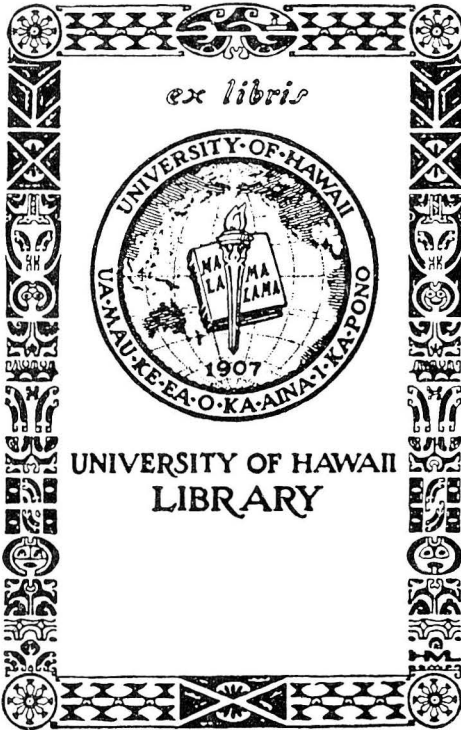


***COCONUT
As An
Ornamental***

Cooperative Extension Service
University of Hawaii
Circular 478

DONALD P. WATSON
Specialist in Horticulture



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THE AUTHOR

Donald P. Watson, Specialist in Horticulture, Hawaii Cooperative Extension Service, and Professor of Horticulture, College of Tropical Agriculture, University of Hawaii.

COCONUT AS AN ORNAMENTAL

In many tropical and subtropical areas, coconut trees (*Cocos nucifera*) are grown for the food they produce, and the varieties grown are based largely on fruit characteristics. In Hawaii, the tree is used primarily for its decorative value and is chiefly thought of as a tall or dwarf palm.

Tall coconut palms may attain a height of more than 80 feet and live as long as 90 years. They begin to bear 6 to 10 years after planting. Dwarf coconut palms rarely grow to be more than 25 feet and bear fruit a little sooner.

Frequently the dwarf types produce low quality coconut meat, so they are not good for commercial production of fruits. They are especially desirable for landscaping home gardens, where the buildings are low, the space is limited and the fruit is easily accessible.

Polynesians use the waxlike inflorescences, the sheaths that enclose the flowers, and the leaves for decorations.

HISTORY

Revelations 22:2 refers to the coconut as "the tree of life, which bears twelve manner of fruits, and yieldeth her fruit every month." Early Arabs and Europeans in the first half of the ninth century mentioned that travellers to China referred to the use of coir fiber and of toddy. Medieval writers called the coconut the Indian nut, a palm tree the frond of which produced a fruit as large as a man's head.

The genus name of coconut (*Cocos*) probably was derived from the Spanish word *coco*, used to describe a monkey's face, because of the three "eyes" at the base of the coconut shell.

Some scientists believe that the coco palm originated on the west coast of Central America, Colombia, Brazil and the West Indies. Others produce evidence that it came from the Indian Archipelago or Polynesia.

Whatever the origin, it is thought that, long before much transportation, the coconut was dispersed in the sea by ocean currents. More recently, however, experiments with the floating capacity of ripe coconuts have shown that, after several days of soaking in sea water, the husk becomes so saturated that eventually it sinks to the bottom of the sea. Yet nuts will float for up to 110 days, enough time to float 3000 miles and still maintain their viability.

According to Hawaiian legend, the coconut palm (niu) was brought from Kahiki (Tahiti) in a canoe along with taro and bananas by Apua

and Aukele, two brothers who lived on Kauai. They landed first at Puna on the Island of Hawaii and planted the first coconuts. Another legend says that the god, Kane, brought the first coconut to Hilo and planted it there to provide food for "earth children." These legends substantiate the idea that it was introduced instead of just floating ashore.

Today the coconut palm extends over most of the tropical regions of the world between the Tropic of Cancer and the Tropic of Capricorn. In areas where it extends farther from the equator (25°N in Florida; 27°S in South America), growth is not as rapid and the production of fruit is reduced.

It is not confined to the sea coasts. Some of the areas of the world with the highest acreages are: Indonesia, Malaysia, Ceylon, the Philippines, New Guinea, India, Thailand, Indo-China, Pacific Territories, East Africa and neighboring islands, Central America, West Indies, and West Africa.

World production of dried coconut meat (copra) is in excess of 3 million tons a year.

ECONOMIC VALUE

The coconut is one of the most valuable trees in the world. Of the 2000 species of palms, the coconut, date and oil palms are important to world economy. Most parts of the tree have economic values: Wood is used for cabinets, fish spears, and posts. Leaves are woven into screens, hats, baskets and fans and are used to thatch houses and for many types of decorations. Polynesians use the midribs of leaves for brooms, to hold flowers to string leis, and for pins. The sheath at the base of the stem of the leaf is woven into sandals and strainers. The shells of the nuts are used as containers and implements. They are made into charcoal, buttons, buckles, lamp stands and other ornamental souvenirs. Husks from the nuts are made into mats, brushes, stuffing, kindling, rope and braided cords.

Developing leaf buds are eaten raw. Sap from inflorescences is rich in sugar and is made into vinegar and wine. Coconut meat is valued for food for man and livestock, for oil, ointment, toiletries and artificial milk. Coconut milk (cream) is the milky juice expressed from the grated meat. The meat from undeveloped nuts is made into a custard pulp for baby food. Coconut water is a semiclear liquid poured from the nut and used as a drink.

The most important product is copra (dried coconut meat), from which oil is extracted for soap. Kernels of the mature nuts are used to make copra in the form of "balls" (whole shelled nuts) or "cups"

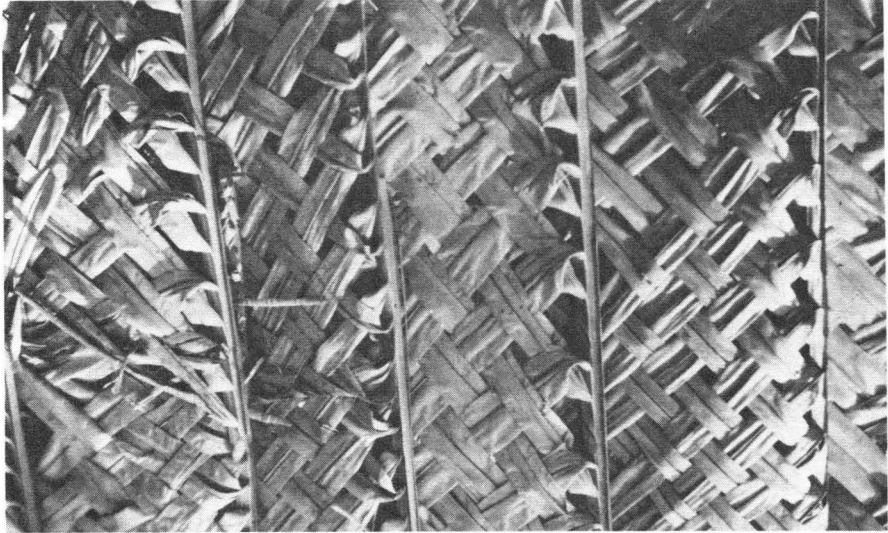


Figure 1. Woven coconut leaves.

(split nuts), both of which are dried in the sun or in specially constructed kilns. Desiccated coconut is prepared by shredding the meat and removing the moisture. "Trend-o-nut" is a trade name given to a product from Ceylon that is tenderized and treated with sugar and salt. All these forms of dried coconut are used in confections.

One hundred grams of coconut cream (ground ripe meat) contain:

| | | | |
|--------------|----------|---------------|-----------|
| Moisture | 53.90% | Calcium | 10.70 mg |
| Calories | 346 | Phosphorus | 122.10 mg |
| Protein | 4.28 gm | Iron | 2.28 mg |
| Fat | 34.68 gm | Thiamine | .030 mg |
| Carbohydrate | 5.99 gm | Niacin | .89 mg |
| Ash | 1.15 gm | Ascorbic acid | 2.80 mg |

Because of its well-balanced nutritive value, the coconut is also used with nutrient medium for growing plant tissues. The whole mature nut is used for reproduction of the plant.

GROWTH HABIT

A mature coconut palm is a tall stately tree. Its single unbranched and often artistically arched trunk is swollen at the base and crowned with several large fan-shaped pinnate leaves. The flowers and fruits are produced in the axils of the leaves. Polynesians believe that the coconut palm has spiritual life. They call this life force "mana" which causes it to grow and produce fruit.

Dwarf coconut palms, known locally as “Samoaan” coconuts, are small in stature. Whether they originated as a mutant of the tall coconut is not clear. Female flowers of the dwarf palms may be fertilized by male flowers on the same plant. As long as fruits are obtained from dwarf trees that are isolated from tall trees, the offspring will be dwarf. When there is a possibility of pollen from a tall coconut reaching dwarf female flowers, the offspring may vary all the way from its tall to its dwarf parent.

The coconut palm has shallow fibrous roots produced from the basal 2 feet (bole) of the stem. The extent of the root system will vary with the type of soil and growing conditions. Usually, the main roots are in the upper 3 feet of soil but extend 20 feet in a horizontal plane. They will not survive in water or waterlogged soil but are tolerant to the presence of some salt in the water.

The trunk begins to form when the leaves with pinnate leaflets appear, about 5 years after planting. It elongates as the leaves are produced and grows in diameter in relation to the vigor of the tree. Unlike many trees, the trunk is swollen at its base and its original diameter does not increase annually. Because it is a monocotyledon, it does not produce bark, cambium and wood in definite rings, so it



Figure 2. Dwarf coconut palms.

cannot repair a wound as do many trees. It cannot withstand severe injury to the layers of corky tissue.

The trunk is crowned with as many as 30 compound leaves (fronds) up to 20 feet in length. Each leaf is supported by a strong broad leaf stalk, the base of which clasps halfway around the trunk. In the center of the crown of leaves, several young leaves are packed into a large bud. These leaves replace the older lower leaves which turn yellow, die, and fall from the tree.

FLOWERS AND FRUIT

Inflorescences (flower clusters) may be green, yellow or red. One inflorescence inclosed in a sheath is produced in the axil of each leaf. The sheath breaks open along the underside, releasing a large white inflorescence. Along the main axis are as many as 40 lateral branches, each with up to 5 nutlike female flowers toward the base and up to 300 small male flowers toward the tip. The female flowers consist of six thick lobes tightly folded over the pistil. Abortive stamens emerge between the ring of lobes and the ovary. The male flowers consist of six stamens and six petallike lobes alternating in two whorls. When the anthers split, great quantities of pollen are shed over a 2-week period.

On tall trees, the female flowers are not usually receptive until after all the pollen is shed, so pollination is usually from a succeeding flower cluster or from another tree. On dwarf trees, self-pollination may occur because the timing of the male and female flowers may overlap. Fruits that result from this fertilization would therefore be likely to produce other dwarf trees.

Hawaiians recognize two kinds of fruits: the Niu Hiwa which is dark green and the Niu Lelo which is more common and yellow when ripe.

Normally, up to 70 percent of the immature fruits (buttonnuts) fall from the tree a few weeks after flowering. The remaining nuts grow rapidly, forming the husk and the cavity containing coconut water. Although it reaches its mature size in 6 months, it takes 9 or more months for it to be fully ripened. The nut is ripe if the water is heard sloshing around when the nut is shaken. A mature nut will weigh up to 6 pounds; as it ripens it will decrease in weight from water loss. Trees often bear as many as 50 fruits a year.

The fruit is enclosed in a sinewy buoyant husk composed of an outer thin smooth tough casing and a thicker hard fibrous layer. Inside this is the shell. On the widest of the three sections of the fruit are three eyes; two of which are hard and one soft. The sprout emerges from the soft eye.

Inside the shell is a thin dark-brown seedcoat attached to the white layer of coconut meat, with a peglike embryo embedded just inside the soft eye. The cavity contains coconut water when the nut is fresh but this is absorbed into the meat with age.



Figure 3. Inflorescence showing male and female flowers.

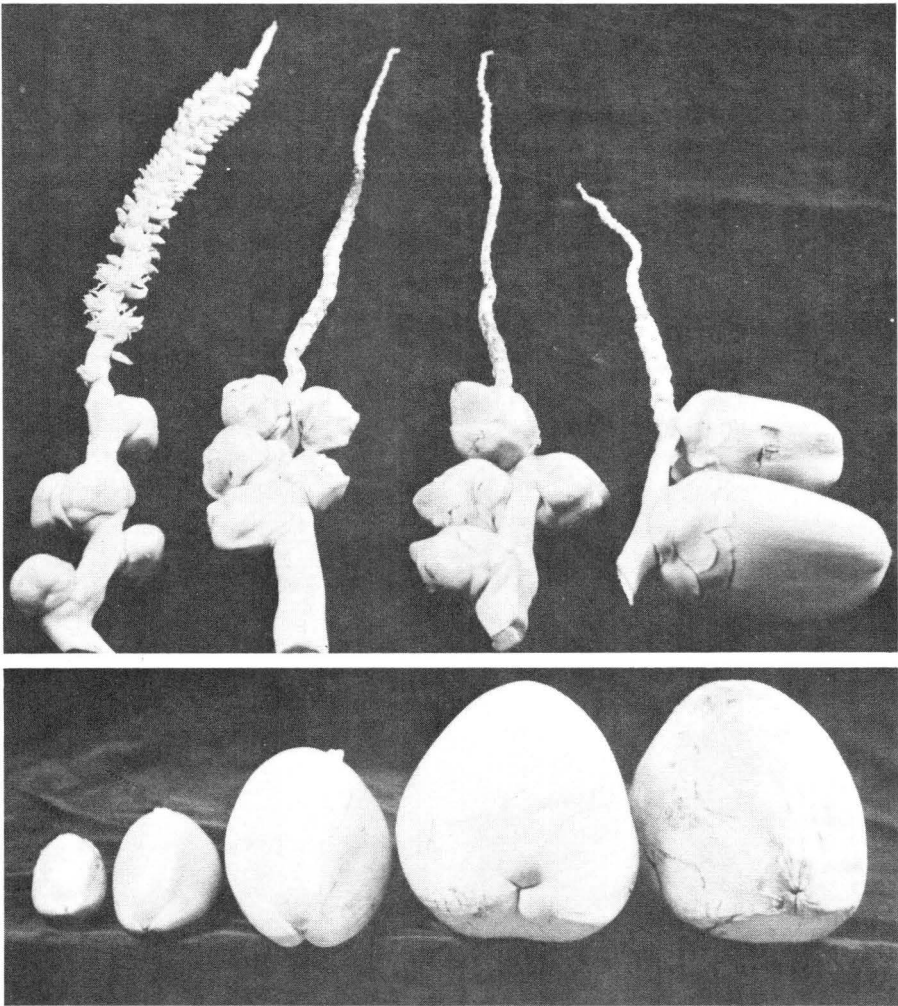


Figure 4. Stages in development of female flowers to mature fruit.

GROW YOUR OWN

Fruits fall from the tree when they are ripe. Often, if the soil is loose and the rainfall is sufficient, they will germinate and grow right where they land.

To germinate a nut, place it, husk and all, on its side in a shallow cavity in the ground; cover only the lower one-third with soil. Place the nut so it is in partial sunlight, and water thoroughly at least once a week. In a tropical climate, in about 3 months, the roots will push out through the husk and young entire leaves (without leaflets) will emerge from the cavity at the end that was attached to the tree.

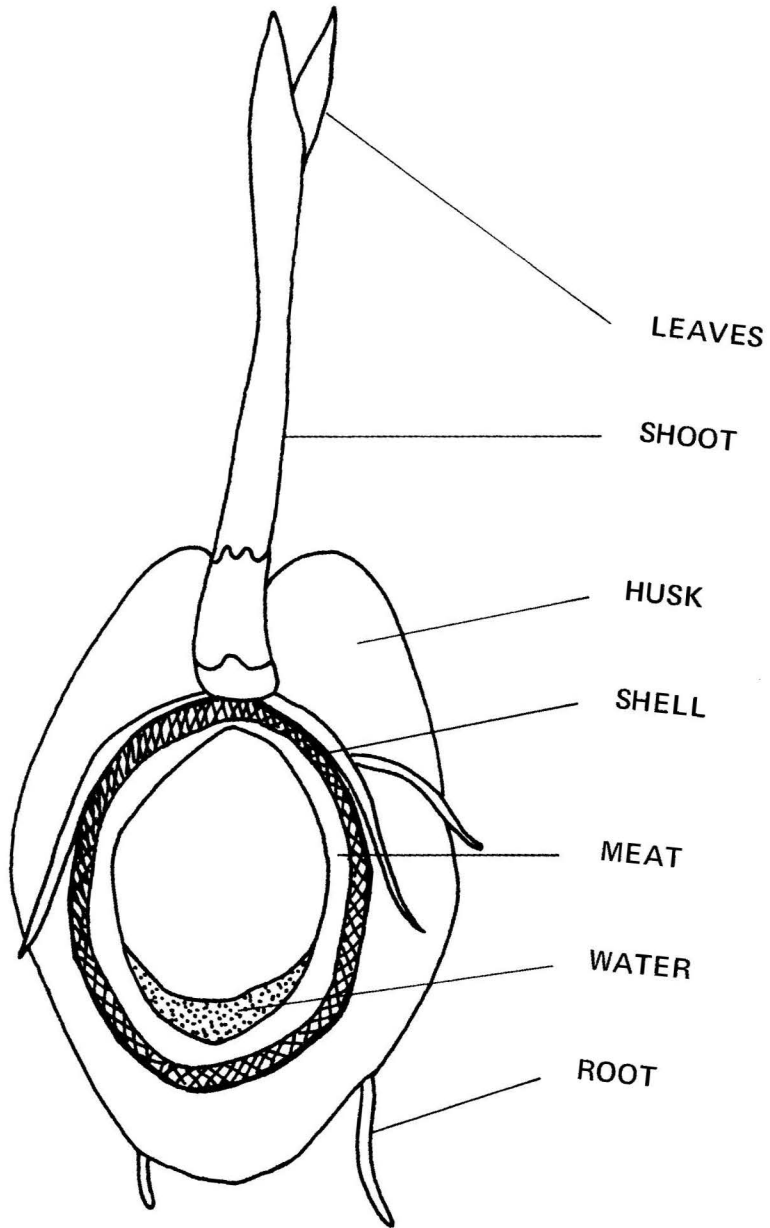


Figure 5. Parts of germinating fruit.

If the tree is to be used as a house plant, it may be germinated in a container that is twice the diameter of the nut. Soak the nut in water for a few days to help speed up germination. Although it may be placed on its side, a better shaped plant will result if the nut is placed pointed end down, so the leaves will emerge at the top. It will germinate faster when the temperature is 80 F and lots of water is available. Under artificial conditions, it may take as long as 6 months to send out its roots and young leaves. Although the palm will not grow indefinitely in a container, it will make a good house plant for a few years.

Polynesians believe that a man, a squid, and a coconut are different but interchangeable forms of the same life force. Therefore, the coconut should be planted with appropriate rites. The fruit is gathered when mature and placed in a cool damp place to sprout. On the day before the full moon, a shallow hole is dug and partially filled with mulch. Then, they go fishing to catch a squid. At midnight, the squid is placed on the mulch and the sprouted coconut on the squid with one hand, while the hole is filled with soil with the other hand. During planting, Polynesians talk to the god Kinolau within the coconut, telling it to grow big strong roots with the spread and grip of the squid, and big nuts fat like the head and body of the squid.

No present-day plant scientist could disagree with these directions: mulch to enrich the soil and organic fertilizer from the squid.

TRIMMING

To maintain the appearance of a coconut palm as an ornamental plant, remove the lower leaves as they turn yellow, and also the flower clusters or fruit. Although a carefully trimmed tree may not appear as ornamental as one that is laden with fruit, damage from falling fruit is the responsibility of the owner of the property on which trees are grown. Fruits falling from untrimmed trees may produce a disagreeable odor and litter.

Since one flower cluster forms in the axil of each leaf, and up to ten leaves grow every year, the tree may need trimming three times a year.

It is not difficult to remove the stems of the leaves and flower clusters from a young tree. With a saw, make a slanted cut close to the trunk so the water will run off the cut surface.

When the trees get tall, it is usually necessary to have the help of tree trimmers. To prevent injury to the trunk, professionals do not climb the tree with the aid of spiked shoes. Because of the expense



Figure 6. Before trimming.

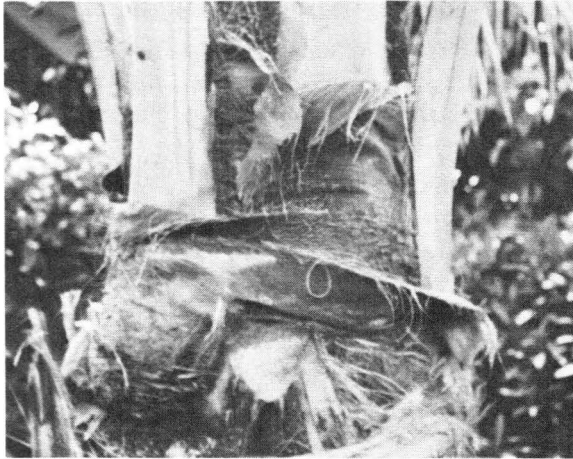


Figure 7. After trimming.

of this operation, trimming may be done less often than if you were doing it yourself.

Recent experiments have demonstrated that spraying inflorescences with ethephon or chloroflurenol after the female flowers were receptive to pollination caused most of the immature fruits to fall from the tree. These sprays did not apparently damage the rest of the tree.

A tree may be removed by cutting the trunk at the surface of the soil and leaving the root in the ground. The plant will normally not sprout again from the base, which eventually will decay.

FEEDING

Coconuts seem to thrive in fertile, porous soil where there is plenty of sun, breeze, and more than 60 inches of rain. The coconut is a perennial plant that continues to produce nuts and new foliage throughout its life, returning little residue to the soil. Few island homeowners follow a regular fertilizer program to provide coconut palms with adequate nutrition, as evidenced by the many light-green or yellow leaved trees. To maintain or restore soil fertility and insure vigorous growth, apply chemical fertilizer twice a year.

A soil analysis is the best method of determining soil deficiencies and recommended applications of fertilizer. The Coconut Research Institute in Ceylon has shown that benefits from regular feeding continue for 15 years after application.

Experiments have shown that coconuts respond to balanced fertilizer formulations containing nitrogen (N), phosphorous (P_2O_5), and potash (K_2O). Using a fertilizer with an analysis of 10:10:30 (plus minor elements), a mature coconut tree would require about 5 pounds of fertilizer in the spring and fall of each year. Young palms should receive lesser amounts, depending on their size and age. Broadcast the fertilizer over the area, extending from 2 feet beyond the trunk out as far as the tips of the leaves. Or apply it over the same area with a root tree feeder attached to the garden hose. Unless heavy rains follow, let the sprinkler run for an hour three times a week following fertilizer application.

In coarse-textured sandy soils, low in organic matter, addition of manure or compost and more frequent feeding with less fertilizer per application will reduce the danger of fertilizer being leached from the soil.

PEST CONTROL

There are many different pests of the coconut. Few insects and diseases reach epidemic proportions; therefore, they rarely require control measures. When one becomes serious, consult your local county agent to get it identified and learn the best method of control.

The following are a few injuries that are most common in Hawaii:

INJURY

Abnormally yellow leaves

Chlorosis is caused by lack of iron, other nutrients or scale insects.

Growing point destroyed

Grubs of the New Guinea sugarcane weevil (*Rhabdoscelus obscurus*) tunnel into the trunk, and the Tahitian coconut weevil (*Dio-calandra taitensis*) bores into leaf bases or petioles.

Bud rot

Bacterial bud rot (*Erwinia* sp., *Fusarium moniliforme*) and Phytophthora bud rot (*Phytophthora palmivora*) may infect the young leaves when wind and rain break the tender buds in the center of the cluster of leaves. This produces a strong odor and can cause death of the apical shoots.

Ragged or skeletonized leaves

Feeding of the larvae of the coconut leaf miner (*Agonoxema argaula*) or the coconut leaf roller (*Hedylepta blackburni*) causes a skeletonizing pattern on the leaves. In exposed windy locations the leaf roller lays eggs in the folds of leaf segments, and larvae web the leaflets together. They feed on the lower surface of the leaves. The upper surface dries up and disintegrates, leaving ragged leaves.

Rats

Rats can become a serious threat to coconuts. They chew holes in the nuts.

Scales

Injury to the leaves from coconut scales (*Aspidistus destructor* and *Pinnaspis buxi*) can be serious when infestation is heavy. The leaves turn yellow.

Stem bleeding

A red exudate oozing from the trunk, caused by *Thelaviopsis paradora*, enters through ruptures causing death by destruction of vascular tissues.

White cottony masses

Large populations of the coconut mealy bug (*Nipaecoccus nipae*) found mostly on older leaves, or (*Palmicultor palmarum*) found on the central young leaves in the growing point of the tree may injure the palm.

***Information on pest control was contributed by Wallace Mitchell, Professor of Entomology, and Albert Martinez, Specialist in Plant Pathology.**

CONTROL

Spray leaves with nutrient solutions; fertilize trees, or inject iron compound into the trunk. (For scale insects see below.)

The tachinid fly (*Lixophaga sphenophorii*) attacks the larvae of the New Guinea sugarcane weevil. Healthy trees often escape attack by these pests.

Place a small cheesecloth bag of copper sulfate crystals in the center of the new growth and allow the rain to dissolve them gradually.

In protected areas, parasites are more beneficial than spraying. Insecticides should be applied as a last resort in localized exposed areas.

Metal bands 18" wide are nailed around the trunk, and poison bait or traps are used.

Ladybird beetles, predators and parasites give effective control but insecticides may be necessary in localized areas.

No known complete control. Do not climb tree using shoes with spikes. Remove affected tissues and spray with copper sulfate.

Sprinkle granules of diazinon on the soil, or spray the trunks with chlordane monthly to kill the ants which protect the mealy bugs from beneficial predators and parasites.

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