Phytophthora palmivora vs. *nicotianae*: Not always equal

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Citrus Expo

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Phytophthora Diseases

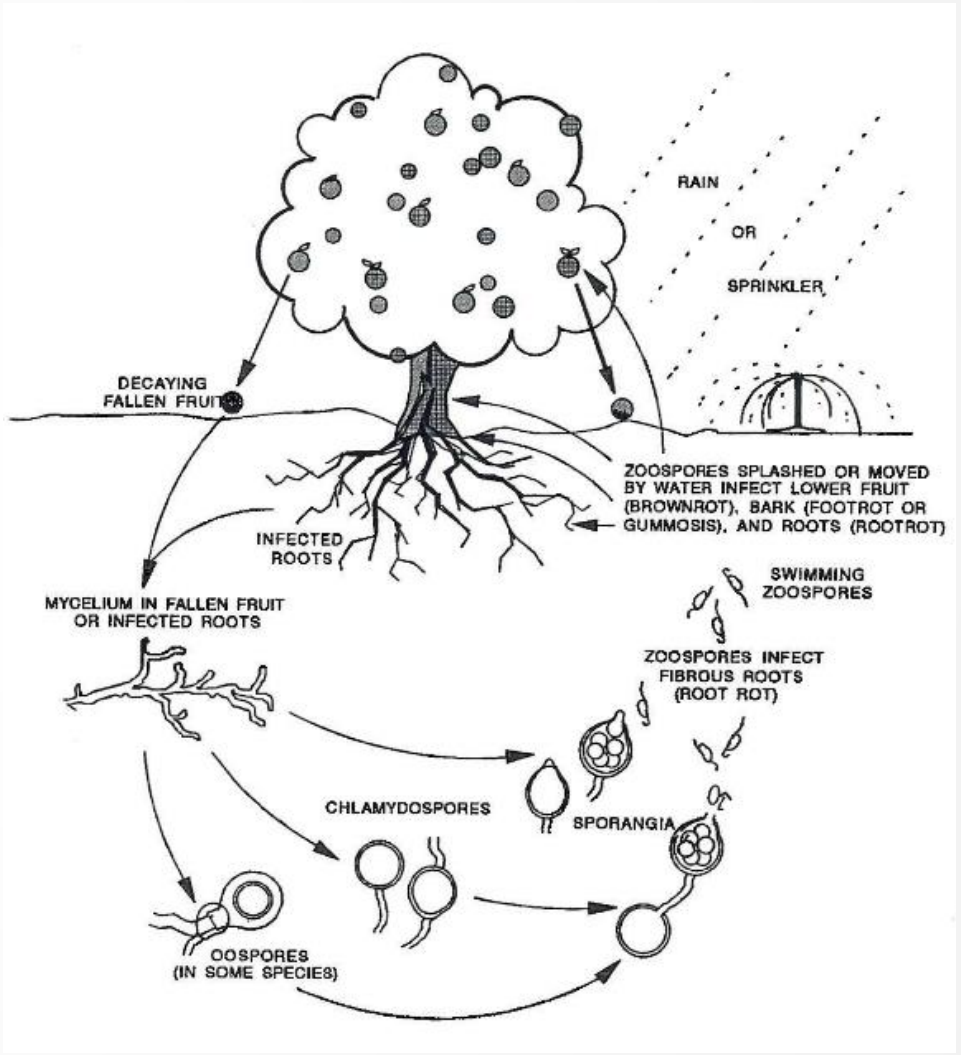
- Soilborne disease that can travel into canopy

- Causes
  - Root Rot
  - Foot Rot
  - Brown rot of fruit (early season)

- Yield reduction estimate
  = 3-6% per year

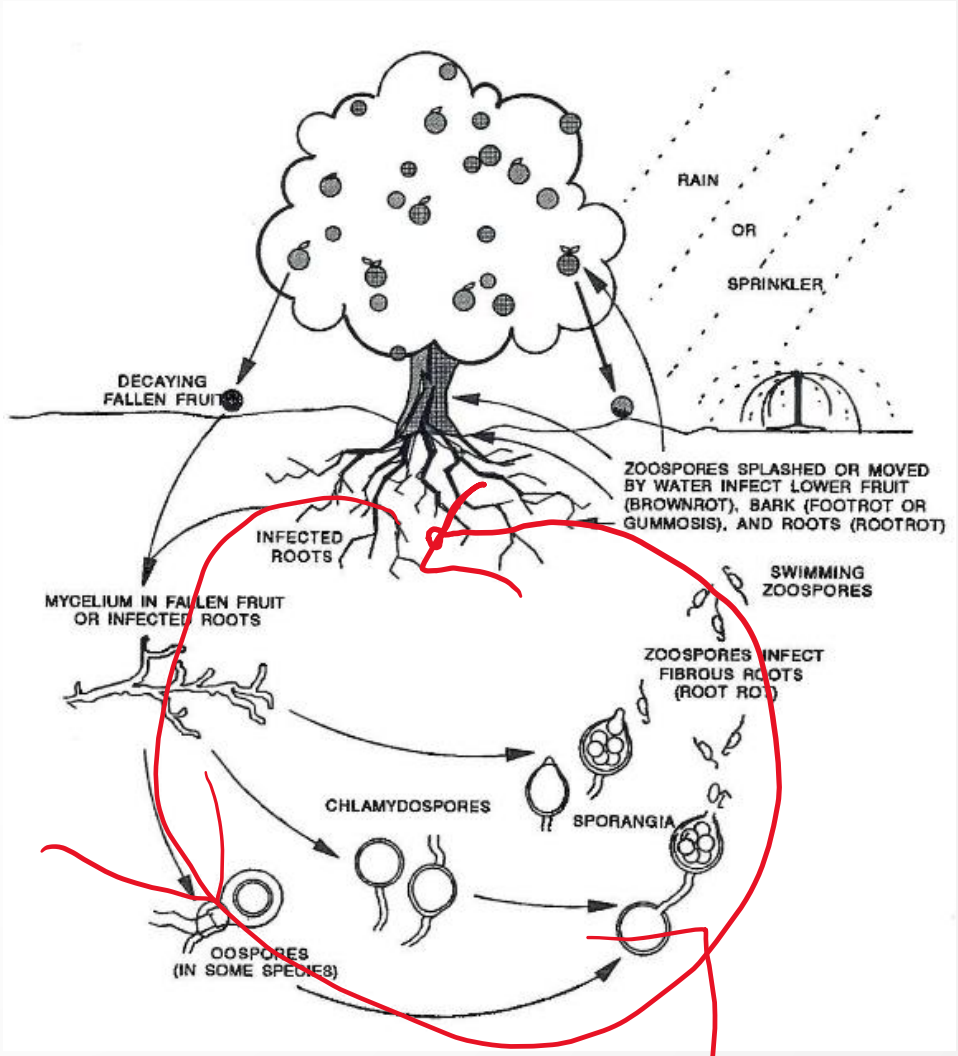
All diseases connected

- Root infection is the main source of new propagules
- Root rot severity drives risk of foot rot and brown rot



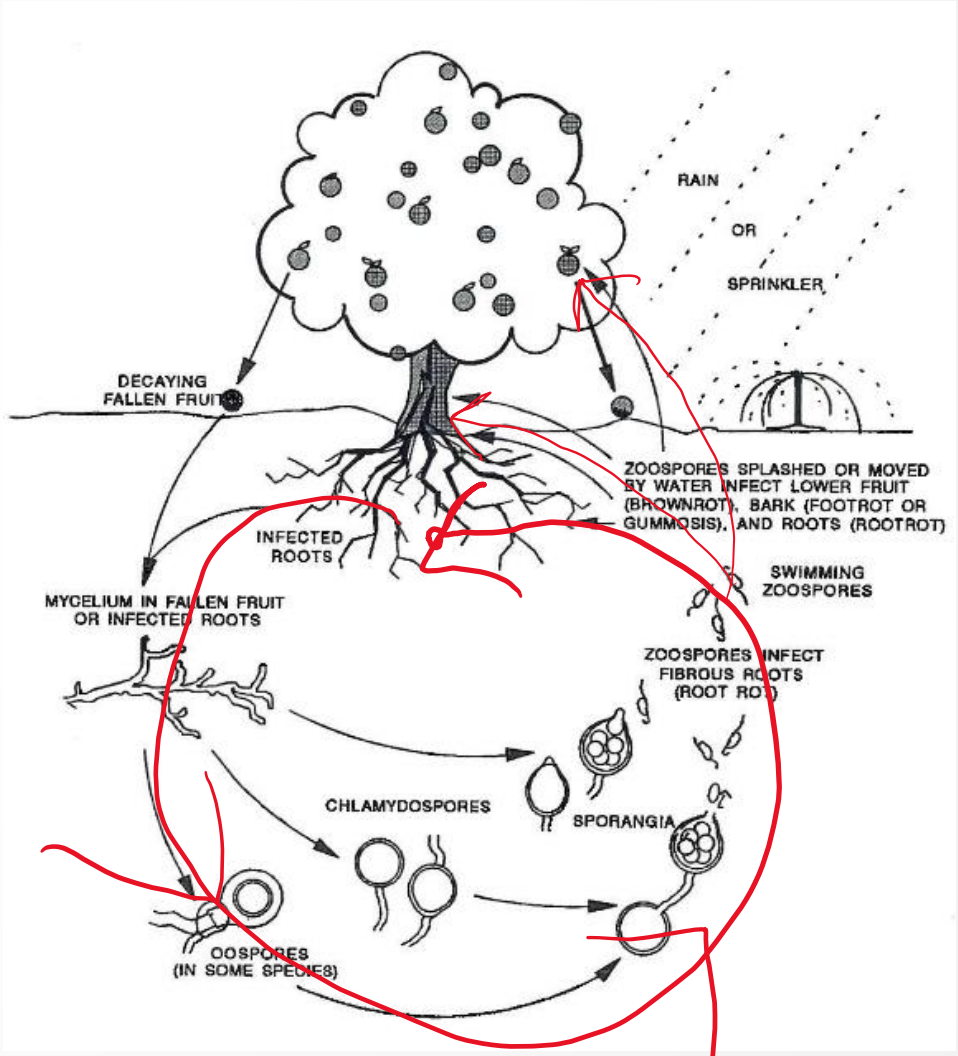
All diseases connected

- Low inoculum



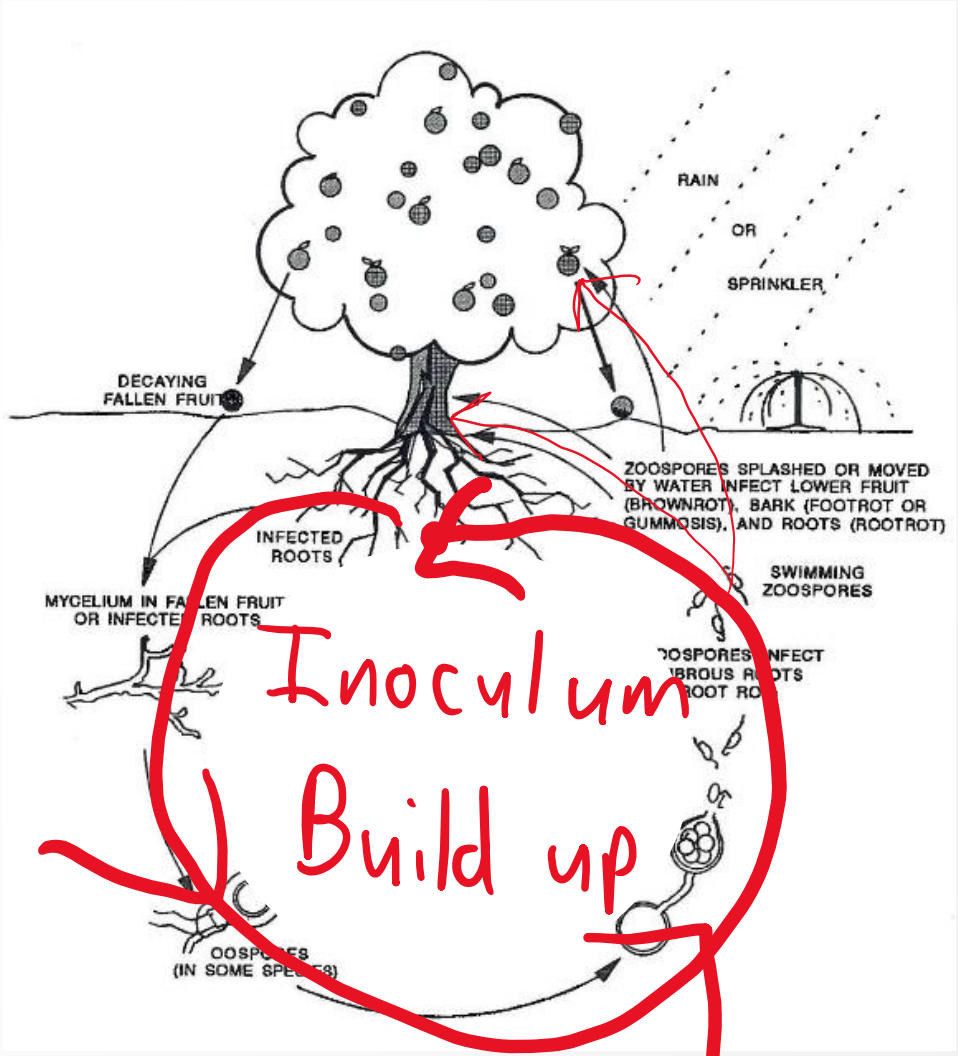
All diseases connected

- Low inoculum
- Low risk of
  - Brown rot
  - Foot rot



All diseases connected

- High inoculum
  - From favorable conditions with little or no management



All diseases connected

- High inoculum
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- Higher risk of
  - Brown rot
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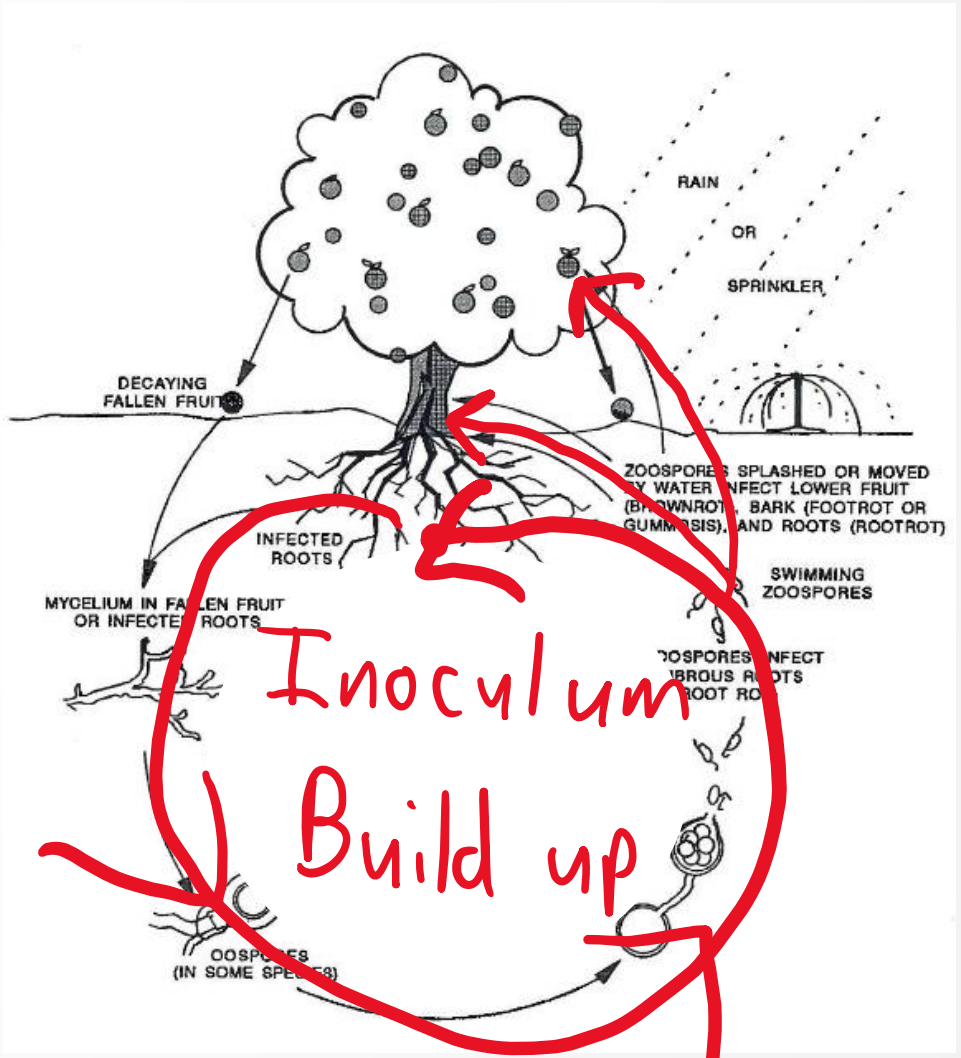
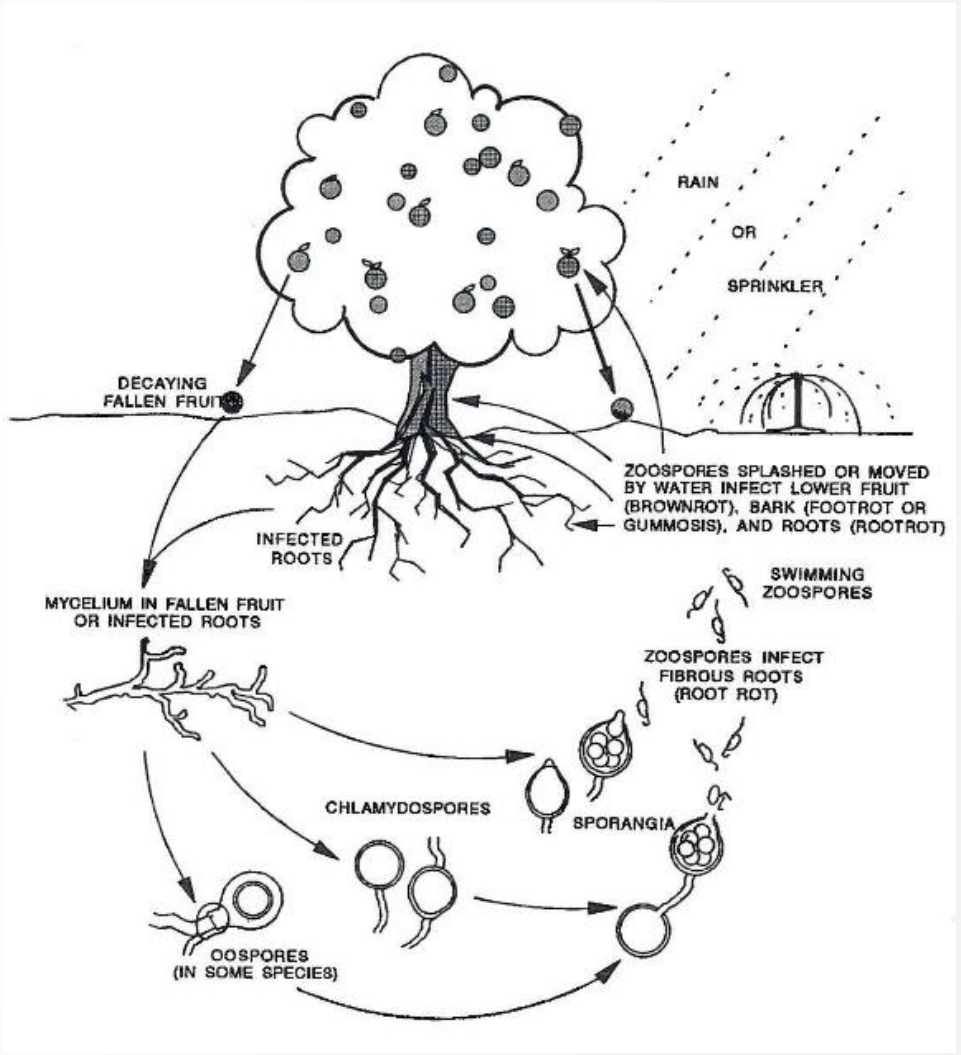


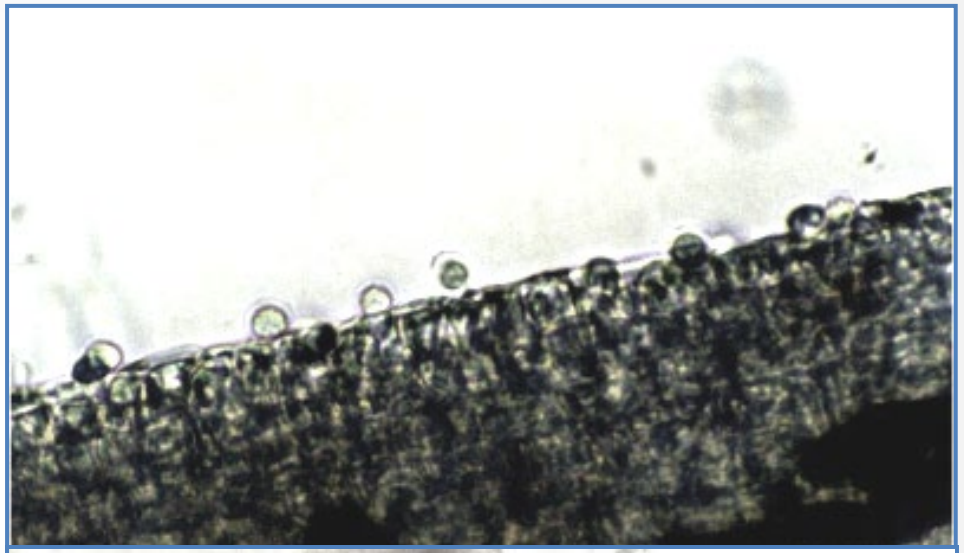
All diseases connected

- Susceptibility of roots
  - New fibrous roots are most susceptible
  - Highest during very wet to very dry cycles
- Wetting and drying increases root exudation
  - Attracts zoospores
- HLB infected roots also exude more exudates that promotes infection



Phytophthora infection cycle under favorable conditions

- Zoospores are released from sporangia swim or splash to the root, bark or fruit
- Spores encyst, germinate, and infect tissues within 24 hrs

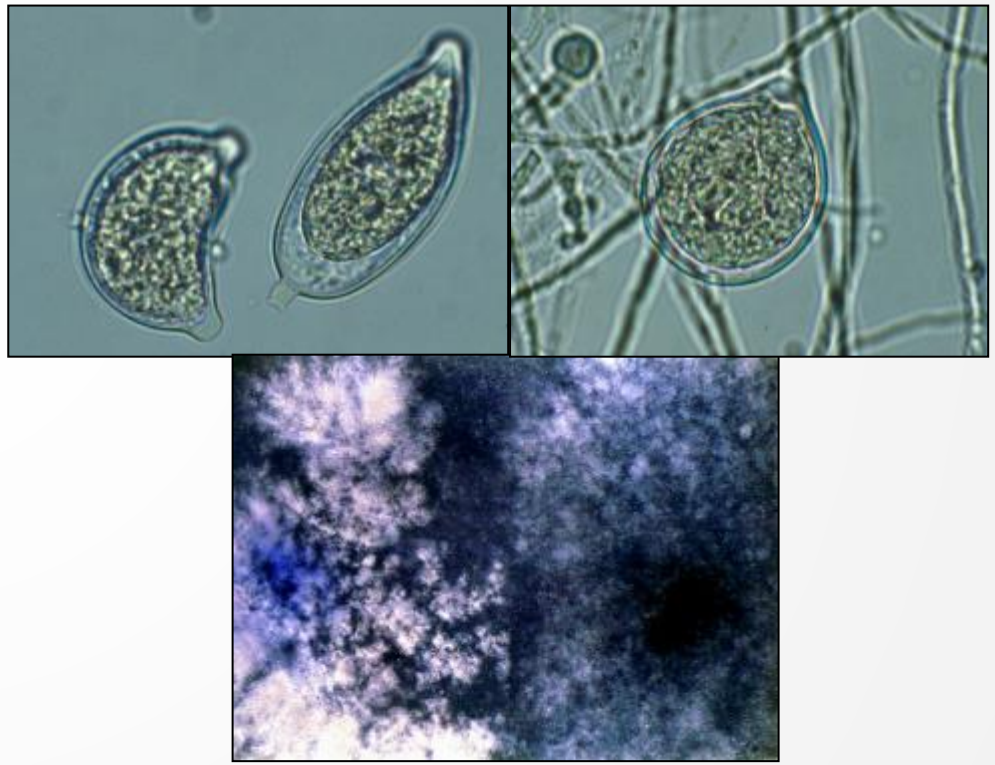


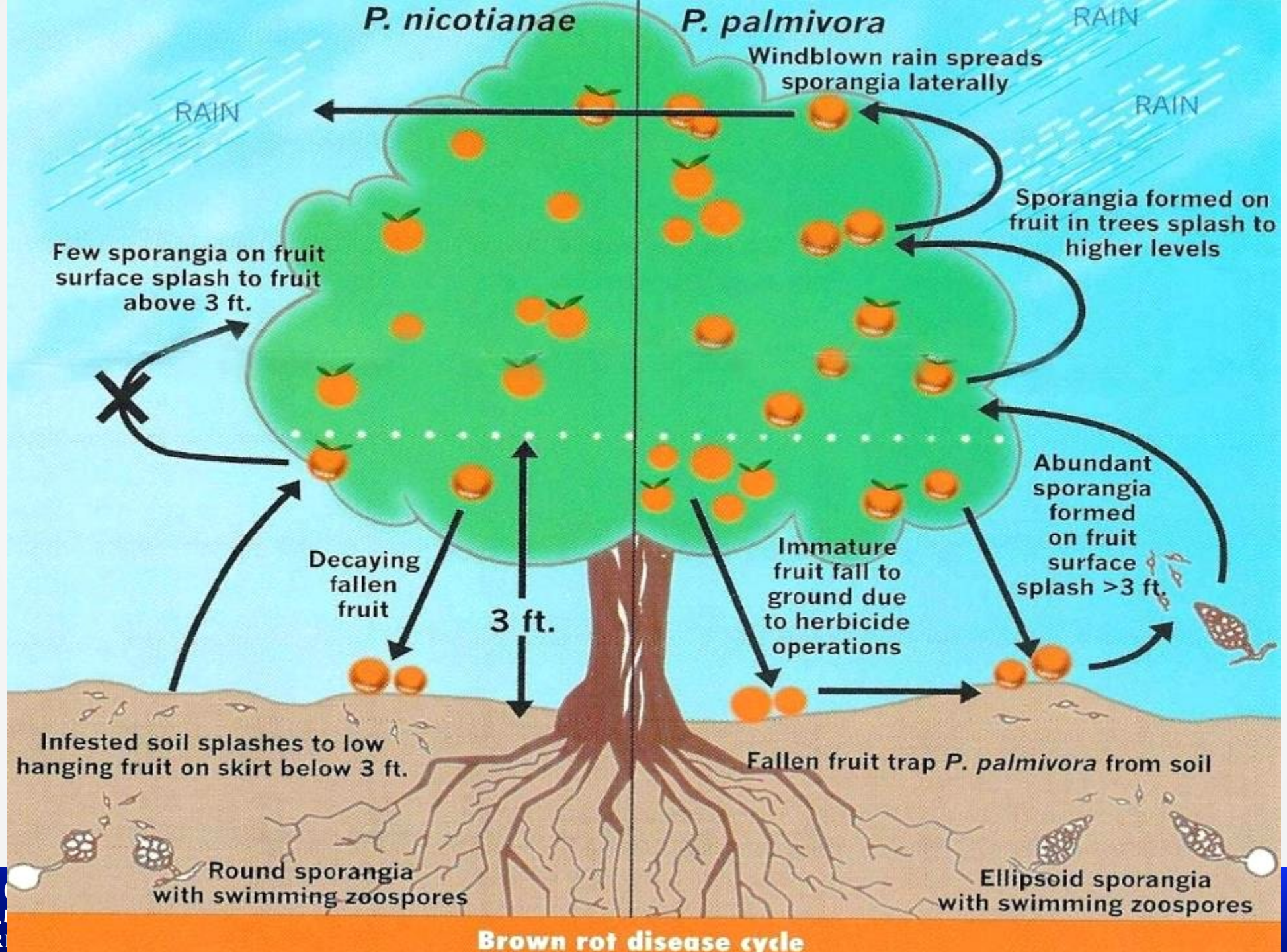
Phytophthora in Florida Citrus

- *Phytophthora nicotianae (parasitica)*
  - common cause of foot rot and root rot statewide
  - Broad environmental conditions
  - Minor brown rot problem
- *Phytophthora palmivora*
  - Prefers poorly drained soils with high water tables
  - Sporadic outbreaks
  - Major brown rot concern

P. palmivora
Sporangia elongated

P. nicotianae
Sporangia round





P. palmivora still causes root rot

- More restrictive environmental preferences
- Rootstock sensitivity is different than *P. nicotianae*
- Sporulates more rapidly

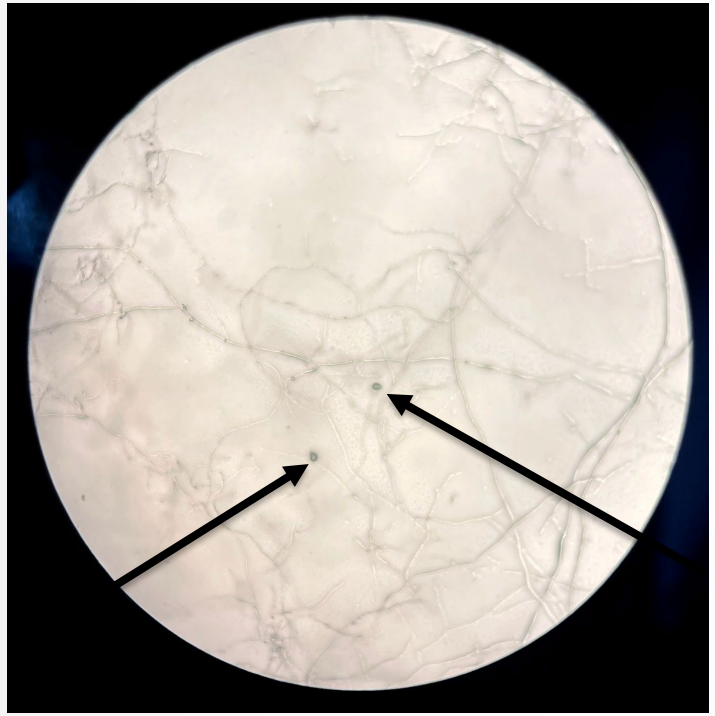
Rootstock susceptibility to root rot depends on *Phytophthora* spp.

	P. nicotianae	*P. palmivora*
Sweet orange	Susceptible	?
Cleopatra	Susceptible	Tolerant
Rough lemon	Susceptible	?
Sour orange	Susceptible	Tolerant
Volkamer lemon	Tolerant	Tolerant
Carrizo citrange	Tolerant	Susceptible
Swingle	Moderately Resistant	Susceptible
Trifoliate orange	Resistant	Susceptible

P. palmivora sporulates more earlier

From 1 spore (propagule) after 3 days

Phytophthora nicotianae



100x magnification

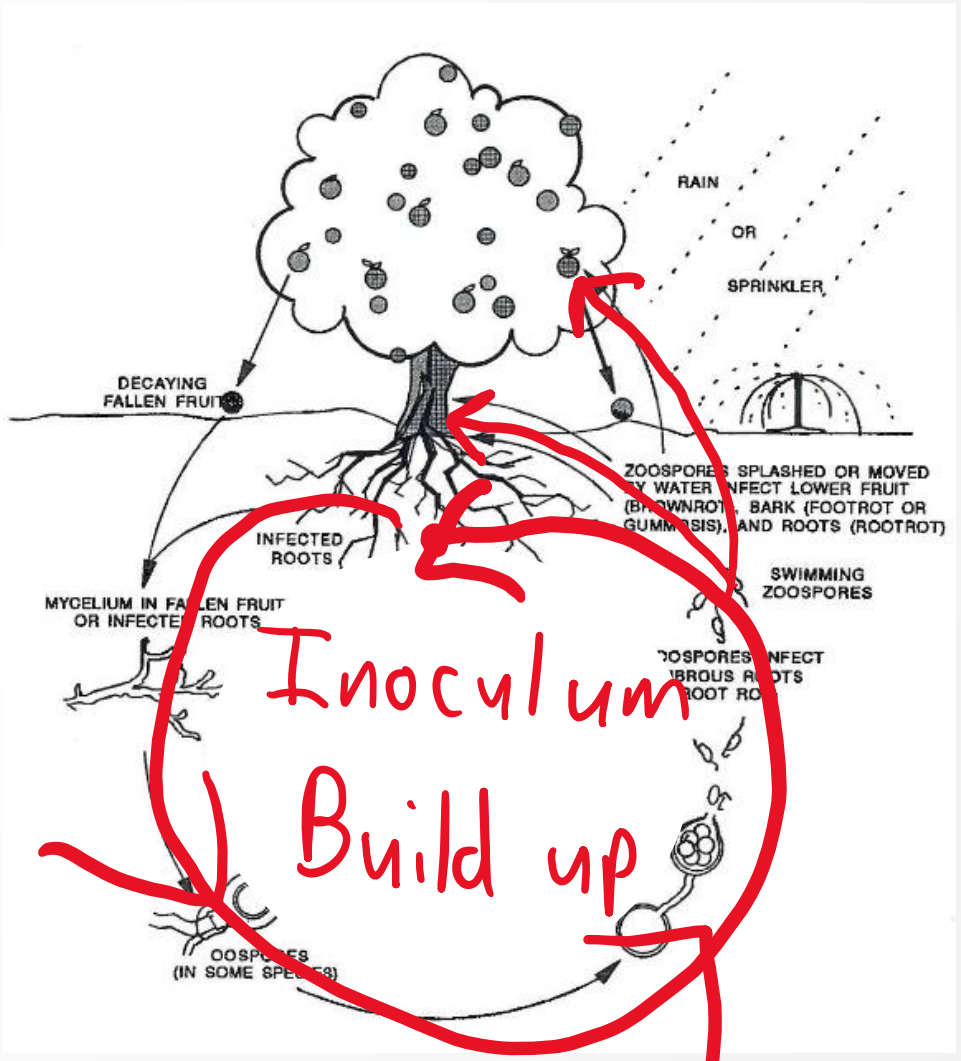
Phytophthora palmivora

100x magnification

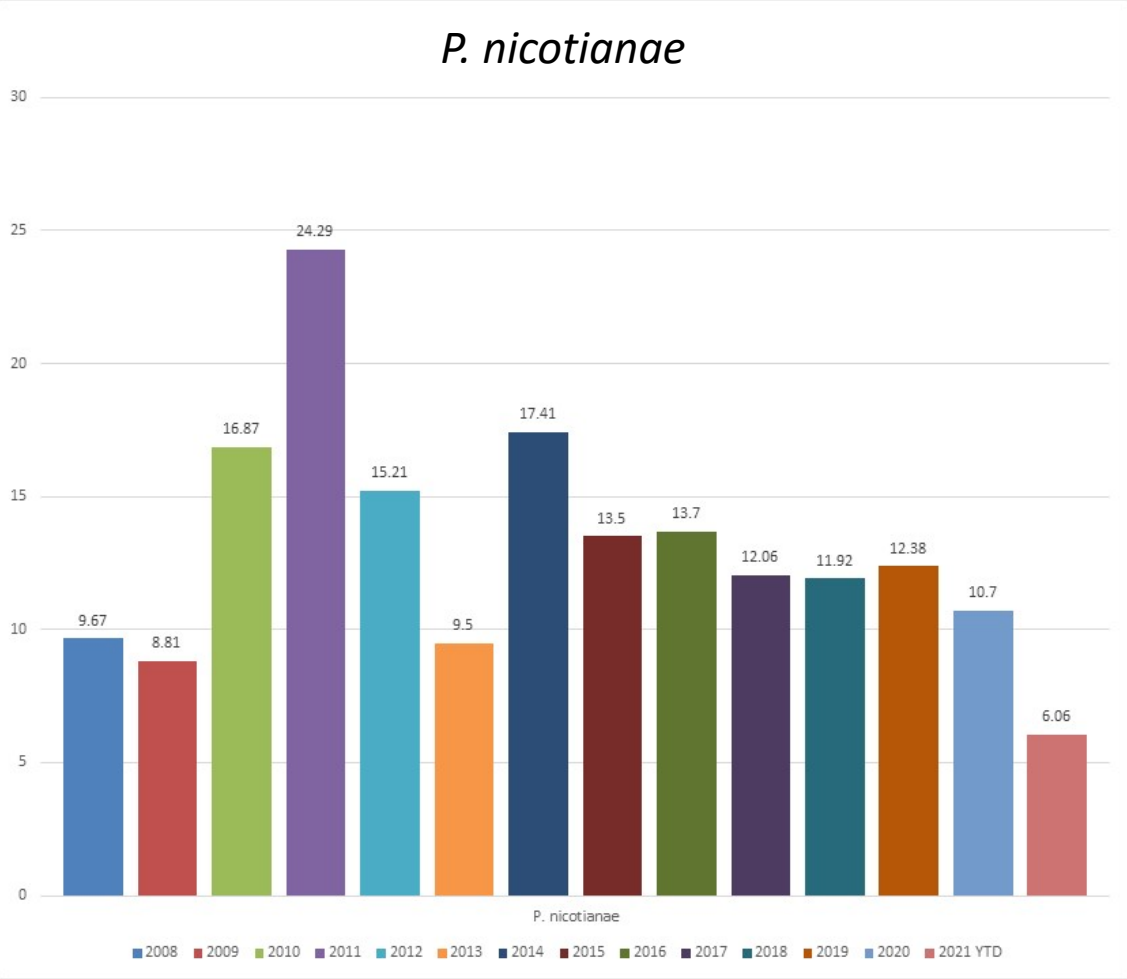
GROUNDWORK LABORATORY

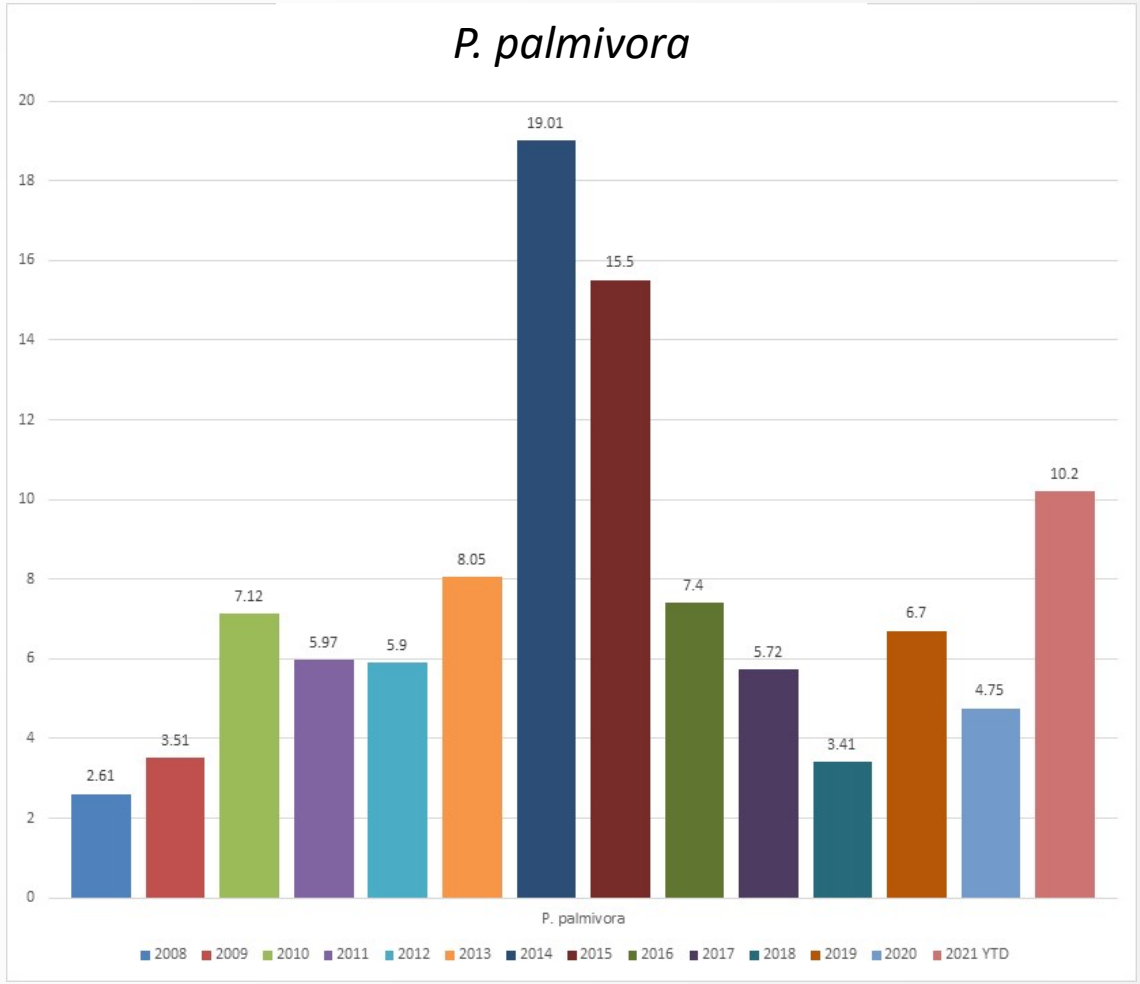
All diseases connected

- High inoculum
  - From favorable conditions with little or no management
- Higher risk of
  - Brown rot
  - Foot rot
- *P. palmivora* – Fruit drop also plays a large role



P. palmivora is surging again





Data courtesy of Syngenta

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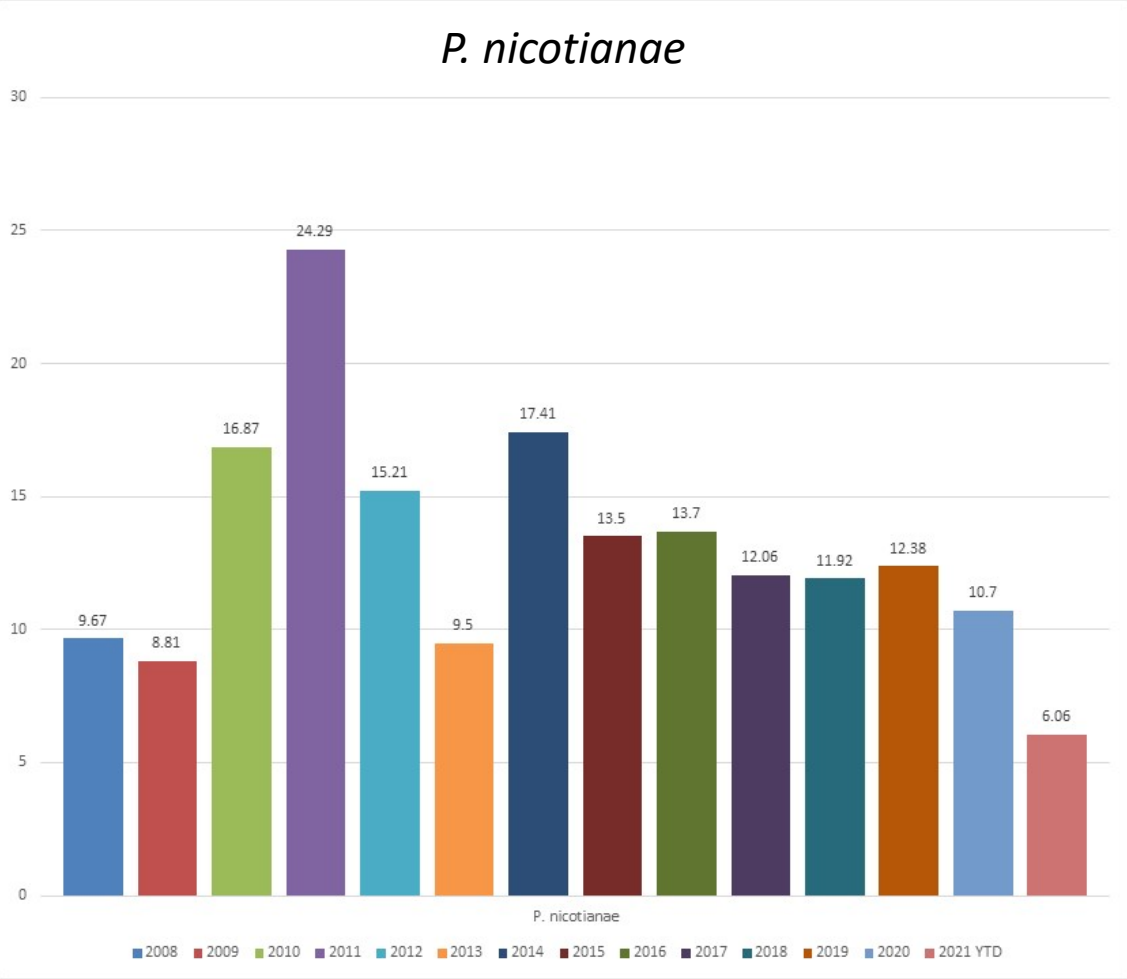
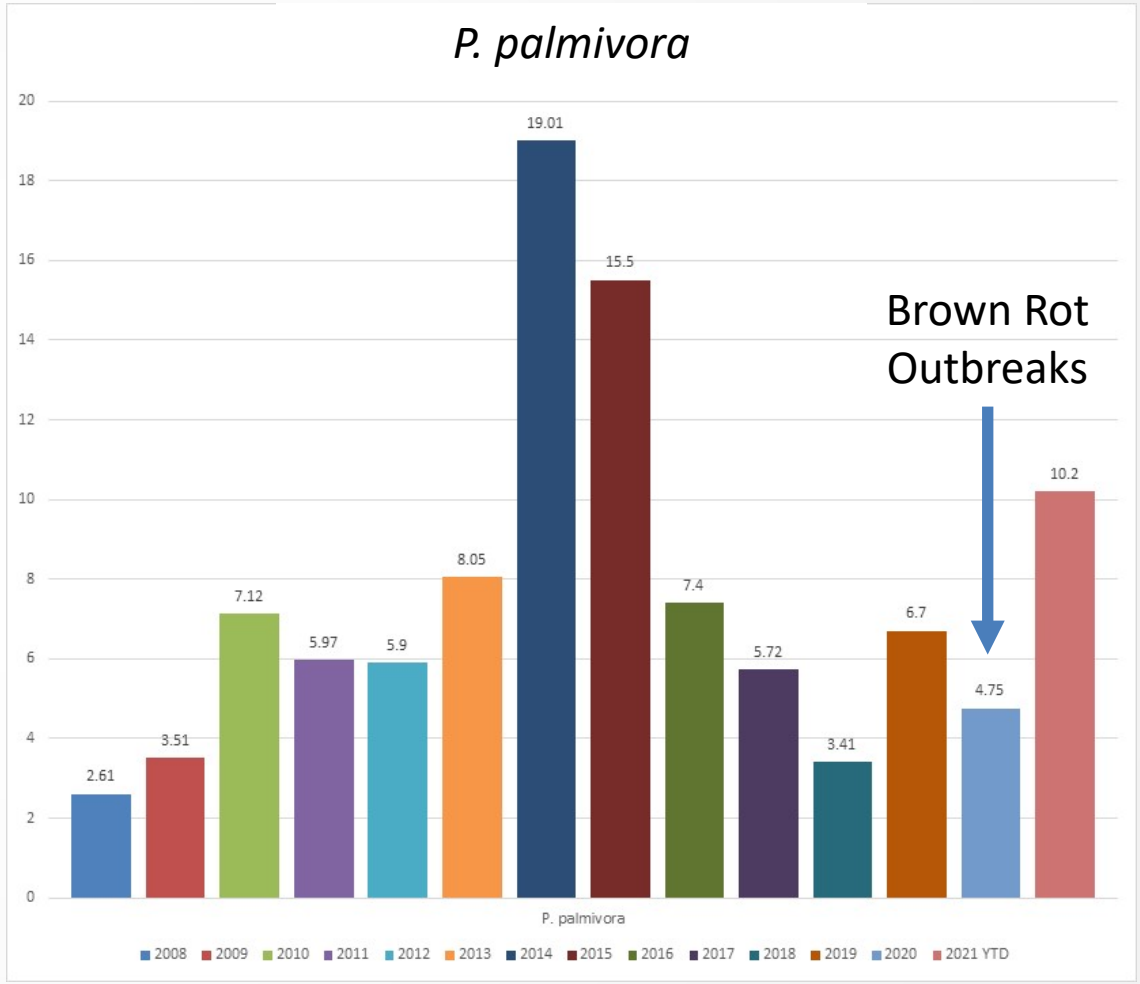
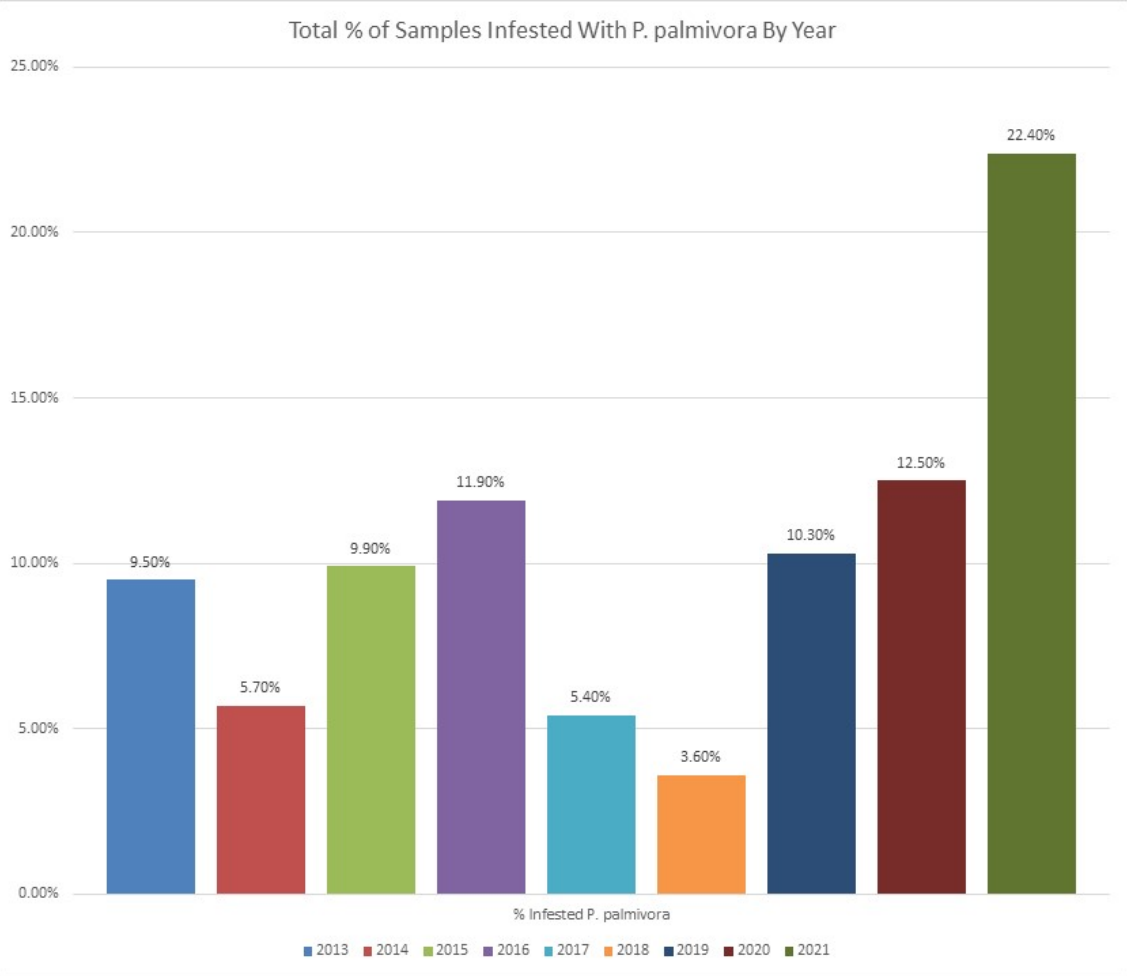




Data courtesy of Syngenta

High % of blocks infested with P. palmivora



- Doubling of infested blocks since last year
- Highest percent of *P. palmivora* samples infested since at least 2008

Data courtesy of Syngenta

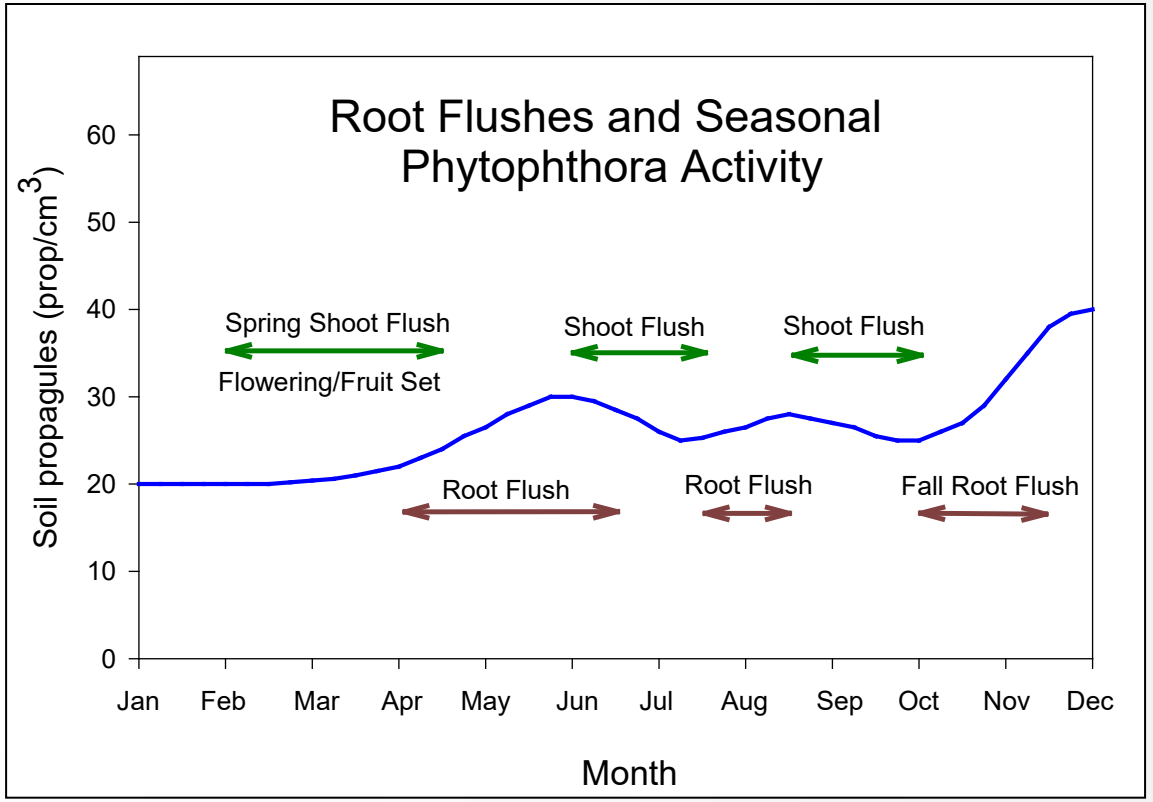
Phytophthora management

- *P. palmivora* can quickly get out of control if unmanaged

- Need to know the species in your groves
  - Susceptibility of rootstock

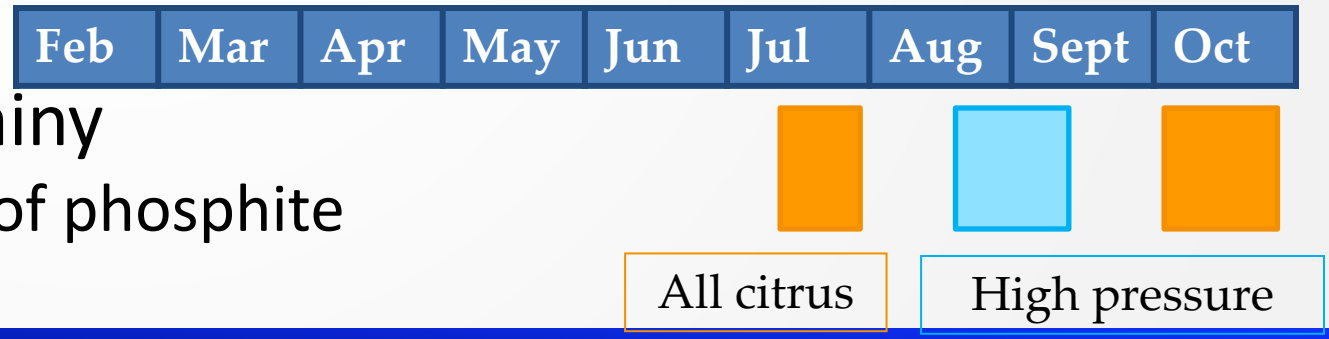
Managing root rot

- Oomyceticides
  - Phosphites/Fosetyl-Al – induces defenses, limited direct action
  - Mefanoxam – requires root uptake for efficacy
  - Oxathiapiprolin (Orondis)
  - Fluopicolide (Presidio)
  - Mandipropamid (Revus: Brown rot or nurseries)
- Rotate phosphites with more effective products



Managing brown rot

- Manage root rot to reduce inoculum (*P. palmivora*)
- Often single spray only
  - Late July
  - Recommended systemic products Aliette, Phostrol, ProPhyt (doubles as root rot treatment)
  - 60-90 days control
  - Manage fungicide resistance, CA has seen reduced efficacy of phosphites
- For high inoculum groves protectant at early signs of fruit drop
  - Copper or Revus
  - 30+ days control (weather)
- October spray needed if very rainy
  - Copper, Revus, or half-label rate of phosphite



Acknowledgements

Data and Images

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- Phytophthora analysis
- Root mass analysis

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