

Coconut

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Scientific Name and Introduction

Coconut (*Cocos nucifera* L.) is marketed at two stages of development. At an immature stage, the fruit (water coconut) contains mainly water and a little jellylike meat instead of the hard, white flesh (meat/endosperm) found in mature coconuts. In Thailand, and now marketed in the United States, immature green nuts are trimmed and shaped, removing most of the husk. The final product has a flat bottom, round body with a pyramid top, and the eyes showing. To prevent browning of the remaining husk, nuts are dipped in 1 to 3% sodium meta-bisulfite for 2 to 5 min and then wrapped in plastic film (Tongdee et al. 1991). Sometimes fungicide is included in the sulfite solution. Alternatively, the husk is removed before dipping in sulfite solution. Fruit are available year round from most tropical countries (Seelig 1970).

Quality Characteristics and Criteria

Major quality characteristics are maturity, size, and freedom from blemishes, cracking, fiber of husked coconuts, and wet or moldy eyes. Check for a sloshing sound for presence of coconut water in the nut. Coconut milk is obtained by removing and grating the hard, white flesh and squeezing out the milky juice. Immature, dehusked coconuts are about 10 cm (4 in) in diameter, weigh about 500 g (1.1 lb), have 100 g (3.5 oz) endosperm, 120 g (4.2 oz) shell, and 250 g (8.8 oz) water.

Horticultural Maturity Indices

Young coconuts are harvested 6 to 9 mo after flowering as they approach full size and the skin is still green (Consignado et al. 1976, Srivichai 1997) and the short stem (rachillae) on the top of individual coconuts that originally held the male flowers (“rat-tail” in Thai) becomes half green and brown. In immature nuts, the skin surface around the calyx (cap) on the top of the coconut is creamy white or a whitish yellow. When the area surrounding the cap is green, the coconut is considered mature and is 10 to 12 mo old. At maturity the skin begins to change from green to yellow, then brown, and the “rat-tail” is entirely brown.

Grades, Sizes, and Packaging

There are no specific grades; informal grades are generally based on size and weight. Mature U.S. dehusked coconuts are sold in 34- to 36-kg (75- to 80-lb) woven plastic or burlap sacks containing 40 to 50 coconuts, plastic mesh bags of 12 coconuts, and cartons with 20 to 25 film-wrapped coconuts weighing 17 to 18 kg (37 to 40 lbs). Immature coconuts (water coconuts) are shaped, dipped in bisulphate, and film-wrapped. They are sold in single-piece cartons containing 10 to 16 nuts. For young coconuts, the entire husk is removed, and the nuts are then dipped in sodium bisulfite before packing.

Precooling Conditions

Room cooling is generally used for mature husked nuts. Forced-air cooling and hydrocooling are acceptable. A rapid temperature change of 8 °C (14 °F) or greater can cause cracking.

Optimum Storage Conditions

Mature coconuts with husk can be kept at ambient conditions for 3 to 5 mo before the liquid endosperm evaporates or before the shell cracks due to desiccation or sprouting. Storage at 0 to 1.5 °C (32 to 35 °F) and 75 to 85% RH is possible for up to 60 days for mature, dehusked coconuts (Maliyar and Marar 1963), and 13 to 16 °C (55 to 60 °F) and 80 to 85% RH for 2 weeks or less. Low RH and high temperature should be avoided.

Young coconuts are normally held at 3 to 6 °C (37 to 43 °F) with 90 to 95% RH, while wrapped and shaped fruit can be held for 3 to 4 weeks. Shaped young coconuts treated with 0.5 to 1.0% sodium meta-bisulfite can be held at ambient temperature for 2 days before browning occurs, while those treated with 2% sodium meta-bisulfite can be held at ambient temperature for 2 to 7 days (Tongdee et al. 1992). Young coconuts that have not been dehusked can be stored for a longer period than dehusked or shaped young coconuts. In dehusked or shaped coconuts, soluble solids content (SSC) declines and total acidity (TA) increases more rapidly than in nondehusked coconuts. Thus, the taste of dehusked or shaped coconuts sours more rapidly than nondehusked coconuts during storage (Somboonsup 1985). The husk acts as an insulator and may increase the storage life of young coconuts.

Controlled Atmosphere (CA) Considerations

No data are available on CA storage. Mature dehusked coconuts are waxed or film-wrapped to reduce water loss. Immature husked nuts can also be film-wrapped or waxed; however, the outside color changes rapidly from white to brown unless they are dipped in sodium bisulfite (Tongdee et al. 1992).

Retail Outlet Display Considerations

Display coconuts at ambient temperatures and do not mist. Nonwrapped or individually wrapped shaped coconuts are displayed at ambient temperatures or at 10 °C (50 °F).

Chilling Sensitivity

When stored at 0 °C (32 °F), immature nuts have green skins that turn brown after 7 days. Few other changes occur in other quality characteristics at this temperature (Consignado et al. 1976).

Ethylene Production and Sensitivity

Ethylene production is very low to near zero for mature husked coconut. There are no reports of sensitivity to ethylene.

Respiration Rates

	<u>Temperature</u>	<u>mg CO₂ kg⁻¹ h⁻¹</u>
Immature	10 °C	7 to 8
	20 °C	13 to 24
Mature	10 °C	6 to 7
	20 °C	13 to 26

To get mL CO₂ kg⁻¹ h⁻¹, divide the mg kg⁻¹ h⁻¹ rate by 1.9 at 10 °C (50 °F), and 1.8 at 20 °C (68 °F). To calculate heat production, multiply mg kg⁻¹ h⁻¹ by 220 to get BTU per ton per day or by 61 to get kcal per tonne per day.

Physiological Disorders

Mechanical damage to immature coconuts will cause the white coir (the stiff fiber from the outer husk) to turn brown and the nut to crack. Younger nuts have a lower rupture force than mature nuts (Tongdee 1991). A rapid temperature change of 8 °C (15 °F) or more during storage of mature husked coconut can lead to cracking (Burton 1982), while freezing occurs at -3 °C (27 °F). Moisture loss causes a loss of water in the nut; this loss can be reduced by RH control, film wrapping, or waxing of mature nuts.

Postharvest Pathology

Superficial mold growth can occur on wet coconuts.

Quarantine Issues

There are no quarantine issues if the nuts are mature, have a dry husk, and are free of surface insects and soil. Some restrictions exist on the importation into certain tropical and subtropical countries from regions affected by palm diseases.

Suitability as Fresh-Cut Product

Meat from both immature (jellylike) and mature (hard) nuts is sold in trays with overwrap or plastic bags for use in desserts. Immature coconuts' jellylike meat and water have to be held at 3 to 5 °C (37 to 41 °F) to avoid spoilage. The jellylike meat and coconut water packaged in small plastic bags are frequently seen held on ice in Southeast Asian markets and roadside stalls. Nonshredded and shredded meat of mature coconuts is packaged in plastic bags for cooking and for use in desserts.

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