

## Palm Diseases\*

LORNE A. McFADDEN

*Sub-Tropical Experiment Station, Homestead, Florida*

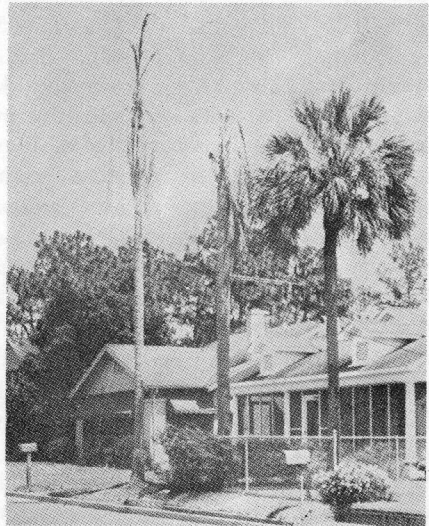
Once established, the palm tree is usually considered easy to grow and maintain and not especially subject to diseases. However, a wide variety of either parasitic or saprophytic organisms, including fungi, bacteria, nematodes and possibly viruses, occur on palms.

### *Diseases Affecting The Roots and Trunks*

*Butt rot of palms*—The butt rot disease, believed caused by the fungus *Ganoderma lucidum* (Leys.) Karst. (*G. sulcatum* Murr.) has been reported in Florida, Mysore, Burma, Malaya and the West Indies. The list of palms attacked by this fungus includes *Arecastrum Romanzoffianum* (Cham.) Becc., *Cocos nucifera* L., *Phoenix sylvestris* (L.) Roxb, *Serenoa repens* (Bartr.) Small, *Phoenix canariensis* Chab., *Sabal Palmetto* (Walt.) Lodd., *Arikuryroba schizophylla* (Mart.) L. H. Bailey, *Areca Catechu* L., and probably many others. In neglected palm plantings the disease spreads rapidly particularly when prompt attention is not given to removal of infected trees. Affected trees are often growing in areas surrounded by dense shrubbery or in wet, poorly drained locations. This disease is especially important since the pathogen usually attacks palms 10 years and upward in age. These trees are of great value in ornamental plantings (Fig. 34). Once the fungus invades the roots and trunk of a tree it becomes difficult or impossible to eradicate the disease.

First evidence of the butt rot disease

in affected palms is poor growth and vigor. The lower leaves turn yellow and die, hang down giving a general drooping effect. The newly formed leaves become progressively smaller until only a few dead leaves remain (Fig. 34). Progress of the disease may be slow,

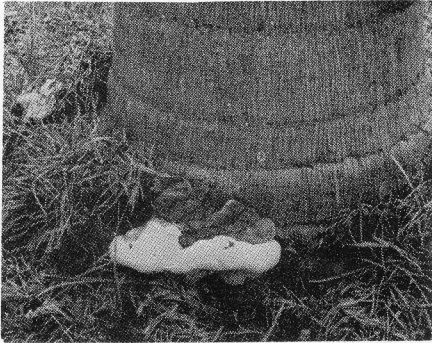


34. *Arecastrum Romanzoffianum*. Palms on left infected with butt rot fungus. Photograph by J. F. L. Childs.

requiring months or possibly years before the tree is finally killed. In the coconut palm the yield of nuts is reduced and an exudation or bleeding of a sticky, reddish-brown juice occurs near the base of affected trees. When cut open, the interior of the trunk is brown for several feet from the ground; the advanced margin of decay is yellowish in color and the rotted tissues emit a musty odor.

The fungus spreads through the soil from diseased to healthy roots and also by means of air-borne spores. The

\*Presented at the Palm Conference, Fairchild Tropical Garden, April 18, 1958. Florida Agricultural Experiment Station Journal Series, No. 881.



35. Trunk of a palm showing fruiting structures (sporophores) of *Ganoderma lucidum*. Photograph by J. F. L. Childs.

spores are borne in mushroom-like structures (sporophores) which grow out from the trunk and roots of diseased trees (Fig. 35). At first greyish and spongy, the sporophores later become hard with a brownish, lacquered upper surface. Mature spores of the fungus fall from the under surface and are disseminated by wind.

Control of the butt rot disease is difficult since the fungus is well established within the roots and trunk of the palm before visible symptoms appear. Root and trunk injury to palms should be avoided, as the fungus probably enters through such wounds. Susceptible palms should not be planted in damp locations or where shrubbery causes excessive shading. Infected trees including sporophores should be removed and burned. The application of fine sulfur to the soil around the trees was found helpful in Mysore (20). In addition, good drainage and sanitation are stressed.

*Phytophthora trunk rot*.—This disease was reported occurring in California (6) on several plantings of the native fan palm, *Washingtonia filifera* (Lind. ex André) H. Wendl. Leaves of affected trees rapidly die due to the rot that develops at or near the base of the trunk.

Within two to three months after infection the rot becomes soft and spongy. Young seedlings, when inoculated, were noted to die within 10 days. The roots of diseased palms are apparently not rotted. The causative organism is considered to be a water mold, *Phytophthora parasitica* Dastur, and infections are believed to occur through wounds under wet conditions.

*Trunk canker*.—A trunk canker of *Arecastrum Romanzoffianum* (Cham.) Becc. caused by *Penicillium vermoeseni* Biourge occurs in California. A leaf base rot of *Phoenix canariensis* Chab. and a bud rot of *Washingtonia filifera* (Lind. ex André) H. Wendl. are caused by the same fungus (2).

*Root rot*.—In Arizona, a root rot of *Washingtonia filifera* (Lind. ex André) H. Wendl. was observed in the Salt River Valley in 1935 (4). The leaves of affected palms die from below upward to the crown and finally the terminal bud dies. Diseased roots turn brown and become water-soaked. The cause of this disease is not known, although laboratory isolations suggested that a *Fusarium* fungus may be involved.

*Red ring*.—A disease of *Cocos nucifera* L. occurring in Brazil, Venezuela, Colombia, Panama, British Honduras and elsewhere is caused by a nematode, *Aphelenchoides cocophilus* Cobb. The nematodes feed in the periphery of the cortex of young palms, releasing a toxic substance which kills affected trees. The region in which large numbers of nematodes are actively feeding turns red-brown in color. Mature palms are not attacked by the nematodes. Infected trees should be removed and burned (11).

*Wilt and trunk rot*.—A disease occurring on *Cocos nucifera* L. and *Roystonea regia* (H.B.K.) O. F. Cook, at Ft.

Lauderdale and Key West, Florida, was briefly described in 1957 (19). Symptoms of the disease include wilting and greying of lower leaves, accompanied with a gumlike exudate along the trunk. When the trunk of an infected palm is split open the vascular tissues adjacent to the point of leaf attachment may be orange-red in color and brown longitudinal streaks are often evident on diseased fronds. The lower leaves wilt and die prematurely. Disease development is rapid, resulting in a complete breakdown of the interior trunk prior to death of the bud. Cause of the disease is not known. Although a *Xanthomonas*-like bacterium was isolated, its pathogenicity was not established.

#### *Diseases Attacking The Buds of Palms*

*Phytophthora bud rot*.—Coconut bud rot caused by *Phytophthora palmivora* Butler is one of the most destructive palm diseases. Its occurrence has been noted wherever palms are grown. Trees of any age may be attacked by this fungus.

During seasons of normal rainfall, bud rot is usually not serious. However, during wet seasons or after hurricanes this disease is frequently troublesome. This is probably due to mechanical damage which makes conditions favorable for the fungus to enter the bud; the fungus also is highly dependent upon water and wind for its dissemination. Small coconut seedlings under crowded, wet conditions in the nursery are at times killed by this fungus (17).

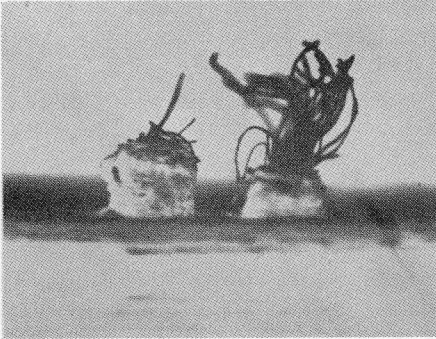
Symptoms of the bud rot disease include wilting, yellowing of the leaves and finally death of the terminal bud. Once the bud is killed the life of the palm is terminated. Infected bud tissues are quickly reduced to an odoriferous, gelatinous mass from which many saprophytic organisms may be isolated.

*Phytophthora bud rot* is also said to occur on *Borassus flabellifer* L. and *Areca Catechu* L.

*Bacterial bud rot*.—A disease first observed in the West Indies and Mauritius in 1913 on the royal palm and the areca nut palm is caused by a bacterial parasite, *Xanthomonas vasculorum* (Cobb.) Dowson. A bud rot of *Dictyosperma album* (Bory) H. Wendl. & Drude ex Scheff. has also been traced to the same cause. On royal palms the disease is characterized by wilting, yellowing and browning of the leaves which later become dry and brittle. Upon cutting open the cabbage leaves, the core area is found to be reduced to a vile-smelling soft rot. A yellow gumlike substance exudes from the vascular vessels when the fronds are cut. As the rot progresses, infected trees become top heavy and the crown falls over. On *Areca Catechu* L. the organism is less destructive. Diseased sections show a dappled pattern, as evidenced by the small brown areas in the affected tissues (15).

*Unknown diseases*.—In recent years considerable attention has been directed toward certain disorders of *Cocos nucifera* L. Throughout tropical and subtropical regions this palm is valued for the coconut crop and for its ornamental attractiveness in landscape plantings.

The cause of unknown disease of the northern Caribbean and bronze leaf wilt of the southern Caribbean and West Africa have not been directly associated with any recognized parasites. Likewise, the cause of *cadang-cadang* in the Philippines and a root disease of coconut palms in Southern India is not known. Both viruses and mineral deficiencies or excess have been under careful investigation in order to explain the above disorders but the true causes remain a mystery (12).



36. Enlarged profile view of *Graphiola phoenicis* on leaf of *Phoenix canariensis*. Photograph by A. P. Martinez.

Palms infected with unknown disease and bronze leaf wilt usually die within four to six months after the first symptoms appear. Yellowing of the outer fronds accompanied with nut fall occurs prior to death of the bud. Bronze leaf wilt causes an earlier leaf wilt and often the older nuts are not shed, whereas in the unknown disease the yellowing foliage remains turgid until the bud dies and all the nuts are shed. Bronze leaf wilt usually attacks older trees. When healthy palms are replanted in areas where the unknown disease occurred, they also become infected within two or three years.

Symptoms of *cadang-cadang* disease of the Philippines include yellowing of the crown and a gradual reduction in size of leaves and a tapering of the stem. Decline of infected palms is gradual prior to actual death.

An unknown disease of the coconut palm occurring at Key West, Florida, resembles in many respects the so-called lethal yellowing disease of coconut in Jamaica. Symptoms include dropping of fruit and a progressive yellowing and withering of the leaves. Affected trees should be removed and burned, since no other known treatment will arrest the disease. The disease has not been observed on the Florida mainland, al-

though danger of spread from the Keys area still exists.

The dwarf Malay coconut has been observed to show considerable resistance or immunity to the disease and widespread planting of this variety has been suggested.

#### *Diseases Attacking The Leaves of Palms*

Many fungi are associated with the various leaf spots on palms.

*Anthracnose*.—Several palm leaf and twig spots have been reportedly caused by the anthracnose fungi (*Colletotrichum*, *Gleosporium*, *Glomerella*) (7). Leaves and stem of fishtail palms (*Caryota* spp.) and others frequently become scorched or blighted due to numerous spots which coalesce causing entire leaflets and fronds to die. Elongated greyish spots with brown borders characterize the anthracnose diseases. Upon close observation, tiny black spore-producing structures are visible in the center of the spots. Under moist conditions rose-colored spores ooze out in mass and are splashed by rain to adjacent leaves. Nurserymen have experienced good control using frequent applications of either maneb or ferbam fungicides and by avoiding overhead watering when possible.

*False smut*.—Many species of palms, particularly *Phoenix dactylifera* L. and *P. canariensis* Chab., are susceptible to attack by the false smut fungus, *Graphiola phoenicis* (Moug.) Poit. Infected leaves contain numerous dark, scablike spots or warts with powdery brown or yellow centers. Under magnification, long flexuous sterile hyphae or threads may be seen (Fig. 36). Control of this disease is largely a matter of destroying infected leaves and spraying plants with a protective fungicide. Avoiding overhead watering and syringing helps prevent spread of the fungus spores (7).

*Leaf blight*.—The fungus *Pestalotia*



37. Container-grown palms in nursery. Plants on left dying from *Helminthosporium* leaf spot. Close spacing of plants and overhead irrigation provide excellent environment for the fungus. Photograph by A. P. Martinez.

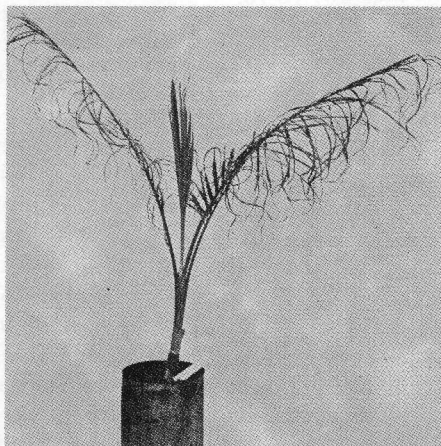
*palmarum* Cke. is reported to occur on leaves of *Cocos nucifera* L., *Arecastrum Romanzoffianum* (Cham.) Becc., *Howeia Forsteriana* (C. Moore & F. Muell.) Becc., *H. Belmoreana* (C. Moore & F. Muell.) Becc. and *Phoenix dactylifera* L. This fungus is not an aggressive parasite but usually causes leaf spots on old or weakened palms or palms growing under unfavorable conditions; young palms exposed to long periods of cold weather frequently develop leaf spots in large numbers (1), (8).

*Helminthosporium* leaf spot. — Leaf spots characterized by oval to irregular sunken spots having tan centers with a definite margin are caused by the fungus *Helminthosporium* (9). Seedlings of *Roystonea regia* (H.B.K.) O. F. Cook, *Arecastrum Romanzoffianum* (Cham.) Becc., *Howeia*, *Cocos nucifera* L., *Phoenix*, *Sabal* and *Thrinax* may be attacked. Under moist humid conditions and high temperatures the spots coalesce, forming large necrotic areas which may involve the entire leaf, killing the young palms (Figs. 37, 38, 39). Regular spray applications of either maneb or ferbam have given satisfactory control. Overhead irrigation should be prevented in so far as possible and removal

of dead leaves and debris is suggested. Proper spacing of young palms in the nursery also helps reduce disease incidence.

*Cylindrocladium* leaf spot.—A leaf spot fungus, *Cylindrocladium macrosporum* Sherb., was first described in Florida occurring on seedlings of *Washingtonia robusta* H. Wendl. The spots are numerous, round to oblong, small, dark in color with translucent borders. The surface of the spots is smooth except in moist or damp weather when they become covered with a thin whitish growth of the fungus. Spread and development of the disease occurs when moisture is present and where poor air ventilation exists, such as under greenhouse conditions. Control of the disease is largely a matter of providing the palms with good ventilation and keeping the leaves dry. (18).

*Exosporium* leaf spot.—A leaf spot common on many palms is caused by the fungus *Exosporium palmivorum* Sacc. The disease is usually found on plants grown under greenhouse or lath where insufficient light is provided. The



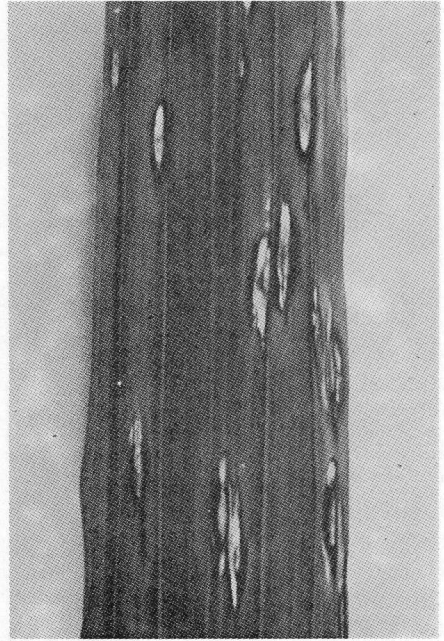
38. Royal palm showing outer leaves infected with *Helminthosporium* leaf spot while new leaf unfolding appears normal. Reproduced from *Principes* 2: Fig. 56.

spots are small, round, yellowish and transparent. These areas coalesce to form large irregular grey-brown blotches which may result in death of entire leaves. Severity of the disease may be reduced by removing infected leaves and spraying the foliage at regular intervals with a fungicide. Overhead watering of the foliage should be avoided whenever possible (7).

*Diamond leaf spot.*—Diamond leaf spot or diamond scale has been reported to occur in California. The causal fungus, *Sphaerodothis neowashingtoniae* Shear. produces elongated diamond-shaped black shiny pustules on the surface of leaves and leafstalks of *Washingtonia*. Affected leaves may live for several years but heavily infected trees eventually die. Diseased leaves should be removed and the plants sprayed with a good fungicide (7).

#### Literature Cited

1. Agarwalla, R. and H. K. Baruah. 1954. On the Biology of *Pestalozzia palmivorum* Causing Brown Spots on Coconut Palm Leaves. *Indian Science Congress Proceedings* 40: 75-76.
2. Bliss, Donald E. 1935. The Relation of *Penicillium vermoeseni* to a Disease of Ornamental Palms. *Phytopathology* 25:896.
3. Briton-Jones, H. R. 1940. *The Diseases of the Coconut Palm*. Bailliere, Tindall and Cox, London.
4. Brown, J. G. 1937. Root Rot of Washington Palm in Arizona. *Plant Disease Reporter* 21:374.
5. Childs, J. F. L. and E. West. 1953. Butt Rot of Queen Palms in Florida Associated with *Ganoderma sulcatum*. *Plant Disease Reporter* 37:-632-633.
6. Darley, E. F. and W. D. Wilbur. 1953. *Phytophthora Trunk Rot of*



39. Typical leaf spots on leaves of *Roystonea regia* caused by a species of *Helminthosporium*. Photograph by A. P. Martinez.

- Washington Palms. *Phytopathology* 43:469-470 (Abstract).
7. Dodge, B. O. and H. W. Rickett. 1943. *Diseases and Pests of Ornamental Plants*. pp. 454-459.
8. Guba, E. F. 1929. Monograph of the Genus *Pestalotia* De Notaris. *Phytopathology* 19:210-212.
9. Martinez, A. P. 1958. *Helminthosporium* Leafspot of Palms. *Principes* 2:105-106.
10. Martyn, E. B. 1945. Coconut Diseases in Jamaica (I) *Tropical Agriculture* 22:51-59.
11. Martyn, E. B. 1953. Red Ring Disease of Coconuts in Trinidad and Tobago. *Tropical Agriculture* 30:43-53.
12. Martyn, E. B. 1955. Diseases of Coconuts. *Tropical Agriculture* 32:162-169.

13. Menon, K. P. V., Nair, U. K. and K. M. Pandalai. 1952. Influences of Waterlogged Soil Conditions on Some Fungi Parasitic on the Roots of the Coconut Palm. *Indian Coconut Journal* 5:71-79.
14. Nagaraj, A. N. and K. P. V. Menon. 1955. Observations on Root Decay in Coconut, its Cause and Its Relation to the Foliar Symptoms of Disease in the Disease Belt of Travancore-Cochin. *Indian Coconut Journal* 8:97-105.
15. Orian, G. 1947. Bud Rot of the Royal Palm in Mauritius. *La Revue Agricole de l'Isle Maurice* 26:223-258.
16. Radha, K. and K. P. V. Menon. 1954. Studies on the Wilt (Root) Disease of the Coconut Palm. *Indian Coconut Journal* 7:99-106.
17. Seal, James L. 1928. Coconut Bud Rot in Florida. *University of Florida Technical Bulletin* 199. pp. 1-87.
18. Sherbankoff, C. D. 1928. Washington Palm Leaf Spot Due to *Cylindrocladium macrosporum* n. sp. *Phytopathology* 18:219-225.
19. Tammen, James. 1957. Wilt and Trunk-Rot of Palm. *State Plant Board of Florida, Twenty-first biennial report* (Volume II, Bulletin 11-A.):85.
20. Venkatakrishniah, N. S. 1956. *Anabe roga* of Coconut and Arecanut Palms Caused by *Ganoderma lucidum* and its Eradication. *Mysore Agricultural Journal* 31:227-231.
21. Venkatarayan, S. V. 1936. The Biology of *Ganoderma lucidum* on *Areca* and Coconut Palms. *Phytopathology* 26:153-175.

## NOTES ON CULTURE

*Continued from page 68*

*Coccothrinax, Euterpe, Geonoma, Reinhardtia, and Roystonea.*

Some species of palms are not known to produce seeds such as *Cyrtostachys Renda* var. *Duvivierianum*; certain species of *Areca*, *Coleospadix*, and *Pinnanga*; *Rhapis* palms; and perhaps a few others. These may be imported as plants. Horticultural varieties of palms which do not come true from seed may likewise be imported as plants. In this category would be our varieties of date palm which, incidentally, are subject to growing in postentry quarantine. Palm plants if permitted entry must conform to size and age limitations discussed elsewhere in this circular.

A large and varied assortment of palms is now established in the United States which should make it possible to get all material likely to be desired from a domestic source. Other desired species would be those which have not been introduced and are to be imported for study or trial by institutions staffed with competent specialists in the group. Wherever possible, botanical material of this category should be imported in the form of seeds either sprouted or un-sprouted.

In the importation of palm material, institutions should arrange this with a minimum of pest risk. Seeds or sprouted seeds would offer the least risk of pest introduction. Sprouted seeds would probably give the best results. To import seeds in the most viable condition they should be taken from fresh fruit. From these, the flesh and fiber should be rubbed off. It is our observation that the seeds will ship best if packed in about half their volume of slightly moistened sphagnum and wrapped in pliofilm or similar plastic moisture-proof cloth. It would be desirable to