

Bacterial Wilt and Blueberries

Jason Hong

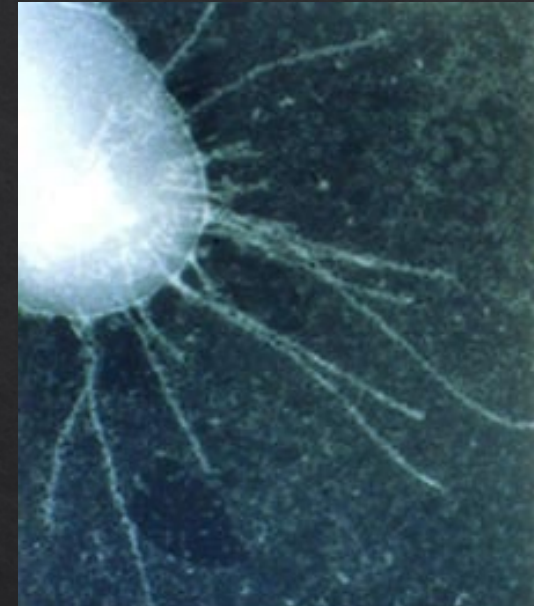
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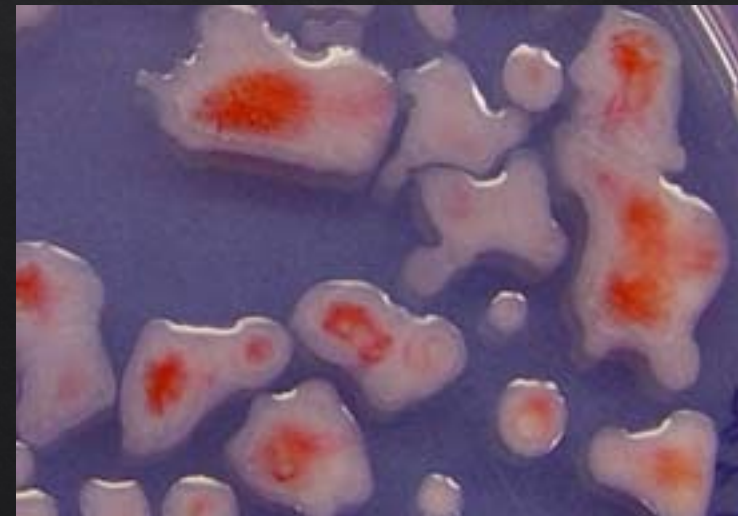
7/15/26

Causal Agent

- ◇ *Ralstonia solanacearum* (RS)
- ◇ Gram (-) rod
- ◇ 0.5-1.5 μm in length
- ◇ Polar flagellum
- ◇ Pathogenic colonies appear smooth, shiny and opalescent
- ◇ Disease occur mostly in tropical sub-tropical regions



http://www.genomenewsnetwork.org/gnn_images/news_content/02_02/ralstonia/ralstonia.jpg



Sign



Background

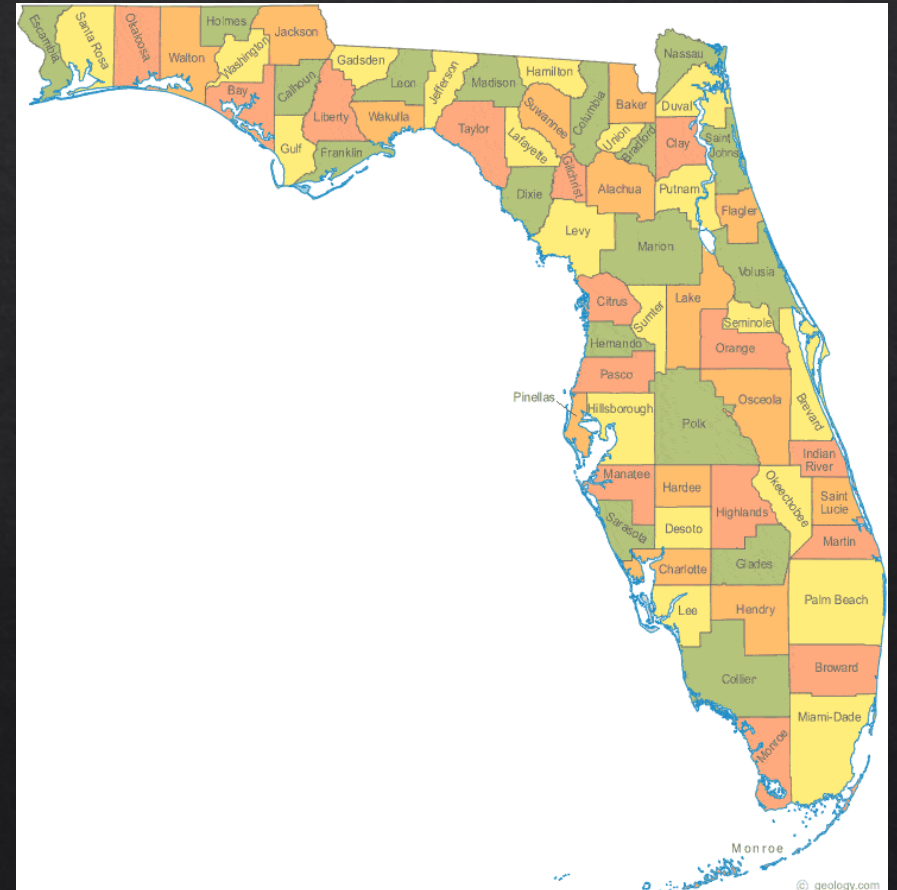
- ◆ *R. solanacearum* was first isolated from potato by Burrill in 1890
- ◆ Smith isolated the pathogen from other hosts 1896
- ◆ Suspected to be native to FL
- ◆ Agricultural Bioterrorism Act of 2002
- ◆ Estimated to infect 200-400 different plants

Background

- ◆ “The disease is not indigenous to Florida, I think, is evident from the fact that it rarely occurs in new portions of the state until after vegetables have been grown for two to three years. (P. Rolfs, Fla. Agr. Expt. Sta. Bul. 1898)”

Background

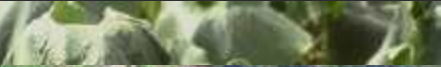
◆ It was later observed that the disease was severe in land cleared from virgin forests, indicating that the RS was naturally found in Florida soils (Sherbakoff, 1920).



Symptoms

- ◊ Wilting
- ◊ Stunting
- ◊ Yellowing
- ◊ Adventitious root formation





Bacterial wilt



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nger.php&h=336&w=448&sz=67&hl=en&start=3&um=1
&prev=/images%3Fq%3Dbacterial%2Bwilt%2Bginger%26



Bacterial wilt on tomato



Bacterial wilt o

<http://www.iita.org/cms/articlefiles/228-image3661.jpg>

Bacterial wilt on banana

Bacterial wilt on ginger

SOURCES OF INOCULUM



Machines



Irrigation water



Stakes



Soil



Weeds

Bacterial wilt at USDA Research Farm

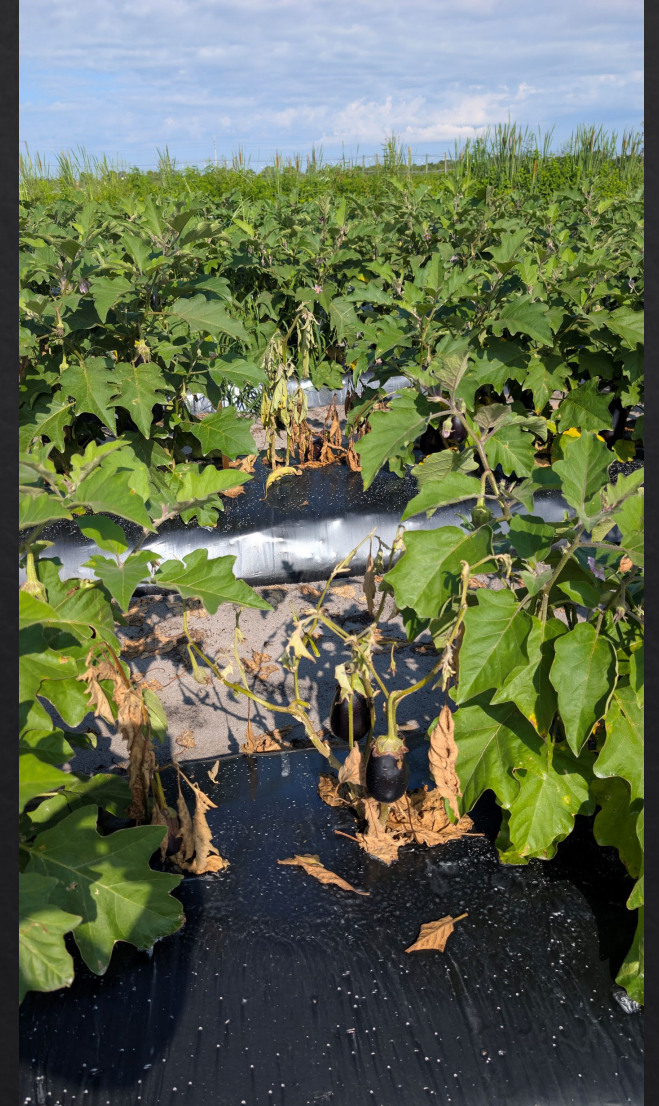


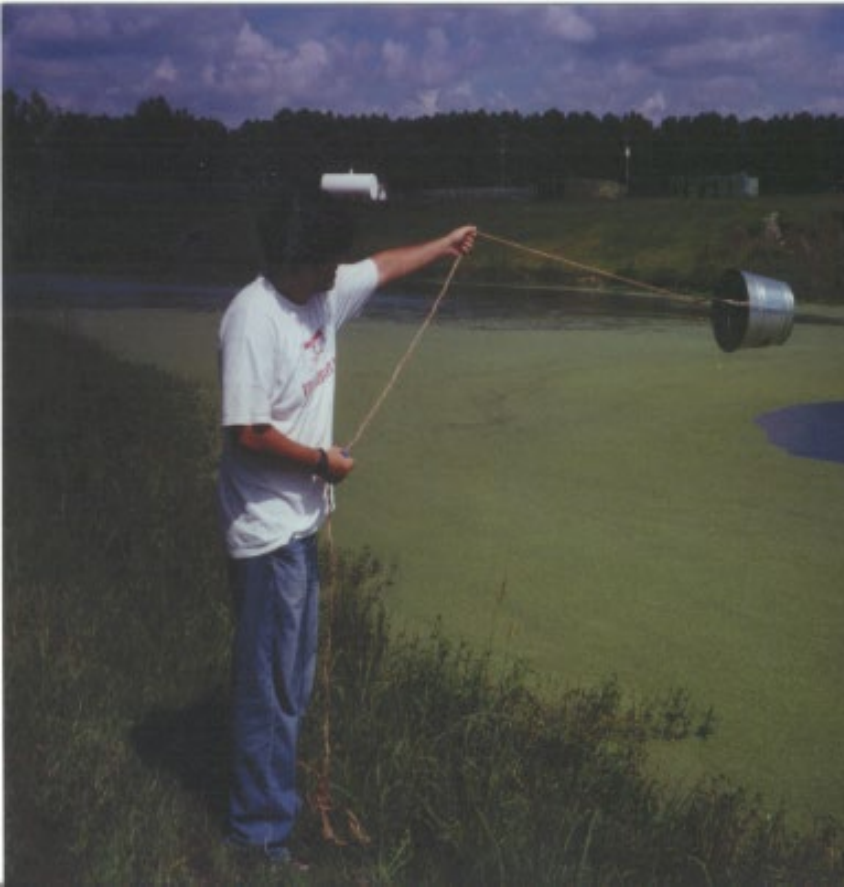
Tomato

Eggplant

Zucchini

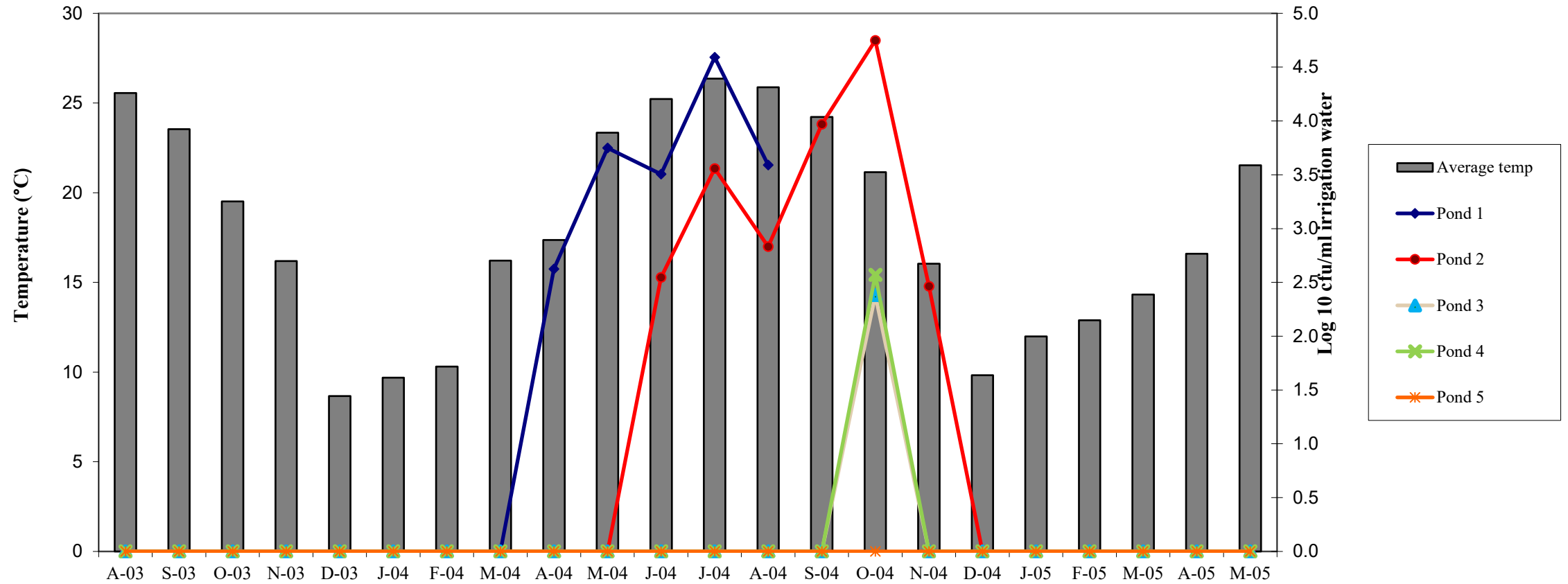
Watermelon





Ralstonia solanacearum in irrigation ponds

R. solanacearum in irrigation ponds



Background Repeated

- ◆ “The disease is not indigenous to Florida, I think, is evident from the fact that it rarely occurs in new portions of the state until after vegetables have been grown for two to three years. (P. Rolfs, Fla. Agr. Expt. Sta. Bul. 1898)”
- ◆ Build up of the RS in the soil.
 - ◆ For tomatoes
 - ◆ 100 cells in 1 ml of soil
 - ◆ No death
 - ◆ 10,000 cells in 1 ml of soil
 - ◆ Possible death end of season
 - ◆ 1,000,000 cells in 1 ml of soil
 - ◆ Complete death in 2-4 weeks
 - ◆ Streaming



UW2

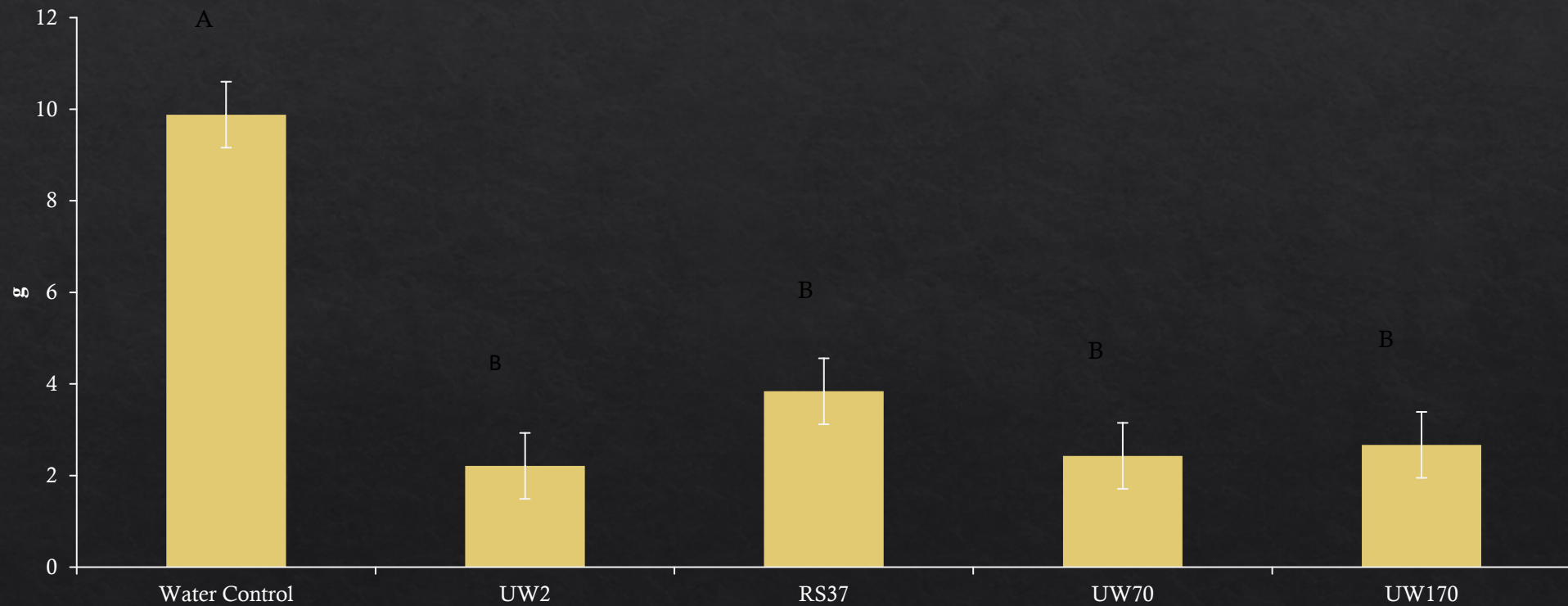
RS37

RS5

Water
Control

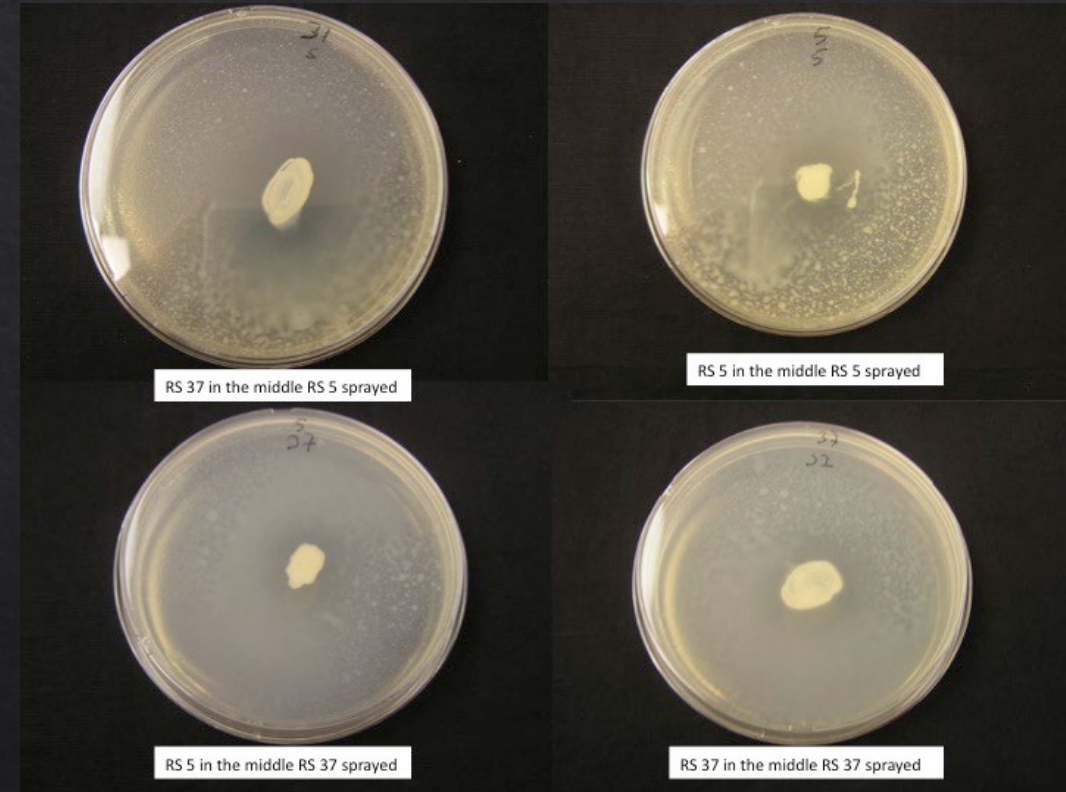
Biodiversity: Exotic Strain

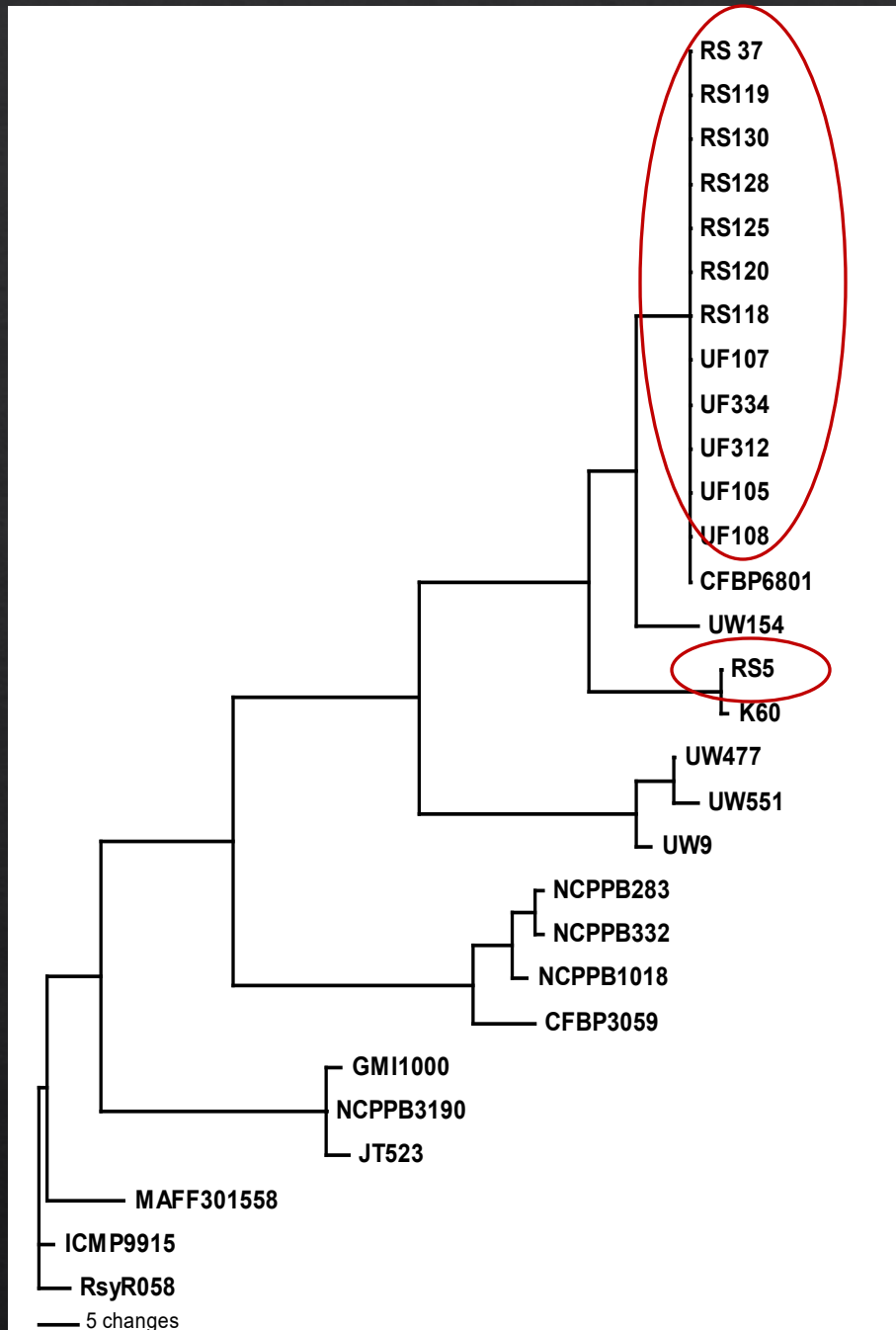
Weight of Banana Roots *Musa Dwarf Namwa* root mass Race 2 strains and RS37



Exotic Strain *R. solanacearum*

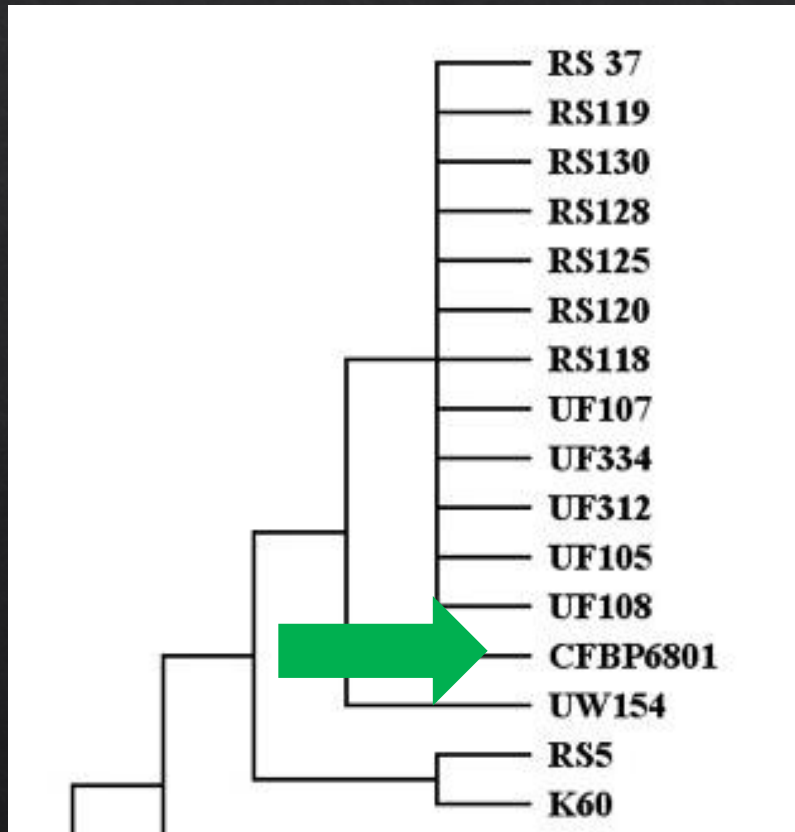
- ◆ RS37 originated from Caribbean caused problems for a greenhouse in Quincy, FL
- ◆ Phylogenetic analysis showed that it not related to native FL strains
- ◆ The only strain collected from irrigation ponds
- ◆ More aggressive on tomato than FL strains





- ◇ Sequencing is based on the *egl*
- ◇ 3 different phylogenetic analysis resulted in the same tree

Biodiversity: Exotic Strain



- ◇ CFBP6801 isolated from Martinique (Wicker, 2007)
- ◇ Reported this strain was more aggressive
- ◇ Causes wilt symptoms on cantaloupe, watermelon, and pumpkin
- ◇ Non-pathogenic on triploid banana (NPB) but can be detected

APPROACHES FOR MANAGEMENT OF BACTERIAL WILT

1) Use of host resistance

Moderately resistant cultivars

SAR inducers:

Actigard: foliar spray + soil drench

2) Reductions of soil inoculum

Stubble-Aid: soil treatment

Cover crops: sorghum-sudan, rye



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RESEARCH ARTICLE

Anaerobic soil disinfestation rather than *Bacillus velezensis* Y6 inoculant suppresses tomato bacterial wilt by improving soil quality and manipulating bacterial communities

Taowen Pan^{1 2 3} , Yulin Chen^{1 2 3}, Sicong Li^{1 2 3}, Lei Wang^{1 2 3}, Joji Muramoto⁴, Carol Shennan⁴, Jihui Tian^{1 2 3}, Kunzheng Cai^{1 2 3}



Symptoms on Blueberries



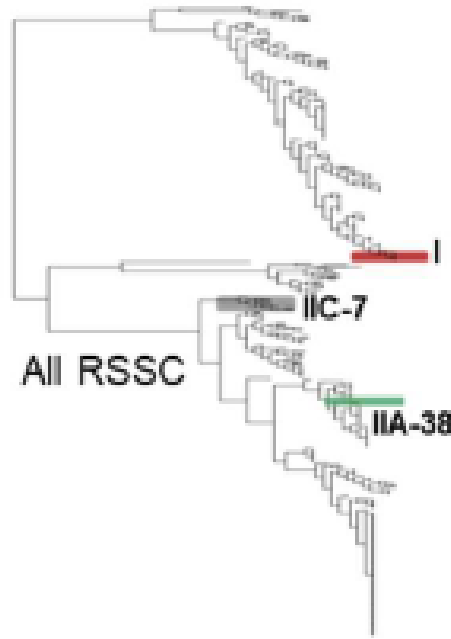
Florida Blueberry
(2016, 2017, 2023)



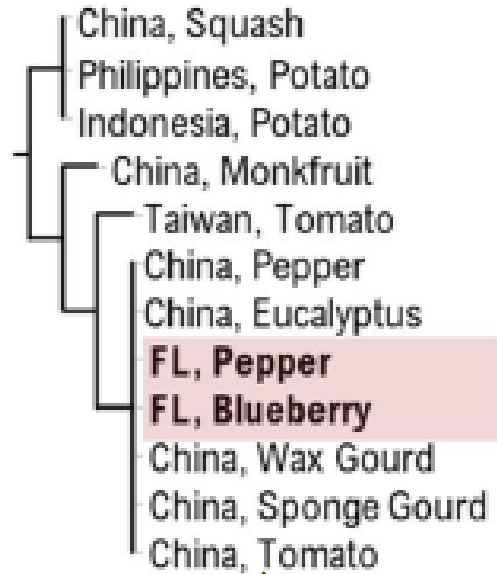
Florida Blueberry (2024)
Irrigation water, Soil,
and Plant



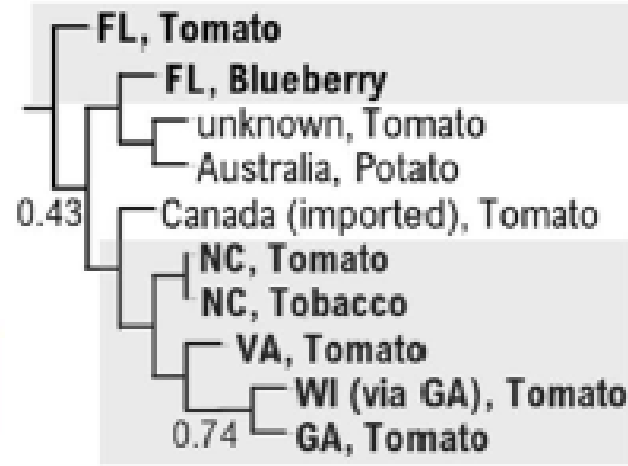
Florida Blueberry (2016-2017)



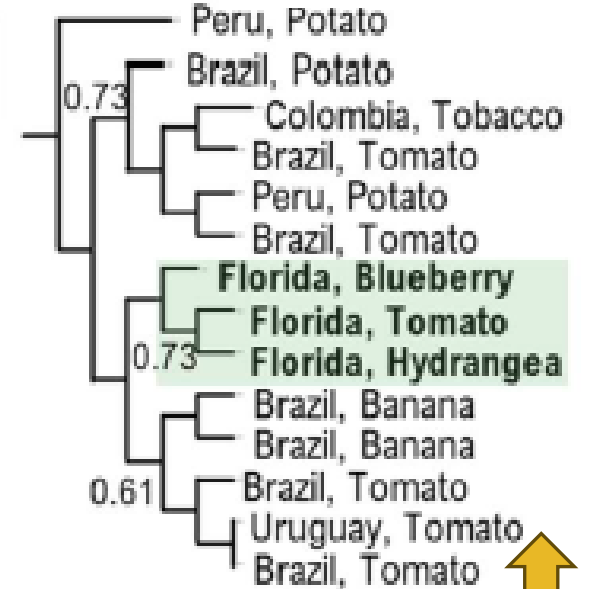
Exotic phyl. I lineage



Endemic IIC-7 lineage



IIA-38 lineage



Florida (2003) Pepper



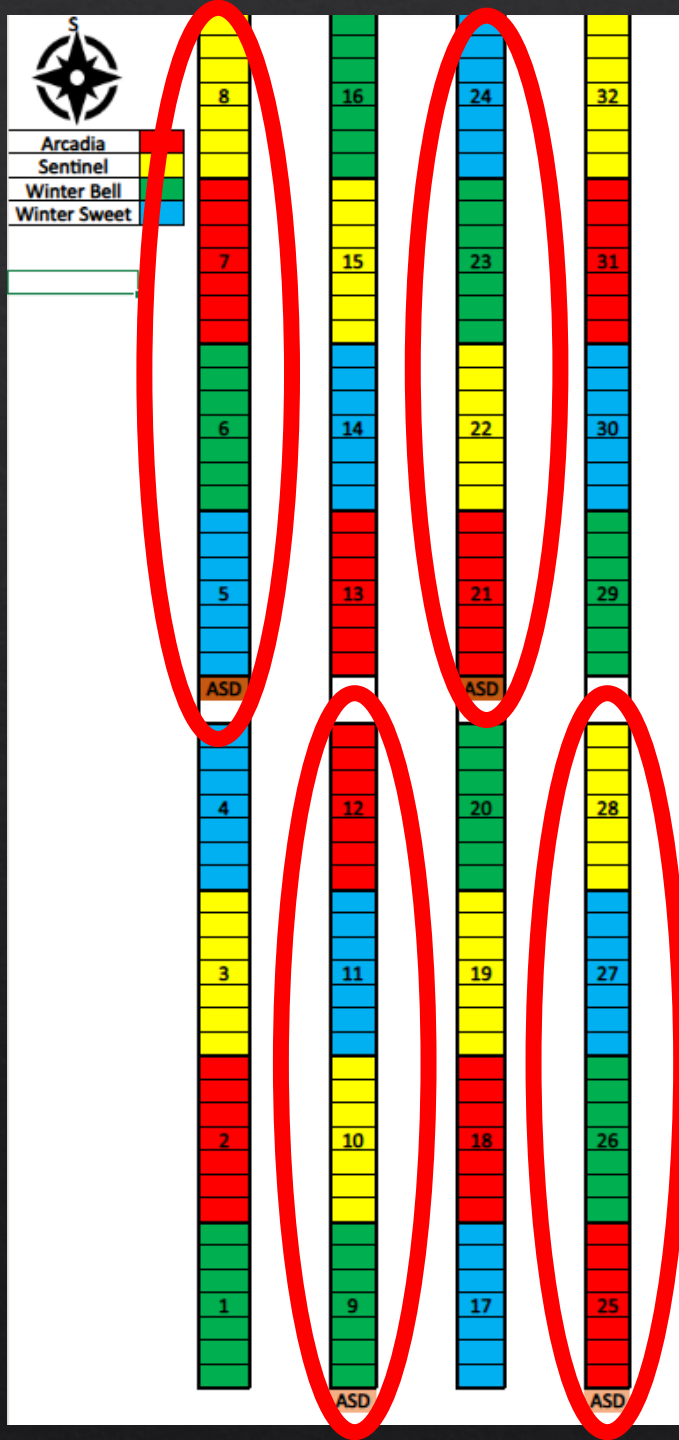
Florida (2001)



South Carolina (1945)

Quincy, Florida (2003-7)
Tomato, Irrigation water,
Aquatic plants





Current Experiments



Blueberry Sensory Data

Panelist	Winter Bell control	Winter Bell ASD		Winter Sweet Control	Winter Sweet ASD
1	vegetative , tart, crunch	sweeter		more tart , crunch	subtle difference aromatic
2	sweet, sour, OK size, earthy	sour, not as sweet, nice size		sweet, not sour, earthy, OK size	one was sweet, rest were sour. Too small
3		slightly more blueberry flavor than control		a little more sour	
4	slightly more sour	Both samples are excellent in flavor & sweetness		both are flavorful & fruity	
5	less sour than ASD	slightly sweeter than control		sweeter and less sour than ASD	
6		sweeter, one berry had more flavor			very slight difference; ASD slightly less sour.

Questions

- ◆ When were blueberry cultivate in FL?
- ◆ Did the blueberry production or genotype change in mid-2010's?
 - ◆ First report of RS on blueberry was 2016.

SUGGESTIONS

- ◆ New pathogenicity tests
 - ◆ Constant watering at 10^4
 - ◆ Test new blueberry varieties with three dominate RS genotypes
- ◆ Genetic comparison of old varieties to new varieties to identify resistance genes

Acknowledgements



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