World War II in emergency transfusions [23]. It can also serve as an emergency short-term intravenous hydration fluid. This is possible because the coconut water has a high level of sugar and other salts that makes it possible to be used in the bloodstream, much like the modern lactated Ringer solution or a dextrose/water solution as an intravenouus solution (IV) [18]. Coconut Water beats dehydration and excellent electrolytes replacement. It contains more electrolytes than most sports drinks and more potassium than banana. Besides that, it is naturally sterile making it safe to drink even without undergoing water purification treatments. The coconut water is said to: aids in exercise performance, Reduces swelling in hands and feet. Prevent premature aging of the skin, Stress reduction. Drinking Coconut Water cleanses and aids kidney function and dissolves kidney stones. Anti-cancer effect, hypoglycemic effects, helps balance blood sugar. It also helps to relieve constipation and improves digestion. Because it is naturally low in calories and fat, it reduces risk of heart disease. Improves blood circulation, lowers high blood pressure and improves blood

cholesterol level. It also possesses anti-aging properties like the oil. Young coconut juice has estrogen-like characteristics [24and 25].

On the kidneys, Coconut Water also has important clinical applications such as treating renal disorders and in the production of clinical dextran. Doctors advise to drink Coconut Water to wash out bacteria that cause UTI "Urinary Tract Infection". Coconut Water contains electrolytes, calcium, potassium, magnesium and other vitamins and minerals that ensure health for the kidney and the urinary bladder [24and 25].

Because there are no calories in Coconut Water, it gives no extra worries for people who intend to lose weight; the calorie counter would not tip a single digit as it has less fat and no cholesterol. The Administration of coconut water has been discovered to have improved the deleterious effects of diabetes mellitus on male reproduction and administration of vitamin E and coconut water also causes regeneration of the gonads [26].

Medicinal Properties of the Coconut Meat

It gives a lasting boost of energy to the body because of its high protein content. Coconut Meat is especially great for people who are trying to gain weight like body builders since it helps build and increase muscle mass. Coconut Meat can also be used to make local and traditional foods like "Suman" in some country [27].

ACKNOWLEDGEMENT

Thanks to Mrs Grace Siloko (my beloved mother), My Friends: Cath. M. Orugbo, Ms Favour Itobore, Ms Favour R. Omonade & Bar. Ms A.U. Igholuya

REFERENCES

1. Pradeepkumar, T., Sumajyothibhaskar, B. and Satheesan, K. N. Management of Horticultural Crops (Horticulture Science Series). 2008, 11(2): 539–587.

2. Peter B., Deaths from falling Coconuts. Journal of Trauma, 1984, 24, (11); 990-991

3. Elzebroek, A.T.G. and Koop W., (Eds). Guide to Cultivated Plants. CABI. 2008, 186–192

4. Adkins, S.W., M. Foale and Y.M.S. Samosir. (Eds.).. Coconut revival – new possibilities for the 'tree of life'. Proceedings of the International Coconut Forum held in Cairns, Australia, 22–24 November 2005. ACIAR Proceedings 2006, 125.

5. Copeland, E.B., Philippine Agriculture Forester; 1911, 1:44-50.

6. Bourke, R. M. and Tracy H., Food and Agriculture in Papua New Guinea. Australian National University press. 2009, p. 327

7. Rosengarten, Frederic, Jr. The Book of Edible Nuts. Dover Publications, 2004. pp. 65–93

8. Thampan, P.K., Handbook on Coconut Palm. Oxford & IBH Publishing Co. 1981

9. Willmer, P., Pollination and Floral Ecology. Princeton University Press.2011, p. 57

10. Perera, L. Suriya A.C.N. Perera, C. K. B. and Hugh C. H., "Chapter 12 – Coconut". In Johann Vollmann and Istvan Rajcan (Eds.). Oil Crops. Springer, 2009, pp. 370–372

11. Grimwood, B. E., Ashman, F. Dendy D.A.V, Jarman, C.G. Little, E.C.S. and Timmins W.H., Coconut Palm Products – Their processing in developing countries. Rome: FAO, 1975, pp. 3–4

12. Somyos K., Handbook: Coconut husk as a potting medium". ASEAN-Canada Forest Tree Seed Centre Project, Muak-Lek, Saraburi, Thailand, 1991

13. Emojevwe Victor, Hypoglycaemic Effects of the Cocos nucifera (Coconut) Husk Extract on alloxan induced Female wistar rats. *Continental Journal of Medical Research.* (2012). 6 (2): 5 – 11.

14. Emojevwe Victor, Jeroh E., Anti-Diabetic Effects of the Cocos Nucifera (Coconut) Husk Extract. *Journal of Medical and Applied Biosciences.* 2012, *Vol. 4, September. Pp 16-25.*

15. Banzon, G. and Velasco, A., Coconut Production and Utilization.1982, p. 277

16. Croucher A. and Martinez, Coconut husk Ash as Fertilizer, *Chemical Abstracts*. 1976, 29

17. Tejano, E. A., State of the Art of Coconut Coir Dust and Husk Utilization (General Overview). Paper presented during the National Workshop on Waste Utilization, Coconut Husk held on November 12, 1984 at the Philippine Coconut Authority, Diliman, and Quezon City, Philippines. *Philippine Journal of Coconut Studies*. 1985

18. Campbell-Falck D. Thomas T. Falck TM. Tutuo N. Clem K, The intravenous use of coconut water.. *American Journal of Emergency Medicine*, 2000, 18(1):108-111

19. Rinaldi, S. Silva, D. O. Bello, F. Alviano, C. S. Alviano, D. S. Matheus, M. E. Fernandes, P. D., Characterization of the antinociceptive and anti-inflammatory activities from Cocos nucifera L. (Palmae). *Journal of Ethnopharmacology*, 2009, 122 3: 541-546.

20. Khonkarn R. Okonogi S. Ampasavate C. Anuchapreeda S., Investigation of fruit peel extracts as sources for compounds with antioxidant and antiproliferative activities against human cell lines. Food & Chemical Toxicology. 2010, 48(8-9):2122-2129.

21. Nevin KG. Rajamohan T., Beneficial effects of virgin coconut oil on lipid parameters and in vitro LDL oxidation. *Clinical Biochemistry*. 2004, 37(9):830-835.

22. Kaunitz, H., Medium chain triglycerides (MCT) in aging and arteriosclerosis. *Journal of Environmental Pathology*, 1986, 6 (3–4): 115–121.

23. Eiseman, B., R.E. Lozano, and T. Hager. Clinical Experience in Intravenous Administration of Coconut Water. In *A.M.A. Archives of Surgery*, 1954

24. Radenahmad, N., Saleh, F., Sawangjaroen, K., Rundorn, W., Withyachumnarnkul, B., Connor, J. R., Young coconut juice significantly reduces histopathological changes in the brain that are induced by hormonal imbalance: a possible implication to postmenopausal women. *Histology & Histopathology*. 2009, 24(6):667-674.

25. De Lourdes A., M., Molina, V., Más, R., Carbajal, D., Marrero, D., González, V., Rodríguez, E., Effects of coconut oil on testosterone-induced prostatic hyperplasia in Sprague-Dawley rats". *Journal of Pharmacy and Pharmacology*, 2007, 59 (7): 995–999.

26. Nwangwa E. K., PhD Thesis, Delta State University, Abraka. 2012

27. Standl, E., Ballestshoffer, B., Dahl, B. and Shagler, H., Predictors of 10 years macrovascular and overall mortality in patients with NIDDM: the Munich practitioner project. *Diabetologia, 2003* 39: 540 -545

28. Gonzales, B. P., Analysis and Pulping of Coir Dust. Emata, R. (Ed.) Coconut Research and Development. V.3, UCAP, Manila, 1970, p. 163-173.