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Colletotrichum Leaf Spot of Red Sealing Wax Palm

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Introduction

Red sealing wax palm, *Cyrtostachys renda* Blume., is an unarmed, monoecious, clumping palm with glossy green leaves. The petioles and sheaths are yellow on young plants and turn distinctively red on mature plants. This attractive indoor tropical palm is relatively uncommon and generally commands high prices. In response to market demand, production of red sealing wax palm grown for export in Hawaii has recently expanded.

In l994, leaf spots were observed on hundreds of red sealing wax palms at a commercial nursery. Fungi that commonly cause palm leaf spots, such as *Bipolaris* and *Calonectria*, were not found to be associated with these spots. Instead, a *Colletotrichum* species was recovered from many of the diseased leaves. In the past, numerous *Colletotrichum* isolates were collected from various palm varieties in Hawaii and tested for their ability to cause disease, but none of them caused disease when applied to healthy palm leaves. Very little experimental work documents *Colletotrichum* as the cause of palm diseases, although the association or presence of *Colletotrichum* with leaf spots has been reported from many palm-growing areas in the world. *Colletotrichum* has been associated with leaf spots on *Phoenix roebelenii*, *Caryota mitis*, *Washingtonia* sp., *Paurotis* sp., and other palms. *Colletotrichum* is frequently saprophytic (i.e., nonpathogenic) and grows on dead plant tissue. Therefore, its isolation from or presence on a leaf spot may not mean that it caused the leaf spot.

This fact sheet reports the isolation of a new *Colletotrichum* strain in Hawaii, the establishment of its pathogenicity and thus its role as the cause of the disease, and the characterization of this new disease.

Symptoms and spread

Leaf spots on red sealing wax palm begin as small, water-soaked, dark green areas about 1–2 mm wide. These areas expand into circular spots with tan to light brown centers, bordered by water-soaked tissue (Figure 1). As the spots expand, lesion centers lighten to very light tan to cream color, with some spots developing brown margins around the centers. Most of the circular spots are 3–7 mm wide, and the size of the necrotic (dead) areas increases as spots coalesce (Figure 2). Large spots develop on young, expanding leaves.

Young leaves are highly susceptible, while older leaves are more resistant to the disease. As the leaf matures, the rate of lesion expansion slows. However, with adequate moisture, new spots continue to form, resulting in larger, older spots with black edges surrounded by numerous small spots and flecks. On mature leaves, these flecks do not expand, and large sections of the leaf become covered by hundreds of flecks. A general yellowing (chlorosis) of the entire leaf surface also occurs (Figures 3 and 4). Yellowing may also occur around individual spots.

Leaf petioles and sheaths are also infected. Typical spots are 5–10 mm long and brown to gray with dark brown to black borders.

Colletotrichum spores are produced on the surface of older diseased leaves and sheaths. These very tiny spores spread to healthy leaves when splashed by water. When leaves remain wet for at least 12 hours, the spores germinate and form a structure called an appressorium. The appressorium firmly attaches the fungus to the leaf. From the appressorium, an infection hypha is produced. This fungal hypha (or thread) penetrates the

Figure 1. Leaf spots caused by *Colletotrichum* on red sealing wax palm, 8 days after inoculation. Early symptoms include circular, tan spots with dark green edges and small spots with brown centers.

Figure 2. Leaf spots caused by *Colletotrichum* on red sealing wax palm, 16 days after inoculation.

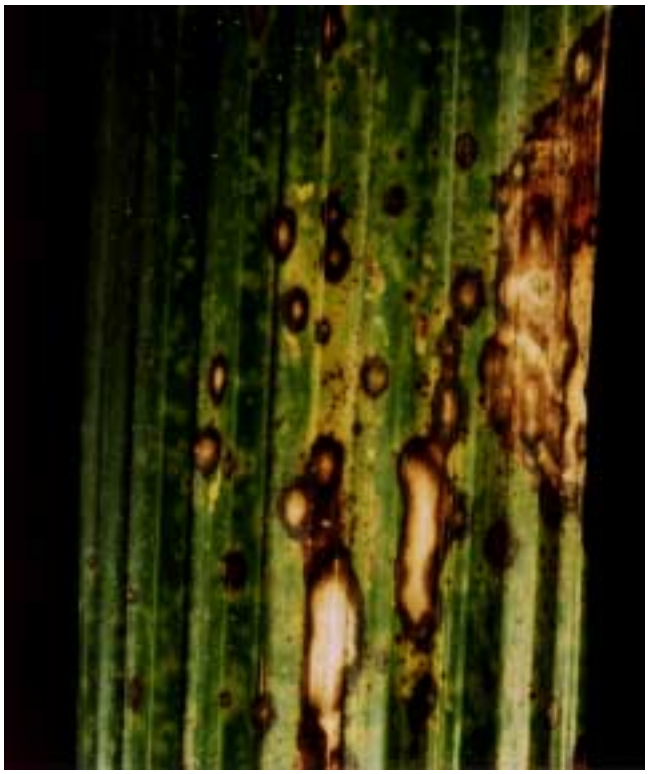
leaf surface, and fungal colonies are eventually formed in the leaf. This growth appears as brown leaf damage or leaf spots. The fungus is also spread by strong wind currents that dislodge spores from agitated leaves, by nursery workers handling diseased plants, and by movement of slugs or other pests. Trays, pots, tags, and other supplies can also be contaminated with spores of the pathogen.

Disease control

Efforts to control this and many other fungal diseases must begin with ***sanitation***. All dead and badly diseased leaves should be removed from the plant. Any infected sheath that can easily be separated from the stem should carefully be removed. For leaves with only a few spots, affected leaf sections or individual leaflets should be pruned. Infected plant debris should be gathered and dumped at county incineration sites or landfills. Potting soil from infected plants should be discarded. If the potting soil is reused, it must be steam-sterilized to eliminate the pathogen. Infected plants and contaminated soil are sources of spores that can initiate new disease outbreaks.

Moisture control is crucial to disease control. Limit overhead irrigation or moisture from rain. This will reduce spread of the pathogen, prevent germination of spores, and reduce development of new spots. If moisture is not controlled, new spots will form continuously, and there will be no breaks in the disease cycle. Dry weather will improve crop quality, but the disease will return when rain resumes.

Figures 3 and 4. Older spots and small blights on red sealing wax palm caused by *Colletotrichum*. Note the dark borders around these spots and the formation of numerous small flecks and spots.



In areas of Hawaii that are very wet during parts of the year, solid-covered greenhouses are strongly recommended. Foliar diseases such as those caused by *Colletotrichum*, *Bipolaris*, and *Cercospora* are greatly reduced and can eventually be eliminated on plants transferred and grown under solid cover. These fungi do not survive for long in the soil and are generally easy to manage once the disease cycle is broken.

Traditionally, diseases caused by *Colletotrichum* have been aggressively controlled by repeated applications of ***fungicides***. These chemicals prevent fungal germination and host penetration, reduce spore production, and interfere with fungal growth within the plant. Mancozeb fungicides, such as Dithane M45, will reduce disease levels but are less effective during periods of continuous rain. Good fungicide coverage of susceptible young leaves is needed to prevent disease. Cleary 3336 has been highly effective in preventing new leaf spots. However, methyl thiophanate fungicides must be rotated with other fungicides to prevent development of resistant *Colletotrichum* populations. The highest level of chemical control of disease is achieved when combined with sanitation and moisture-control practices.

If the palm crop is severely diseased with *Colletotrichum*, the following should be implemented:

- Remove all dead, severely diseased and heavily spotted leaves. Trim larger spots from leaves or remove leaflets on leaves with few spots. Remove sheaths which are spotted.
- Place the crop under solid cover or construct a rectangular frame to cover the bench with heavy, clear plastic to keep the foliage as dry as possible. The frame should be at least 3 feet high. This plastic covering should primarily cover the top of the frame and the sides should be kept open, otherwise humidity levels will be too high.
- Increase the spacing between plants to allow good air circulation.
- Apply fungicides to protect new leaves. As new leaves are produced, remove older leaves that have

any signs of disease (flecks, small spots, yellow areas).
- Continually monitor the crop and remove leaves with spots as soon as they appear.

Other palms

Chrysalidocarpus lutescens (golden palm), *Chamaedorea seifrizii* (bamboo or reed palm), *Howeia forsterana* (Forster sentry or kentia palm), and *Rhapis excelsa* (lady palm) were also tested. No disease or a few small spots developed following inoculations with the new *Colletotrichum*.

***Colletotrichum* biology and implications**

In laboratory culture, the *Colletotrichum* species that attacks palms produces spores that are slightly larger than those observed for many isolates of *C. gloeosporioides*. However, they still fall within the size range given for *C. gloeosporioides*. Further studies are needed to determine whether the palm pathogen is a new species.

There are frequent reports of dark fruiting bodies found on older spots or in the center of leaf spots on palms. These fruiting bodies are identified as those of *Glomerella cingulata*, the sexual stage of *Colletotrichum gloeosporioides*. However, *C. gloeosporioides* is an extremely common saprophyte and quickly invades dead tissue created by other pathogens. Spores produced by *Glomerella cingulata* are called ascospores and are discharged into the air. Thus, the fungus is rapidly distributed throughout any greenhouse or field. *Glomerella* ascospores that land on diseased leaves germinate and produce fungal mycelia (threads) that feed on the dead leaf tissue. Within a week or two, the fungus will produce *Colletotrichum* spores on the surface of the dead leaf. Later, the dark fruiting bodies of *Glomerella* are produced. *Colletotrichum gloeosporioide*s and *Glomerella cingulata* are different names for the same fungus. The former name refers to the asexual stage, and the latter refers to the sexual stage.

Our studies of several diseases caused by *Colletotrichum* have demonstrated that isolates of *C. gloeosporioides* producing the *Glomerella* sexual stage are *not* the causal agents of disease, even if this fungus is easily and often isolated from diseased tissue. Thus, unless pathogenicity tests are conducted, any *Colletotrichum* species isolated from various palm diseases should not be assumed to be the pathogen. Finding the *Glomerella* stage in older lesions does not strengthen the assumption that *Colletotrichu*m is the causal agent.

To date, the *Glomerella* stage for the pathogenic *Colletotrichum* isolated from red sealing wax palm has not been produced in culture or on the host. Spores of *Colletotrichum* are readily found on infected palms, but dark fruiting bodies have not been observed. If and when this stage is found, the type or species of *Colletotrichum* it produces needs to be determined. Nonpathogenic strains of *C. gloeosporioides* could easily grow on tissue killed by the pathogenic *Colletotrichum*.

The same situation exists for other diseases caused by *Colletotrichum*. The *Glomerella* stage of pathogenic *Colletotrichum* from anthurium, basil, and orchids has not been observed on old host tissue or in culture. All *Colletotrichum* isolated from these hosts that produce the *Glomerella* stage have been tested and are not pathogenic.

The term "anthracnose" is commonly used to describe diseases caused by *Colletotrichum*. In palms, it has also been applied to leaf spots on seedlings irrespective of the associated fungi, which include *Botryodiplodia*, *Leptosphaeria*, and *Melanconium*. To avoid confusion, we have not used the term "anthracnose" here.

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