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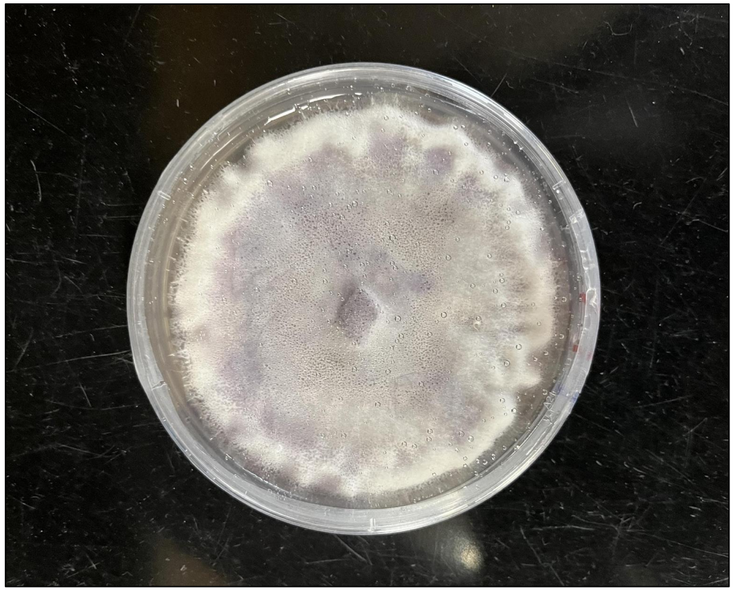
Update on Fusarium Wilt of Blackberry in NC



Jamie Lanzalotto, Bill Cline, and Sara Villani
Department of Entomology and Plant Pathology
North Carolina State University, MHCREC

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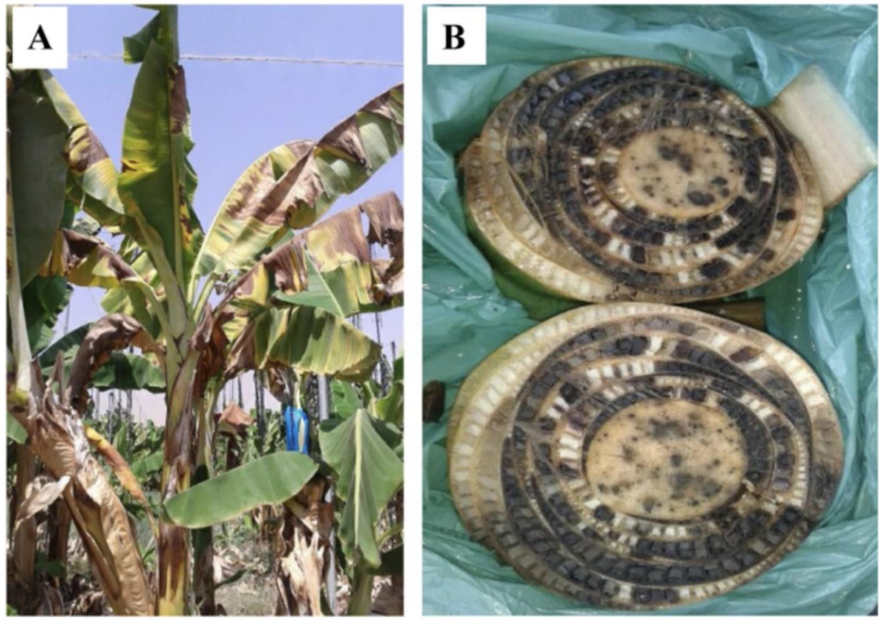
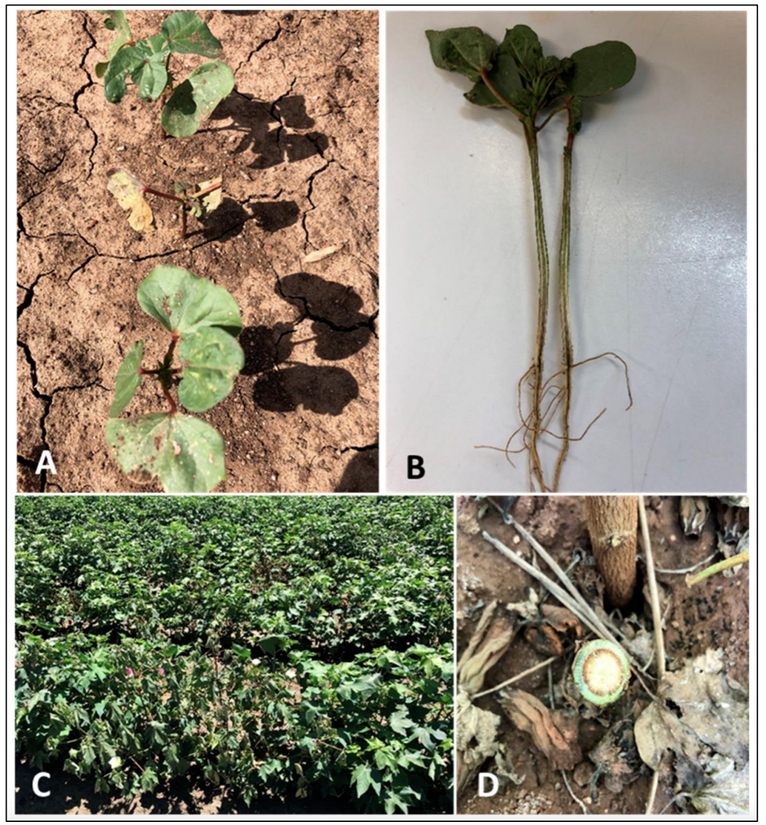
Fusarium oxysporum in Other Hosts

Figure 1



Fusarium oxysporum f. sp. *cubense*
(Mayman et al, 2020)

Fusarium oxysporum f. sp. *lycopersici*
(Inga Meadows)



Fusarium oxysporum f. sp. *vasinfectum*
(Le et al, 2022)

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Fusarium oxysporum in other Hosts

Fusarium oxysporum
f.sp. *fragariae*

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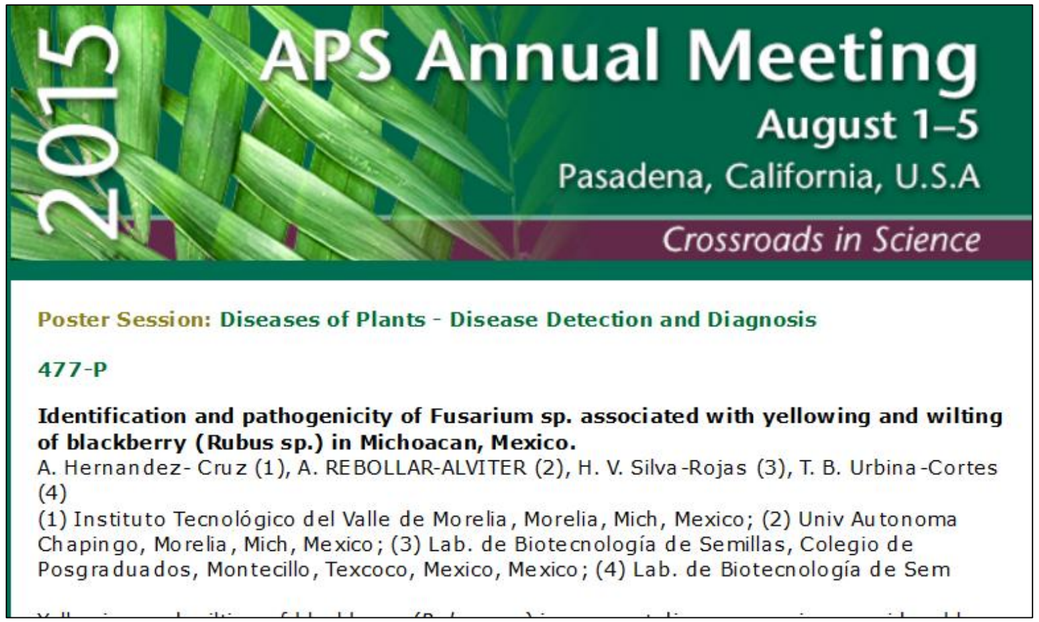
Fusarium Wilt of Blackberry (FWB): A Brief History

Mexico 2011/2015: *Fusarium oxysporum* identified as causal agent of wilting of blackberry



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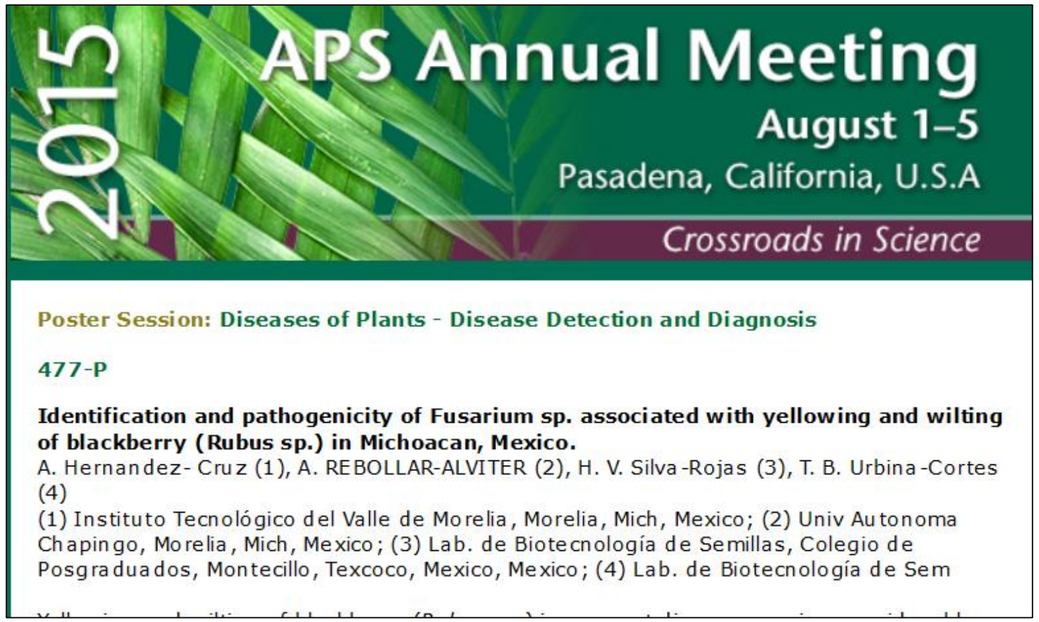

Poster Session: Diseases of Plants - Disease Detection and Diagnosis

477-P

Identification and pathogenicity of Fusarium sp. associated with yellowing and wilting of blackberry (Rubus sp.) in Michoacan, Mexico.

A. Hernandez- Cruz (1), A. REBOLLAR-ALVITER (2), H. V. Silva -Rojas (3), T. B. Urbina -Cortes (4)

(1) Instituto Tecnológico del Valle de Morelia, Morelia, Mich, Mexico; (2) Univ Autonoma Chapingo, Morelia, Mich, Mexico; (3) Lab. de Biotecnología de Semillas, Colegio de Posgraduados, Montecillo, Texcoco, Mexico, Mexico; (4) Lab. de Biotecnología de Sem

California, 2011 (2007?): *Fusarium oxysporum* identified as causal agent of wilting of blackberry

DISEASE NOTES

First Report of a Wilt Disease of Blackberry Caused by *Fusarium oxysporum* in California

T. R. Gordon, S. C. Kirkpatrick, P. M. Henry, M. Kong, and J. C. Broome

Affiliations

Published Online: 2 Mar 2016 | https://doi.org/10.1094/PDIS-07-15-0784-PDN

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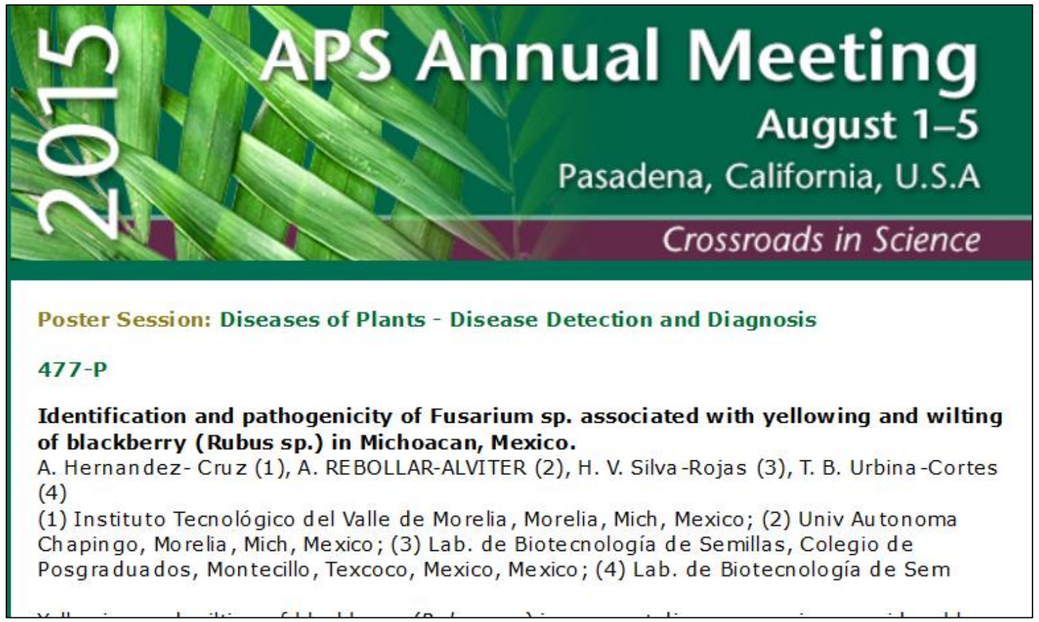
Fusarium Wilt of Blackberry (FWB): A Brief History

Mexico 2011/2015: *Fusarium oxysporum* identified as causal agent of wilting of blackberry



California, 2011 (2007?): *Fusarium oxysporum* identified as causal agent of wilting of blackberry

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2017: *Fusarium oxysporum* f.sp. *mori* (FOM) identified as the causal pathogen of **Fusarium Wilt of Blackberry**

RESEARCH

Fusarium oxysporum f. sp. _mori_, a New Forma Specialis Causing Fusarium Wilt of Blackberry

A. M. Pastrana, S. C. Kirkpatrick, M. Kong, J. C. Broome, and T. R. Gordon

Affiliations

Published Online: 4 Oct 2017 | https://doi.org/10.1094/PDIS-03-17-0428-RE

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Fusarium Wilt of Blackberry (FWB): A Brief History

North Carolina, 2015 (2020): *Fusarium oxysporum* identified as causal agent of wilting of blackberry

DISEASE NOTES

First Report of Fusarium Wilt of Blackberry Caused by *Fusarium oxysporum* f. sp. *mori* in North Carolina

A. M. Pastrana, W. O. Cline, T. W. Wong, D. C. Watson, J. Mercier, K. Ivors, J. C. Broome, L. M. Quesada-Ocampo, and T. R. Gordon

Affiliations

Published Online: 22 Jan 2020 | https://doi.org/10.1094/PDIS-09-19-1980-PDN

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Chatham County NC, 2020

Fusarium Wilt of Blackberry (FWB): A Brief History

Chatham County NC, 2020: ‘Navaho’

- Pender County, Sampson County, and Cleveland County have confirmed cases of FWB

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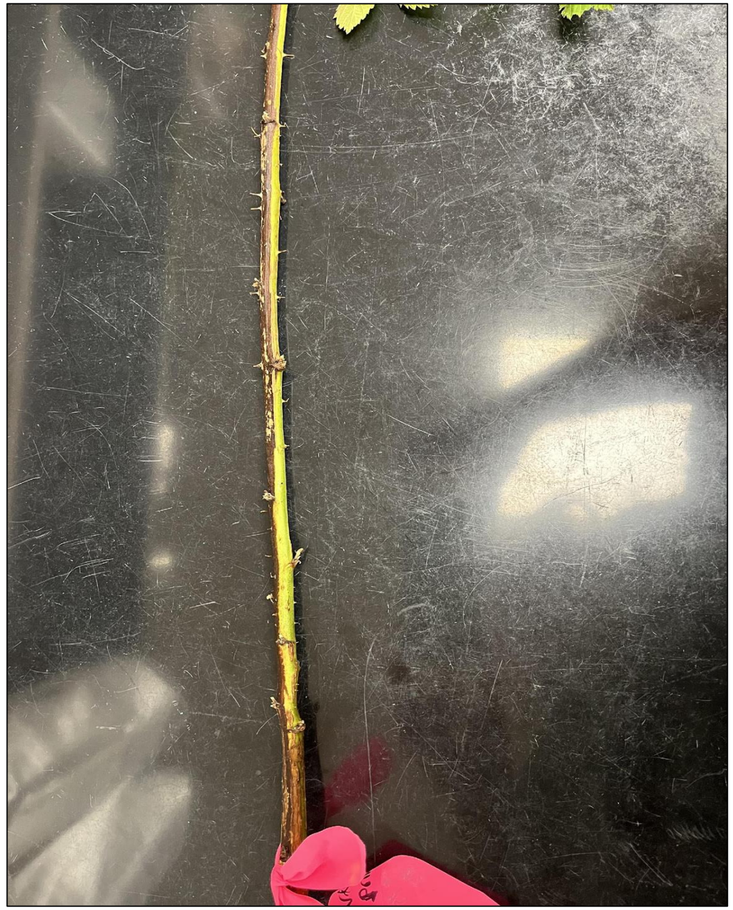
Fusarium Wilt of Blackberry (FWB): Symptoms and Signs



Dark brown to black streaking, often one-sided

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Fusarium Wilt of Blackberry (FWB): Symptoms and Signs

Gray to pink sporulation on floricanes

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Fusarium Wilt of Blackberry (FWB): Symptoms and Signs

Relatively rapid wilt and death

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Fusarium Wilt of Blackberry (FWB): Why Should You Care?

- Diseased plants typically die within three years of infection
  - Economically viable plantings of blackberries should produce fruit for at least seven years in order to be worth the cost of inputs
  - According to Southern IPM, blackberry production valued around $12 million in NC
- Fumigation and other fungicides have not proven to be effective in treating or preventing this disease
- Wild blackberries (*Rubus allegheniensis*) may act as host reservoir for this disease and could possibly contribute to new pathogenic strains of *Fom* in NC
- Several cultivars highly susceptible to FWB

Fusarium Wilt of Blackberry (FWB): Current Research in NC

Phase I

- Conduct an expansive sampling of cultivated blackberries across the state.
- Conduct phylogenetic analysis of isolates of *Fusarium oxysporum* to determine to determine “strains” present in NC and compare with strains from California, Mexico and 2015 NC isolates
- Conduct pathogenicity and virulence assays of all isolates using a highly susceptible and (more) tolerant cultivar
- Screen select isolates for pathogenicity and virulence on 10+ commercially available cultivars commonly grown in the SE USA

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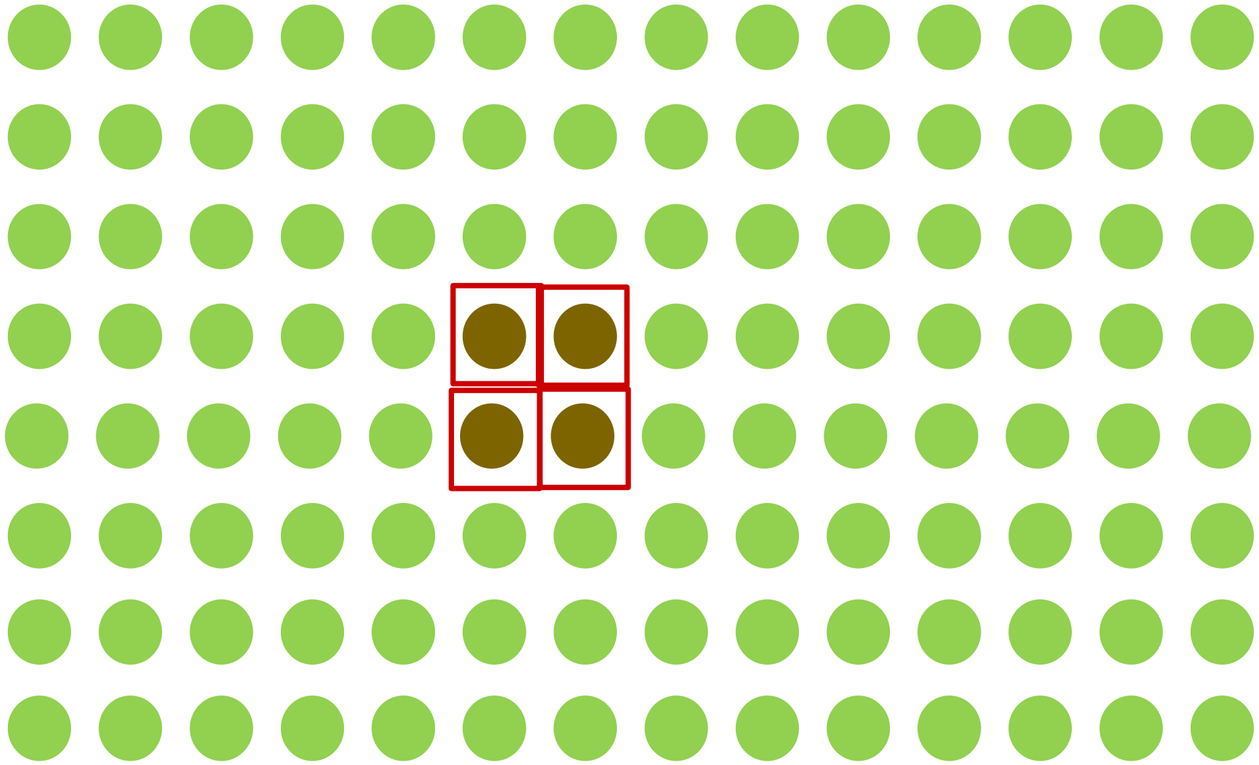
FOM sampling: Summer 2022 and 2023

Original Gameplan



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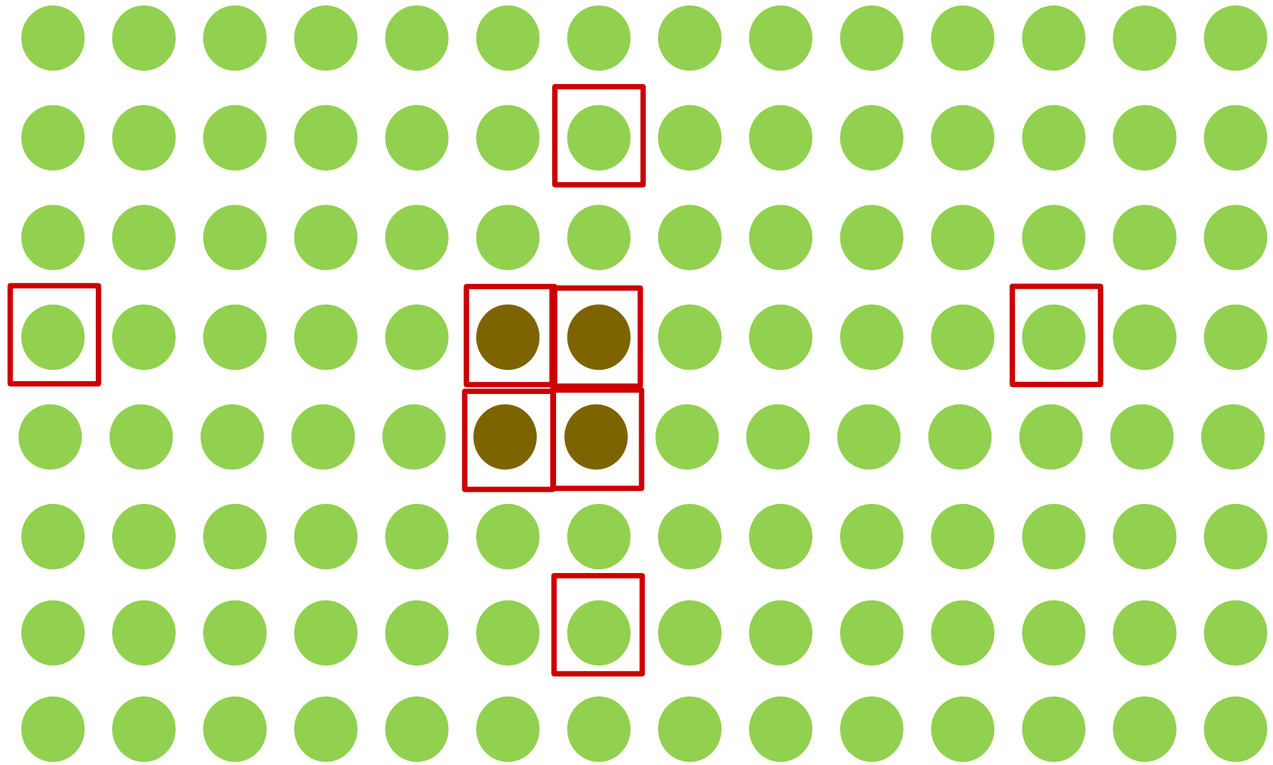
FOM sampling: Summer 2022 and 2023

Original Gameplan



- Sample 1-4 symptomatic plants within hotspot
- Sample asymptomatic plants 25 ft down and across rows in either direction

FOM sampling: Summer 2022 and 2023

Contingency Plan

- 3 plants of each infected cultivar sampled per farm
- Prime-Ark 45 and Monica >> Ouachita > Victoria, Natchez, and Galaxy
- Roots, primocane, floricane sampled June and July

- Wild blackberry *Rubus allegheniensis* (reservoir hosts?)

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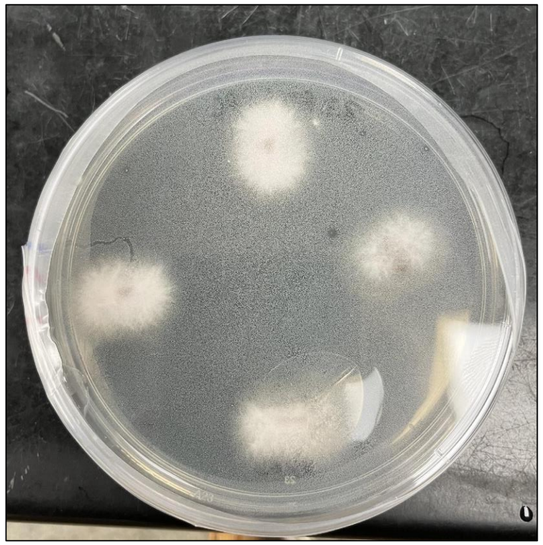
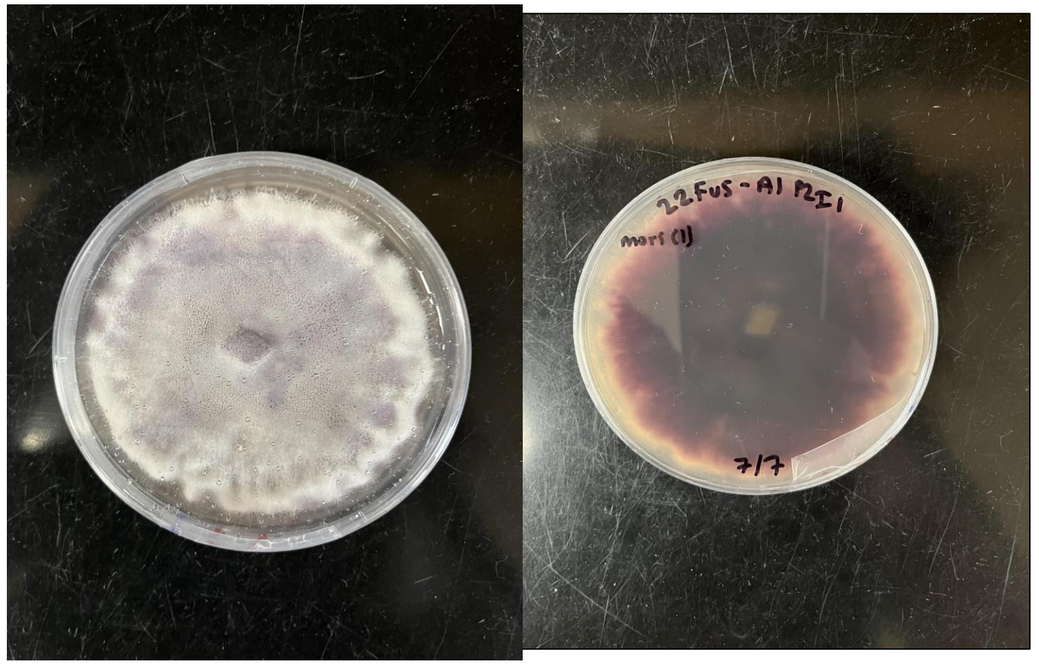
FOM sampling: Summer 2022 and 2023





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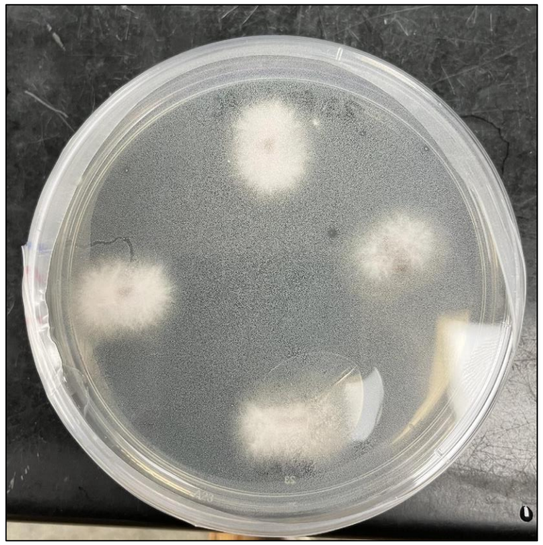
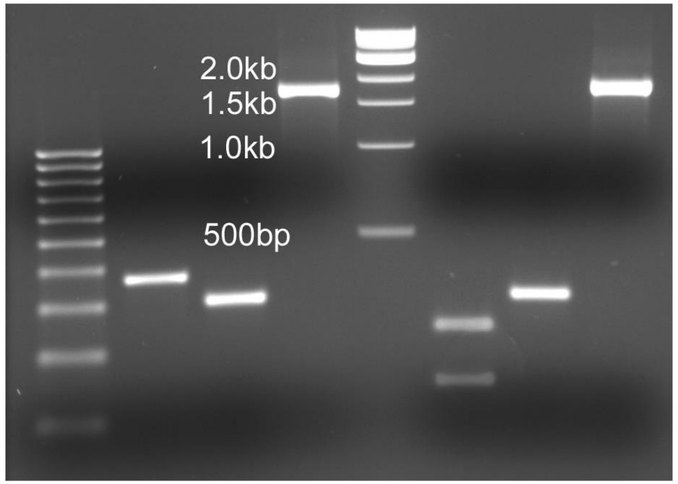
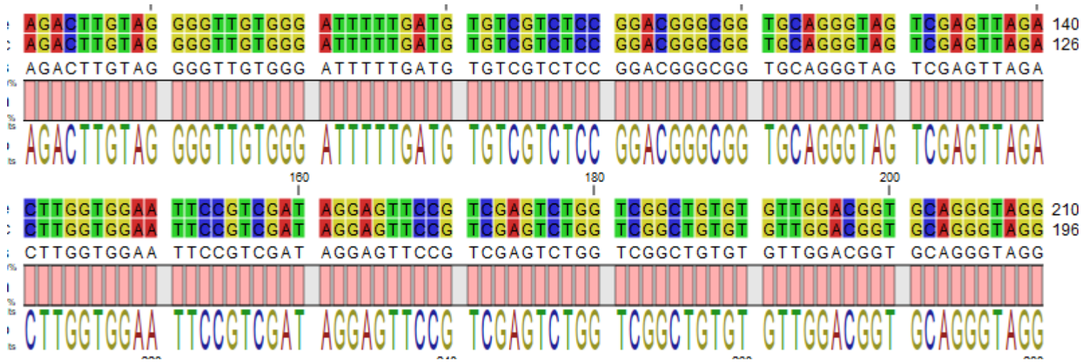
FOM sampling: Summer 2022 and 2023

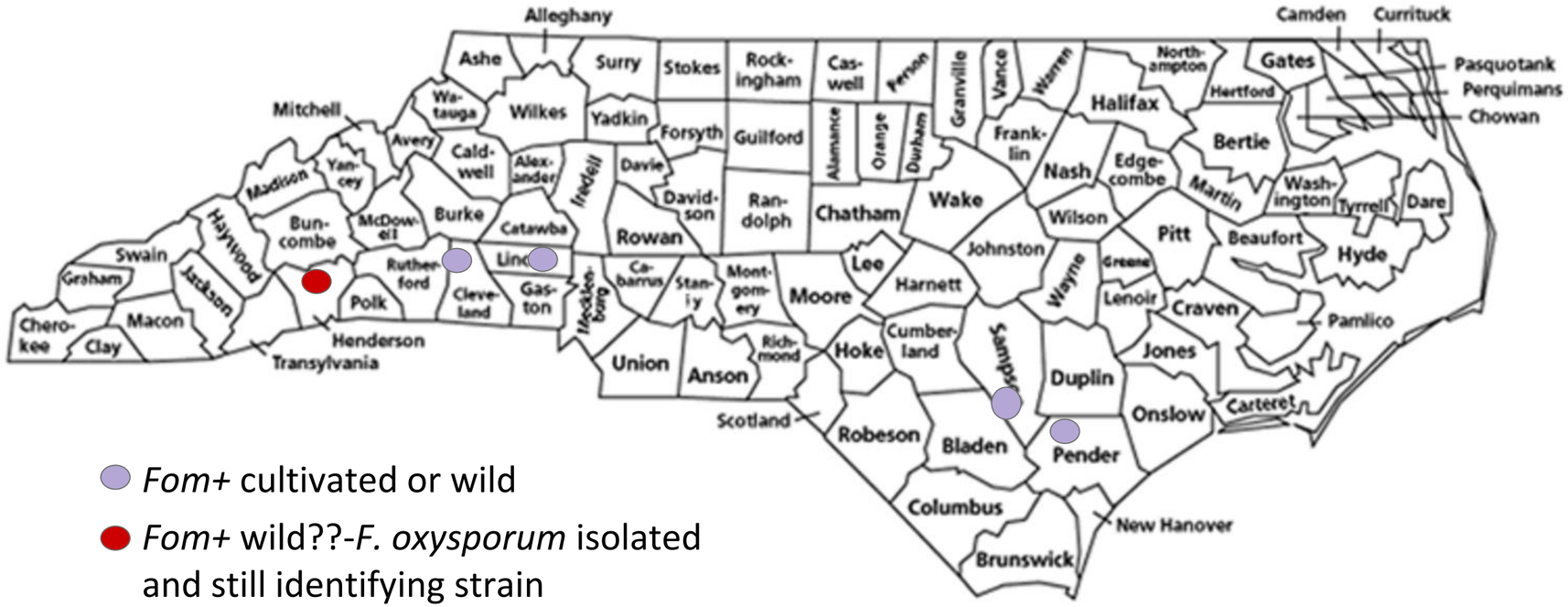






FOM sampling: Summer 2022 and 2023

- Collected samples from seven farms across four counties
- Collected wild blackberry samples from each farm
- Began sequencing samples with ITS



Fom+ cultivated or wild

Fom+ wild??-*F. oxysporum* isolated and still identifying strain

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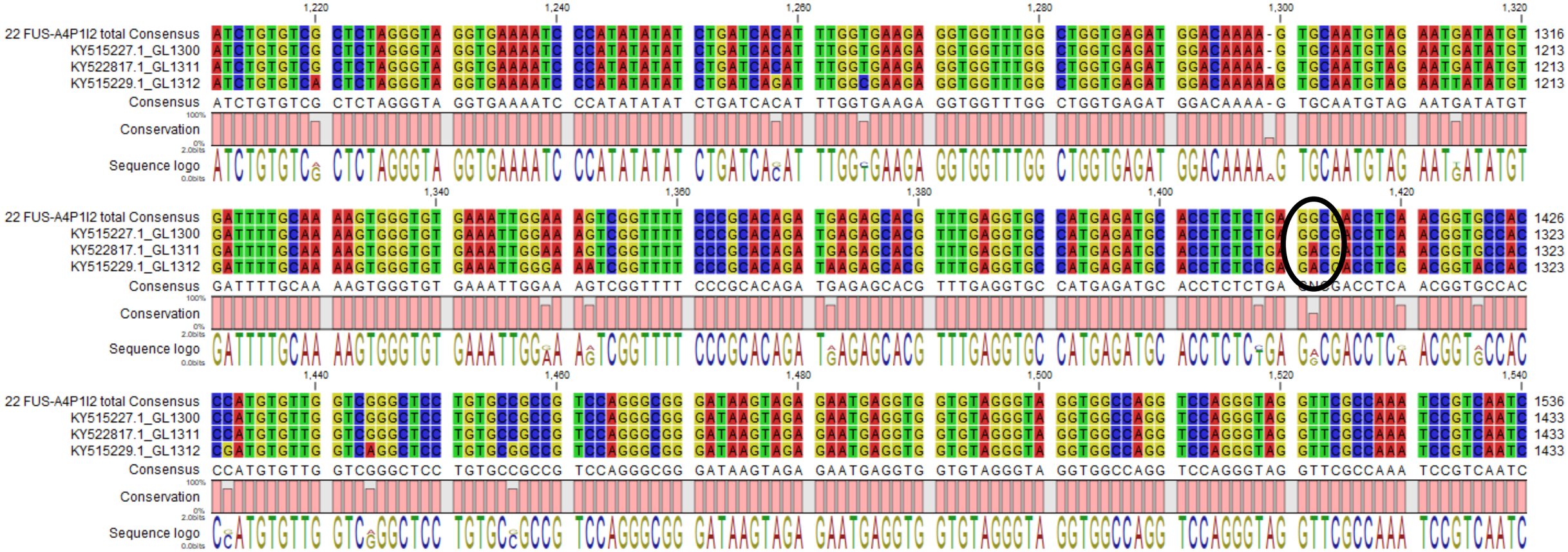
FOM Identification: Summer 2022 and 2023



- Seq Line 1: NC Foothills, Natchez, 2022
- Seq Line 2: Mexico, 2011, Tupi, 2011
- Seq Line 3: California, BD467.1, 2007,
- Seq Line 4, Eastern NC, 2015

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What's Next for FWB Studies in NC?

- Complete FWB sampling: Western NC and wild blackberry outside of 5-mile radius of commercial blackberry plantings
- Pathogenicity and virulence/aggressiveness assays on commercially available cultivars and wild blackberry grown in SE USA
- Vector studies with pollinators (J. Hayter and J. Walgenbach)
- Microenvironment studies to improve hot spot prediction risk
- Collaborations with U. Arkansas, UGA, others??

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Best Management Practices for Now

- No definitive data on cultivar resistance. Navaho may be more tolerant based on limited field observations.
- Sanitize and protect your feet!
- Use clean planting stock
- Remove diseased plants and destroy residue
- Avoid re-planting in known infested areas
- Fumigation may have some benefit
- Soil- and plant-borne -- avoid transfer of infested soil or infected plants to clean fields/areas
- Work clean fields first, infested areas last to avoid spreading spores (harvesting, pruning etc.)

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The New and Improved

MyIPM App

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Information Provided by MyIPM App

- 9 fruit crops
- Diagnostics
  - Insect/Pathogen biology
  - Disease signs/symptoms
  - High quality, zoomable photo gallery
- Chemical, biological, cultural control
- Audio from specialists

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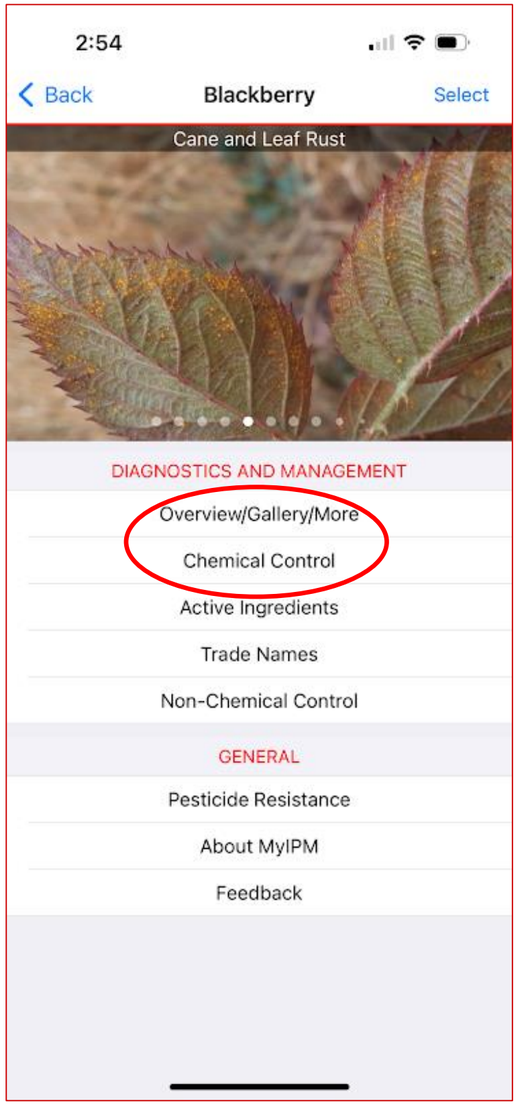

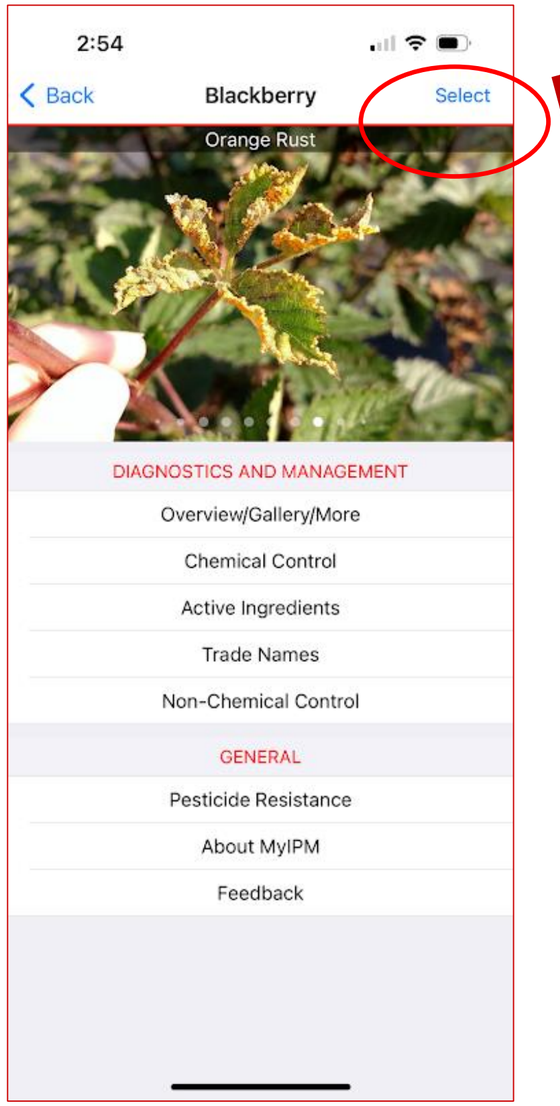

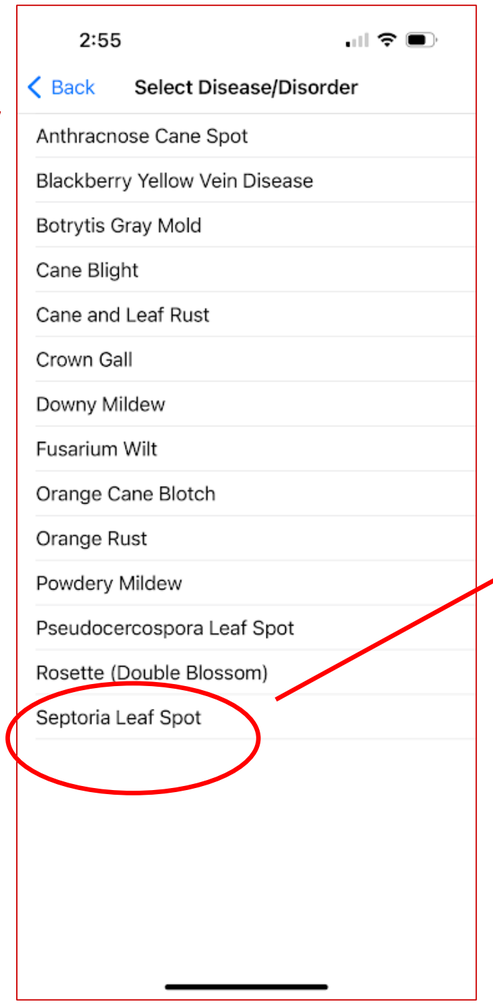

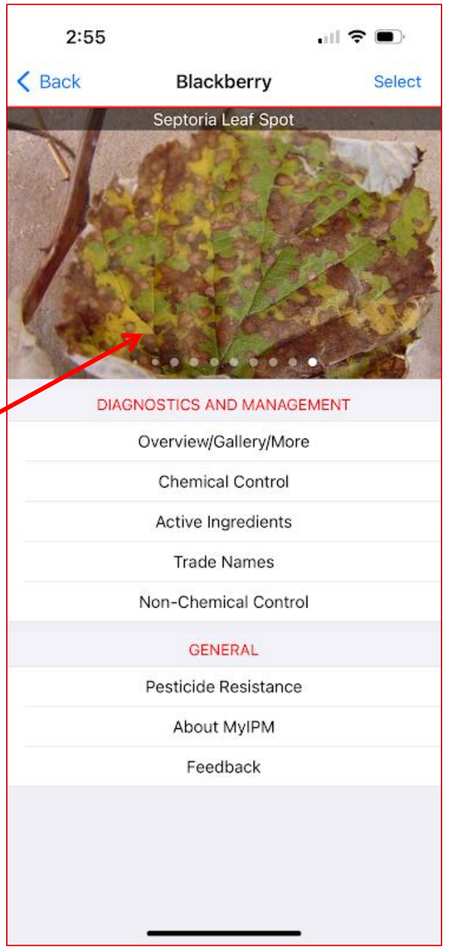

Scroll between diseases or click on “select” to help with identification and access more information

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Resources and Thanks!

- https://smallfruits.org/files/2022/01/2022-Caneberry-Spray-Guide.pdf
- https://content.ces.ncsu.edu/north-carolina-agricultural-chemicals-manual
- https://content.ces.ncsu.edu/fusarium-wilt-of-blackberry