

Biocontrol Pepper Field Study

Treatment and rate/A, applied at 7-day intervals	Dead Plants (%) ^z				AUDPC ^y
	8 Aug	15 Aug	22 Aug	29 Aug	
Untreated control	40.3 bc ^x	68.1 a	84.7 a	93.1 a	1536.1 a
Presidio SC 4 fl oz -alt- Elumin SC 8 fl oz -alt- Orondis Gold SC 55 fl oz	0.0 d	0.0 b	1.4 c	1.4 d	14.6 c
Howler WP 2.5 lb + Dyne-Amic 0.375% V/V -alt- Orondis Gold SC 55 fl oz	0.0 d	1.4 b	2.8 c	1.4 d	34.0 c
Revus SC 8 fl oz	2.8 d	2.8 b	1.4 c	2.8 d	48.6 c
YSY WP 12.5 lb	31.9 c	48.6 a	54.2 b	56.9 c	1030.6 b
Theia WP 3 lb + Dyne-Amic 0.375% V/V	47.2 ac	54.2 a	63.9 ab	68.1 bc	1229.9 ab
AVIV SL 30 fl oz	56.9 ab	63.9 a	69.4 ab	88.9 a	1443.8 ab
AC203 SL 24 fl oz	65.3 a	70.8 a	76.4 ab	83.3 ab	1550.7 a



Control Strategies

Choosing Fungicides for Cucumber Protection

Phytophthora

Presidio (43)*
Revus (40)
Acrobat/Forum (40)
Ridomil Gold Bravo (4+M5)
Ridomil Gold MZ (4+M3)

Downy Mildew

Orondis Ultra (49)
Orondis Opti (49+M5)
Elumin (22)
Ranman (21)
Zampro? (45+40)
Previcur Flex? (28)
Zing! (22+M5)
Gavel (M22)

Bravo (M5)
Mancozeb (M3)

* Values in parentheses indicate FRAC code

Making the Most of Fungicides

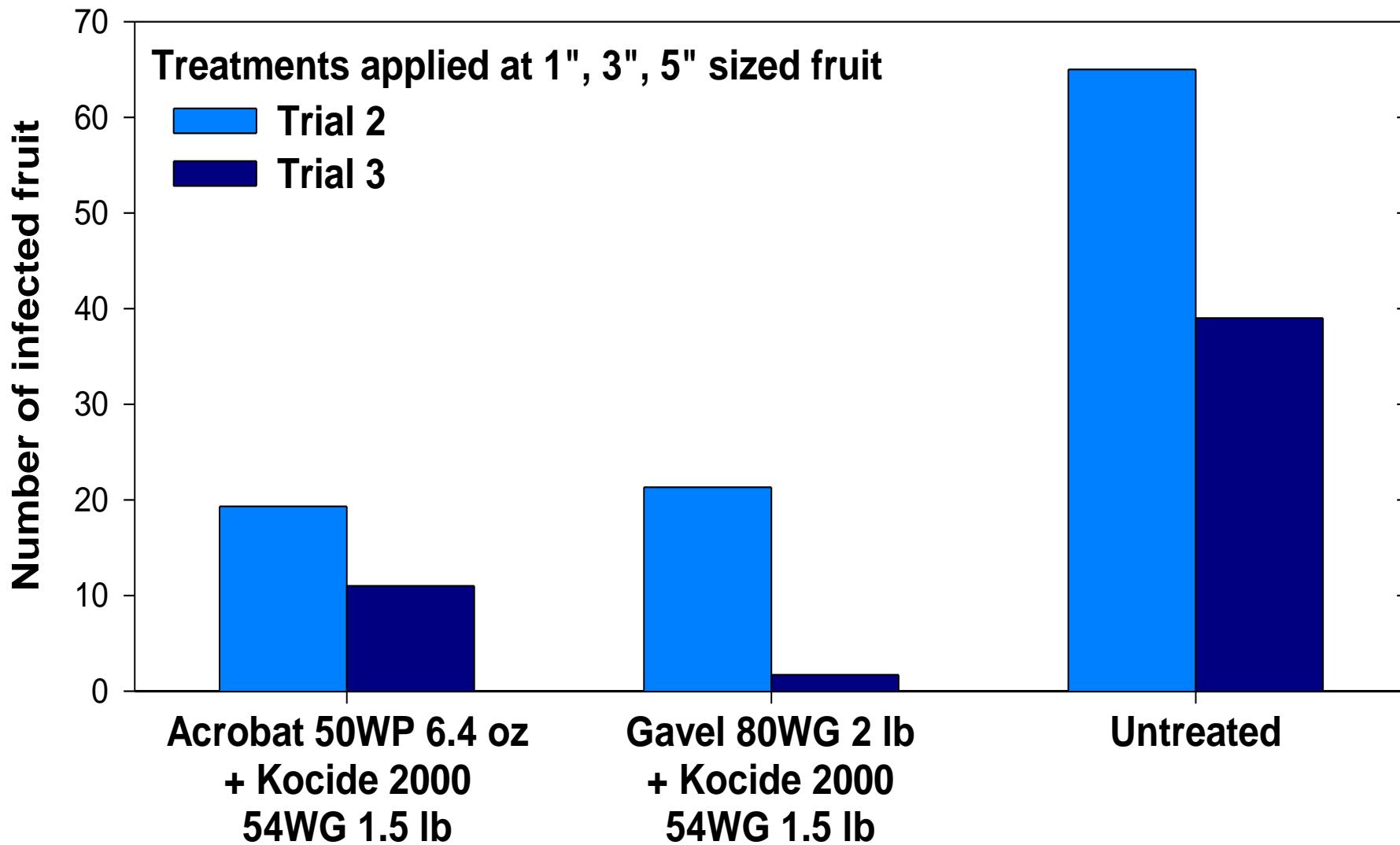
- ❖ Maximize fungicide coverage
- ❖ Keep spray intervals short
- ❖ Apply before a rain
- ❖ Come back quickly after a rain
- ❖ Protect the fruit (1", 3", 5")



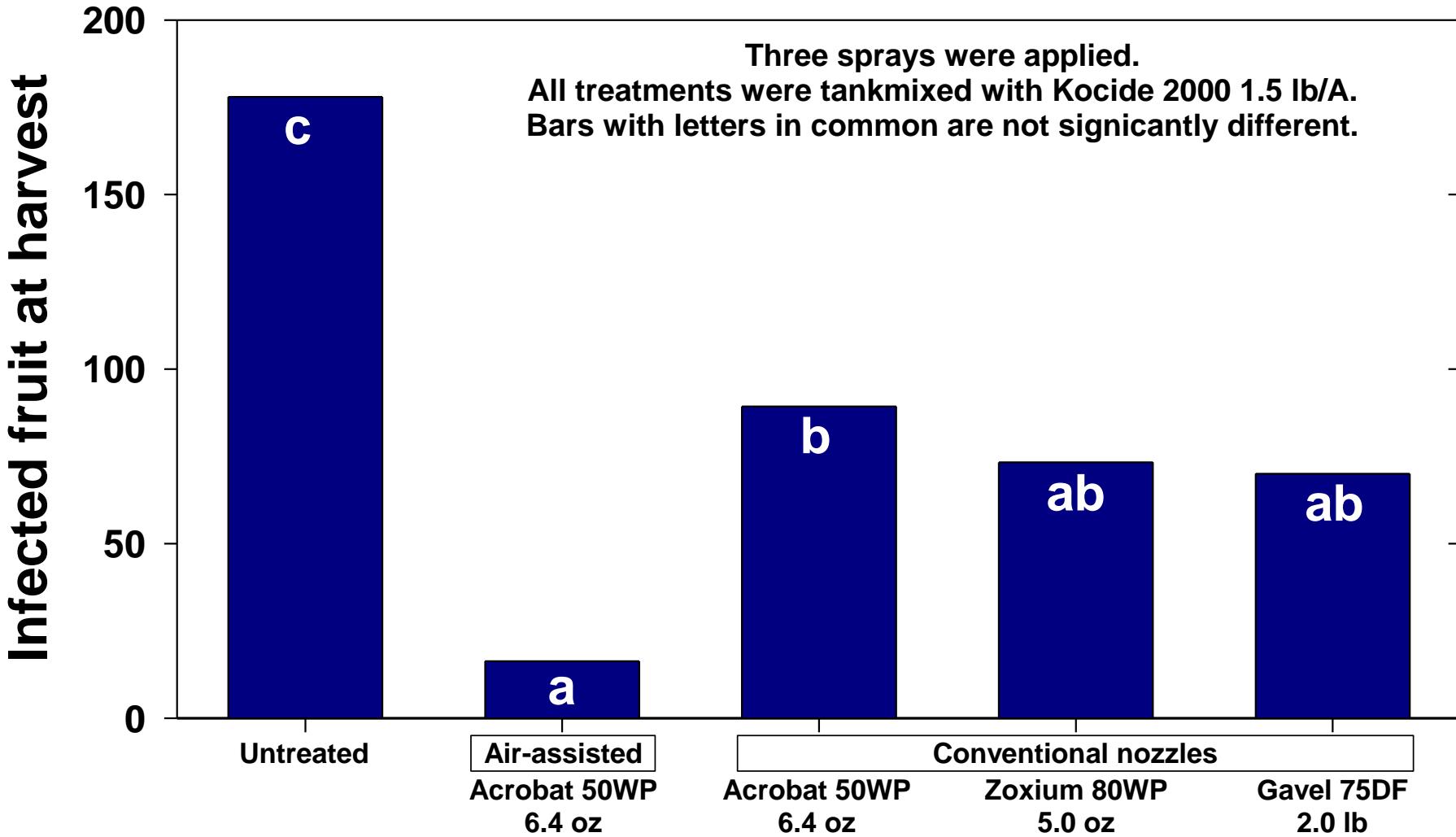
Fungicides Must Reach the Cucumber Fruit

- ❖ Need a lethal dose of product to cover the fruit
- ❖ Too much water (GPA) can dilute the solution to a non-lethal dose and run-off the fruit
- ❖ Increase coverage by angling nozzles forward or using Twin Jets
- ❖ Avoid nozzles that produce large droplets
 - ✓ Air-induct, Drift Guards
- ❖ Too much pressure and fines will drift, and droplets evaporate before reaching the fruit

Evaluation of Acrobat and Gavel to Manage *P. capsici* Blight on Pickles



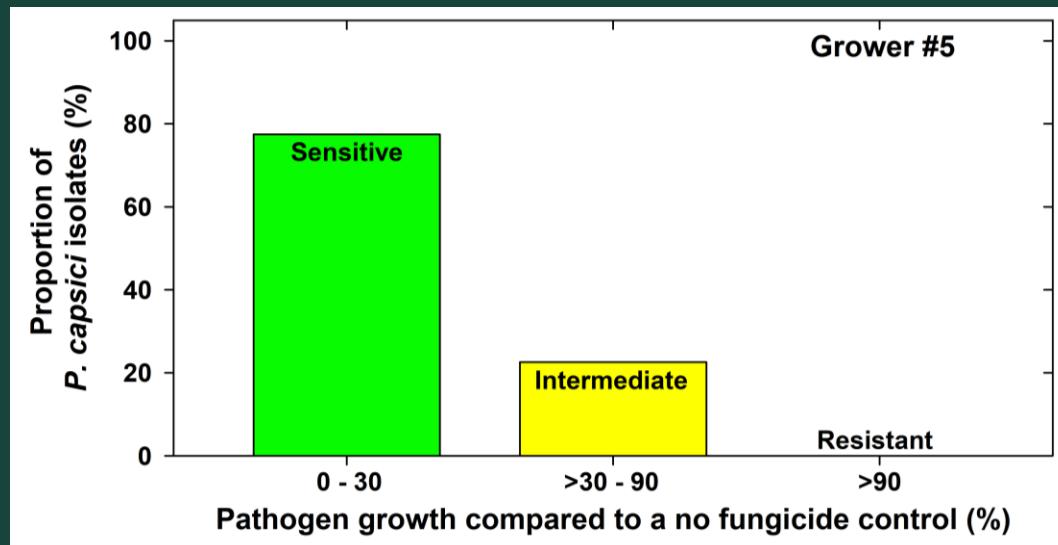
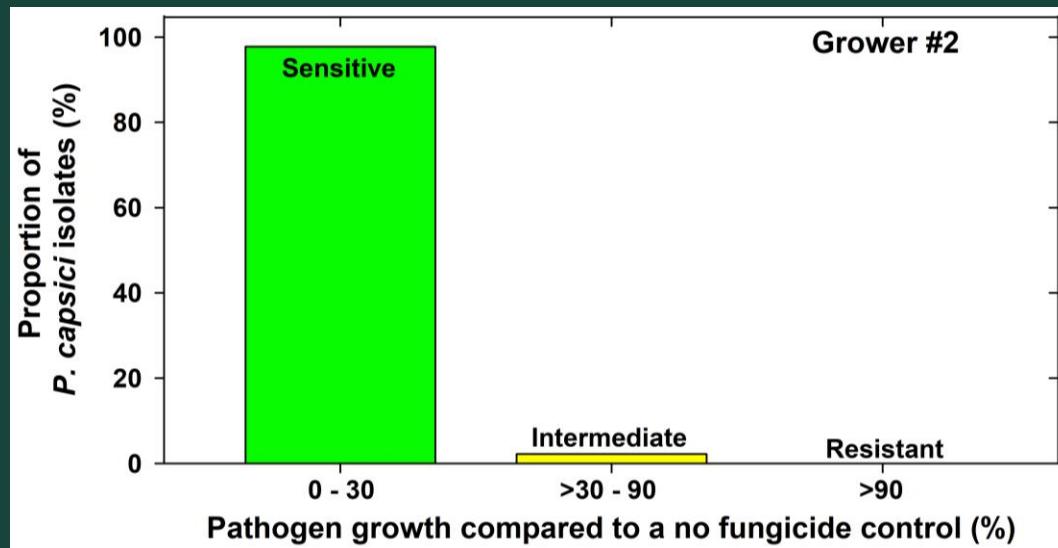
Large scale field studies evaluating the effectiveness of foliar fungicides for the control of *P. capsici*.



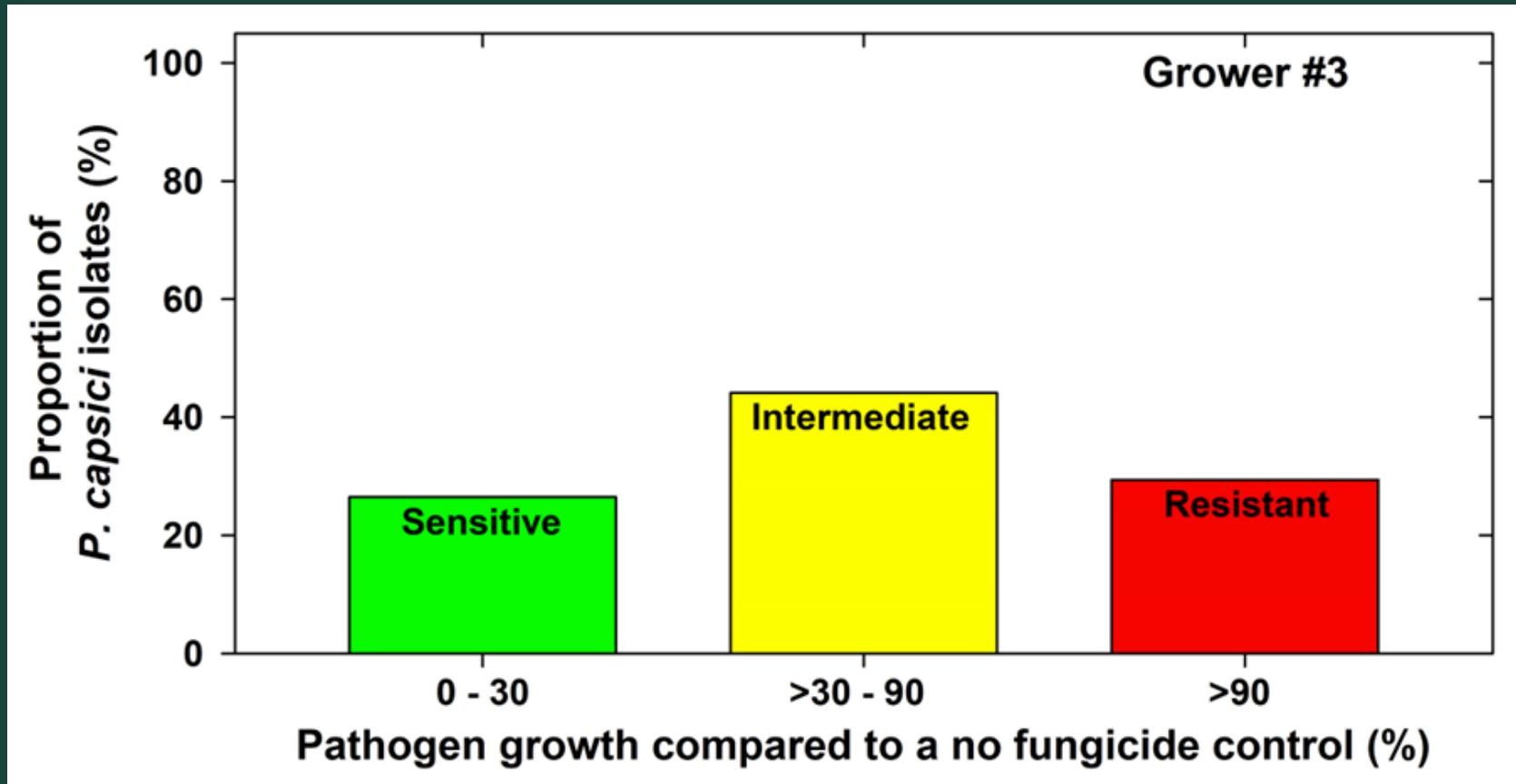
Fungicide Resistance

- ❖ Sometimes *Phytophthora* is not affected by fungicides = **Resistance**
- ❖ To delay resistance, rotate fungicides with different FRAC codes
- ❖ When resistance does occur, choose a fungicide with a different FRAC code

Case Study: *P. cap* Resistance



Intermediate → Resistant



Control Strategies

Phytophthora can be prevented but not cured

- ❖ Irrigate conservatively, not prior to harvest
- ❖ Ensure excellent fungicide coverage
- ❖ Do not dump culls/diseased fruit on fields
- ❖ Apply fungicides early and rotate products
- ❖ Avoid susceptible rotational crops
- ❖ Use resistant pepper varieties when possible
- ❖ Tile and subsoil fields as needed
- ❖ Do not use surface water for irrigation
- ❖ Work problem fields last, power wash equipment

Thanks for Your Support

Pickle Packers International Inc.

- Agricultural Research Fund
- Pickle and Pepper Research Committee

MSU AgBioResearch Project GREEEN

The USDA IR-4 Project

MI Specialty Crop Block Grant,
administered by the Michigan
Vegetable Council





MICHIGAN STATE UNIVERSITY

Phytophthora found in Michigan surface water: irrigation ponds, a creek and a river...

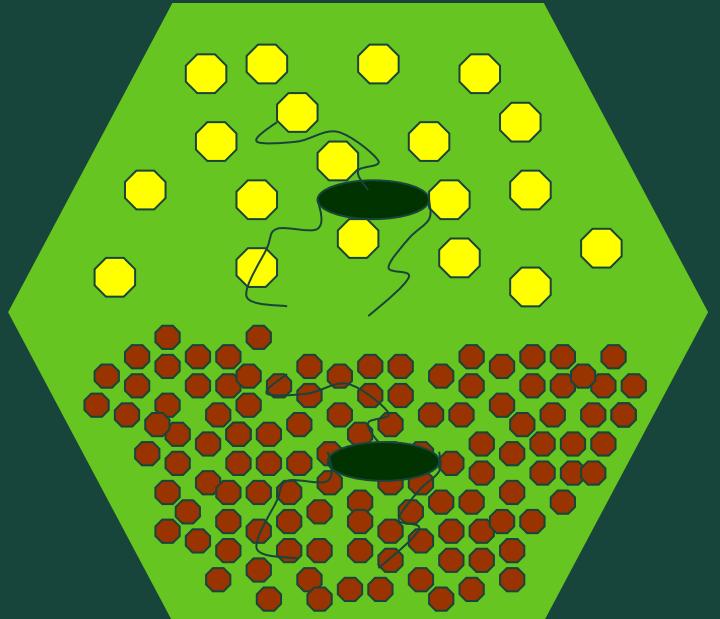
It may be spread readily by water

Water source	Nearby field(s)		Detection
	Infested	History	
Naturally-fed pond	yes	no	frequent
Well-fed pond 1	no	yes	none
Well-fed pond 2	no	yes	once
River	yes	yes	frequent
Creek	yes	yes	frequent

Fungicide Sprays

- ❖ Want particle in fine to very fine size range
- ❖ Higher pressure with smaller nozzle openings
 - ✓ Creates more spray droplets
- ❖ 20-50 GPA

- Yellow hexagon: 100 GPA 8006 @ 40 psi
- Red hexagon: 50 GPA 8003 @ 60 psi



Air-Assisted



- ❖ Small droplet size
- ❖ High speed fans
- ❖ Increased spray coverage

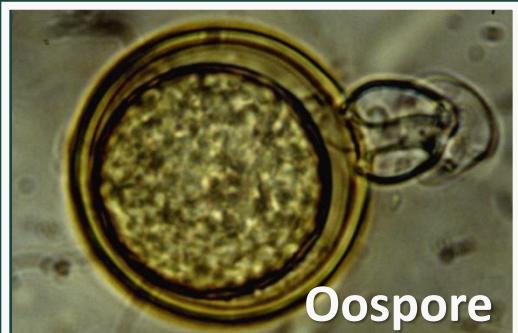
✓ **Do you know where your droplets are?**



If mefenoxam works, then what's the problem?

- ❖ In every population there may be a very low (perhaps undetectable) number of intermediately resistant individuals of *Phytophthora capsici*.

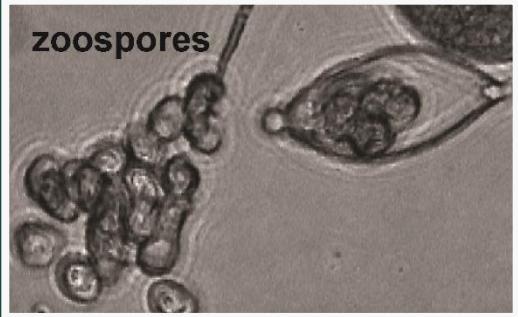
Management Challenges



Oospore



Sporangia

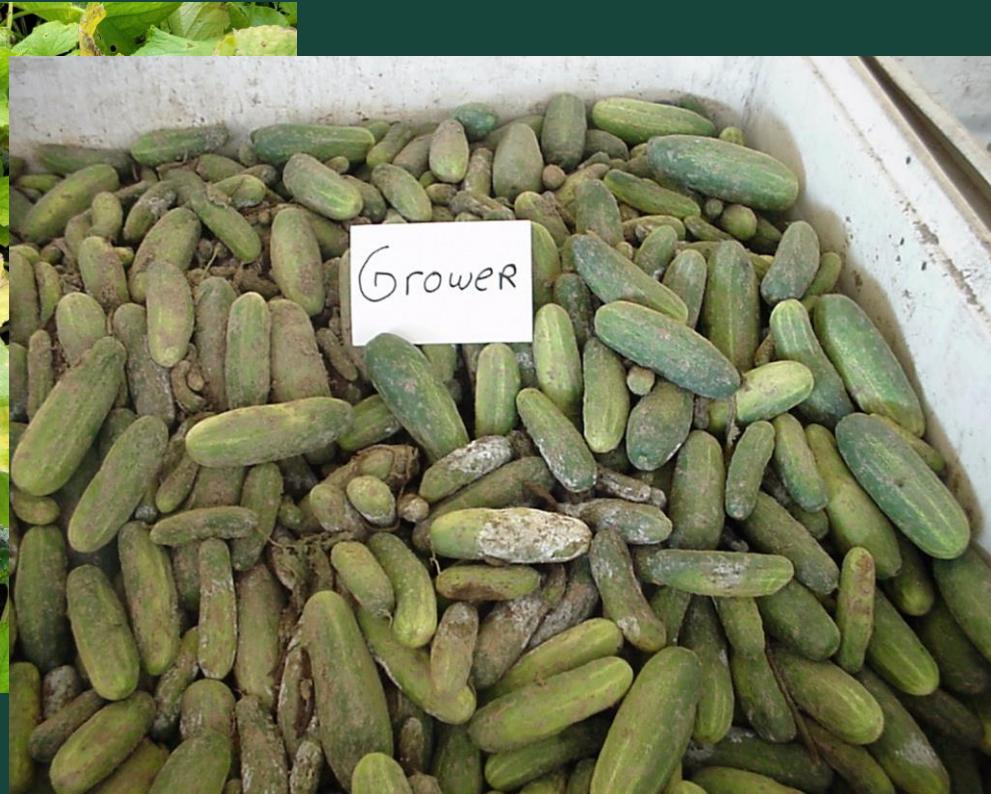


zoospores

- ❖ Pathogen can survive 10+ years in soil (oospore)
- ❖ Sporangia form on infected plants and release 20-40 motile zoospores when exposed to water
- ❖ Disease explodes following heavy rain

Phytophthora capsici

A significant threat to cucumber production





The build-up of mefenoxam resistant *Phytophthora capsici* isolates in a cucumber field

- = Sensitive
- = Intermediate
- = Fully Resistant

