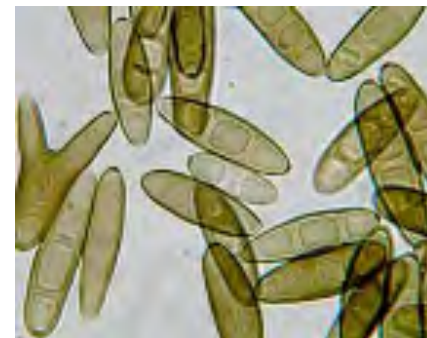




# Pitahaya Diseases



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# Diseases – *Cause for Concern?*

- Pitahaya imported into California, and exported from California (to Hawaii for instance)
  - Is it disease-free?
  - How can we know it is disease free?
  - Are we ruining our industry??

# California has a Huge Advantage!

## *In Pitahaya Production*

- Our dry climate allows us to grow this fruit without fungicides (at least until something new comes along)
- The tropical countries have to use a lot of fungicides on pitahaya, much like the avocado production in tropical countries

# Diseases in California

- Generally, with our dry climate, the diseases are few, however:
- Plants can be damaged by intense light, and this damaged tissue may be susceptible to stem rot caused by a bacterium
- Plants can be damaged by too much water, making them susceptible to root rot caused by several fungi



# Disease Caused by Bacteria

- Soft rots of the stem and blades are caused by *Xanthomonas campestris* and *Erwinia carotovora*
- *Several countries report these as Enterobacteria cloacae (2009). Are they the same??*
- Calcium deficiency in Mexican plantings has been shown to make this problem worse



# Soft Rots

- Soft stem rot caused by *Erwinia caratovora* in Taiwan matches a stem rot found in Calif.
- Infection starts from injured areas (sunburn, other diseases spots caused by anthracnose)
- Control includes pruning out dying stems and spraying with copper sulfate



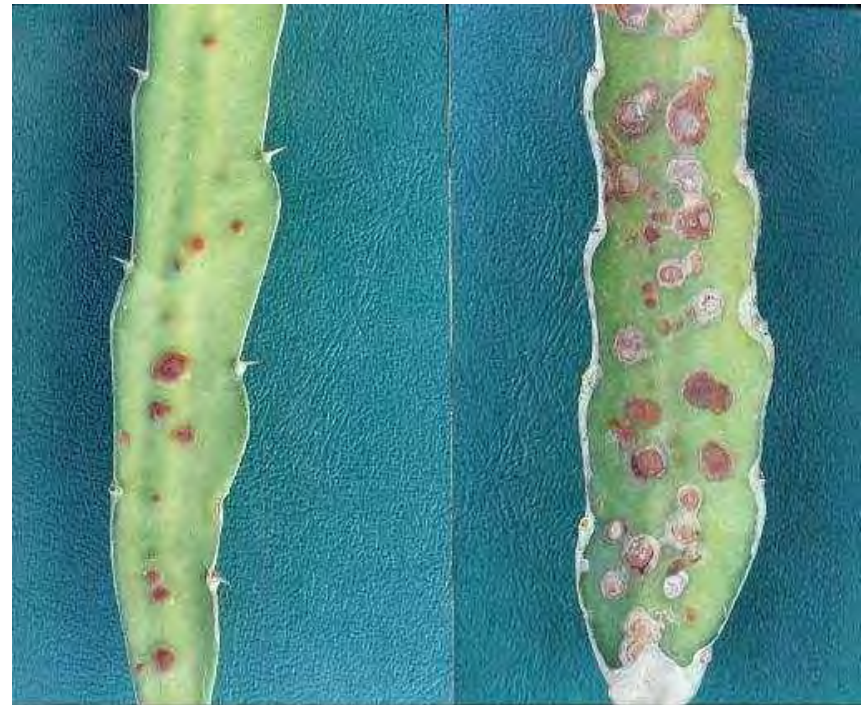
# Diseases Caused by Fungi

- Dothierella (*Botryosphaeria*) ★
- Anthracnose (*Colletotrichum*) ★
- *Bipolaris*
- *Fusarium* ??
- *Alternaria*
- *Phytophthora* ??

# Botryosphaeria

## *Brown Stem Spot Disease*

- *Botryosphaeria dothidea*
- First reported in Mexico in 2003
- The *Fusicoccum* stage was isolated in pure culture, re-inoculated and the exact same symptoms were produced
- Small chlorotic specks which enlarge up to 5 cm in diameter



# Botryosphaeria

- Picture is from Thailand



# Botryosphaeria Disease Management

- Prune off dead limbs and dispose away from the plantings. Maintain a thick layer of mulch to hasten decomposition of fungi on the ground. Use good sanitation and optimal cultural practices to minimize disease.
- When weather changes from cool to warm, appropriately modify the irrigation program, and pay special attention to irrigation needs during periods of hot weather.



# Anthracnose

- *Colletotrichum gloeosporioides*
- Reported in S. Florida in 2007
- Reddish brown lesions with conspicuous chlorotic haloes developed concentrically on the edges of vine ribs.
- Lesion centers became white and coalesced to rot much of the vine column, and in severe cases, only the vascular column in the vine center was not diseased
- From Palmateer, Ploetz, van Santen and Correll 2007



# Management of Anthracnose

- Remove diseased branches
- Clean clippers with 10% bleach
- If high rainfall and misty wet conditions, apply copper hydroxide prior to wet conditions. Copper will reduce new infections, but will not “cure” an existing infection.

# Bipolaris Fruit Rot



- This rot begins as small tan, circular lesions on the fruit surface and as the disease progresses the lesions enlarge and turn black.
- Usually a black felt-like growth of the fungus can be observed on the lesions. Under ideal conditions (warm and humid), the fruit develops large areas of soft rot.

# Bipolaris fruit rot

- The lesions are caused by a fungus, *Bipolaris cactivora*. This species causes stem and fruit rot of cacti (including pitahaya) in California, Florida, Europe and Japan.
- Former name was *Helminthosporium*



# Bipolaris fruit rot

- The disease is most severe on mature and ripe fruit. While young stems are susceptible to *B. cactivora*, mature stems are relatively resistant to infection.
- Bipolaris rot on ornamental cactus is most severe between 75-91 F.
- In general, diseases caused by *Bipolaris* are favored by humid conditions.
- Inoculum sources include diseased plants in the field and crop residue. Conidia are most often spread by wind, irrigation and rain.

# Bipolaris fruit rot

- “The high incidence of fruit rot affecting commercial operations in Miami-Dade County over the past 2 years requires an effective disease management strategy.”
  - T. L. B. Tarnowski, A. J. Palmateer, and J. H. Crane, University of Florida, Tropical Research and Education Center, Homestead 33031-3314

# Management of Bipolaris fruit rot

- Currently there are no fungicides labeled for use on pitahaya in California and Florida.
- Cultural management includes limiting canopy wetness by irrigating in the morning so plant surfaces can dry quickly throughout the day.
- Maintain a weed free planting and remove and discard diseased plants (i.e. stems, fruits, and flowers) promptly when symptoms occur.
- *(From the Sarasota Fruit and Nut Society)*



# Pitahaya plant from the field (July, 2013)



Outer stem cut away



# Infection in the xylem and phloem

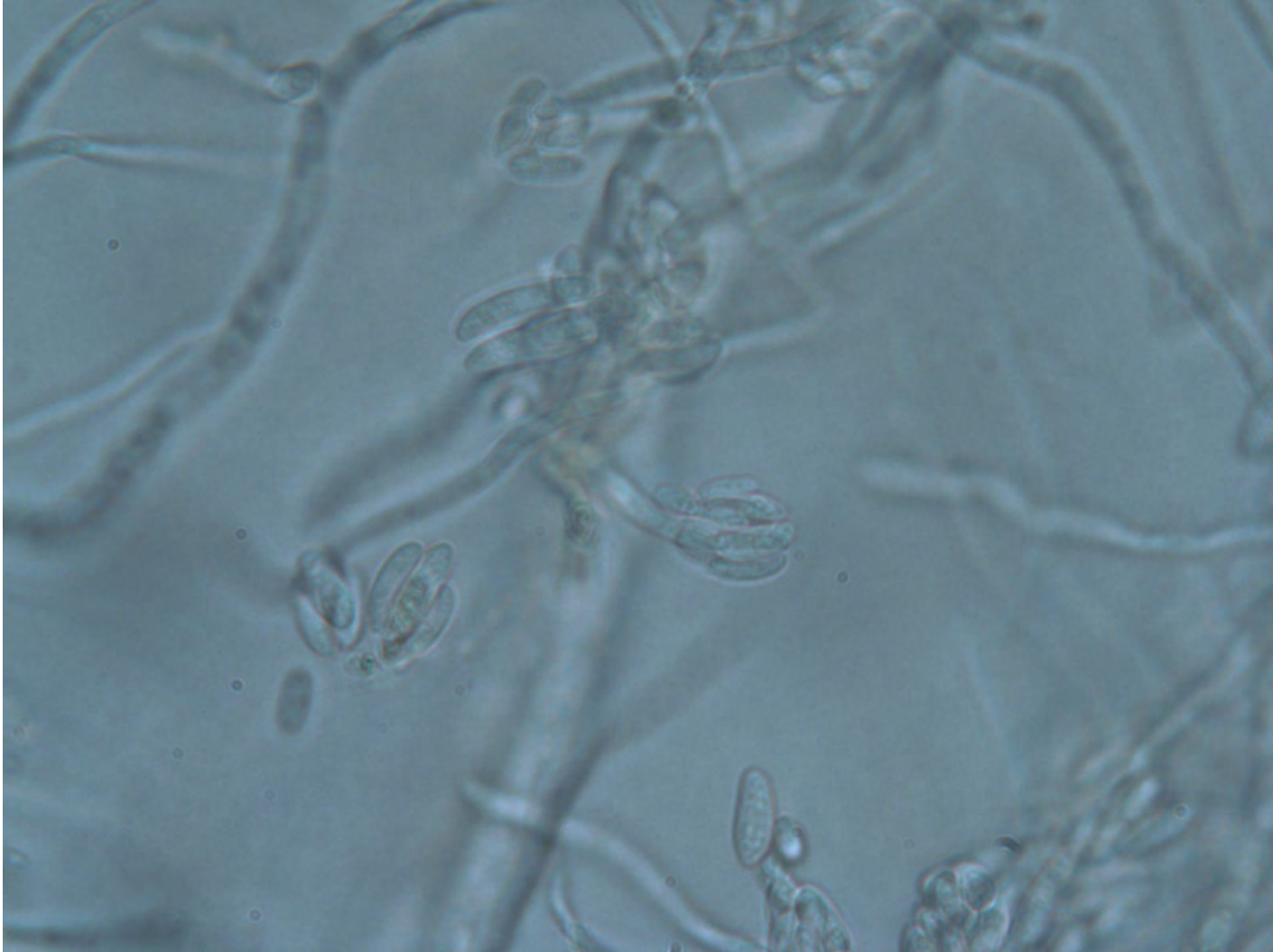


# *Fusarium* conidia in pure culture

(isolated from this same plant)



Another view, with mycellium



# Which *Fusarium*?

- *Fusarium* sp. been isolated for several years by other plant pathologists
- Dr. Akif Eskalen is the first to identify to species by analyzing DNA
- The verdict?

# Diseases Caused by Nematodes

## Cactus Root Knot



*Thank you!*



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