

Going Coconuts

By Lynn A. Kuntz, Editor-in-Chief

In northern climes, the image of a palm tree laden with coconuts likely evokes thoughts of an exotic getaway and nothing more nourishing than a piña colada. However, in tropical countries around the world, the coconut tree, *Cocos nucifera*, provides people with many of their basic needs, from shelter to medicine to decorations to—of course—food. It is so integral to the populations where it grows that one of its ancient Sanskrit names is “tree that supplies everything needed for life.”

Approximately 93% of coconut production occurs in the Asian and Pacific tropics, with the two biggest producers being Indonesia and the Philippines. The coconut tree comes in many varieties, typically categorized as “tall” or “dwarf” and their hybrids, and bears its fruit under a crown of fan-shaped leaves. These nuts grow year-round and, depending on the variety, are different sizes, shapes, colors and weights. Typically, a full-grown palm produces at least one mature bunch of 5 to 15 coconuts every month. The nuts are sometimes harvested when they are young or, more typically, left to ripen until the coconut is 11 to 12 months old. At that point, they are either manually harvested or left to drop off the tree. The mature nuts produce better quality and higher quantities of copra (nutmeat) and coconut oil.

While there are a few foods derived from the coconut palm other than the nut, such as hearts of palm and a sweet palm sap with 16% sucrose, sometimes called toddy (especially after fermentation, to which it is highly prone), the vast majority come from the nut. The mature fruit of the coconut palm is a 3-sided seed covered by reddish-brown fiber (the husk, or mesocarp) and a smooth, outer skin (the rind, or exocarp). The round coconut seen in groceries is the dehusked fruit that consists of coconut milk, and “meat” (the kernel, or endosperm), surrounded by a hard shell (endocarp). Generally, after dehusking, the coconut is split in two, the coconut water is drained off, and the resulting “cups” undergo a drying process (sun-drying, kiln-drying or a combination of both), where the meat shrinks and is easily removed from the shell. Drying reduces moisture content from 50% to below 7%. Improperly dried copra can encourage mold growth (*Aspergillus flavus* and other aflatoxin-related molds).

Coconut oil

Coconut oil processing consists of two major types: Extraction that uses copra is called the dry process, while the method that starts with fresh coconuts is generally called the wet process. Copra contains about 65% to 72% oil. After oil extraction, by expression or prepress solvent extraction, the remaining coconut cake is usually fed to livestock. Copra-derived coconut oil must undergo chemical refining, bleaching and deodorizing. This results in a yellowish, odorless, tasteless oil with a melting point of 76°F (24.4°C). It can be hydrogenated, which creates a hard, brittle, solid fat with a melting point of 92°F to 104°F (33°C to 40°C). Coconut oil has a steep solid-fat index (SFI) and sharp melting point, which is useful in products such as coffee whiteners.

Coconut oil is high in saturated fatty acids, primarily medium-chain triglycerides (MCTs), fatty acids with 6 to 12 carbons. Like palm oil, it is often called a “lauric fat” due to its high level of lauric acid (C₁₂H₂₄O₂), about 46% to 50%. MCTs have been noted for their beneficial effects on health, particularly in the areas of human energy metabolism—research shows their consumption results in less body-weight gain and decreased size of fat deposits—and satiety. This is attributed to the different way they are metabolized in the body versus long-chain triglycerides—they are absorbed directly into the portal circulation and transported to the liver for rapid oxidation. Lauric and capric (C₁₀H₂₀O₂) fatty acids may also have antibacterial and antiviral properties.

Coconut oil was categorized as one of the high-saturate "tropical" fats that was believed unhealthy in the '80s and found in everything from movie popcorn and bakery spray oils to cookie fillings and candy. However, according to Bob Wainwright, technical director, Cargill Dressings, Sauces & Oils, Charlotte, NC, it has not played a significant role in reformulation strategies aimed at trans-fat reduction. "This is not the result of a reluctance by food processors to accept it as an ingredient, but rather a function of supply, cost, chemical and physical attributes, and saturated-fat content. Coconut oil and hydrogenated coconut oil are especially well-suited ingredients—clean flavor and flavor release, excellent oxidative stability—for many vegetable dairy and confectionery applications, and as such have traditionally played a significant role in their formulation. Hence, these product applications did not present a substantial reformulation opportunity during the journey to minimize trans fat."

While coconut oil is used for frying in tropical countries, it "is generally not a good candidate for deep frying," according to Wainwright, "because the smoke point (350°F, or 177°C) is low relative to the temperatures required for most frying operations. In addition, commingling coconut oil with rather meager quantities of common non-lauric oils, such as soybean, typically results in excessive foaming."

Virgin coconut oil (VCO) is gaining a reputation as a healthy food, both through medical research and anecdotal reports. The Philippine National Standard for VCO defines it as: "oil obtained from the fresh, mature kernel (meat) of the coconut by mechanical or natural means, with or without the use of heat, without undergoing chemical refining, bleaching or deodorizing, and which does not lead to the alteration of the nature of the oil... VCO is ... essentially water-clear or colorless. It contains natural vitamin E and has not undergone any hydrolytic and atmospheric oxidation as demonstrated by its very low free-fatty-acid content (even without refining) and low peroxide value." VCO has a fresh coconut aroma, the intensity depending on the extraction process.

The meat of the matter

Coconut meat, including that from young coconuts, can be eaten fresh, but most for industrial use is dried. Dried, or desiccated coconut, is the dried, white, particulate or shredded food obtained from freshly peeled coconut kernels. The nutmeat is washed and sterilized, and stabilized with sulfur dioxide. During drying to a moisture of about 2.5%, the wet kernel is traditionally shredded into nine different cuts, grouped under three broader categories such as granular cuts, shred cuts and specialty cuts. These can be further-processed into products such as sweetened coconut, toasted coconut, colored coconut and creamed coconut. Codex standards specify less than 3% moisture and not less than 55% fat for grated, desiccated coconut, and categorize it into three specified granular sizes (extra-fine, fine and medium), as well as unspecified sizes such as flake. The standards allow the addition of sulfur dioxide.

The nutritional profile of dried coconut is not significantly different from fresh coconut. High-quality desiccated coconut is white and crisp and maintains a sweet, fresh taste. Dried coconut meat—although high in fat (approximately 65%)—is considered nutritious. In addition to the fat and digestible carbohydrates (7%), it contains a high level of dietary fiber (16%), protein (9%) and minerals such as zinc, iron, potassium and phosphorus, and vitamins such as folate and vitamin C.

Milking the coconut

Coconut milk and cream are extracted from coconut meat, with coconut milk having a higher water content. Coconut cream "typically has a fat content higher than 20%," says Kasi Sundaresan, Ph.D., manager, research, development, and quality, iTi tropicals, Inc., Lawrenceville, NJ. "The product we supply runs at about 24% fat. The total solids in the product is 30% to 32%. The standard of identity is set by the Codex standards."

Codex standards divide the products into four categories: light coconut milk (6.60% to 12.60% solids), coconut milk (12.70% to 25.30%), coconut cream (25.40% to 37.30%) and coconut cream concentrate (37.45% minimum). The standards permit the addition of maltodextrin and sodium caseinate, as well as bleaching agents, emulsifiers, preservatives and stabilizers and/or thickeners.

Because the fat content of coconut cream is so high, "during the processing of finished products, typically finished products such as beverages and/or frozen novelties, the use of stabilizers helps to provide body and texture, and prevent separation in the finished product," says Sundaresan. "The stabilizers typically used are guar gum, xanthan gum, carboxy methylcellulose and gellan gum, as well as others."

Some South Pacific countries, especially Samoa, make coco jam (siamu popo) from coconut milk cooked in brown sugar and glucose. Coco jam is used as a spread in many coconut-producing countries, and often as a pancake syrup, cake filling, dessert topping or meat marinade. It contains 75% to 76% soluble solids.

Coconut water

"Coconut water, the liquid found in coconuts, has been popular in tropical countries for many years, but it is gaining popularity in the United States due to increasing awareness about the potential health benefits, such as high potassium content and low caloric load," says Sundaresan. "Due to the growing popularity of coconut water, the consumption of coconut water has grown from a niche market at the natural-food-store level to mainstream in the United States."

Coconut water is considered a natural isotonic beverage, with a similar level of electrolytic balance as human blood. World War II medics in the Pacific often used the sterile coconut water directly from the nut for emergency plasma transfusions. It makes an excellent rehydration drink for diarrhea patients.

Young coconuts (between six and nine months old) contain about 750 ml of juice, known as coconut water. Coconut water contains about 4.5% solids, 4.0% of which is carbohydrates. It also contains about 0.020% calcium, 0.001% phosphorus and 0.500% iron. Concentrating has a minimal impact on the nutritional profile of the drink if processed in a correct manner, says Sundaresan.

"Plain coconut water has very little flavor impact of its own, which is actually a good attribute," continues Sundaresan. "It can be easily blended with other fruits and flavors to make interesting beverages and food products. If it is blended with other fruits and flavors, the flavor profile of the showcased fruit or flavor can be demonstrated while still maintaining a 100% juice profile with minimum caloric-load impact. The flavor one is trying to achieve is fairly easy because of the minimal flavor impact of the coconut water."