

Fusarium Decline of Queen Palms and Mexican Fan Palms in Florida

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For those of you familiar with previous updates, you might recall the title was “New Disease of Queen Palms (*Syagrus romanzoffiana*) in the South Florida Landscape.” The change in the title reflects additional information obtained since the last update prepared in May 2006. This document is a summary of information regarding this new disease. If you only want to know the “bottom line,” please fast forward to the summary.

Why has the title changed? First, I am feeling more confident with each pathogenicity experiment that the pathogen is *Fusarium oxysporum*. I am tentatively naming the new disease “Fusarium decline.” Second, a second host has been identified, *Washingtonia robusta* (Mexican fan palm). Third, while the disease is still primarily observed in landscapes, container and field nurseries are also now documented as disease sites. Fourth, while the disease has not been documented in north Florida, it seems likely that the disease will occur in other locations besides the southern half of the state.

History

The sporadic death of queen palms in one Palm Beach County was first brought to our attention in 2003. Conversations with landscape maintenance staff throughout the southern half of the state, where most queen palms are grown, indicated the problem was observed in other counties at approximately the same time. This meant the 2004 and 2005 hurricane seasons could not be blamed for the spread of the problem. While initially less than 1% of the queen palms died in a single landscape, there are now sites where upwards of 5-10% of the queen palms have died. Until early 2007, no other palm species had been affected, even in landscapes dominated by a mixture of palm species. Most of the queen palms observed had been in the landscape for five or more years – i.e., it was affecting established palms and not newly transplanted plants. Only one nursery had been affected until early 2007, and it was a container nursery and not a field nursery.

Host Expansion

In late April/early May 2007, I obtained samples of diseased leaves from *Washingtonia robusta* from three locations distant to each other – Lee County, Orange County and Pinellas County. Two samples were from palms established in the landscape and one sample was from a field nursery. One of the landscape palms was on a property site where the disease had been observed previously on queen palms. The field nursery had never observed the disease prior to this time, and the disease occurred simultaneously in a queen palm block and a Mexican fan palm block (situated side by side). These palms had been in the field for approximately two years.

Probable Pathogen (or Patience is a virtue!)

I have consistently isolated *Fusarium oxysporum* from diseased queen palms (mature with trunks) in the landscape since early 2004. However, it was not uncommon for other “potential” pathogens to be isolated at the same time and from the same small piece of tissue, including

other *Fusarium* species. On the other hand, *Fusarium oxysporum* has been the only “potential” pathogen isolated from the petiole tissue of diseased queen palms growing in a container nursery and, most recently, from diseased queen and Mexican fan palms growing in a field nursery (juveniles without trunks).

To confirm which fungus isolated from a diseased plant is the pathogen, plant pathologists must complete a series of steps called Koch’s postulates. The first step is consistent isolation of a pathogen from symptomatic host tissue. In the second step, the pathogen is grown in pure culture and its characteristics documented. The third step is inoculation of a healthy plant with the pure culture of the pathogen, using the same plant species from which the pathogen was originally isolated. This inoculated plant must then develop symptoms similar to those observed initially. The fourth step is recovery of the same fungus used for inoculation purposes.

Sometimes completing Koch’s postulates is a simple task; sometimes it isn’t! It has been extremely difficult to complete Koch’s postulates with the *Fusarium oxysporum* and queen palms. We have set-up a series of experiments using queen palms (seedlings and juveniles) and thus far, IF the palms die, they are dying from *Fusarium oxysporum* and not from other “potential” pathogens. On the other hand, when *Washingtonia robusta* seedlings were inoculated the first time (using the exact same isolates as used for the queen palms seedlings), all inoculated plants died within a month.

Preliminary DNA analysis indicates that the *Fusarium oxysporum* isolates obtained throughout the state and from both palm hosts are the same. Furthermore, this *Fusarium oxysporum* appears to be new. It does not appear to match any other known pathogenic *Fusarium oxysporum* strains, including the strains that cause Fusarium wilt of Canary Island date palm, edible date palm and oil palm. Further DNA analysis is needed to confirm these preliminary results.

Pathogen x Host(s)

Fusarium oxysporum is not a single fungus, but is composed of subgroups called *formae speciales*. In general, these subgroups are determined based on the host species affected by the fungus because these subgroups cannot be separated based on the typical characteristics used to separate fungi. Examples: The primary host of *Fusarium oxysporum* f. sp. *canariensis* is *Phoenix canariensis* (Canary Island date palm). The only host of *Fusarium oxysporum* f. sp. *albedias* is *Phoenix dactylifera* (date palm), and this fungus is only found in Morocco and Algeria. The primary host of *Fusarium oxysporum* f. sp. *asparagi* is *Asparagus officinalis* (asparagus). Thus, it is quite surprising, but not impossible, to have isolated the same *Fusarium oxysporum* from two different palm species. Whether other palm species will be affected is simply not known.

However, this is an alarming development relevant to management strategies and potential spread of the pathogen. If queen palms had been the only host, then avoiding the planting of queen palms into an affected area would have been a useful long-term strategy. While we have observed the continuing northward movement of queen palms (they really are not very cold hardy) with some dismay, *Washingtonia robusta* are relatively cold hardy and are found throughout the state. This means the disease can spread throughout the state. In other words, it is no longer just a south Florida problem.

Symptoms

The problem has always appeared to be a disease. No insects are observed in association with symptomatic palms, nor are nutritional deficiencies implicated in the problem.

- Queen palm

Symptoms on queen palms (a featherleaf palm) are as follows. The lowest (oldest) 2-3 leaves turn brown (leaflets and petiole) but do not break or hang down (Figure 1). The next 2-3 youngest leaves in the canopy will turn varying shades of yellow. This pattern continues up through the canopy (Figure 2) until the entire canopy is brown. It looks as if the canopy has been freeze-dried in place (Figures 3 and 4). The time between initial symptoms and palm death is only a few months. The symptoms are different from early senescence of leaves with potassium deficiency, a common nutrient deficiency of queen palms. With severe potassium deficiency, the leaflets will be brown but the petiole will be green. With the new disease, both the leaflets and the petiole are brown.

Closer examination of the yellowing leaves and the next green leaf in the canopy should reveal what is believed to be the initial target of the pathogen – the leaf petiole at the point where it is bending out of the canopy. There are areas of discoloration (brownish-red color) at this point that seem to spread in both directions on the petiole (a stripe), toward the trunk and toward the leaf tip (Figure 5). The petiole is not soft and rotted, but simply discolored. Cross-sections through the petiole reveal internal discoloration (Figure 6). Cross-sections must be made with a sharp saw and not with a crushing tool such as pruning shears or loppers, as the crushing motion will discolor tissue also. Leaflet tips, even on lower green leaves, may exhibit drought-like symptoms. I have also noted that many leaves initially exhibit one-sided death symptoms, where the leaflets on one side of the leaf are brown (necrotic) but the leaflets on the other side of the leaf are green, with the brownish-red stripe on the petiole corresponding to the side with the dead leaflets (Figure 7).

- Mexican fan palm

Symptoms on Mexican fan palms will also have more brown (necrotic) lower leaves than normal and subsequently younger leaves with leaf blades that are partly green and partly yellow or brown (Figure 8). The petioles of these leaves will have a brown to reddish-brown stripe running from the blade back to the trunk (Figure 9). Again, it appears to be a relatively short time (a few months) between initial symptom development and palm death. Cross-sections through the striped petiole reveals an associated internal discoloration. The individual leaf symptoms (brown stripe with uneven leaf blade coloration) will look the same as another disease that can be observed on Mexican fan palms, petiole blight. Petiole blight is not normally a fatal disease, whereas *Fusarium* decline is fatal.

For both palms, the apical meristem (bud) of the palm is not killed until sometime after the canopy turns completely brown. When cross-sections are made through the crown of a dying queen palm, the bud is still clean and white, but older leaf and inflorescence (flower) bases are discolored and usually rotted. The symptoms and their development suggest the pathogen is producing a toxin.

Pathogen Movement

Based on the locations of the disease (both on queen palms and now Mexican fan palms) throughout the southern half of the state, it would appear that the pathogen is most likely spread to new sites by wind. Once the disease is established in a landscape or neighborhood or nursery, it is possible the pathogen could be spread by pruning tools, in addition to being spread by wind. Therefore, as with Fusarium wilt of Canary Island date palms, it may be useful to sterilize pruning tools prior to pruning queen palms and Mexican fan palms, even those that appear healthy. If the client insists on having leaves of a diseased palm trimmed (rather than removing the entire palm immediately), sterilize the pruning tool prior to pruning the next palm. See the table below for materials to use for sterilizing pruning tools.

Management Strategies

Palms with Fusarium decline should be removed immediately and the canopy destroyed. As long as the disease has not moved down into the trunk tissue, the trunk can be recycled as mulch. Removing the diseased palm removes a potential inoculum source of the disease. However, caution should be used regarding Mexican fan palms. Without a laboratory test, it is not possible to know if a Mexican fan palm has Fusarium decline or petiole blight. If it has petiole blight, the palm does not need to be removed, as it is not likely to die. Until more is known about the disease, it would not be recommended to plant a queen palm or Mexican fan palm back into the site where the diseased palm was located.

No fungicides are recommended. Curative applications would not be feasible since the palms decline so quickly after the disease symptoms are observed. Also, fungicides have not been shown to be effective in controlling similar diseases such as Fusarium wilt of Canary Island date palms.

Photographs illustrating symptoms can be found at the following website:

http://flrec.ifas.ufl.edu/palm_prod/fusarium.shtml

Summary

- The quick-killing disease of queen palms (*Syagrus romanzoffiana*) has spread to another host, the Mexican fan palm (*Washingtonia robusta*).
- The disease has been observed in landscapes, a container nursery and a field nursery.
- The disease has been documented thus far only in the southern half of the state (Orlando to Tampa to Cocoa Beach and all areas south – inland and coastal). However, it is quite likely the disease will spread further north over time.
- Infected palms die quickly, often within a few months of the initial symptoms.
- There is no cure once a palm is infected, and no preventive fungicide treatments are recommended.
- The disease is probably spread by wind into new sites. Once established, it could also be spread by pruning tools. Pruning tools should be sterilized after each palm is trimmed.
- Palms, especially queen palms and Mexican fan palms, should not be replanted into a site where a palm with this disease was removed.
- The disease is tentatively called Fusarium decline of palms. The fungus *Fusarium oxysporum* appears to be the pathogen.

Table 1. Suggested materials and soaking times for disinfecting pruning tools. Information developed for managing Fusarium wilt of Canary Island date palm.

Material ^z	% Solution	Soaking time
Household bleach (ex: Chlorox)	25% (1 part bleach + 3 parts water)	5 minutes minimum
Pine oil cleaner (ex: Pine Sol)	25% (1 part cleaner + 3 parts water)	5 minutes minimum
Rubbing alcohol (70% isopropyl)	50% (1 part alcohol + 1 part water)	5 minutes minimum
Denatured ethanol (95%)	50% (1 part alcohol + 1 part water)	5 minutes minimum
^z The above materials were shown to be effective in eliminating the fungus from the wood dust or palm sap trapped on pruning tools (Simone, 1998). It is suggested that the solution be replaced after ten trees or every two hours. Rinse the tool with fresh water after disinfecting. Other potential disinfectants would be trisodium phosphate or quaternary ammonium salts. The latter is recommended as a 5% solution, soaking for 5 minutes (Smith et al., 2003).		