

# Know your enemy before you engage: a case study



*2018 Tri-State IPM Workshop*

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# Diagnose your symptoms!... Accurate diagnosis is key

- Is the problem biotic or abiotic?
- Is it disease or a pest?
- Selection of pesticides
- Reduce crop losses
- Send samples to your diagnostic clinic!



*Pythium* root rot



Water stress



# Case study: root rot woes in poinsettia





# A grower observed 10-15% losses to root disease several years in a row

## The problem was determined to be caused by *Pythium*

- Consulted with an extension specialist (Canada)
- Id based on symptoms and timing (October)
- *Pythium* is a common problem in poinsettia, often in early Oct.



- Flagging 7 wks post potting
- Brown, rotting roots
- Wilting
- Plant death

# Chemical fungicides had been used with success until recently

## Plan of action taken:

- Selected products labeled for *Pythium* – Subdue/metalaxyl
- Applied products at transplant to pots
- Nothing applied in propagation

## But the disease problem continued!

- Two newbies entered the picture



A fungicide resistant *Pythium*?



Hmm, what species is it?

Lets do an experiment!

# An on-farm research trial was set up to evaluate chemical and biological strategies

Grower had not used biopesticides ...was willing to give it go

Treatment Trade Name (Chemical/Spp. Name)	Application 1 at approx. wk 32 (Rate)
1. Truban® (ETRIDIAZOLE) + Subdue® (METALAXYL)	Truban® applied as drench when roots hit edge of pot (240mL/380L at 150 mL/pot) ; Subdue® drench (24 mL/1000 L at 150 mL per pot) applied in week 39
2. Truban® (ETRIDIAZOLE)	Drench when roots hit edge of pot
3. Previcur® (PROPAMOCARB HYDROCHLORIDE)	Drench at potting (1 ml/L; 150 mL per pot)
4. RootShield Plus® ( <i>TRICHODERMA HARZIANUM</i> T- 22/G-41)	Drench at potting (150 ml at 0.5 g/L)
5. RootShield Plus® + Previcur®	Previcur drench at potting (1ml/L); RootShield 1 week after potting (150 ml at 0.5 g/L)
6. PreStop® ( <i>GLIOCLADIUM CATENULATUM</i> )	Drench at potting (150 ml at 1% suspension, i.e. 10g/L)
7. Actinovate® ( <i>STREPTOMYCES LYUDICUS</i> )	Drench at potting (150 ml at 0.5g/L)
8. Untreated	Water

# The crop was monitored for symptoms

- Symptoms developed in late September
- Plants sent to the diagnostic clinic (had not been done before)
- 10/11 samples were positive for...***Fusarium oxysporum***!!

A case of  
misdiagnosis!



This is NOT a  
fungicide resistance  
problem



# No disease control observed on plants treated with Truban or Subdue

## Why?

- Because the problem was caused by *Fusarium*!
- Previcur and Rootshield Plus had some effect
- Rootshield Plus + Previcur was the most effective treatment



# “My roots are amazing”

## The grower was impressed with Rootshield Plus results

- Enhanced root growth
- Improved crop uniformity
- Decided to use continue using the product

## Trials were conducted again the next year

- Changed fungicide controls to Medallion and Compass
  - (for activity against Fusarium)
- Grower applied Compass as a foliar spray in propagation
- Very little disease! (<4% loss)

# Some thoughts:

## **Biopesticides work best when applied early**

- Research is needed to evaluate propagation substrates and fungicide/biopesticide compatibility
- High disease pressure → precede bios with a chemical fungicide

## **Proper identification can save you time and money**

- Different diseases can superficially look the same
- Many root rot diseases have similar symptoms, and many are almost impossible to differentiate correctly without further testing

# Potential causes of Poinsettia collapse

Timing	Symptoms	Likely culprit
Any stage, but may not show up until November	Base of stems appear soft and wet. Roots are brown and water soaked. When dry, the pith of the lower stem is brown when cut; the stem has a gray canker.	Phytophthora root/stem rot
Any stage	Rooted cuttings are stunted, yellow, and wilted. Roots are brown and look “wet”; Outer layers of root tissue strip off. Later, lower leaves yellow and drop.	Pythium rot root
September to October	Plants may be stunted; will wilt suddenly and die. Roots and crowns may turn brown-black and become soft. Rotted areas may develop cream-orange, wet-looking, spore masses.	Fusarium wilt
Late in season under cooler conditions	Roots turn black. Plant wilt. Longitudinal splits form at the stem base at and below soil line. Leaves yellow and fall.	Black root rot (Thielaviopsis)
Early or late	<u>Early</u> : cuttings wilt and yellow. Roots are rotted. <u>Late</u> : lower leaves yellow and fall off; Sunken dark brown cankers on stem may reach slightly above soil line. Brown lesions visible on roots.	Rhizoctonia wilt

<https://onfloriculture.wordpress.com/2017/09/12/fainting-freedom-red-wilting-whitestar-potential-causes-of-poinsettia-collapse-solutions-and-the-importance-of-testing/>



# Can you tell the difference? Probably not



*Pythium*



*Rhizoctonia*



*Fusarium*

**But your diagnostician can!**

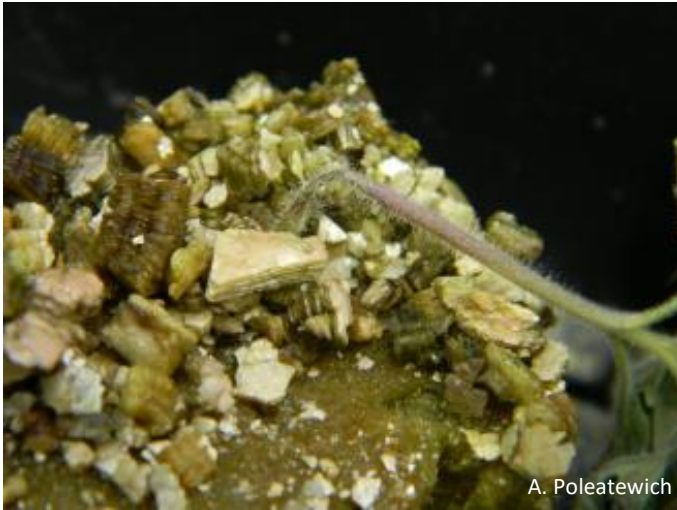
...we look macroscopically, and confirm microscopically, and often culture to confirm

# Diagnosis has implications for selection of pesticides

Five groups → Five Kingdoms

	<b>True Fungi</b>	<b>Oomycetes</b>	<b>Bacteria</b>	<b>Viruses</b>	<b>Nematodes</b>
<b>Kingdom</b>	<b>Fungi</b>	<b>Stramenopila</b>	<b>Procaryotae</b>	<b>Virus</b>	<b>Animalia</b>
<b># species</b>	<b>100,000</b>	<b>?</b>	<b>&gt;1,600</b>	<b>&gt;2,000</b>	<b>1,000</b>
<b># plant pathogens</b>	<b>&gt;10,000</b>	<b>?</b>	<b>c. 100</b>	<b>c. 500</b>	<b>&gt;100</b>
<b>Examples</b>	<b><i>Botrytis,</i> <i>Fusarium</i></b>	<b><i>Pythium,</i> <i>Phytophthora</i></b>	<b><i>Clavibacter,</i> <i>Xanthomonas</i></b>	<b>PepMV, TMV</b>	<b>RKN</b>

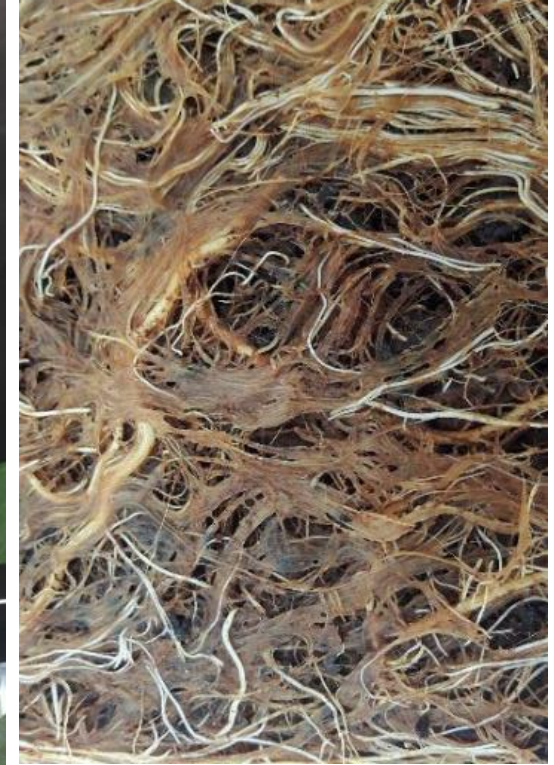
# *Pythium* spp. are ubiquitous soil-borne pathogens



**Damping off**



**Stem and crown rots**

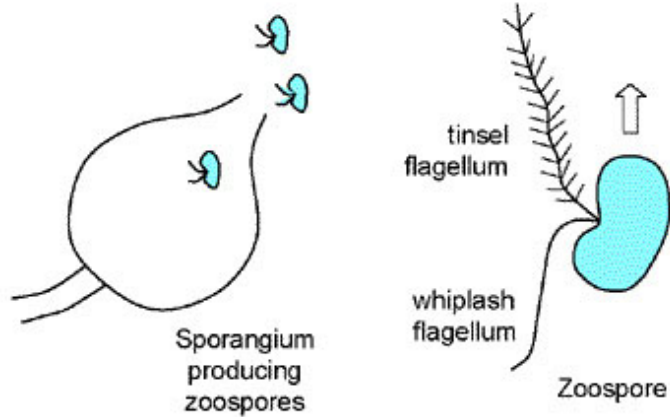


**Root rots and wilting**



# *Pythium* is a water mold – in the Phylum Oomycota

Not a 'true' fungus!

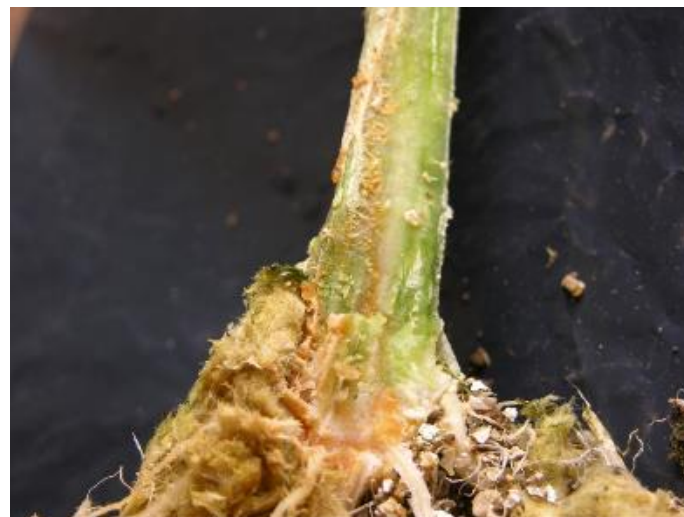


**Characteristic feature is the production of swimming zoospores**

# *Fusarium* also causes root rots and wilts



**Wilt**



**Crown rot**



**Rootz rot**



**Stem rot**

***Fusarium* and *Pythium* are very different biologically**

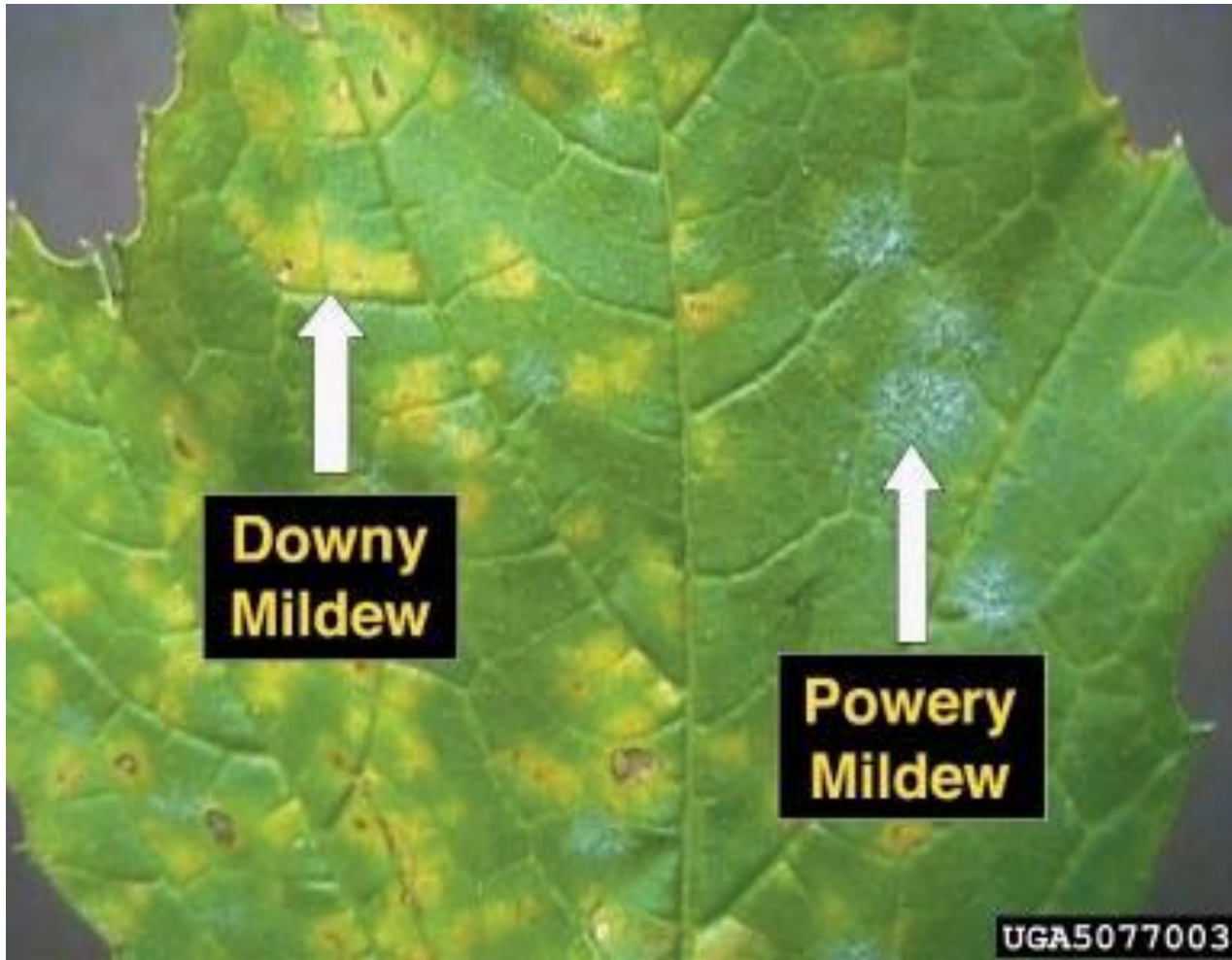
**Require different fungicides**





# Downy Mildews....are not true fungi and require different fungicides than powdery mildews





**Downy  
Mildew**

**Powery  
Mildew**

UGA5077003

# Disease scouting

## Things to keep in mind

1. More than one pathogen or disease can occur on a plant at one time
2. There are symptoms that may appear identical for two different diseases
3. Symptoms caused by abiotic stress can mimic those caused by a biotic agent





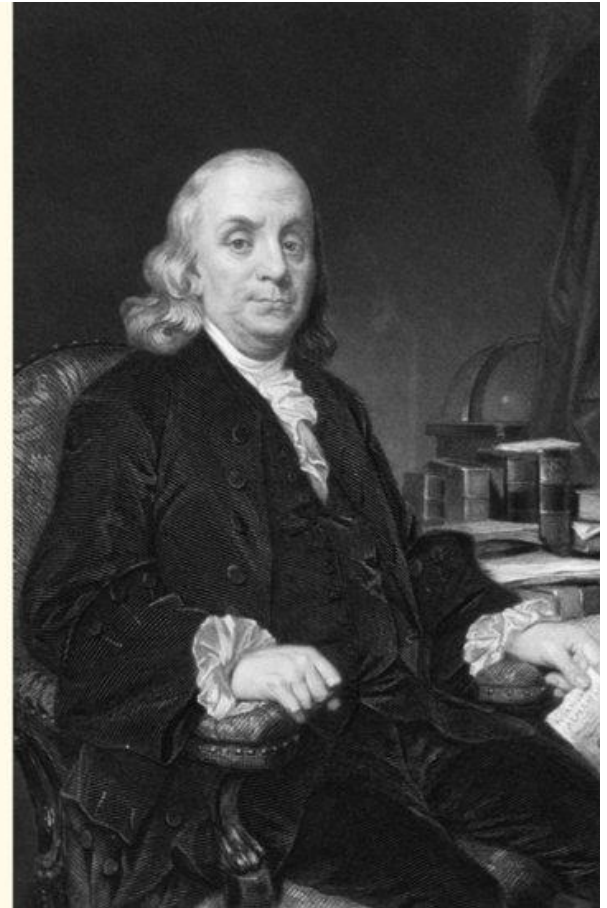
An introduction to today's hand-on demonstration...

## 3M Petrifilms for testing sanitation

**And Fungi!!**

**“In wine there  
is wisdom, in  
beer there is  
Freedom, in  
water there is  
bacteria.”**

**— Benjamin  
Franklin**



# Petrifilms as a tool to measure risk

Petrifilms are plastic cards coated in a dehydrated nutrient film with microbial indicators

Different types of Petrifilm are available for aerobic bacteria, yeasts & molds (i.e., fungus and fungal-like organisms), or other pathogens of importance to human health.

## What can you use them for?

- Indicator of biological load
- Water quality (contamination)
- Irrigation water treatment efficacy



# Resources

## Resources for best practices

- University of Florida – Paul Fisher
- Flowers Canada/OMAFRA  
[https://onfloriculture.files.wordpress.com/2017/02/water-quality-testing-on-site\\_2017.pdf](https://onfloriculture.files.wordpress.com/2017/02/water-quality-testing-on-site_2017.pdf)

## Where to order

- Nelson-Jameson (\$1.00/film)
- 3M