THE UNIVERSITY OF ARIZONA

Cooperative Extension

Yuma County

Plant Disease Diagnosis
Finding solutions

Dr. Bindu Poudel-Ward

Extension Plant Pathologist

Plant Diagnostician

University of Arizona

Cooperative Extension-Yuma County

bpoudel@arizona.edu

April 6, 2022

THE UNIVERSITY OF ARIZONA
Cooperative Extension
Yuma County

Yuma Plant Pathology

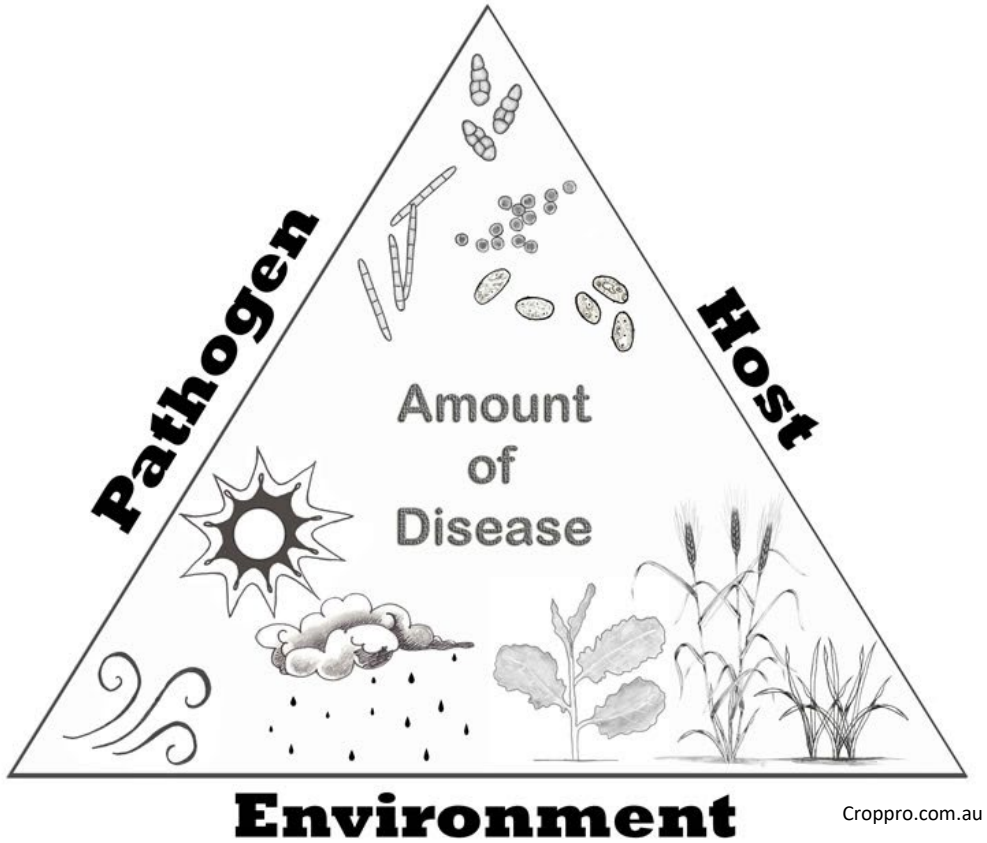
- Applied research
- Extension
- Plant Disease Diagnostic (field and clinical)
- Field trials

NPDN National Plant Diagnostic Network

WPDN Western Plant Diagnostic Network

Arizona Plant Diagnostic Network

Plant Pathology/Disease Triangle



Croppro.com.au

Causal Agents

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

Fungi and oomycetes

- Irish Famine (1845-1847)
- Oomycetes
- *Phytopthora infestants*
- 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 (*Cryphonetrica parasitica*)
- Powdery mildew, smut fungi, rust fungi

THE UNIVERSITY OF ARIZONA
Cooperative Extension
Yuma County

Fusarium wilt

THE UNIVERSITY OF ARIZONA
Cooperative Extension
Yuma County

Scerotinia drop: *S. sclerotiorum & S. minor*







THE UNIVERSITY OF ARIZONA
Cooperative Extension
Yuma County

Downy mildew: *Bremia lactucae*

Pic credit: Scott McKenna

Blogs.Cornell.efu

THE UNIVERSITY OF ARIZONA
Cooperative Extension
Yuma County

Alternaria leaf spot: *Alternaria spp*

THE UNIVERSITY OF ARIZONA
Cooperative Extension
Yuma County

Damping off

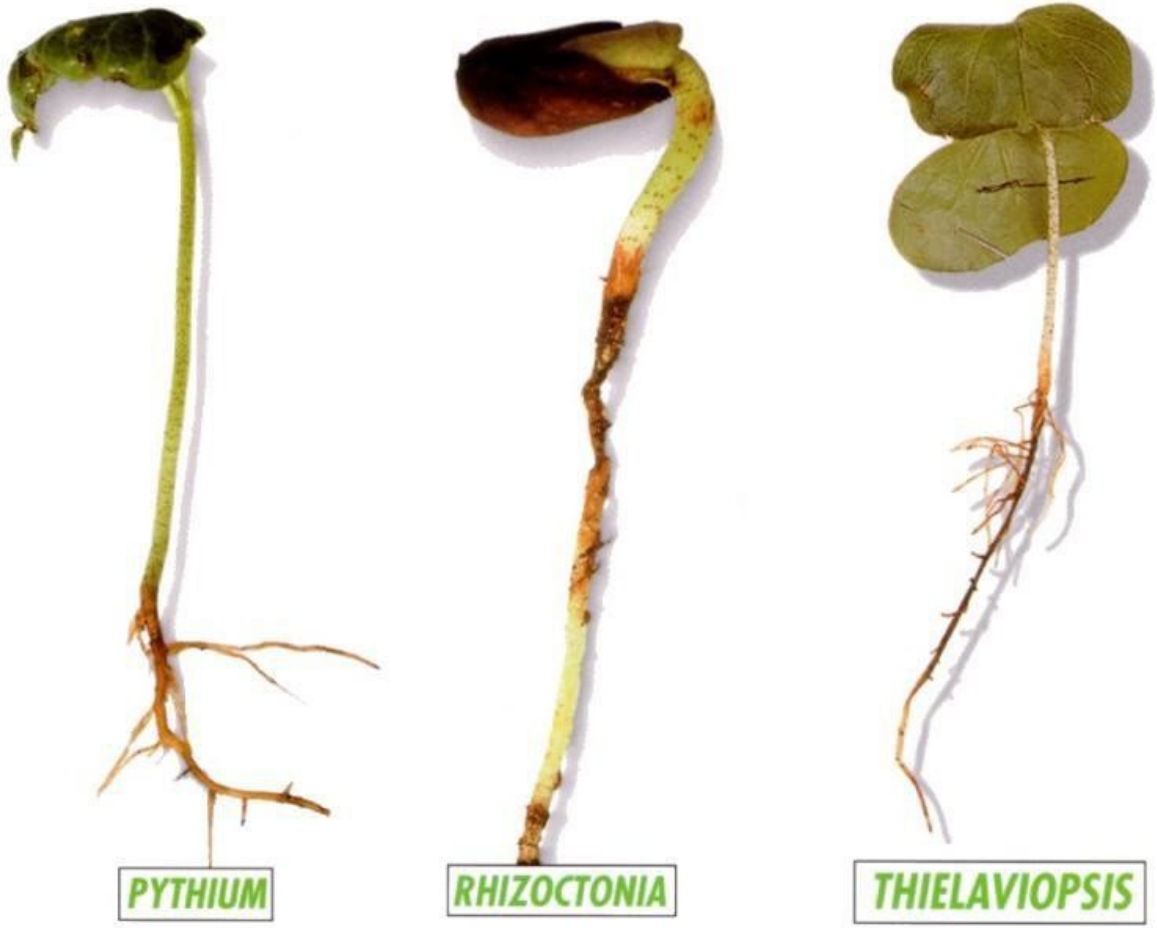
Rhizoctinia spp, Fusarium spp, Pythium spp, Alternaria spp

THE UNIVERSITY OF ARIZONA
Cooperative Extension
Yuma County

Seedlings Damping off

- *Fusarium spp*
- *Pythium spp*
- *Thielaviopsis spp*
- *Rhizoctonia spp*

- TEST!



Texas root rot/Texas root rot

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


Cottonic.com

THE UNIVERSITY OF ARIZONA
Cooperative Extension
Yuma County

Phytopthora crown/root rot:
Phytopthora megasperma

THE UNIVERSITY OF ARIZONA
Cooperative Extension
Yuma County

Fusarium wilt

THE UNIVERSITY OF ARIZONA
Cooperative Extension
Yuma County

Powdery mildew of wheat

- *Blumeria graminis* f. sp. *Tritici*
- True fungi unlike downy mildew
- High N high risk
- High humidity
- Dense canopy

THE UNIVERSITY OF ARIZONA
Cooperative Extension
Yuma County

Purple blotch: *Alternaria porri*

Stemphylium blight:
Stemphylium vesicarium

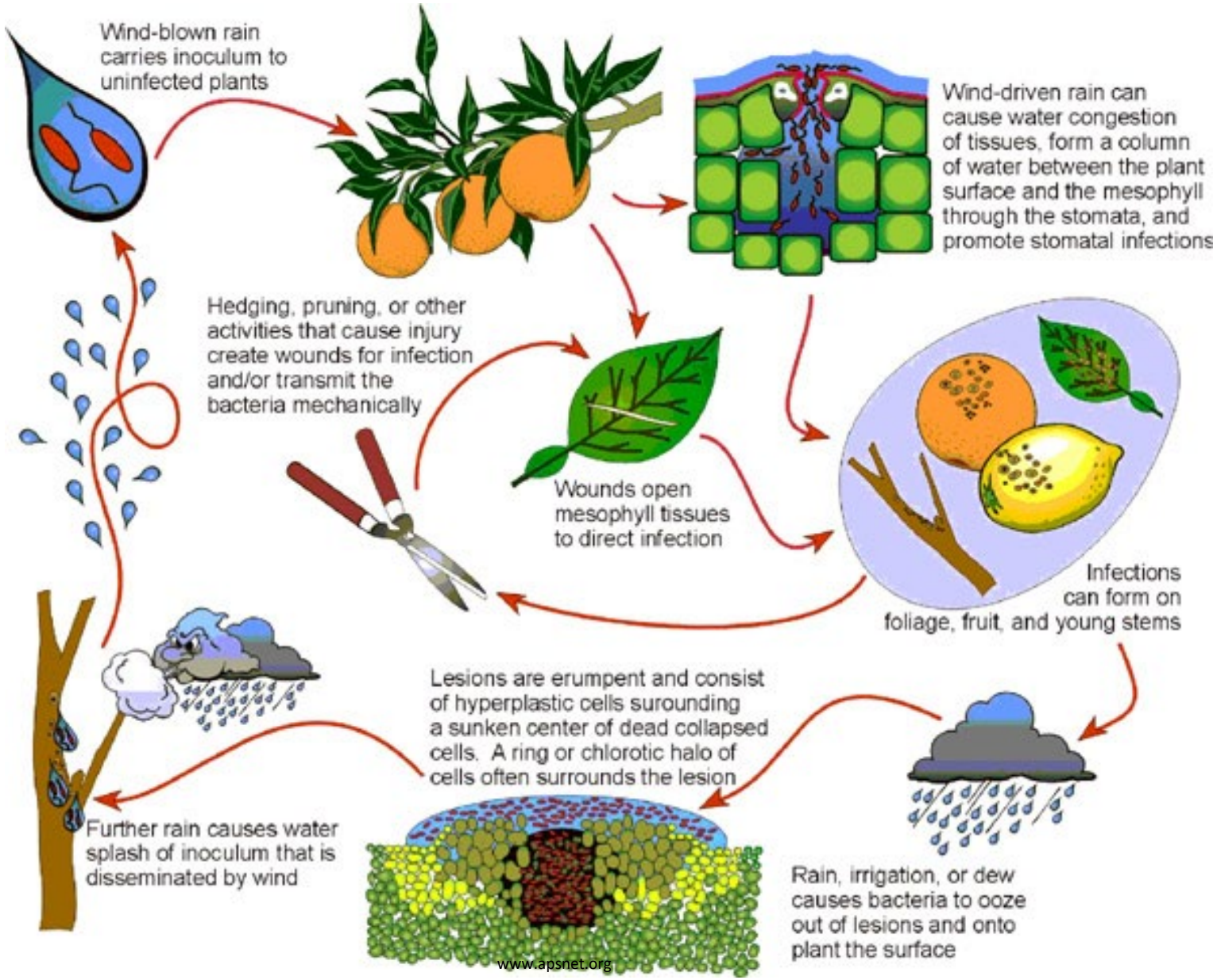
Bacteria

- Citrus Canker, fire blight in apples and pear
- Fruit blotch in melons

Bacteria

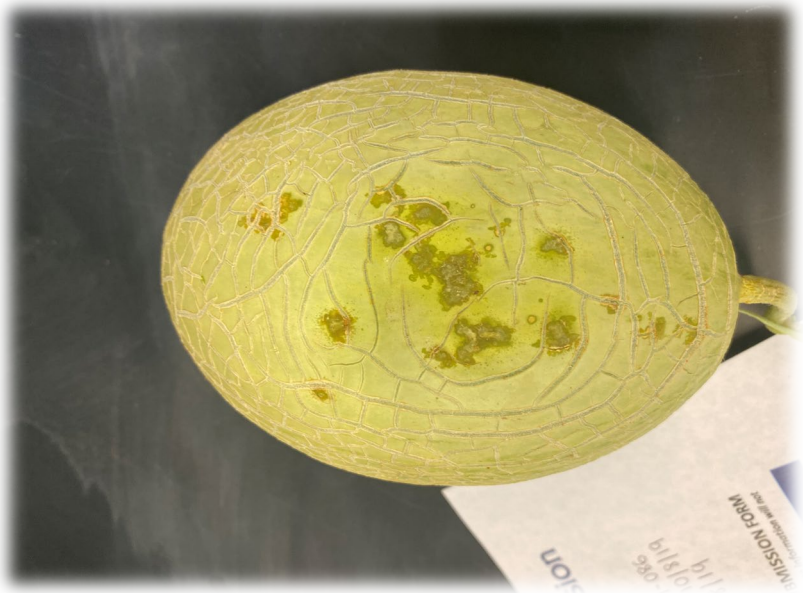
- Citrus Canker
- Bacteria
- *Xanthomonas axonopodis* pv. *citri*
- *Xanthomonas axonopodis* pv. *aurantifolii*
- 1912 in Florida Georgia line
- 20 years to eradicate, millions of $$$ and trees

www.apsnet.org


Wind-blown rain carries inoculum to uninfected plants
Wind-driven rain can cause water congestion of tissues, form a column of water between the plant surface and the mesophyll through the stomata, and promote stomatal infections
Hedging, pruning, or other activities that cause injury create wounds for infection and/or transmit the bacteria mechanically
Wounds open mesophyll tissues to direct infection
Infections can form on foliage, fruit, and young stems
Lesions are erumpent and consist of hyperplastic cells surounding a sunken center of dead collapsed cells. A ring or chlorotic halo of cells often surrounds the lesion
Further rain causes water splash of inoculum that is disseminated by wind
Rain, irrigation, or dew causes bacteria to ooze out of lesions and onto plant the surface
www.apsnet.org

THE UNIVERSITY OF ARIZONA
Cooperative Extension
Yuma County

Bacterial fruit blotch: *Acidovorax citrulli*



THE UNIVERSITY OF ARIZONA
Cooperative Extension
Yuma County

Black rot: *Xanthomonas campestris pv campestris*

THE UNIVERSITY OF ARIZONA
Cooperative Extension
Yuma County

Bacterial leaf blight

- *Xanthomonas axonopodis* pv *malvacearum*
- Angular leaf spot
- Warm humid weather
- Dispersed by rain/sprinkler

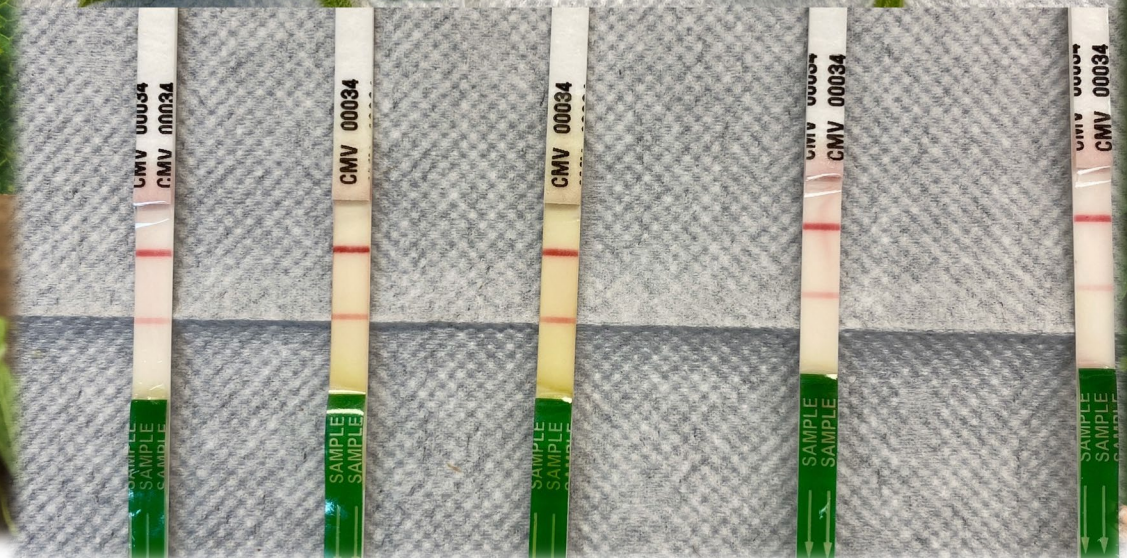

Seminolecropnews.com

Viruses

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

THE UNIVERSITY OF ARIZONA
Cooperative Extension
Yuma County

Viruses



THE UNIVERSITY OF ARIZONA
Cooperative Extension
Yuma County

THE UNIVERSITY OF ARIZONA
Cooperative Extension
Yuma County

Alfalfa mosaic virus

THE UNIVERSITY OF ARIZONA
Cooperative Extension
Yuma County

Cotton leaf curl virus

- Geminiviruses: whiteflies
- Leaves curl upwards
- Early infection stunts plants
- Yield reduction

Cotton leaf crumple virus

- Geminiviruses: whiteflies
- Leaf curls downwards
- Yield reduction

Viruses

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

www.apsnet.org

Nematodes

- Microscopic plant parasitic worms
- Vector viruses

https://ohioline.osu.edu

www.infonet-biovision.org

THE UNIVERSITY OF ARIZONA
Cooperative Extension
Yuma County

Nematodes

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

Plant Diagnostics

unleash the inner detective in you

Diagnostics

- Biotic (fungi, bacteria, nematodes, viruses, oomycetes, insects)

- Abiotic (nutritional, weather damage, toxicity)

Alfalfa 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!

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!?!?

Causal Agents

- Fungi and oomycetes-humidity, movement within the field, soilborne
- Bacteria-warm and humid, rain/sprinkles
- Viruses- vectors, plant material movement
- Nematodes- soil/water movement

Abiotic issues

- Day/night temp, frost, irrigation water: secondary infection
- Wind, sand, drift
- Herbicide, spray
- Cultural: compact soil, damage by machinery, oil spill, wrong rate of chemicals
- Growth stage/nutrient, too much/too little nitrogen
- Genetic: male/female/varietal susceptibility
- Nursery batch (sudden start/stop of symptoms, could be disease related)

THE UNIVERSITY OF ARIZONA
Cooperative Extension
Yuma County

Abiotic problems




THE UNIVERSITY OF ARIZONA
Cooperative Extension
Yuma County

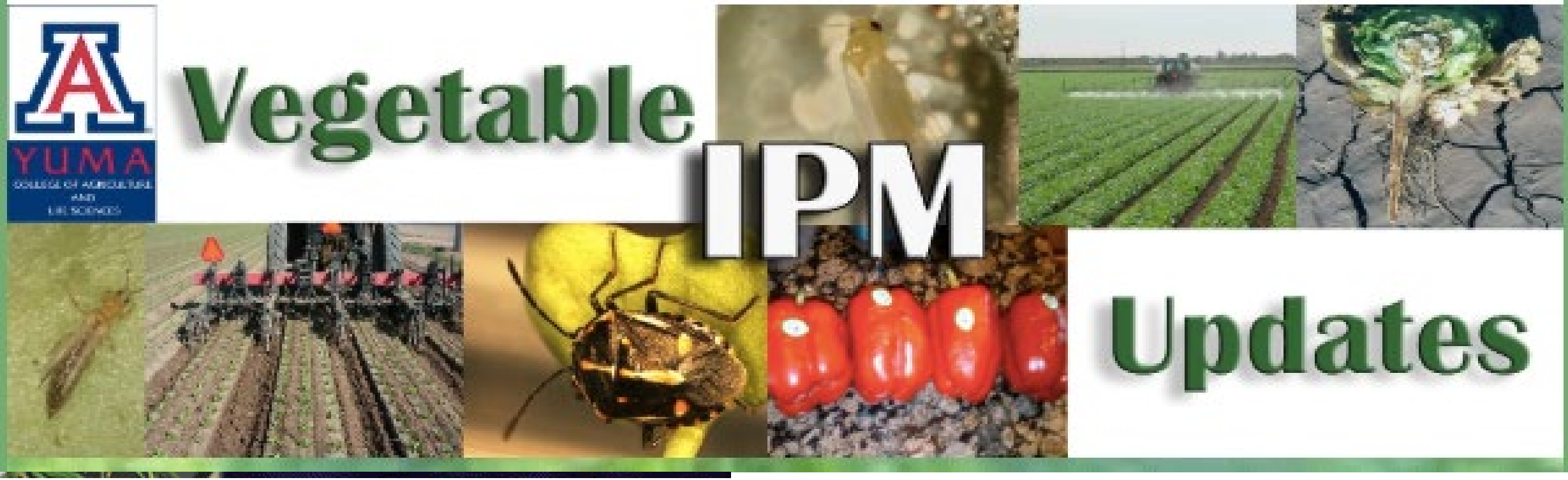
THE UNIVERSITY OF ARIZONA
Cooperative Extension
Yuma County

Abiotic problems?

DIY tips

DIY tips

Vegetable IPM Updates



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

AZVegIPM-Team@email.arizona.edu

marcop@ag.arizona.edu

Select Lab By

Pests-Pathogen

Lab Name

Diagnostician

All Pest Alerts

Labs by Pest-Pathogen

General Pathology

Dr. Mike Matheron's Lab
Field and Urban: Yuma County
(928) 782-5863
matheron@ag.arizona.edu
Submission Instructions

Dr. Alex Hu's Lab
General Pathology
520-626-6287
epp@email.arizona.edu
Submission Instructions

Dr. Bindu Poudel's Lab
Extension Plant Pathologist/Plant Disease Diagnostician
928-782-5879
bpoudel@email.arizona.edu
Submission Instructions

Bacteria and Fungi

Dr. Mike Matheron's Lab
Field and Urban: Yuma County
(928) 782-5863
matheron@ag.arizona.edu
Submission Instructions

Dr. Barry Pryror's Lab
Fungal Diagnostics
(520) 626-5312
bmpryor@ag.arizona.edu
Submission Instructions

Entomology

Entomology
Insect identification and taxonomy
520-621-6446
wehall@email.arizona.edu
Submission Instructions

Dr. Peter Ellsworth's Lab
IPM and Field Specialist
(520) 381-2225
ellsworth@ag.arizona.edu
Submission Instructions

Dr. Dawn Gouge's Lab
Urban Specialist
(520) 381-2223
dhgouge@ag.arizona.edu
Submission Instructions

Dr. John Palumbo's Lab
Pesticide and Insect Control
(928) 782-3836
jpalumbo@ag.arizona.edu
Submission Instructions

Nematodes

Dr. Patricia Stock
General Nematologist
520-626-3854
spstock@email.arizona.edu
Submission Instructions

Viruses

Dr. Judith Brown's Lab
Virus - Vector
(520) 621-1402
jbrown@ag.arizona.edu
Submission Instructions

Dr. Zhongguo Xiong's Lab
Virus - Citrus
(520) 621-9869
zxiong@ag.arizona.edu
Submission Instructions

How to submit sample:

1.Choosing sample/samples to send

1. Pick **one** plant that is a **good example** of the problem/sickness
2. Try to send **multiple plants** at different **stages of sickness**
3. Send **one healthy plant** for reference
4. Remember, there is no such thing as too much sample!

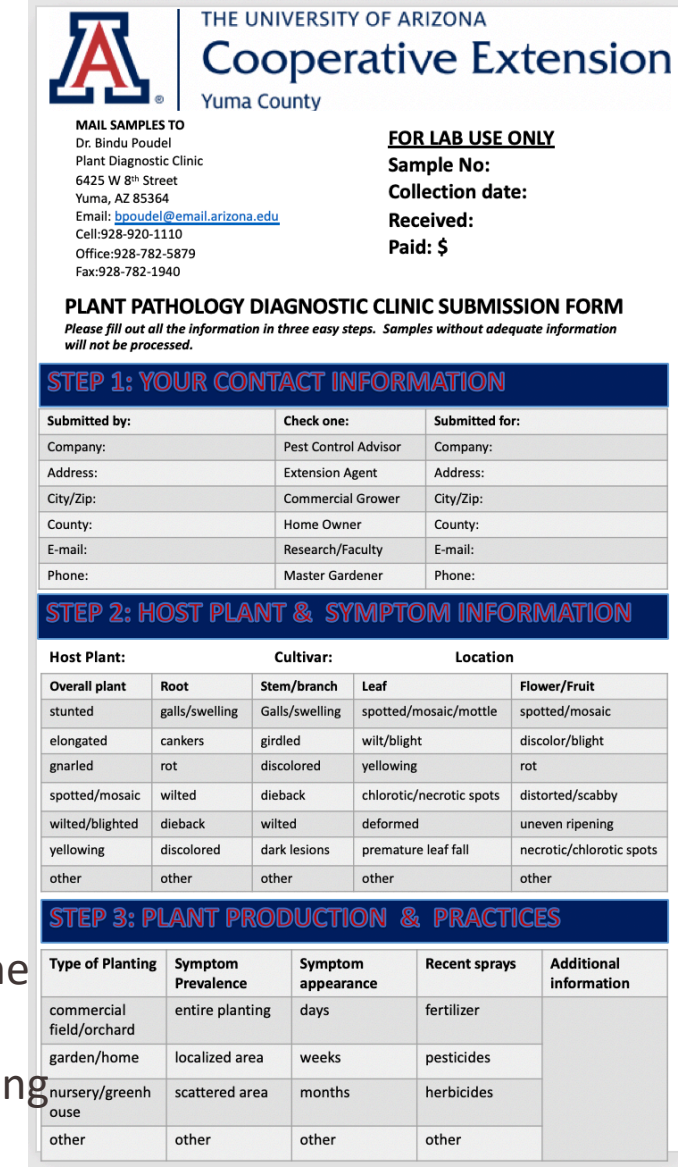
2.Fill out the **plant sample submission form**.

1. Please fill out as much information as you can, this helps with rapid diagnostic.
2. **Forms** are also available at Yuma Ag Center (6425 W 8th Street) and Yuma County Cooperative Extension office (2200 W 28th Street St 102).
    1. Feel free to take extra copies or make copies for future needs

3.Mail or drop off **submission form** with sample

1. Mail to: Yuma Plant Health Clinic 6425 W 8th Street, Yuma AZ 85364. Please ship overnight.
2. Drop off: Yuma Plant Health Clinic 6425 W 8th Street, Yuma AZ 85364
    1. Drop off samples at the Clinic by 3 PM, it allows us to process the samples same day, so you can get your diagnostic results within 48 hours.

4.If you are shipping samples please remember to include the **USDA Aphis Permit** for moving plant samples.



THE UNIVERSITY OF ARIZONA
Cooperative Extension
Yuma County

MAIL SAMPLES TO
Dr. Bindu Poudel
Plant Diagnostic Clinic
6425 W 8th Street
Yuma, AZ 85364
Email: bpoudel@email.arizona.edu
Cell:928-920-1110
Office:928-782-5879
Fax:928-782-1940

FOR LAB USE ONLY
Sample No:
Collection date:
Received:
Paid: $

PLANT PATHOLOGY DIAGNOSTIC CLINIC SUBMISSION FORM

Please fill out all the information in three easy steps. Samples without adequate information will not be processed.

STEP 1: YOUR CONTACT INFORMATION

Submitted by:	Check one:	Submitted for:
Company:	Pest Control Advisor	Company:
Address:	Extension Agent	Address:
City/Zip:	Commercial Grower	City/Zip:
County:	Home Owner	County:
E-mail:	Research/Faculty	E-mail:
Phone:	Master Gardener	Phone:

STEP 2: HOST PLANT & SYMPTOM INFORMATION

Host Plant: **Cultivar:** **Location**

Overall plant	Root	Stem/branch	Leaf	Flower/Fruit
stunted	galls/swelling	Galls/swelling	spotted/mosaic/mottle	spotted/mosaic
elongated	cankers	girdled	wilt/blight	discolor/blight
gnarled	rot	discolored	yellowing	rot
spotted/mosaic	wilted	dieback	chlorotic/necrotic spots	distorted/scabby
wilted/blighted	dieback	wilted	deformed	uneven ripening
yellowing	discolored	dark lesions	premature leaf fall	necrotic/chlorotic spots
other	other	other	other	other

STEP 3: PLANT PRODUCTION & PRACTICES

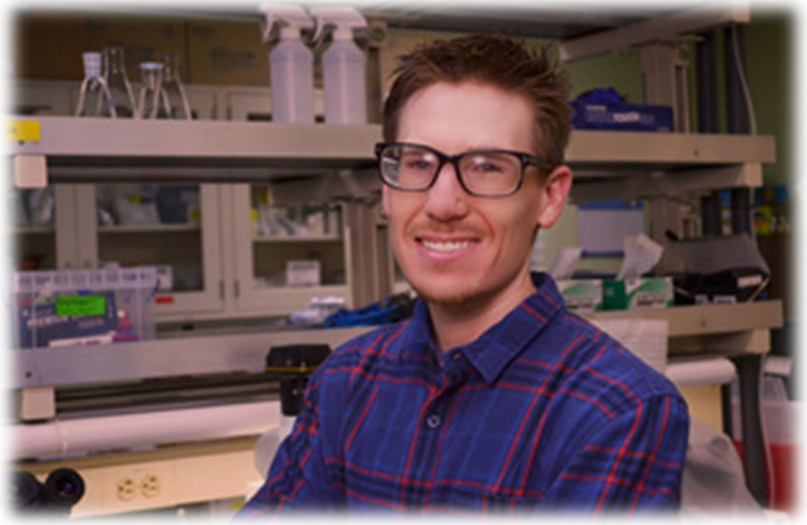
Type of Planting	Symptom Prevalence	Symptom appearance	Recent sprays	Additional information
commercial field/orchard	entire planting	days	fertilizer	
garden/home	localized area	weeks	pesticides	
nursery/greenhouse	scattered area	months	herbicides	
other	other	other	other	

THE UNIVERSITY OF ARIZONA
Cooperative Extension
Yuma County

THE DREAM TEAM

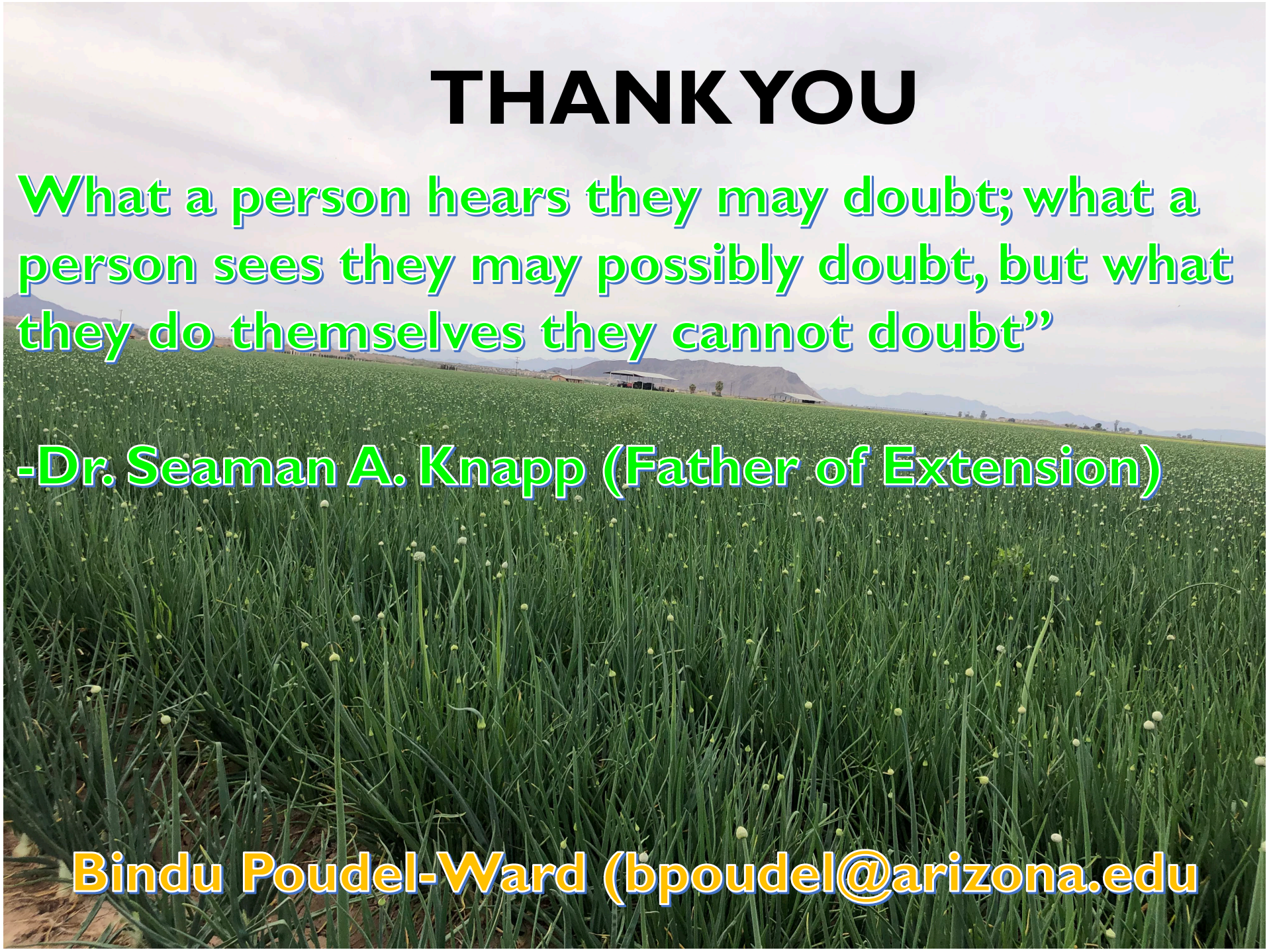
Dr. Bindu Poudel-Ward

Martin Porchas Sr.



Jason Furr

Dr. Neeraja Singh


THANK YOU
What a person hears they may doubt; what a person sees they may possibly doubt, but what they do themselves they cannot doubt”
-Dr. Seaman A. Knapp (Father of Extension)
Bindu Poudel-Ward (bpoudel@arizona.edu