

CITRUS GROWERS' INSTITUTE

APRIL 9, 2024

Rick Dantzler

Citrus Research and Development Foundation

700 Experiment Station Road

Lake Alfred, FL 33850

Research Strategy: 3-Legged Research Stool

1. Maximize efficacy of OTC
 - A. Getting more product into the phloem
 - B. Combining it with other compounds, molecules or production practices
2. Finding molecules or compounds to replace OTC if necessary
 - A. CLas resistance
 - B. Phytotoxicity to low pH or multiple injections
3. Developing the “tree of the future”
 - A. Molecular breeding
 - 1) CRISPR: non-GMO and GMO
 - 2) GMO
 - B. Conventional breeding

Research Under Contract: 63 Projects

Research to implement the Research Strategy

- A. Maximize efficacy of OTC: 13 projects underway.
Examples:

- 1) pH neutral OTC formulation
- 2) Combine OTC with Elemental Enzymes peptide product
- 3) Using OTC in combination with GA or 2,4-D
- 4) Effects on psyllid from OTC usage
- 5) Injecting dozens of experimental rootstocks and scions to see if there is a difference
- 6) Different dosages of OTC
- 7) Injecting in larger branches instead of the trunk
- 8) Leaving the mixture in the tank for up to 3 days – **Don't do it**
- 9) Combine it with Kphite, Prophyt (Phos acids), and Magna Bond (copper sulfate)

B. Finding substitutes for OTC: Six projects underway.
Examples:

- 1) Drs. Scully, Heck, and Niedz
 - a) CRDF's involvement
 - i. Paying Scully
 - ii. Compensating grower-cooperators
- 2) Dr. Kranthi Mandadi's top five from the hairy root assay
- 3) Dr. Ozgur Batuman – five antimicrobials, plus streptomycin in combination with OTC
- 4) Dr. Yu Wang – up to 100 natural molecules with antimicrobial effects

C. Developing the “tree of the future”: Nine projects underway. Examples

1) Molecular breeding

- a) Drs. Mou and Dutt: Crossing the best GMO rootstocks with the best GMO and non-GMO scions which were created for resistance
- b) Dr. Charlie Messina: UF/IFAS Crop Transformation Center – 5 new gene constructs that convey tolerance or resistance
- c) Dr. Nian Wang: Creating non-GMO Valencia and Hamlin trees that are resistant/tolerant through gene editing. Continuation of the work that led to the licensing by Soilcea of the best created to date
- d) Drs. Deng, Gmitter, and Dutt: Evaluate their CRISPR-edited Duncan grapefruit mutants for resistance to HLB. If resistance is confirmed, the data will lead to the identification of target genes that can be edited in other varieties.

- 2) Conventional plant breeding: Five projects underway.
Examples:
 - a) Process to date
 - b) Research funded
 - (1) Inventorying project – funded
 - (2) Plan for 127 acres of CREC property – funded
 - (3) Coca Cola project – funded
 - (4) Three-year Grand Plan – in negotiation
 - c) Other projects of note (3-legged research stool doesn't preclude other serious issues of unique opportunities)
 - (1) Heck - symbiont
 - (2) Diaprepes
 - (3) Nutrition
 - (4) Citrus Fix
 - (5) Blackspot

3. Is the injection of OTC working? Yes, but results are mixed.

A. Context

- 1) Severe freeze in January of 2022
- 2) Hurricane Ian in September of 2022
- 3) Mild freeze in December of 2022
- 4) Severe drought until May of 2023

B. OTC approval: January of 2023

- 1) Learning curve
- 2) Injection began in late spring
- 3) Without weather events, what could we expect?