

2018 Great Plains Growers Conference,
Vegetable IPM Track

Updates on Pythium Stem and Root Rot of Cucurbits



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Today's Outline

1. Background
2. Which *Pythium* species attack cucurbits?
3. To which fungicides are *Pythium* spp. sensitive?
4. Are cucurbit rootstocks resistant to *Pythium*?
(preliminary)
5. Summary

“Typical” Symptoms of *Pythium* on Muskmelon



What Is *Pythium*?

- A water mold (oomycete) – not a fungus
- Belongs to the same family as *Phytophthora*
- Over 140 species known – may be as many as 300 species
- Morphologically identified based on spore size, shape, other characteristics
- Current ID with DNA fingerprinting

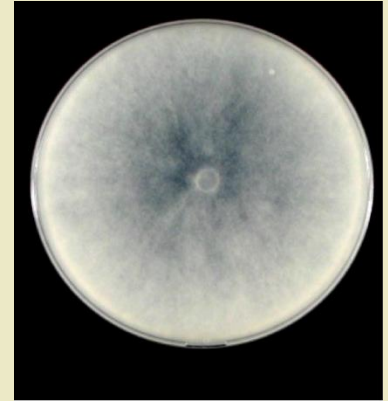
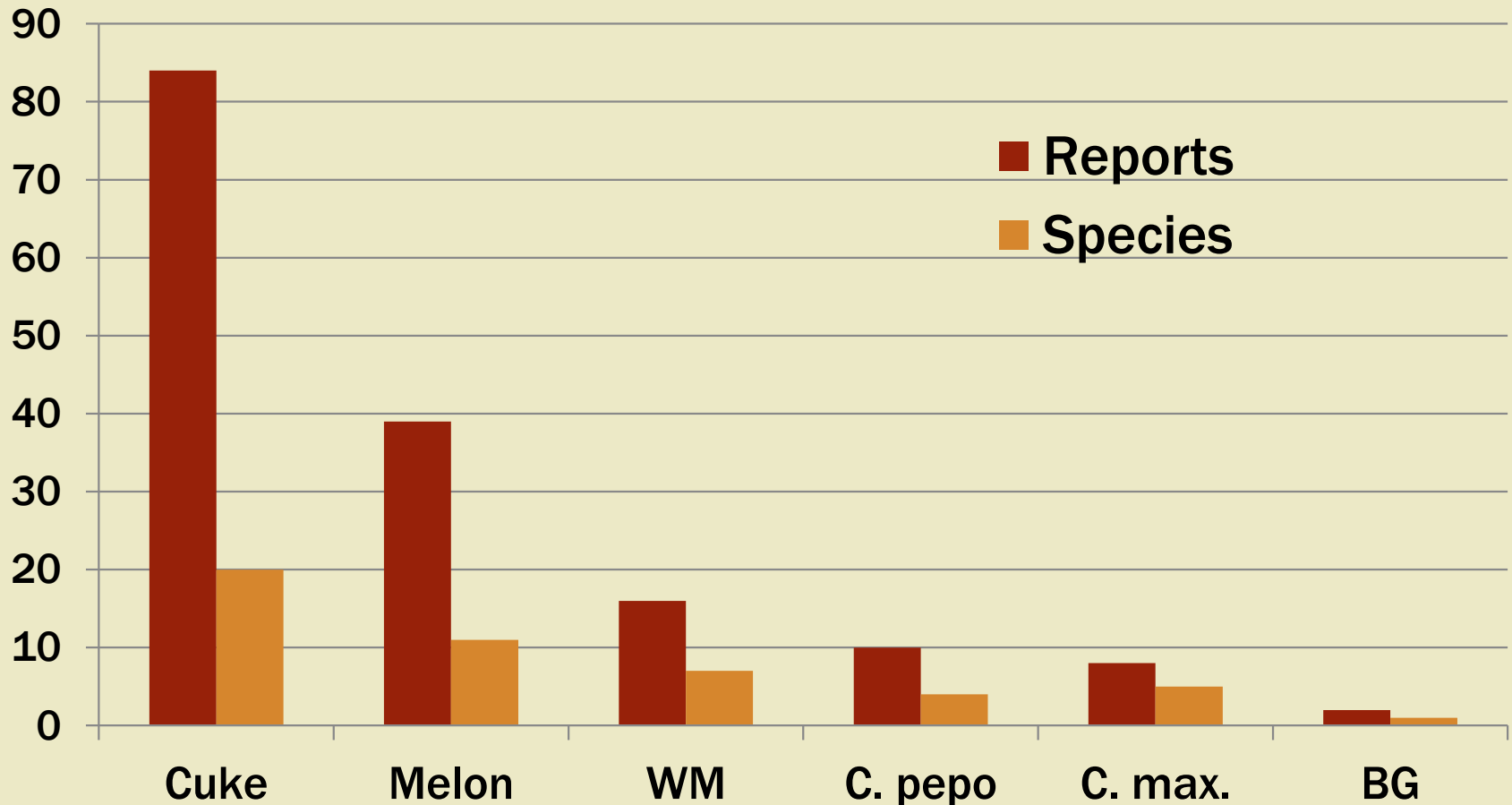


Photo credit: Koji Kageyama, Japan

Pythium on Cucurbits: 159 Reports of 23 species (2015)



Reports of *Pythium* on Cucurbits

Species	Number of Reports
<i>P. aphanidermatum</i>	69
<i>P. ultimum</i>	25
<i>P. debaryanum</i>	23
<i>P. irregulare</i>	9
<i>P. myriotylum</i>	4

Pythium aphanidermatum, A typical *Pythium* species

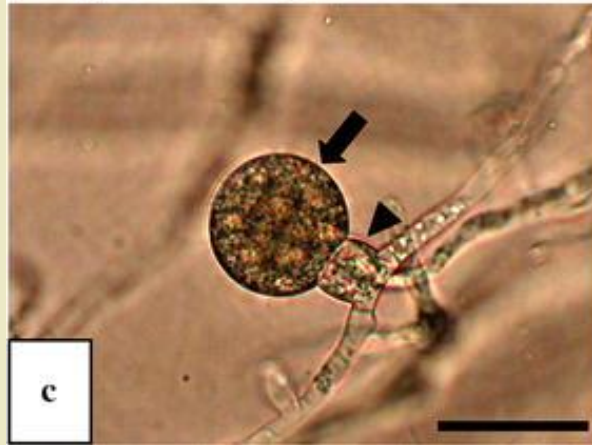
Sporangia



Zoospores



Oogonium



Oospores



Photos: Miyake et al. 2015. J. Gen. Plant Pathol., Fig. 2.

Grafting Watermelon



- Common in Asia and Europe - starting in the U.S.
- Rootstocks
 - Inter-specific hybrid squash [*Cucurbita maxima* x *C. moschata*]
 - Bottlegourd
- Grafting prevents Fusarium wilt
- Grafting increases tolerance to low temperature and high moisture

Pythium Survey on Cucurbits

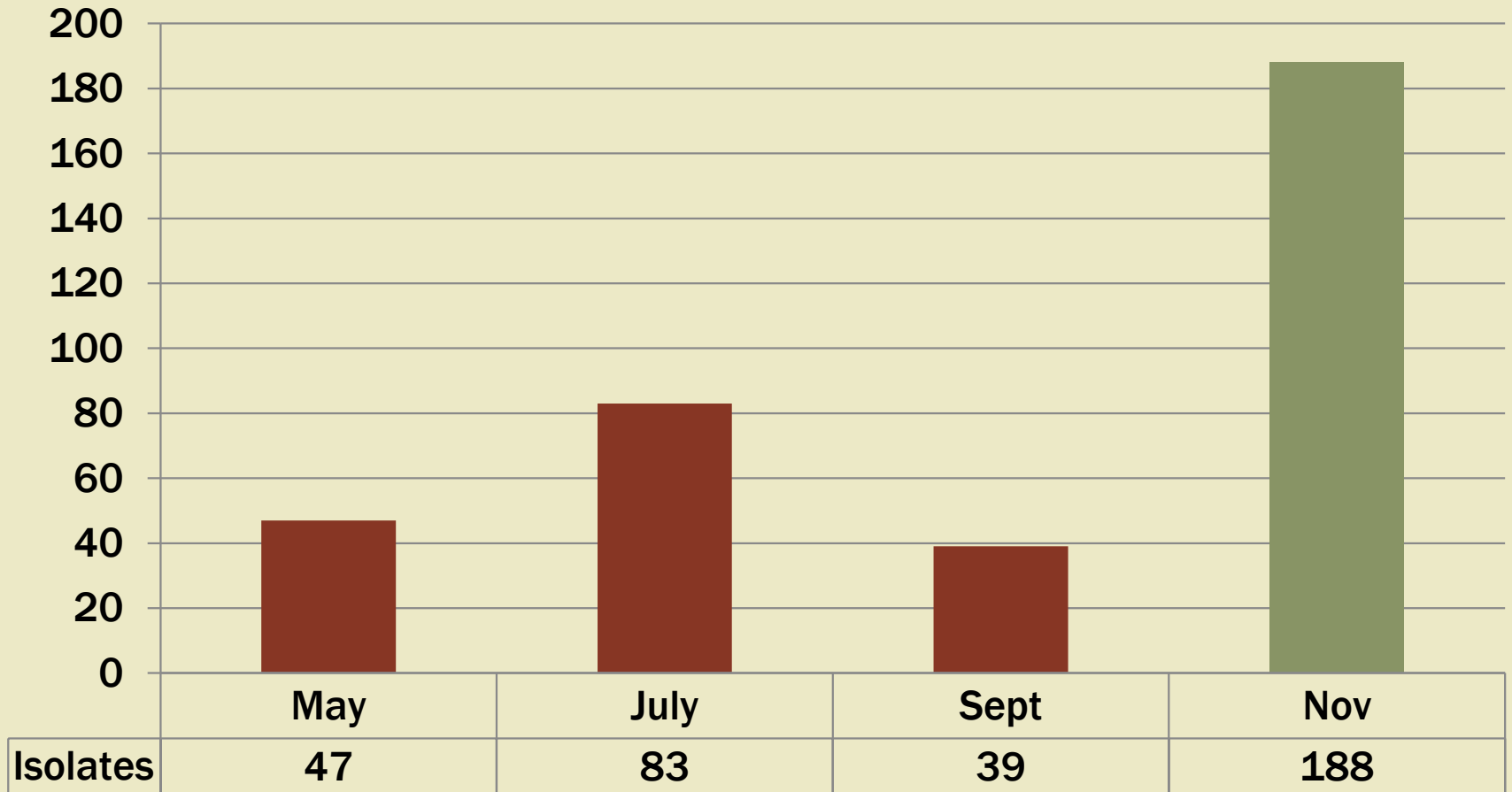
Objective: Identify *Pythium* spp. that cause stem and root rot on four representative cucurbits

- Watermelon ‘Sugar Baby’
 - Cucumber ‘Marketmore 76’
 - Bottlegourd (unnamed cultivar)
 - Hubbard squash ‘Golden Hubbard’
-
- Four fields - two conventional and two organic
 - Four planting dates - May, July, September, November
 - Two years - 2017 and 2018
 - DNA “barcode” to ID species

Pythium Symptoms on Cucurbits



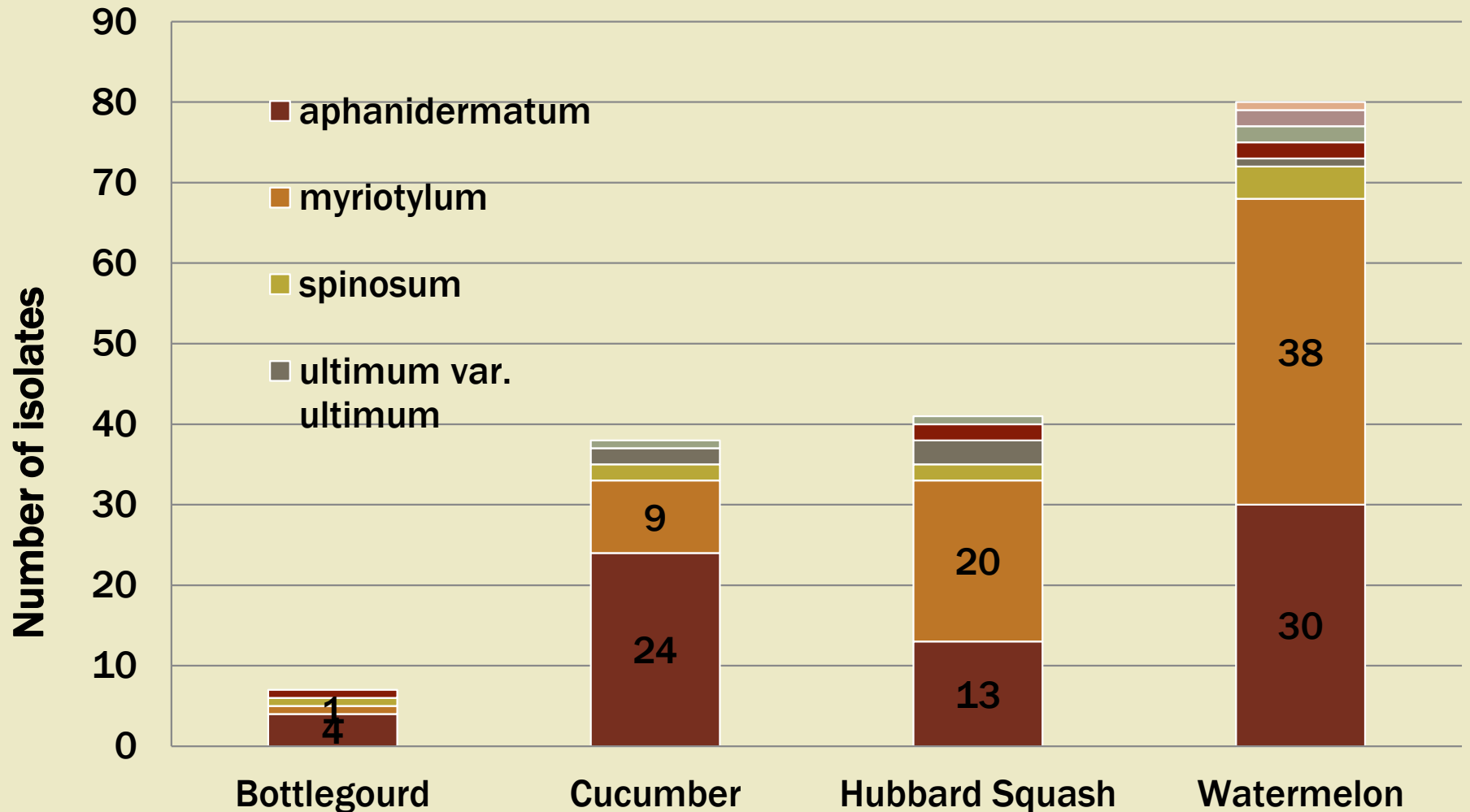
Pythium Survey Results: 357 Isolates



Pythium Survey Results: 8 Species Identified May to Sep 2017

Species	Number of Isolates
<i>P. aphanidermatum</i>	69
<i>P. myriotylum</i>	69
<i>P. spinosum</i>	13
<i>Phytopythium helicoides</i>	6
<i>P. ultimum</i> var. <i>ultimum</i>	5
<i>P. irregulare</i>	4
<i>P. acanthicum</i>	2
<i>P. ultimum</i> var. <i>sporangiferum</i>	1

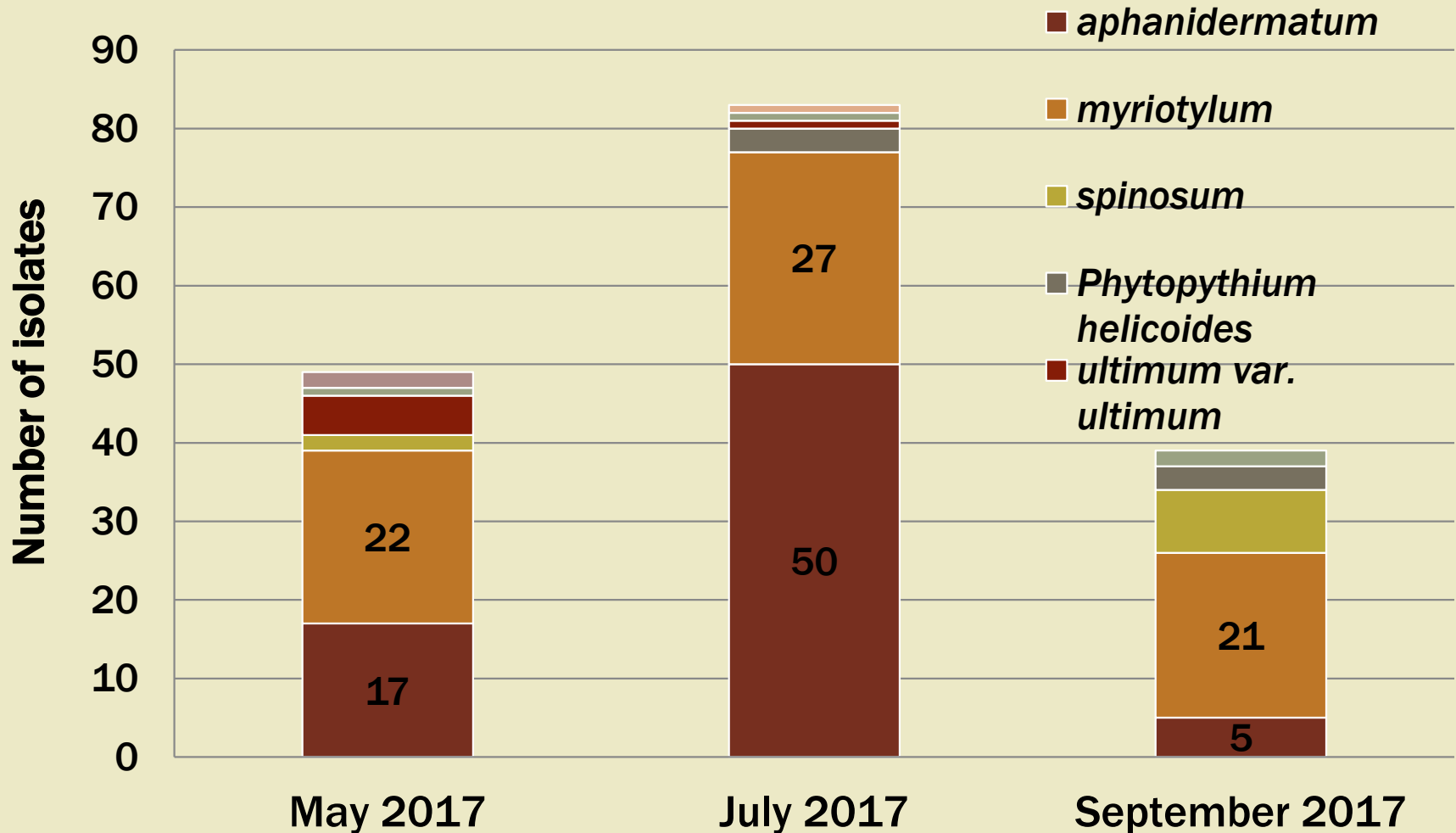
Pythium Survey Results: Crop



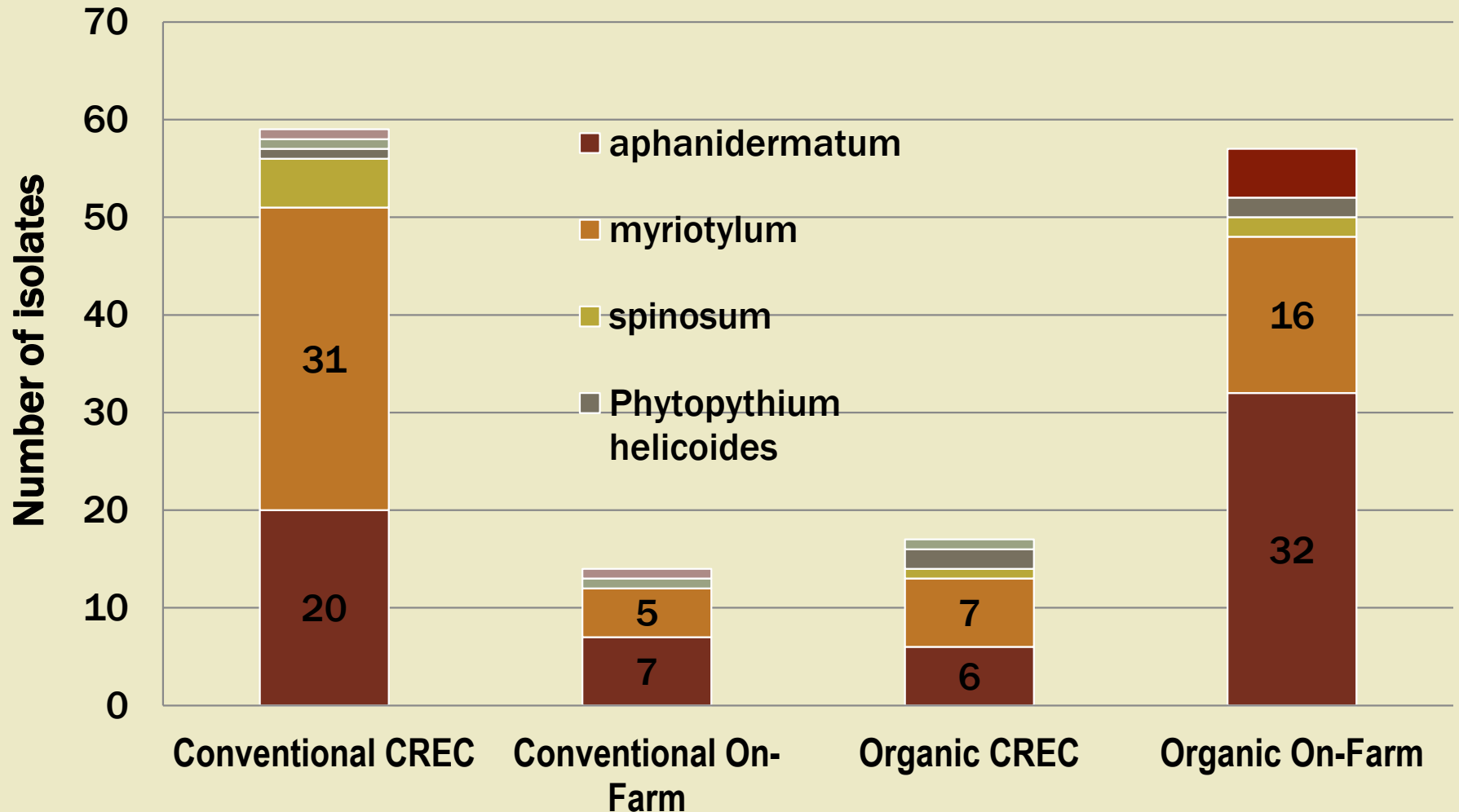
First Reports of New Combinations

<i>Pythium</i> species	<i>Cucurbita maxima</i> (squash)	<i>Lagenaria siceraria</i> (bottlegourd)
<i>P. myriotylum</i>	*	*
<i>P. ultimum</i> var. <i>ultimum</i>	*	
<i>P. spinosum</i>		*
<i>Phytopythium helicoides</i>	*	*

Pythium Survey Results: Planting Date



Pythium Survey Results: Field



Fungicide Sensitivity of *Pythium* spp.

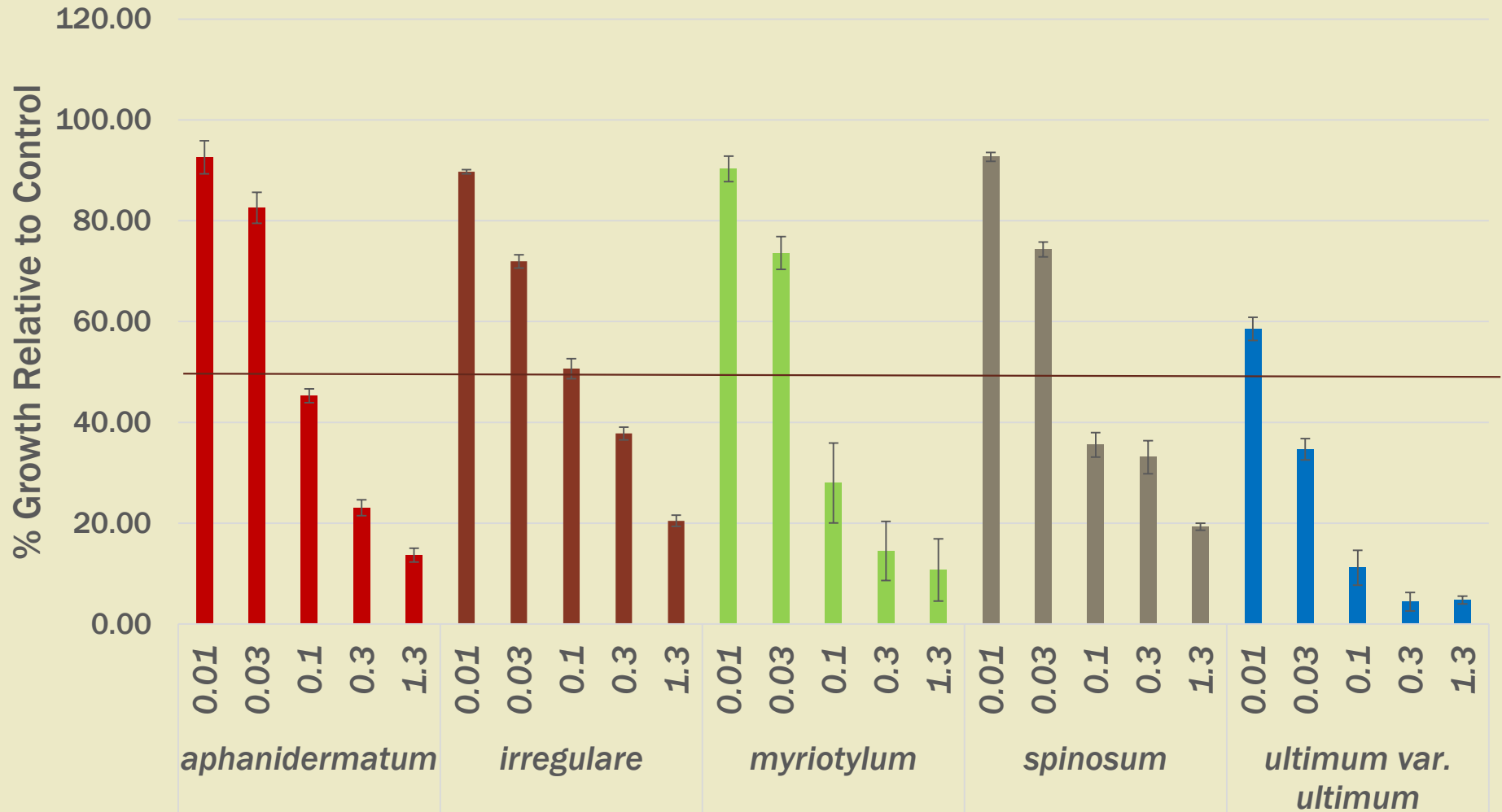
Objective: Identify any fungicide resistance present in *Pythium* isolates

Add 1 of 3 fungicides to culture medium:

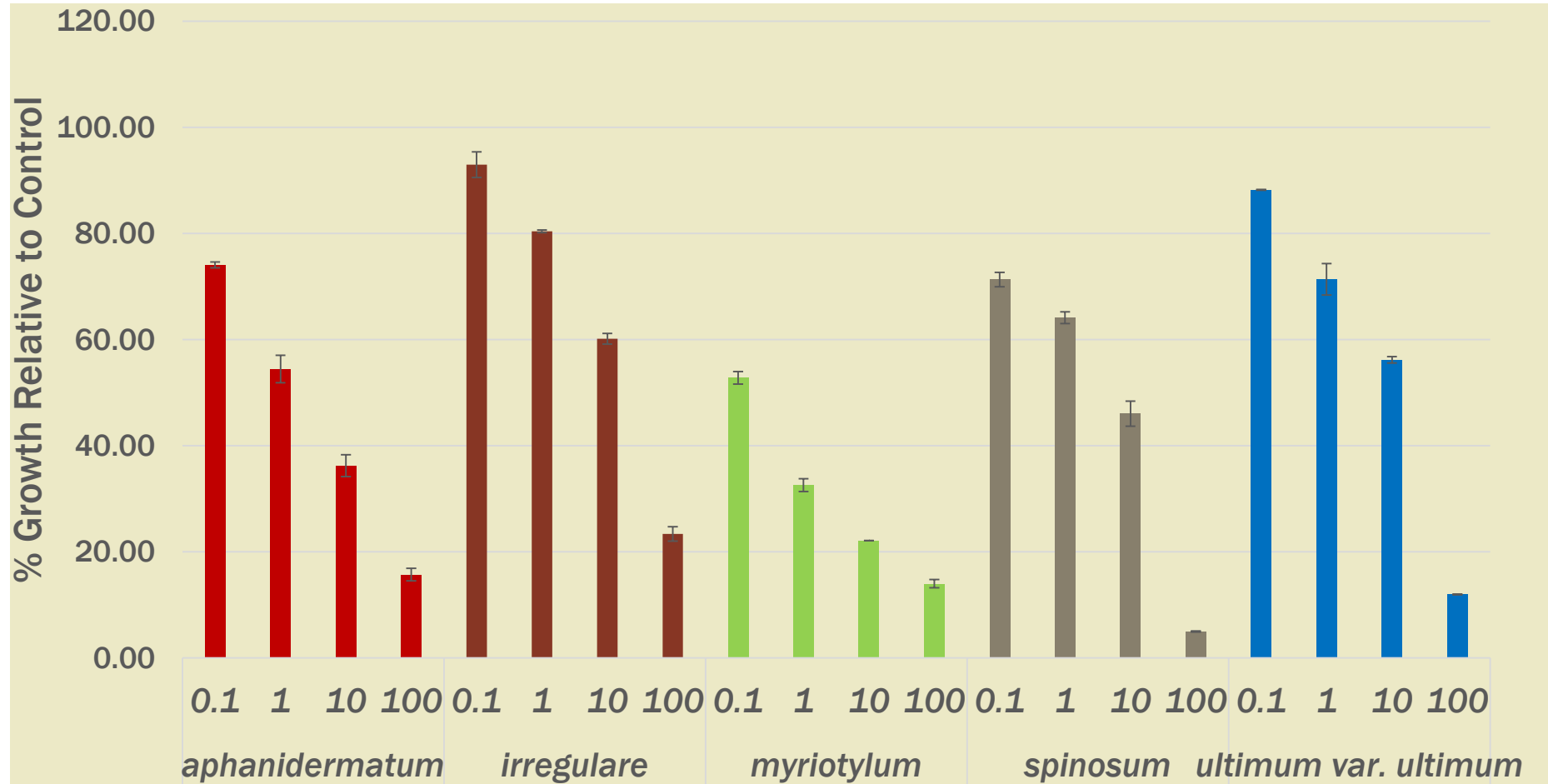
- | | |
|------------------|-------------------|
| 1) Ridomil Gold | [mefenoxam] |
| 2) Previcur Flex | [propamocarb] |
| 3) Orondis | [oxathiapiprolin] |

- ✓ Screen a representative sample of species from each planting date
- ✓ Measure colony radius after 36 hour growth
- ✓ Calculate EC₅₀ for each fungicide

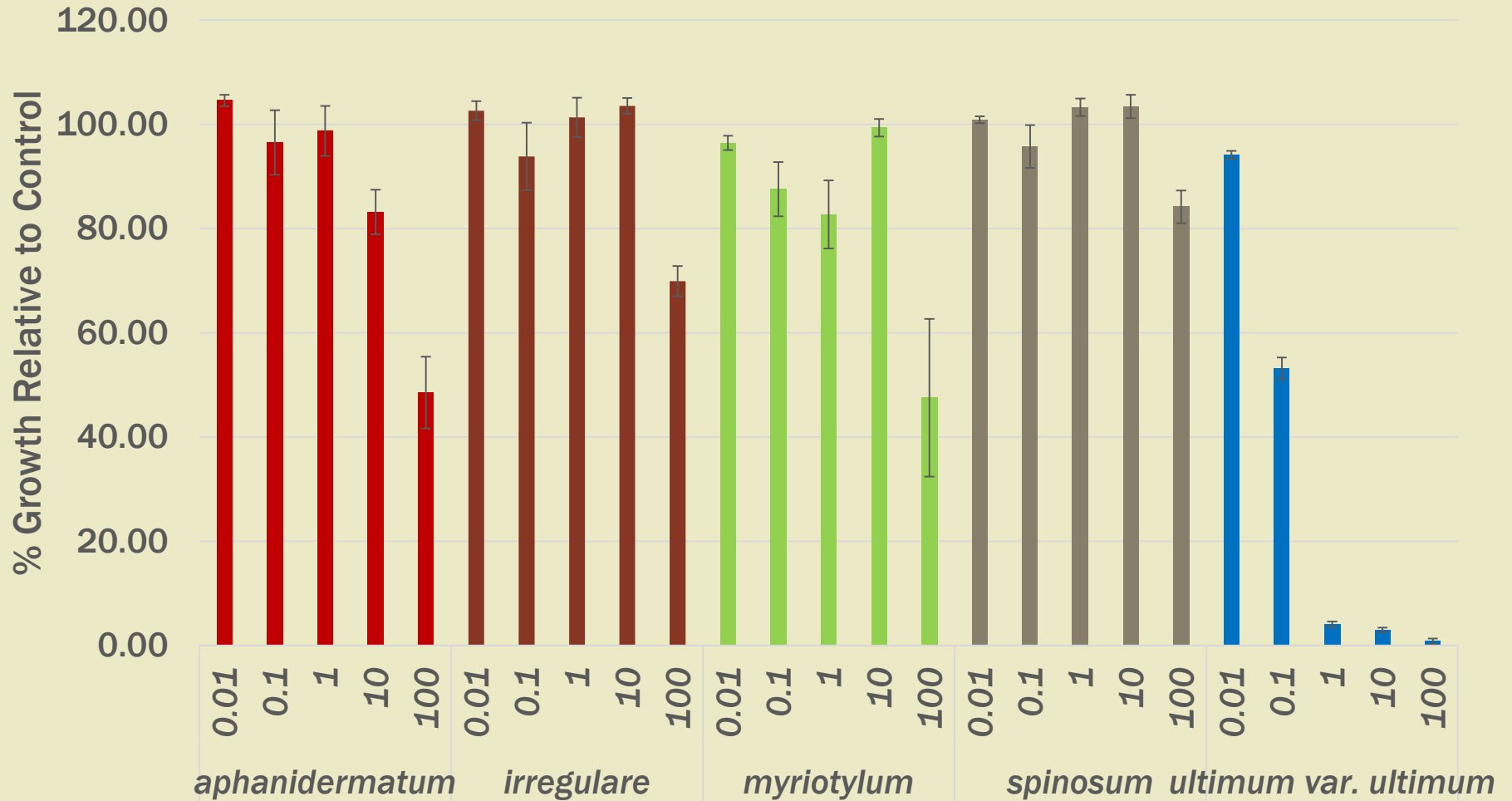
Pythium Species Sensitive to Ridomil Gold



Pythium Species Sensitive to Previcur Flex



Only *Pythium ultimum* var. *ultimum* Sensitive to Orondis



Fungicide Sensitivity of *Pythium* spp. Preliminary Results

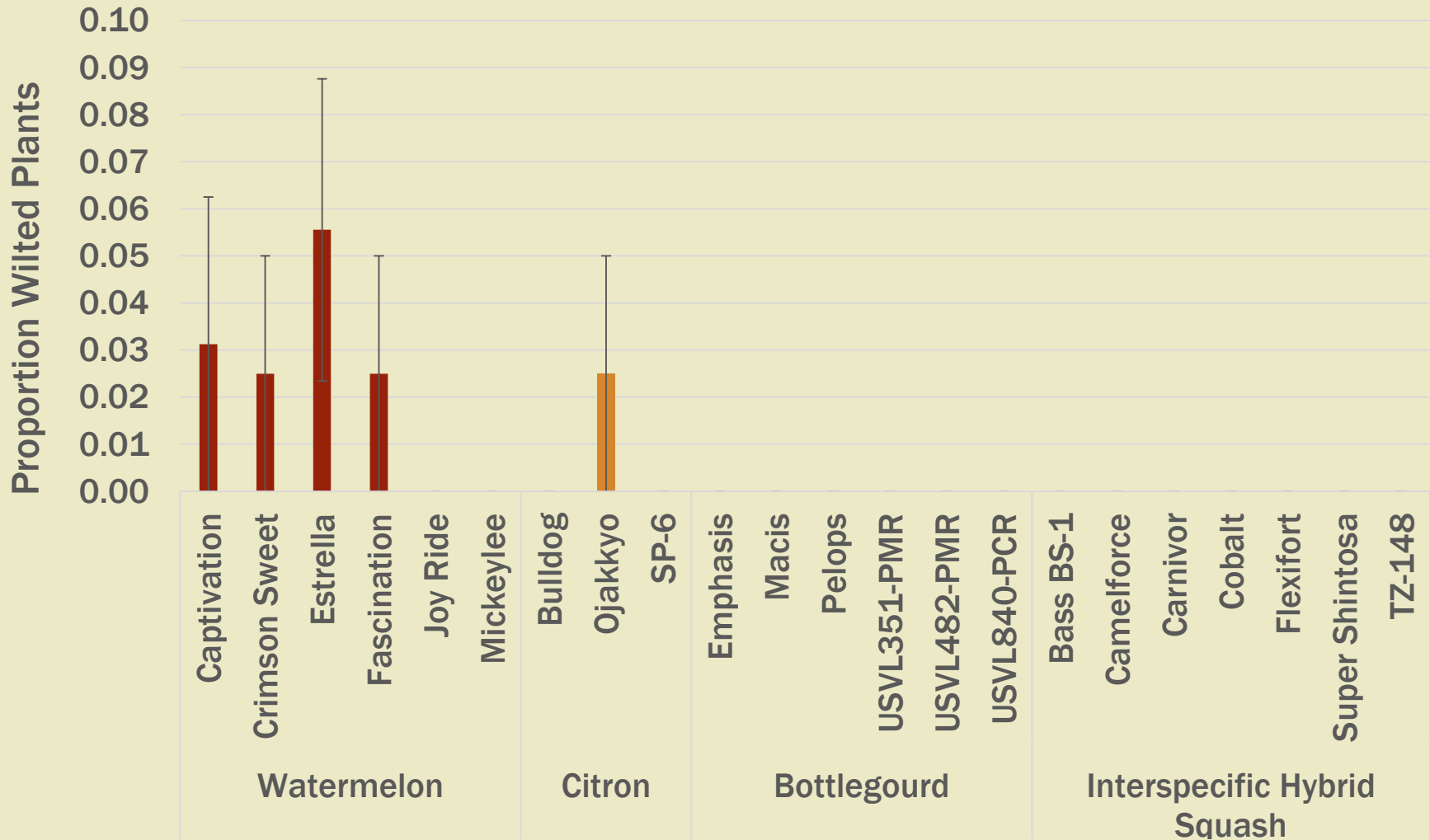
Fungicide	Sensitive	Moderately Sensitive	Resistant	Total
Ridomil Gold	22	0	0	22
Previcur Flex	20	1	1	22
Orondis	3	0	19	22
Species	Ridomil Gold	Previcur Flex	Orondis	
<i>aphanidermatum</i>	0.3	1.7	>100	
<i>irregulare</i>	0.1	13.2	>100	
<i>myriotylum</i>	0.1	0.3	>100	
<i>spinosum</i>	0.1	3.2	>100	
<i>ultimum</i> var. <i>ultimum</i>	0.01	5.3/77	0.2	

Rootstock Resistance Trial

Objective: Screen 22 commonly used cucurbit rootstocks for resistance to *Pythium*

- Bottlegourd (6), inter-specific hybrid squash (7), citron (3), and watermelon (6) (control)
- Field naturally infested with *Pythium*, including *P. aphanidermatum*
- Four replications with 10 plants each
- August to September 2017

Average Incidence on Rootstocks & Watermelon



Summary and Preliminary Recommendations (1 of 2)

- Watermelon more susceptible than bottlegourd
 - Watermelon more susceptible than reported
- *P. myriotylum* more common than expected
- No differences, so far, between conventional and organic fields
 - High variation by field
- Some *Pythium* species seem to respond to temperature while others do not
- Most species insensitive to Orondis



Summary and Preliminary Recommendations (2 of 2)

- ***Pythium* attacks stressed cucurbits**
 - High soil moisture
 - Low temperature—early and late season transplanting
- **Minimize stress or “baby your plants”**
 - Improve soil drainage
 - Subsoiling
 - Raised beds—with water furrows cut across
 - Adding organic matter
 - Row covers for spring transplanting
- **Fungicides**
 - Previcur Flex to transplants
 - Ridomil Gold via drip irrigation immediately after transplanting

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