



# Hawai'i Landscape Plant Pest Guide: Plant Diseases

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## Algal Leaf Spots

Algal leaf spots in Hawai'i are caused by two species of filamentous green algae, *Cephaleuros virescens* and *Cephaleuros parasiticus*. The diseases may occur where plant foliage is often wet due to rain or irrigation or in areas with high relative humidity. Species of *Cephaleuros* occur commonly on leaves of tea (*Camellia sinensis*), kava (*Piper methysticum*), pepper (*Piper nigrum*), magnolia (*Magnolia grandiflora*), coffee (*Coffea arabica*), oil palm (*Elaeis guineensis*), avocado (*Persea americana*), vanilla (*Vanilla planifolia*), mango (*Mangifera indica*), breadfruit (*Artocarpus altilis*), guava (*Psidium guajava*), coconut (*Cocos nucifera*), cacao (*Theobroma cacao*), and some citrus (*Citrus* spp.) cultivars.

## Symptoms

- Circular, velvety patches of brownish-orange algal bloom on upper leaf surfaces (*C. virescens*).
- On guava, fruit spotting and leaf spots surrounded by yellow halos (*C. parasiticus*).

## What to Do

- Sanitation: Remove spotted leaves; prune affected, low-hanging branches; collect and discard fallen leaves.
- Pruning: Prune overhanging trees around diseased plants.
- Reduce plant stress: Keep plants well fertilized. Improve soil drainage.
- Fungicides: Some fungicides will provide control. The Bordeaux mixture is commonly recommended.
- Weed control: Keep weeds around affected plants under control.
- Interplant very susceptible hosts with less susceptible hosts.

## More Information

- “*Cephaleuros* Species, the Plant-Parasitic Green Algae”: <http://www.ctahr.hawaii.edu/oc/freepubs/pdf/PD-43.pdf>



Algal leaf spot of magnolia.



Algal fruit and leaf spot of guava.



Algal leaf spot of avocado.

## Anthracnose

*Anthracnose* is the name given to a group of diseases caused by different fungi that affect the foliage and fruits of important fruit species such as mango, avocado, papaya, banana, and many other plants. Anthracnose diseases are most severe in high-rainfall locations in Hawai'i. Although damage to plants is not fatal, the disease is unsightly and can destroy fruits and flowers, reducing yields significantly.

### Symptoms

- Sunken spots on fruits, often appearing after harvest ripening. These spots are usually dark in color and often develop a salmon-colored mass of sticky spores within. The spots may form a teardrop array on fruits in association with draining rainwater.
- Small to large brown, black, or tar-like spots on leaves and flowers.
- Death of young shoots; defoliation; cankers on twigs, branches, or trunks.

### What to Do

- Apply registered fungicides to protect flowers and young fruits from infection.
- Refrigerate fruits after harvest; consume ripe fruits promptly.
- Pick up fallen fruits; rake leaves and twigs.
- Interplant non-susceptible plants.
- Control weeds, improve soil drainage, and otherwise reduce relative humidity.
- Prune plants to increase sunlight penetration and air movement within plant canopies.
- Avoid wetting foliage when irrigating.

### More Information

- “Anthracnose of Avocado”: <http://www.ctahr.hawaii.edu/oc/freepubs/pdf/PD-58.pdf>
- “Mango Anthracnose (*Colletotrichum gloeosporioides*)”: <http://www.ctahr.hawaii.edu/oc/freepubs/pdf/PD-48.pdf>



Mango anthracnose (fruit).



Mango anthracnose (inflorescence).



Avocado anthracnose.



Papaya anthracnose.



Cacao anthracnose.

## Bacterial Leaf Spots and Blights

Bacterial leaf spots and blights in Hawai'i are caused by various genera of plant-pathogenic bacteria, including *Pseudomonas*, *Acidovorax*, *Xanthomonas*, and *Erwinia*. Such diseases are favored by rainy weather and foliage that is frequently wet for several hours.

### Symptoms

- Leaf spots, ranging in color from brown to charcoal black, sometimes showing hydrosis or water soaking of infected tissues. The spots may be surrounded by yellow halos and have well-defined, angular margins defined by leaf veins.
- Blackened veins.
- Leaf blight, sometimes appearing at leaf margins and associated with hydathodes.
- Premature defoliation.

### What to Do

- Remove spotted and blighted leaves; prune the affected low-hanging branches; collect and discard fallen leaves.
- Avoid sprinkler irrigation that impacts leaves of susceptible plants.
- Prune overhanging trees around diseased plants to increase sunlight penetration and air circulation.
- Grow susceptible plants in sun, not in the shade.
- Reduce plant stress: Keep plants well fertilized. Improve soil drainage.
- Keep weeds around affected plants under control to reduce relative humidity and to promote the drying of wet leaves.
- Interplant very susceptible and less susceptible hosts.
- Avoid planting symptomatic plants.
- Grow seedlings under cover to protect from rainfall.

### More Information

- “Bacterial Leaf Blight of Panax (*Polyscias guilfoylei*)”: <http://www.ctahr.hawaii.edu/oc/freepubs/pdf/PD-75.pdf>
- “Bacterial Leaf Blight of Aglaonema”: <http://www.ctahr.hawaii.edu/oc/freepubs/pdf/PD-64.pdf>
- “Bacterial Leaf Spot of Hibiscus in Hawai'i”: <http://www.ctahr.hawaii.edu/oc/freepubs/pdf/PD-72.pdf>
- “Bacterial Leaf Blight of Fishtail Palm”: <http://www.ctahr.hawaii.edu/oc/freepubs/pdf/PD-65.pdf>



Bacterial leaf spot of hibiscus.



Bacterial leaf blight of fishtail palm.

Below: Bacterial leaf blight of aglaonema; far left, bacterial leaf blight of panax; middle: bacterial leaf blight of syngonium.



## Black Spot of Rose

Black spot, caused by the fungus *Diplocarpon rosae*, is a common disease in Hawai'i where susceptible roses grow with foliage that remains wet for prolonged periods from rainy, cool weather or sprinkler irrigation.

### Symptoms

- Black spots with feathery margins on upper leaf surfaces and stems
- Leaf yellowing, browning, curling, and defoliation.

### What to Do

- Plant only top-quality, disease-free plants of resistant varieties. Use wider plant spacing in areas with high rainfall or high relative humidity. Choose rootstocks and scions well adapted to Hawai'i's conditions.
- Select planting sites in open, sunny locations. This allows air circulation to enhance leaf drying within canopies. Avoid planting near windbreaks.
- Practice strict sanitation: Collect and compost or bury diseased and fallen leaves; remove severely infected leaves from plants.
- Prune canes periodically to improve aeration in the canopy and remove sources of spores.
- Maintain plant vigor. Fertilize according to recommendations.
- Avoid working with plants when the foliage is wet to reduce the transfer of spores from plant to plant.
- Avoid wetting foliage by sprinkler irrigation, or if this is impossible, irrigate during morning hours so the foliage can dry during the day.
- Destroy wild, abandoned, or unwanted roses that serve as sources of fungal inoculum.
- Control weeds and provide good soil drainage to reduce relative humidity in the plant canopy.
- Periodically apply preventive or curative fungicides to prevent new infections or to arrest symptom development.

### More Information

- "Black Spot of Rose in Hawai'i": <http://www.ctahr.hawaii.edu/oc/freepubs/pdf/PD-80.pdf>



Black spot appears as black spots or patches with feathery margins on the upper surface of leaves and stems.



Spots may coalesce to form blighted areas. Leaves may turn yellow.



Severe spotting may cause leaf death and premature defoliation.

## Cankers

Cankers are sunken areas of dead tissue or splits in the bark or epidermis of branches, stems, or trunks of woody plants, caused mainly by plant-pathogenic fungi or bacteria and by physical injuries.

### Symptoms

- Foliage on affected branches wilts and turns brown or black. Branch dieback in the upper canopy is often the first noticeable symptom of a canker disease.
- Sunken areas on bark, with a sharp margin between healthy and diseased tissue, sometimes associated with stem bleeding (oozing sap).
- Girdling or death of stems, branches, or entire trees.

### What to Do

- Plant landscape species that are well adapted to the local environment in well-drained soils.
- For safety, prune away dead or dying branches, as they may dislodge and fall. Make pruning cuts within the healthy wood, away from the diseased wood. Remove and destroy the pruned branches.
- Avoid using sprinkler irrigation that impacts plant stems.
- Avoid over-irrigation, and move drip irrigation emitters progressively farther from plant stems over time.
- Moderate applications of slow-release fertilizers may improve the health of infected plants, but avoid over-fertilization.
- Maintain optimum plant vigor by using recommended practices for nutrition, pruning, and irrigation for each tree or plant species.
- Avoid transmitting canker pathogens between plants on pruning shears.
- Remove dead or dying trees and destroy them.



Branch canker on mango showing internal branch necrosis and gummosis.



Stem bleeding of a shower tree canker caused by *Phomopsis* sp. and internal stem necrosis.



Stem cankers may consist of longitudinal splits in the bark (here, *Acacia koa*).



Stem canker of rose.



*Phomopsis* stem canker of a shower tree, associated with over-irrigation.

## Coconut Heart Rot

In the 1970s, a severe disease of coconut trees caused by *Phytophthora katsurae* was found on Kaua'i. Infected trees usually died within one year. During the 1980s, the disease was also found on O'ahu, Maui, and Hawai'i. It is common in some landscapes and resorts on these islands, especially in windward areas. The pathogen spreads during windy, rainy weather; infects the crown of the coconut plant; and kills the youngest leaf first. This symptom may appear within several weeks of a large storm event.

### Symptoms

- The initial and diagnostic symptom is the death of the youngest leaf on the plant. This upright leaf turns brown quickly. By this stage in the disease progress, it is too late to save the plant.
- Nut drop and nut rot.
- Leaf and plant death. The tops of diseased plants may fall off, leaving a bare, standing stem.
- Internal stem necrosis, from the crown of the plant to its base.

### What to Do

- In locations where the disease occurs frequently, protect plants periodically with a registered pesticide labeled for *Phytophthora* on coconut.
- It is possible to improve the health of coconut plants by periodically (at least once or twice per year) drenching the root zone or injecting plant stems with a liquid fertilizer product containing phosphorous acid. Note, however, that injections of coconut stems create wounds that do not heal and may allow the entry of other pathogens.
- Disinfest pruning tools between coconut trees.
- Pick up and destroy fallen nuts with symptoms.
- Completely remove and destroy dead and dying coconut plants.
- Interplant coconut with other palm species to reduce disease transmission.

### More Information

- "A New *Phytophthora* Fruit and Heart Rot of Coconut": <http://www.ctahr.hawaii.edu/oc/forsale/RES138.pdf>



The youngest leaf, brown and dead, is the diagnostic symptom for coconut heart rot.



Internal stem necrosis at the crown of a diseased coconut.



Internal stem necrosis at the base of a coconut tree with heart rot.

## Herbicide Injury: Glyphosate

Products containing glyphosate are the most popular herbicides in Hawai'i. They are used in a wide variety of settings from landscapes to farms. However, when they are used in excess or on non-target plants, unintentional injury may result.

### Symptoms

- Abnormal stem proliferation (also known as witches' broom)
- Leaf narrowing, production of strap-like leaves
- Reduction in leaf size
- Leaf chlorosis (yellowing), complete or between veins
- Leaf distortion (curling, wrinkling)
- Retarded vertical stem regrowth after pruning
- Plant stunting.

### What to Do

- Train herbicide applicators to mix and apply herbicides in accordance with herbicide label instructions (the label is the law).
- Avoid herbicide contact with foliage of non-target plants. Do not spray on windy days.
- Control grassy weeds before they produce seeds to minimize their spread.
- Use a spray shield to help contain overspray.
- Encourage non-climbing, low-growing nitrogen-fixing ground covers around landscape plants.
- Apply composts and mulches around plants to inhibit weed growth (but keep mulches and composts away from contact with woody stems).
- Use string trimmers or mowers instead of herbicides to control weeds, or weed by hand.
- Use alternative herbicide products instead of glyphosate.
- Do not exceed the recommended dosage of glyphosate in spray applications.
- If climbing or tall weeds cover landscape plants, do not spray the plants with glyphosate; remove them by hand.
- Prune low-hanging branches away from ground before applying glyphosate.

### More Information

- "Glyphosate Herbicide Injury to Coffee": <http://www.ctahr.hawaii.edu/oc/freepubs/pdf/PD-56.pdf>



Glyphosate herbicide injury to a pruned shrub: witches' broom.



Glyphosate herbicide injury to a coffee seedling: foliar yellowing and witches' broom with narrow, strappy leaves.

## Leaf Spots

A variety of different fungi and algae, some bacteria, and certain viruses, along with nutrient deficiencies and pesticide injuries, cause spots or holes in leaves. These unsightly problems normally may not cause significant harm to plants, but when severe they can cause blight and defoliation.

### Symptoms

- Spots on leaves, varying in color, size, and texture. Affected tissue may fall out, leaving holes or a tattered appearance.
- Similar symptoms may be caused by some insects or mites or may have non-parasitic causes.

### What to Do

- Obtain a correct diagnosis. This will help you identify the pathogen and select the best pesticide.
- Remove fallen leaves and debris promptly. Prune out and dispose of severely infected leaves to reduce the spread of disease.
- Avoid sprinkler irrigation or adjust sprinklers to avoid wetting foliage. Avoid wetting the foliage late in the day—leave enough time for wet leaves to dry before sunset.
- Reduce relative humidity around affected plants by controlling weeds, improving soil drainage, and pruning plants to increase air flow in the canopy.
- Plant susceptible species in full sun; avoid growing them next to windbreaks.
- Grow resistant varieties. Avoid planting symptomatic plants.
- Ensure that plants receive adequate fertilizer. Some leaf spot diseases caused by *Cercospora* can be avoided or minimized with adequate nitrogen and potassium.
- Diversify the landscape so that like plants are not grown adjacent to each other.



Leaf spot of papaya caused by *Asperisporium caricae* is a common landscape pest that can also attack papaya fruits.



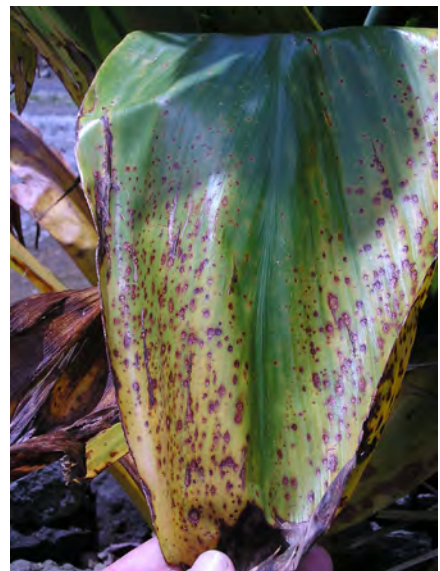
Palms suffer from a variety of different fungal leaf spot diseases.



A fungal leaf spot disease of hibiscus.



Leaf spots of spider lily, although small, may coalesce to form blight and cause defoliation.



Leaf spot of ti, caused by the fungus *Cercospora* sp., is associated with under-fertilized plants.



## Powdery Mildews

Powdery mildew diseases are caused by many species of fungi. Some of these fungi are host-specific, while others have wider host ranges. Powdery mildews tend to occur in dry but humid weather where warm days are followed by cool nights. They do not require moisture on plant surfaces for infection or reproduction.

### Symptoms

- Powdery white growth appears on leaves, shoots, flowers, and fruits.
- Some hosts show stunting, distortion, discoloration, and necrosis of the young, terminal growth.

### What to Do

- Avoid planting susceptible species or cultivars; replace severely affected plants with resistant cultivars.
- Grow plants in full sun; prune plants to improve air circulation and to increase light penetration, as the disease is favored in shady, humid environments.
- Avoid excessive fertilization or irrigation, as these practices stimulate susceptible new plant growth (young tissues can be more susceptible).
- Collect and compost or bury diseased and fallen leaves; remove severely infected leaves from plants.
- Apply fungicides periodically and in a timely fashion to protect highly susceptible plant species. Effective products include neem oil, horticultural oils, wettable sulfur, potassium bicarbonate, and some other synthetic fungicides. Always read the label to see if the product is registered for use on the intended plant.
- Destroy infected wild, abandoned, or unwanted plants that serve as sources of fungal inoculum.

### More Information

- “Mango Powdery Mildew”: <http://www.ctahr.hawaii.edu/oc/freepubs/pdf/PD-46.pdf>
- “Powdery Mildew of Poinsettia”: <http://www.ctahr.hawaii.edu/oc/freepubs/pdf/PD-87.pdf>



Powdery mildew of *Haplostachys haplostachya* leaves.



Powdery mildew can affect common landscape fruits such as papaya and mango.



Powdery mildew of poinsettia foliage.



Powdery mildew of snowbush (*Breytia nivosa*) leaves.



Powdery mildew of mango.

## Planting Too Deeply

When some trees are planted too deep in perpetually wet or heavy soils, roots may suffocate and the bark at the base of the stem may rot. The health of such trees declines gradually over several years as opportunistic soil fungi attack the root and stem tissues.

### *Symptoms*

- Branch dieback
- Leaf yellowing, defoliation
- Basal stem canker and rot; stem girdling at soil line
- Root rot
- Unthrifty growth; tree death.

### *What to Do*

- Ensure that when transplants of fruiting trees are placed into prepared holes, the 1st lateral root appears at or just below the soil surface. Some trees suffer disease symptoms when planted even 1" too deep.
- To ensure that transplants do not sink within transplant holes over time, do not dig the holes too deeply, and do not compensate for a hole that is too deep by filling the bottom of the hole with very loose soil.
- Avoid over-irrigation and over-fertilization of newly transplanted fruit trees. When they are planted too deep, the wet conditions allow the stem bark to rot and become girdled, eventually causing plant death. The irrigation can also destroy soil structure by dispersing clay particles, leading to insufficient root aeration. Too much fertilizer can burn plant roots and tender stem tissues, causing them to rot.
- If transplant soils are heavy, with high clay content, aerate the soil in the transplant hole with cinder, compost, and sand before planting.
- Where young fruit trees are planted too deep, dig away the soil around the stems to expose the first lateral root.
- Do not allow mulch placed around trees to contact the stem. As mulch composts, it generates heat that may injure stems and lead to stem decay.



Dieback of shower tree planted too deeply in resort landscape.



The bark of stems may girdle when planted too deeply and over-irrigated.



Longan, lychee, and some other landscape fruit trees may exhibit chlorotic, unthrifty foliage.



The 1st lateral root should be at ground level, not 2" or more beneath the soil surface.



Internal stem necrosis of a fruit tree planted too deeply.

## Root Knot

Once established in soils, root-knot nematodes (*Meloidogyne* spp.) are virtually impossible to eradicate, and the damage they cause to plants can be significant. The common foliar symptoms of root knot resemble those of certain plant nutrient deficiencies.

### Symptoms

- Knots and galls on roots
- Root cracking and rot
- Plant stunting, unthrifty growth, and dieback
- Yellow leaves
- Poor fruit and vegetable yield.

### What to Do

- Do not assume plants only need fertilizer and water, when in fact those can make the problem worse: Diagnose the disease by inspecting roots for galls.
- Do not install nematode-infested fill soils at a new site; test the soil first for *Meloidogyne* spp. at a diagnostic laboratory.
- Grow *Meloidogyne*-resistant plant varieties where possible; consult CTAHR.
- Do not transplant symptomatic plants; discard them.
- Do not start new seedlings in untreated soils. Kill nematodes in potting soils by applying heat (at least 122°F for 15 minutes).
- Composts inhibit plant-parasitic nematodes in a number of ways; apply to soils and planting beds.
- Grow French or African marigolds to kill or repel root-knot nematodes in planting beds.
- If possible, graft susceptible plants onto *Meloidogyne*-resistant rootstocks.
- Avoid over-irrigation and over-fertilization of plants.
- Do not replant susceptible species in an infested area.
- Chemical nematicides in landscapes are not a viable management option.

### More Information

- “‘Awa Root-Knot Disease”: <http://www.ctahr.hawaii.edu/oc/freepubs/pdf/PD-20.pdf>
- “Managing Coffee Nematode Decline”: <http://www.ctahr.hawaii.edu/oc/freepubs/pdf/PD-23.pdf>
- “Noni Root Knot, a Destructive Disease of *Morinda citrifolia* in Hawaii”: <http://www.ctahr.hawaii.edu/oc/freepubs/pdf/PD-27.pdf>
- “Root-Knot Nematodes on Cucurbits in Hawai'i”: <http://www.ctahr.hawaii.edu/oc/freepubs/pdf/PD-84.pdf>



Root knots and galls on a root system, the diagnostic symptoms.



Root knot, caused by *Meloidogyne* sp.



Knots and galls can appear on roots at the soil surface.



Severe galling can develop on susceptible plants.

## Root Rots

Soil-borne plant-pathogenic fungi in wet or poorly drained soils usually cause the root rots seen in Hawai'i landscapes. These diseases can significantly diminish plant growth and be fatal to severely affected plants.

### Symptoms

- Discolored, sparse root systems; root decay
- Plant stunting and wilting; yellowed or brown foliage; defoliation; branch dieback
- Poor rooting strength: Plants are easily uprooted by hand, and stems wobble easily in soils when grasped and shaken back and forth.

### What to Do

- First obtain an accurate diagnosis of the disease and pathogen. When you see a wilting or yellowing plant, for example, do not assume that it only needs water or fertilizer—which, if added, can only worsen a root rot disease.
- Drench the soil around affected plants with a registered pesticide labeled for the disease. This can save some plants.
- Inspect all transplants for discolored roots; do not plant if they have root rot.
- Ensure planting sites have well-drained, well-aerated soils. Add cinder and compost to heavy soils for better drainage and aeration.
- Avoid over-irrigation and over-fertilization; both can cause or lead to root rots. Move irrigation emitters progressively farther away from plant stems over time to encourage extensive root exploration of the soil.
- Avoid planting in low-lying areas or where rainwater drains through a property.
- Avoid moving pathogen-infested soils to new locations. Clean soil from tools, clothing, and vehicles between locations.
- Break up soil hardpans during site preparation. Do not use bulldozers to scrape weeds from sites, as this displaces topsoil and exposes hardpans.



*Dodonea viscosa* ('a'ali'i) tree with *Phytophthora* root rot.



Leaves of coffee with *Pythium* root rot may flag or droop downward.



Roots of severely affected trees are black, and stems may rot.



Foliage of Chinese pine seedlings with *Rhizoctonia* root rot is brown.



Brown roots of Chinese pine seedlings with *Rhizoctonia* root rot.

## Rusts

Rust diseases occur on many plants in Hawai'i, including shrubs, trees, and herbaceous plants. Rusts are named for the color and appearance of yellow, brown, or orange powdery spore masses produced on infected hosts. Rust fungi tend to have restricted host ranges. In some cases weeds, as alternate hosts, are involved in the pathogen life cycle. Rusts occur commonly during cool, rainy weather. Rust fungi are obligate biotrophs: They must have a living host plant to complete their life cycles.

### Symptoms

- On broadleaf hosts, small brown to orange pustules are visible on the undersides of leaves, with corresponding yellow spots on the upper leaf surface.
- On some hosts such as *Acacia koa*, witches' brooms can form.

### What to Do

- Grow resistant varieties.
- Plant in a sunny location; prune plants to improve air circulation.
- Avoid overhead sprinklers or overhead irrigation, which can spread rust spores and provide leaf wetness needed for infection.
- Compost or bury diseased and fallen leaves; remove severely infected leaves.
- Prune and destroy witches' brooms and severely diseased shoots and branches.
- Fungicides are generally not recommended for control of rust diseases. Most ornamentals can tolerate low levels of disease. For high-value plants or where disease is severe, rotate among fungicides with different modes of action to prevent development of resistance.
- Destroy infected weeds and unwanted plants that are sources of fungal inoculum.

### More Information

- "Plumeria Rust": <http://www.ctahr.hawaii.edu/oc/freepubs/pdf/PD-46.pdf>
- "Kweilingia Rust of Bamboo": <http://www.ctahr.hawaii.edu/oc/freepubs/pdf/PD-74.pdf>
- "Rusts of *Acacia Koa: Atelocauda digitata*": <http://www.ctahr.hawaii.edu/oc/freepubs/pdf/PD-63.pdf>
- "Plumeria Rust": <http://www.ctahr.hawaii.edu/oc/freepubs/pdf/PD-61.pdf>
- "Rust of Lemongrass": <http://www.ctahr.hawaii.edu/oc/freepubs/pdf/PD-57.pdf>
- "Rust of Ko'olua 'Ula (*Abutilon menziesii*)": <http://www.ctahr.hawaii.edu/oc/freepubs/pdf/PD-31.pdf>



Abutilon rust



'Ōhi'a rust



Plumeria rust



Rust of beach heliotrope



Rust of lemongrass

## Stem Bleeding (Gummosis) of Palms

This disease is caused by stem wounding in the presence of the soil-borne plant-pathogenic fungus *Chalara paradoxa* in a moist environment.

### Symptoms

- The diagnostic symptom is a conspicuous black stain coming from a hole or wound and seeping down the stem.
- There is a soft, slowly expanding stem decay that blackens with age.
- Darkly pigmented liquid bleeds down the trunk from the point of infection, covering the stem surface with a black layer of fluids.
- A cavity may develop beneath the affected area.
- Over a period of years, the fungal invasion of the interior stem can rot the stem entirely, causing plant decline and death.
- Basal stem invasion may occur in wet areas, producing a black collar of diseased stem tissue at the plant–soil interface.
- Roots may be blackened and decayed.

### What to Do

- Avoid wounding palm trunks at all stages of growth and maintenance or during their harvest and transport for installation in a landscape. Do not drive stakes into palm trunks to secure them to trucks.
- Avoid contact of wounded palm stems with soil.
- Do not install sprinkler irrigation emitters that spray water on coconut trunks.
- Avoid using spikes to climb the palms for pruning; avoid unnecessary pruning.
- For early infections, chisel or scrape out the rotten portion. Treat wounded or infected areas with fungicide and tar (for example, Bordeaux paste, mancozeb, or copper oxychloride), followed by sealing with coal tar two days later.
- Palm species susceptible to *Chalara paradoxa* are *Areca catechu*, *Brahea edulis*, *Caryota* spp., *Cocos nucifera*, *Elaeis guineensis*, *Phoenix africanus*, *Phoenix canariensis*, *Phoenix dactylifera*, *Raphis* sp., *Roystonea elata*, *Sabal palmetto*, *Sygarus romanzoffina*, and *Washingtonia filifera*.

### More Information

- “Stem Bleeding of Coconut Palm”: <http://www.ctahr.hawaii.edu/oc/freepubs/pdf/PD-30.pdf>



Stem bleeding of coconut palm.



Stem bleeding of coconut palm.



Stem bleeding of coconut palm.



Stem bleeding of coconut palm: interior decay of stem.