

# Mefenoxam resistance within *Phytophthora* and *Pythium* in GA

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# *Phytophthora* and *Pythium*

- Cause majority of root disease in ornamental crops
- Also may cause leaf spots and blights



# Root Disease Management

- Primarily through irrigation management – avoid overwatering
- Sanitation to reduce spreading pathogens into production
- Fungicide drenches, sprenches or sprays
  - Mefenoxam (Subdue MAXX)
  - Aliette (Fosetyl-Al) and other phosphonates
  - Etridiazole (Truban, Terrazole, Banrot)
  - Fenamidone (FenStop)
  - Cyazofamid (Segway)
  - Dimethomorph (Stature DM)

# Mefenoxam resistance

- Metalaxyl (Subdue 2E) was introduced in the late 1970s for *Phytophthora* and downy mildew disease control.
- It was widely used in agronomic and horticultural crops primarily for *Phytophthora* management
- In the late 1990's, Syngenta labeled the active enantiomer, mefenoxam, alone as Subdue MAXX
- Resistance to metalaxyl/mefenoxam has been documented in numerous crops, including ornamentals in several states (PA, NY, NC, VA, SC)
- Assumed it was also present in GA, but did not know for sure or how prevalent it was within nurseries and greenhouses

# Methods

- Collected plant samples showing root disease symptoms at 17 ornamental production facilities in 2010-2011
  - 9 specializing in container-grown woody shrubs
  - 8 specializing in floriculture or herbaceous crops
- Total of 152 plant samples
- Roots, stems, leaves were plated onto selective media to recover *Pythium* and/or *Phytophthora*



# Fungicides Resistance Screening

- Isolates were transferred to agar plates containing 0, 10, and 100 ppm mefenoxam
- Plates were incubated for up to 4 days
- Hyphal growth of the isolate was measured and compared to the growth of the control (0 ppm)
- Isolates growing greater than 40% of the growth of the isolate on non-amended (0 ppm) medium were considered resistant



# Results

- Out of 152 samples, recovered Oomycete root pathogens from 122 (80% of samples)
- 39 *Phytophthora* species (26% of samples)
- 83 *Pythium* species (55% of samples)
- Remaining 20% of samples either no pathogen or a non-Oomycete pathogen was recovered

# Woody Ornamentals

Nursery	<i>Phytophthora</i>	% Resistant	<i>Pythium</i>	% Resistant
1	2/7	100	5/7	60
2	2/7	100	3/7	66.7
3	----	----	4/4	100
4	1/8	0	4/8	75
5	1/6	100	2/6	50
6	3/10	0	3/10	100
7	1/1	100	----	----
8	----	----	6/8	100
9	12/31	16.7	17/31	82.3
<b>Total</b>	<b>22/82</b>	<b>36.3</b>	<b>44/82</b>	<b>81.8</b>



# Floriculture/Herbaceous Crops

Nursery	<i>Phytophthora</i>	% Resistant	<i>Pythium</i>	% Resistant
1	----	----	7/10	14.2
2	1/10	0	6/10	66.7
3	2/12	50	6/12	50
4	2/8	50	5/8	20
5	6/14	(66.7 MR)	7/14	28.6
6	2/7	100	2/7	50
7	----	----	5/5	0
8	4/4	0	----	----
<b>Total</b>	<b>17/70</b>	<b>23.5</b>	<b>38/70</b>	<b>31.6</b>

# Ornamental Nursery Plants

	<i>Phytophthora</i>	% Resistant	<i>Pythium</i>	% Resistant
Woody	22/82	36.3	44/82	81.8
Herbaceous	17/70	23.5	38/70	31.6
<b>All Plants</b>	<b>39/152</b>	<b>30.8</b>	<b>82/152</b>	<b>58.5</b>

# *Phytophthora* species identified

- *Phytophthora nicotianae*
  - *Phytophthora pini*
  - *Phytophthora drechsleri*
  - *Phytophthora palmivora* (all resistant to mefenoxam)
  - *Phytophthora undulata* (all resistant to mefenoxam)
  - *Phytophthora citrophthora*
  - *Phytophthora* sp.
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- Did not recover *Phytophthora cinnamomi*
  - Still working on *Pythium* species identification

# Conclusions

- Resistance to mefenoxam exists within ornamental nurseries and greenhouses in GA
- *Pythium* and *Phytophthora* root disease control failure may be due to mefenoxam resistant populations within a production facility
- Resistant isolates of *Pythium* or *Phytophthora* can be imported into facilities on incoming plants and be present even if the facility has no past history of using mefenoxam