



Is Coconut Oil Good for You?

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Introduction

Coconut palm (*Cocos nucifera*) is a tropical tree that grows mostly in Asia and the Pacific region. There are two varieties of coconut tree, "tall" and "dwarf". The tall variety grows very slow and produces fruits 6-10 years after planting and remains productive 80-120 years. It takes about 12 months for the fruits to mature. The height of the dwarf variety is less than half that of the tall variety and it produces fruits 1-2 years earlier. The tall coconut palm is preferred for oil production, because its fruits are larger and kernels contain more oil than the dwarf type, which produces high-quality drinking nuts. The fruits of coconut palm have a single seed and a yellow, orange, green, brown or reddish brown colored smooth and waxy epidermis. A fibrous husk, and a blackish very hard woody endocarp encloses the fruit. The seed is surrounded by a brown testa enclosing a 1-2 cm thick layer of white meat. This part holds copra oil and coconut water that fills three quarters of the large central cavity.

Ripe fruits of dwarf and tall coconuts weigh about 748-907 and 974-2063 g and the meat fraction are about 260-344 and 362-976 g, respectively. Coconut meat which has an original moisture content of 45% is dried to 6% moisture to produce copra. Oil content of fresh meat and copra are about 40% and 65%, respectively.

Processing Oil extraction

Coconut oil production involves three stages: pretreatment, extraction and refining. The pretreatment method used for coconut fruit depends on the oil extraction technique to be used for oil extraction. There are two extraction methods used for oil recovery, wet or dry.

The first step in wet extraction is size reduction for better extraction efficiency. Ripe coconut fruits are peeled, cut into pieces and shredded using a coconut milling machine. Then, water is added to the shredded kernel at a ratio of 1:2 by weight, followed by mixing and pressing to obtain coconut milk. After about 3 hours of incubation of coconut milk, three phases, a cream layer rich in oil on top, a middle layer rich in protein and bottom layer comprising of water are formed. The top cream layer is syphoned out and heated at 100 °C until oil is separated and a white sediment referred to as "blondo" is

formed. Oil is separated from the sediment by centrifugation or filtration. Blondo contains a protein content of about 24%. The wet extraction can be carried out with cold water or boiling the coconut meat in water. There are also studies exploring enzyme aided aqueous extraction, but this process is still in the research and development phase (see Fact Sheet FAPC-159 Oil and Oilseed processing II: Oil Extraction Techniques).

Dry extraction starts with copra which is the dried coconut meat separated from the shell. The oil is extracted by pressing copra in screw presses (expellers), followed by solvent extraction to recover the residual oil from the cake (see fact sheet FAPC-159 Oil and Oilseed processing II: Oil Extraction Techniques).

Crude oil refining

Crude oil is further processed to get edible grade refined oil. The refining process is very similar to that of other vegetable oils (see fact sheet FAPC-160 Oil and Oilseed processing III: Crude Oil Refining and Preparation for Biodiesel Production).

Quality and properties of oil

Grade and quality of any oil are determined by the processing methods used for production. Virgin coconut oil is extracted from fresh coconut milk obtained from the meat of a coconut by mechanical means with or without heat application. Virgin coconut oil does not go through any chemical refining or deodorization and it is colorless and has natural fresh coconut aroma and taste. Refined-Bleached-Deodorized (RBD) oils have little or no typical pleasant coconut smell and taste, because volatile flavor compounds are removed from the oil during the deodorization step of refining.

Fatty acid composition of coconut oil is shown in Table 1. Since coconut oil mostly contains saturated fatty acids (92%), it is quite stable against oxidation. Fatty acids with 8 to 12 carbon atoms are classified as medium-chain fatty acids. About 62% of the fatty acids in coconut oil are medium-chain fatty acids, which is the highest amount found in vegetable oils.

Although, the oil is highly saturated, it has a relatively low melting point (23-25 °C) because of its high content of short- and medium-chain fatty acids.

Table 1. Fatty Acid Composition of Coconut Oil. Adapted from (Firestone 1999).

Fatty Acid Name	Content (%)
Caprioc (C6:0)	0-0.6
Caprylic (C8:0)	4.6-9.4
Capric (C10:0)	5.5-7.8
Lauric (C12:0)	45.2-50.3
Myristic (14:0)	16.8-20.6
Palmitic (16:0)	7.7-10.6
Stearic (18:0)	2.5-3.5
Oleic (18:1)	5.4-8.1
Linoleic (18:2)	1.0-2.1
Linolenic (18:3)	-
Arachidic (20:0)	0.0-0.2

A group of compounds known as phytosterols are biologically active components naturally present in vegetable oils in minor amounts. Many scientific studies link these minor oil components to health benefits including antioxidation, antiatherosclerosis, anticancer, plasma cholesterol lowering and free radical inhibition effects. Total phytosterol content of coconut oil is about 800 mg/kg (Table 2). The major phytosterols present in the oil are β -sitosterol (about 47%) and Δ^5 -avenasterol (about 27%). The ratio of β -sitosterol to Δ^5 -avenasterol is commonly used to detect the adulteration of coconut oil with palm kernel oil. Coconut oil contains less β -sitosterol and more Δ^5 -avenasterol than palm kernel oil, hence, β -sitosterol/ Δ^5 -avenasterol ratio of coconut oil smaller (1.8) than that of palm kernel oil (11.6). Therefore, a larger β -sitosterol/ Δ^5 -avenasterol ratio than 1.8 in coconut oil would indicate adulteration with palm kernel oil.

Tocopherols and tocotrienols are two groups of fat-soluble compounds with antioxidant properties. The total tocopherols content of coconut oil varies from trace to 50 mg/kg. The contents individual tocopherols in coconut oil (mg/kg) are as follows: α -tocopherol (0-17), β -tocopherol (0-11), and γ -tocopherol (0-14). Coconut oil also contains α -tocotrienol (0-44 mg/kg).

Oil Utilization

Although coconut oil is commonly used for home frying of foods such as banana chips, or in shallow pans in tropical countries, it is not suitable for industrial frying because of its high, short and medium-chain fatty acid content which are highly volatile and lead to excessive smoke generation at relatively low temperatures. The smoke point of virgin (unrefined) (350 °F, 177 °C) and refined coconut oil (400 °F and 204 °C) are lower than other commodity oils used for industrial frying such as sunflower seed oil (smoke point 490 °F, 225 °C). Coconut oil is commonly used in personal care products. Coconut oil is rich in short and medium-chain fatty acids, such as caprylic (C8:0) and capric (C10:0), which are easily absorbed in the digestive tract and provide immediate energy. However, they are not stored in adipose tissue. This makes coconut oil an effective ingredient in sports foods, infant foods and in clinical nutrition applications.

Table 2. Phytosterol composition of coconut oil.

Phytosterol	Amount (mg/kg of oil)
Cholesterol	0.6-3.0
Brassicasterol	0.0-0.09
Campesterol	7.5-10.2
Stigmasterol	11.4-13.7
β -Sitosterol	42.0-52.7
Δ^5 -Avenasterol	20.4-35.7
Δ^7 -Stigmasterol	0.0-3.0
Δ^7 -Avenasterol	0.6-3.0
Others	0.0-3.6
Total	470-1,110

Health Effects

There has been a lot of buzz about the health benefits of coconut oil ranging from weight loss to being a cure for Alzheimer's disease, which has caused confusion among the consumers. It is important to understand what is in the products you purchase and consume to judge their nutritional impact. Regardless if it is virgin (not refined), refined or partially hydrogenated, coconut oil is a highly saturated fat (see Table 1) and it is considered a solid fat. One tablespoon of coconut oil contains more than 11 grams of saturated fats. The daily limit for saturated fats recommended by the American Heart Association is 13 grams. It is widely accepted by the scientific community and health care providers that saturated fat raises LDL (low density lipoprotein) or "bad" cholesterol. There are some research studies suggesting that medium-chain fatty acids may have potential health benefits such as weight loss, appetite control, increased metabolism and anti-inflammatory effects. Some likened coconut oil to the medium-chain triacylglycerides used in those studies without mentioning that their chemical structure, absorption and metabolism of those present in coconut oil are different. Since over 50% of fatty acids in coconut oil is lauric acid, it is classified as lauric oil. Our body digests and metabolizes lauric acid like a long-chain fatty acid, not like a medium-chain fatty acid, therefore, coconut oil does not provide the health benefits of medium-chain fatty acids.

Conclusions

Coconut oil is a highly saturated solid fat and has a relatively low smoke point. Hence, it is not suitable for industrial frying applications. Coconut oil is widely used in personal care products. It is also a good ingredient in foods that are formulated to provide quick energy, such as products designed for athletes and infants.

Health care professionals (see below references) emphasize that "although eating coconut oil in moderation isn't going to result in great harm to your health, it's not likely to help you lose weight either. If you enjoy the flavor of coconut oil, use it sparingly as part of an overall healthy dietary pattern".

References:

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