



THE UNIVERSITY OF ARIZONA

Cooperative Extension

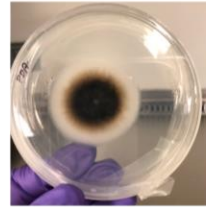
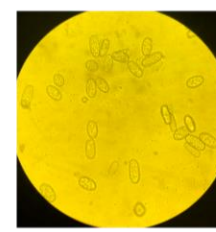
Yuma County



Plant Disease: Diagnosis & Management

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September 14, 2020

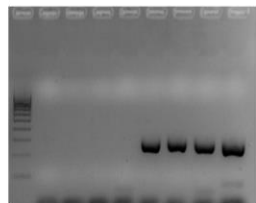




PLANT HEALTH

RESEARCH & EXTENSION

DIAGNOSTICS



MOLECULAR DIAGNOSIS



OUTREACH



Questions/collaborations/internship/sponsorship

Contact:

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Arizona Plant Diagnostic Network

Yuma Plant Health Clinic

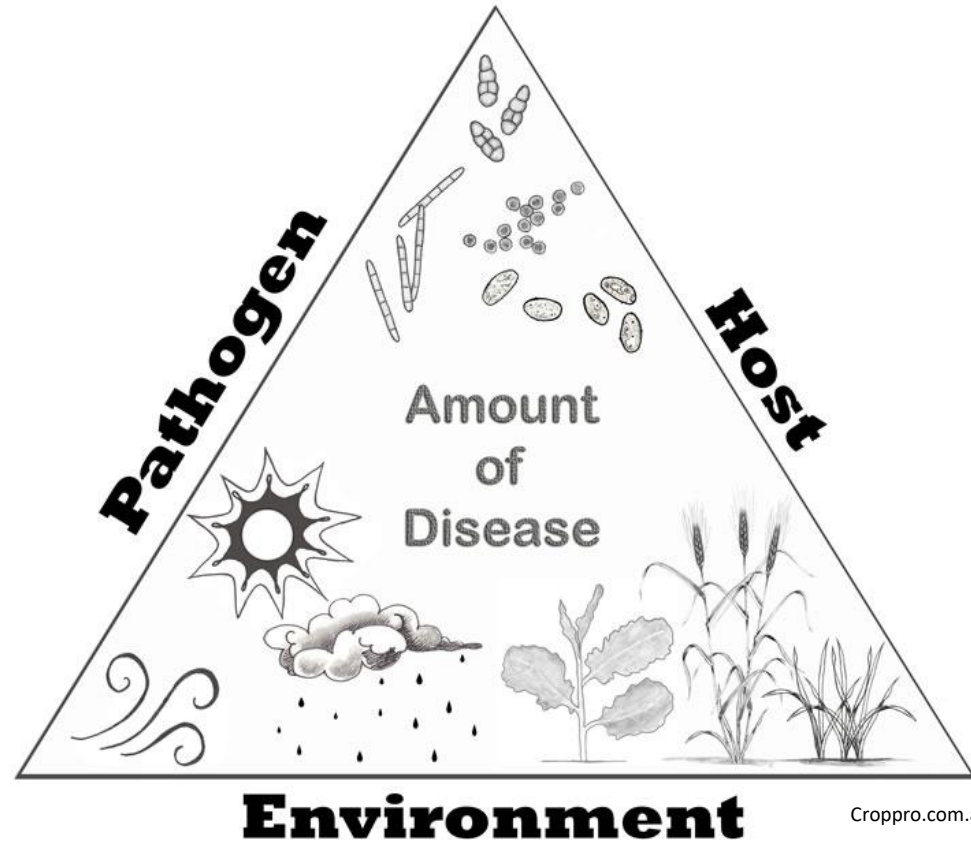


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Disease Triangle



Croppro.com.au

Causal Agents

- Fungi and oomycetes
- Bacteria
- Viruses
- Nematodes
- Phytoplasmas
- Parasitic plants- dodder, mistletoes



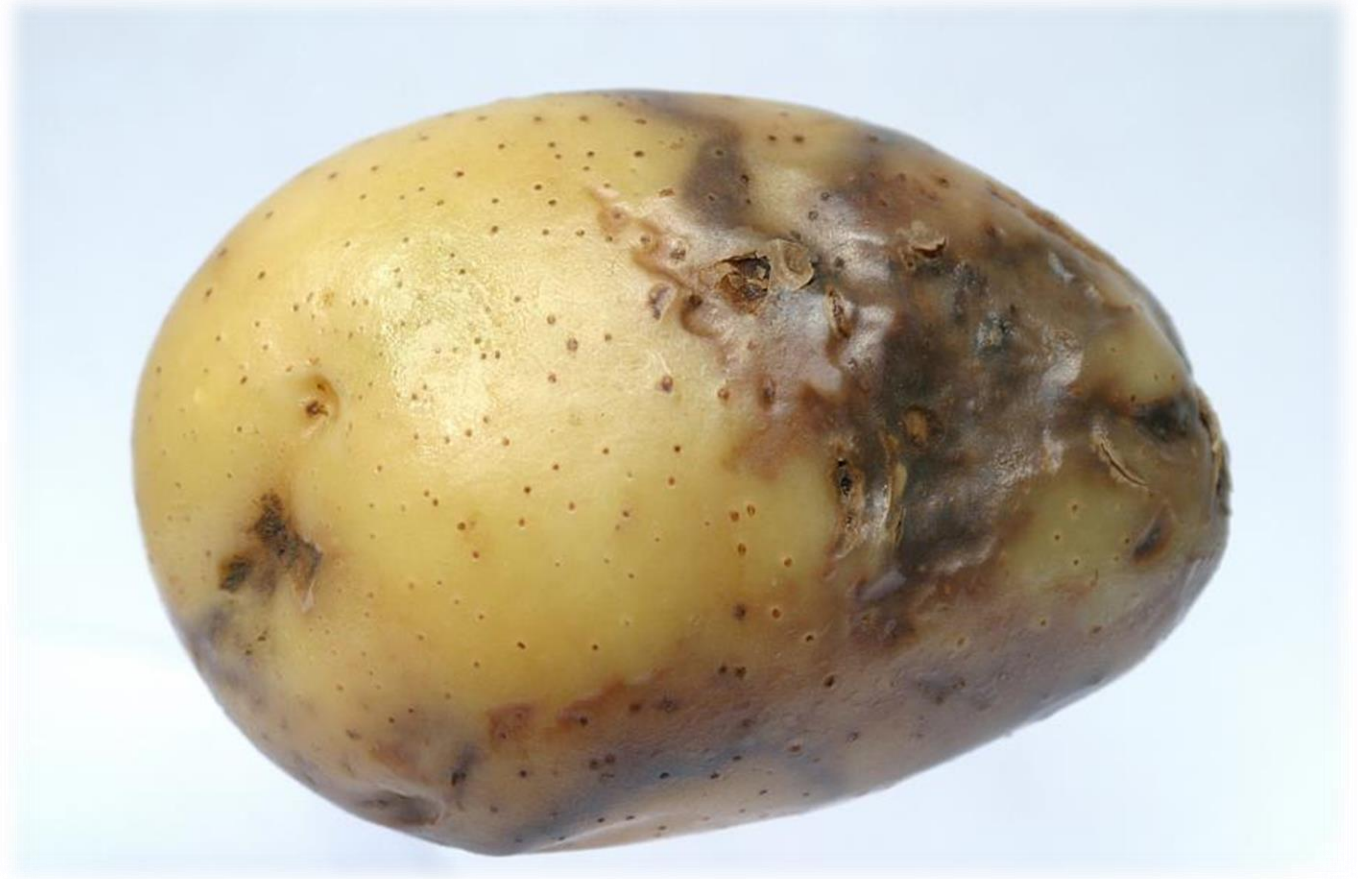
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Fungi and oomycetes

- Irish Famine (1845-1847)
- Oomycetes
- *Phytophthora infestans*
- Over 1 million deaths
- 1.5 million mass migration
- Downy mildew fungi



potatoes.ahdb.org.uk

Fungi

- Most common cause of plant diseases
- Chestnut blight (*Cryphonectrica parasitica*)
- Powdery mildew, downy mildew, smut fungi, rust fungi





Fungi

- Fusarium wilt
- Damping off in seedling and in greenhouse plants
- Lettuce sclerotinia drop



Alternaria leaf spot: *Alternaria* spp





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Purple blotch: *Alternaria porri*



Stemphylium blight:
Stemphylium vesicarium



Texas root rot/Texas root rot

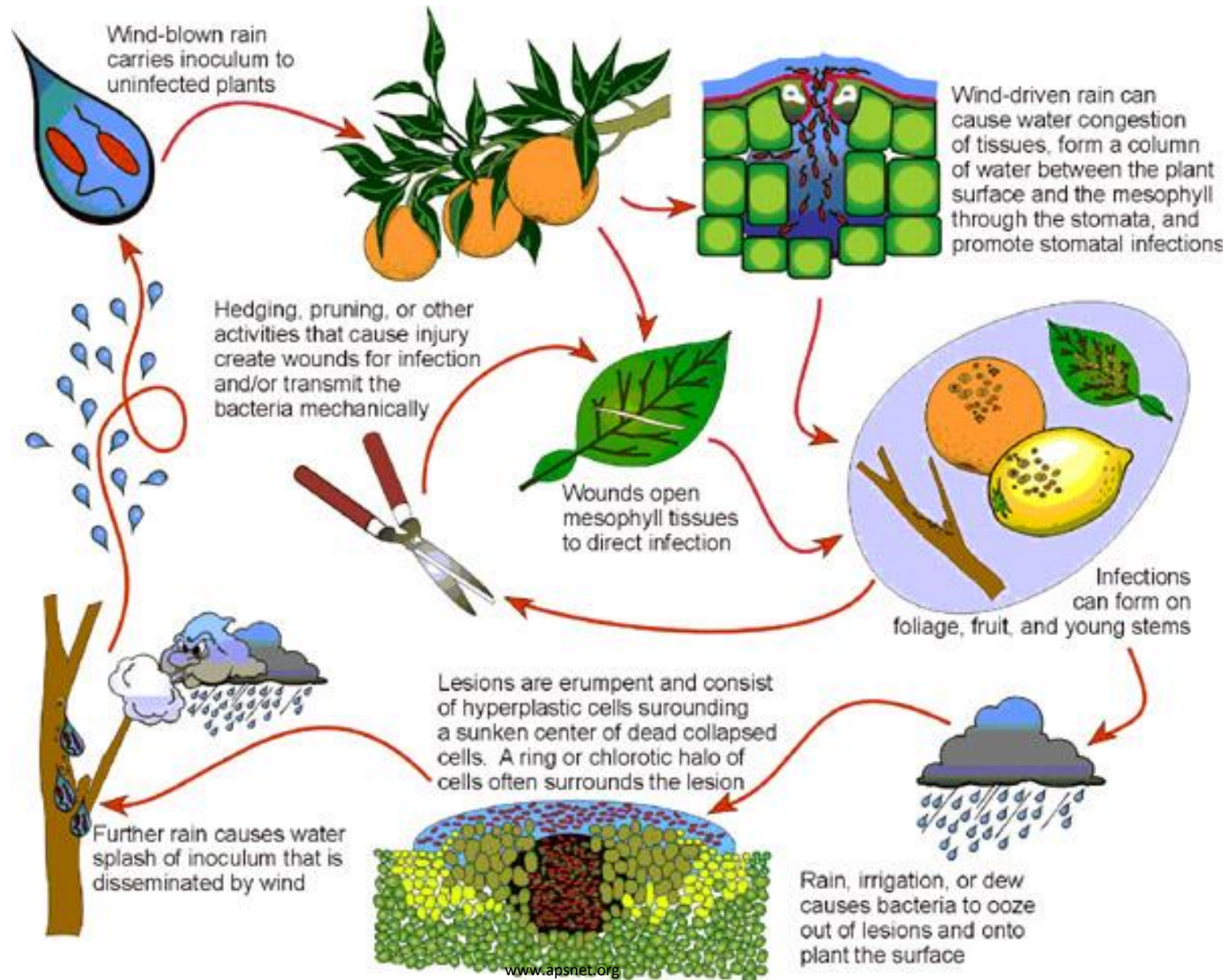
- *Phymatotrichopsis omnivora*
- Vascular tissue collapse
- Leaves still attached to branches
- Sclerotinia survives several ft under for several years



Bacteria

- Citrus Canker
- Bacteria
- *Xanthomonas axonopodis* pv. *citri*
- *Xanthomonas axonopodis* pv. *aurantifolii*
- 1912 in Florida Georgia line
- 20 years to eradicate, millions of \$\$\$ and trees





Bacteria

- Fruit blotch in melons
- Black rot in cole crops



Viruses

- Cassava mosaic diseases
- Virus complex
- Food security in African countries
- Main source of starch
- Most are vectored by whiteflies...



Viruses

- Systemic infection: no cure!
- Mosaic, mottles, colorful patterns to attract insect vectors



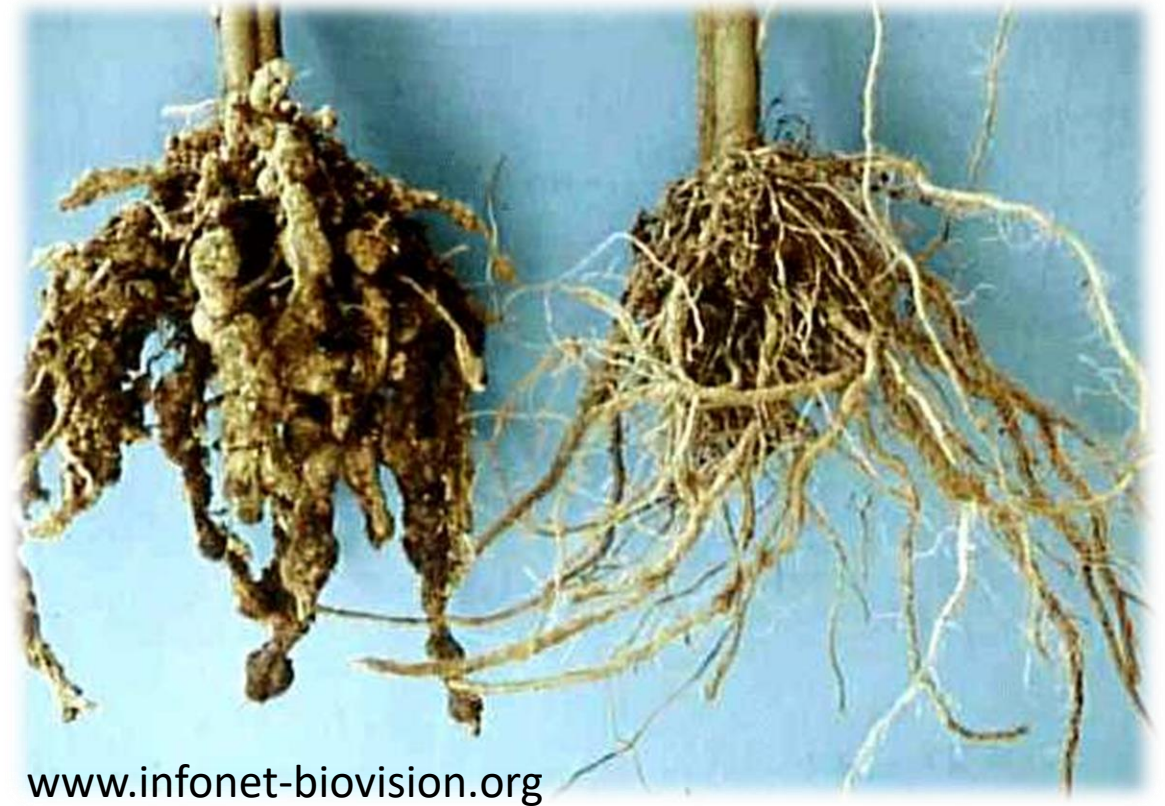


Alfalfa mosaic virus



Nematodes

- Microscopic plant parasitic worms
- Vector viruses



Phytoplasma

- Cellwall less bacteria, vectored by plant hoppers



<https://www.frontiersin.org/articles/10.3389/fmicb.2019.01349/full>



<https://edis.ifas.ufl.edu>

Dodder (*Cuscuta* spp)

- Parasitic plant
- Takes nutrients from the plants
- Unmarketable hay/no seed production
- Vectors plant viruses





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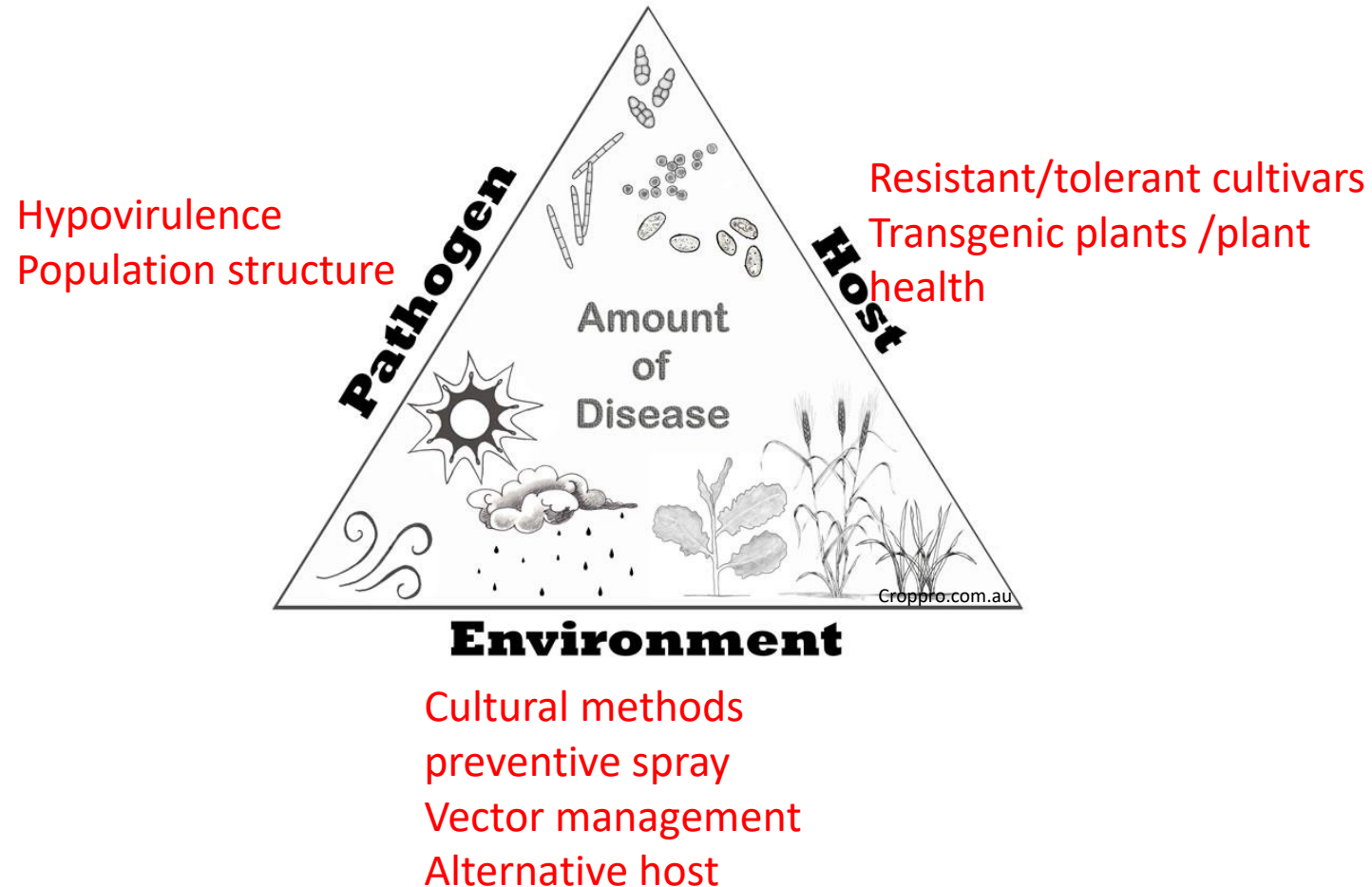
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Abiotic problems



Disease Management



Plant Diagnostics

unleash the inner detective in you

Diagnostics

- Biotic (fungi, bacteria, nematodes, viruses, oomycetes, insects)
- Abiotic (nutritional, weather damage, toxicity)



Alpha alpha mosaic virus?



Source plants grown in potting mix in greenhouse

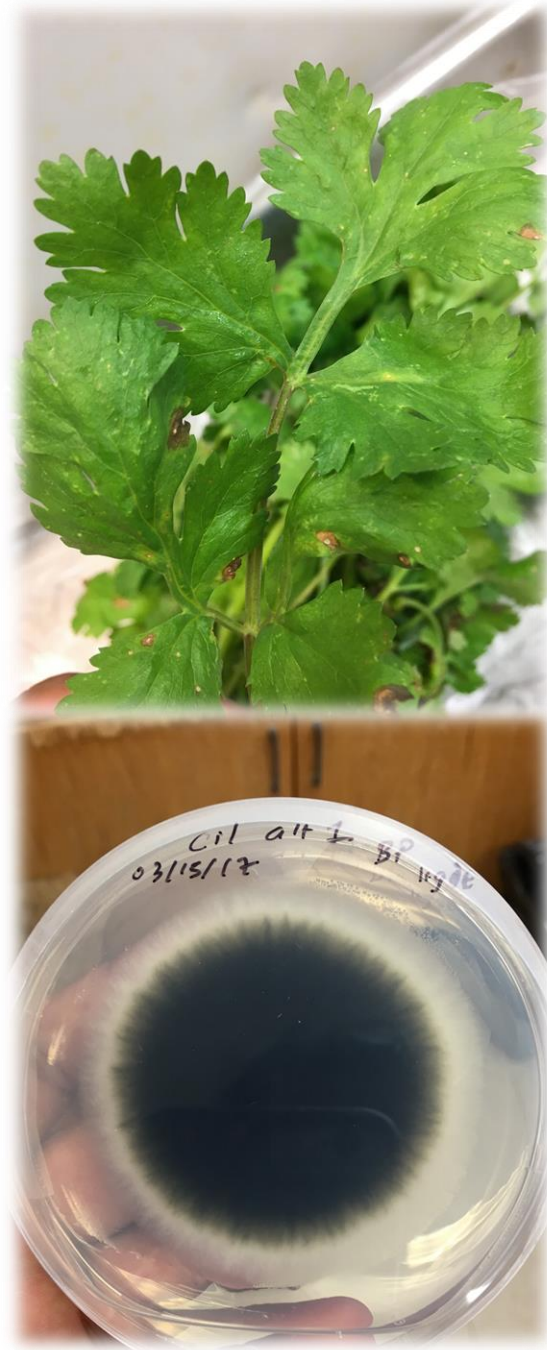


Diagnostics

- Examine the host
- Look for signs of pathogen
- Know the application history of fertilizers, pesticides, herbicides etc.
- Observe the distribution of symptoms in the field and within the plant
- Test!

KOCH'S POSTULATE

- Association
- Isolation
- Inoculation
- Re-isolation



What happens to the samples you drop in the clinic?

Sick plants in the clinic



Observe the host plant



What about these?

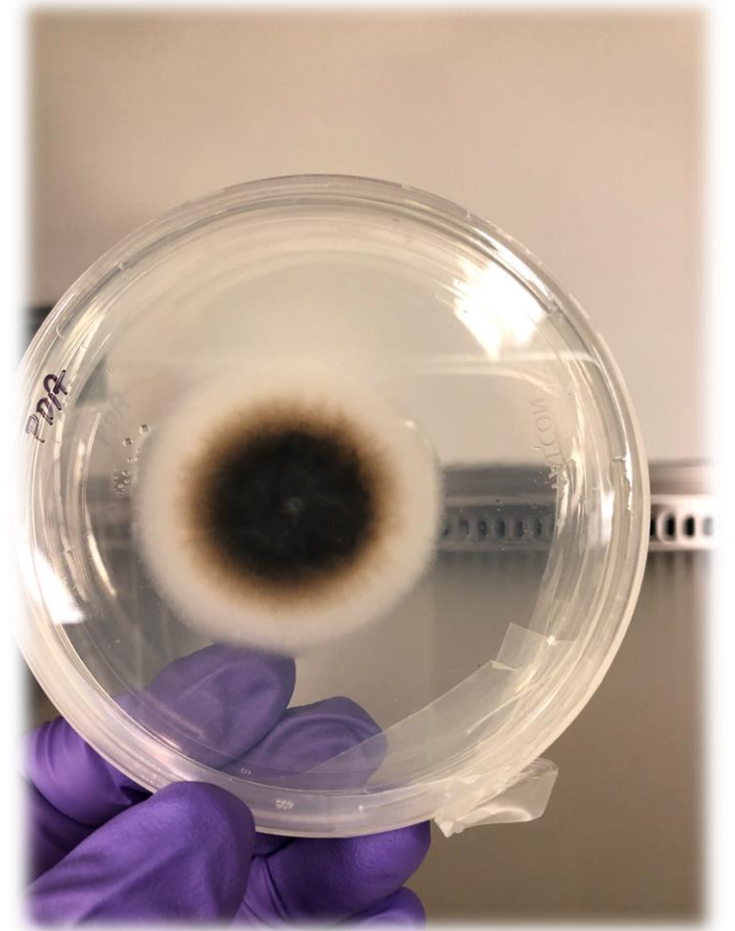
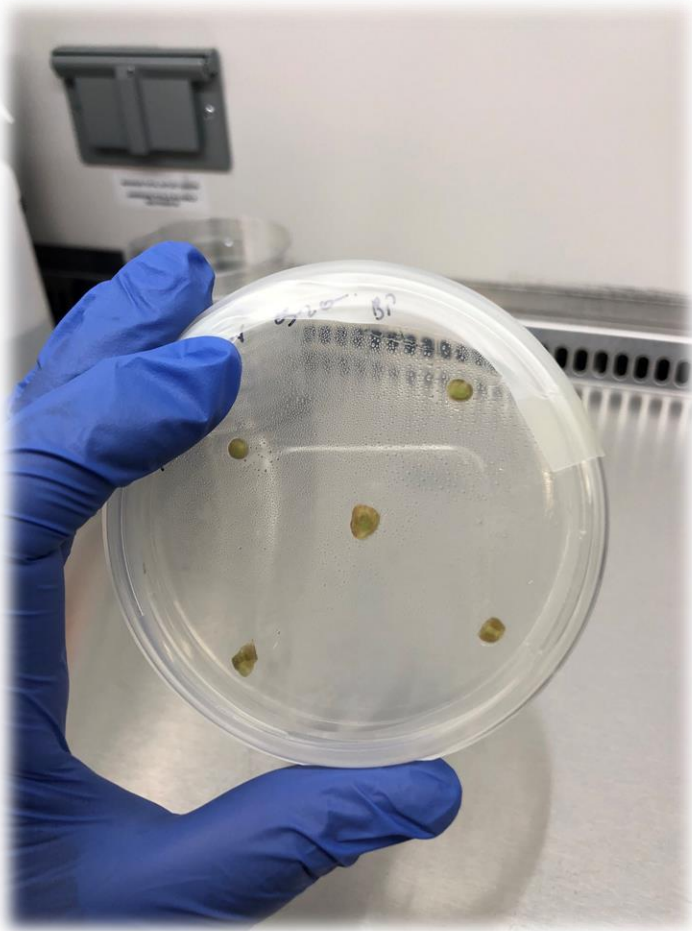


What happens at the clinic....

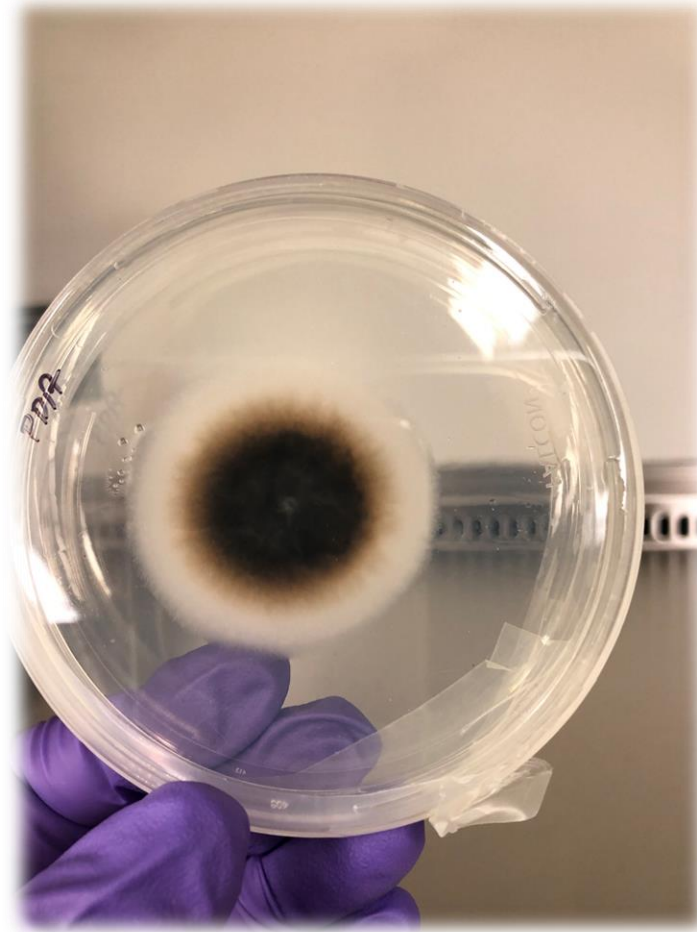


Stays at the clinic...

Surface sterilization and isolation



Rhizoctonia solani



Molecular diagnosis

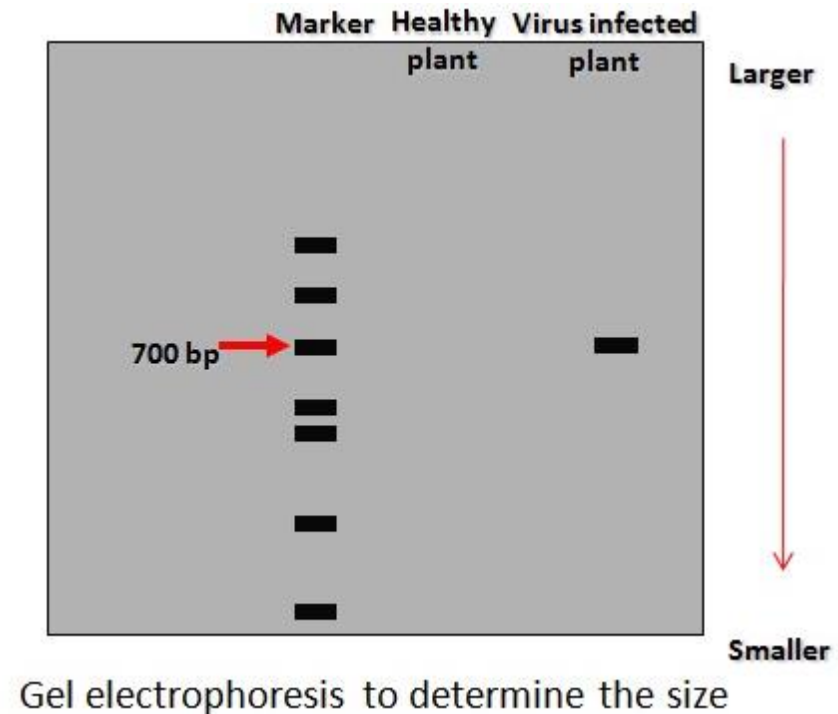
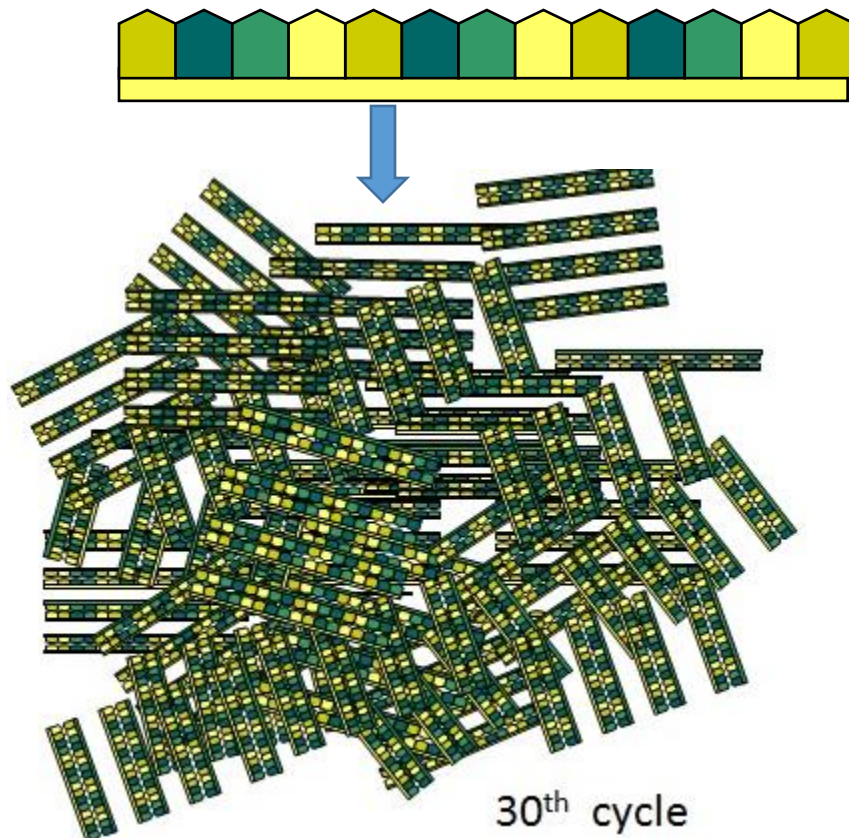
- Isolation of RNA/DNA of the pathogen
- Reverse transcription/Polymerase Chain Reaction (PCR)
- Genome Sequencing

RT-PCR: How does it work?

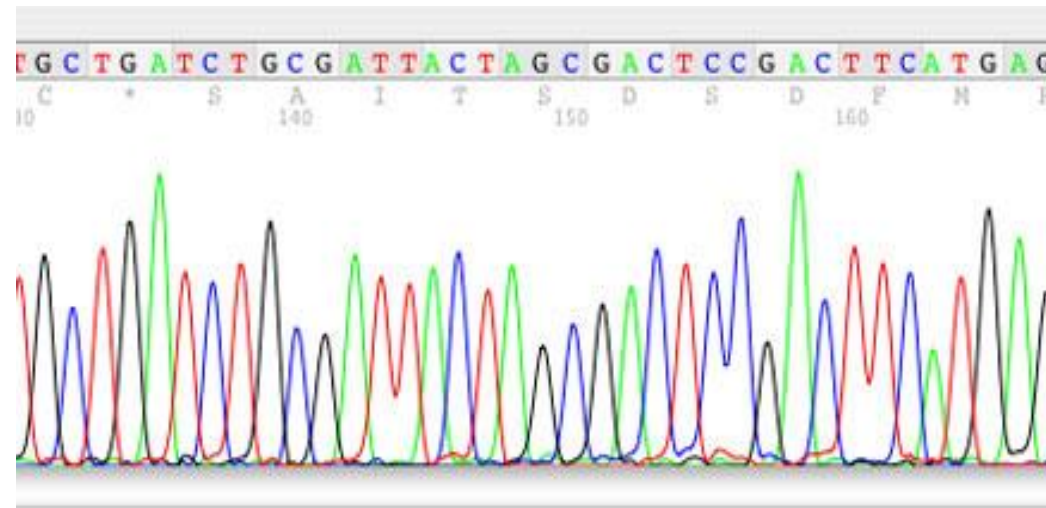
Extract good quality RNA

Perform reverse transcription to make cDNA

Perform PCR



Sequencing



TN	TGGTGAATTATGCCTGTATGTTGCTGAAAGATCTGCAGAGCATTTTGATAAGGAAAAGC-A	76
OR	TGGTGAACCTCTGCCTGTATGTTGGCGGAAAAATCTGCTGAACACTTTTGACAAGG-AAGCGA	2445
TN	AGTCACTTAAAGTTCATG-CGAAAGGCACAAGGATTGCATGAACAG-GAGGAGTTTGTCCA	134
OR	AATCGCTCAGGTTTCATGAGGAAA-ACCCAAGGATTACCGGAA-GGTGATGAATTTGTTCA	2503
TN	GGAGGGACCACTGGACG-AG-TACAG-TTGTGGTTTGTATCTACAA-CT-TG--AAGGATA	187
OR	AGAGGGTCC-CTTTA-GTGGTTTC-GACGGTAGTTTG--C--CAATCTCTGCTAAGGCCA	2556
TN	TATCGGAGCTATCCATGCCGCATTTTCA-CGAGTCCGATGACACACATCAGGTCCATGGC	246
OR	TATCAGAGCTATCAATGCCCCATTTCCATC-AGGCAGACGAGACCCACCAGATACATGGG	2615
TN	TGCACTGACCATAAGGTGTTCTGCTGTAACTCTCTATGGGGAC-AAGTGTGCCGTGGAGCA	305
OR	TGCACTGACCATAAGGTCTTTTGTTCAGTCTATAT-GGGACGAAGTGCAATGTGGAACA	2674

Turnaround time: 5 mins

Cost: Almost none



Turnaround time: 5 mins

Cost: \$10 for immunostrips



Turnaround time: 1 week

Cost: \$100



Turnaround time: 1 month

Cost: \$1200

And still no diagnosis!?!?



DIY tips



DIY tips



DIY tips



Select Lab By

[Pests-Pathogen](#)[Lab Name](#)[Diagnostician](#)

All Pest Alerts



Asian Citrus Psyllid



Labs by Pest-Pathogen

General Pathology

Dr. Mike Matheron's Lab
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Bacteria and Fungi

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Vegetable

IPM

Updates



NOT ACTORS>>>REAL IPM GUYS....:-)



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Thank you!

“Keep your friends close and your farmers closer”

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