

Fusarium Wilt of Canary Island Date Palms in Florida

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The value of ornamental palms in Florida is virtually impossible to estimate considering both the nursery and landscape situations as well as the effect of palms on tourism each year. In late 1994 and into 1995, a series of palm disease samples were received in the Florida Extension Plant Disease Clinic at Gainesville, from both nursery and landscape sites where Canary Island date palms (*Phoenix canariensis*) had declined to death. Laboratory isolations resulted in the consistent recovery of the fungus *Fusarium oxysporum*. Since that time, this fungus has been positively identified as *F. oxysporum* f.sp. *canariensis* -a strain of the fungus that is particularly aggressive on the Canary island date palms. This represents the first report of this new palm disease in Florida and only the second report of this wilt disease in this hemisphere (first report from California).

Fusarium wilt disease is a true wilt disease. It does not, however, produce the plant wilt symptoms familiar to most of us from experience with such common Florida vegetables as tomatoes, eggplant, and watermelon. Wilt diseases affecting woody plants do not produce “droopy” plants but rather cause leaf desiccation to death and irregular dieback of branches or entire stems. Fusarium wilt of *P. canariensis* is just this type of disease and is similar in symptoms to such diseases as Fusarium wilt of mimosa or wax myrtle in Florida’s land-

scapes. Palm decline symptoms are a direct result of the loss in function of the water conducting cells within the plant. In other Fusarium wilt diseases, there is evidence that the fungus causes cell dysfunction through physical plugging, enzymatic action, and/or the action of fungal toxins. The specific mechanism in this palm wilt disease is not fully known but is likely to involve one or more of the previously mentioned mechanisms.

History

Canary Island date palm wilt is one of three true wilt diseases that affect specific palm genera worldwide. The most important of these diseases is date palm wilt or “Bayoud” disease of the true date palm (*Phoenix dactylifera*) that was described in the late 1800’s in north Africa. This disease is caused by the fungus *Fusarium oxysporum* f.sp. *albedinis* and has caused the death of >10 million date palms in that region of the world. The pathogen can infect other *Phoenix* spp. but is less lethal on these. The second wilt disease of palms was described in 1946 from African oil palm (*Elaeis guineensis*) caused by *Fusarium oxysporum* f.sp. *elaedis* in the west central African nations of Benin, Congo, Cote d’Ivoire (Ivory Coast), Nigeria and Zaire. The oil palm *Fusarium* is specific to this genus of palms. Neither the true date palm wilt nor the oil palm wilt are known to occur in the northern hemisphere. The most recent palm wilt disease was described by the Italians and French

in 1973. This disease was severe on Canary island date palms and less aggressive toward true date palms. The fungus involved was named *Fusarium oxysporum* f.sp. *canariensis*. Between the years 1973-1977, this new disease was reported from Italy, France, Japan, the Canary Islands and California. First sightings in California were from mature 30-50 year old Canary Island date palms in landscape situations. In 1978, this disease was reported from palm nurseries as well. Present reported distribution of this disease in California includes: Los Angeles, Orange, Riverside, Sacramento, San Bernardino, San Diego, San Mateo, and Santa Barbara counties. Distribution within Florida to date includes: Lake, Lee, Manatee, Pinellas and Sarasota counties in either nurseries or landscape sites. Complete survey information for Florida does not exist.

Symptoms

Palms affected by *Fusarium* wilt exhibit general decline symptoms as caused by other root or stem diseases. Affected palms exhibit reduced vigor during early disease onset. Primary symptoms are foliar, with lower, older fronds desiccating and dying from the lower trunk toward the bud (Fig. 1). Occasionally, the first symptomatic leaf may be in the mid-canopy and the following decline may seem one-sided on the tree. Affected fronds die in a one-sided manner, from the lower leaflets (pinnae) and spines out to the frond tip. Dieback continues from the tip to the frond base on the other side of the rachis (Fig. 2). Some leaves may die from the frond tip back to the base on both sides of the rachis simultaneously (Fig. 3). A linear brown stripe develops on the lower surface of the frond rachis, extending a variable distance out from the frond base (Fig. 4). Some pinnae and spines may exhibit necrotic streaking as well. Vascular discoloration is evident in both cross and longitudinal sections of the rachis. Discrete pockets of salmon-pink to brown tissue can be observed in cross sections (Fig. 5). In longitudinal sections, similarly col-

ored streaks of tissue will be apparent (Fig. 6).

Some variation in symptom appearance and development is to be expected. Symptoms will be most pronounced as plants enter a period of higher temperature and greater water demand. There are also several rachis blight diseases that can cause frond death in a manner similar to *Fusarium* wilt, but do not lead to plant death. These other fungi often cause solid zones of necrotic tissue in the rachis that will be obvious in cross section. Clear symptoms of *Fusarium* wilt can be masked by the occurrence of two different diseases on the same plant. Where palm weevils exist in the locality with *Fusarium* wilt, these insects can invade the wilt stressed trees and cause more rapid palm death and obscure the symptoms of *Fusarium* wilt.

The Pathogen

The *Fusarium* genus represents a large group of related fungi that include both saprophytes and pathogens. There are more than 20 species of *Fusarium* of economic importance in Florida across various crops. One of these species is *Fusarium oxysporum* - a species which has more than two dozen biotypes or strains that are plant specific. These strains are called "forma specialis" (f. sp.) or varieties. They are all morphologically identical in the laboratory, differing in their ability to infect particular plant hosts or cultivars of a single plant species. Clinical recovery of a *Fusarium* sp. from a palm frond or root does not mean that the *Fusarium* wilt disease is present. "Fusarium" is a very nonspecific diagnosis. Similarly, the isolation of a *Fusarium oxysporum* from roots, fronds or bud tissues does not confirm *Fusarium* wilt either. Recovery of *Fusarium oxysporum* from palms coupled with the key symptoms mentioned earlier, suggest *Fusarium* wilt disease. This fungus still needs to be clinically identified to the 'canariensis' strain. This verification involves the inoculation of a healthy plant which may take months to

years to complete, or the nucleic acid fingerprinting of the suspect pathogen compared to known isolates of the fungus from other areas - a matter of weeks. The University of Florida at Gainesville is offering this faster method now.

Based upon available world literature, the *Fusarium* wilt pathogen from Canary Island date palm can infect the following palms: *Phoenix canariensis*, *Phoenix reclinata*, and *Phoenix dactylifera*. This pathogen does not invade *Phoenix roebelenii* in California and normally only damages the offshoots on the true date palm. Unpublished data from Dr. Howard Ohr of the University of California - Davis, indicates that this fungus will also invade mature *Washingtonia filifera*. In California, neither *Washingtonia robusta* nor *Archontophoenix cunninghamiana* was susceptible to this pathogen. The susceptibility of *Phoenix sylvestris* or the many other palm genera and species grown in Florida is presently unknown.

Disease Spread

Introduction of this disease into new areas of Florida is primarily dependent upon the movement of infected trees or infested soil. The *Fusarium* pathogen does not have a widely disseminated, airborne spore stage. An infected plant and/or infested soil must be introduced into a landscape or nursery for subsequent infection. If a Phoenix planting is disease-free at present, future development of *Fusarium* wilt is highly unlikely without the direct introduction of the pathogen.

Present scientific literature indicates that the *Fusarium* pathogen of oil palm in Africa is both seed- and pollen-transmitted. This does not occur in the true date palm pathogen. The ability of *F. oxysporum* f.sp. *canariensis* to infect seed is unknown at this time.

Local spread in an area where the fungus is known to exist can be directly tied to maintenance activities. The *Fusarium* fungus

is well distributed through the tree especially through the water conducting cells. Pruning can introduce the fungus or fungus-infested saw dust between pruning saw teeth or lopper blades. Pruning activities can spread the fungus among trees within a landscape or nursery or between landscapes.

Disease Management

The potential management of *Fusarium* wilt on Canary Island date palms is dependent upon rapid and accurate diagnosis in both the nursery and landscape. Failure to properly identify this disease will result in subtle but effective spread of this fungus in the immediate environment. Misidentification of a palm dysfunction such as *Fusarium* wilt will result in the unnecessary destruction of an expensive palm.

Management of this disease in the nursery begins with prevention. In purchasing stock from other sources, try to inspect stock prior to purchase. Evaluate palms for key symptoms. If palms are exhibiting decline symptoms, an alternative palm supplier would be desirable. Within the nursery, palms need to be examined on a bi-weekly basis for frond symptoms as they appear - especially during the warm-to-hot seasons. Properly sample symptomatic palms and seek lab verification of this pathogen. Infected palms should be removed and destroyed. Avoid scattering infested soil within or among rows of palms. Clean tools used in palm removal with bleach or rubbing alcohol. Leave the infested site fallow or replant with a non-palm species. Since the host range of the *Fusarium* wilt pathogen is undefined in Florida, replanting with a palm is a risk situation where infested soil exists. Restricted use of soil fumigants like methyl bromide/chloropicrin or metam sodium (Vapam') can provide an added measure of fungus control in infested sites. Use of these fumigants, however, is not likely to eradicate this fungus from the site.

The nursery practice of severe lower frond pruning on *P. canariensis* to achieve greater height of cleared trunk can result in effective, rapid spread of the wilt fungus. Where this disease is known to exist in the nursery, limit pruning cycles to once a year and remove only dead lower fronds. Use several pruning saws or loppers in the pruning cycle. Use one tool on each tree. Disinfect this tool in either a 1:1 ratio of bleach in water or undiluted rubbing alcohol. Choose the next pruning saw from the disinfectant solution to prune the next palm.

In landscapes, Fusarium wilt disease can spread rapidly due to the impact of landscape maintenance activities across numerous properties, neighborhoods and communities. Landscape maintenance companies should avoid multiple pruning cycles. Prune only dead fronds to minimize the risk of fungus movement. Although Canary Island Date palms are severely pruned in the “hurricane cut” at the time of installation to enhance establishment, this severe pruning style should be discontinued once the palm is established. Maintenance personnel should be alert to the key symptoms of Fusarium wilt. Suspect palms should be sampled and submitted for wilt determination. Fusarium wilt-affected palms should be carefully removed from the landscape. These trees should be taken to the landfill rather than committed to a municipality’s yard waste recycling program. It is unlikely that this fungus will be destroyed by the chipping and piling process normally used for yard wastes. Infested sites should be replanted to non-palm species until further host range information is available.

Fusarium Wilt Diagnosis

Based upon experience with this disease in Florida thus far, there are four key symptoms necessary for a field diagnosis of Fusarium wilt disease:

1. Progressive frond death from oldest to newest canopy.
2. One-sided leaflet death on a declining frond.
3. A prominent brown stripe on the rachis base starting at the trunk and extending out a variable distance toward the frond tip.
4. Discolored vascular bundles in the “striped” fronds.

If these symptoms are present, a diagnosis of Fusarium wilt is likely but not absolute due to the presence of other rachis blights in Florida. Seek laboratory verification prior to destruction of a Fusarium wilt-suspect palm.

For proper laboratory verification of Fusarium wilt of Canary Island date palm, collect 3-4 petiole bases from fronds exhibiting either one-sided leaflet death or tip dieback and the lower brown striping of the rachis. If only 1-2 fronds have clear symptoms, remove a symptomless lower and upper frond as well. Remove the lower 12-18 inches of each frond and remove the spines before packaging. If several trees are symptomatic, disinfect loppers or pruning saws between trees (as discussed earlier). Complete a Plant Disease Diagnostic Form (#2901) that is available from any county Extension office in Florida. Submit the completed form, samples and remittance to the following address for Fusarium wilt verification:

Florida Extension Plant Disease Clinic, Bldg. 78 Mowry Rd, University of Florida, Gainesville, FL 32611; Phone-(352) 392-1795, Fax-(352) 392-3438.

Verification of Fusarium-wilt suspect samples is very important. The Gainesville lab is the only diagnostic facility in Florida and in the United States that can accurately identify this pathogen to the strain that kills Canary Island Date palms - in a matter of 2-3 weeks. This new diagnostic method is the result of an on-

going research program directed toward accurate, rapid identification of this new disease in Florida for best, long-range management of this problem. Remember that there are several species of the fungus *Fusarium* that can be isolated from roots, leaves and buds of palms that are not causing *Fusarium* wilt disease. Similarly there are strains of *Fusarium oxysporum* recovered from palm tissues that do not cause *Fusarium* wilt. Do not destroy suspect palms needlessly. When you can, obtain a precise diagnosis on this new plant disease in Florida.

The host range of this new fungus is not defined among all the palm genera used in Florida. Assist the University of Florida, I.F.A.S., in mapping the distribution of this new fungus to best limit its potential spread in Florida.

Nursery personnel as well as landscape maintenance professionals' situations are urged to proceed with disease diagnosis. At first symptom appearance, proceed with proper palm sampling and submission. In this way, the distribution of this new fungus can be mapped throughout Florida for most efficient management. All records relating to palm wilt incidence in Florida are confidential.



Figure 1. Lower frond death caused by *Fusarium* wilt.



Figure 2. One-sided leaflet death on *Fusarium*-infected palm.



Figure 3. Fusarium wilt caused frond death from tip back toward the trunk.



Figure 4. External brown streak on an infected rachis of a Canary Island date palm.



Figure 5. Pockets of vascular browning in frond cross section.



Figure 6. Vascular streaking and discoloration in longitudinal section of palm frond.