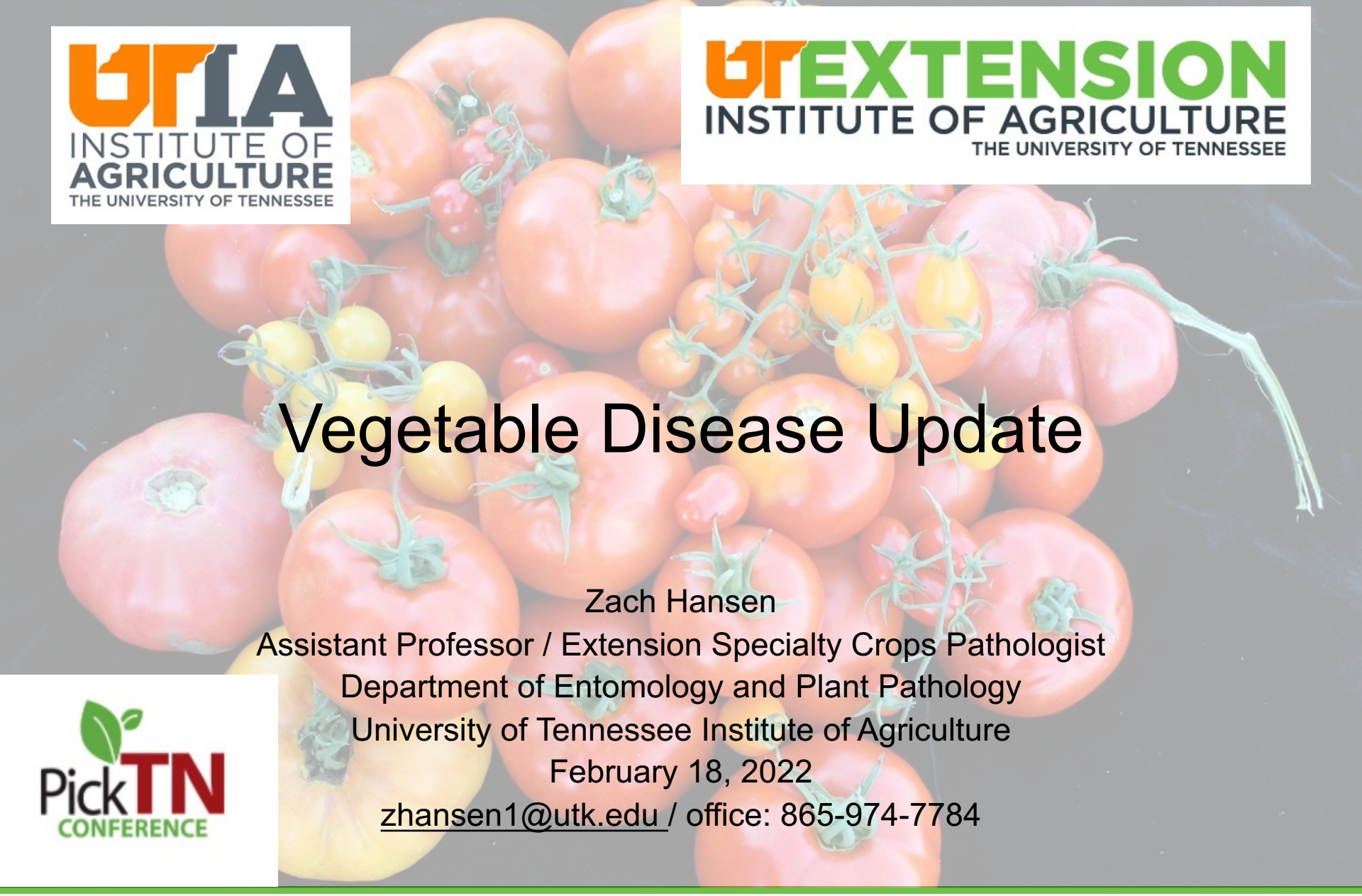

Vegetable Disease Update

Zach Hansen
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University of Tennessee Institute of Agriculture
February 18, 2022
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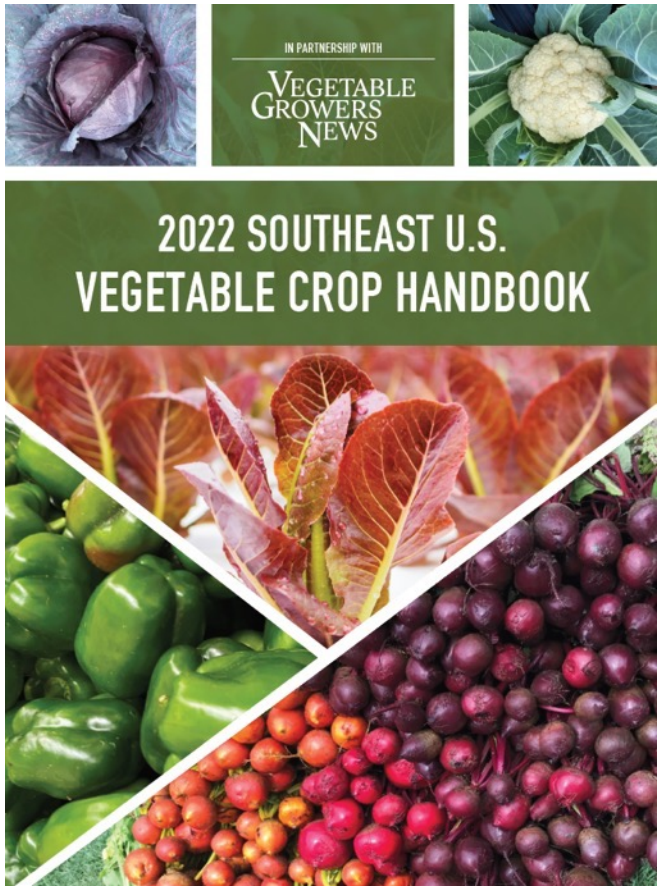
Since 1963, the IR-4 Project (IR-4) has been the primary entity in the United States to **facilitate registrations of conventional pesticides and biopesticides on Specialty Food crops (fruits, vegetables, nuts, herbs, spices) and non-food Environmental Horticulture crops**.

Chemical control and variety selections
2022 Southeastern U.S. Vegetable Crop Handbook



Available for free download:

vegetablegrowersnews.com/2022-southeast-vegetable-crop-handbook/

Phytophthora blight

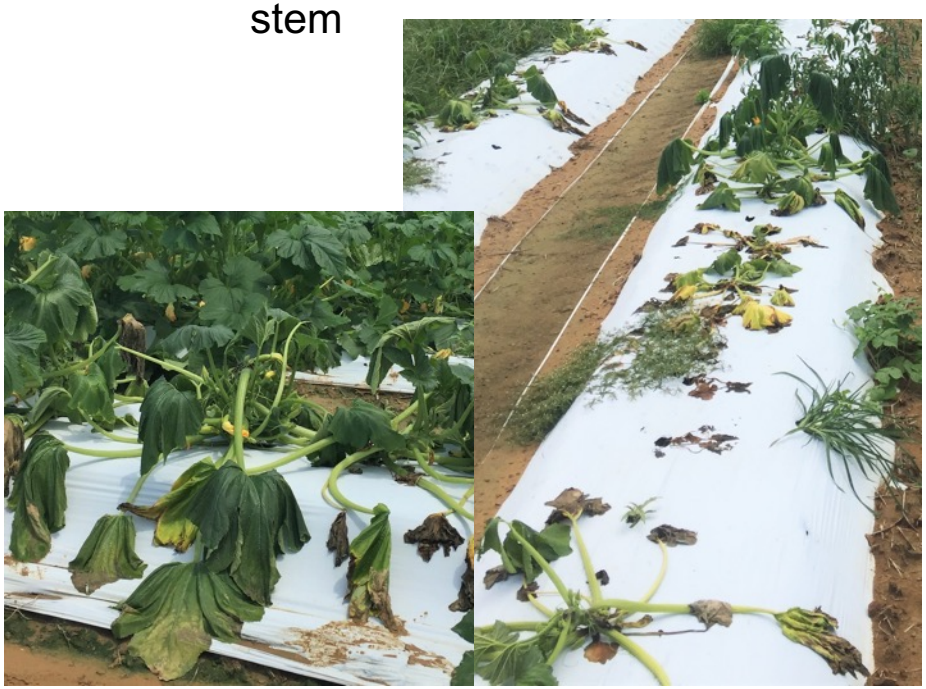
Phytophthora blight

Oomycete (water mold) - *Phytophthora capsici*

- Effects several important crops
  - Cucurbitaceae (pumpkins, summer/winter squash)
  - Solanaceae (peppers, tomatoes, eggplant)
  - Fabaceae (beans)

Phytophthora blight vine crop symptoms

- Crown and root rot
  - Sudden permanent wilting
  - Plants may die within days
  - Brown, water-soaked roots and stem



- Fruit rot
  - Water-soaked spot
  - Originating where fruit touches ground, or stem
  - Soft lesions
  - White sporulation

Phytophthora blight on summer squash

Phytophthora blight pepper symptoms

- Crown and root rot
  - Sudden permanent wilting
  - Plants may die within days
  - Brown, water-soaked roots and stem
  - Brown, water-soaked leaf and stem lesions

- Fruit rot
  - Water soaked spot
  - Originating where fruit touches ground, or stem
  - Soft lesions
  - White sporulation

Phytophthora blight on peppers

Phytophthora blight management

- Difficult to manage
- Management program should include
  - Avoidance (wash shared equipment)
  - Cultural practices
    - Crop rotation
    - Raised beds
    - Well drained soil
    - Plastic mulch, drip irrigation
    - Dispose of culls off site
    - Avoid untreated surface irrigation water
  - Host resistance
    - Some resistance in peppers
    - Most cucurbits susceptible
  - Chemical control
    - Always read the label
    - Rotation is important

Tennessee *P. capsici* fungicide sensitivity results

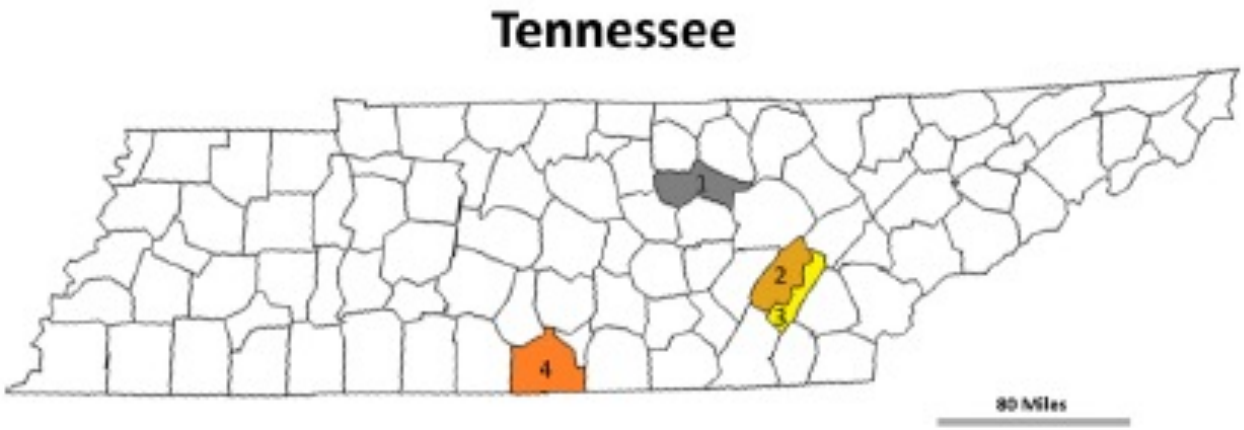
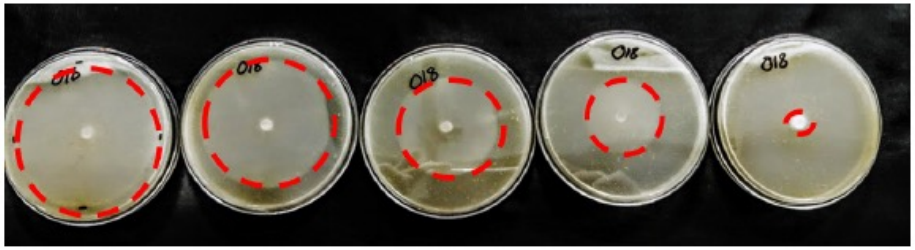


Fig. 1. Map of Tennessee and the counties isolates were collected from in 2018 and 2019; 1 = Putnam County, 2 = Rhea County, 3 = Bledsoe County, and 4 = Lincoln County.

Fungicide sensitivity testing

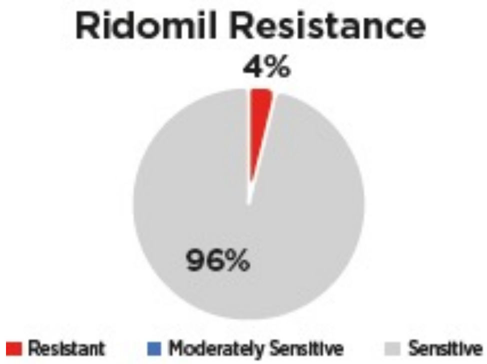
Product*	Active ingredient(s)
Orondis Gold 200	oxathiapiprolin
Forum 4.17SC	dimethomorph
Revus	mandipropamid
Presidio	fluopicolide
Ridomil Gold SL, Ultra Flourish	mefenoxam
Ranman	cyazofamid

184 isolates collected in 2018 & 2019 from four farms in three counties were tested

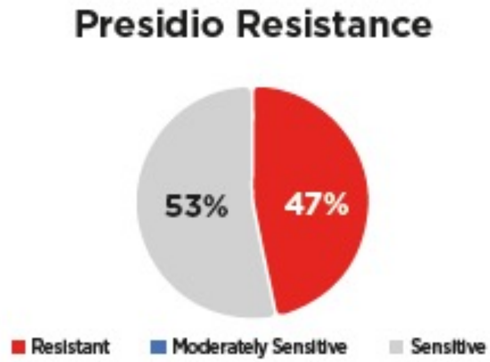


Fungicide sensitivity testing

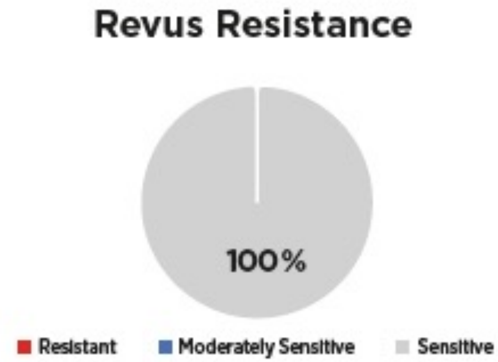
AI: mefenoxam



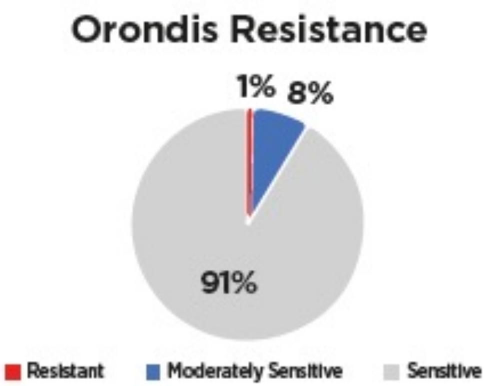
AI: fluopicolide



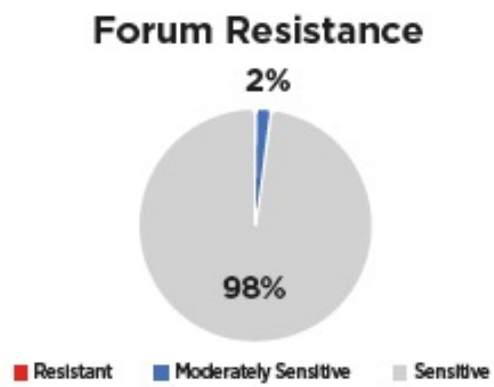
AI: mandipropamid



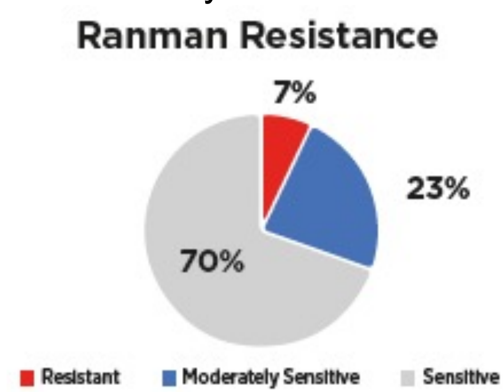
AI: oxathiapiprolin



AI: dimethomorph

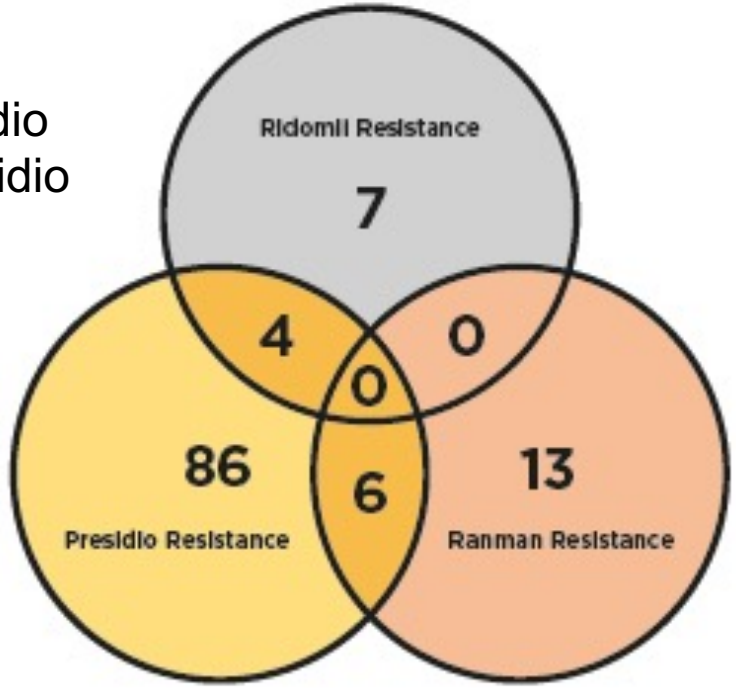


AI: cyazofamid

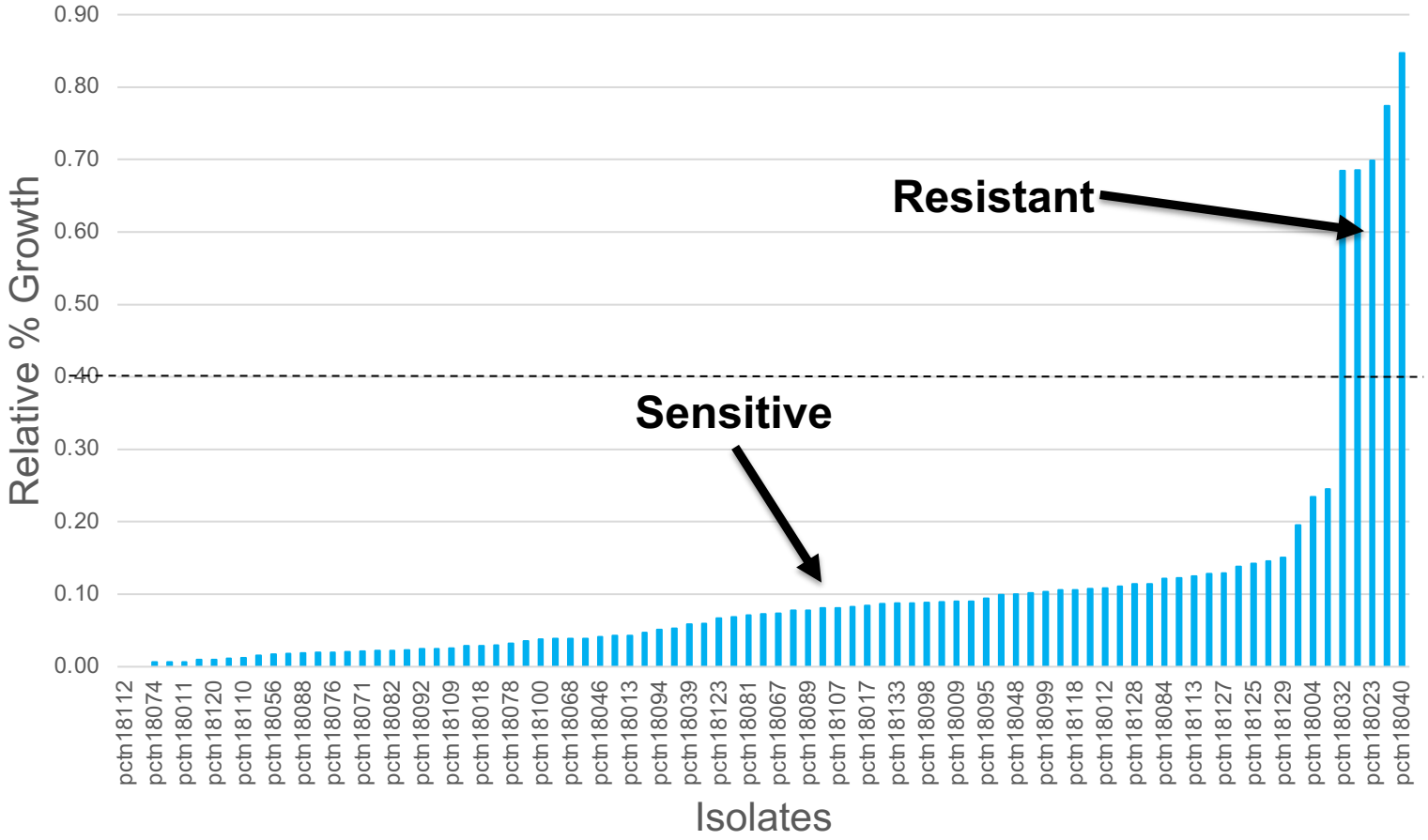


Resistance to multiple active ingredients

- 4 samples resistant to Ridomil AND Presidio
- 6 samples resistant to Ranman AND Presidio

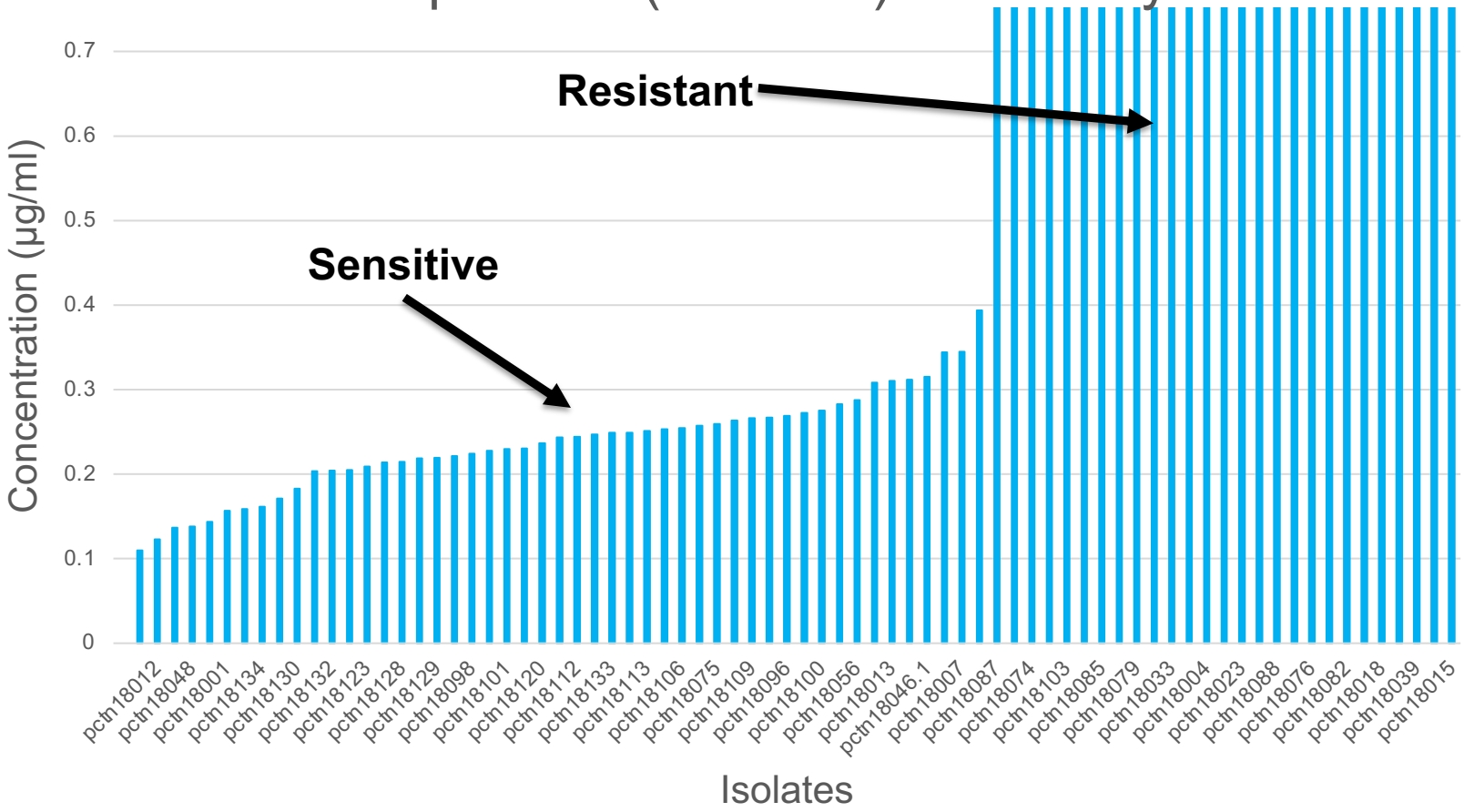


Mefenoxam (Ridomil) Sensitivity



4% (7/184) of isolates were resistant to mefenoxam (Ridomil)

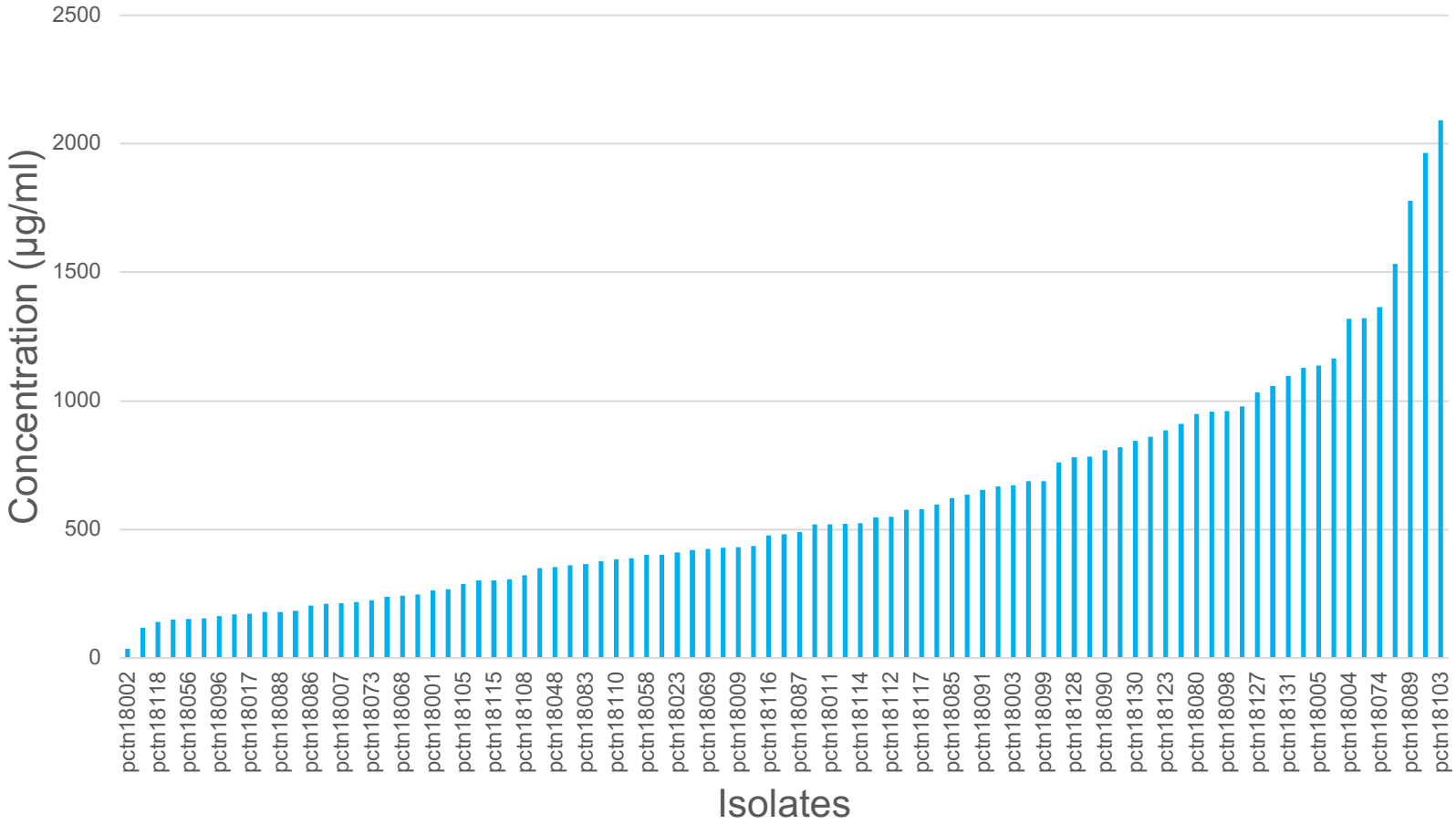
Fluopicolide (Presidio) Sensitivity



47% (86/184) of isolates were resistant to fluopicolide (Presidio)

*5 isolates were resistant to both Ridomil and Presidio (3%)

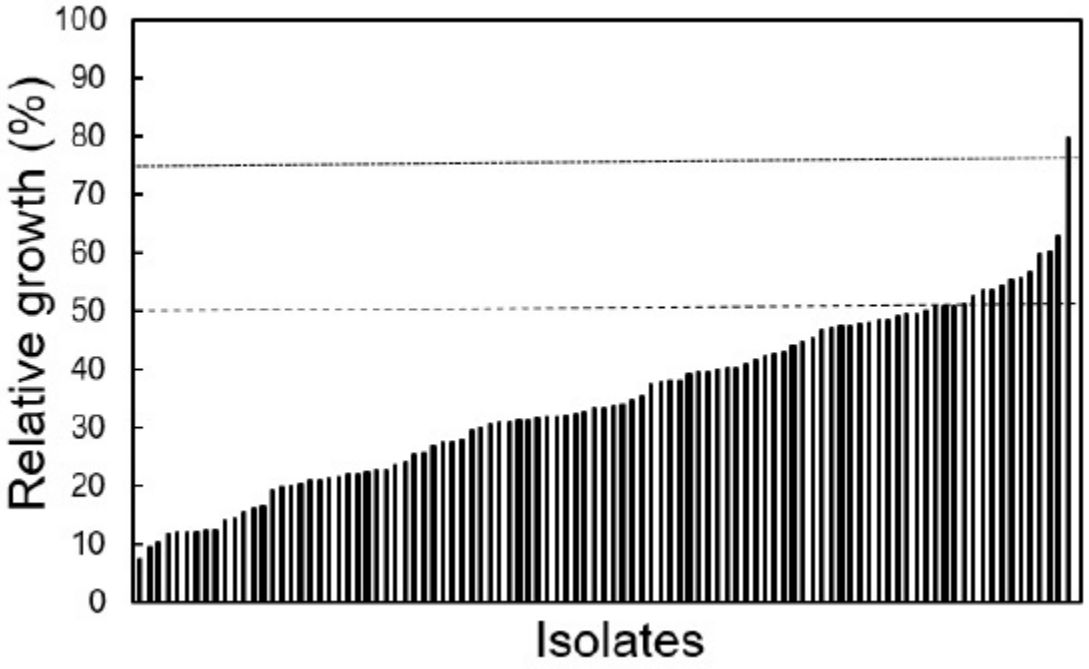
Cyazofamid (Ranman) Sensitivity



7% (13/184) of isolates were resistant to cyazofamid (Ranman)

- 23% (43/184) were moderately sensitive to Ranman

Oxathiapiprolin (Orondis) Sensitivity



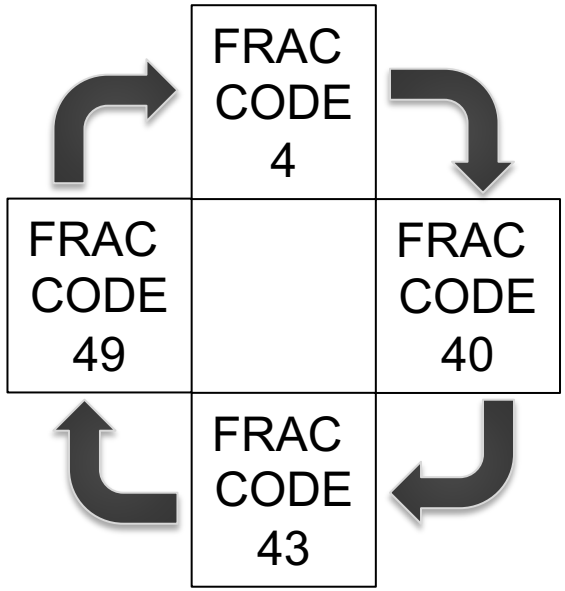
One isolate (<1%) was resistant to oxathiapiprolin (Orondis)

- 8% (15/184) isolates were moderately sensitive to Orondis

All isolates were sensitive to the remaining fungicides

- Dimethomorph (Forum)
- Mandipropamid (Revus)

Rotate fungicides



Conclusions

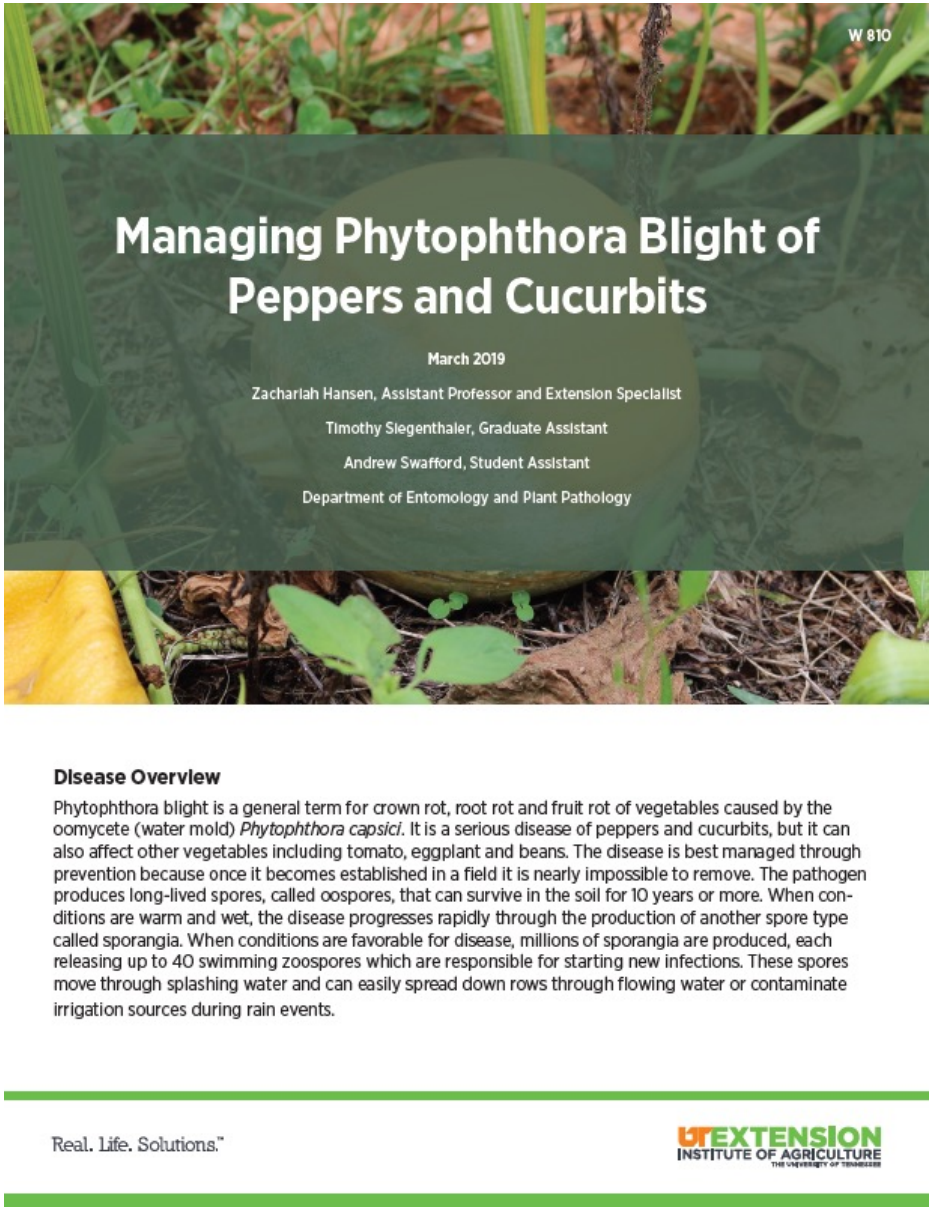
Resistance	Product	Active ingredient(s)	For pepper, cucurbit, or both	Efficacy	Application method	Max. consecutive applications	Max. applications per season
Rare	Orondis Gold 200	oxathiapiprolin	both	good	in furrow, transplant water, drip	2	4
Rare	Orondis Opti A	oxathiapiprolin	both	good	foliar	2	6
Rare	Orondis Ultra*	oxathiapiprolin + mandipropamid	both	good	foliar	2	4
None	Revus*	mandipropamid	both	good/fair	foliar	2	4
None/unknown	Zampro	ametoctradin + dimethomorph	both	good/fair	drench, drip, foliar	2	3
Common	Presidio*	fluopicolide	both	good/fair	drip, foliar	1	2
Rare	Ridomil Gold + copper	mefenoxam + copper	pepper	good/fair	varies by crop	4	4
Rare	Ridomil Gold SL, Ultra Flourish	mefenoxam	both	fair	preplant incorporated, soil spray, drip	1	2
Common	Ranman	cyazofamid	both	fair	transplant water, foliar	3	6
Unknown	Reason	fenamidone	pepper	fair	foliar	1	3

Table taken from UT Extension publication W810 “Managing Phytophthora Blight of Peppers and Cucurbits”

Conclusions

- Best against Phytophthora blight
  - Orondis (Gold 200, Ultra)
- Fair against Phytophthora blight
  - Ridomil (high resistance risk)
  - Zampro
  - Forum
  - Revus
  - Elumin
  - Ranman (high resistance risk)
  - Presidio (high resistance risk)

These products also manage downy mildew



UT Extension Publication W 810

- utextension.tennessee.edu/

or

- www.utspecialtycrop.com

W 1003

Fungicide Recommendations for Phytophthora Blight Management in Tennessee in Light of Newly Discovered Fungicide Resistance

Tim Siegenthaler, Research Specialist
Zachariah Hansen, Assistant Professor and Extension Specialist
Department of Entomology and Plant Pathology

Introduction

Phytophthora blight, caused by a fungus-like organism named *Phytophthora capsici*, is a common vegetable disease throughout Tennessee. Primarily, this disease affects cucurbits, such as squash, cucumber, pumpkin and melons, and peppers but can infect a wide range of other hosts as well. Signs and symptoms of *Phytophthora* blight are root rot, crown rot, fruit rot, rapid wilting and circular necrotic lesions, which often have white spores present on the surface of the plant. See UT Extension publication "Managing Phytophthora Blight of Peppers and Cucurbits W 810" for more information on *Phytophthora* blight symptoms and diagnostics. *Phytophthora* blight is soilborne and thrives in wet and temperate soils. Disease spread occurs through the movement of spores found in infested soil, plant material, surface water (such as irrigation ponds and streams) and farm equipment. Once *Phytophthora* blight infests a field it can be difficult to manage. The disease can spread rapidly within a field and can persist in the soil for many years. Several methods are recommended to manage the disease, including avoidance, cultural controls and chemical controls (W810).

Fungicides are an important tool for *Phytophthora* blight management, and several fungicide products are available. However, fungicide resistance has been observed in *P. capsici*, which limits the potential effectiveness of these chemical controls. Fungicide resistance in *P. capsici* varies among regions so it is very important to test local populations in order to track the development of resistance. For this reason, we screened samples of *P. capsici* from Tennessee farms to document fungicide resistance.

Information on the products tested in this study can be found in Table 1. A complete list of fungicides labeled for *Phytophthora* blight management can be found in the Southeastern U.S. Vegetable Crop Handbook. An analysis of costs associated with a *Phytophthora* blight fungicide program in commercial peppers is available in the UT Extension publication "Sample Budgets for Large-scale Bell Pepper Operations and the Impact of Phytophthora Blight on Farm Revenue and Costs. 2019 W 831."

Summary of experiments

In 2018 and 2019, we collected samples of cucurbit and pepper plants infected with *Phytophthora* blight from Rhea, Bledsoe, Putnam and Lincoln Counties. A total of 184 pathogen samples were screened for fungicide resistance. The fungicides included in the experiments were Ridomil (mefenoxam), Ranman (cyazofamid), Forum (dimethomorph), Presidio (fluopicolide), Revus (mandipropamid), and Orondis (oxathiapiprolin) (Table 1), which were six of the most effective fungicides available at the time of testing. Samples were tested in the lab with a series of fungicide concentrations from high to low concentrations. *Phytophthora* growth was

UT Extension Publication W 1003

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Cucurbit downy mildew

Oomycete (water mold) – *Pseudoperonospora cubensis*

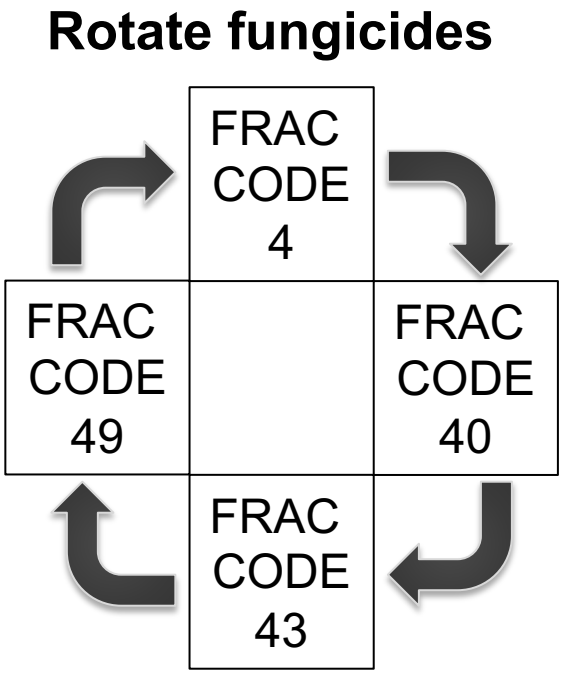
- Host specific
- All cucurbits are susceptible
- Spores are dispersed long distances
  - overwinter in warm climates or greenhouses
- Disease favored by high humidity and wet conditions
- Symptoms
  - Angular, yellow lesions bound by leaf veins
  - Lesions may appear water soaked or brown in certain varieties
  - Brown, dark “powdery” sporulation on lower leaf surface

Cucurbit downy mildew

- Management
  - Chemical control – avoid resistance – rotate fungicides!
    - GOOD
      - Oxathiapiprolin (**Orondis**)
      - Ethaboxam (**Elumin**)
      - Cyazofamid (**Ranman**)
    - FAIR
      - Ametoctradin + dimethomorph (**Zampro**)
      - Famoxadone + cymoxanil (**Tanos**)
      - Fluazinam (**Omega**)
      - Mefenoxam (**Ridomil**)
      - Propamocarb (**Previcur Flex**)
  - Cultural practices
    - Avoid excess leaf wetness
      - Drip irrigation
      - Increased row and plant spacing

Rotate fungicides for cucurbit downy mildew management

- Resistance to 13 fungicides indicated in SE Veg Crop Handbook



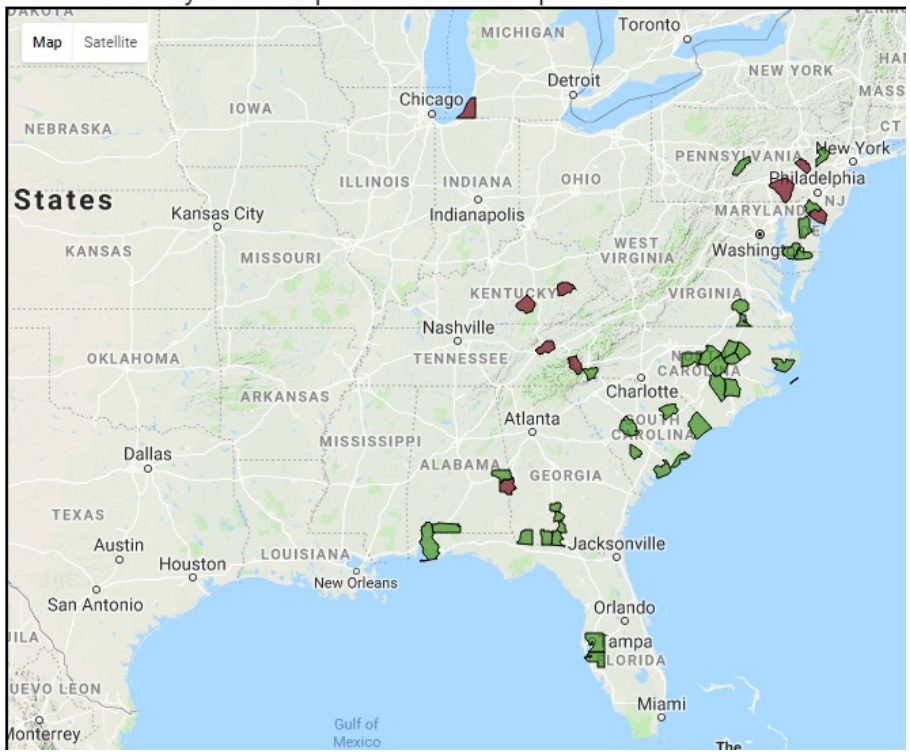
cucurbit downy mildew FORECASTING

PREPARE. PREDICT. PREVENT.

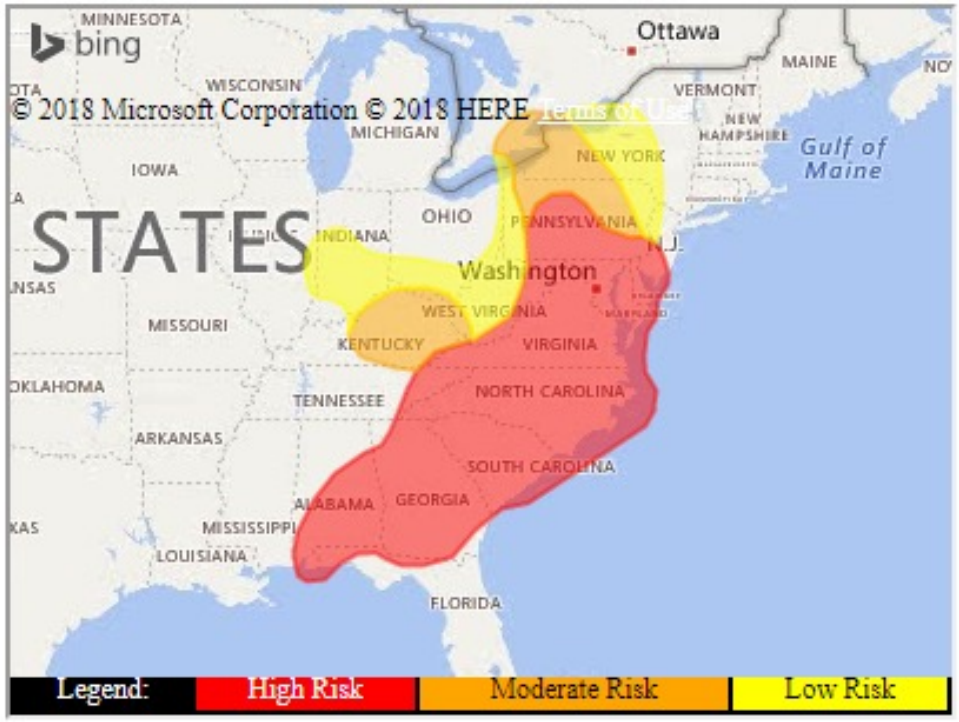
Cucurbit ipmPIPE

cdm.ipmpipe.org

Cucurbit Downy Mildew Epidemic Status Map



Risk prediction map for Day 2: Monday, July 30



Cucurbit downy mildew

Oomycete (water mold) – *Pseudoperonospora cubensis*

- Sentinel plot first reports (Knoxville)
  - 2018: July 30
  - 2019: July 31
  - 2020: August 9
  - 2021: July 20
  - 2022: ???

Cucurbit downy mildew clades

- Clade 1
  - Watermelon
  - Pumpkin
  - Squash

Photos: Bugwood.org

- Clade 2
  - Cucumber
  - Cantaloupe

Photos: Bugwood.org

Choose disease resistant varieties

- Excellent strategy for powdery and downy mildew management
- See “Specific Commodity Recommendations” in SE Veg Handbook for details

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