Tree Diseases in Southern California

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Work at South Coast Research and Extension center showed fertilizer effects in the expression of *Fusarium* in Hebe

- Keim and Humphrey (1984) found that Calcium nitrate fertilized plants developed less disease than Ammonium sulfate fertilized plants.

Some History

• Foxy only found in *Phoenix canariensis*, (Feather 1979).
• Later, *Phoenix dactylifera* was shown to be susceptible (Ohr and others 1980)


Treatments

two factor factorial experiment in random blocks

Species
• *Phoenix roebelini*
• *Phoenix reclinata*
• *Phoenix canariensis*
• *Washingtonia filifera*
• *Phoenix dactylifera*

Fertilizer
• Calcium Nitrate
• Ammonium Sulfate
• CAN 27 (Calcium ammonium sulfate)
• Apex Palm Plus
• Untreated
Palm Growth as affected by fertilizer sources

![Bar graph showing growth metrics for different fertilizer sources. Each bar has a letter indicating statistical significance, with different letters denoting different groups. The x-axis labels are CANO3, NH4SO4, CAN27, Apex, and check. The y-axis represents the growth metric, which could be volume or number of new leaves.](image)
Plant volumes ($m^3$)
Percent palms surviving, 2011

- roebelini: 100%
- reclinata: 70%
- canariensis: 30%
- filifera: 50%
- dactylfera: 80%
Survival percentages by species and fertilizer (Aug 2011)
Fusarium Recovery

- *Fusarium oxysporum* was recovered from *Phoenix canariensis*, *P. reclinata* and *Washintonia filifera*

- Foxy was not recovered from *P. dactylifera* or *P. Robelini*.
PCR and sequencing

- Confirm a match to the 567 base pair primers of Plyler et al.
Things to note

• F.oxy can not isolated from dacs or roebelini but from all others
• Nitrate treatment no *P. canariensis* survivors argues against finding of Keim.
• CAN 27 seemed to push the most growth
The variable response of Canary Island Date Palm to infection by *Fusarium oxysporum* f.sp. *canariensis* and *Nalanthamnala vermoeseni*. 
A new disease on Queen Palm

*Fusarium* spp. Isolated from the dying tree.
Dothiorella

- Symptoms are easily confused with Fusarium wilt.
- Disease is not systemic
- Disease thrives on drought stressed tissues/trees.
Vascular browning is quite distinct in the *Dothiorella* disease.
Dothiorella will fruit in the dead tissues on the petiole
New Palm Diseases
A new *Serenomyces* causing petiole blight on Phoenix

*Images from Soil and Plant Lab Inc.*
Rachis Blight on *Phoenix canariensis* caused by *Cocoicola* spp.

Images from Soil and Plant Lab Inc.
Petiole Blight
Washingtonia filifera
Cocoicola californica

Images from Soil and Plant Lab Inc.
Root Collar inspections are necessary for trees (always)
Trunk flat sides

- Indicate that the cambium has stopped growing on that side of the tree
- Cambial death is often associated with incipient root rot or loss of large and important roots.
Buried Trunks often show Symptoms or signs under or in Bark

- Signs of mycelium
- Symptom of oxidation of tissues
Alder Decline
*Phytophthora siskiyouensis*

- Alders have been dying in record number in Southern California
- Michael Coffey and Deborah Matthews have found that this new *Phytophthora* is associated with the disease
- The disease, like many *Phytophthora* diseases, causes extensive basal cankers that girdle the tree.
Alder Problems
Dieback in canopy of white alders, *Alnus rhombifolia*, in Irvine, CA.

Problem identified by Don Hodel (UCCE L.A. Co.) and Kelly Parkins
dime to quarter sized moist spots on trunks
What we isolate most is?

Botryosphaeria spp.
Basal Cankers caused by \textit{Phytophthora} spp.

- These are rapidly advancing tree destroying pathogens
- Aside from Oak Root Fungus, \textit{Phytophthora} spp. are the most prevalent tree killers in Southern California landscapes
Canker on root of dead tree
Basal Canker on oak

• Many insects may associate with these cankers but it is not known if any of them vector disease.
• Sycamore borer
  – A clear winged moth.
Botryosphaeria canker of Ficus microcarpa

*Botryosphaeria* spp. taking out a whole street in Santa Monica
Symptoms in Stems
On thin barked or green-barked trees sometimes the stem must be washed to see the symptoms of a canker.

The effects of washing on symptom display on *Ficus microcarpa* ‘nitida’
Fruiting bodies are very difficult to see because they are covered in dirt

- There are both pycnidia and perithecia of this fungus present on cankered branches
- DNA sequencing is underway at UCR as well as pathogenicity testing.
Symptoms in stems

A new canker disease in *Ficus microcarpa* ‘nitida’ note branch collar is slowing progress of the infection.
Ficus Canker

Anamorph

Teleomorph
Corymbia citriodora canker

- uncertain etiology.
- Branch and trunk canker
- Basal trunk canker
Old Trees Rot!

Old trees have more decay.
It is impossible to limit the progress of decay in trees once they have been infected!!
Decay is best limited by proper management over the course of a tree’s lifetime.

From forest pathology.org
Jim Worrall
Heart Rot of Trees

- Ganoderma
- Laetiporus
- Often associated with a decline in vigor.
- Associated with wounds to roots or the main stem
- Wood decay fungi feed on stored sugars in wood and on the wood itself.

Multiseriate rays stained with Potassium iodide to show starch storage in wood (Kevin Smith Seminar, San Marino, CA)
Wounds and the potential for their infection in the deeper layers of the tree’s xylem.
Heart Rot: a monocyclic disease
Conks

- White Rots
  - Armillaria
  - Oxyporus
  - Ganoderma

- Brown Rots
  - Laetiporus
Heart Rot
Ganoderma lucidum
Oxyporus latemarginatus
Wood Decay Fungi

- *Laetiporus sulfureus*
  a brown rot fungus

- *Oxyporus latemarginatus*
  a white rot fungus
Queen Palm Rot
Palm Tree Anatomy and Physiology: Trunk Cross Section

Internal Vascular Bundles

Starch Filled Parenchyma
Trunk Rot on Queen Palm
*Syagrus rommanzoffiana*

*Systotrema* spp.