

Use of Gibberellic Acid Treatments to Improve Health and Yield of HLB Diseased Trees

Tripti Vashisth

Associate Professor and Citrus Extension Specialist

UF IFAS CREC

Take home message

1. Another 'Tool' in the citrus tree health management toolbox
2. Gibberellic acid (GA) available for use in citrus in Florida
3. GA can improve fruit set, development, and yield
4. Effect of GA is 'holistic', response is gradual
5. Application time is critical



GA influences number of physiological processes

- Shoot elongation
- Flowering
- Fruit set
- Fruit growth
- Fruit abscission
- Fruit senescence



GA in Florida Citrus

- Labeled for use on Florida citrus
- See PGR chapter in UF/IFAS Citrus Production Guide
- Pesticide table 7 for more information on GA products available for use in Florida
- PGRs are regulated as pesticides
- ***Label is the Law***

Table 2. Plant growth regulator sprays—Florida citrus. **CAUTION:** Growth regulators may cause serious problems if misused. Excessive rates, improper timing, and fluctuating environmental conditions can result in phytotoxicity, crop loss, or erratic results. Under certain environmental conditions, 2, 4-D may drift onto susceptible crops in surrounding areas. Observe wind speed restrictions and follow all label directions and precautions.

Variety	Response	Time of Application	Growth Regulator and Formulation	Product Rate or Volume per Acre
Grapefruit	Delay of rind aging process and peel color development at maturity; combine with 2, 4-D for fruit drop control.	August–November. Late sprays can result in re-greening.	Gibberellic acid, GA ₃ (ProGibb 4%, ProGibb 40%, ProGibb LV Plus) ²	16–48 gram a.i. ³
Tangerine-hybrids				20–40 gram a.i.
Navel oranges				16–48 gram a.i.
All round orange				20–60 gram a.i.
Navel oranges Ambersweet orange Sweet orange	Improvement of fruit set and yield; can result in small size and leaf drop.	December–late January	Gibberellic acid, GA ₃ (ProGibb 4%, ProGibb 40%, ProGibb LV Plus) ²	15–25 gram a.i.
Tangerines Mandarins Grapefruit		Full bloom		8–30 gram a.i.
Processing oranges (late varieties)		Color break		20 gram a.i.

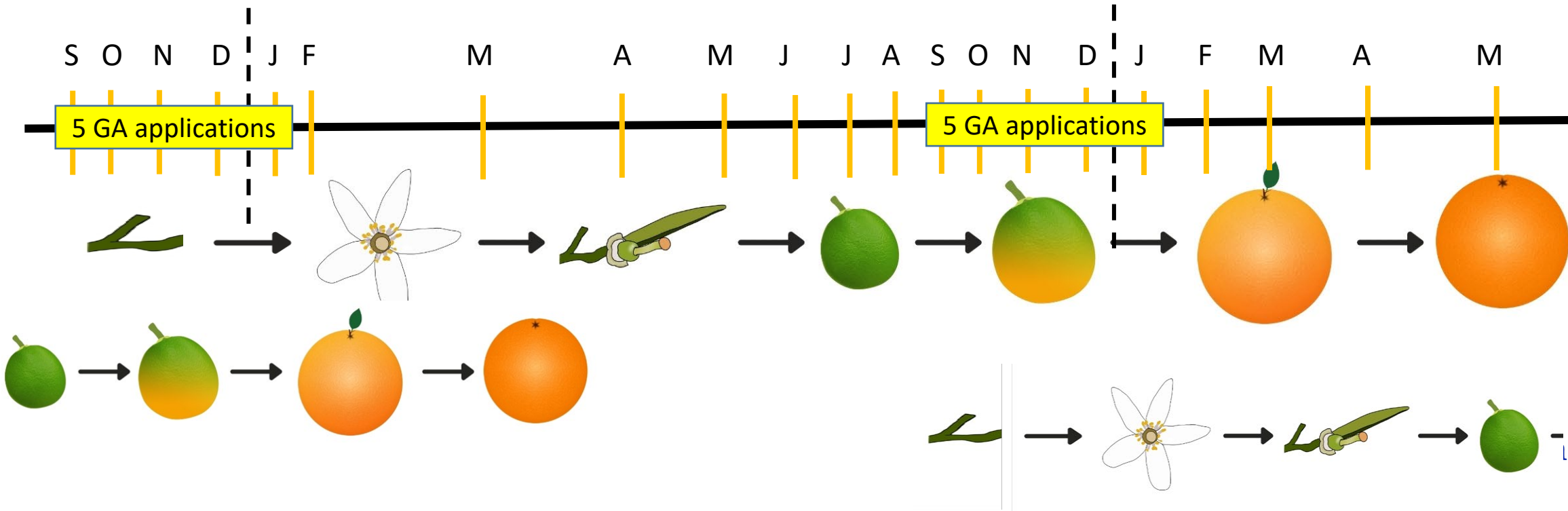
¹Rates are based on application of 500 gal. per acre to mature trees. The effects of applications at lower volumes (concentrate sprays) are unknown.

²Do not use in spray solutions above pH 8.

³Active ingredient; follow the label for variety-specific rates and conversion to fluid ounce per acre.

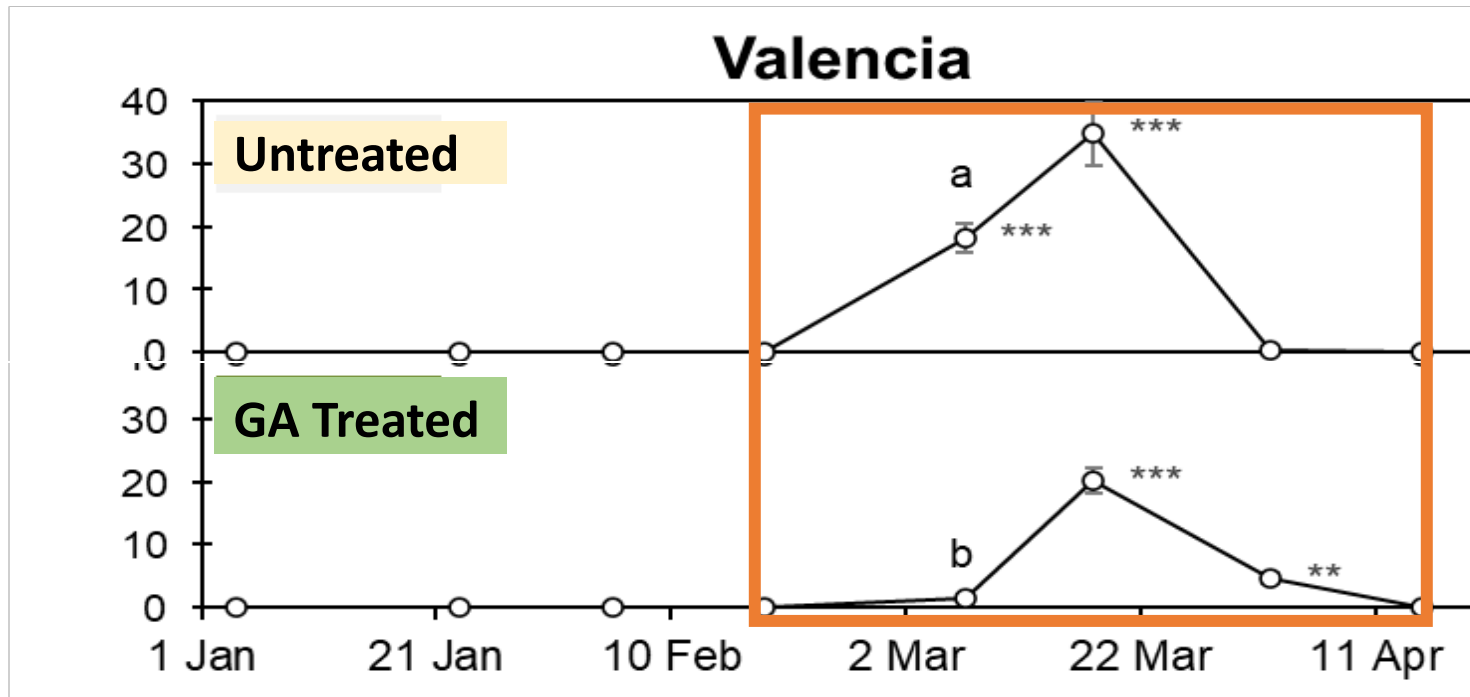
Valencia Orange Field Study (2016-2021)

- 10 year old 'Valencia' on swingle
- GA applied monthly from September to January
 - 10 fl oz per acre (Progibb LV) + 0.125% surfactant (Induce)
 - 1 gallon per tree spray volume



Valencia Orange Field Study (2016-2021)

GA provided a more synchronized bloom period



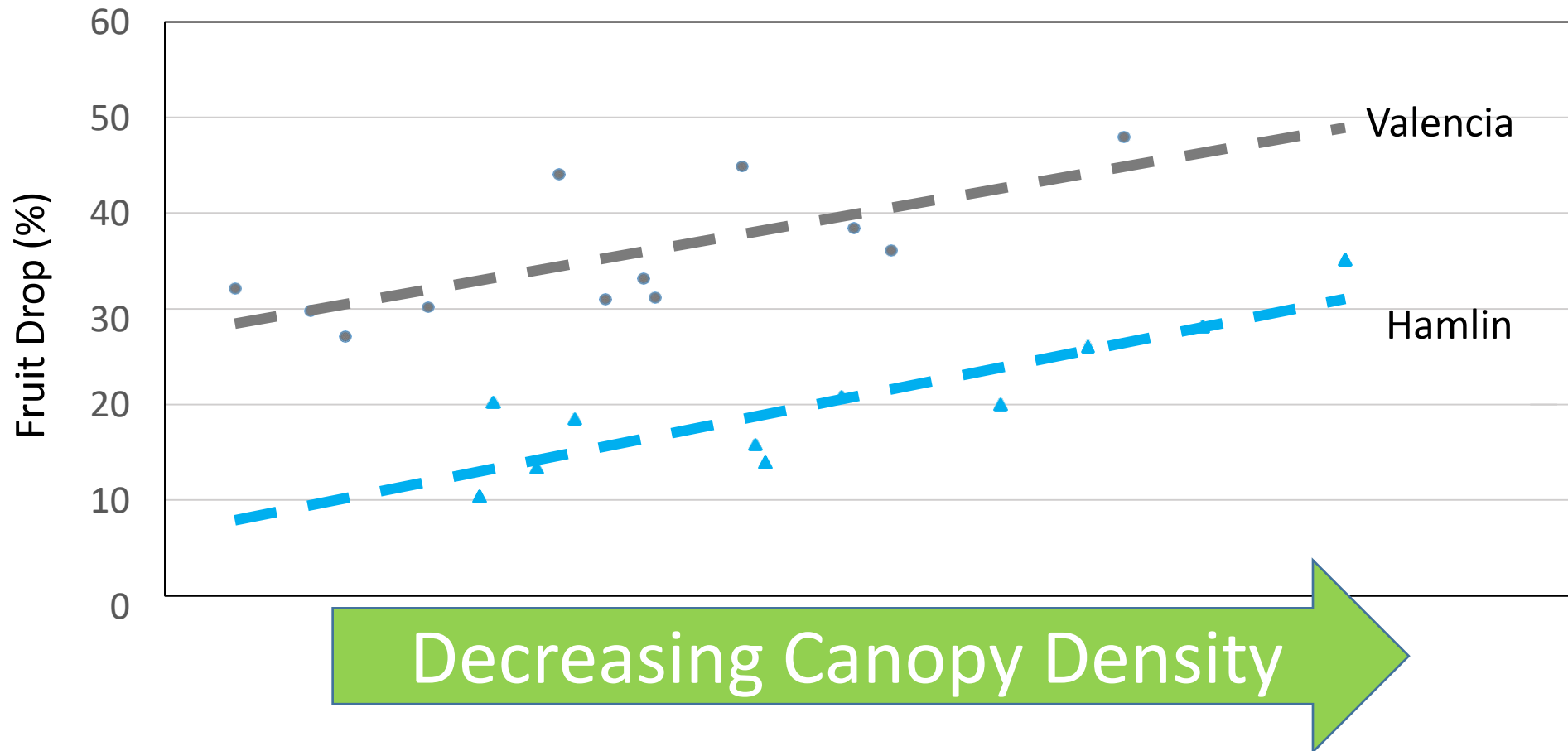
Valencia Orange Field Study (2016-2021)

GA-treated trees maintained dense tree canopies



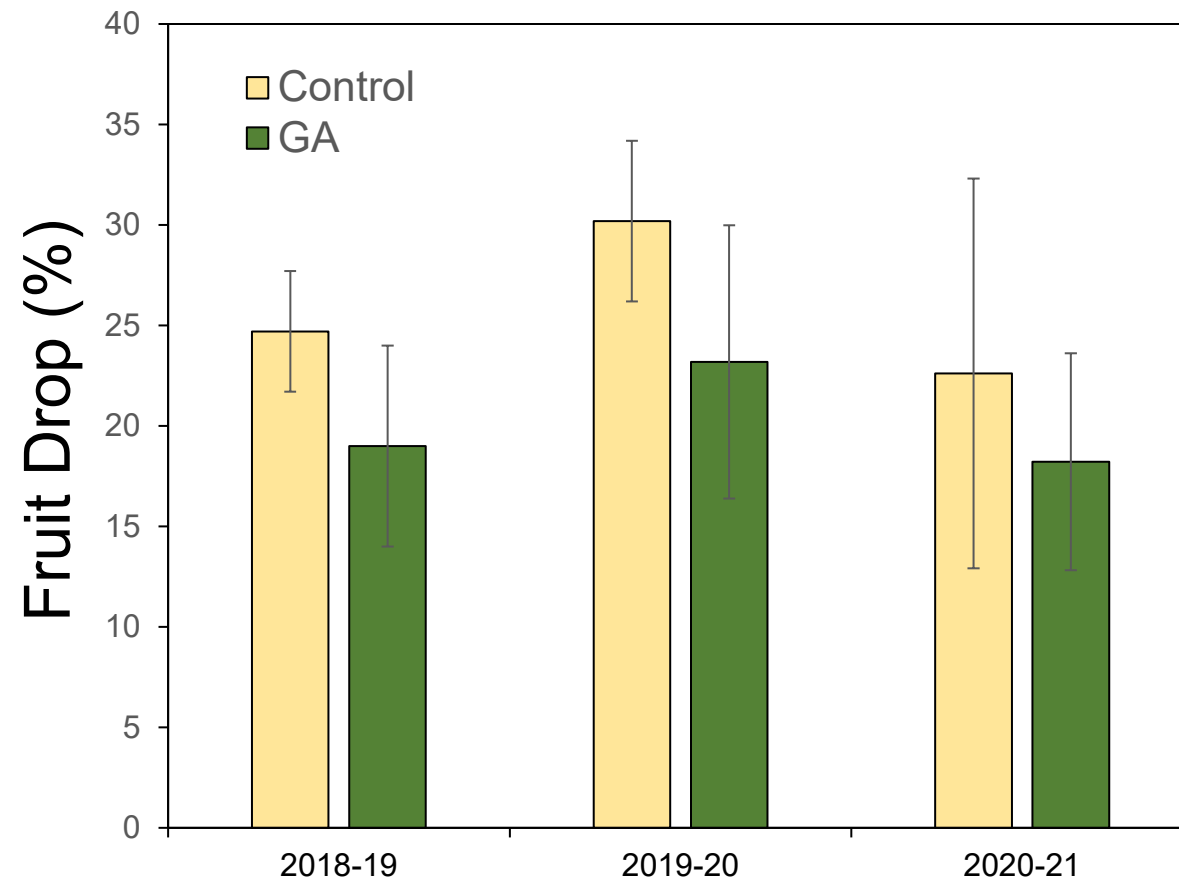
Previous Research has shown...

...trees with denser canopies drop less fruit



Valencia Orange Field Study (2016-2021)

GA-treated trees drop less fruit



Valencia Orange Field Study (2016-2021)

GA increased fruit yields compared to untreated plots

Due to changes in grove management, soil pH dropped below 5.5

Treatment	Fruit yield (lb/tree) per year				
	2016-17	2017-18	2018-19	2019-20	2020-21
Control	99	213	209	163	119
GA	172	255	282	207	169
p-value	0.2	0.15	0.02	0.10	0.07

Increase in number of GA applications

Valencia Orange Field Study (2016-2021)

Trees treated with multiple GA applications produced more fruit

4 year average

	pounds/tree	p value
Control	176 b	0.06
GA	228 a	

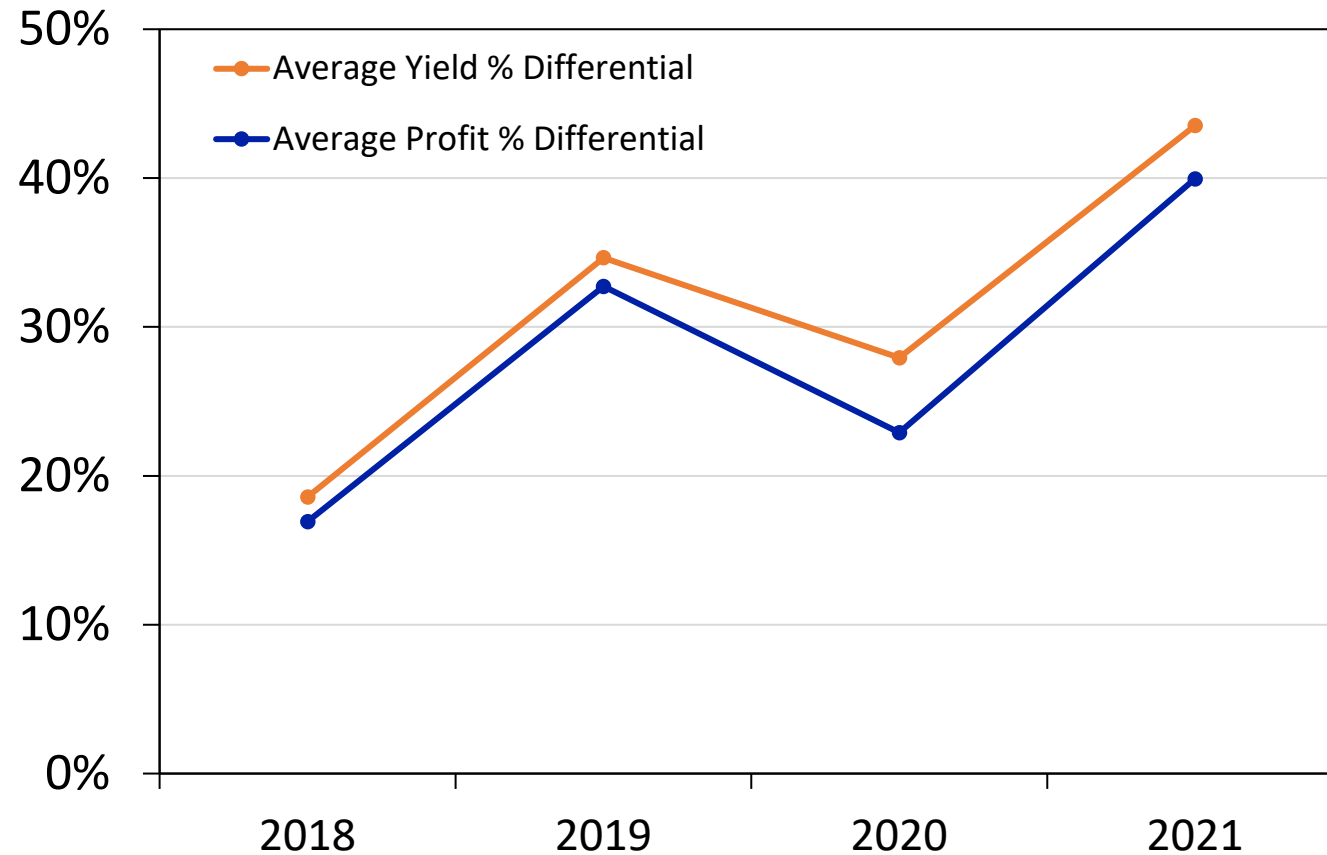
Extrapolation
(150 trees/acre)



	Boxes per acre
Control	293
GA	380

Valencia Orange Field Study (2016-2021)

Economic benefit of GA



Valencia Orange Field Study (2016-2021)

Economic benefit of GA

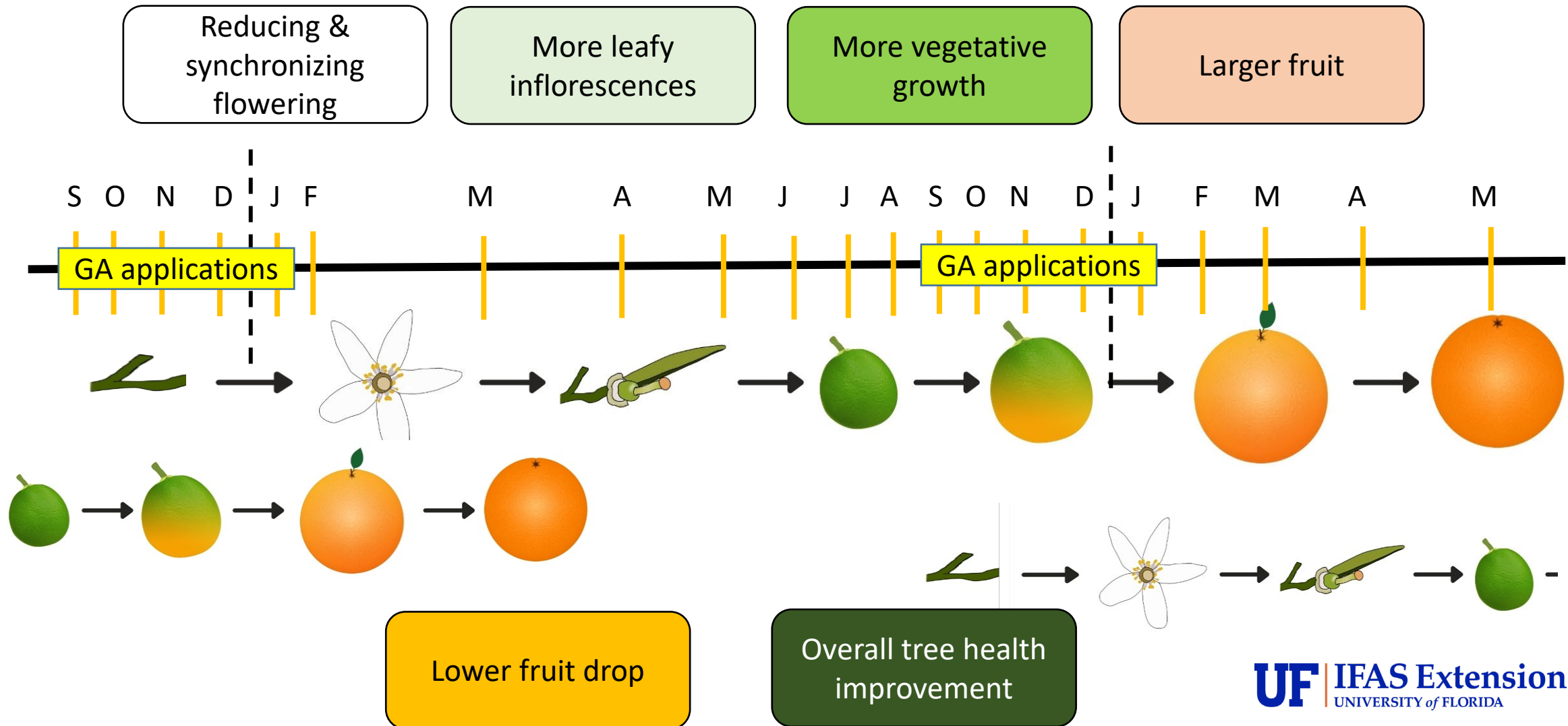
	2018	2019	2020	2021
Profit per acre based on <u>average yield</u> (across all plots)	\$1030	\$1712	\$457	\$1123
Profit per acre based on <u>lowest yield</u> (poorest response observed)	\$-556	\$1019	\$260	\$806

GA improves tree health

In-depth molecular and chemical analysis reveals:

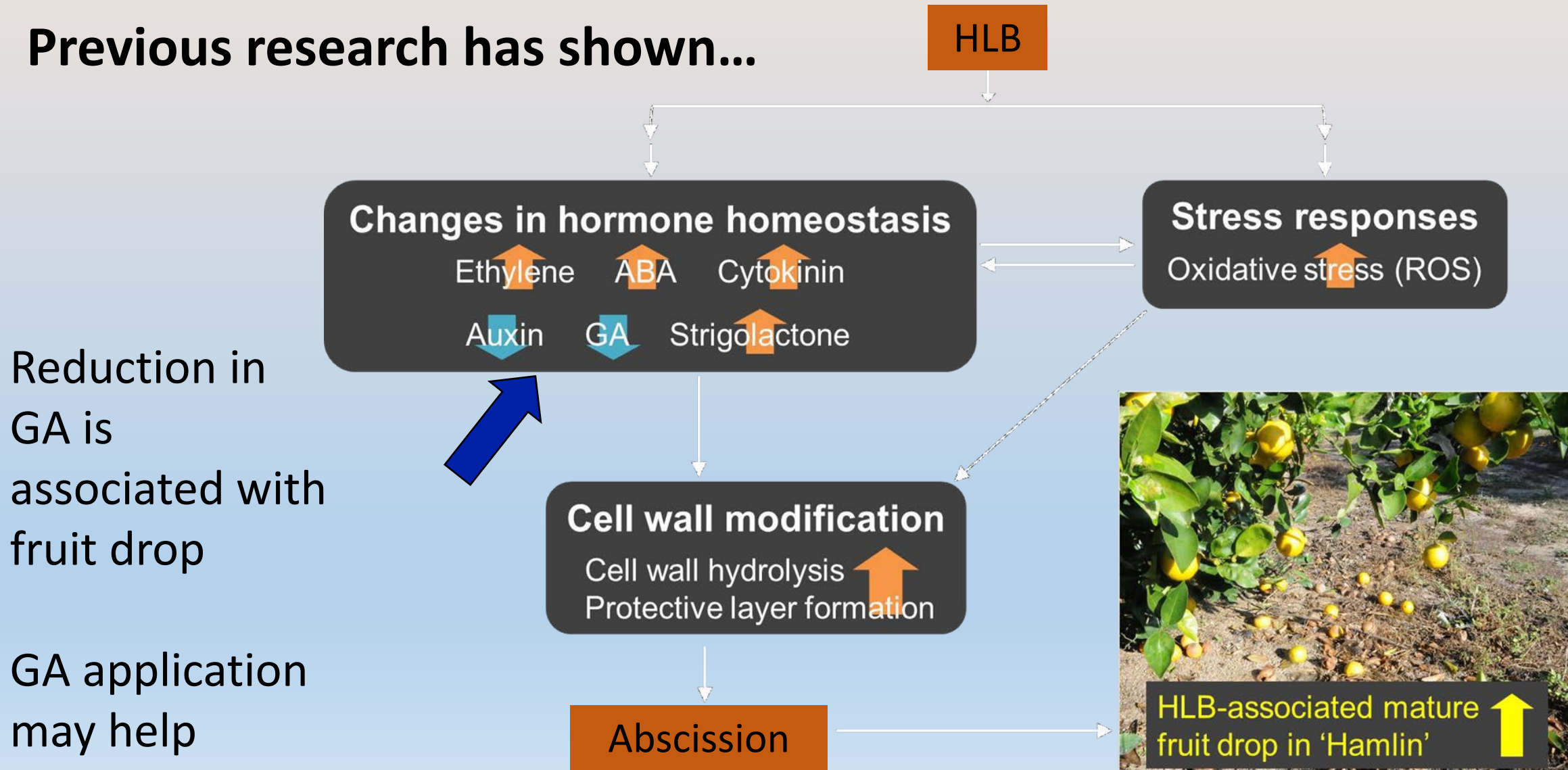
- Less starch build up
- Better oxidative stress mitigation
- Better plant defense response
- Better carbohydrate metabolism and translocation

How is GA helping Valencia?



What about Hamlin?

Previous research has shown...

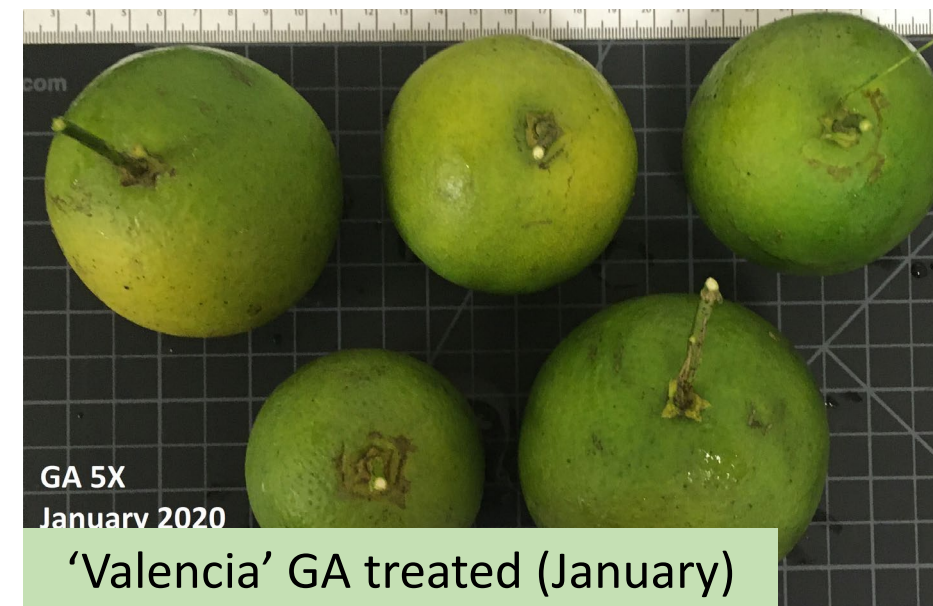


What about Hamlin?

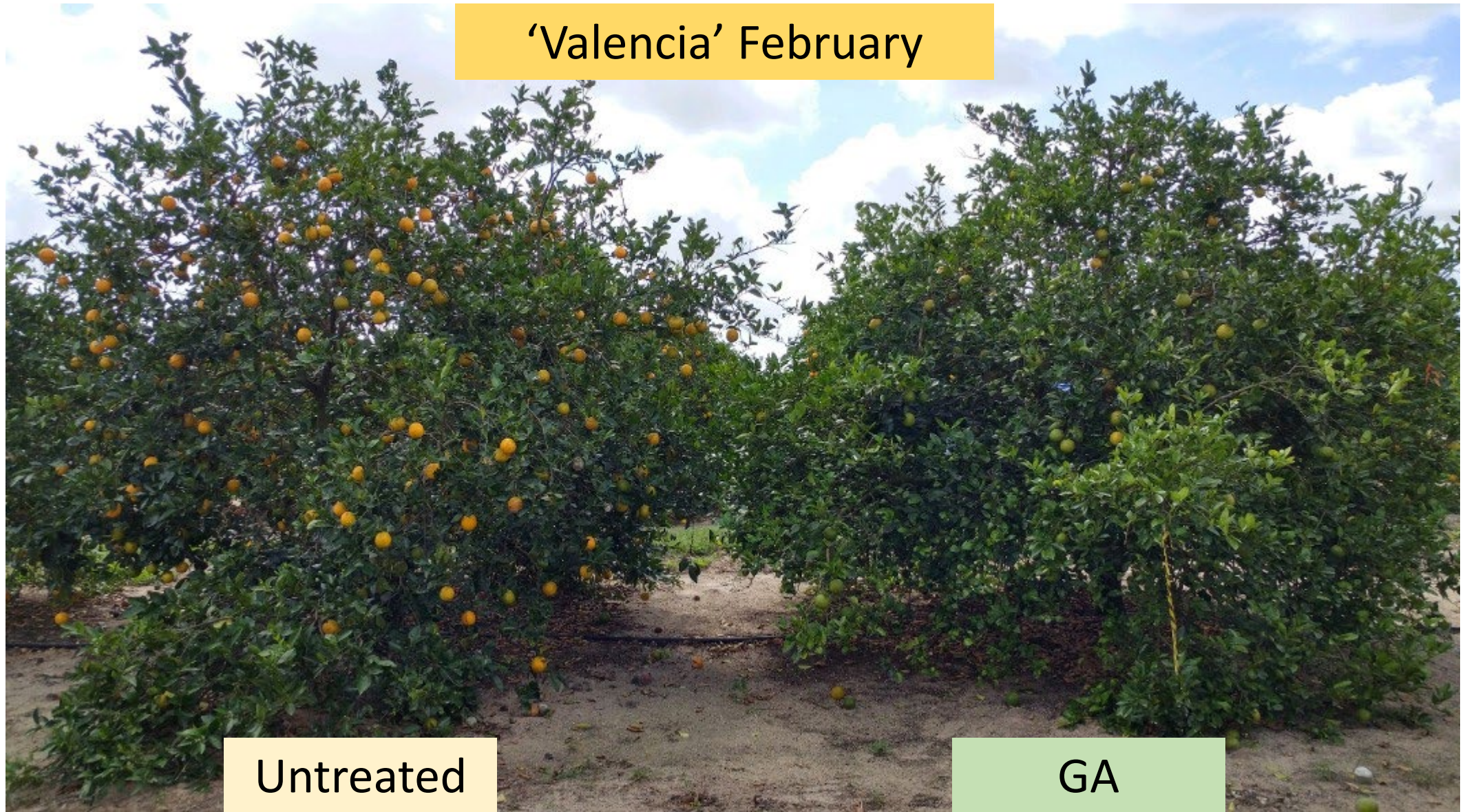
- Hamlin have a shorter fruit development period
- GA application in August, September, and October
 - 10 fl oz Progibb LV per acre per application
 - GA 20 g ai or 33 mg/liter per acre per application
 - 0.125% Surfactant (nonionic, low foam; Induce)
 - Spray volume: 125-150 gallons per acre
- GA application will keep the fruit green
- May extend harvest window
- May suppress early off-season bloom and result in synchronized bloom

Precautions for GA use

- Fruit Color
 - GA slows down the color change process or can even reverse the color change
 - It delays the rind aging
 - EXTRA PRECAUTIONS must be taken for FRESH FRUIT
 - May need a 4-5 month gap between last GA application and harvest
 - Degreening can be an option
 - May delay harvest



'Valencia' February



Untreated

GA

Pay attention to fruit color as well as canopy density **UF** IFAS Extension
UNIVERSITY of FLORIDA

Precautions for GA use

Flowering

- GA suppresses flowering
 - Applying too close to bloom could negatively affect bloom/fruit set
- Do not apply after January 10, possibly December 31
- Weather can influence flowering
 - If early flowering is predicted, stop sooner than January

GA use cautions (physiological)

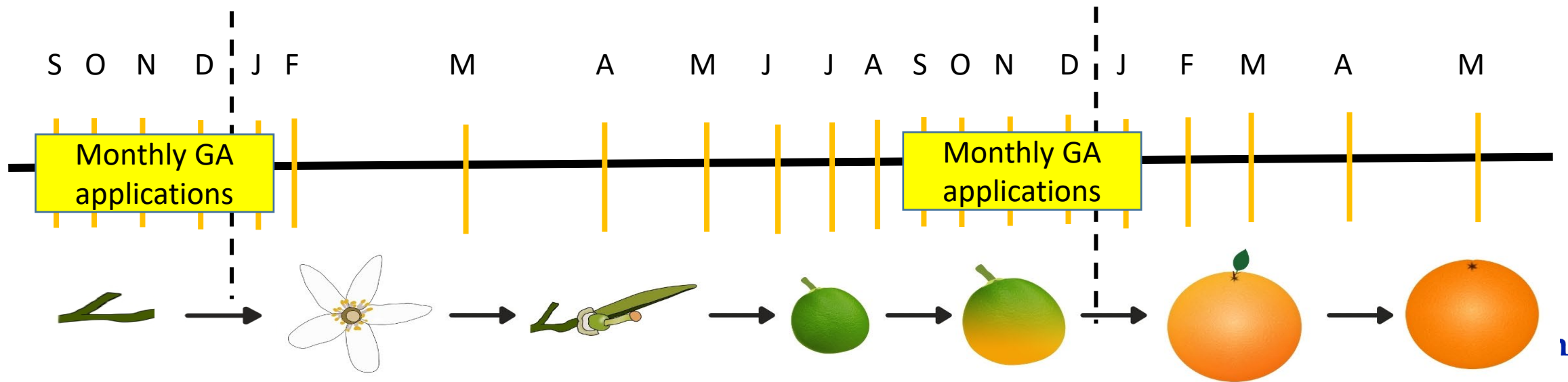
- Time of application is the key
- GA application during flowering can improve fruit set
 - If fruit set has been a problem, GA can be beneficial
- More fruit set is not necessarily beneficial in every case
 - A stressed tree may not retain 'excessive' crop load
 - Good chance of increased fruit drop
 - Tree may collapse
- Post 'June drop' GA application can be beneficial for fruit development
- February GA application on 'Valencia' caused excessive mature fruit drop

GA use considerations

- 4 hour REI
- If it rains within 2 hours of application, apply again
- Not much information on tank mixes
- Use water with a pH of 4.0 to 8.5
- Copper fungicides and/or oils within three weeks (before or after) the ProGibb LV Plus application have been known to result in significant leaf drop and fruit drop
- Phytotoxicity when GA + homobrassinolide applied

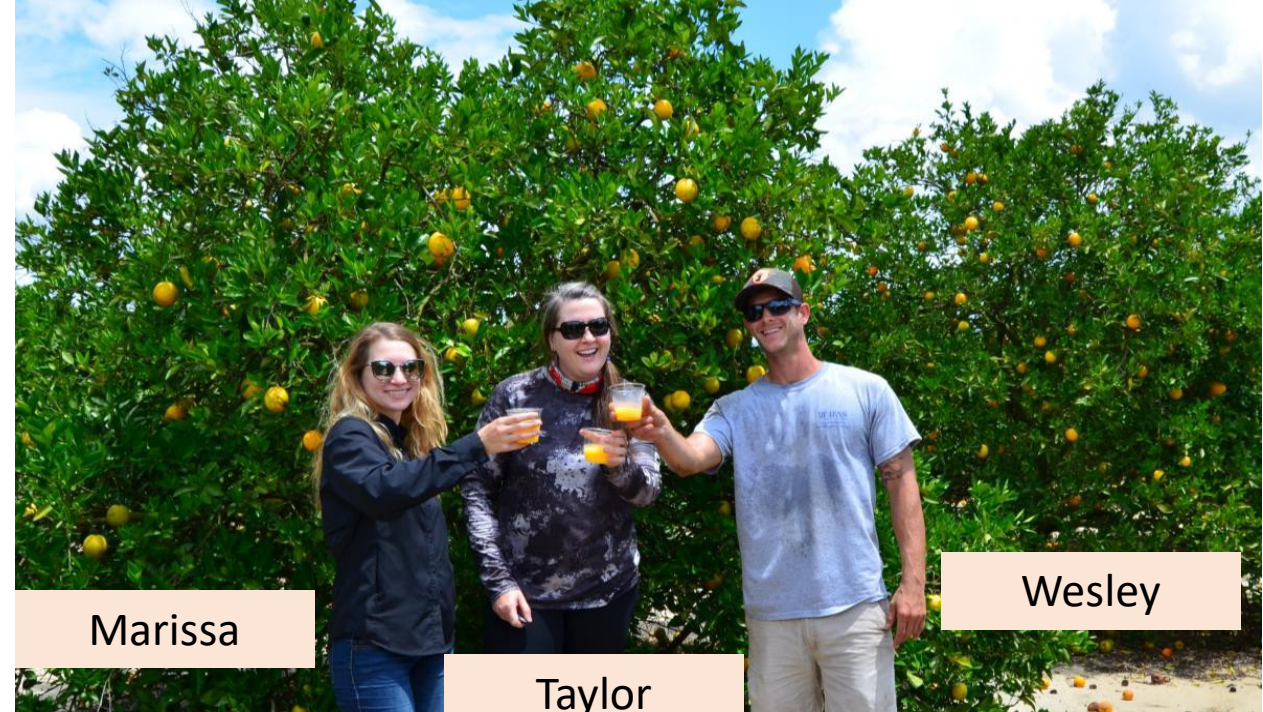
GA Use Pattern for Valencia Orange

- 5 GA applications can improve yield in Valencia
 - Sep-Jan (monthly application)
 - 10 fl oz Progibb LV plus per acre per application
 - GA 20 g ai or 33 mg/liter per acre per application
 - 0.125% Surfactant (nonionic, low foam; Induce)
 - Spray volume: 125-150 Gal/A (good spray coverage)



Thank you!

- Citrus Initiative
- CRDF (Flowering GA Trial)
- Dr. Ariel Singerman
- Peace River Packing
- Valent Biosciences
- Dr. Lisa Tang
- Sukhdeep Singh
- Mary Sutton



Marissa

Taylor

Wesley

