



Avocado Root Rot Disease Management

Avocado Disease in California

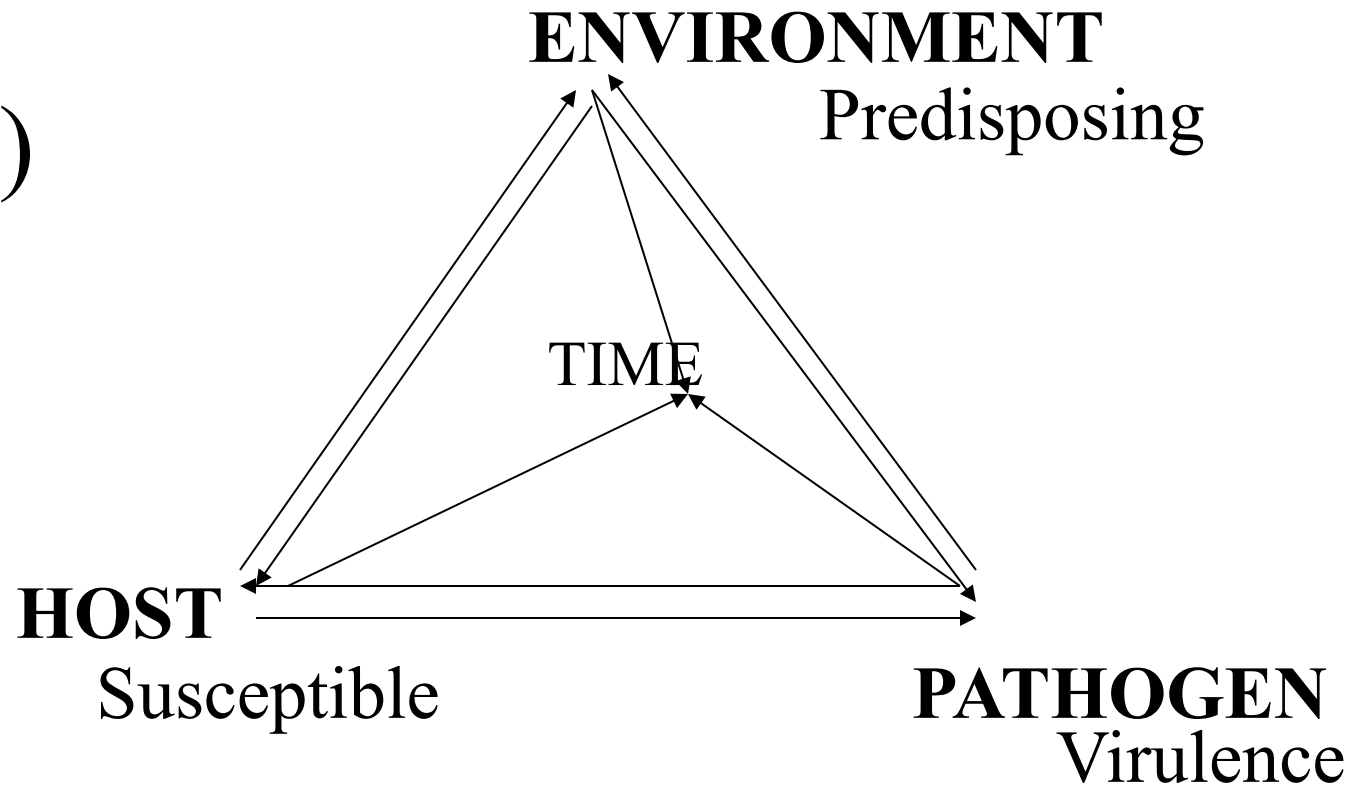


- Minor Diseases (Unless they happen to be in your grove!)
- The Major Disease, Avocado Root Rot



Disease

- Biotic
- (Abiotic)



ABIOTIC – environmental factors that set up a plant for disease

heavy crop load

salinity – specific (Cl, Na, B) and total

water – too much, too little, frequency

freeze

grafting

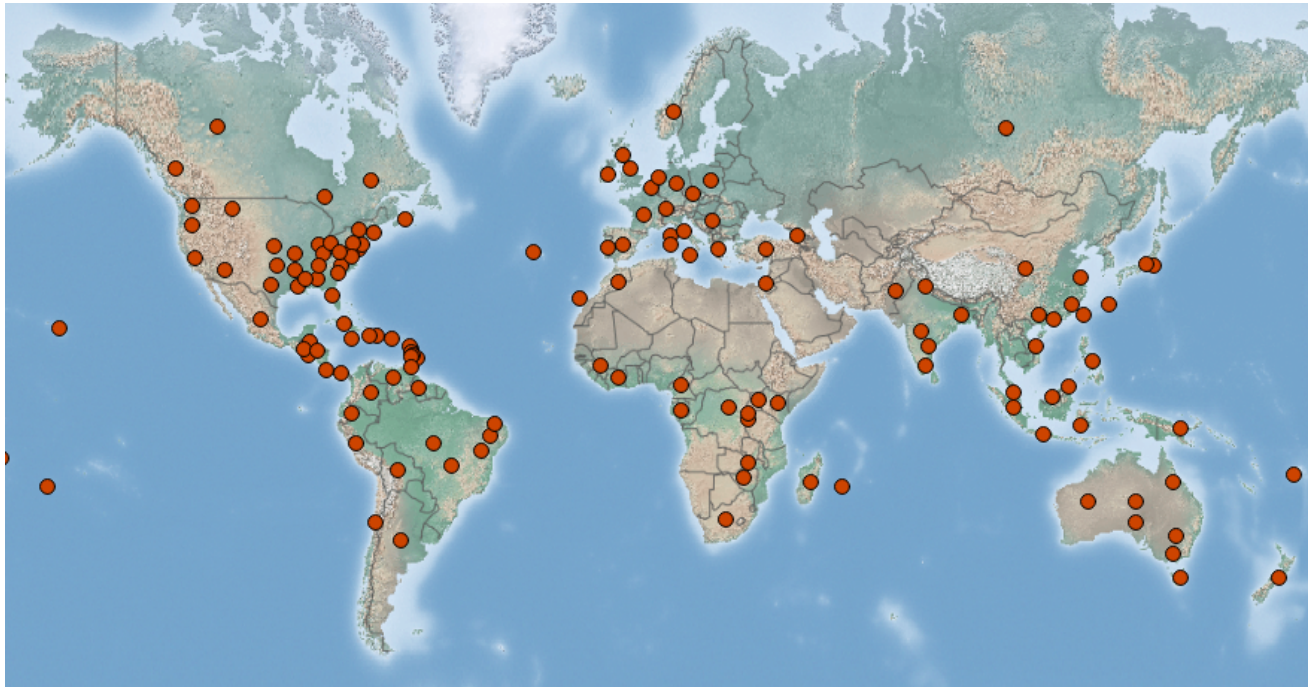
pruning

insect attack

sunburn/heat

STRESSSSS !!!!!!!!!!!!!!!!

- *Phytophthora cinnamomi* – commonly referred to as Avocado Root Rot
 - Widely considered the most important disease of avocado worldwide
 - 2000 estimate ARR costs \$30 million/annually
 - Soil-borne pathogen, first described in 1922 as a pathogen of cinnamon trees in Sumatra
 - First report on avocado was in Puerto Rico in 1929
 - Has worldwide distribution and affects more than 3,500 plant species
 - Avocado, pineapple, chestnut, macadamia, kiwi fruit, peach, pear



Wherever plants have been taken, the disease organism has been taken.

Avocado Root Rot – shows thinning foliage (*Phytophthora cinnamomi*)



- Most serious avocado disease in California
- Thrives on excess soil moisture and poor drainage
- Symptoms: leaves are small, pale green, wilted, can see the sky through the tree

NO roots. No water uptake. No water uptake. Sad looking tree
How to distinguish Drought from Root Rot?
More water is going to make Root Rot worse.



Canopy thins out from top



Staghorning

Leaves wilt



Small, yellow leaves. Salt burn. Often heavy flowering



UC State-wide IPM Program
© 2004 Regents, University of California



Small, numerous, sunburned
fruit





NO leaf mulch
Lack of energy,
wind blow for
lack of canopy



Digging into
the soil, hard
to find roots
Only larger ones



If you can find them: White feeder roots rot and turn brown



Avocado Root Rot

- Small feeder roots may be absent, or if present are blackened, brittle and dead
- The absence of feeder roots prevents the uptake of moisture, the soil under diseased trees stays wet even though the trees appear wilted
- Pencil sized roots and larger are not attacked by this fungus

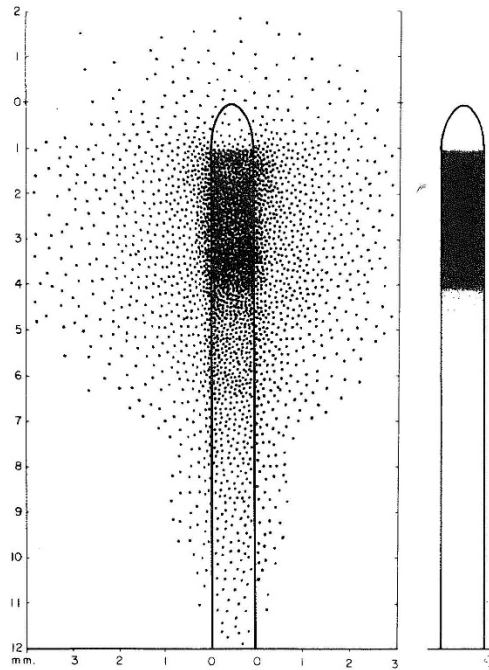
Avocado Root Rot

- Trees can die rapidly (we have seen 5 acres die in 3 months during wet years), or very slowly
- Can be spread into the grove by water (runoff from neighbor or recycled pond water), equipment (ladders, bins, tractors, shovels), shoes, coyotes and dogs carrying infected fruit, hooves of horses, infected nursery stock

Phytophthora cinnamomi

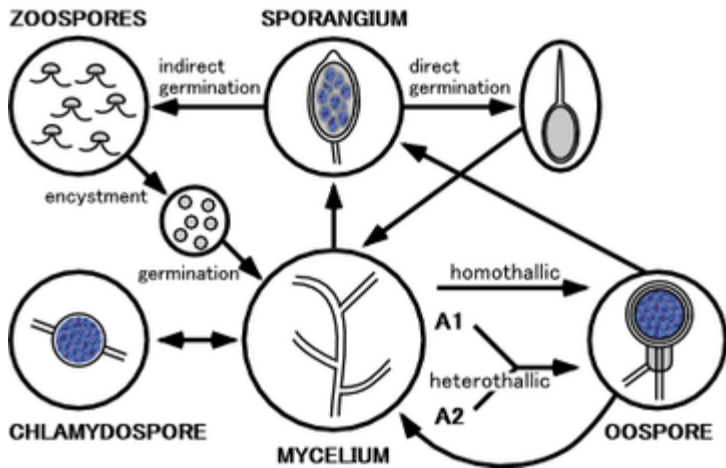
is everywhere, so growers need to be good irrigators which is the primary defense against root rot.





It is not a fungus
but a brown algae
with a cell wall of
cellulose, not chitin

Attraction of zoospores to avocado
feeder roots, and subsequent
infection immediately behind root
cap.



Water Molds – zoospore swims
gypsum slows it down

Chlamydospores are long-lived
more than 50 years in soil?

- Gypsum (CaSO_4)
 - 25 pounds per tree
 - Improves soil structure, increases drainage and aids in leaching salts
 - Calcium strengthens cell walls
 - Phytophthora uses pectolytic enzymes to dissolve the bond between cell walls
 - Calcium inhibits the activity of these enzymes
 - Reduces root exudates that Phytophthora uses to find roots
 - Calcium causes zoospores to encyst – they are no longer motile



Fungal cellulase production is antagonistic
to *Phytophthora*



Mulch
Mound

Clonal Rootstocks can have a significant response difference to the root rot pathogen



Latas



Duke 7



Toro Canyon



VC 801



VC 218



Thomas

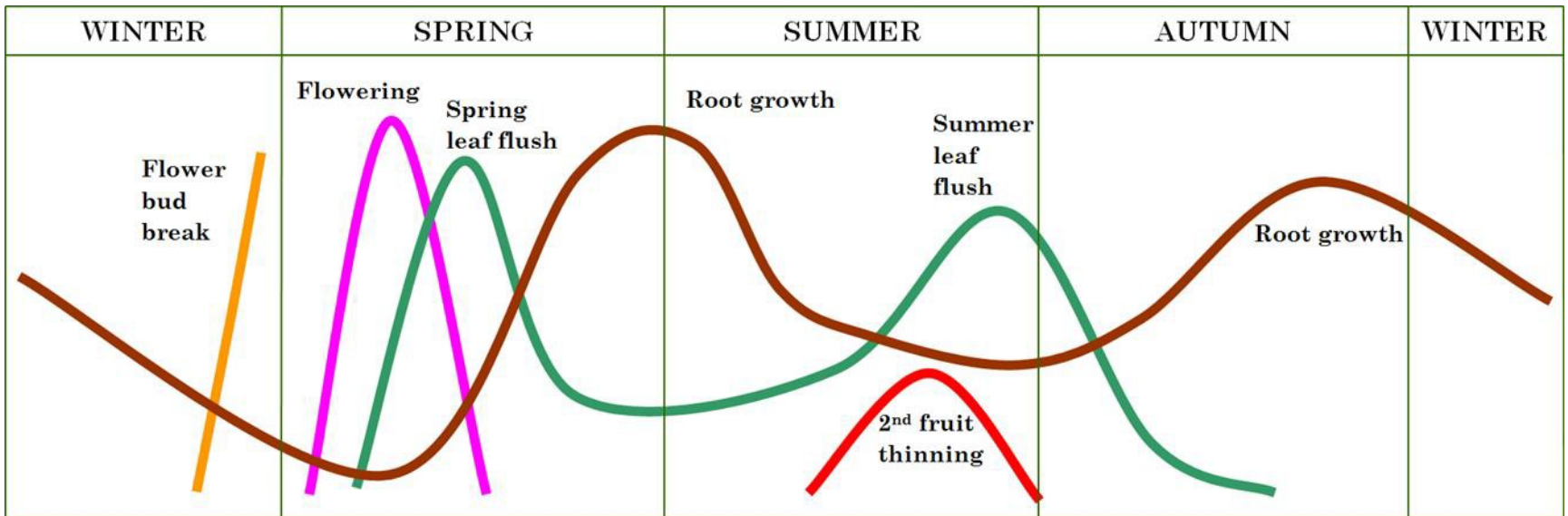
Avocado Root Rot

- Control: careful irrigation, sick trees should be on a different irrigation block, or have sprinklers with less output until trees recover
- Control gophers/ground squirrels, water moves rapidly through their runs, adds to water problems
- Interplanting is a challenge. Crop rotation to citrus, cherimoya, persimmon, deciduous fruits and berries

Avocado Root Rot

- Phosphorous acid/Phosphonate/Phosphite works!, but doesn't eradicate the fungus.
- Buffered material is preferred, (0-28-25)
- Acid form is 0-60-0, severe damage to bark
- Can be used as foliar, soil drench, fertigated, trunk injection, trunk spray
- Depending on how material is registered

Growth Cycles are Important for Management



Air Temperatures most conducive to *Phytophthora* root rot

- Optimum temp for P.c. 60 - 85° F
- Optimum temp for avo 71 - 90° F
- Less than 71° F root growth slows = root rot severe
- More than 81° F avocado grows better than P.c. = root rot less severe

Phosphorous Acid, 0-27-25, buffered

Less trunk damage, uses twice as much
product (compared to 0-60-0)



Roots one year after phos acid injection



True Fungicides registered

Mefenoxam (Ridomil Gold)

Soon Oxathiapiprolin (Orondis)

Issues of resistance, such as occurred with metalaxyl

Avocado Root Rot

Important Control Methods

- Mulch heavily with wood chip-based mulch (greenwaste)
- Gypsum applied to soil at 25 lbs/tree
- Plant in mounds or ridges for re-plants to improve drainage
- Use clonal Phytophthora-tolerant rootstocks
 - Duke 7, Toro Canyon, Dusa, Latas

IRRIGATE TO THE NEEDS OF THE TREE

Trunk Canker caused by *Phytophthora mengei* (*citricola*)



- Second most important disease in coastal CA
- Fungus has a wide host range: walnut, cherry, cherimoya, fir
- Occurs on the base of the trunk where wet from fog/irrigation



Questions?