Non-invasive Inoculation Method of Tomato Fruit with *Geotrichum candidum*

Kate Fiedler, Steve Rideout
Virginia Tech
Eastern Shore AREC, Painter, VA

kfiedler @ vt.edu
www.facebook.com/vtesarecpp

Outline

- Introduction and Objective
- Proposed Vacuum Method
- Validation of Non-invasive Method
- Results & Comparison to Established Method
- Future Use and Testing

Tomato Sour Rot

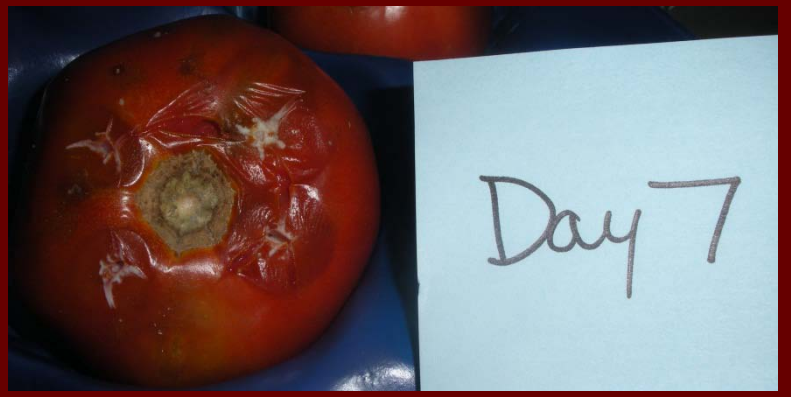
- *Geotrichum candidum* is the causal agent of sour rot in tomato fruits
- Saprophytic “yeast-like” organism
- Major losses in-field and particularly postharvest
- Disease can proliferate in cold room storage conditions (55°F)
- Larger outbreaks are seen as a result of fall harvests characterized by significant rainfall events, heavy fogs, and fluctuating temperatures.

Sour Rot Control and Suppression

- Currently there are no in-field treatments to control sour rot infections
- Limited postharvest treatments
  - Harvest when plants and fruit are dry
  - Follow correct postharvest sanitation protocols
  - Use of propiconazole (Expected label in near future)
    - Effective when tested with wounding method
- Research needed to better understand pathosytem in hopes of improving disease control

Past Screening Methodology for Efficacy on Tomato Sour Rot

- Punch 4- 2.0mm holes on shoulders of tomato fruit
- 0.02 mL conidial suspension of *G. candidum* (10^6 spores/mL) inserted into holes using a pipette
- Incubate at 55°F with 80% relative humidity



Need for New Inoculation Methodology?

- Current screening techniques do not reflect natural fruit infections.
- Wounding methods to infect may change the response to postharvest treatments and other experimental procedures.

Proposed New Infiltration Method

1) Disinfect fruit and stem scar
   - Swab with 70% alcohol
2) Apply surfactant and let sit for 5 minutes
   - Silwet-77
3) Pipette spore suspension (10^6 spores/mL) onto stem scar

Proposed New Infiltration Method

4) Put in vacuum chamber

5) Place -0.01 MPa pressure on fruit for 2 minutes

6) Release vacuum for 1 minute, repeat 2x more

7) Incubate at 55°F with 80% relative humidity

New Infiltration Method (cont.)

- Spore suspension infiltrates fruit due to unequal pressures (inside vs. outside)
- There is enough pressure to be pulled into fruit below the stem scar
- Inner fruit → Ideal environment for pathogen growth:
  - Moist
  - Dark
  - Nutrients available

Experiment 1: Testing the Utility of Surfactant

- *Stem scars are dry and have high surface tension, which can inhibit the entrance of liquids.*
- *Does adding a surfactant before inoculation increase the infection rate with the vacuum inoculation method?*

- Tomatoes swabbed with surfactant or left dry before applying spore suspension.
- Vacuum inoculation methods followed as stated previously.

Experiment 2: Comparing Wounding and Vacuum Methodology

- Tomato fruit inoculated by either wound or vacuum methods.
- Compare total number of infected fruit and time for symptoms to develop.

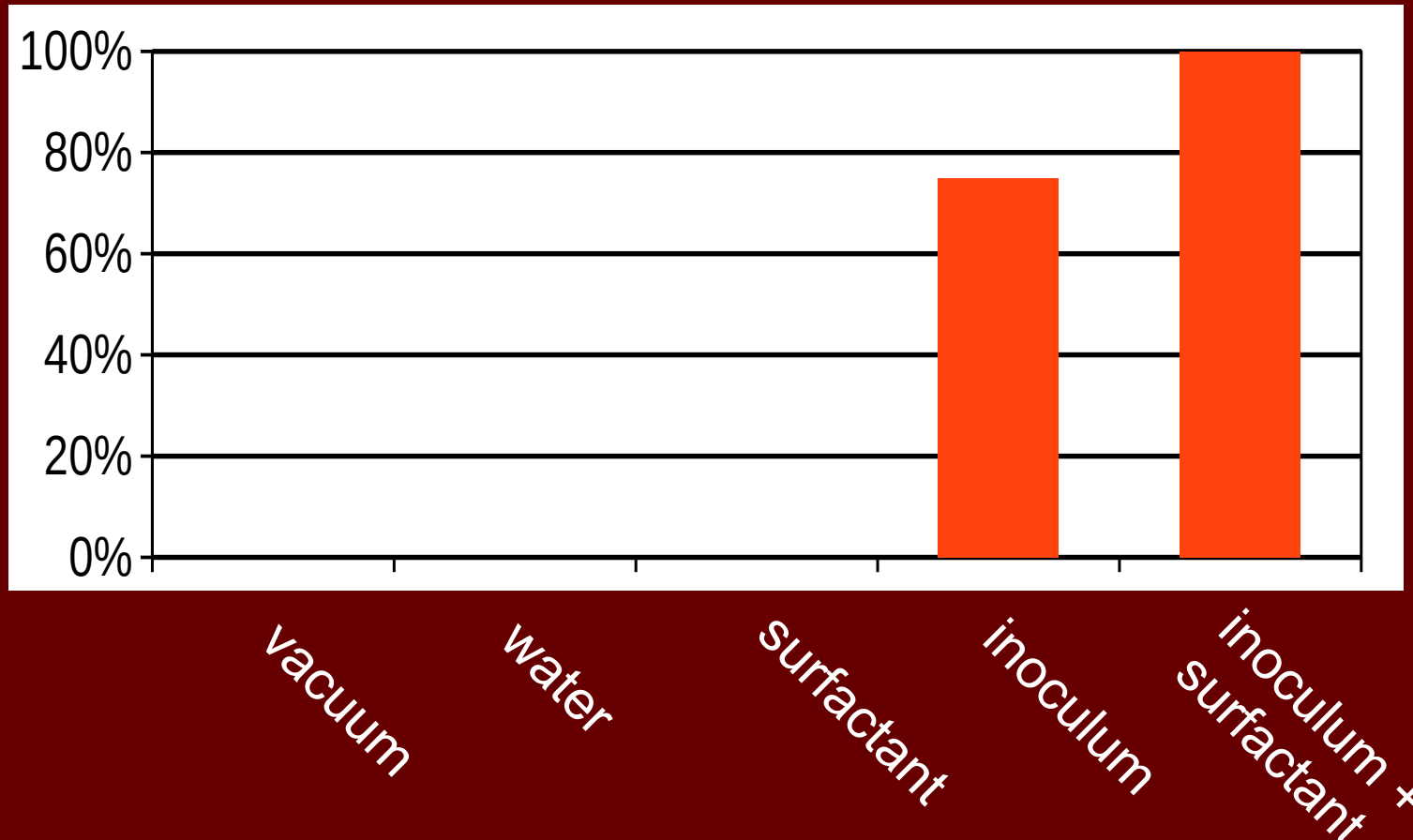
Experiment 3: Vacuum method on fruit developmental stages

- *There are difficulties infecting non-red tomatoes for research purposes.*
- *Will vacuum inoculation be more successful at infecting fruit with sour rot?*

- **Red**, breaker (**green** turning **orange**), and **green** tomatoes inoculated using vacuum procedure.
- Rate of infection and total number of fruit infected compared to data from previous studies.

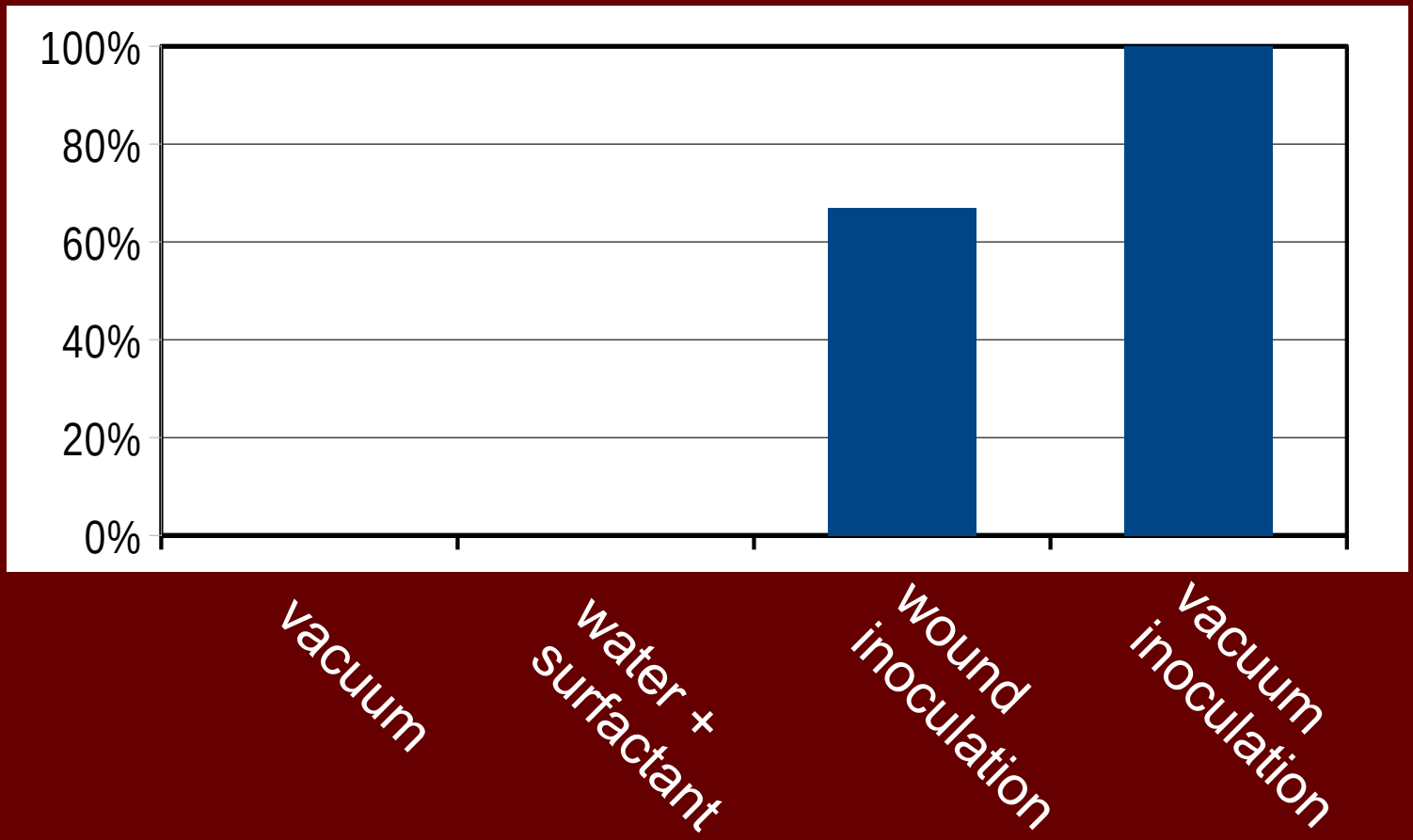
Results: Experiment 1

Resulting infected fruit from vacuum pressure inoculation with and without surfactant (breaker stage fruit).



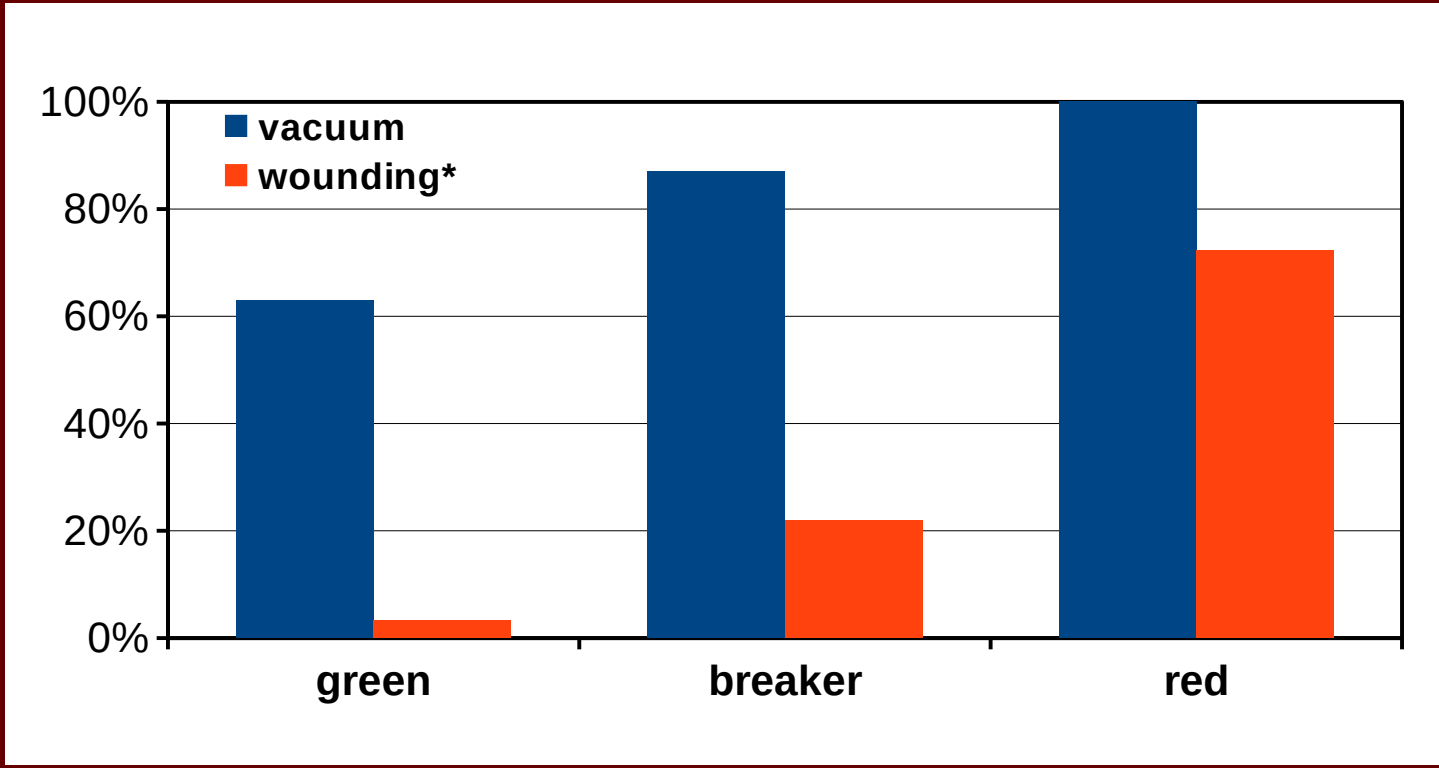
Results: Experiment 2

Resulting infected fruit from wound and vacuum inoculation (breaker stage fruit).



Results: Experiment 3

Resulting infected fruit from vacuum and wounding inoculation on 3 growth stages of tomato fruit.



*data from wound inoculation of different stages of tomato development from previous study, Steve Rideout, Virginia Tech.

Preliminary Conclusions

- Vacuum inoculation better simulates the physiology of in-field sour rot infections.
- Using surfactant can reduce surface tension from old stem scars to increase infection rates.
- Vacuum inoculation has a higher incidence of infection than wound inoculated fruit.
- Vacuum inoculation results in more infection in green, breaker, and red stages of fruit development than wound inoculation.

Goals for Future Studies

- Investigate efficacy of postharvest chemicals used against sour rot infections using vacuum inoculation versus wounding.
- Use vacuum inoculation to determine susceptibility differences among varieties to *G. candidum.*

Acknowledgments

Committee Members:

Jerry Bartz, University of Florida

Anton Baudoin, Virginia Tech

Rob Williams, Virginia Tech

Mike Bledsoe, Village Farms

Richard Davis, Six L's

Gary Vallad, University of Florida