



Figure 1: *Phoenix canariensis*, Canary Island Date Palm. Photo: Heather Schreck

***California Pest Rating Proposal for
Fusarium oxysporum f. sp. canariensis* Mercier & Louvet 1973**

Date palm wilt

Proposed Pest Rating: A

Comment Period: 11/20/2019 through 1/4/2020

Initiating Event:

Fusarium oxysporum f. sp. canariensis has not been assessed under the pest rating proposal system. The risk of this pathogen to California is evaluated herein and a permanent rating is proposed.

History & Status:

Background:

A wilt disease of Canary Island date palm, *Phoenix canariensis*, was first observed in 1970 in France by Mercier and Louvet, who isolated and named the pathogen *Fusarium oxysporum* f. sp. *canariensis*. During the 1970s, mature *P. canariensis* trees (30-50 years old) were dying from a rapidly spreading, severe, frond-destroying disease in street plantings and landscapes in Los Angeles, Orange, San Diego, and San Bernardino counties. Two fungi were consistently isolated from the symptomatic fronds, *Gliocladium vermoeseni* (now *Nalanthamala vermoeseni*), which causes Pink Rot, and *Fusarium oxysporum*. Both fungi were pathogenic in inoculation studies on *P. canariensis* (Feather et al., 1979).

Fusarium oxysporum was also found to be causing the death of 5-7-year-old *P. canariensis* trees growing as nursery stock in Borrego Springs, California, which has a hot, desert environment. Inoculation studies showed that *F. oxysporum* could infect date palms (*P. dactylifera*) through stem injections and by direct infection of seedlings planted in infested soil (Feather et al., 1978). There was great concern regarding the risk this pathogen posed to the California date industry in the counties of Riverside, Inyo, and Imperial, and in 1980, CDFA established a State Interior Quarantine (3419. Date Palm Disease) to protect the date orchards. At that time, this disease was not known to be of general distribution in California. Although there are no restrictions on the movement of susceptible trees in the area under quarantine, Nursery and Seed Services regulations do not allow for movement of this pest in the nursery trade. The quarantine covers the entire state for the protection of the California date industry in those named counties.

Experimental and observational evidence suggests that other *Phoenix* species may be susceptible to *Fusarium oxysporum* f. sp. *canariensis*, including *Phoenix dactylifera* (date palm), *Phoenix reclinata* (Senegal date palm), and *Phoenix sylvestris* (wild date palm), but actual cases of infection in these species in the landscape or nurseries in California or Florida are rare when compared to frequency of disease in *Phoenix canariensis* (Elliot, 2016; CDFA PDR Database).

When *F. oxysporum* f. sp. *canariensis* is found in a nursery, the nursery can enter into a compliance agreement with their County Agricultural Commissioner. The purpose of the compliance agreement is to prevent the sale or movement of infected or exposed trees, seeds or fronds. During the minimum 2-year term of the agreement, the quarantined nursery block is defined by susceptible species planted in the ground or in containers near each other where they could be forming root graphs, or where soil and/or water can move between them. Pruning of fronds is prohibited as it minimizes symptoms and can spread the disease. Trees are inspected quarterly, and all symptomatic trees should be removed and taken to the landfill.

Hosts: *Phoenix canariensis* (Canary Island date palm), wild date palm (*Phoenix sylvestris*), *Phoenix reclinata* (Senegal date palm), *Phoenix dactylifera* (true date palm) (Farr and Rossman, 2019; Elliot, 2015; Feather et al., 1989; Simone, 2004)

Symptoms: As is typical for a *Fusarium* wilt, the disease affects the vascular system of the palm by occluding the xylem vessels with macroconidia and hyphae, blocking the movement of water into the

leaves. Diagnosis often starts with the observation of foliar wilt in excess of normal aged-leaf senescence. Early symptoms on individual fronds are a one-sided leaflet dieback, necrotic and brown streaking on the lower rachis base of older fronds, and a light brown to red brown necrosis within the vascular bundles. The symptoms usually appear on the oldest fronds first, and often on only one quadrant or one side of the tree. Over a few months to a few years, symptoms spread up and around in the canopy as successively younger fronds die and wilt but remain attached to the trunk. The tree dies when it lacks enough foliage to photosynthesize or when the leaf bud is infected. Trees growing in moderate climates along the coast die more slowly than trees growing in hotter, inland areas (Downer et al., 2009). Trees are often co-infected with Pink Rot (*N. vermoeseni*) which can make isolation of *F. oxysporum* f. sp. *canariensis* more difficult. Morphological identification of the pathogen in culture cannot be done below the species level and identification to the forma specialis level is made through DNA sequencing.

Transmission: The fungus can spread through the movement of infested soil or water, infected trees and seeds, and through pruning (Downer et al., 2009; Simone, 2004). Although often speculated on based from the observed patterns of disease in nurseries and ornamental plantings, no aerial spread of the disease with wind-born or vectored conidial spores has been proven. The use of boot spikes to climb trees and the use of chain saws for pruning creates wounds on trees and allows introduction of the conidia directly to susceptible green tissues, which are accidentally moved from infected to healthy trees with contaminated sawdust on saws, spikes, and other equipment.

Current disease management centers around the rapid and accurate diagnosis of the pathogen from mixed fungal infections with Pink Rot or secondary decay organisms, prevention of pathogen introduction to new plantings through sanitation of equipment, and destruction of diseased plants without using chipping or other methods that allow movement of inoculum (Downer et al., 2009). The pathogen produces long-lasting, thick walled chlamydospores that can survive in the soil without a host for as long as 25 years. When new trees are planted on sites where trees have died, they can be infected through their roots growing in infested soil (Downer, 2006).

Damage Potential: This is a highly lethal disease of young and mature trees that is easily spread by unsanitary tree trimming practices and by the planting of contaminated nursery stock. Removal of diseased fronds by the nurseries immediately prior to sale is problematic as consumers are unaware that their trees had any symptoms of disease. Arborists and landscapers should observe untrimmed trees at a nursery for a minimum of 12 months prior to purchasing and moving them. Transplanting of mature trees, often moving them from the desert to the coast to create “instant landscapes” around new construction, is a common stressor that increases tree susceptibility. Over-pruning to form “pineapples” or “chicken heads” in the tree crowns should also be avoided as it involves the cutting of green fronds which creates an entry point for the pathogen and increases tree stress. The loss of a mature landscape specimen and the cost of the subsequent removal of the dead tree by digging and craning can be thousands of dollars per tree. When tree trimmers move through ornamental plantings without properly sanitizing their tools, large numbers of mature trees can be infected simultaneously and will die over the subsequent months to years. Because the pathogen can survive as

chlamydospores in the soil for decades, it is not advisable to replant with any susceptible host. This disease can permanently remove multiple *Phoenix* species from landscapes.

Worldwide Distribution: Africa: *Morocco*; South America: *Argentina*; Asia: *Japan*; Europe: *France, Greece, Italy, Spain*; North America: *United States* (California, Florida, Louisiana, Nevada, South Carolina, Texas); Oceania: *Australia* (EPPO, 2019).

Official Control: This pathogen is on the A1 Quarantine list for Bahrain (EPPO, 2019) and it is on the Harmful organisms list for Egypt, New Zealand, Oman, and the United Arab Emirates (USDA PCIT, 2019). CDFA maintains a state interior quarantine (3419) to protect *Phoenix* date palms in Imperial County and in sections of Inyo and Riverside counties.

California Distribution: This pathogen is widespread in non-desert areas of Southern California, with smaller numbers of detections along the Central Coast, in the San Francisco Bay area and in the Sacramento Valley, in nurseries, street plantings, and landscapes. Infected *Phoenix canariensis* trees have occasionally been found in inside the protected area, in the cities of Blythe, Niland, and Winterhaven.

California Interceptions: none

The risk *Fusarium oxysporum* f. sp. *canariensis* poses to California is evaluated below.

Consequences of Introduction:

- 1) Climate/Host Interaction:** Both the Canary Island and the Senegal date palms are native to Africa and are hardy down to -10°C. They tolerate a range of climates from humid to semi-arid but do best in mediterranean climates like Southern California. Canary Island date palm is one of the most planted palms worldwide (Palmpedia, 2019). Date palm (*P. dactylifera*) is an occasional host, grown for fruit in the desert.

Evaluate if the pest would have suitable hosts and climate to establish in California.

Score: 3

- Low (1) Not likely to establish in California; or likely to establish in very limited areas.
- Medium (2) may be able to establish in a larger but limited part of California.
- **High (3) likely to establish a widespread distribution in California.**

- 2) Known Pest Host Range:** For this formae specialis of *Fusarium oxysporum*, the hosts appear to be limited to a few species of *Phoenix* palms.

Evaluate the host range of the pest.

Score: 1

- **Low (1) has a very limited host range.**
 - Medium (2) has a moderate host range.
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- High (3) has a wide host range.

- 3) Pest Reproductive Potential:** The pathogen does not have an aerial spore but spores are present inside the green wood and spread easily with unsanitary tree trimming. It forms long lasting chlamydo spores that stay in the soil for decades. It can be seed-borne.

Evaluate the natural and artificial dispersal potential of the pest.

Score: 2

- Low (1) does not have high reproductive or dispersal potential.
- **Medium (2) has either high reproductive or dispersal potential.**
- High (3) has both high reproduction and dispersal potential.

- 4) Economic Impact:** This is a lethal pathogen and when spread to a nursery or landscape, it can remain in the soil for decades, eliminating the land from production.

Evaluate the economic impact of the pest to California using the criteria below.

Economic Impact: A, B, C, D

- A. The pest could lower crop yield.**
- B. The pest could lower crop value (includes increasing crop production costs).**
- C. The pest could trigger the loss of markets (includes quarantines).**
- D. The pest could negatively change normal cultural practices.**
- E. The pest can vector, or is vectored, by another pestiferous organism.
- F. The organism is injurious or poisonous to agriculturally important animals.
- G. The organism can interfere with the delivery or supply of water for agricultural uses.

Economic Impact Score: 3

- Low (1) causes 0 or 1 of these impacts.
- Medium (2) causes 2 of these impacts.
- **High (3) causes 3 or more of these impacts.**

- 5) Environmental Impact:** *Phoenix* palms are not native to California. Some have escaped cultivation in southern California to invade stream corridors as well as orchards and, occasionally, landscaped areas. These escaped trees could become a reservoir for inoculum in a local area

Environmental Impact: D, E

- A. The pest could have a significant environmental impact such as lowering biodiversity, disrupting natural communities, or changing ecosystem processes.**
 - B. The pest could directly affect threatened or endangered species.**
 - C. The pest could impact threatened or endangered species by disrupting critical habitats.**
 - D. The pest could trigger additional official or private treatment programs.**
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- E. **The pest significantly impacts cultural practices, home/urban gardening or ornamental plantings.**

Environmental Impact Score: 3

- Low (1) causes none of the above to occur.
- Medium (2) causes one of the above to occur.
- **High (3) causes two or more of the above to occur.**

Consequences of Introduction to California for *Fusarium oxysporum* f. sp. *canariensis*: Medium

Add up the total score and include it here. **12**

- Low = 5-8 points
- Medium = 9-12 points**
- High = 13-15 points

- 6) **Post Entry Distribution and Survey Information:** Official records in California show detections in multiple counties over a wide geographic area and variety of climates.

Evaluation is 'High'.

Score: -3

- Not established (0) Pest never detected in California or known only from incursions.
- Low (-1) Pest has a localized distribution in California or is established in one suitable climate/host area (region).
- Medium (-2) Pest is widespread in California but not fully established in the endangered area, or pest established in two contiguous suitable climate/host areas.
- High (-3) Pest has fully established in the endangered area, or pest is reported in more than two contiguous or non-contiguous suitable climate/host areas.**

- 7) **The final score is the consequences of introduction score minus the post entry distribution and survey information score:**

Final Score: Score of Consequences of Introduction – Score of Post Entry Distribution and Survey Information: 9

Uncertainty: none

Conclusion and Rating Justification:

Based on the evidence provided above and its status as a quarantine pest in California, **the proposed rating for *Fusarium oxysporum* f. sp. *canariensis* is A.**

References:

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Responsible Party:

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***Comment Period: 11/20/2019 through 1/4/2020**

***NOTE:**

You must be registered and logged in to post a comment. If you have registered and have not received the registration confirmation, please contact us at [plant.health\[@\]cdfa.ca.gov](mailto:plant.health[@]cdfa.ca.gov).

Comment Format:

- ❖ Comments should refer to the appropriate California Pest Rating Proposal Form subsection(s) being commented on, as shown below.

Example Comment:

Consequences of Introduction: 1. Climate/Host Interaction: [Your comment that relates to “Climate/Host Interaction” here.]

- ❖ Posted comments will not be able to be viewed immediately.
 - ❖ Comments may not be posted if they:
 - Contain inappropriate language which is not germane to the pest rating proposal;
 - Contains defamatory, false, inaccurate, abusive, obscene, pornographic, sexually oriented, threatening, racially offensive, discriminatory or illegal material;
 - Violates agency regulations prohibiting sexual harassment or other forms of discrimination;
 - Violates agency regulations prohibiting workplace violence, including threats.
 - ❖ Comments may be edited prior to posting to ensure they are entirely germane.
 - ❖ Posted comments shall be those which have been approved in content and posted to the website to be viewed, not just submitted.
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Proposed Pest Rating: A
