



Bringing Back Florida Citrus using CRISPR

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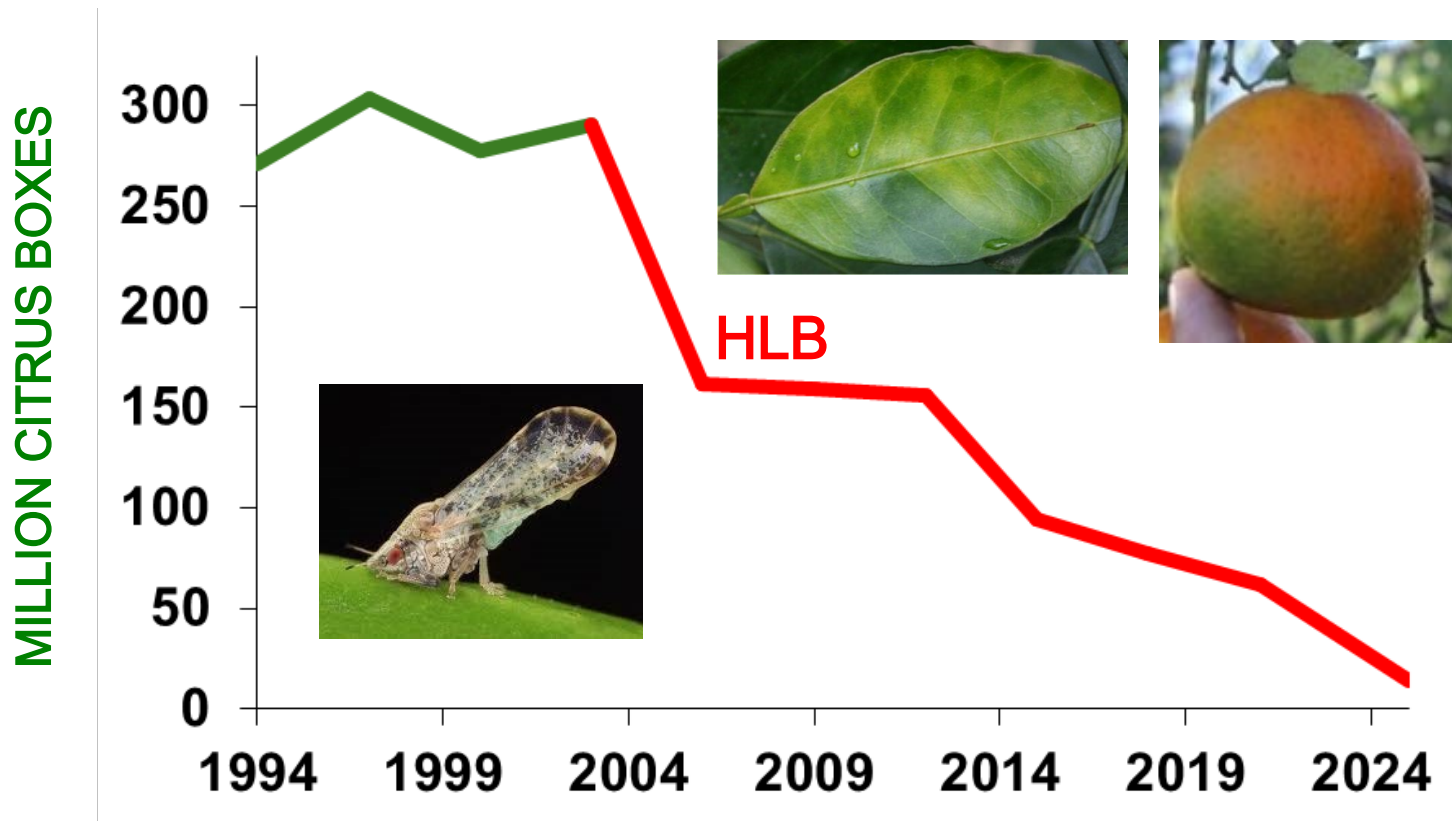
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Introduction

-  Florida Citrus Industry
-  CRISPR
-  Grower Tool: HLB-resistant CarriCea T1 rootstock
-  Bringing Back Florida Citrus

Florida Citrus Production 95% Decline



Source: USDA National Agricultural Statistics Service 2018-19, Dec. 2024, Photos from UF/IFAS



FLORIDA'S DNA





CITRUS GREENING'S FLORIDA

MYFLORIDA.COM

APR



DEAD ORANGES



NEWS / BUSINESS

Florida's famous orange groves may soon disappear

Population growth, hurricanes and a vicious citrus greening disease have left the industry reeling.

Economy / Business

A major Florida grower is exiting the citrus business

Commercialization of CRISPR Agricultural Products

Gene-edited High Oleic Soybean Oil Now Available in the US



Premium quality high-oleic soybean oil developed through gene editing is now available in the US market. The soybean oil known as Calyno™ was developed by experts from Calyxt, Inc. This is the first gene-edited food released for consumers in the US.



NEWS | 14 December 2021

GABA-enriched tomato is first CRISPR-edited food to enter market

Sanatech Seed's Sicilian Rouge CRISPR-edited 'health-promoting' tomatoes reach consumers and may open the market to more genome-edited fruit, vegetables and even fish.

MARCH 8, 2022

Gene-edited beef cattle get regulatory clearance in US

by Candice Choi



CRISPR-edited Conscious Greens officially debut in foodservice

Published May 16, 2023

Megan Poiniski
Senior Reporter



Permission granted by Conscious Greens

Non-browning and extended life bananas are here—thank you gene editing

Elaine Watson | AgFunder News | February 27, 2025

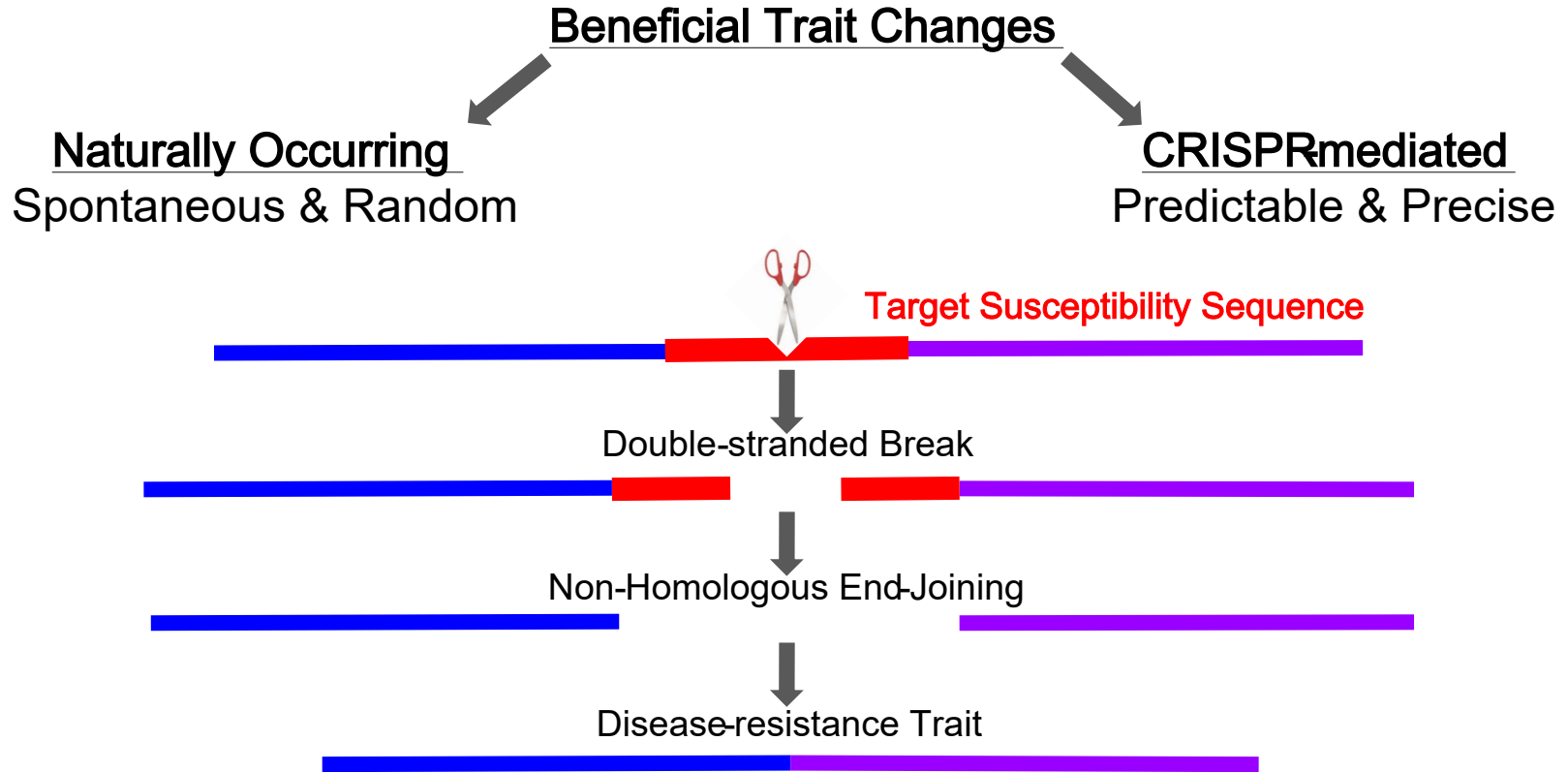


Soilcea's Disease-Resistant Sweet Orange Trials Report Promising Results

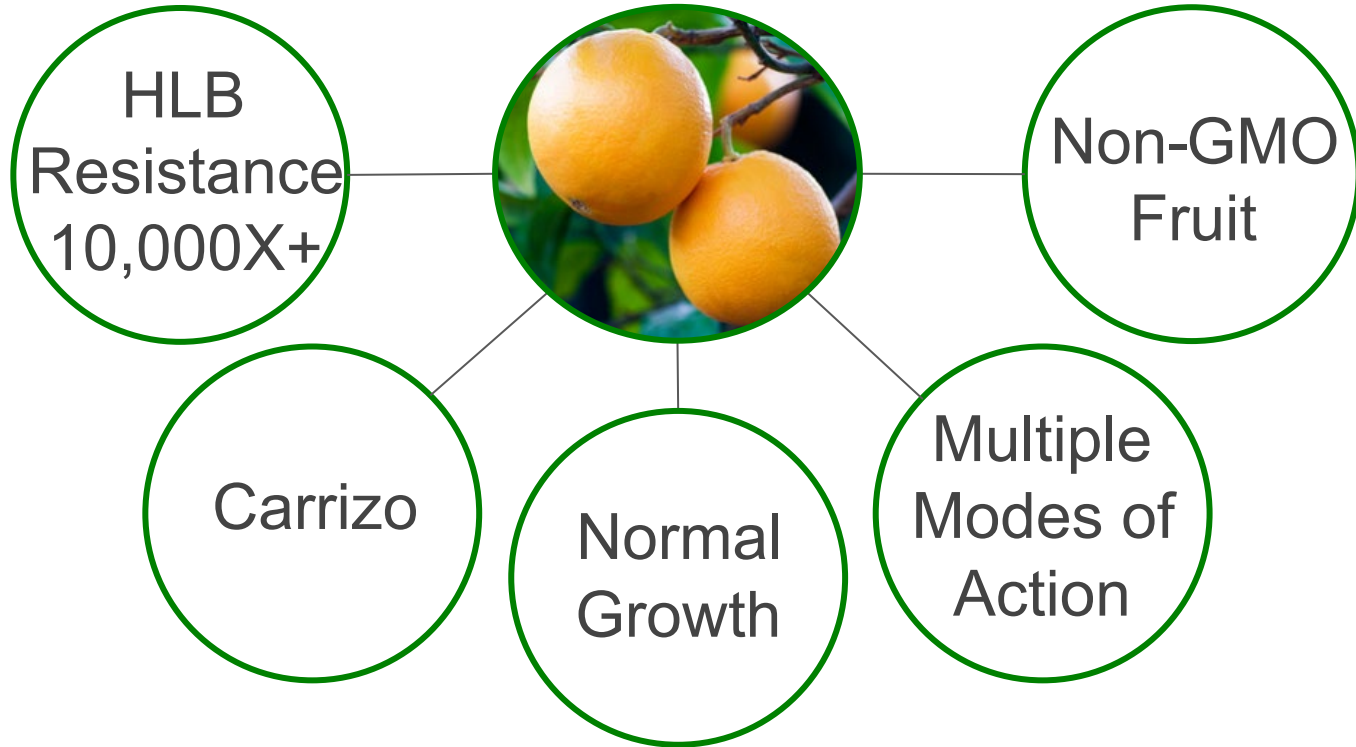
Column • March 5, 2025

The revitalization of Florida's citrus industry won't happen overnight, but a variety of sweet orange developed by biotechnology company Soilcea is showing impressive resistance to the devastating effects of Huanglongbing (HLB or citrus greening disease) in a current trial.

Natural Process and CRISPR Produce Same Outcome



New Grower Tool: CarriCea T1 Rootstock

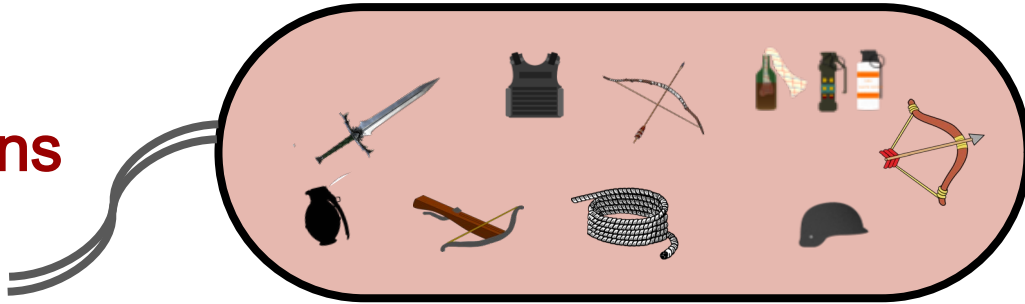


Soilcea's approach for disease-resistant citrus varieties



Pathogens use effectors (weapons) to turn off plant host natural defense mechanisms (targets) to rapidly multiply in the plant.

Pathogens



: Effectors

Plants



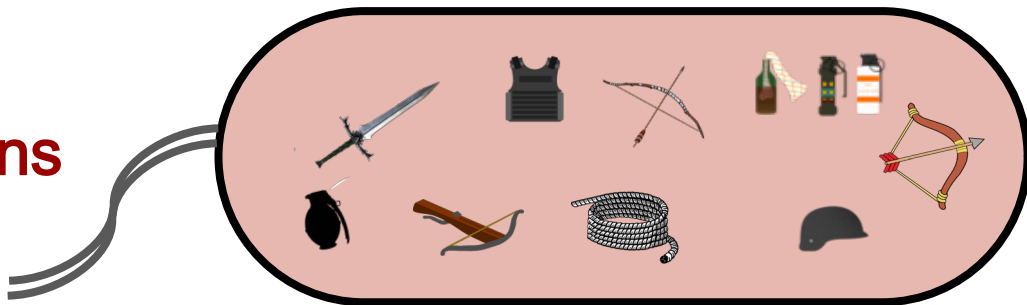
: Targets

Soilcea's approach for disease-resistant citrus varieties



Soilcea disrupts effector-plant interactions using CRISPR precision breeding to restore the tree's natural defense mechanisms to prevent HLB disease.

Pathogens



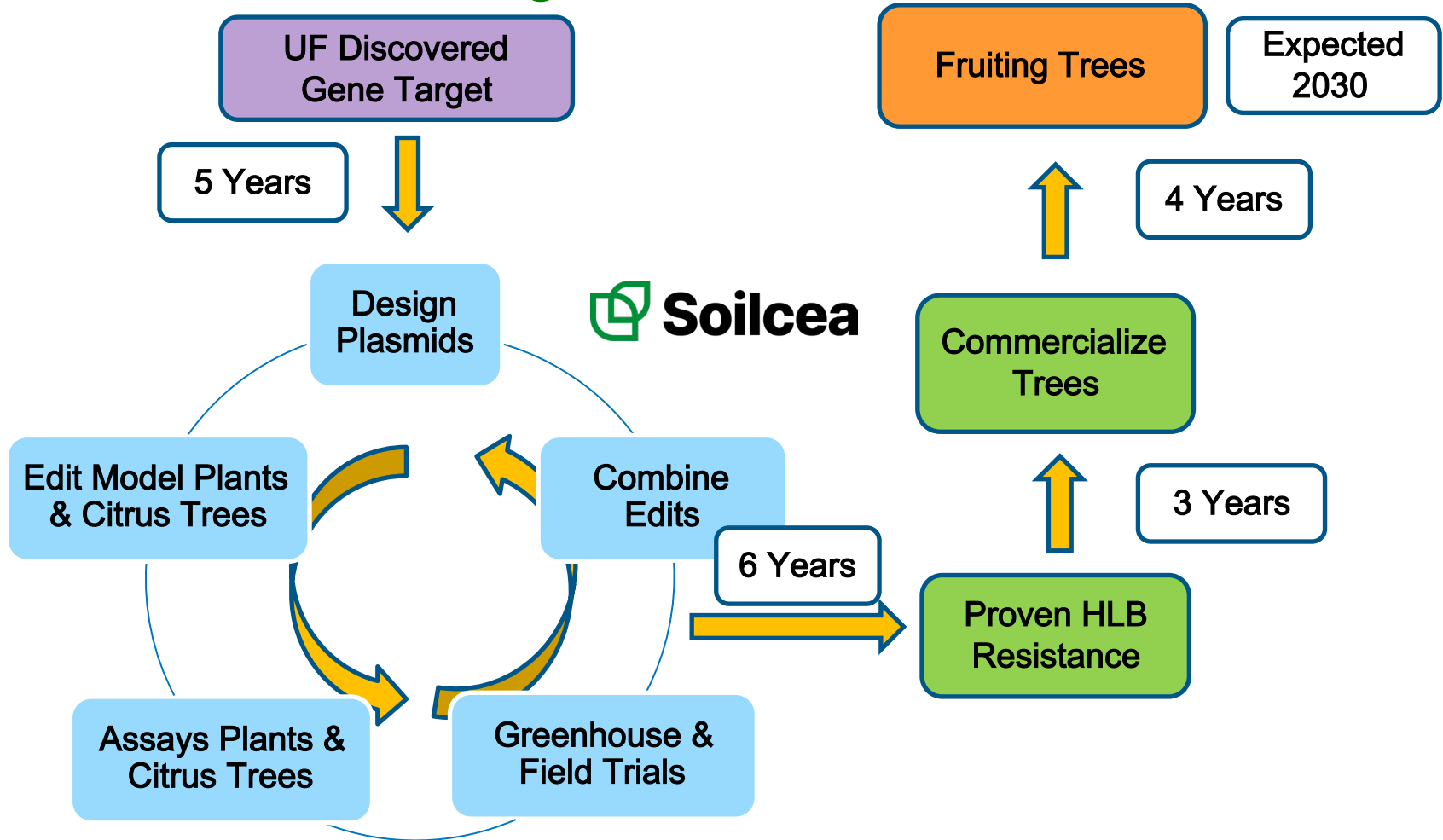
: Effectors

Plants

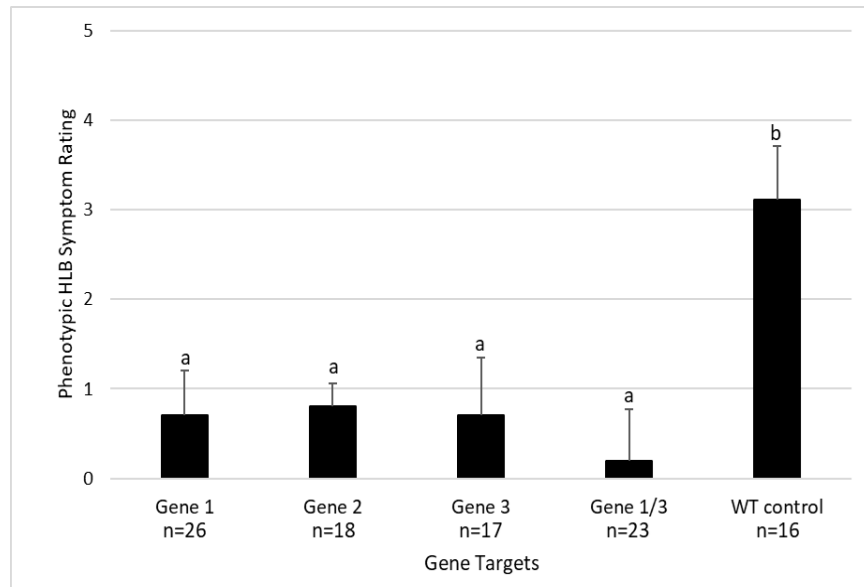
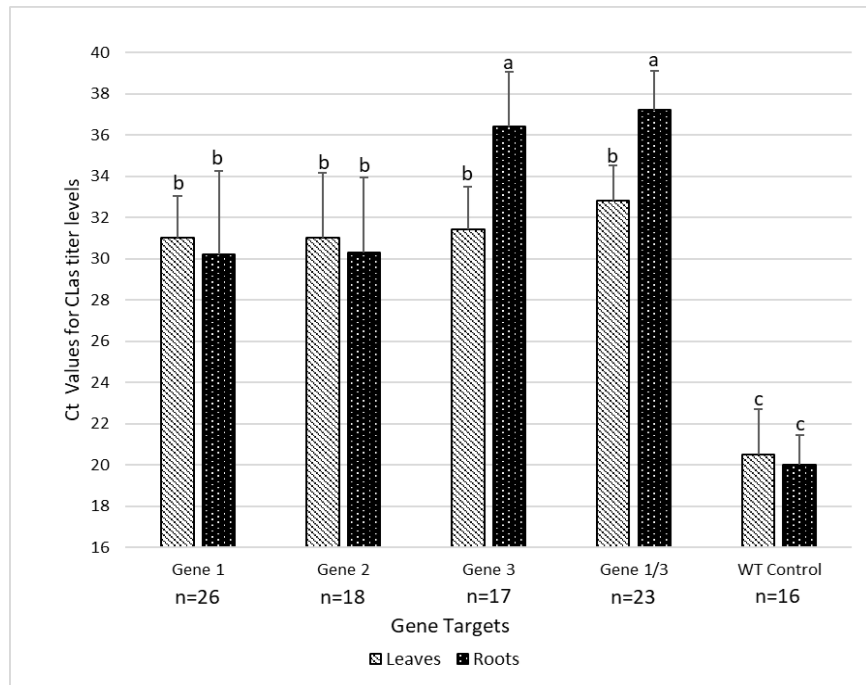


: Targets

Precision Breeding Timeline



10,000x+ reduction in CLas levels in Carrizo



Figures. Ct Values found in leaf midvein or hairy root tissue of edited citrus plants two years, post inoculation and visual rating of the phenotypic HLB symptoms observed on edited citrus trees that had been inoculated with CLas and planted two years ago. The graph shows the Ct Values for CLas titer levels from DNA which was measured through qPCR. Trees were assessed for characteristic HLB symptoms such as blotchy mottling, corky veins, and dieback. The scale was from 0 to 5, with 0 showing no visible symptoms, and 5 showing severe symptoms. A standard rating system was developed for consistent symptom screening. Significance groups were determined by Fisher's LSD using variance calculated with ANOVA. A p-value = 0.05 was used as threshold for significance.

2x increase in Trunk Diameter and 25% increase in Brix in Carrizo

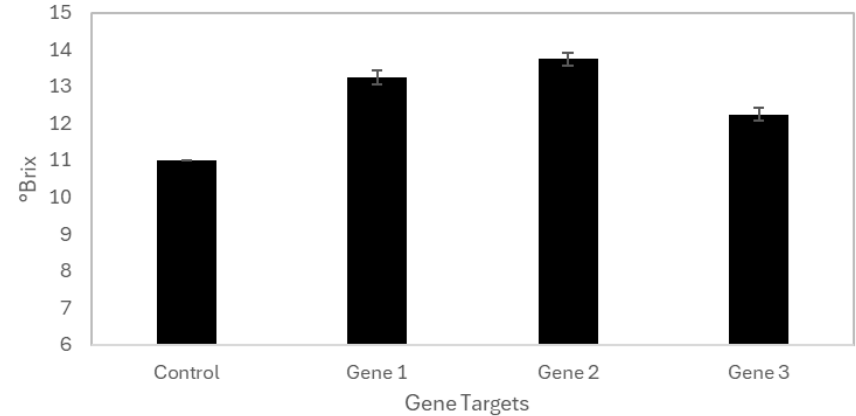
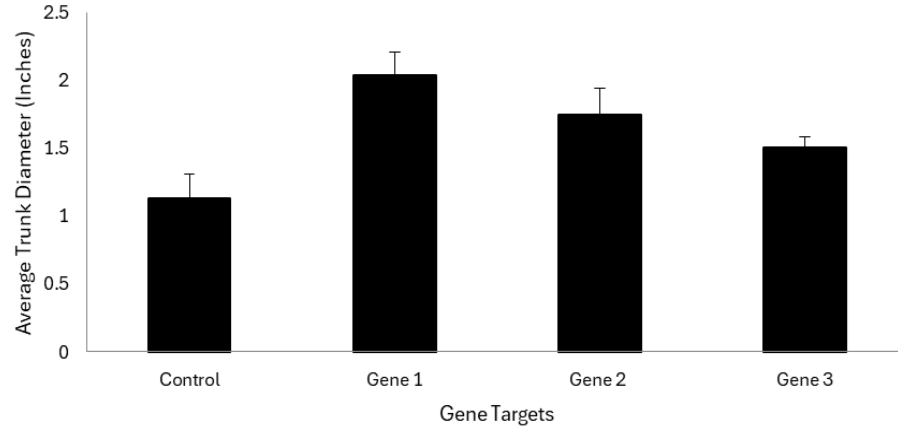


Figure. Average Trunk Diameter and °Brix of CRISPR-edited and non-edited citrus trees, two years post planting. Trunk diameter and °Brix were assessed between trees with edited and non-edited carrizo rootstocks. A p-value <0.05 was used as a significance threshold.



Wild-type Control

Soilcea Tree

HLB Infected Valencia grafted on Carrizo

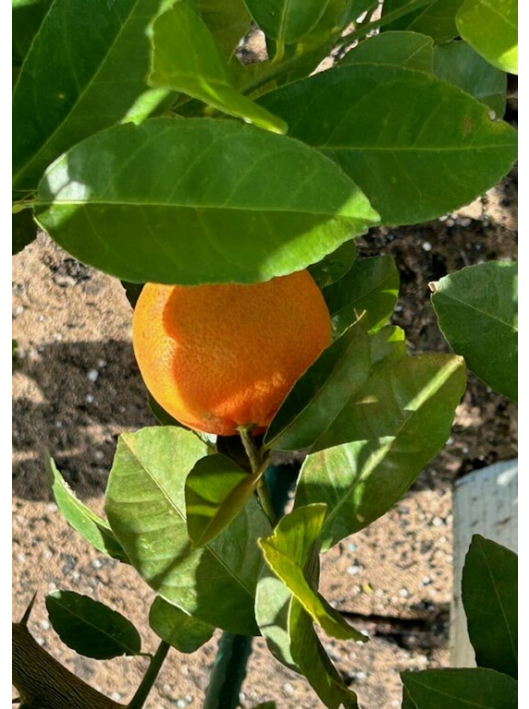
Wild-type control



Soilcea Tree



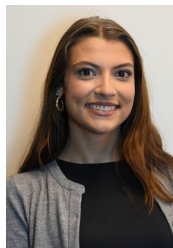
Tree Flowering & Fruit Set on Soilcea rootstock



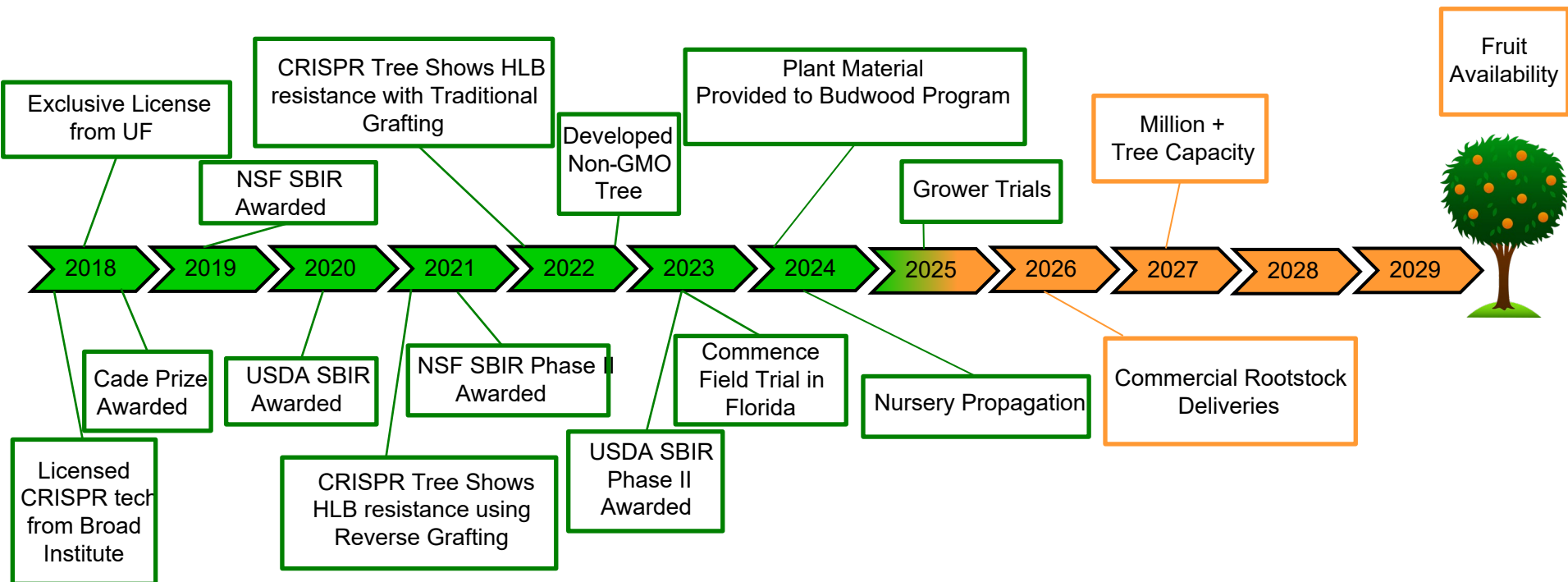
CarriCea T1 Rootstock Propagation & Grafting



Soilcea Team



Timeline



\$256 Billion ROI to Florida Citrus Industry from an HLB-resistant Tree

- 🍊 HLB economic contribution restoration (8.83x multiplier)
- 🍊 \$29 Billion in grower profits over 45 years for 200,000 Acres
- 🍊 \$145,324 in grower profits per Acre over the lifetime of the Grove
- 🍊 \$1,002 in grower profits per Tree over its productive life
- 🍊 \$23.30 in grower profits per tree per year
 - Growers can expect to gain ~208 boxes per acre (Restoring yields from 140 back to 428 boxes) = \$19.01 per tree
 - \$783/year per acre saved in caretaking costs = \$5.40 per tree
 - Does not include costs associated with bags and antibiotic injections

Bringing Back Florida Citrus

Need HLB resistance

- New Grower Tool: Soilcea HLB-resistant CarriCea T1 Rootstock

Nursery Propagations

- Capacity for 1 million CarriCea T1 for CRAFT Cycle 7

Replant Industry

- Final approval imminent
- \$40 Reimbursement for CarriCea T1 as emerging variety

Please reach out if interested in learning more



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USDA SBIR 2023-03957

HLB (MAC) Group



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