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Gliocladium and Fusarium Diseases of Palms

DONALD R. HODEL

University of California Cooperative Extension, 2615 S. Grand Ave. Suite 400, Los Angeles, CA 90007

Diseases caused by the fungi *Gliocladium vermoeseni* (*Penicillium vermoeseni*) and *Fusarium oxysporum* are responsible for causing severe damage and death of several palm species common in the landscape. Species of the genera *Washingtonia*, *Arecastrum*, and *Chamaedorea*, are most severely affected by *G. vermoeseni* while *Phoenix canariensis* is severely affected by *F. oxysporum*.

F. oxysporum and *G. vermoeseni* have been isolated from mature trees of *Phoenix canariensis* in California that were exhibiting symptoms of wilt and dieback (Feather et al. 1980). This disease has become severe in southern California and in the San Francisco Bay-Sacramento areas of northern California. With *P. canariensis*, the older, mature leaves are attacked initially, reducing the crown to the young, emerging leaves in the center bud (Fig. 1). Diagnostic symptoms include the death of pinnae on one side of the leaf, vascular browning, and a black-brown dry rot of petioles and rachises. Pink pustules formed from spore masses may be encountered on the surfaces of petioles. Infected trees may live for several years or die in a matter of months (Feather et al. 1979, 1980). The vascular browning and death of pinnae are attributable to *F. oxysporum* while the dry rot and masses of pink spores are attributable to *G. vermoeseni*. Although both fungi may be associated with wilt and dieback of *P. canariensis*, it is felt that *G. vermoeseni* by itself is not usually lethal on these palms since the latter fungus has been found on *P. canariensis* for years without serious loss (H. D. Ohr, per. comm.). *F. oxysporum* has been isolated by itself from diseased *P. canariensis* growing in nurseries in inland desert areas of southern California. This indicates that *F. oxysporum* can occur on diseased trees without *G. vermoeseni* and that *F. oxysporum* can establish itself and cause disease in inland desert areas of southern California where *G. vermoeseni* has not been recorded (Bliss 1938, Feather et al. 1980). Study is necessary on the interaction that exists between the two fungi in the wilt and dieback of *P. canariensis*.

Studies have indicated that wilt and dieback of *P. canariensis* are transmitted from tree to tree almost entirely by mechanical means through the use of pruning tools (Feather et al. 1980). In California, it is a common practice by landscape maintenance firms to prune drastically the crowns of *P. canariensis* to 25% of their original canopy. This practice increases the time between prunings thereby saving labor costs. Unfortunately, this periodic pruning serves as an ideal method of transmitting the disease. To reduce the risk of spreading the disease during pruning of *P. canariensis*, it is advisable to disinfect pruning tools before pruning each tree. Flat-bladed saws rather than chain-saws should be used for pruning since the former are easier to clean. To disinfect, saw blades can be immersed in a solution of equal parts of household bleach (5.25% sodium hypochlorite) and water for at least 5 minutes (Feather et al. 1980). Evidence exists also that *Fusarium oxysporum* can attack *P. canariensis* from the soil through roots. For this reason, it is not advisable to replant

1. *Phoenix canariensis* infected with *Fusarium oxysporum*. The leaves in the lower two-thirds of the crown are dead leaving only the upper one-third of the crown with live leaves. Photo by H. D. Ohr.

P. canariensis in the same location where diseased trees were since the soil may harbor the fungus. Use of chemicals has so far proved ineffective in treating this disease (Feather et al. 1980).

Gliocladium vermoeseni alone has been reported to be pathogenic on several species of ornamental palms in Florida, Belgium, France, and California (see references cited). Certain species of the genera *Chamaedorea*, *Washingtonia*, and *Arecastrum* are the most severely affected. Other genera with species reported to be susceptible include *Archontophoenix*, *Chrysalidocarpus*, *Howea*, *Phoenix*, *Metroxylon*, *Daemonorops*, *Pelagodoxa*, and *Scheelea* (Bliss 1938). Diseases on these palms caused by *G. vermoeseni* have been commonly called pink bud rot or *Penicillium* rot. Bliss (1938) provides an extensive review of literature and unpublished data pertaining to *Gliocladium* disease of palms although some of the symptoms on diseased *Phoenix canariensis* that he attributes to *G. vermoeseni* are probably attributable to *F. oxysporum* as was discussed earlier.

Although *G. vermoeseni* may play only a minor or secondary role in wilt and dieback of *P. canariensis*, it appears to play a major role in serious disease of *Arecastrum romanzoffianum*, *Washingtonia filifera*, and *Chamaedorea seifrizii*. With the first two species of outdoor landscape palms, the fungus attacks the newer leaves initially and may progress downward into the center bud area killing the tree. Specimens infected by the disease can be recognized by the tremendous pink spore masses on diseased tissue and stunted and deformed leaves and terminal growth (Bliss 1938). However, attacks of *G. vermoeseni* are not always fatal. It is not uncommon to observe palms that have had the disease at one time but have recovered and have been left with some stunted or deformed leaves in an otherwise healthy crown. *G. vermoeseni* also causes cankers or lesions on trunks of *Arecastrum romanzoffianum*. These cankers or lesions are sunken, darkened areas having a dry, punky consistency. Beneath these areas are zones of moist, reddish-brown tissue where the fungus is active. These cankers are unsightly and may prove fatal if they progress to where they weaken the trunk causing it to break (Bliss 1938).

G. vermoeseni on these palms in California is restricted to the coastal climatic zones from the San Francisco Bay area to the Mexican border. It does severe damage in these areas but has not been noted from inland desert areas (Bliss 1938). The fungus seems to be most active in a climate that is cool and moist with high atmospheric humidity for a considerable portion of the year as is found in coastal California. Unfortunately, these cool, moist periods that are accentuated during the winter occur when the palms are growing most slowly. These environmental conditions favoring the fungus at the expense of the host enhance disease development.

2A–D. *Chamaedorea seifrizii* infected with *Gliocladium vermoeseni.* A, Early stage of infection indicated by circular necrotic areas on leaf base. B, Advanced stage of infection showing dark, sunken areas and hard, sappy exudate on basal portion of stem. C, Basal sucker killed by advanced infection. D, Close-up of basal sucker showing hard, sappy exudate and pink spore masses (lower right on leaf base) appearing as white specks. Photos by J. Pusey.

Diseased tissues should be removed and destroyed where possible since they serve as sources of wind-borne spores. Trunk cankers on *Arecastrum romanzoffianum* have been treated successfully by mechanical removal during their initial stages of development. The use of *Washingtonia robusta* as a substitute for *W. filifera* in costal areas is advocated since the former is quite resistant to *G. vermoeseni*. The use of chemicals against the disease on these palms has not been documented but sprays or drenches of the buds and crowns using benomyl in combination with mancozeb and chlorothalonil may prove beneficial as a preventive treatment.

Gliocladium vermoeseni causes a serious problem on palms of the genus *Chamaedorea*. Species affected include *C. seifrizii*, *C. erumpens*, *C. elegans*, *C. metallica*, and *C. tepejilote* (Atilano et al. 1980, Humphrey et al. 1984, Keim and Maire 1975, Reynolds 1964). It is extremely troublesome on *C. seifrizii* where it was first recorded in Florida in 1964 (Reynolds 1964) and in California in 1975 (Keim and Maire 1975). The disease is a common and serious problem in nurseries in both areas. In fact, it is unlikely that there are nurseries in either area growing *C. seifrizii* that are totally free of the disease. The disease is characterized by a leaf-sheath rot found mostly on the lower and basal portions of stems although it may be encountered on the upper portions of the stem also. In addition, it is not uncommon to find dark brown necrotic areas on pinnae or leaf bases of the oldest or lower fronds (Fig. 2A). These lower fronds will die prematurely resulting in a bare looking stem. The disease has a tendency to work its way up the stem from older fronds to younger fronds. Severe and/or advanced infections often move into the hard, pithy stem tissue behind or inside the leaf sheath and may eventually kill that stem (Fig. 2B). Infected stems may have reduced "breaking" or basal suckering, resulting in a spindly, empty appearing plant (Fig. 2C). A dark, sappy exudate emanating from diseased areas is often associated with advanced infections (Fig. 2D). Pinkish brown spore masses are usually abundant and visible on lower and basal leaf sheaths.

Disease development is favored by moist, humid conditions and temperatures from 65–85° F (20–28° C). In addition, cultural practices which wound the stem of *Chamaedorea* palms such as removal of yellowing yet not dead leaf sheaths seem to enhance disease spread and development (Atilano et al. 1980).

Cultural controls include providing for good air movement around the plants, lowering humidity, avoiding practices which result in splashing or dripping water on the leaves, and wherever possible and practical adjusting temperature regimes to a range unfavorable to the pathogen. Cultural practices which cause wounds should be avoided or modified to minimize injury to the host plants. Thorough spraying of foliage and drenching of basal stem areas at 7–14 day intervals with benomyl, benomyl and mancozeb, and/or chlorothalonil may prove beneficial in suppressing the disease (Atilano et al. 1980, Humphrey et al. 1984).

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