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Palm Diseases in the Landscape

Integrated Pest Management for Home Gardeners and Landscape Professionals

Several major, potentially lethal diseases can attack landscape palms in California (Figure 1). The best strategy for managing these diseases is an integrated approach that combines prevention, exclusion, sanitation, appropriate species selection, and proper care. Selecting the right palm for the right spot, then planting and caring for it properly, are critical to avoid most diseases or help palms recover from some diseases.

Maintain healthy, vigorous palms through appropriate selection and cultivation.

- Select the right palm for the right place.
- Plant and transplant palms correctly.
- Follow appropriate irrigation practices.
- Apply a specialized palm fertilizer—one high in nitrogen and potassium with half as much magnesium as potassium—following label rates and directions.
- Keep turfgrass, groundcovers, shrubs, and weeds at least 2 feet away from the trunk, and maintain mulch several inches deep over this area.
- Apply mulch.
- Minimize pruning and other cultivation practices that can wound palms.
- Avoid using chain saws and tree spikes, because they can spread inoculum and cause wounds.
- Use straight-edge, manual saws, thoroughly disinfect blades before use on each palm, and prune out and appropriately discard of infected material and palms.
- Don't recycle or chip infected material for use as mulch, because it might contain and spread the pathogens.

Figure 1. Palm diseases often lead to a reduced leaf canopy. From top left: California fan palm with diamond scale; Canary island date palm with Fusarium wilt; California fan palm with petiole blight.

Even if you inherit a poorly adapted or managed palm, providing proper care can significantly reduce the chances for disease development and help reduce disease severity. Prevention is usually better than treating a disease after it develops, and in some instances, it is the only option. Use fungicides only as a last resort.

Table 1 provides quick identification of the major palm diseases discussed in this publication. Table 2 lists common palms in California, their botanical names, and their resistance or susceptibility to these diseases.

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DIAMOND SCALE

Despite the name, diamond scale is not an insect pest. Instead the fungus *Phaeochoropsis neowashingtoniae* causes this common foliar disease, which derives its name from its characteristic black, diamond-shaped fruiting bodies.

Hosts

Diamond scale attacks primarily the California fan palm in coastal regions and the intermediate and interior valleys of California subject to marine influence; it rarely occurs in arid regions such as the Central Valley or the deserts of Southern California.

Diamond scale can occur on hybrids of the California fan palm with the Mexican fan palm, and the incidence and severity usually are proportional to the amount of California fan palm in the hybrid. Diamond scale has not been observed on pure Mexican fan palm or any other palm species in California.

Symptoms and Biology

The palm typically has a much reduced canopy of leaves (Figure 1). Older or lower leaves prematurely yellow and die. Close inspection reveals shiny black, diamond-shaped fruiting bodies ⅛ to ⅓ inch long by 1⁄16 to ⅛ inch wide on leaf blades and petioles (Figure 2). Lower, older leaves are most severely affected because the longer the leaf remains exposed, the greater the number of infections; however, even upper,

Table 1. Identification of Major Palm Diseases in California at a Glance.

Disease and pathogen	Common hosts	Symptoms
Diamond Scale *Phaeochorospsis neowashingtoniae*	California fan palm and hybrids with the Mexican fan palm (*Washingtonia* × *filibusta*)	• Much reduced canopy of leaves. • Older or lower leaves prematurely yellow and die first • Small, shiny black, diamond-shaped fruiting bodies on leaf blades and petioles
Fusarium Wilt *Fusarium oxysporum* f. sp. *canariensis*	Canary Island date palm	• Much reduced canopy of leaves • Symptoms usually in older or lower leaves first and only on one side of leaf • Leaves turn yellow then brown but remain hanging on the palm • Most leaves affected or dead in advanced cases • Extensive, external, brown to black discoloration or streaking along the petiole and rachis • Reddish-brown internal tissue with a slight pinkish blush
Petiole/Rachis Blight *Cocoicola californica* *Serenomyces* spp.	Mostly the date palms and fan palms	• Reduced canopy of leaves • Lower or older leaves are first and most severely affected. • Pinnae die on one side of leaf blade first in pinnate-leaved date palms • Segments in the leaf blade yellow and die in a wedge-shape pattern in fan palms • Petiole and rachis have a reddish brown, dark brown, or even black streak
Pink Rot *Nalanthamala vermoeseni*	Nearly all outdoor landscape and indoor palms, especially queen palm and California fan palm	• Spotting and rotting on nearly any part of the palm • Symptoms occur on leaf bases, petioles, rachises, blades, the apical meristem area where leaves are produced, inflorescences (flower stalks), roots, and possibly even the trunk • Stunting, distortion, discoloration, and even death of new leaves as they emerge from the apical meristem • Pinkish spore masses • Brownish syrupy exudate • Infected plants weaken and can die, especially if the apical meristem is attacked
Sudden Crown Drop *Thielaviopsis paradoxa* (unconfirmed)	Canary Island date palm, date palm	• Canopy of leaves remains green and healthy • Pseudobark appears normal and intact • Internal decay destroys the trunk • Palms frequently pruned with a chain saw are the most susceptible • Look for palms with sculpted “pineapples” or, especially, “skinned” or “peeled” trunks

new green leaves will have some black fruiting bodies. Initial infection sites are dark, water-soaked spots the size of a pinprick that eventually turn black and enlarge.

Heavily infected leaves have a black, sooty dust that rubs off easily when you brush against or handle them during removal, making the plant a nuisance to work with.

Disease severity often is cyclical. The dry, warm seasons of summer and fall favor growth of California fan palm rather than diamond scale. Palms tend to grow quickly, producing leaves faster than the pathogen can colonize them.

In contrast, the moist, cool seasons of winter and spring favor the pathogen over the host. Palms tend to grow more slowly, and the disease advances higher into the canopy, resulting in a sparse canopy of leaves.

Because of their more vigorous growth rate, young palms tend to have less disease and a fuller canopy of leaves than older, less vigorously growing plants.

Although not particularly lethal by itself, diamond scale reduces vigor and stresses the palm, leaving it vulnerable to other diseases such as pink rot.

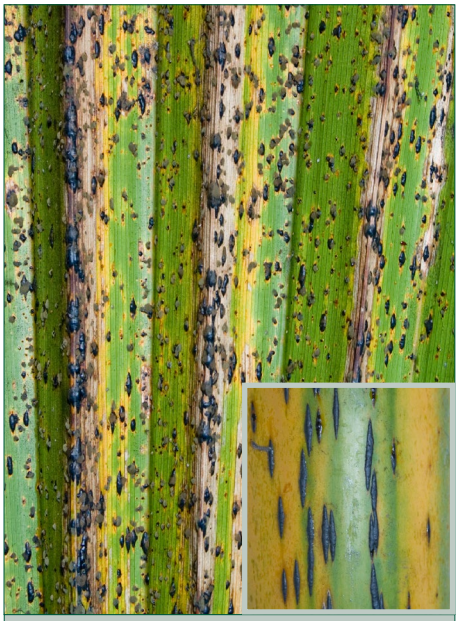

Figure 2. Diamond scale fruiting bodies occur on leaf blades and petioles. Inset: close up of the black, shiny, hard, diamond-shaped fruiting bodies.

Management

The best option in areas where the disease occurs is to replace the California fan palm with diamond scale-resistant species of similar habit, such as the Mexican blue palm, San Jose hesper palm, Guadalupe palm, Australian fountain palm, Chinese fountain or fan palm, Chinese windmill palm, and pure Mexican fan palm.

Keep existing California fan palms as vigorous as possible by irrigating regularly, especially in the summer and during winters with little rainfall. Fertilize regularly to encourage rapid growth.

The fungal spores that cause diamond scale are everywhere and can travel by wind and water; therefore, removing and disposing of infected leaves is probably not a viable management strategy.

FUSARIUM WILT

The fungus *Fusarium oxysporum* f. sp. *canariensis* causes Fusarium wilt, a lethal vascular disease of Canary Island date palm. The fungus destroys the vascular tissue of the palm, leading to decreased water uptake, wilt, and death.

Host

Different forms of *Fusarium oxysporum* exist, and they typically are host-species-specific. The form in California, and referred to as forma specialis *canariensis*, causes disease only on Canary Island date palms in the landscape. However, in a field experiment forma specialis *canariensis* also attacked California fan palm and Senegal date palm. Keep in mind that forma specialis *canariensis* has only been observed attacking Canary Island date palms, not other kinds of palm, in a landscape setting. Other forms of *Fusarium oxysporum* cause wilts on other kinds of date palms and other palm species but in other parts of the world.

Symptoms and Biology

The palm has a much reduced canopy of leaves (Figure 1). Symptoms usually appear in older or lower leaves in the canopy first, then move toward the upper or newest leaves, although occasionally mid-canopy leaves are affected first. Leaves turn yellow then brown but remain hanging on the palm.

Initially symptoms might affect the leaflets or pinnae on only one side of the leaf. Pinnae on the other side remain green, although they eventually also will turn brown and die (Figure 3A). This pattern was once thought to be diagnostic for Fusarium wilt, but other diseases such as petiole and rachis blights and pink rot also can cause one-sided death of leaves. Pinnae death typically occurs first at the base then moves progressively toward the leaf tip, although this pattern sometimes is reversed.

In contrast to petiole and rachis blights (see later), which also produce one-sided leaf death but only on a few leaves, typically with Fusarium wilt many leaves in the canopy are affected or dead. The quantity of diseased or dead leaves or green, healthy leaves in the canopy can help to identify most cases of Fusarium wilt. Typically with Fusarium wilt a preponderance of leaves in the canopy will be affected or dead. Similarly, if the palm is frequently pruned to remove dead leaves and constantly appears to have a much reduced canopy of living leaves, it likely has Fusarium wilt.

Another common symptom of Fusarium wilt is extensive, external, brown to black discoloration or streaking along the petiole and rachis (Figure 3B). This streaking corresponds to internal discoloration of vascular tissue when viewed in transverse section. Internally the tissue is reddish-brown and often has a slight pinkish blush (Figure 3C); although incompletely understood, this pinkish discoloration might be diagnostic for the disease.

In the landscape, Fusarium wilt nearly always spreads on pruning tools, especially chain saws. The pathogen enters

cut petioles and, in extreme cases, the cut and exposed vascular tissue of severely pruned or skinned trunks (trunks where the persistent leaf bases have been skinned or peeled off). The pathogen can spread indirectly during pruning, because contaminated sawdust can drift as far as 100 feet.

The pathogen also can spread by entering the palm through its roots. Canary Island date palms tend to form a dense, extensive network of above-ground roots called pneumatophores, especially under excessively damp or wet conditions, and these may facilitate pathogen entry.

Fusarium wilt might spread if people dispose of diseased palms or their seeds using a municipal yard-waste program that recycles debris into mulch. The pathogen can survive in the soil for at least 25 years.

Infected palms can die within a few months after symptoms appear, or they can linger for several years. Because wilt diseases decrease the ability of the host to take up water, palms with Fusarium wilt in cooler, more humid environments such as near the coast, might show reduced disease severity and survive for many years. Infected palms in hotter, drier interior climates might show severe symptoms and die rapidly.

Because Fusarium wilt stresses palms, the opportunistic and mostly secondary disease pink rot is frequently present and can obscure or mask symptoms and hasten death. In fact, pink rot might kill a palm before Fusarium wilt runs its course.

Management

Because no cure exists for Fusarium wilt and it is nearly 100 percent fatal, prevention and exclusion are critical to disease management. When first planting, obtain palms from a reliable source, and avoid poorly drained soils and excessive irrigation that can increase the formation of above-ground roots.

Keep the area around the base of the trunk free of plants, which can damage above-ground roots, and avoid using municipal yard waste as mulch on Canary Island date palms.

Do not replant a Canary Island date palm in the same site where one died or was removed because of Fusarium wilt. The fungus surviving in the soil can infect a new, healthy palm. Instead, use other species of palms including Mexican blue palm, San Jose hesper palm, Guadalupe palm, pindo palm, queen palm, and Mexican fan palm.

If you want the date palm "look," consider staminate (male) plants of the date palm (*Phoenix dactylifera*), which are more robust than the pistillate (female) fruit-bearing plants and more closely imitate the larger, robust habit of Canary Island date palms.

Frequently pruned Canary Island date palms are more likely to suffer from Fusarium wilt than those in an unmaintained setting. If you must prune, thoroughly clean and disinfect all tools prior to work on each palm by vigorously brushing them to remove sawdust and other particles. Disinfect the tools for 10 minutes in a 1:3 pine-oil-to-water solution, 1:1 solution of household bleach, or heat saw blades for at least 10 seconds per side with a handheld butane torch. Clean and disinfect (as described above) all tools used in the root zones of Canary Island date palms, such as shovels, spades, rakes, hoes, and weeders, because they can spread the disease.

Use manual pruning saws rather than chain saws whenever possible, because chain saws are difficult if not impossible to clean and disinfect adequately. If you have extremely valuable palms, consider using a new saw for each tree, which you either could discard after one use or dedicate for future use on that one palm only. Avoid pruning palms in windy weather to minimize the spread of sawdust.

Because a Canary Island date palm with Fusarium wilt eventually will die, it is prudent to remove it as soon as possible. To avoid spreading the pathogen, excavate the root ball and use a crane to remove the palm with its crown of leaves, trunk, and root ball still attached, if possible. Keep cutting, grinding, and digging to a minimum.

Use plastic or wooden barriers to contain sawdust and other diseased plant parts during removal. After collecting and securely bagging all debris, prepare removed palms for incineration or removal to a landfill; do not use a waste recycling program. Removing the soil will likely not prevent the spread of Fusarium wilt because just one small piece of infected root is all that is necessary to infect a newly planted palm.

Figure 3. Symptoms of Fusarium wilt. A: pinnae brown on one side. B: reddish-brown internal petiole tissues with a slight pinkish blush. C: dark streaking along the rachis or petiole.

Table 2. Common Palms of California and Their Relative Disease Susceptibility.

Palm	Mostly Disease Resistant	Diamond Scale	Fusarium Wilt	Petiole/Rachis Blight	Pink Rot	Sudden Crown Drop
Australian fountain palm (*Livistona australis*)	✓					
Bamboo palm (*Chamaedorea* spp.)					✓	
California fan palm (*Washingtonia filifera*)		✓		✓	✓	
Canary Island date palm (*Phoenix canariensis*)			✓	✓	✓	✓
Chinese fountain or fan palm (*Livistona chinensis*)	✓					
Chinese windmill palm (*Trachycarpus fortunei*)					✓	
Date palm (*Phoenix dactylifera*)				✓	✓	✓
Fishtail palm (*Caryota* spp.)	✓					
Guadalupe palm (*Brahea edulis*)	✓					
Kentia palm (*Howea forsteriana*)					✓	
King palm (*Archontophoenix cunninghamiana*)					✓	
Lady palm (*Rhapis* spp.)	✓					
Majesty palm (*Ravenea rivularis*)	✓					
Mediterranean fan palm (*Chamaerops humilis*)	✓					
Mexican blue palm (*Brahea armata*)	✓					
Mexican fan palm (*Washingtonia robusta*)	✓			✓		
Pindo palm (*Butia odorata*; sometimes known by the misapplied name *B. capitata*)	✓					
Pygmy date palm (*Phoenix roebelenii*)	✓			✓		
Queen palm (*Syagrus romanzoffiana*)					✓	
San Jose hesper palm (*Brahea brandegeei*)	✓					
Senegal date palm (*Phoenix reclinata*)	✓			✓		
Triangle palm (*Dypsis decaryi*)	✓					

PETIOLE AND RACHIS BLIGHTS

Cocoicola spp. and *Serenomyces* spp. are the primary pathogens causing petiole and rachis blights in palms although other fungi, including *Diplodia*, *Dothiorella*, *Fusicoccum*, *Macrophoma*, *Phoma*, and *Phomopsis* have also been implicated. The diseases cause the petiole (the slender stalk holding the leaf blade to the leaf base) and sometimes the rachis (the extension of the petiole with pinnae along its length), and then the entire leaf to die. Although typically not lethal, they can stress the palm sufficiently that other diseases kill it.

Hosts

Petiole and rachis blights primarily attack date palms and California and Mexican fan palms.

Symptoms and Biology

The palm often has a reduced canopy of leaves (Figure 1). Lower or older leaves are first and most severely affected. In the pinnate-leaved date palms pinnae typically die on one side of leaf blade first, with those on the opposing side remaining green (compare with Fusarium wilt earlier) (Figure 4A). In the fan palms, segments in the leaf blade yellow and die in a wedge-shape pattern (Figure 4B). In both types of palms the petiole and rachis typically have a reddish brown, dark brown, or even black streak (Figure 4C) that corresponds to internal discoloration of vascular tissue when viewed in transverse section. Close examination of diseased petioles and rachises might reveal fungal structures of the pathogen, especially fruiting bodies, causing the blight. Eventually the entire leaf dies.

In contrast to Fusarium wilt on Canary Island date palms, which also produces one-sided leaf death and affects many leaves in the canopy, typically with petiole and rachis blights only a few leaves in the canopy are diseased.

While pinnae (of a pinnate leaf) or segments (of a fan or palmate leaf) die, they are not infected; only the petiole or rachis is infected. Pinnae and segments die because the pathogen has caused vascular tissues in the petiole or rachis to die. Although the disease can move higher into the canopy, killing more leaves, it rarely kills the palm; however, it can weaken or stress a palm so that another disease like pink rot can kill it.

Management

Little is known about management of petiole and rachis blights and environmental factors that favor disease development. Because fungal spores are probably the primary methods of disease spread and high humidity is likely an important factor encouraging disease development, sanitation and water management are critical in managing these blights.

Removal and disposal of affected leaves might be a means of reducing disease spread to nearby palms. On smaller palms avoid overhead irrigation. Maintain palms in optimal cultivation and health as described earlier.

Figure 4. Symptoms of petiole and rachis blight. A: pinnae dead on one side with streaking along the rachis. B: segments of leaf blade yellowed and dying in wedge-shaped pattern. C: reddish-brown streak the length of the petiole.

PINK ROT

The fungus *Nalanthamala vermoeseni* (previously called *Penicillium vermoeseni* or *Gliocladium vermoeseni*) causes the disease pink rot. Caused by a weak but opportunistic pathogen, pink rot primarily is a secondary disease that affects stressed, weakened, and or wounded palms. While it can attack all parts of a palm, it is most problematic in the growing tips, or apical meristem where new leaves are produced, and in newly emerged leaves. Its role in causing trunk decay on queen palm and other species is unconfirmed.

Hosts

Pink rot can affect nearly all outdoor landscape and indoor palms in California, including king palms, bamboo palms, some date palms, Chinese windmill palms, kentia palms, queen palms, and California fan palms.

Symptoms and Biology

Symptoms of pink rot are variable and include spotting and rotting on nearly any part of the palm. Symptoms occur on leaf bases, petioles, rachises (Figure 5), blades (Figures 6 and 7), the apical meristem area where leaves are produced, inflorescences (flower stalks), roots, and even the trunk (Figure 8) although this latter occurrence is unconfirmed in many cases. Stunting, distortion, discoloration and even death of new leaves as they emerge from the apical meristem is common (Figures 9 and 10). Pinkish spore masses, from which the disease derives its name, are often present, especially when protected behind overlapping leaf bases or

other structures (Figure 11). Brownish syrupy exudate also might be present. Infected plants weaken and decline and eventually can die, especially if the apical meristem is attacked.

Like diamond scale, disease severity frequently can be cyclical in large, established palms. For example, the pathogen can infect growing tips and spear leaves, the youngest leaves that have not yet unfolded, during the cooler, moist weather of winter and spring when leaf production and growth are slow. This scenario is especially true of California fan palms. As weather warms in late spring and early summer and the winter-produced spear leaves push out and unfold, previous damage appears even though the disease no longer is active. The palm then produces an abundance of disease-free leaves during vigorous summer and fall growth. As leaf production and growth slow in the winter, the disease becomes more active again. This cyclical nature and the way palms produce leaves sequentially in the crown often results in a distinctive pattern of a few damaged leaves regularly distributed among otherwise healthy ones.

Cultivation or environmental conditions can stress or weaken palms, making them susceptible to pink rot.

These conditions include:

- palms planted too deeply
- transplanted palms, especially when done at the incorrect time of year, such as the fall and winter
- excessive irrigation
- poor drainage
- poorly aerated root zones
- improper nutrition
- pest infestations and other diseases and disorders
- cold weather or freeze damage

Figure 5. Leaves of this Medjool date palm have symptoms of pink rot on the rachis.

- inappropriate pruning and leaf-base removal
- poorly adapted species

Although not always necessary for disease development, wounds facilitate pathogen entry and increase infection risks. Avoid injuring palms when pruning and performing other horticultural procedures. Especially avoid premature leaf-base removal, which can tear and wound the trunk, causing permanent damage and increasing infection risk.

High humidity and temperatures of 65° to 80°F favor the pathogen and disease development. Palms grown in cool, humid, coastal areas are more susceptible to pink rot than those grown in warmer, more arid, inland sites. Pink rot is unusually problematic on bamboo palms produced in humid greenhouses nurseries, especially if overhead sprinkler irrigation is used; in these situations it causes leaf and trunk rot, bleeding, wilt, and death.

The fungal spores that cause pink rot are everywhere and can travel by wind and water; therefore, removing and disposing of infected leaves is probably not a viable management strategy.

The judicious and temporary use of some fungicides can be effective in suppression of pink rot until the cultivation problems stressing the palm can be corrected; however, fungicidal treatment alone is not a viable management strategy. Fungicides can be beneficial after heavy pruning to protect wounds and freshly cut, immature tissue, or

Figure 6. A leaf of this Canary Island date palm has symptoms of pink rot. The leaf was attacked when it was still developing in the apical meristem area.

Figure 7. A newly emerging leaf of this Canary Island date palm has symptoms of pink rot.

Figure 8. The trunk of this kentia palm has pink rot. Note the pink spore masses.

Figure 9. Stunting and distortion of new leaves emerging from the apical meristem of this newly transplanted Medjool date palm is characteristic of pink rot.

Figure 10. In this California fan palm pink rot has killed some of the newly emerging leaves. Note the diamond scale, which likely stressed this palm, making it susceptible to pink rot.

Figure 11. Pink rot attacked and killed the newly emerging leaves of this Chinese windmill palm.

both, or temporarily to protect stressed palms in unfavorable environmental conditions.

SUDDEN CROWN DROP

Sudden crown drop is a lethal disease where, as the name implies, the entire crown, including the canopy of leaves and upper part of the trunk, which can weigh several tons, fails and drops from the top of the trunk with little or no warning (Figure 12). Hidden internal decay weakened the trunk until it could no longer support the crown.

Although the fungus *Thielaviopsis paradoxa* has been isolated from Canary Island date palms that have failed due to sudden crown drop, it is unconfirmed that this pathogen is the primary cause of the disease. Other pathogens might be involved, either alone or in tandem with *T. paradoxa*.

Hosts

Sudden crown drop primarily affects Canary Island date palms and, to a lesser extent, date palms.

Symptoms and Biology

Unfortunately, no conspicuous symptoms of sudden crown drop occur. The canopy of leaves typically remains green and healthy and the outer layer of trunk tissue (pseudobark) appears normal and intact, making this disease extremely problematic to detect. However, internally hidden decay is destroying the trunk in a roughly hourglass shape, with the healthy tissue on the inside and the decayed tissue on the outside still within the intact pseudobark (Figure 13). Sufficient healthy tissue remains inside the trunk to maintain a normal-appearing canopy of leaves. Eventually, the healthy tissue in the "waist" or constricted part of the hourglass is insufficient to support the weight above it, and the trunk fails, suddenly dropping the crown of leaves and attached portion of trunk.

Although cultural factors, including drought stress, may promote disease development and severity in Canary Island date palms, the extensive use

Figure 12. Sudden crown drop caused the entire crown, including the canopy of leaves and upper part of the trunk to suddenly to fall from this Canary Island date palm.

Figure 13. These transverse sections from a Canary Island date palm trunk show, from right to left, how infection and decay from sudden crown drop (darkened tissue) regress away from the initial point of infection.

of chain saws to prune leaves and to shape and sculpt "pineapples," the ball-like mass of persistent leaf bases just below the leaves, and especially to "skin" or "peel" trunks of old, persistent leaf bases can create gaping wounds that facilitate pathogen entry and onset of decay. Thus, annual screening or testing is essential for detection.

Frequently pruned Canary Island date palms, especially those with a history of chain saw pruning, are the most susceptible to sudden crown drop. Look for palms with sculpted "pineapples" or, especially, "skinned" or "peeled" trunks below the leaves where the surface appears smooth, devoid of elliptic leaf base scars, or even straight-sided instead of round, sure indicators of past chain saw use (Figure 14). Not only can such severe pruning create entry sites

Figure 14. Sculpting "pineapples" and skinning trunks below the leaves can cause Canary Island date palms to be susceptible to sudden crown drop.

for the pathogen, the typical position of such pruning, high up on the trunk where tissues have yet to attain anywhere near their maximum strength and resistance to decay, increases the likelihood of decay and crown drop.

Management

Avoid pruning practices such as sculpting "pineapples," and "skinning" or "peeling" trunks of old leaf bases, which typically create large wounds that facilitate pathogen entry.

Thoroughly clean and disinfect all pruning tools prior to work on each palm by vigorously brushing them to remove sawdust and other particles. Disinfect the tools for 10 minutes in a 1:3 pine-oil-to-water solution, 1:1 solution of household bleach, or heat saw blades for at least 10 seconds per side with a handheld butane torch. Clean and disinfect as described for saws all tools used in the root zones of Canary Island date palms, such as shovels, spades, rakes, hoes, and weeders, which can spread the disease.

For detection of sudden crown drop use a heavy rubber mallet or sturdy wooden stick to sound and listen for hidden decay in the upper part of the trunk. When sharply struck, healthy tissue emits a solid, sharp, resonating tone and the stick bounces back quickly. In contrast, decayed tissue emits a low, dull thud when sharply struck and the stick does not bounce back with much force. If sounding detects decayed tissue, then the area can be probed with a long, sharp, slender tool to determine extent of decay. If decay is extensive, the palm should be removed.

Because a Canary Island date palm with sudden crown drop will eventually die and poses an extreme and imminent hazard, it is prudent to remove it as soon as possible following the same procedures outlined earlier under Fusarium wilt to prevent the spread of pathogens.

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WARNING ON THE USE OF PESTICIDES

Pesticides are poisonous. Some pesticides are more toxic than others and present higher risks to people, nontarget organisms, and the environment. A pesticide is any material (natural, organic, or synthetic) used to control, prevent, kill, suppress, or repel pests. "Pesticide" is a broad term that includes insecticides, herbicides (weed or plant killers), fungicides, rodenticides, miticides (mite control), molluscicides (for snails and slugs), and other materials like growth regulators or antimicrobial products such as bleach and sanitary wipes that kill bacteria.

Always read and carefully follow all precautions and directions provided on the container label. The label is the law and failure to follow label instructions is an illegal use of the pesticide. Store all chemicals in the original labeled containers in a locked cabinet or shed, away from food or feeds, and out of the reach of children, unauthorized persons, and animals. Never place pesticides in food or drink containers. Consult the pesticide label to determine active ingredients, correct locations for use, signal words, and personal protective equipment you should wear to protect yourself from exposure when applying the material.

Pesticides applied in your garden and landscape can move through water or with soil away from where they were applied, resulting in contamination of creeks, lakes, rivers, and the ocean. Confine pesticides to the property being treated and never allow them to get into drains or creeks. Avoid getting pesticide onto neighboring properties (called drift), especially onto gardens containing fruits or vegetables ready to be picked.

Do not place containers with pesticide in the trash or pour pesticides down the sink, toilet, or outside drains. Either use all the pesticide according to the label until the container is empty or take unwanted pesticides to your local Household Hazardous Waste Collection site. Contact your county agricultural commissioner for additional information on safe container disposal and for the location of the Hazardous Waste Collection site nearest you. Follow label directions for disposal of empty containers. Never reuse or burn the containers or dispose of them in such a manner that they may contaminate water supplies or natural waterways.

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