



Moving new HLB therapies to the grove with Symbiont technology

Dr. Michelle Heck
USDA, ARS, Ithaca NY
Research Molecular Biologist
Lead Scientist
Co-Director, Bench to Field Pipeline:
A NIFA CAP Project

April 13, 2023
Florida Citrus Show



Ithaca, NY @ Cornell



What is required to develop a solution to citrus greening?



Therapeutic Molecules

Delivery Strategy

Big effects

+

Bold Leadership

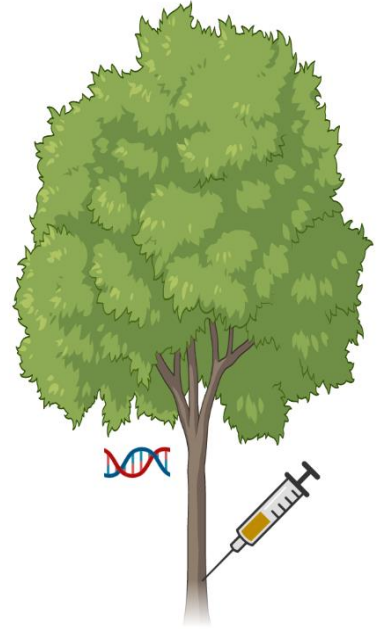
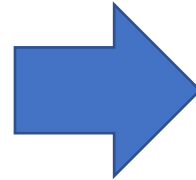
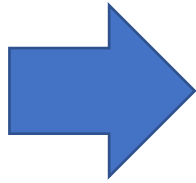
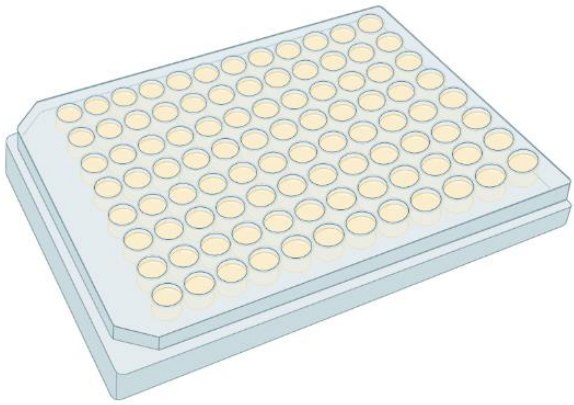
=



What is required to develop a solution to citrus greening?



Bench to Field Pipeline (Now Open for ~1500 Submissions)



High Throughput
Pre-screen

(*L. crescens* or psyllid
homogenate)

Detached Leaf
Assay

(Nymph Assay or
CLas RNA abundance)

Greenhouse
Experiments
(phytotoxicity and systemic
movement)

Field
Trial
(Delivery?)

Screen of 182 plant-based peptides -> 5 candidates



Peptide	Prescreen	Detached Leaf Assays	
	L. crescens growth rate	CLas Survival	Psyllid transmission
Positive Control	0%	4%	5%
3569	27%	22%	
3573	31%	40%	
3605	33%	200%	
3497	33%	100%	
3584	33%	79%	
3627	33%	158%	
3626	34%	79%	
3570	34%	1%	4%
3543	35%	1%	3%
3364	36%	3%	13%
3531	37%	1%	0%
3376	38%	20%	
3590	39%	398%	
3629	40%	4%	3%
Negative Control	100%	100%	37%

Laura Fleites, Steven Higgins, & other Heck Lab Members

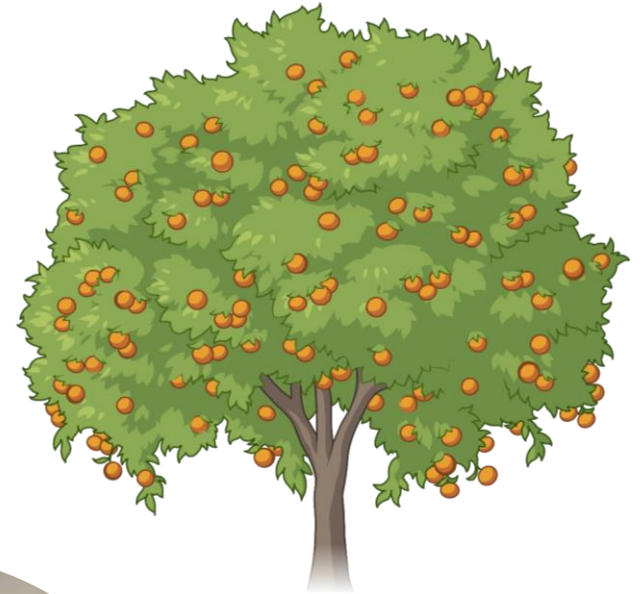
What is required to develop a solution to citrus greening?

Therapeutic
Molecules

+

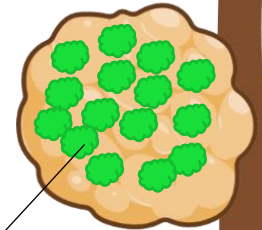
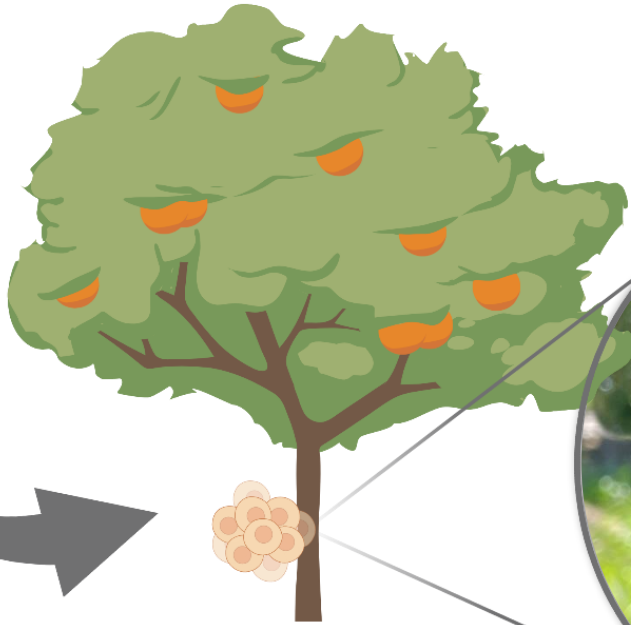
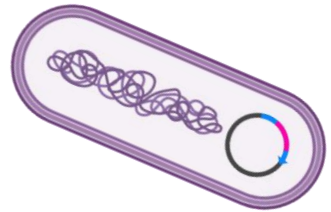
Delivery
Strategy

=



The Symbiont Delivery Method

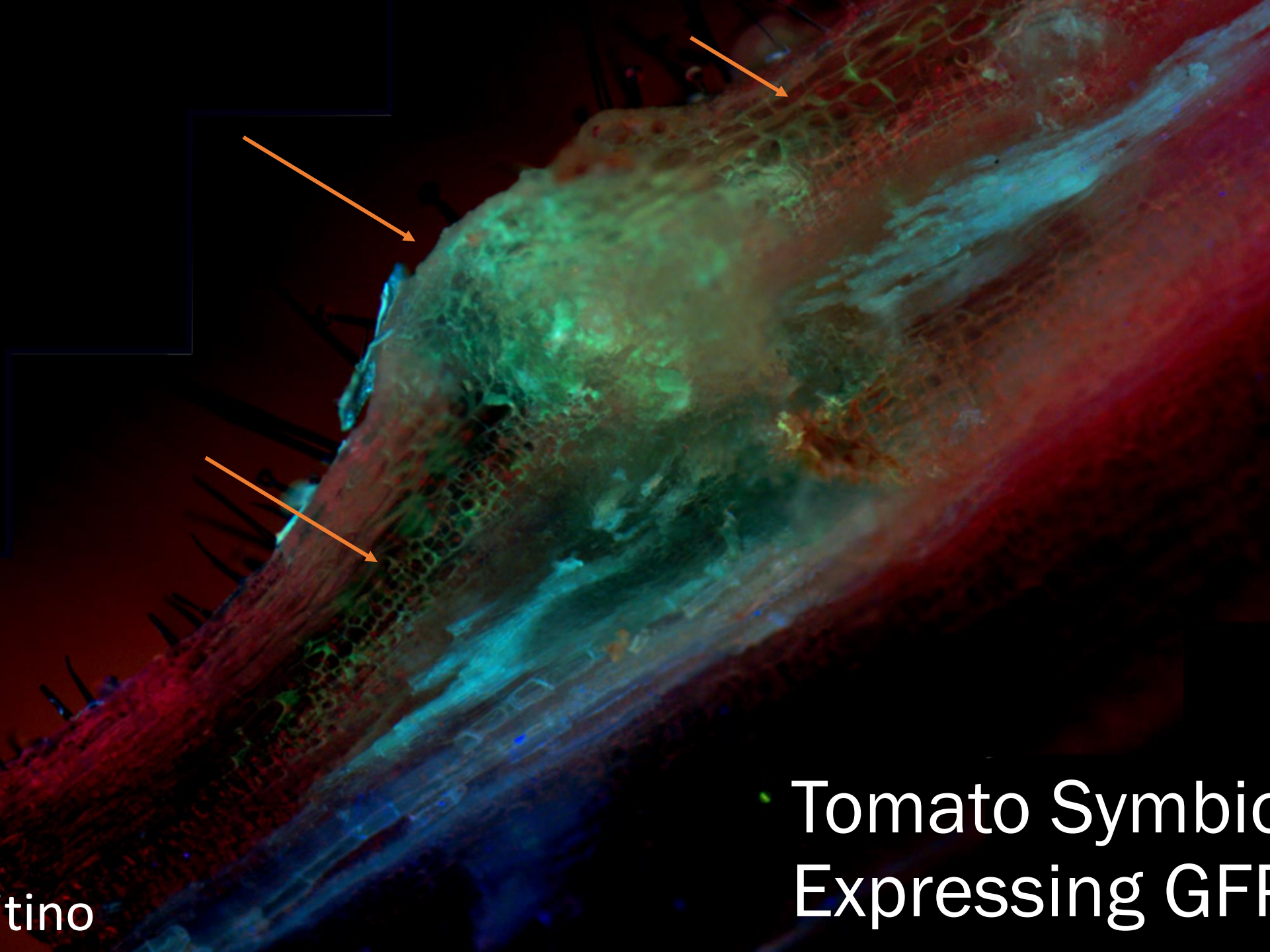
Symbiont-forming inoculum



Product of Interest

Plant cells are modified to form Symbionts & produce therapeutic molecules.

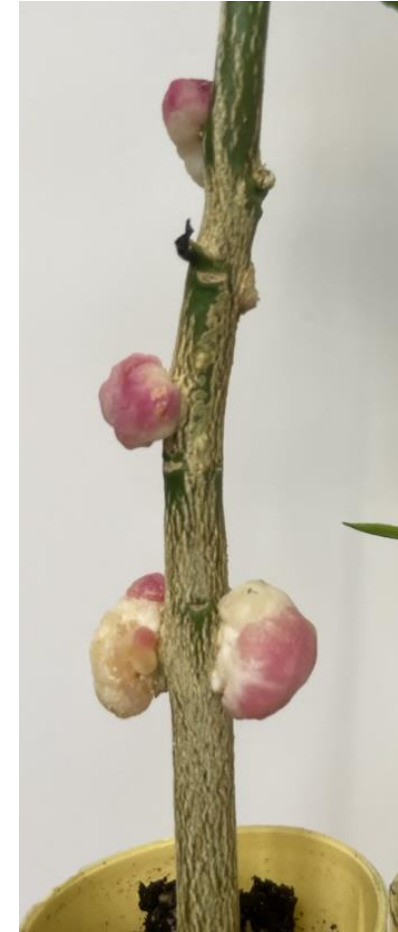
Symbionts produce & deliver molecules directly into tree.



Tomato Symbiont
Expressing GFP

Every Roadblock Prior to Field Trial Was Solved

- Plants support Symbionts without negative affect on plant health/yield
- Symbionts develop rapidly for rapid plant response (within 1 month)
- Symbionts export therapeutic molecules into the tree and improve tree health: Alleviate HLB symptoms



Marco Pitino

Symbionts as a Treatment for Citrus Greening



ANTIMICROBIAL
SYMBIONT



CONTROL
SYMBIONT

- Strategy is working in the greenhouse
- Field trial planning underway
- Discussions with APHIS and the EPA on the field trial site permits are in progress

Laura Fleites, Marco Pitino, Joe Krystel, Sam Coradetti, Bob Adair

Easing Regulatory Concerns – *A Game Changer*

We expect to be approved by
EPA as a biopesticide

