Overview

- Food Safety Modernization Act
- Recent work on indicators in the field

FSMA

- January, 2012...

Focus on Water and Soil Amendments

Framework for Developing Research Protocols: Evaluating Microbial Hazards and Controls During Production That Pertain to the Quality of Agricultural Water Contacting Fresh Produce That May Be Consumed Raw

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Study Objectives

- Evaluate the fate of coliforms and E. coli sprayed onto oranges if low microbial quality water is used.
  - Ca. 6 log CFU/ml coliform water
  - 1,000,000 cells per ml
  - Sensitive method of recovery
  - Allows us to detect 1 E. coli cell/10 oranges

  Four harvest dates; all Valencia
  - March, April, May and June 2012
Study Methods

Six trees were selected.

Three replicates of 10 oranges each are collected from each tree.

Three trees were sprayed with low quality water.

Three replicates of 10 oranges each are collected from each tree.

Harvested fruit are brought into the lab.

Populations of coliforms and E. coli are enumerated from the surface initially by surface plating onto E. coli/colliform chromagar.

Finally using Most Probable Number E. coli/colliform enrichments.

Samples are collected immediately and 2 and 6 h following spraying.

Samples collected until E. coli is no longer detectable by enrichment on 2 subsequent samples (if there is enough fruit on the tree).

Weather data were monitored.
March 2012

Take away message:
First trial, learning experience, only run for 6 days due to miscommunications.

April 2012

Take away message:
E. coli populations detectable at day 12, but undetectable beyond day 17.

April 2012

Take away message:
E. coli populations detectable at day 12, but undetectable beyond day 17.

May 2012

Take away message:
E. coli populations undetectable at day 8, detectable days 10 and 13, undetectable at day 15.
May 2012

Take away message:
E. coli populations undetectable at day 8, detectable days 10 and 13, undetectable at day 15.

June 2012

Take away message:
Slow decline, Significant E. coli increases on day 2 and 3, rain/high humidity through day 6, detectable populations at day 16, no detectable populations at day 23.

Comparison to other work

Evaluate the fate of E. coli on grapefruit leaves.
- Ca. 7 log CFU/ml E. coli
- 10,000,000 cells per ml
- Sprayed onto leaves (10 leaves copper canker treatment; 10 leaves water), repeated 3 times
- Stored 48 h at room temperature, ambient relative humidity
- Recovery Method
  - 1 leaf into 99 ml buffer, spiral plated onto EMB
  - Limit of detection 3 log CFU/leaf

Comparison to other work

No E. coli detected on grapefruit leaves after 48 h.
- None detected with canker copper spray
- None detected with water spray
Comparison to other work

Summary of E. coli counts in 4 field trials, March, April, May, and June, 2012

Comparison to other work

Similar to Narciso et al., all counts were below 3 log CFU within 48 h.

Summary

- Initial declines in E. coli populations are rapid when %RH fluctuates over the course of the day
- Similar results seen in field trials for lettuce and leafy greens
- Within 48 h, populations decreased to less than 3 log CFU/fruit
- Similar to Narciso et al., 2012 on Grapefruit leaves
- In April and May, by 48 h populations less than 1 E. coli cell per fruit (0 log CFU/fruit)
- In June, relative humidity had less fluctuation, and counts remain higher
- Influence of Rain
  - Higher counts/detection after rainfalls
  - Rates of population decline slower

Next Steps

- Repeat experiments September/October – May/June
  - Influence of cool weather, lower RH

Questions Remaining

- How high should initial inoculum be?
  - 3, 4, 5, 6, 7 log CFU/ml?
- What is appropriate endpoint? Limit of detection?
- Influence of Copper or other foliar sprays?

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Questions?