Fusarium Wilt Risk Management In Tomato

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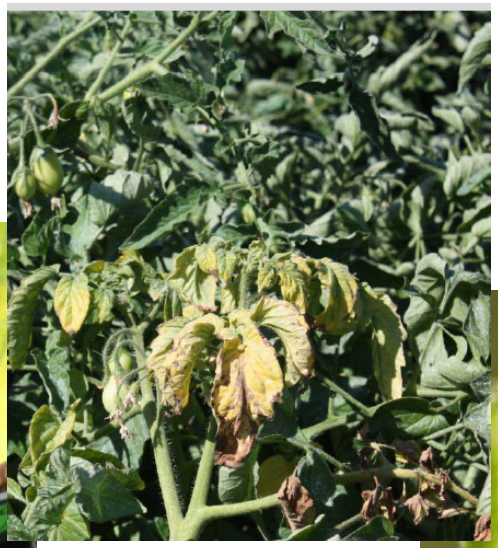
Fusarium wilt of tomato

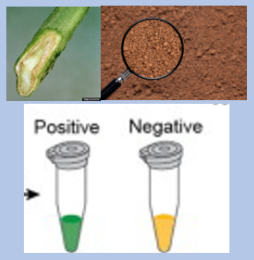
Fusarium wilt-diagnosis

Based on symptoms



Planning to develop a molecular diagnosis tool

Identify genes unique to Fol race 3 (2018)



Develop detection assay for diseased plants (2019, 2020)

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Fusarium Wilt

Fusarium oxysporum
f. sp. *lycopersici*

- Race 1
- Race 2
- Race 3

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The Fusarium wilt pathogen

Fusarium oxysporum
forme specialis
lycopersici

=

A form of *F. oxysporum* that only causes **wilt** in tomato

Other plants can become infected by the fungus, but do not develop symptoms

There are many other *F. oxysporum* strains, but none cause wilt in tomato

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Movement into new fields

- Fol race 3 is not new
  - Present in the Sutter basin many years
- Recently has spread
  - Present in Fresno Co
  - Major impacts in some fields

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To manage movement

- The main way Fol R3 is likely moving is on infested soil and plant tissue on equipment
- To manage:
  - Clean field equipment between fields
  - Especially harvesters and trailers

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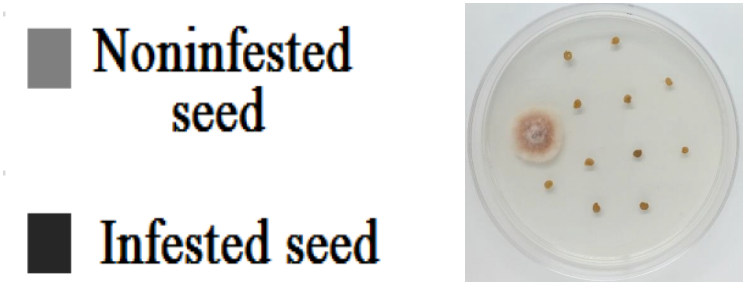
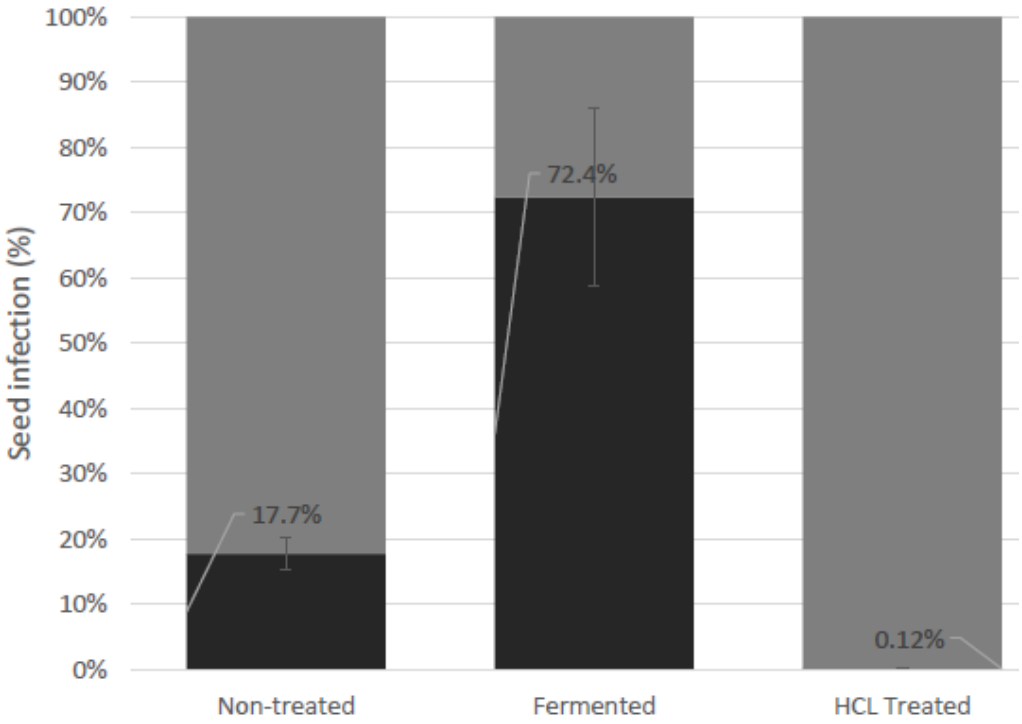
Is infected seed a pathogen source?

Fol race 3 **can** infect seed

- Looked at seeds from infected plants in the field
  - 17% of seeds infected (5,000 seeds)

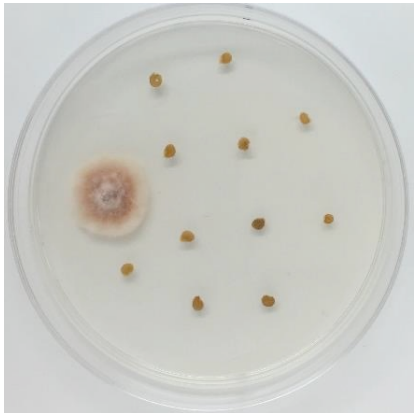




Is infected seed a pathogen source?

Is Fol R3 infesting seed lots?

- **NO. FOL R3 was NOT recovered from seed lots**
- Assayed 10,000 seed in each of 7 commercial seed lots:



Seed lot	*Fusarium* per 10,000 seeds	F. oxysporum	Fol R3? (Path Tested)
1	0	0	0
2	0	0	0
3	0	0	0
4	0	0	0
5	7	1	NO
6	0	0	0
7[z]	1	1	NO

H. Doan

Managing Fusarium wilt: F3 varieties

- Fusarium wilt race 3 resistant varieties are commercially available (FFF)
  - Not everyone can use though
  - Limited F3 seed availability
  - Reduced yields and quality of many F3 varieties

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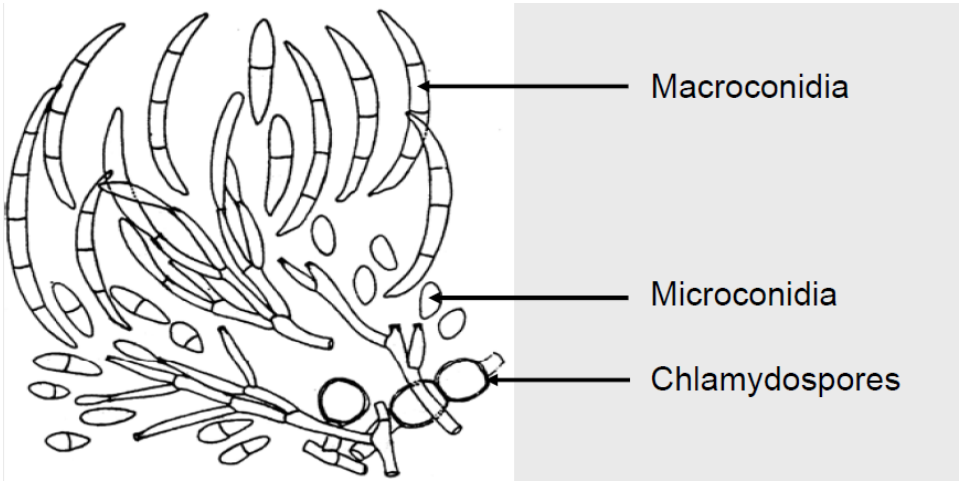
Managing Fusarium wilt:
Rotating out of tomato when Fusarium wilt develops

- Millions of spores in each infected tomato
- Produces survival spores for long term persistence in soil
- Can live off of dead plant tissue



How long can it survive in fields?

When can the field be replanted to tomato?

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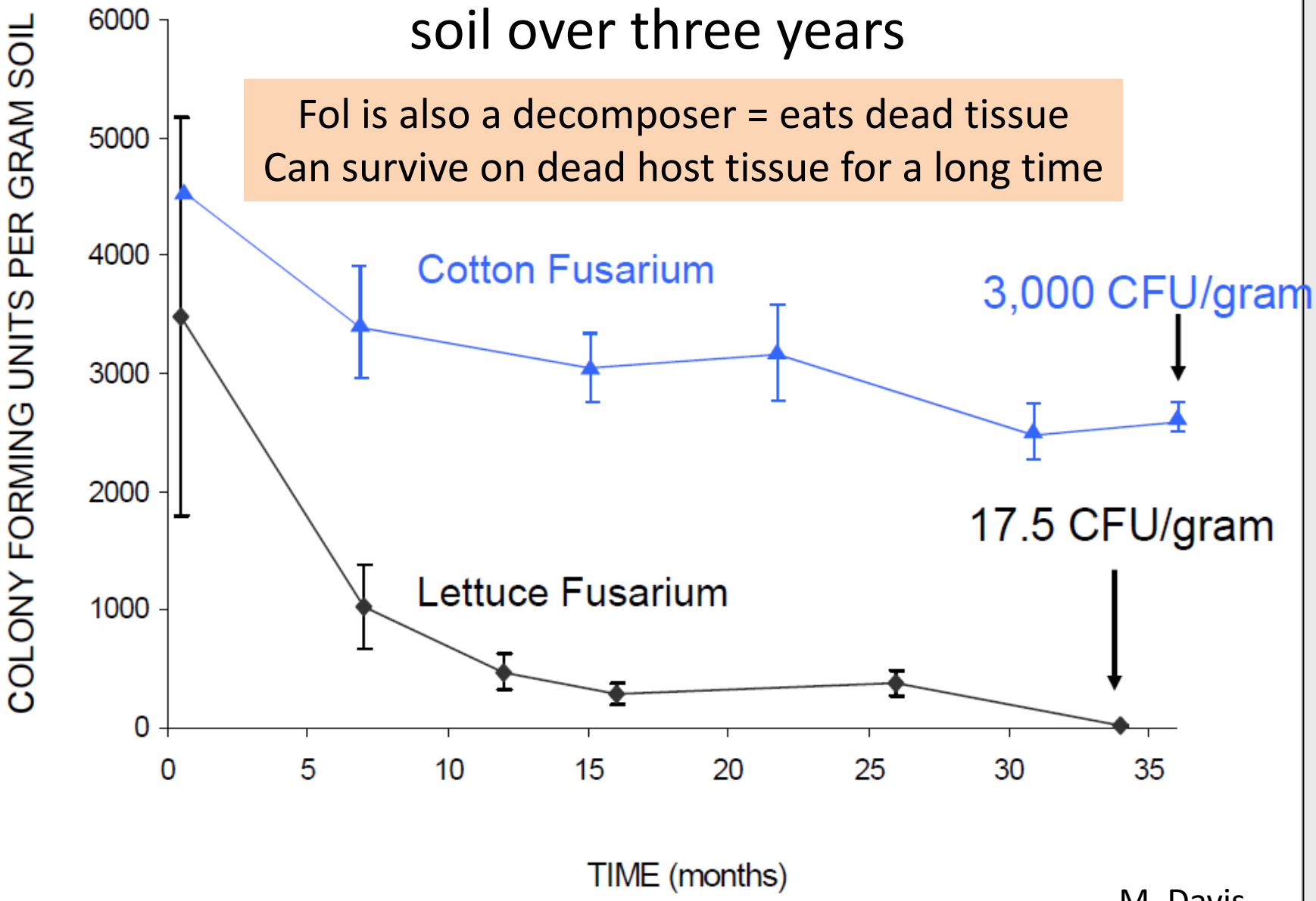
Survival of Fusarium in fallow field soil over three years

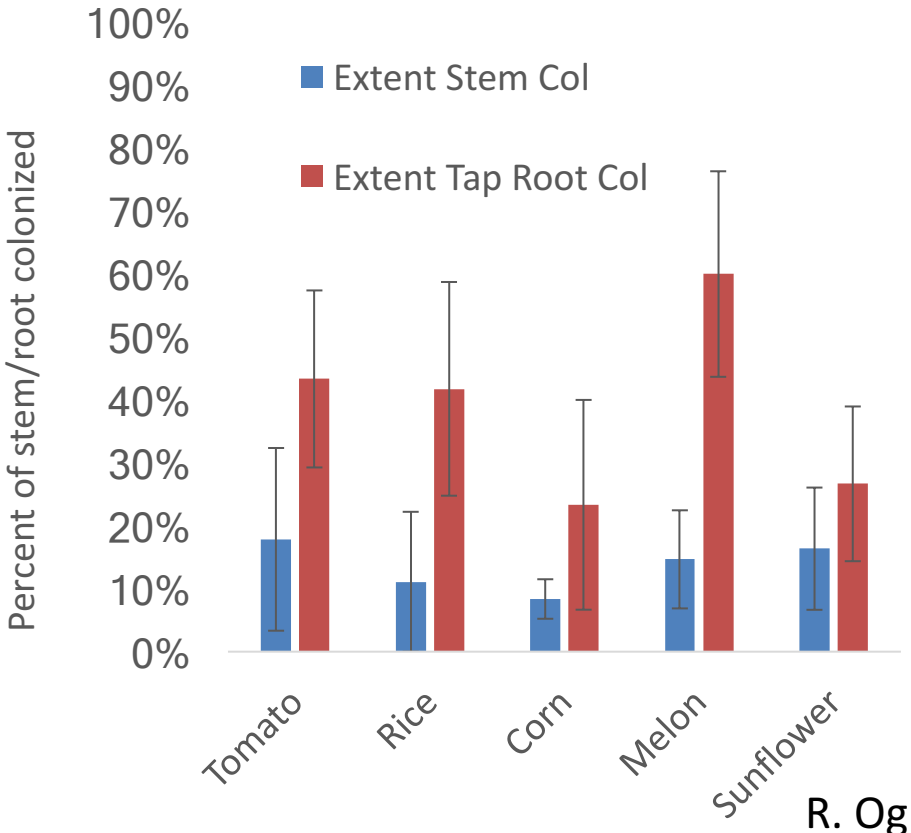
Fol is also a decomposer = eats dead tissue
Can survive on dead host tissue for a long time



M. Davis

Managing Fusarium wilt:
Rotating out of tomato when Fusarium wilt develops

- What you rotate with may be important
  - Appears able to infect other crops—working to identify
- Managing host weeds may be important
  - Working to identify weed hosts



R. Oguchi

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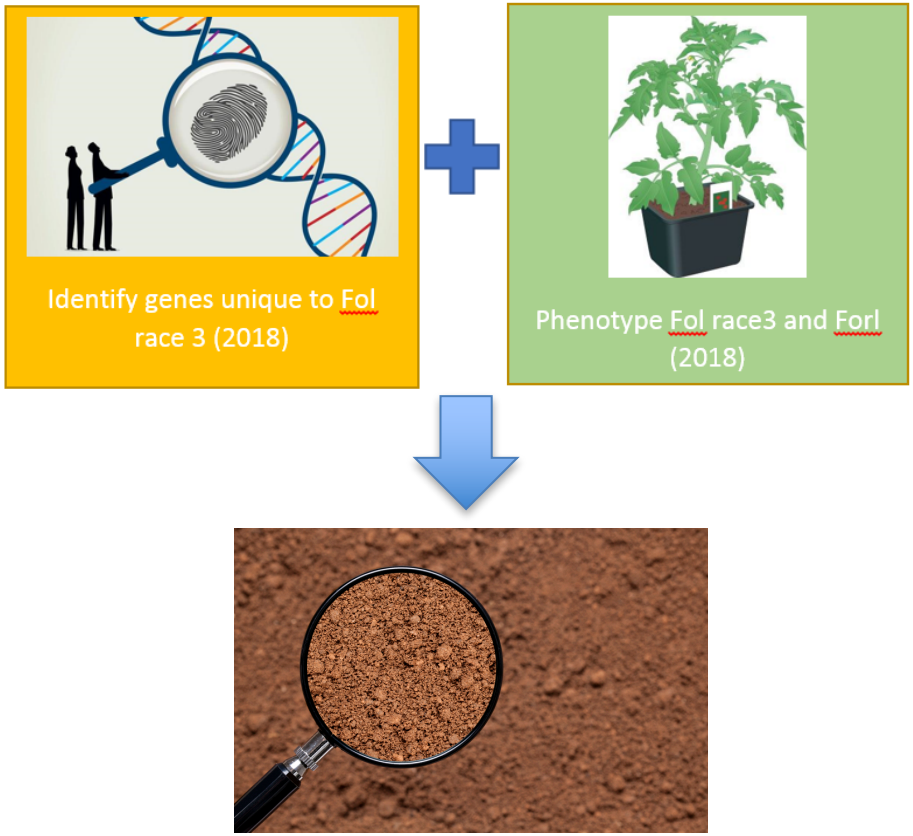
Managing Fusarium wilt:
Rotating out of tomato when Fusarium wilt develops

How can inoculum load be measured?

→ Use determine risk of planting tomato

→ Working on developing a tool to quantify inoculum loads in the soil



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Managing Fusarium wilt:
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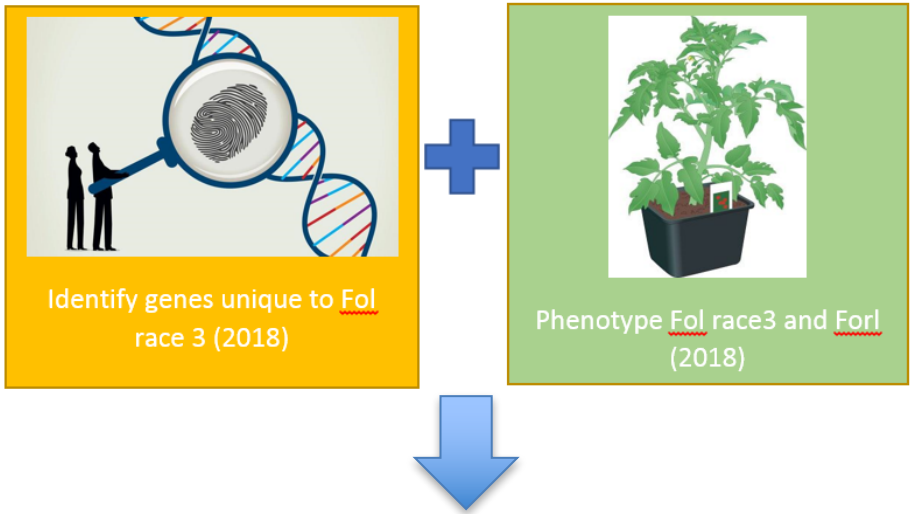

What is the target inoculum load for replanting?

→ Working to determine economically significant thresholds

→ This number likely varies based on soil environment and variety

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Environmental risks

- Certain environmental conditions may:
  - Increase Fusarium wilt development in F2 varieties at low inoculum levels
  - Stimulate disease development in F3 varieties at high inoculum levels?

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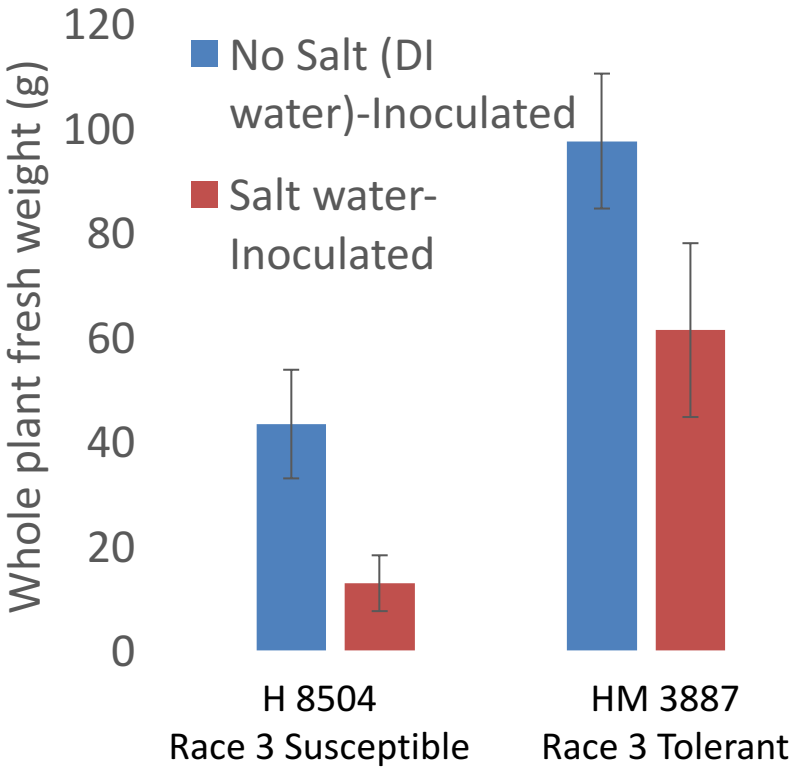
Environmental risks: salinity

Accelerates Fusarium wilt

Reduces total plant biomass



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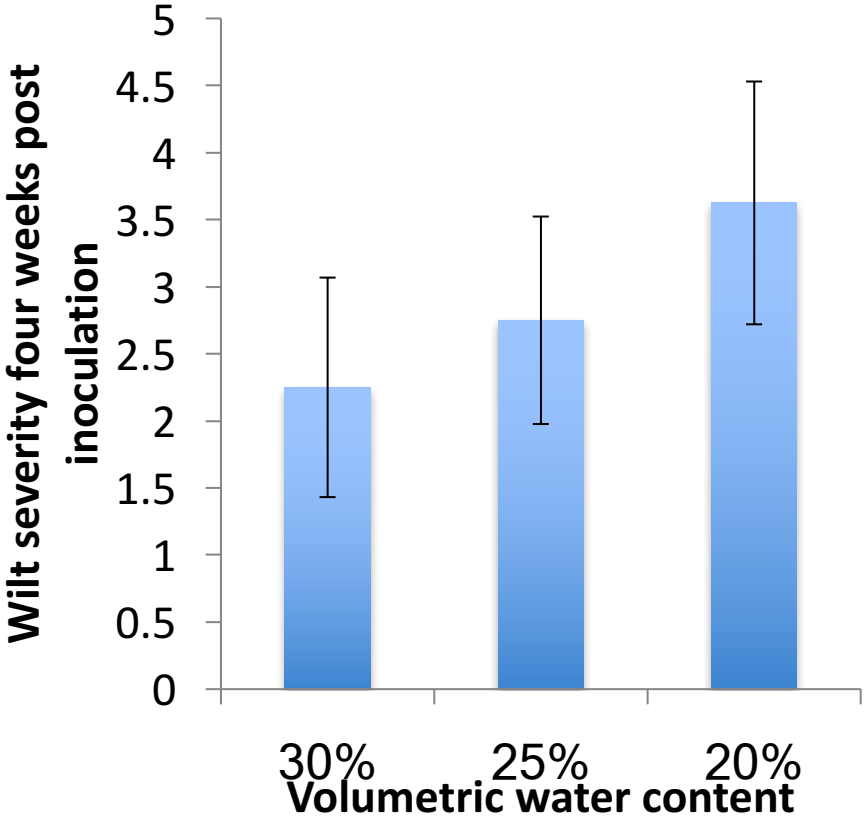
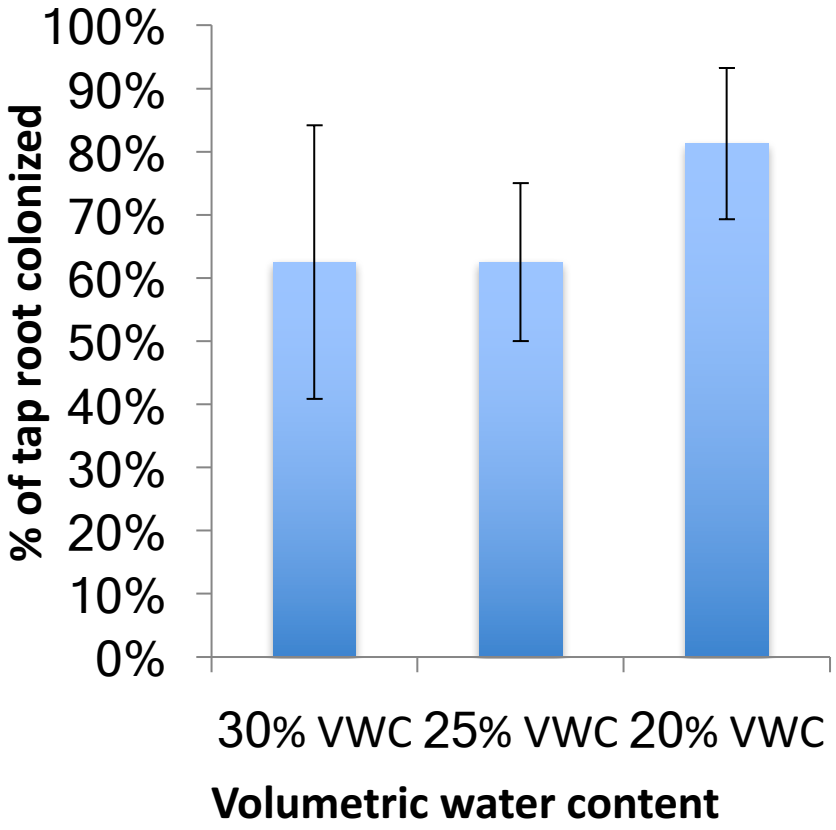
E. Hellman

Environmental risks: soil moisture and deficit irrigation

Accelerates Fusarium wilt



Increases root colonization



J. Del Castillo Múnera

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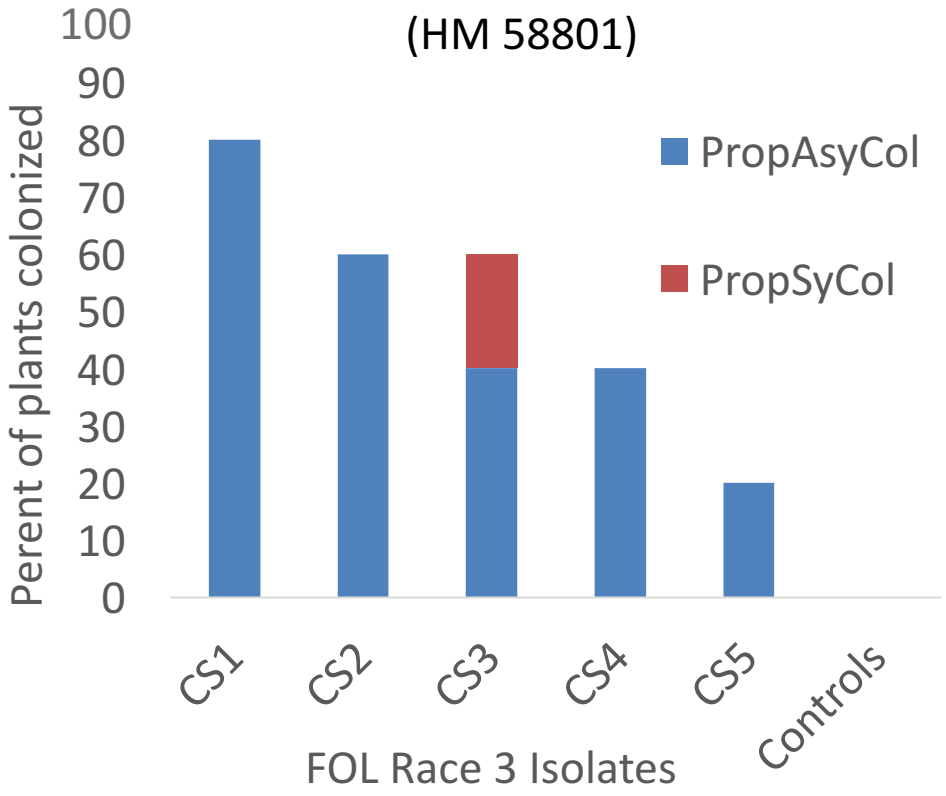
Can environmental conditions trigger disease in F3 resistant varieties?

Fol R3 can systemically colonize F3 varieties and cause disease (HM 58801)



Fusarium wilt development in a Resistant F3 variety

Currently screening F3 systemic hosts and conditions triggering disease

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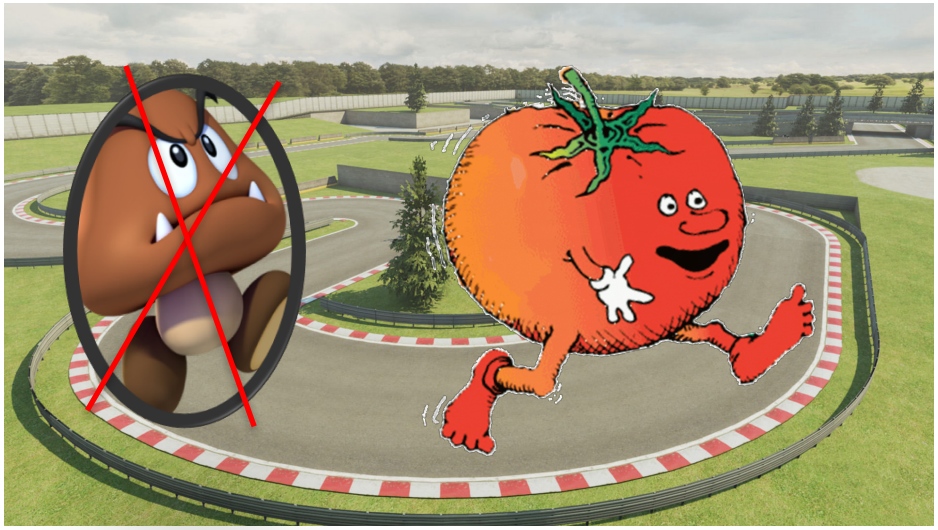
How can we reduce the risk of Race 4 emergence?

- A game of chance
- Mutations arise by chance
- The larger the FoI race 3 population, the more likely one strain will mutate
- Reducing FoI R3 population size will reduce the risk of race 4 emergence



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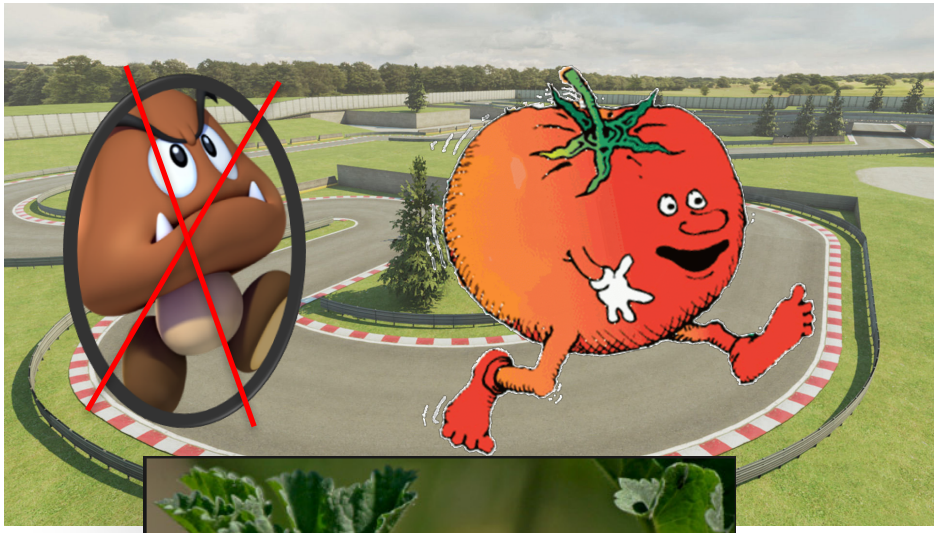
How can we reduce the risk of Race 4 emergence?

- How to reduce Fol R3 population size
  - Prevent spread within and between fields
  - Rotate with other crops that do not host the fungus
  - Manage weeds that act as inoculum reservoirs

  → Ongoing research



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Movement

- Any way plants and soil are moved
- *Probably not seed*

Fol R3 management

- Resistance
- Rotation/fallow
- Prevent spread
- Manage cryptic populations

Fol R4 risk management

- Reduce population size and spread

Thank you; questions?

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