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 Fo 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



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 University of California

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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



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



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)

Noninfested seed
Infested seed



H. Doan

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:



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



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? University of California

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

^oercent of stem/root colonized



- 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



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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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?



Environmental risks: salinity



Accelerates Fusarium wilt



Reduces total plant biomass



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Environmental risks: soil moisture and deficit irrigation



Accelerates Fusarium wilt

Increases root colonization



Can environmental conditions trigger disease in F3 resistant varieties?



Fusarium wilt development in a Resistant F3 variety



Currently screening F3 systemic hosts and conditions triggering disease

How can we reduce the risk of Race 4 emergence?

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



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
 - \rightarrow Ongoing research



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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