Pitahaya Diseases

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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 fungicides on Pitahaya, much like avocado production in tropical countries
Diseases – *Cause for Concern?*

– There is always a cause for concern because everything can become diseased.
– While certain Pitahaya varieties are grown for the quality of their fruit, they will also select for diseases as more acreage is grown.
– We have not experienced Pitahaya cultivation in California during wet winters.
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
Cactus Virus X on Pithaya

Image: from Deborah Matthews
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 — Whitewashing before onset of the problem
Diseases Caused by Fungi

• Dothiorella (*Botryosphaeria*)
• Anthracnose (*Colletotrichum*)
• Bipolaris
• Fusarium
• Alternaria
• Phytophthora
Botryosphaeria
Brown Stem Spot Disease

- *Botryosphaeria dothidea*
- First reported in Mexico in 2003, isolated in Ventura County.
- The *Fusicoccum/Dothiorella* 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 cladodes
- Clean clippers with 10% bleach or use a torch
- 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.”
Management of Bipolaris fruit rot

• Currently there are no fungicides labeled for use on Pitahaya in California or 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)*
Diseases of the main stem

- The central cylinder of Pitahaya feeds the entire plant.
- If the xylem of the main stem is compromised the entire plant will lose production.
- Often the outer part of the cladophyll can rot away and the main cylinder of conductive tissue will support the vine.
- While Root rot and collar rot are reported they are not well understood in California.
- Likely there are *Phytophthora* or *Pythium* collar rots of Pitahaya that need to be studied.
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)
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?
Phytophthora, Pythium??

- Root rot is certainly known but the etiology is uncertain
- When root rot is present plants:
  - Have poor tolerance to drought
  - Sunburn more readily
  - Stop growing
  - Fruit are smaller
  - Susceptible to other diseases
- Poor root development may mimic root rot disease
From Today
• Crassulacean Acid Metabolism
• Stomata closed in the day
• Therefore if in full sun and drought stressed or root rotted they will sunburn.
Sunburn

- Damages the cladodes
- May cause an entry point for other fungal pathogens
- Is a symptom that roots may not be healthy
Stomata of Pitahaya
Stomata in Pitahaya cultivars and species

- Nicaragua
- Florida/San Diego
- Mexico, Columbia San Diego

Thank you!

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