

The Coconut Palm in Florida¹

Timothy K. Broschat and Jonathan H. Crane²

- **Scientific Name:** *Cocos nucifera* Linn.
- **Family:** Arecaceae

ORIGIN

Comparatively little is known about the origin and early distribution of the coconut palm, probably because it was so widely spread throughout the tropical areas of the world so many years ago. It is believed to be native to the Malay Archipelago or the South Pacific.

DISTRIBUTION

The coconut is widespread throughout the tropics, typically being found along sandy shorelines. It has been spread largely by man but also by natural means. The fruit can float for long distance and still germinate to form new trees after being washed ashore. Commercial plantings are confined to the tropical lowlands, but it will also fruit in a few warmer subtropical areas. In Florida it is successfully grown from Stuart on the east coast and Punta Gorda on the west coast, south to Key West.

IMPORTANCE

The coconut is the most extensively grown and used nut in the world and the most important palm. It is an important commercial crop in many tropical countries, contributing significantly to their economies. The chief product is copra, the source of coconut oil used for making soap, shampoo, cosmetics, cooking oils and margarine. Much of the fruit is consumed locally for food. The coconut palm more than any other plant, gives a tropical effect to the Florida landscape. It is highly valued as an ornamental but is also grown on a limited commercial basis in Florida for coco frio, a refreshing drink made from the water inside green coconuts.

DESCRIPTION

Tree. Large single-trunked palm tree with a smooth, columnar, light grayish brown trunk, and topped with a terminal crown of leaves. Tall varieties may attain a height of 80 to 100 feet (24 to 31 m) while dwarf varieties are shorter in stature. The trunk is slender and often swollen at the base. It is typically curved or leaning, but is erect in some cultivars.

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2. T.K. Broschat, Professor of Environmental Horticulture, Ft. Lauderdale Research and Education Center, University of Florida, Ft. Lauderdale, FL 33314
Dr. Jonathan H. Crane, Professor and Tropical Fruit Crop Specialist, Tropical Research and Education Center, Homestead, FL 33031

Leaves. The pinnate leaves are feather-shaped, up to 18 feet (5.5 m) long and 6 feet (1.8 m) wide. The leaf stalks are 3 to 5 feet (0.9 to 1.5 m) in length and spineless.

Flowers. Male and female flowers are borne on the same inflorescence. The inflorescences emerge from canoe-shaped sheaths among the leaves and may be 2 to 3 feet (0.6 to 0.9 m) long and have 10 to 50 branchlets. Male flowers are small, light yellow, and are found at the ends of the branchlets. Female flowers are larger than male flowers, light yellow in color, and are found towards the base of the branchlets. Coconut palms begin to flower at about 4 to 6 years of age.

Fruit. Roughly ovoid, up to 15 inches (38 cm) long and 12 inches (30 cm) wide, composed of a thick, fibrous husk surrounding a somewhat spherical nut with a hard, brittle hairy shell. The nut is 6 to 8 inches (15 to 20 cm) in diameter and 10 to 12 inches (25 to 30 cm) long. Three sunken holes of softer tissue called "eyes" are at one end of the nut. Inside the shell is a thin, white, fleshy layer, about one inch thick at maturity, known as the "meat" or copra. The interior of the nut is hollow but partially filled with a watery liquid called "coconut milk". The meat is soft and jelly-like when immature but it becomes firm at maturity. The coconut milk is abundant in unripe fruits but it is gradually absorbed as ripening proceeds. The fruits are green at first turning brownish as they mature. Yellow varieties go from yellow to brown.

PRODUCTION

The coconut palm starts fruiting 6 to 10 years after the seed germinates and reaches full production at 15 to 20 years of age. It continues to fruit until it is about 80 years old with an annual production of 50 to 200 fruits per tree, depending on cultivar and climate. The fruits require about a year to develop and are generally produced regularly throughout the year.

CULTIVARS

Several cultivars of coconut palms are grown in Florida (Table 1). They differ in their petiole and fruit color, straightness (or crookedness) of the trunk, leaflet and leaf width, growth rates, presence or absence of a swollen trunk base or bole, adaptability to Florida's soil conditions, and resistance to lethal yellowing disease. The 'Jamaican Tall' (= 'Atlantic Tall') is a rapid-growing variety with a swollen trunk base and crooked trunk. It is well-adapted to Florida. The 'Malayan Dwarf' cultivar has three color forms that differ in the color of the immature fruits and petioles (green, yellow, or gold). It is smaller and slower-growing than the 'Jamaican Tall' and has a narrow straight, non-swollen trunk. The 'Panama Tall' (= 'Pacific Tall') is a large, robust palm with a large diameter crooked and swollen trunk, rapid growth rate, and either green or bronze-colored fruits and petioles. The 'Maypan' is a hybrid between the 'Malayan Dwarf' and the 'Panama Tall' and resembles the 'Jamaican Tall' in appearance.

The 'Malayan Dwarf' cultivar and the hybrid 'Maypan' have been widely planted in Florida because of their reported resistance to lethal yellowing (LY), a fatal disease of coconut palms in Florida and parts of the Caribbean region. Although these varieties were originally believed to be highly resistant to this disease, long-term trials in Florida have revealed that they are only slightly less susceptible than the 'Jamaican Tall's' they were intended to replace. The only cultivar in the United States that has been demonstrated in long-term studies to be resistant to LY is the 'Fiji Dwarf' (Niu Leka), a slow-growing variety with very broad leaves and leaflets. It can have either bronze or green fruits and petioles and has a very thick crooked trunk. It is well-adapted to Florida soils, but unfortunately is not yet commercially available.

PROPAGATION

Propagation is entirely from seed which are ready for planting if they produce an audible "sloshing" sound when shaken. The nuts are placed on their sides and buried to about one-half their thickness with sand or mulch. They may be planted in closely spaced rows in well-drained seedbeds or they

may be planted directly into large pots. Germination is best under high temperatures (90 to 100 degrees F). Upon germination, the shoot and root emerge through the side or one end of the nut. Young palms, about 6 months old, can be transplanted directly into the field or be grown in pots in the nursery for a few more years.

CLIMATE AND SOILS

The coconut palm is typically found along tropical, sandy shorelines since it can tolerate brackish soils and salt spray. However, salt is not required for the growth of healthy plants and they can be successfully grown well inland. Coconut palms grow well in a wide range of soil types, provided they are well-drained, and a wide pH range, from 5.0 to 8.0. Successful growth requires a minimum average temperature of 72°F and an annual rainfall of 30 to 50 inches or more. The trees may be injured by cold when the temperature falls below 32°F (0°C). They require full sunlight and are tolerant to wind and temporary flooding.

PLANTING AND SPACING

Coconut palms may be planted at any time of the year but the warm, rainy summer months are best. The trees can be successfully transplanted at any period in their growth, provided they are properly handled. Preplanting soil preparation depends upon soil type and depth of the water table. In low lying areas, beds several feet high and wide should be constructed to prevent waterlogging of the root zone during wet periods. In some areas a hardpan in the soil profile may need to be broken up and mixed with topsoil prior to planting. In the rocky calcareous soils of Miami-Dade County, rock plowing to a depth of 6 to 8 inches (15 to 20 cm) and trenching about 16 to 24 inches (41 to 60 cm) wide and 18 to 24 inches (45 to 60 cm) deep is recommended.

The tree should be set at the same depth at which it was growing in the container. The new tree should be watered immediately after planting and frequently thereafter until it is well established. A mulch applied to the soil surface around the tree will help retain soil moisture and restrict weed growth. Commercially, the trees are planted at spacings of 18 to 30 feet (5.5 to 9.1 m) apart. In home gardens, they should be planted

where they will receive full sun and not be crowded. At least 1 inch of water should be supplied weekly by rainfall or by irrigation, especially during the first year following transplanting..

ENVIRONMENTAL STRESSES

Drought: Coconut palms are tolerant of dry soil conditions. However, for optimum fruit production and quality, regular irrigation is recommended during dry periods.

Flooding: Coconut palms are tolerant of waterlogged or flooded soil conditions for a few days. However, trees may decline and die when exposed to prolonged flooding or waterlogged soils.

Cold temperatures: Coconut palms are injured by temperatures of 32 degrees F (0 degrees C), with desiccated foliage as the primary symptom. More severe freezes can also result in death of the bud. Coconut palms are not suitable for areas that regularly experience freezing temperatures.

Wind: Coconut palms are quite tolerant of windy sites and generally survive hurricane force winds. The most common damage from hurricane winds is loss of leaves and toppling over. If uprooted palms are righted promptly and adequately watered, survival of these palms is usually quite good.

Salt: Coconut palms are tolerant of saline water and soils, as well as salt spray.

Lightning: Lightning occasionally strikes tall coconut palms. Symptoms of lightning strikes include sudden collapse of the canopy, trunk splitting, and bleeding.

NUTRITIONAL PROBLEMS AND FERTILIZATION

Coconut palms in the landscape are susceptible to several nutritional deficiencies. Nitrogen (N) deficiency appears as a uniform yellowing of the oldest leaves, but can affect the entire canopy. Growth rate will be sharply reduced.

Potassium (K) deficiency is probably the most widespread and important deficiency of coconut palms throughout the world. Early symptoms occur

first on the oldest leaves as translucent yellow-orange or necrotic spotting. Necrosis of the leaflet margins, followed by leaflet tip necrosis will also become apparent. Symptoms increase in severity towards the tip of the leaf. In severe cases the trunk will begin to taper in diameter ("pencil-pointing") and new leaves will emerge chlorotic, short, and frizzled in appearance. Death often follows if immediate treatment is not given. The most effective treatment is sulfur-coated potassium sulfate broadcasted under the canopy at a rate of 1.5 lbs/100 sq. ft. of canopy area 4 times per year. Addition of 1/3 as much magnesium (Mg) at the same time will prevent a Mg deficiency from following treatment for K deficiency.

Magnesium deficiency appears as broad yellow bands along the outer edges of the oldest leaves in the canopy. The center of the affected leaves will remain distinctly green with this deficiency. It is usually treated with magnesium sulfate, preferably coated to reduce leaching losses.

Manganese (Mn) deficiency sometimes occurs on coconut palms, particularly in the spring months following a cold winter. Symptoms occur on the newest leaves, which emerge greatly reduced in size. They typically exhibit a singed appearance along the edges. Manganese deficiency can also be caused by fertilization or soil amendment with composted sewage sludges. Although Mn deficiency caused by cool soil temperatures is usually a short-lived problem, Mn deficiency caused by composted sewage sludges can be fatal if manganese sulfate is not promptly and regularly applied. For this reason, composted sewage sludges should not be used on any ornamental plants that are susceptible to Mn deficiency.

Boron (B) deficiency occasionally occurs on coconut palms, particularly during rainy weather, which leaches B through sandy soils. Symptoms include premature fruit drop and tip dieback on new leaves. Sometimes a sequential pattern of triangles will appear within a single new leaf as the palm alternately experiences B deficiency and sufficiency during leaf development. It can be treated with borax (sodium borate) or boric acid.

In order to prevent nutritional deficiencies from occurring or to correct mild deficiencies, regular maintenance fertilization with a "palm special" fertilizer is recommended. These fertilizers should contain N, P, K, and Mg in approximately a 2-1-3-1 ratio (e.g., 8-4-12-4). They should have all of their N, K, and Mg in a controlled release form to prevent rapid leaching of these nutrients through the soil and contain about 1 to 2 % Fe and Mn, plus trace amounts of Zn, Cu, and B. The most effective way to apply these fertilizers is with a rotary spreader, covering the entire soil area beneath the canopy of the palm (usually about 450 to 500 sq. ft.) A rate of 1.5 lbs of palm special fertilizer per 100 sq. ft. of canopy area every 3 months or 1 lb/100 sq. ft. every 2 months is ideal. In low rainfall areas or in areas having soils with high cation exchange capacities, rates and application frequencies can be reduced.

DISEASES

Lethal yellowing is the most important disease of coconut in Florida. Since it was discovered in Key West over 200 years ago, it has crept northward, killing hundreds of thousands of palm trees and endangering virtually all of the tall coconut palms in Florida. It is caused by a tiny organism called a phytoplasma that is visible only with the aid of an electron microscope. Early symptoms are premature dropping of coconuts and blackening of flower stalks. The leaves then turn yellow, beginning with the lower ones and progressing to the crown which dies and eventually topples from the tree. The tree usually dies within 6 months after exhibiting the first symptoms. Leaves of 'Malayan Dwarf' coconuts do not show the typical yellowing symptoms, but instead become wilted and turn brown before the bud eventually dies. Injection of an antibiotic (oxytetracycline) may result in remission of symptoms within 4 weeks but additional applications at 4 month intervals are required to keep the tree alive. Roguing and destruction of the infected palms and replacement with non-susceptible palm species is recommended.

Bud rot, caused by the fungus *Phytophthora palmivora* Butler, is found in all areas where the coconut palm is grown. Early symptoms, found on young developing leaves, are brown sunken spots, yellowing and/or withering. The leaves turn a light

grayish brown, becoming darker brown as they collapse at the base. The infection spreads inward to the bud and outward to surrounding leaves which turn yellow and fall. Young nuts fail to develop and fall but those well-formed before infection continue to mature. A very disagreeable odor emanates from the decaying bud. Both juvenile and adult trees can be affected. Disease development most commonly occurs after periods of heavy rains and is prevalent in poorly-drained sites. Once symptoms become visible, treatment is seldom successful. This disease can be prevented by periodic foliar sprays with fosetyl-Al (Aliette) or soil drenches with metalaxyl (Subdue). Palms showing advanced symptoms should be removed and destroyed since they may serve as a source of inoculum.

PESTS

A number of pests including several kinds of scale, palm aphid, spider mites, mealybugs, palm weevils and caterpillars are occasionally found but usually do not require control measures. Coconut scale occasionally may cause extensive damage and heavy infestations should be controlled by appropriate measures. Nuts showing constriction and/or a rough corky surface are infested with coconut mites. Current recommendations may be obtained from your local County Agent.

HARVESTING

Harvesting is done throughout the year. The time from fruit set to full maturity is about 12 months. The fruit should be harvested fully ripe for copra and dehydrated coconut. Drinking nuts should be picked earlier, at about 7 months. The nuts may be harvested by skilled climbers or may be cut from the ground, using a knife attached to a long pole.

USES

There are literally hundreds of uses for coconuts and their products. The meat of immature coconuts can be eaten with a spoon or be scooped out and made into ice cream. Coconut milk, abundant in unripe nuts, is a refreshing and nutritious drink. The meat in mature coconuts is firm and can be eaten fresh or may be used for making shredded coconut. The most important economic product is obtained by drying the

meat into copra which is pressed to produce coconut oil, primarily used in making soap and cosmetics. Coconut oil is also used for cooking and making margarine. The husk fiber is combed out and sold as coir, a material for making rope and coconut matting. Coir dust is an excellent substitute for peat moss in potting soils. The trunks may be used for building timbers and the leaves used for house thatching. The coconut palm has little commercial importance in Florida but is highly valued as an ornamental. It gives a tropical effect to the Florida landscape and provides fruit for home use.

Table 1. Coconut palm cultivars in Florida.

Cultivar	Type	Lethal yellowing resistance	Petiole and immature fruit color
Jamaica Tall	Tall	Very low	Green or bronze
Panama Tall	Tall	Rather low	Green or bronze
Malayan Dwarf	Semi-Dwarf	Rather low	Green, golden, or yellow
Maypan hybrid	Tall	Low	Green or bronze
Fiji Dwarf (Niu Leka)	Dwarf	High	Green or bronze

Table 2. Nutrient value of raw copra [100 g (3.5 oz)].

Constituent	Proximate value	Constituent	Proximate value
Water	47%	Calcium	14.0 mg
Calories	354 kcal	Iron	2.43 mg
Protein	3.3 g	Magnesium	32.0 mg
Fat	33.5 g	Phosphorus	113.0 mg
Cholesterol	0 mg	Potassium	356.0 mg
Carbohydrate	15.2 g	Sodium	20.0 mg
Total dietary fiber	9.0 g	Vitamin C	3.3 mg

Table 3. Nutrient value of coconut water [100 g (3.5 oz)]

Constituent	Proximate value	Constituent	Proximate value
Water content	95%	Calcium	24.0 mg
Calories	19 kcal	Iron	0.3 mg
Protein	0.7 g	Magnesium	25.0 mg
Fat	0.2 g	Phosphorus	20.0 mg
Cholesterol	0 mg	Potassium	250.0 mg
Carbohydrate	3.7 g	Sodium	105.0 mg
Total dietary fiber	1.1 g	Vitamin C	2.4 mg