

# Phytophthora Crown and Root Rot Review

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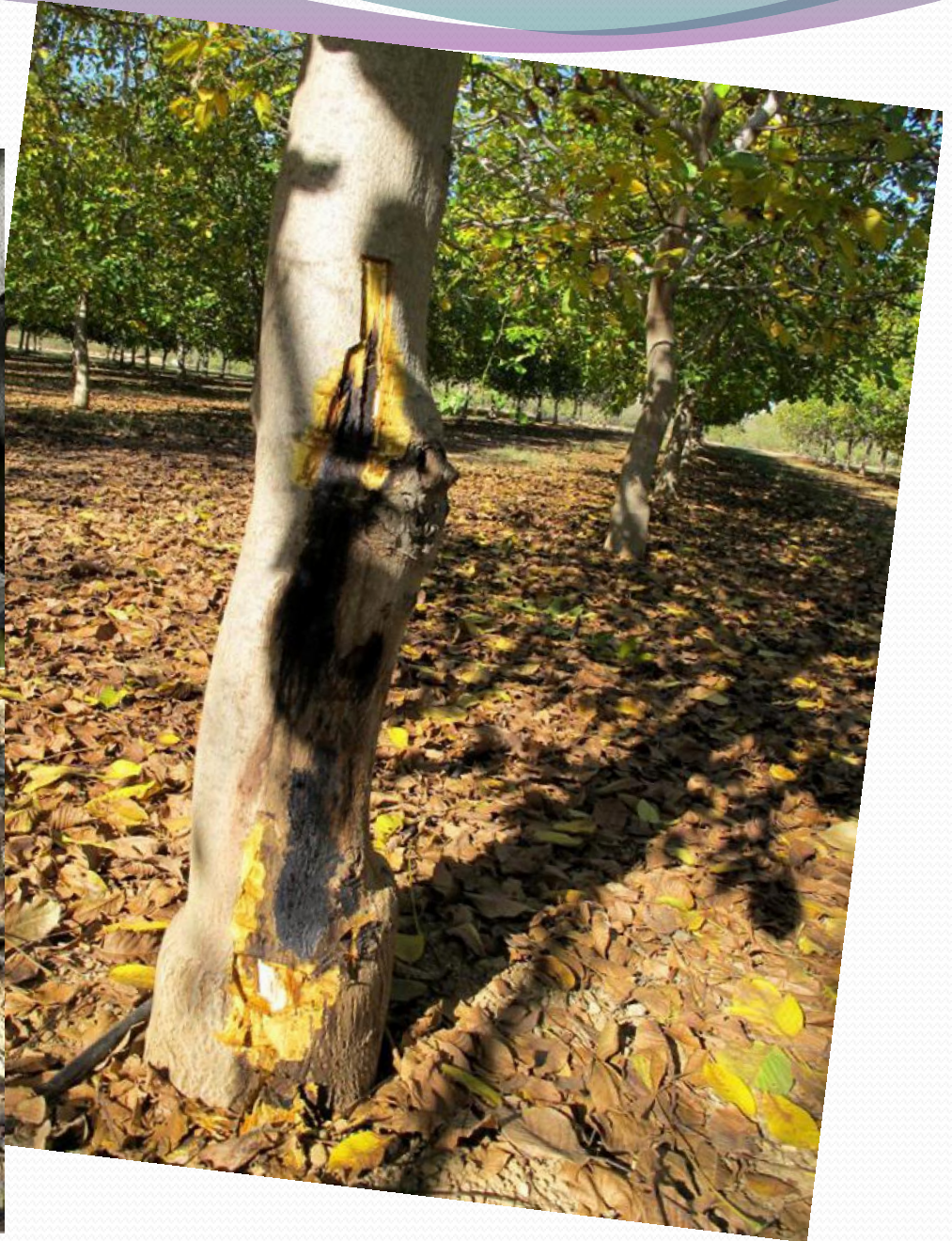
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# Phytophthora – from Greek words for “Plant Destroyer”

- Reported in 1912 on poorly drained soil in Southern California
- By 1921 reported in several California walnut areas
- 1931 evidence of *P. cactorum* and *P. citrophthora*
- Since 1950 increase in incidence (over 14 species)

# Phytophthora cankers



# Phytophthora crown and root rots



Poor terminal growth, small chlorotic leaves, terminal shoot dieback, tree collapse and death

Orchard affected by  
the **oak root fungus**,  
*Armillaria*

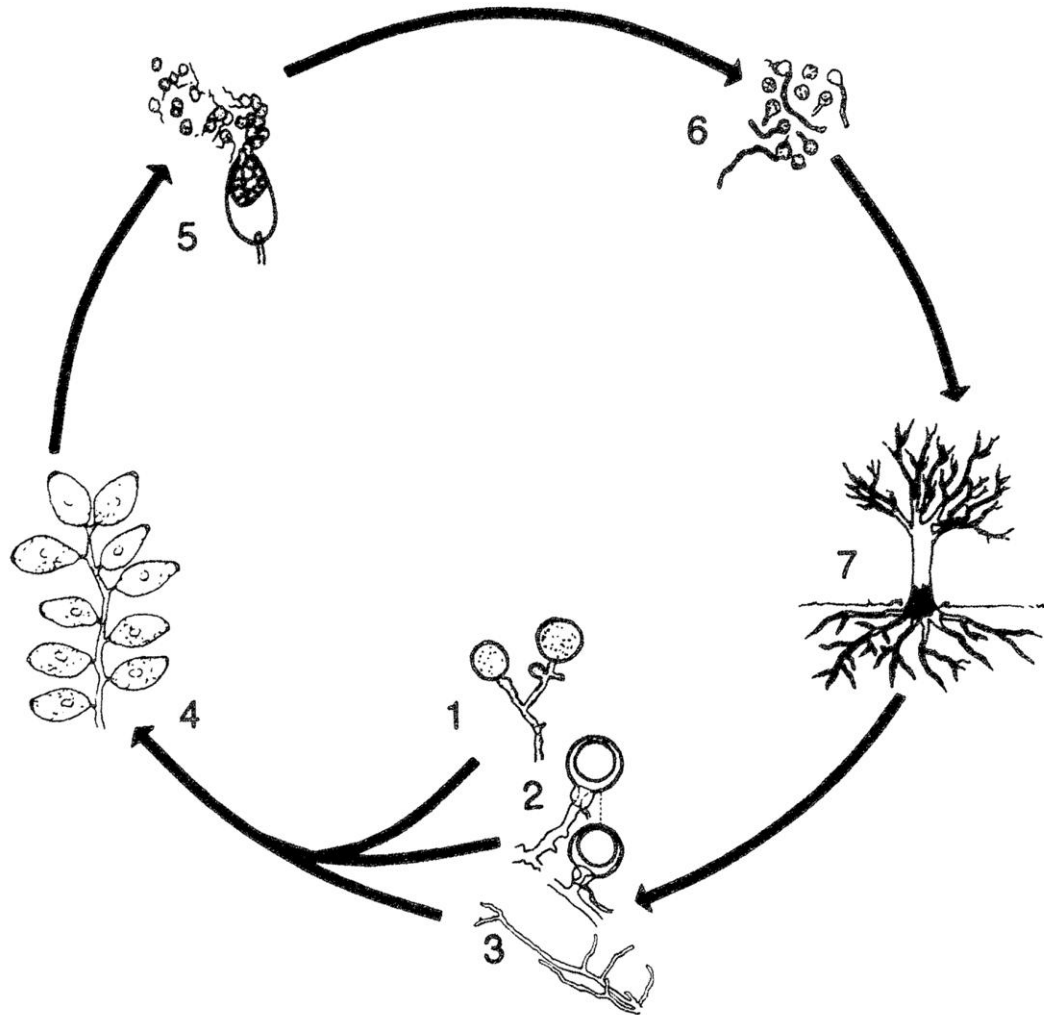


# Lethal Paradox Canker



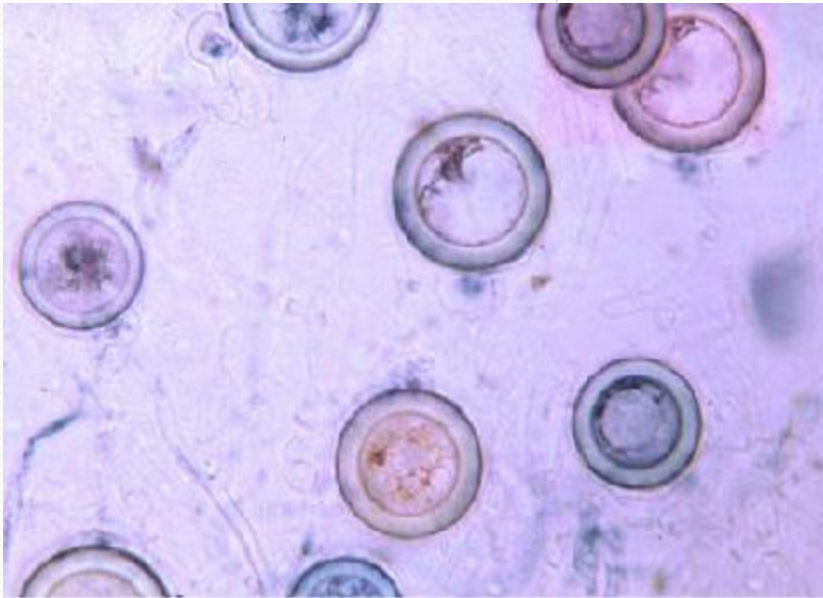
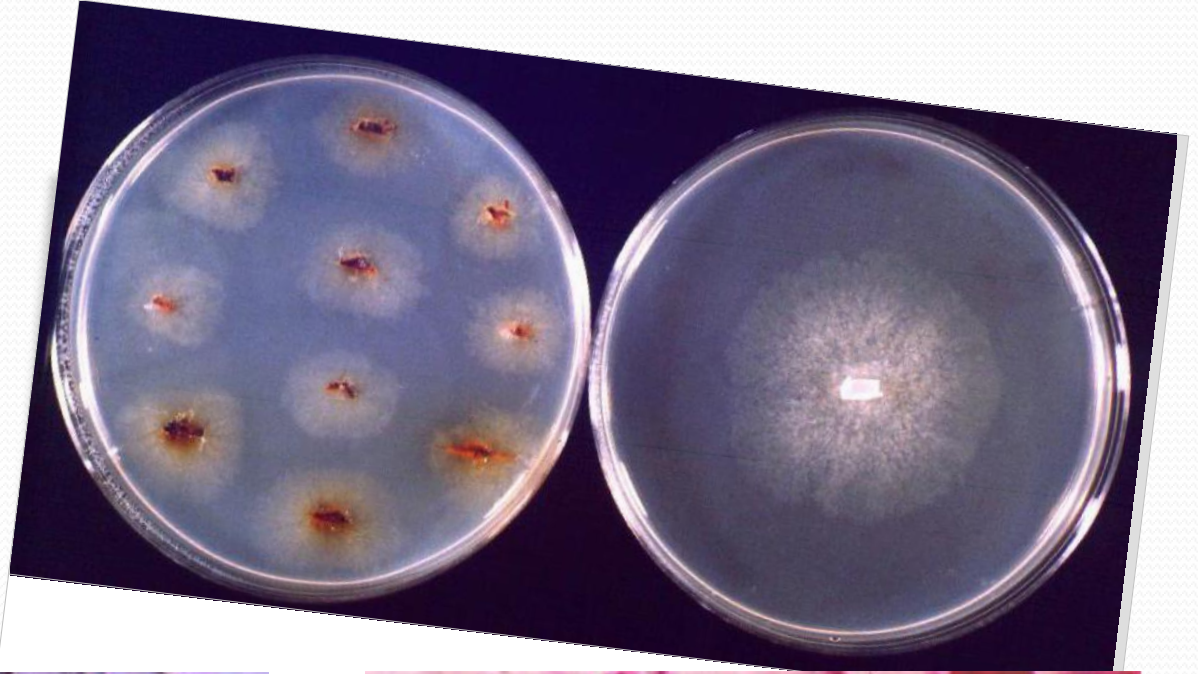
- Many species of Phytophthora involved
- Soil inhabiting – root and soil cankers
- Surface water is typically infected
- Usually associated with heavy soils, poor drainage, low spots, standing water, and/or irrigation systems wetting trunks or soil around crown

# Phytophthora cycle



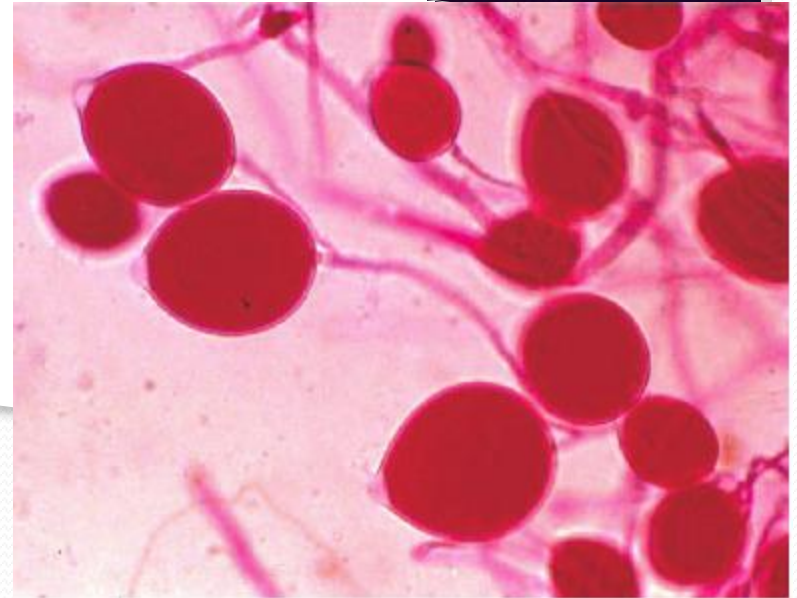


## Phytophthora, “Plant Destroyer”



Oospores

(long-term persistence, sexual reproduction)



Sporangia

(rapid spread, asexual reproduction)

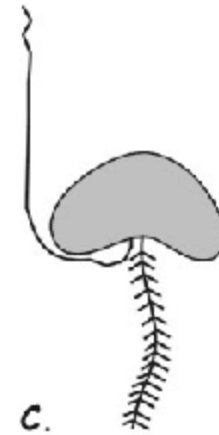
# More pictures, Phytophthora

*Photos: Wharton and Kirk, MSU*



Oospore, note thick wall

Sporangium, note zoospores, (one swimming out)



c. Zoospore drawing, note flagella

*Photo: Sullivan, NC State*

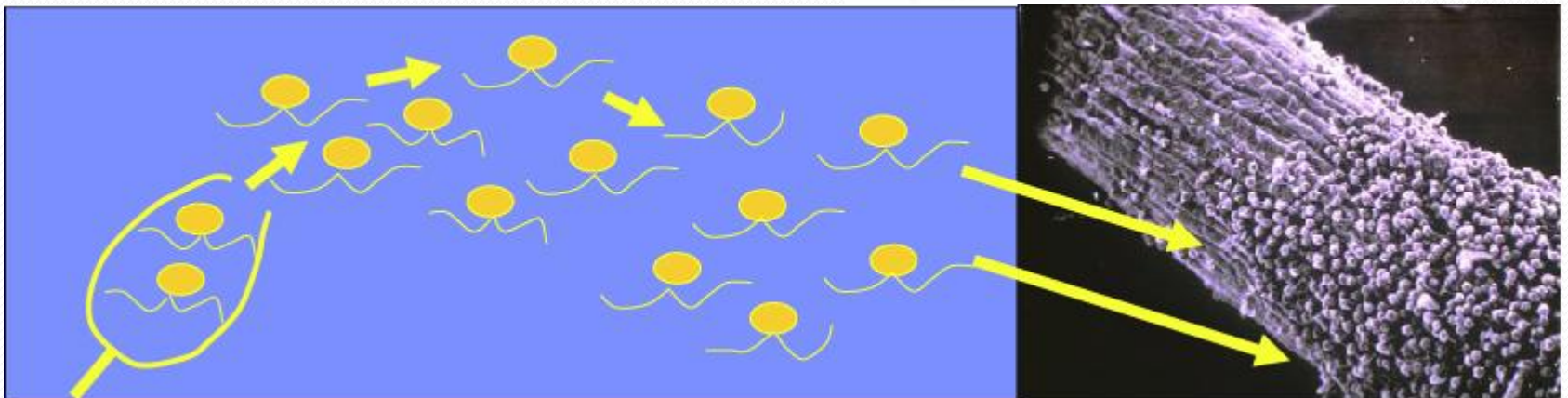
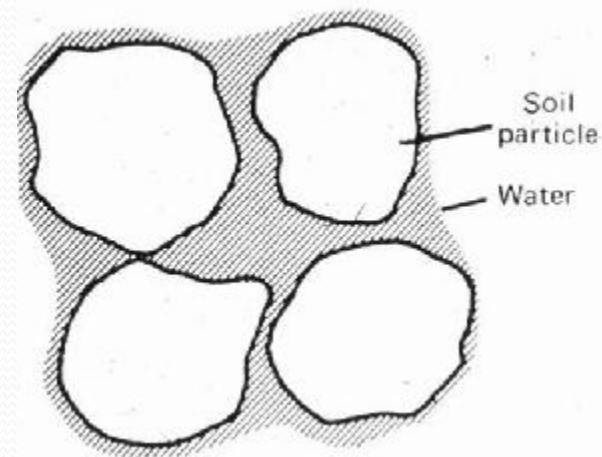


Zoospores on root

# Role of free water in root and crown infection by Phytophthora

(Soil) water saturation favors:

- sporangia production
- zoospore production
- zoospore dispersal
- zoospore attraction to roots



# Phytophthora severity and incidence are influenced by:

- Phytophthora species
- Soil type – drainage/water saturation
- Temperature – cool and moist optimal
- Rootstock Black < Paradox < RXI

# What can we do?

- Careful selection of planting sites
- Identify and modify soil barriers to drainage
- Plant on berms to drain water away from crown
- Sprinkler placement and stream splitters
- Root stock selection Black < Paradox < RXI
- Phosphonate sprays can help



**New walnut planting in Tehama County**

# Placement of water



# Placement of water





## Placement of water



# Field testing of RX1 rootstock

Joe Grant, UCCE Farm Advisor



7-15-2003



9-16-2011

Orchard area infested with *P. cinnamomi*

# Field validation of RX1 rootstock

Joe Grant, UCCE Farm Advisor

A photograph of a field where young trees are being planted. The trees are arranged in rows, and the ground is dark brown soil. In the foreground, two trees are visible, showing their rootstock. The background shows a line of trees and a grassy field.

RX1 and Paradox seedling trees were planted April 2010;  
there were 100 two-tree pairs

## Field testing RX1 (trees planted 2010)

Joe Grant

Yr	Rootstock	Mortality (%)
2010	PDX sdg	0
	RX1	0
2011	PDX sdg	17 (+6)
	RX1	0
2012	PDX sdg	31 (+17)
	RX1	0

\**P. cinnamomi* isolated from 54% of dead trees and 21% of poorly growing trees (2012).



2011 photo by J. Grant

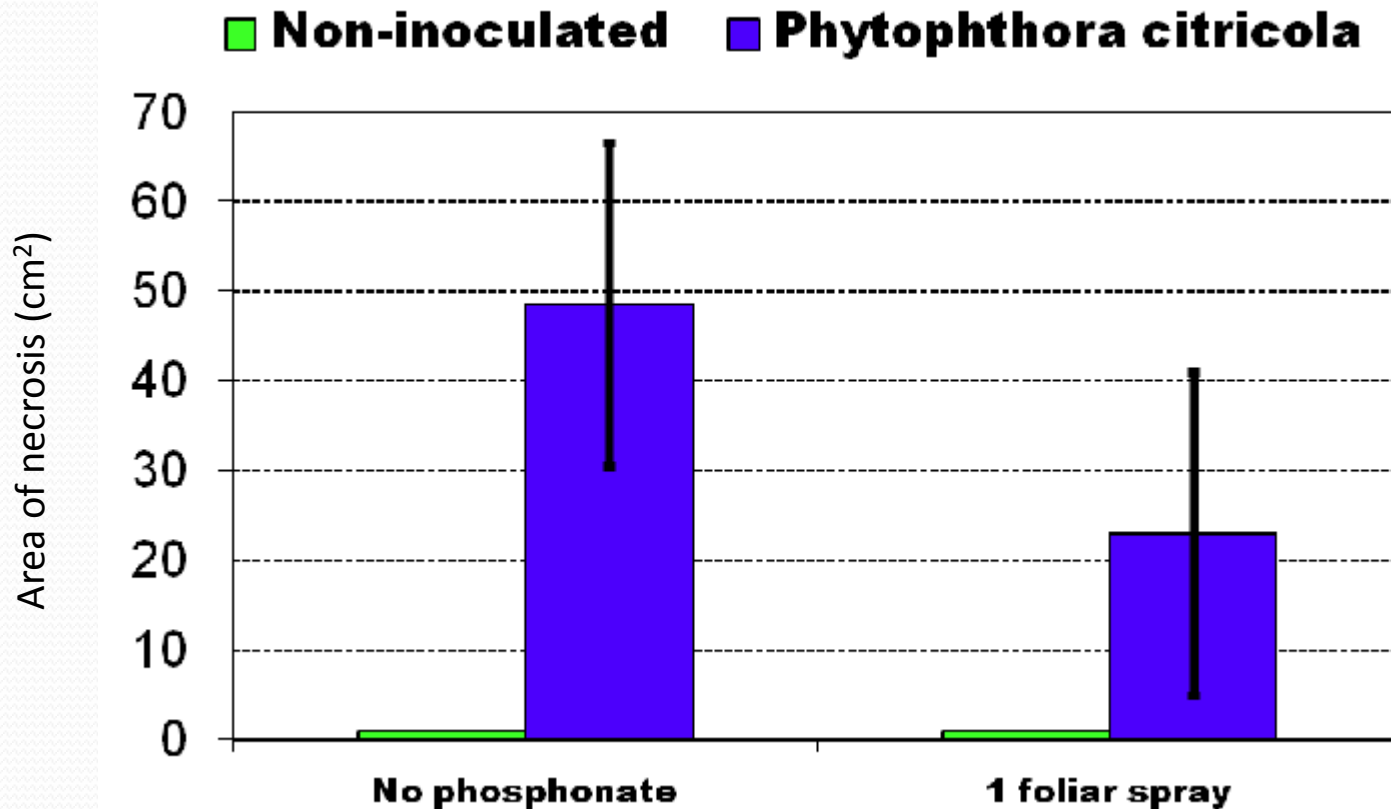


08/03/2012 22:22

2012 photo by J. Grant

# Efficacy of phosphonate treatments (3 qts./A)

- Trees inoculated 7 months after phosphonate treatments completed
- Cankers measured 3 months after inoculation



# Some Key Points



Phytophthora typically localized but can be devastating

*To minimize losses from Phytophthora:*

- Good preparation (site selection, ripping, drainage)
- Irrigate to meet ET, but avoid prolonged water saturation (>>24 hr)
- Consider new rootstock option (RX<sub>1</sub>)
- Phosphonate sprays can help

There are “new” Paradox problems to watch for.

More field experience needed with Paradox clones.



*Thank You!!*