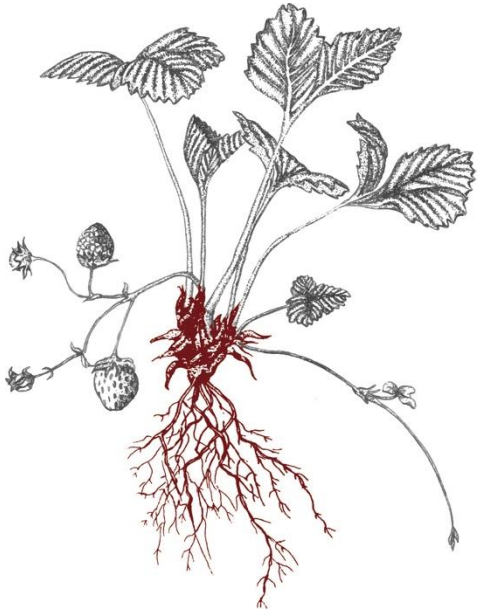
Updates on Fusarium wilt research



Peter Henry
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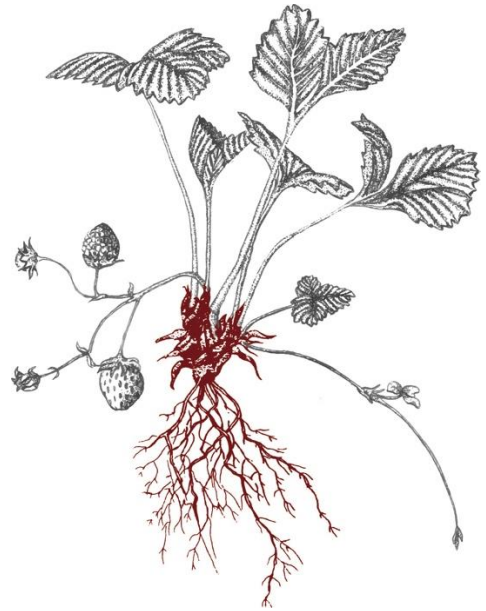
February 2025

USDA ARS Agricultural Research Service



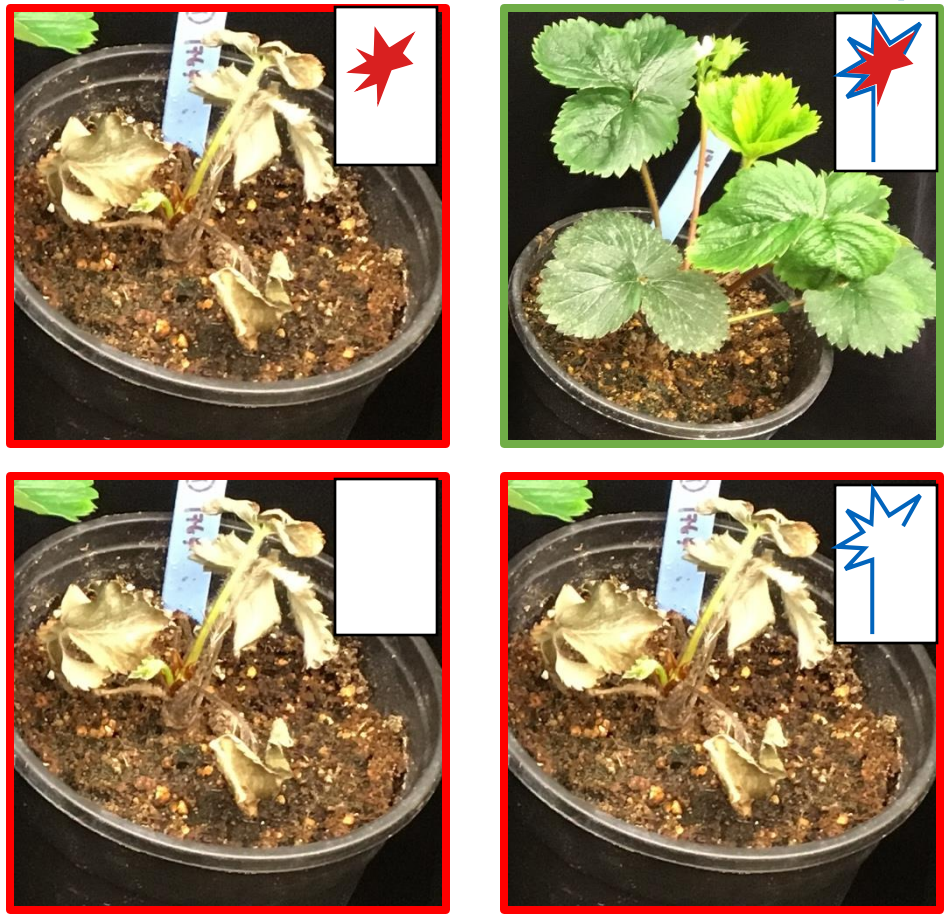
Fusarium wilt: “race 1” versus “race 2”

fw1
(susceptible)

FW1
(resistant)

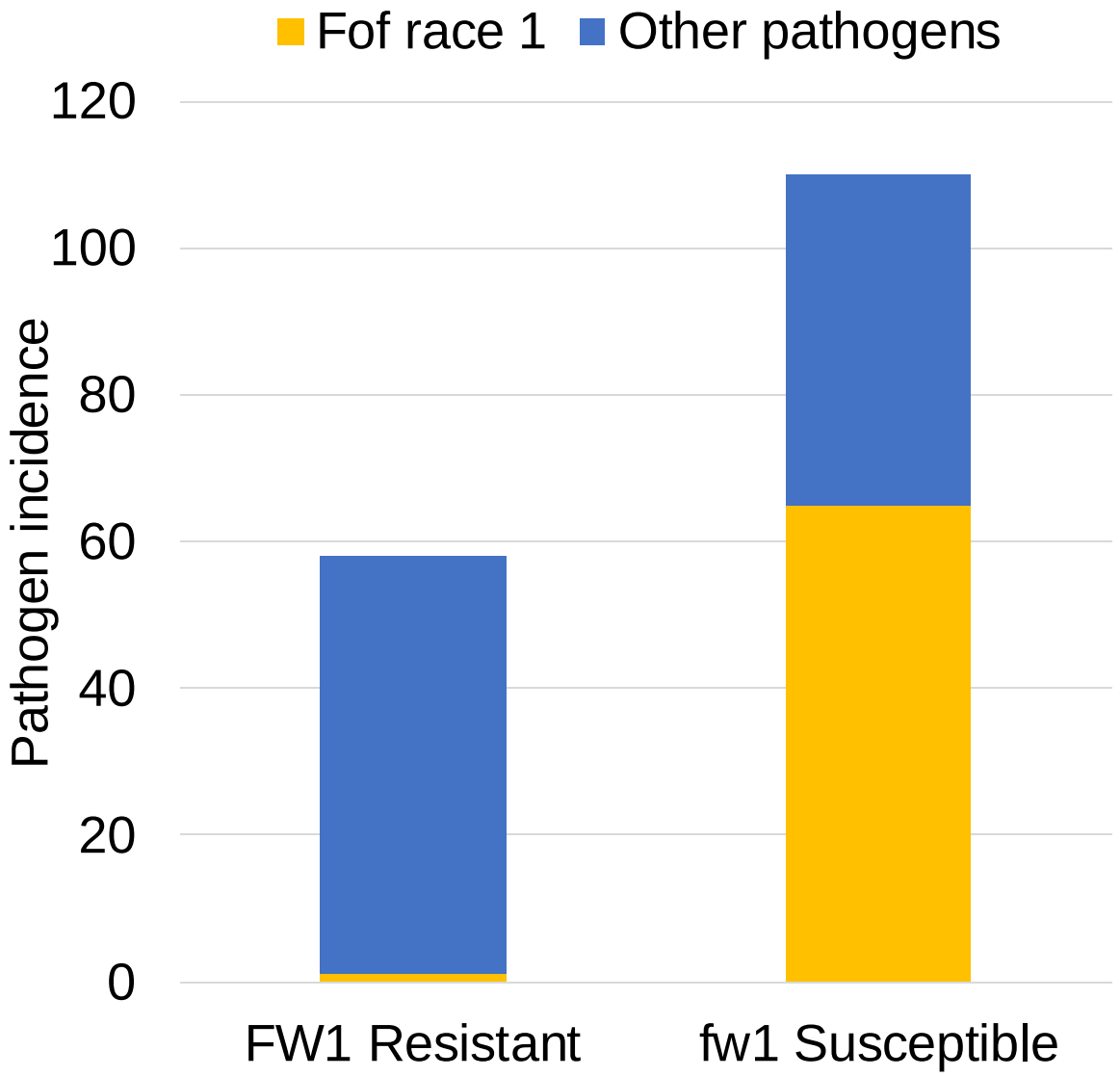
Fof race 1

Fof race 2



- *FW1* Resistant varieties:
  - San Andreas
  - UC Eclipse
  - UC Keystone
  - UC Golden Gate
  - Portola
  - Fronteras

Genetic resistance is key to managing Fusarium wilt



- In Watsonville/Salinas, Fusarium wilt is the most common disease on susceptible varieties.
- Results from ~150 diseased samples taken in
  - 2021 led by Cal Poly
  - 2022 led by USDA

- **Confirmed *Fof* race 2 in November, 2022**
- Summer-planted
- Portola (*FW1*-resistant)
- High wilt disease severity

Progress on diagnostics and surveillance

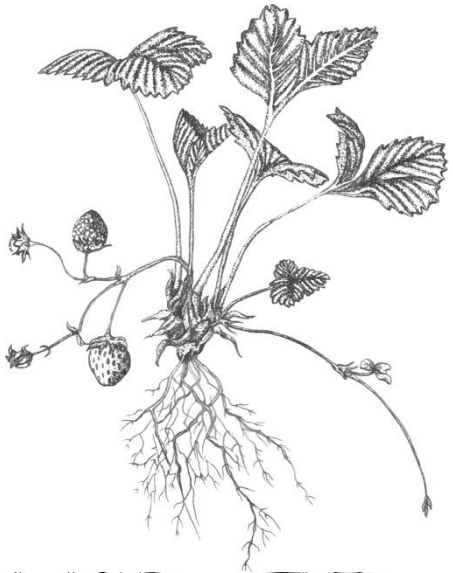
- **In the 27 months since discovering CA Fof race 2 in Oxnard:**

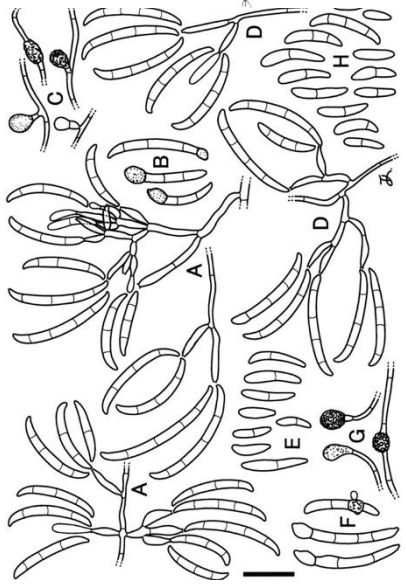
- qPCR and RPA assays were developed and technically validated.

- RPA diagnostic validation results are promising and on-going

- >2,500 samples were tested and only **detected *Fof* race 2 in 6 fields in Oxnard**
  - 3 fields summer-planted
  - 3 fields fall-planted

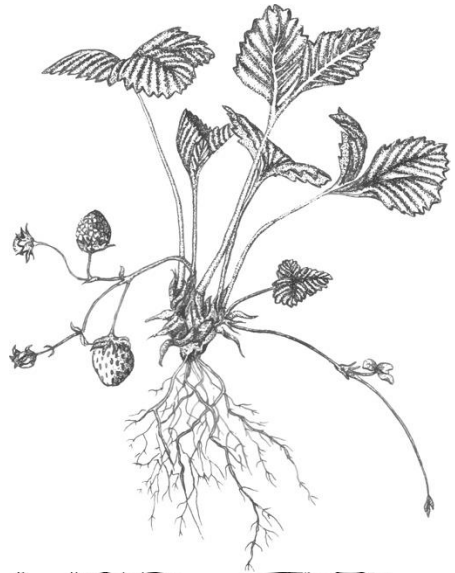
Overview

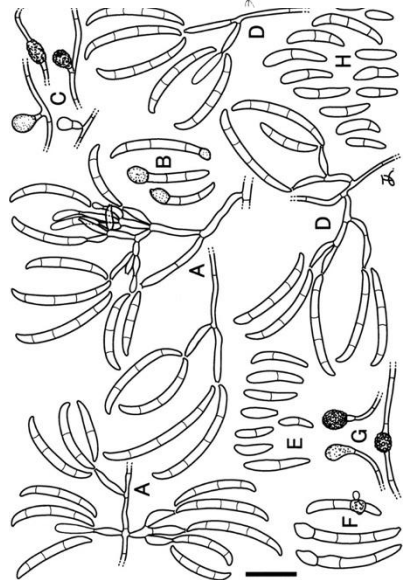




KPAM applications for Fusarium wilt management

Fusarium aerial dispersal: potential and implications



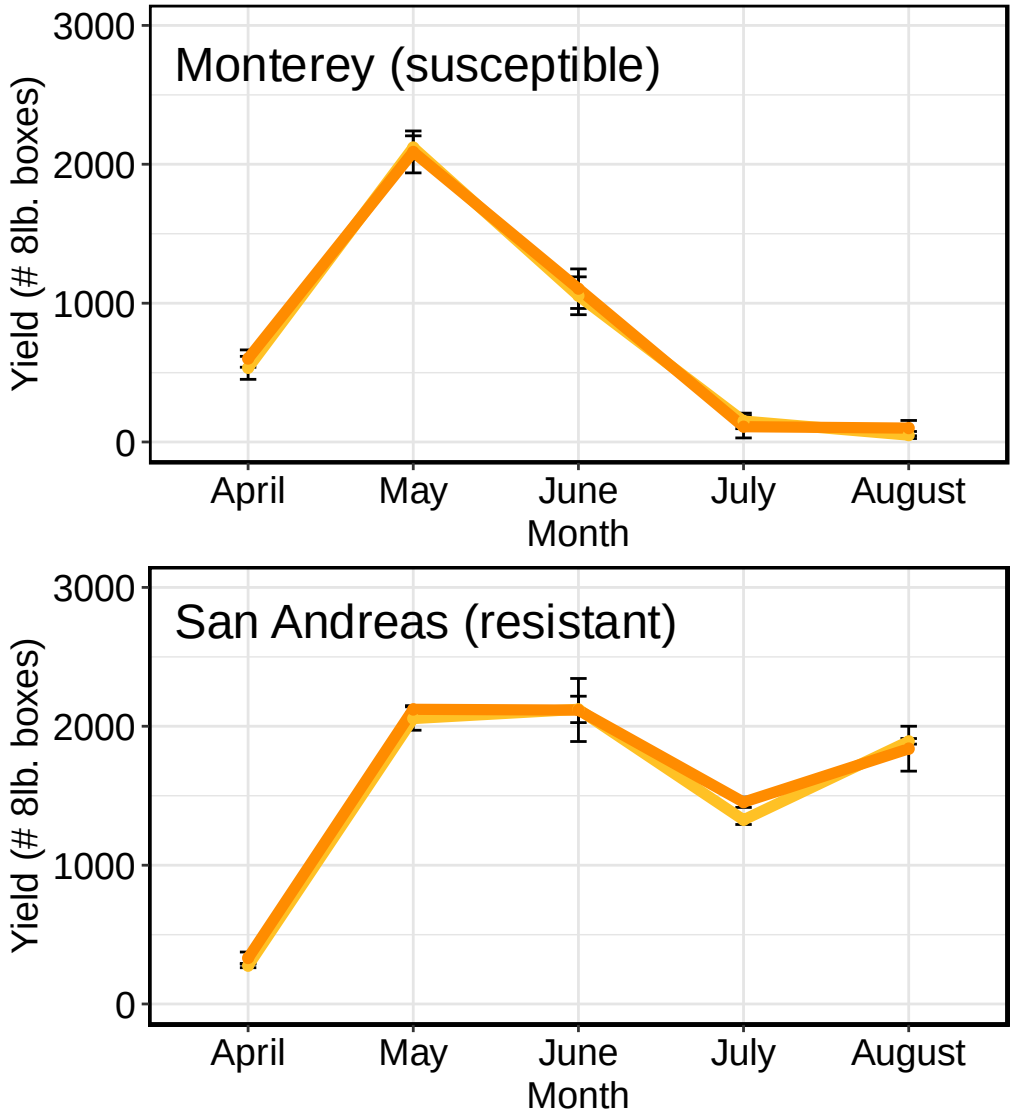


Treatments, Dates and Rates

• KPAM (CT)	9/28/19	20 gal per acre
• Dominus (CT)	9/28/19	20 gal per acre
• TriClor	10/12/19	350# per acre
• KPAM (PP)	10/19/19	47 gal per acre

- CT = crop termination
- PP = pre-plant

Is 2x better than 1x KPAM?

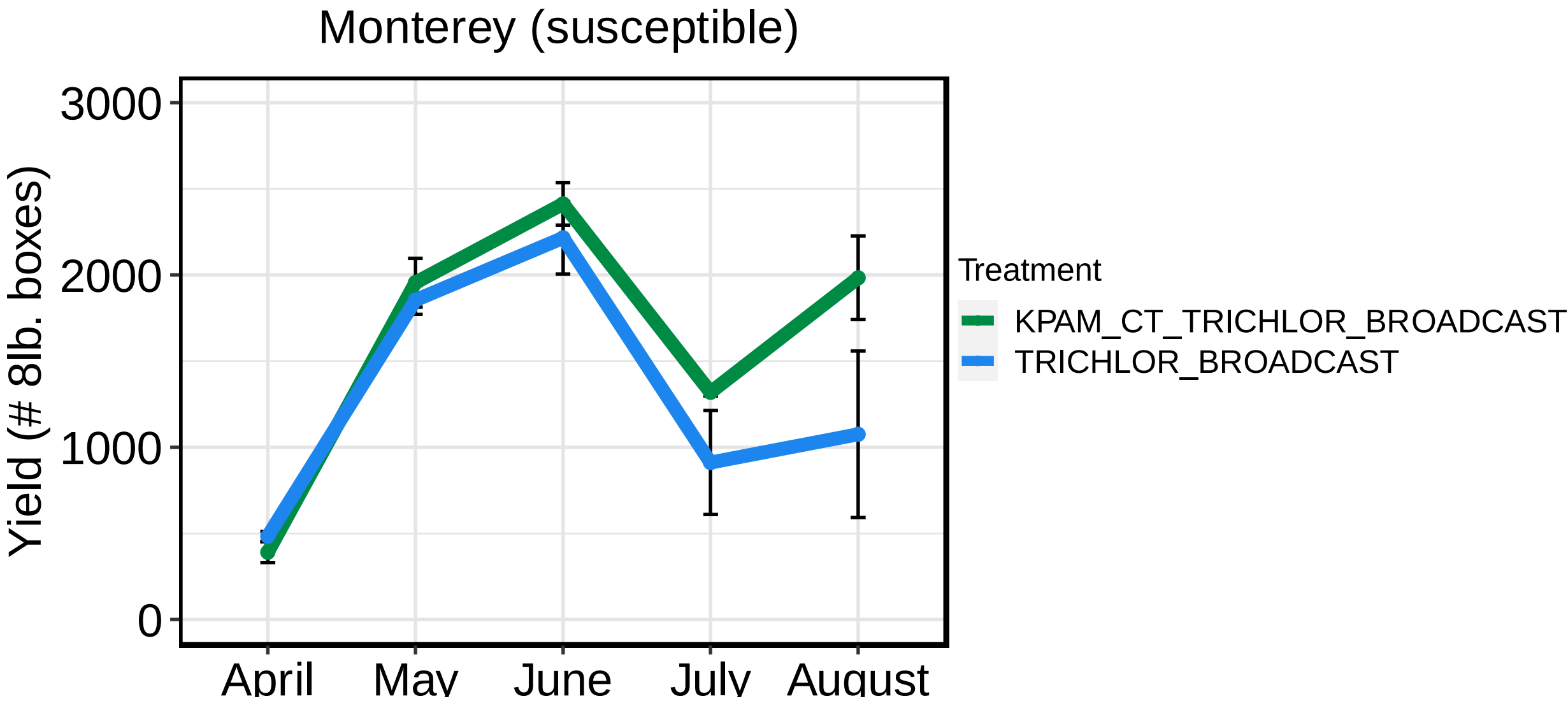


Treatment

KPAM_CT

KPAM_CT_KPAM_BED

Does KPAM crop termination improve flat fumigation?



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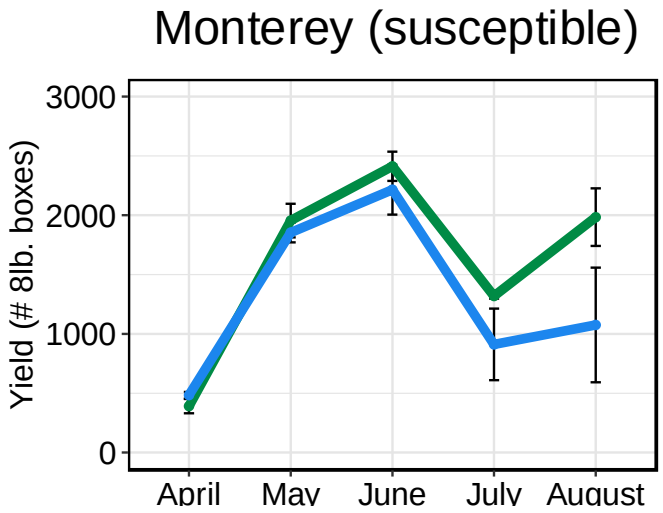
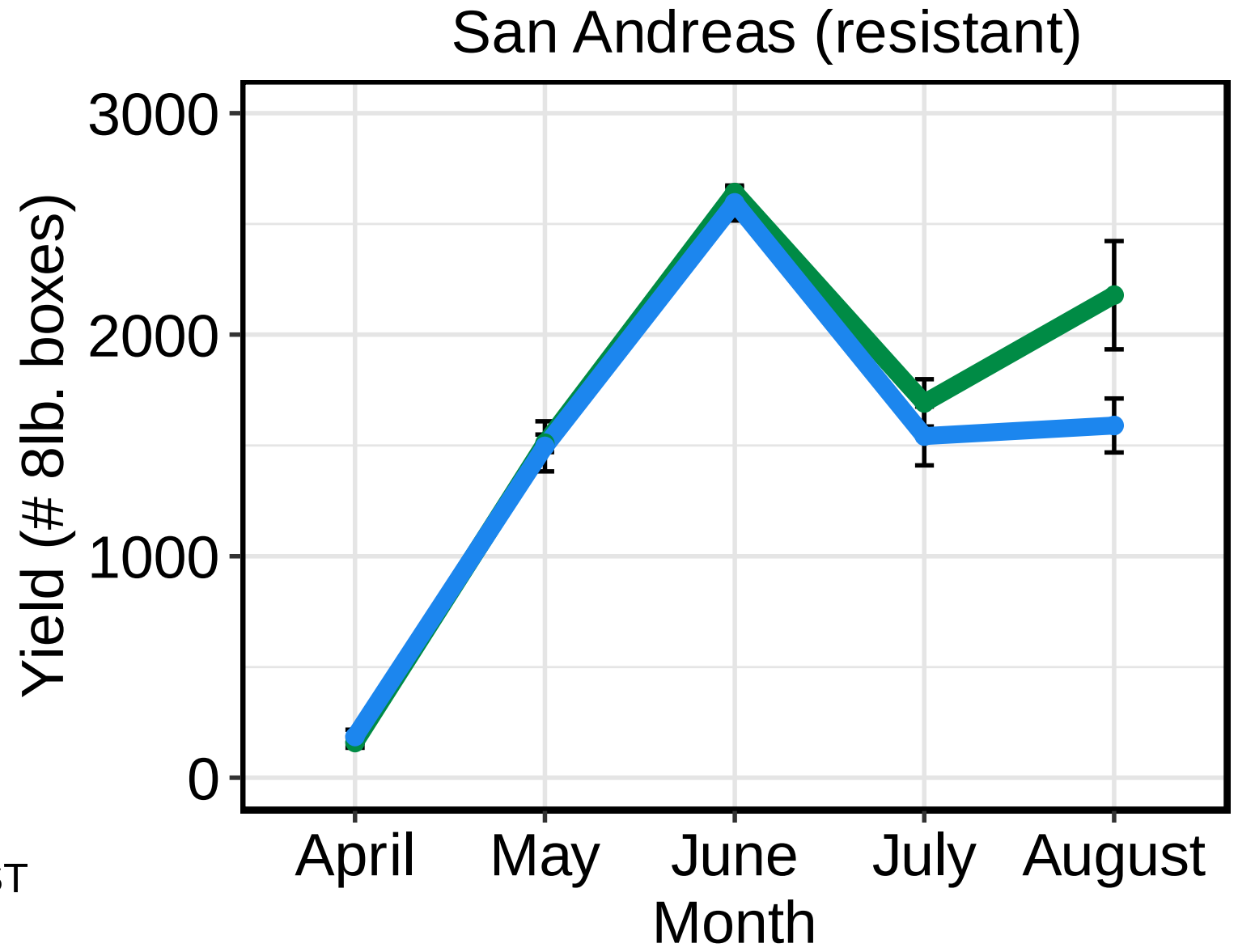


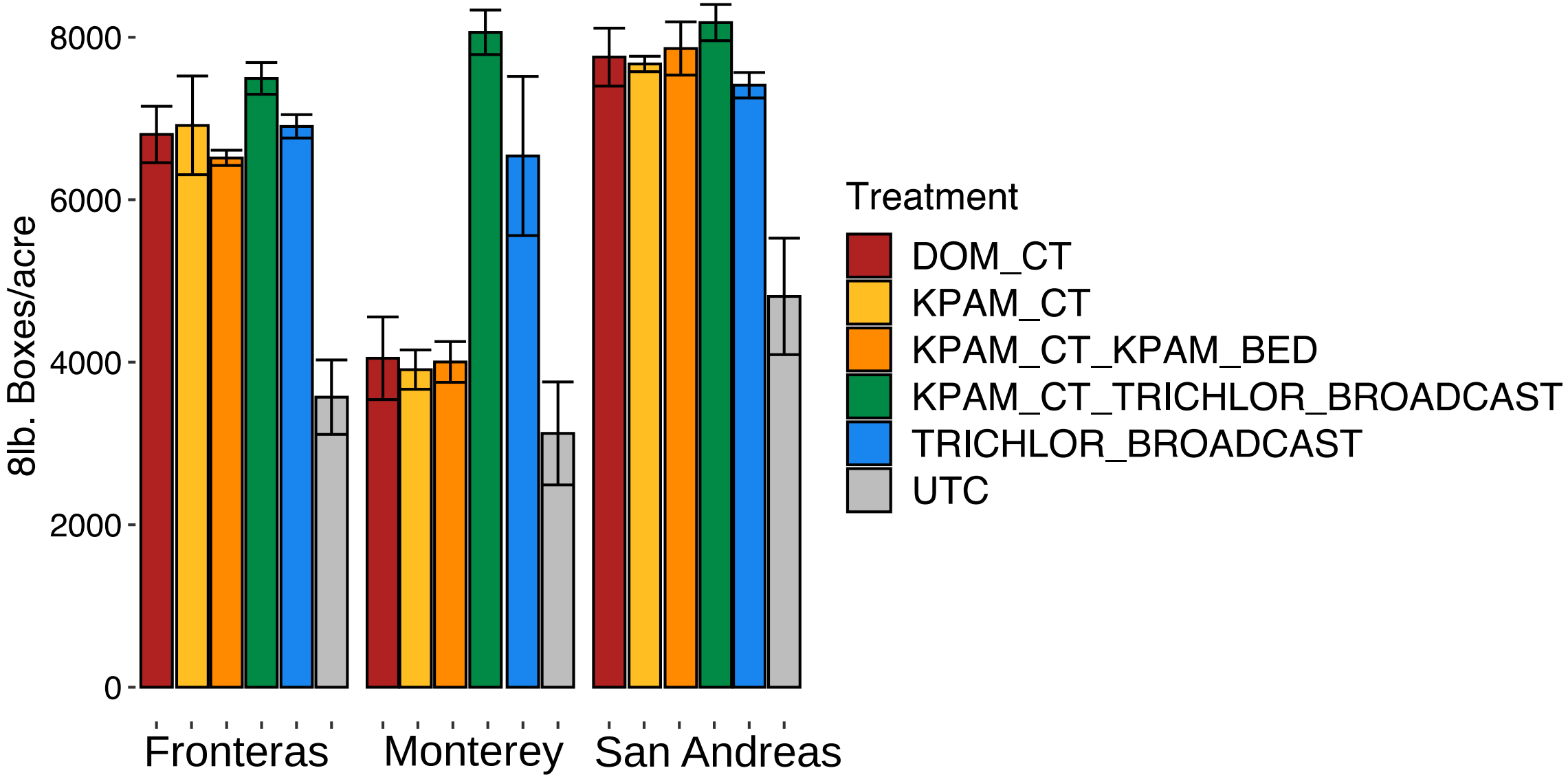


Treatment

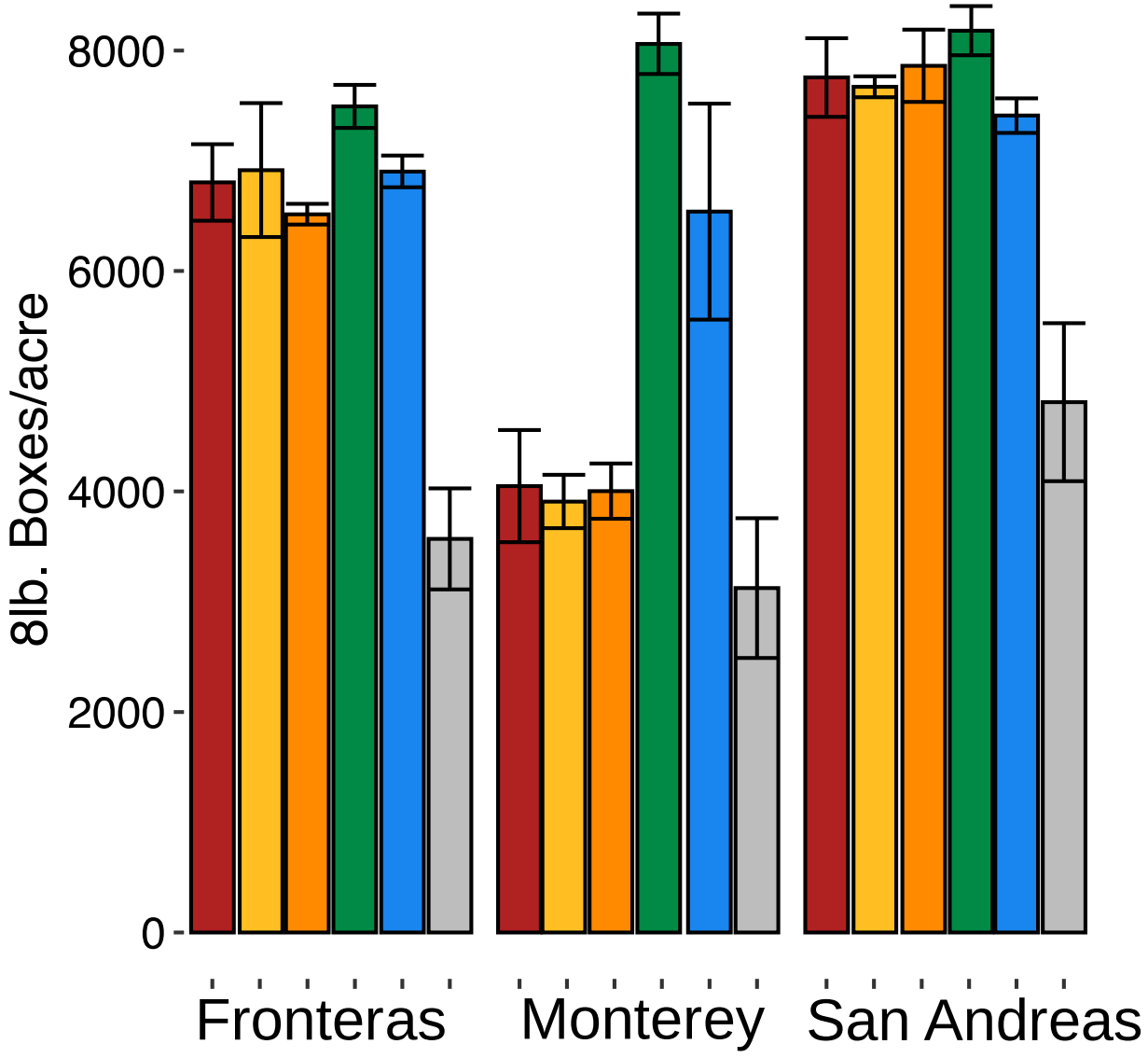
KPAM_CT_TRICHLOR_BROADCAST

TRICHLOR_BROADCAST

Does KPAM crop termination improve flat fumigation?

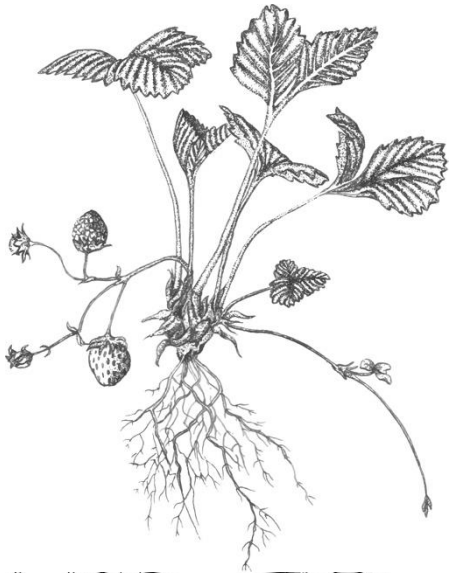


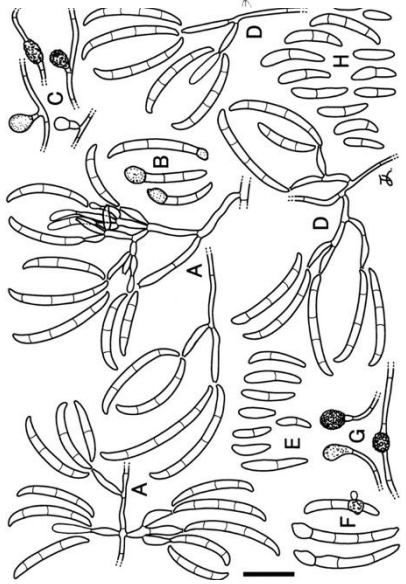
Takeaways



- Two, consecutive applications of KPAM **did not** yield better than a single application
- Crop termination before broadcast was slightly better than broadcast alone
- This trial was in a highly-infested field, KPAM may be less problematic where no pathogens are present.

Overview





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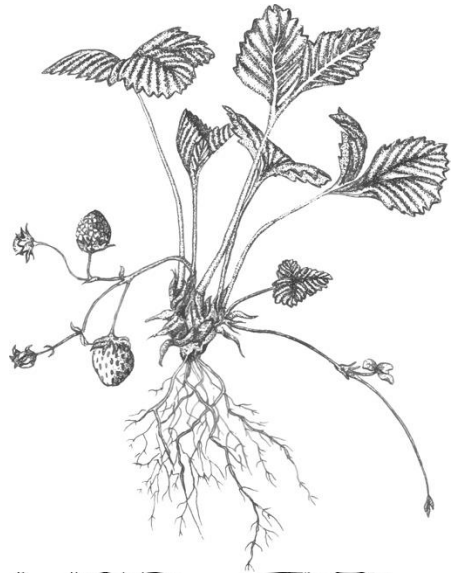
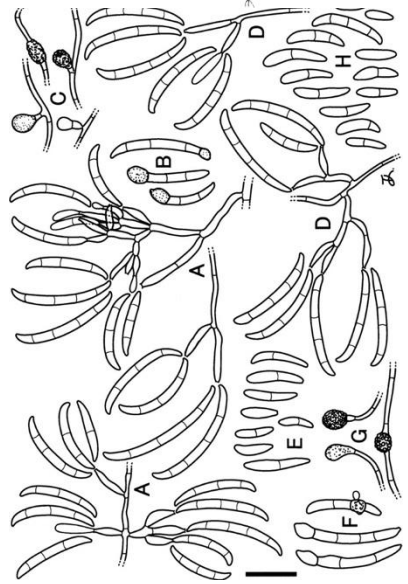
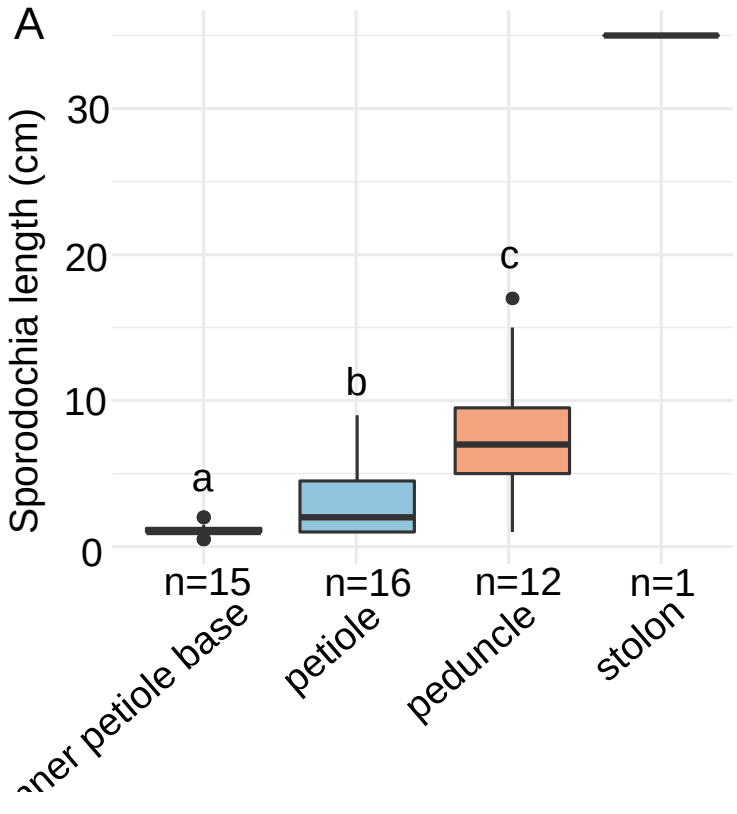




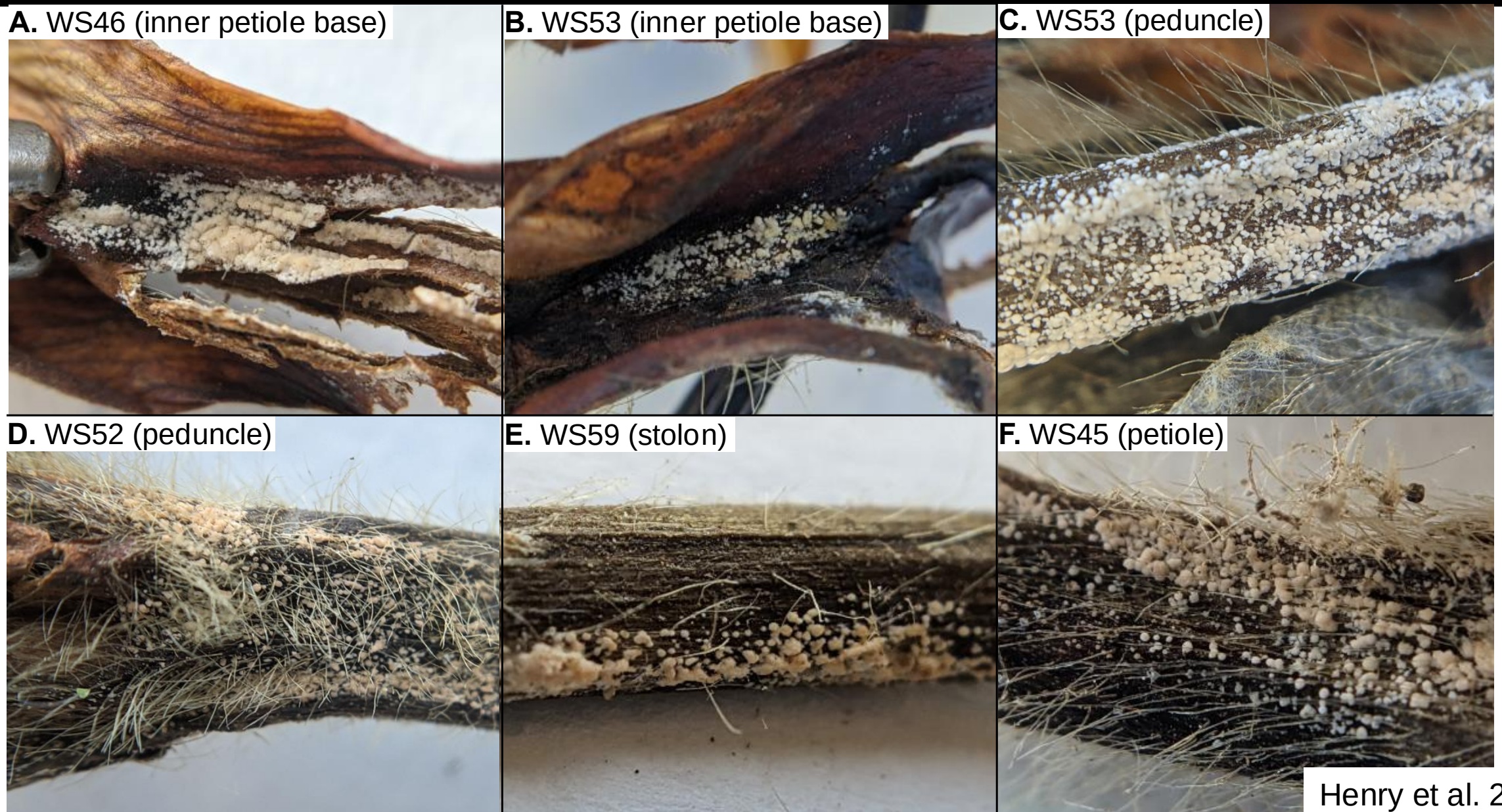
Sporodochia formed by *F.o. fragariae*

- Discovered at 87% of Fusarium wilt-afflicted fields (*n*=24)
- Found on most plants



Henry et al. 2024

Sporodochia formed by *F.o. fragariae*



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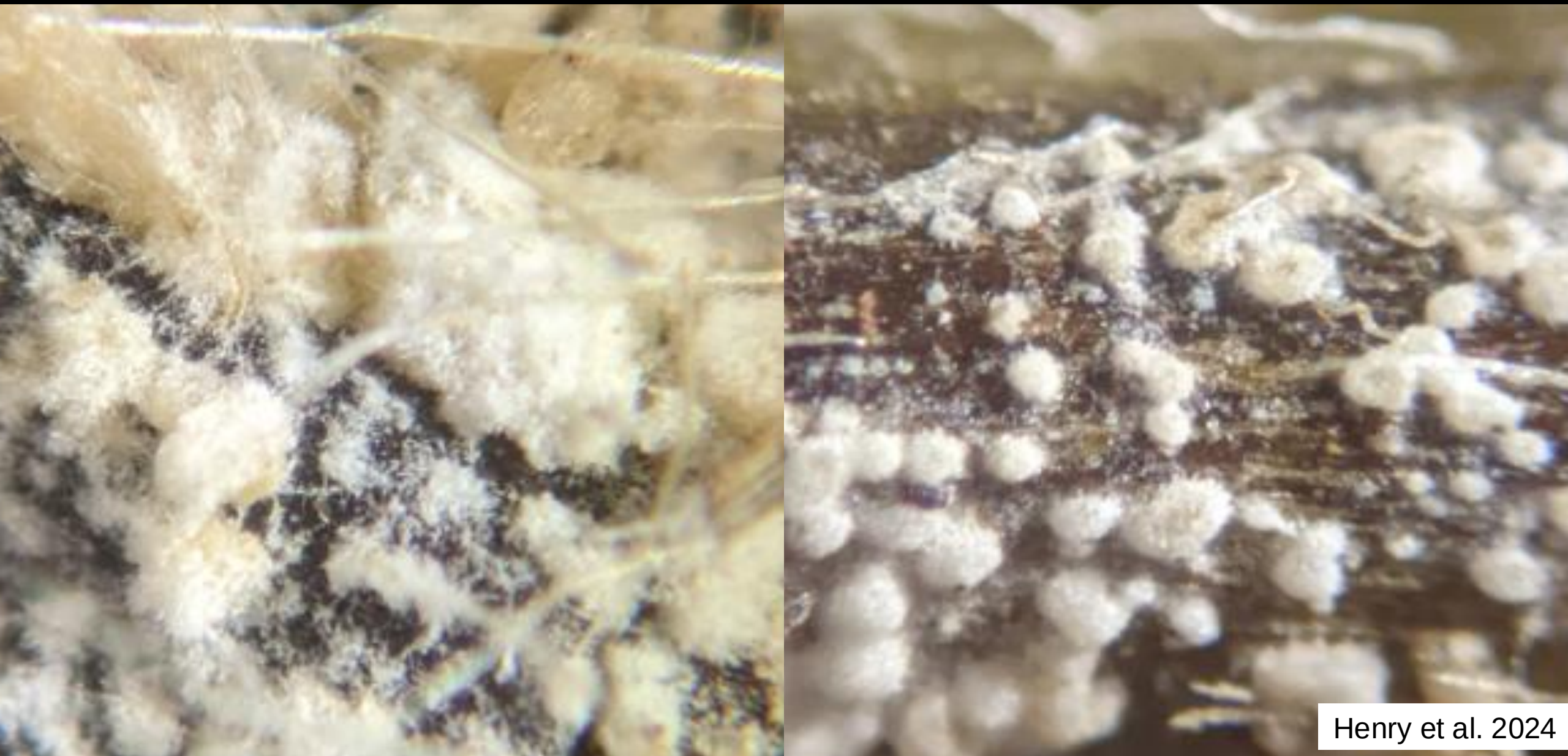

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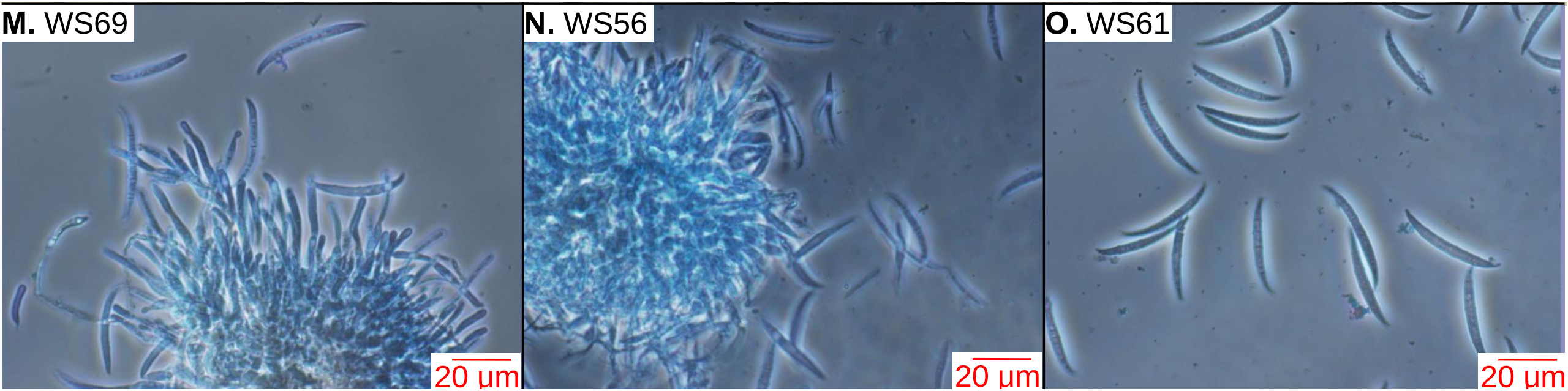
Only macroconidia observed



Henry et al. 2024

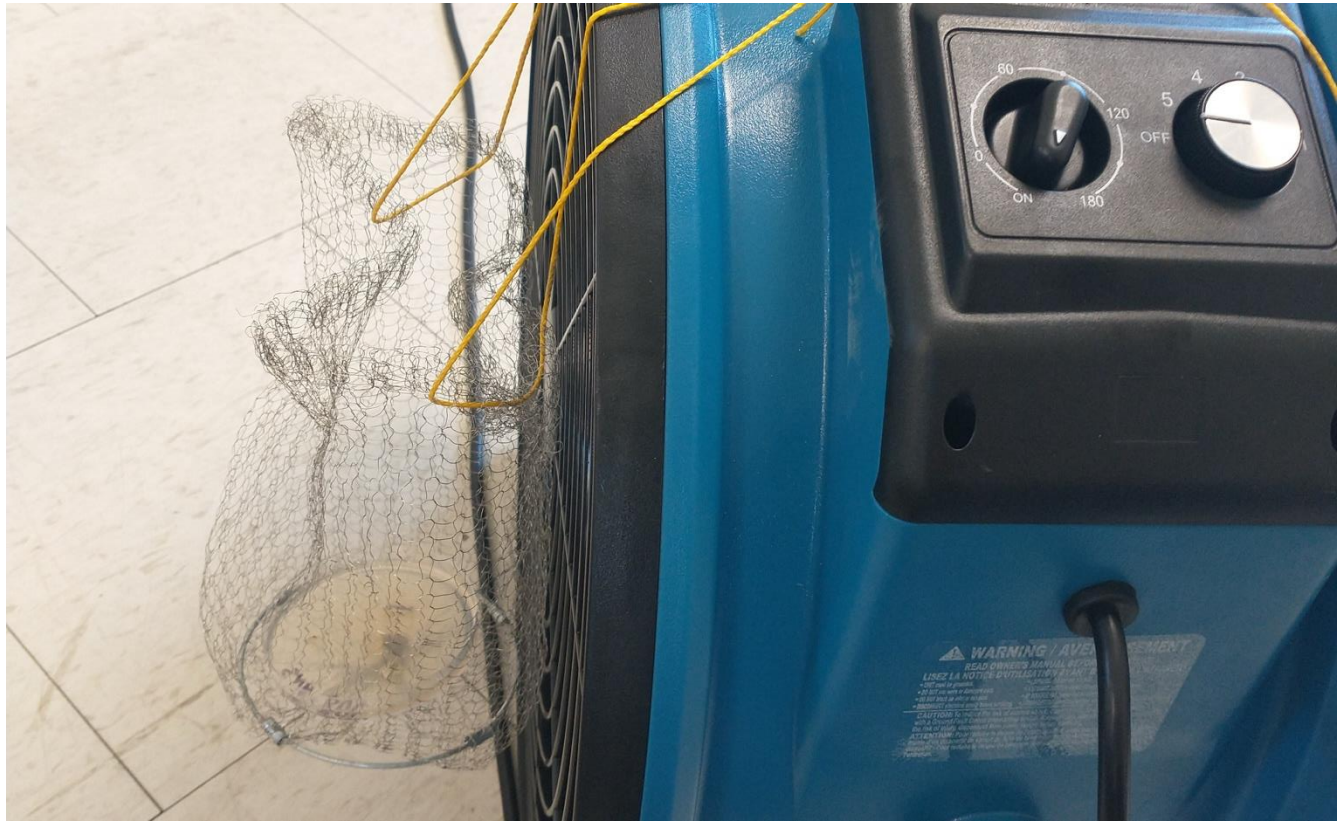
Pennsylvania State University x USDA Alliance:
Gabriel Sacher, Sharifa Crandall, Nicholas LeBlanc

Can wind disperse spores from sporulating plants?

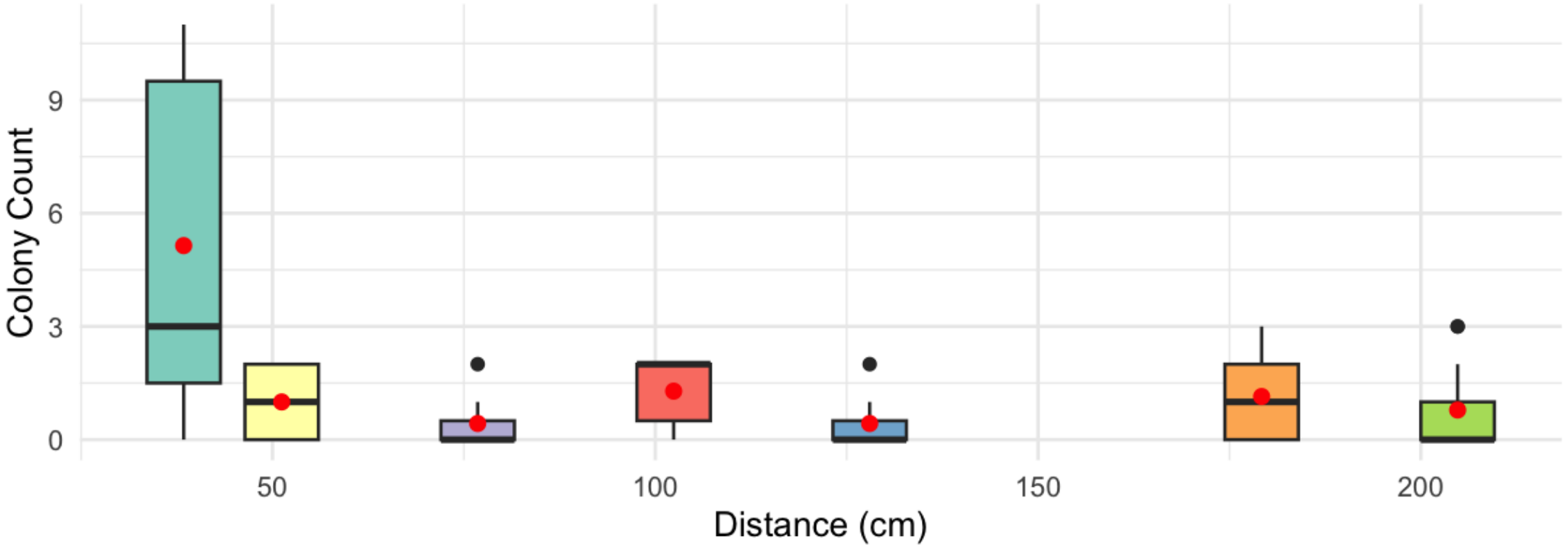
Can these spores infest soil?

Dislodge spores using a wind tunnel

- Sporulating plant as inoculum source
- Wind speed 7.5 or 4.6 m/s for 15 min
- Media plates and spore trap for capture



Spores can be dislodged in the wind



Aerial spores detected by spore traps

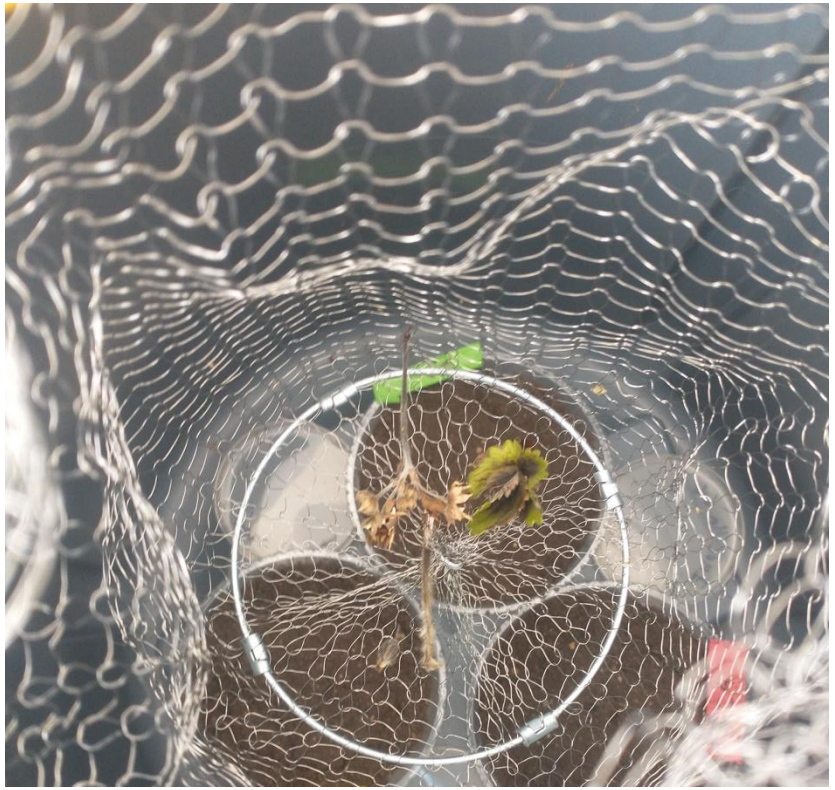
Pennsylvania State University x USDA Alliance:
Gabriel Sacher, Sharifa Crandall, Nicholas LeBlanc

Can wind disperse spores from sporulating plants?

Can these spores infest soil?

Settling tower inoculation of soil

- Treatments = Autoclaved, fumigated, or non-treated soil
- Inoculate via wind on sporulating strawberry plant
- Tracked soil infestation over time

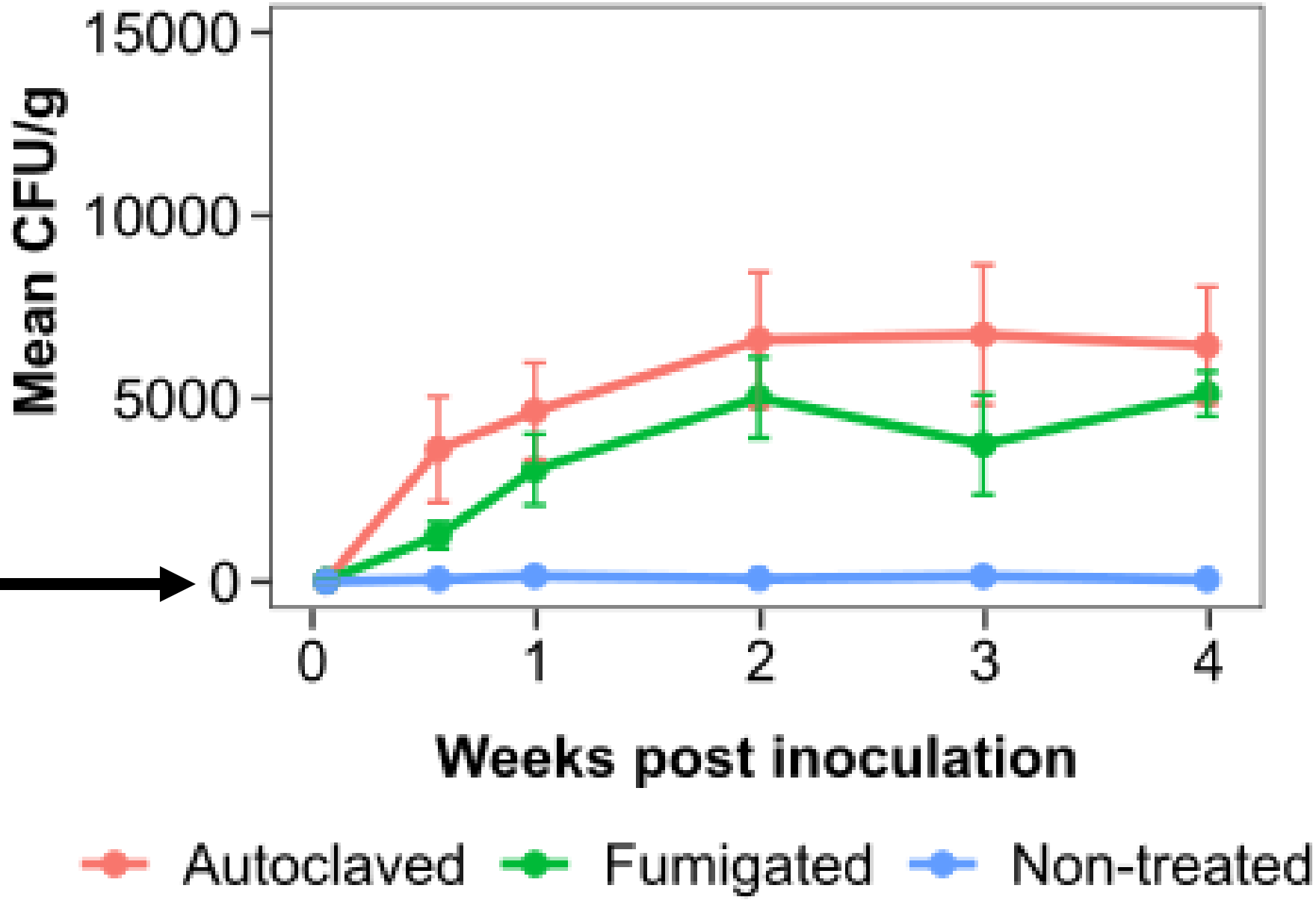


Fumigated soils are greater risk of infestation

Minimum = 1 spore per 20 cm^2

Maximum = 1 spore per 0.8 cm^2

Fumigated soils are greater risk of infestation



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Summary

- *Fof* regularly creates spores that can be aerially dispersed
- Aerial spores detected in-field and in simulated wind tunnels
- Spores can rapidly colonize fumigated soils and grow to damaging levels, even when starting inoculum is very low

Acknowledgements

Grower collaborators

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USDA ARS Agricultural Research Service

NIFA

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