




Fate of Indicator Organisms on Orange Trees in the Grove

Michelle D. Danyluk and Tim Spann
2012 Packinghouse Day and Indian River Postharvest Workshop
August 23 and 24, 2012


Overview

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



FSMA

- January, 2012...



FSMA

Preharvest	Postharvest
<ul style="list-style-type: none"> ● Soil amendments ● Air and Wind ● Wild & Domestic Animals ● Water ● Human Handling 	<ul style="list-style-type: none"> ● Contaminated containers ● Unclean storage facilities ● Transport vehicles ● Human handling ● Cross contamination


(1) Ch. IV. Outbreaks Associated with Fresh and Fresh-cut Produce. FDA. Updated April 12, 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

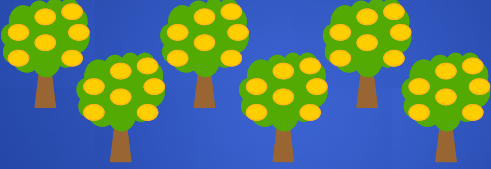
Linda Harris, Jeffrey Bender, Elizabeth Bihn, Tyann Blessington, Michelle Danyluk, Pascal Delaquis, Lawrence Goodridge, A. Ibekwe, Sanja Ilic, Kalmia Kniel, Jeffrey LeJeune, Donald Schaffner, Don Stoeckel, and Trevor Suslow



Study Objectives

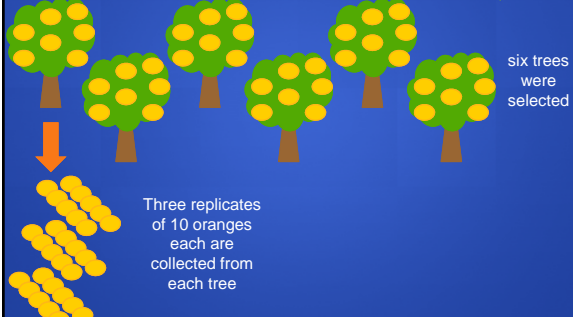
- Evaluate the fate of coliforms and *E. coli* sprayed onto oranges if low microbial quality water is used.
 - Ca. 6 log CFU/ml coliform water
 - 1,000,000 cells per ml!
 - Sensitive method of recovery
 - Allows us to detect 1 *E. coli* cell/10 oranges
- Four harvest dates; all Valencia
 - March, April, May and June 2012

Study Methods



six trees were selected

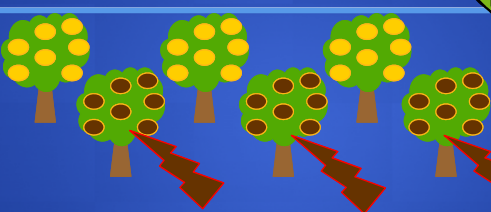
Study Methods



six trees were selected

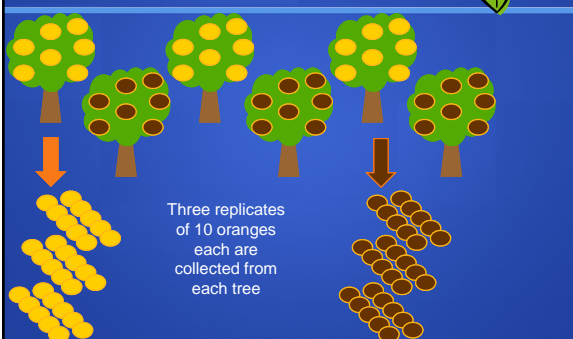
Three replicates of 10 oranges each are collected from each tree

Study Methods



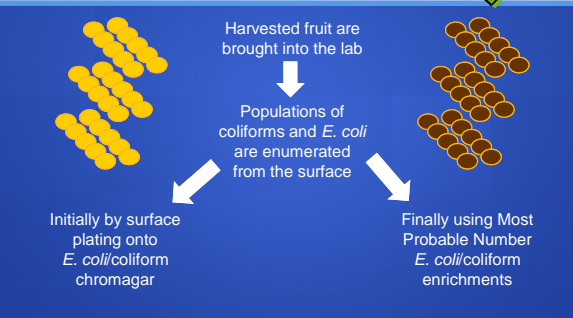
Three trees were sprayed with low quality water

Study Methods



Three replicates of 10 oranges each are collected from each tree

Study Methods



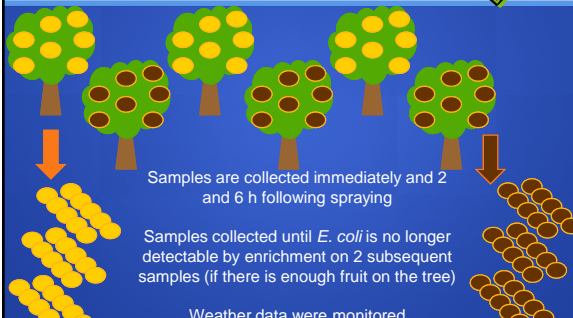
Harvested fruit are brought into the lab

Populations of coliforms and *E. coli* are enumerated from the surface

Initially by surface plating onto *E. coli*/coliform chromagar

Finally using Most Probable Number *E. coli*/coliform enrichments

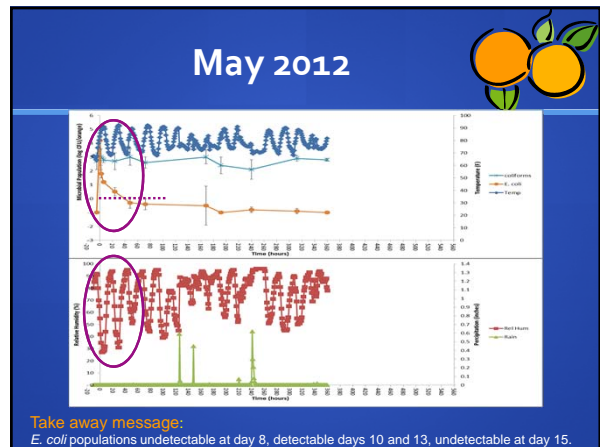
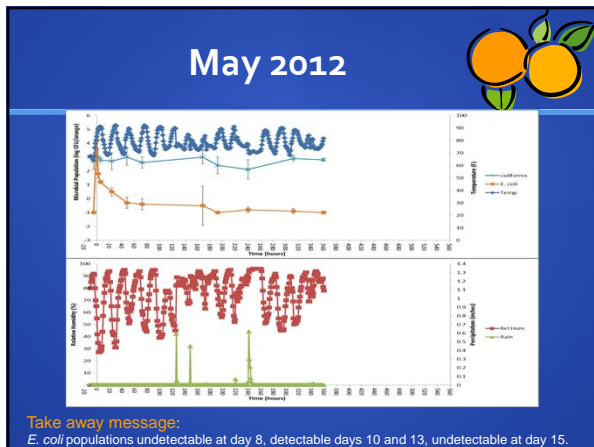
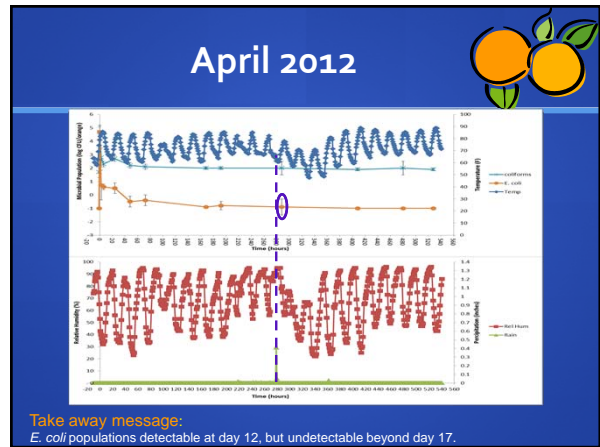
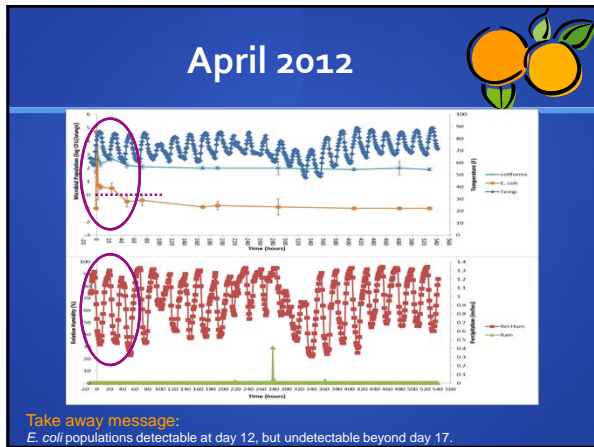
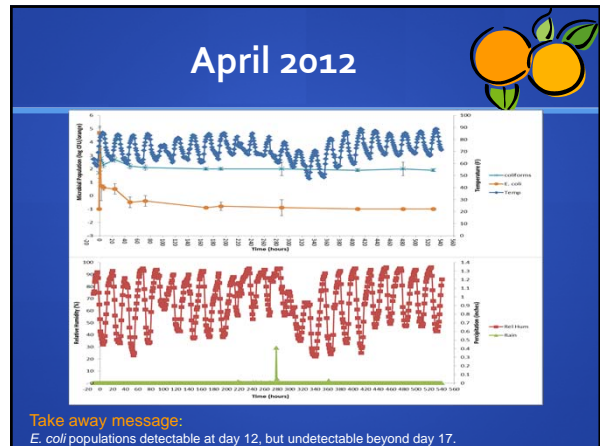
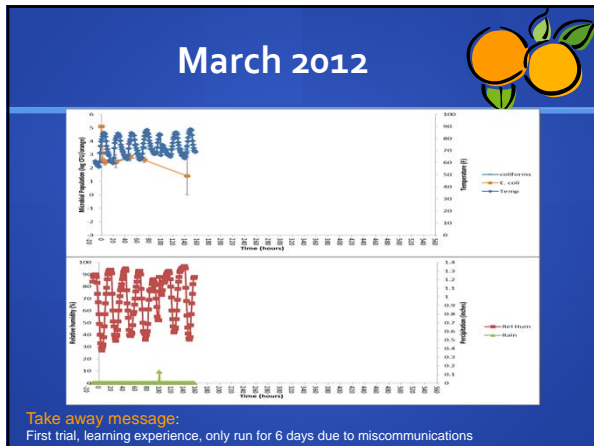
Study Methods

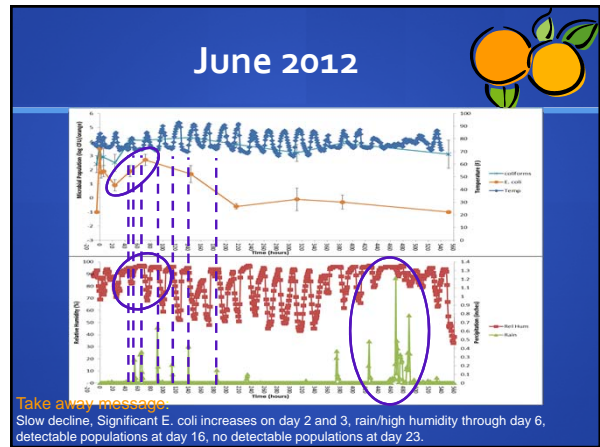
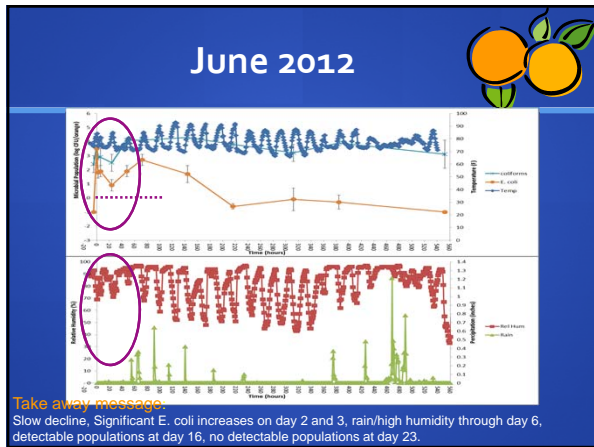
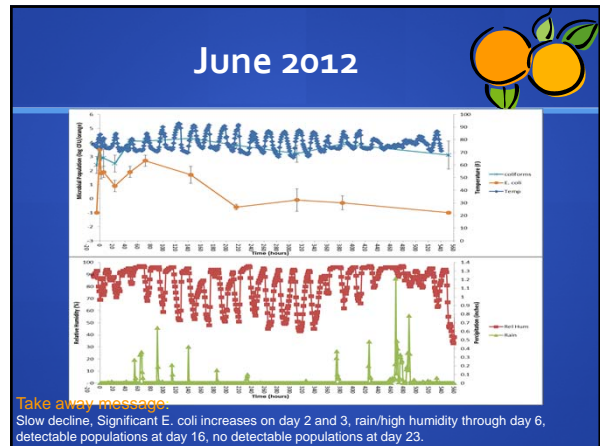
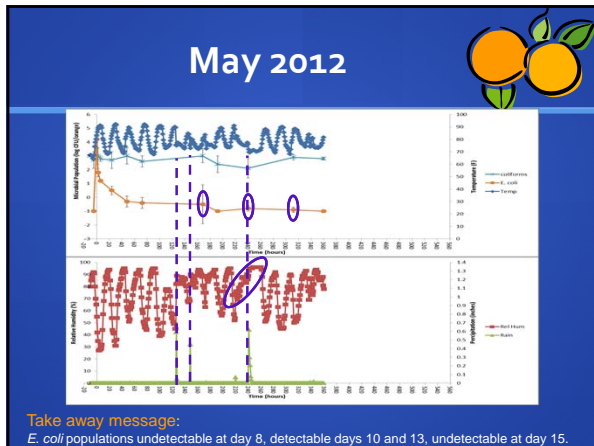


Samples are collected immediately and 2 and 6 h following spraying

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





Comparison to other work

Journal of Applied Microbiology

Letter in Applied Microbiology ISSN 0268-0254

ORIGINAL ARTICLE

Effect of copper hydroxide sprays for citrus canker control on wild-type *Escherichia coli*

J.A. Narciso¹, C.M. Ference¹, M.A. Ritenour² and W.W. Widmer¹

¹ USDA-ARS, US Horticultural Research Laboratory, Citrus and Subtropical Laboratory Unit, Fort Pierce, FL, USA
² Institute of Food Sciences, University of Florida, FL, USA

- 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

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- 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 end point? Limit of detection?
 - Influence of Copper or other foliar sprays?

Acknowledgements

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 - Lorrie Friedrich, Gwen Lundy, Luis Martinez, Dennis Cornelio
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Questions?