

# Treat HLB trees with the right PGR at the right time

By Tripti Vashisth, Wesley Webb and Taylor Livingston



**A**s trees become symptomatic for HLB, leaves experience an imbalance of plant hormones. This hormonal imbalance exacerbates HLB symptoms and can lead to more stem dieback, poor vegetative growth and fruit drop. This ultimately leads to reduced bearing wood, resulting in yield losses and tree decline. Thus, the use of growth-promoting hormones can be beneficial for boosting growth in HLB-affected trees. This article will

discuss using three PGRs — cytokinin, auxin and gibberellic acid (GA) — on HLB-affected sweet oranges to improve their growth and productivity.

A recent study that compared healthy and HLB trees found that HLB-affected trees have a high accumulation of salicylic acid (a plant defense-promoting hormone) throughout the growth phase of a leaf. They also had high abscisic acid (a plant hormone well known to accumulate during water-deficit conditions). They

had low levels of growth-promoting hormones such as auxin, cytokinin and GA. This suggests that HLB-affected plants invest in plant-defense response at the expense of growth and thus exhibit poor growth characteristics. Figure 1 shows some examples of subpar leaf and shoot growth, which can lead to poor photosynthesis in HLB-affected plants. This causes low fruit set and retention of the crop, resulting in economic losses.

In the last two to three years, several PGR trials have been established to identify treatments that enhance growth in HLB-affected trees. Exogenously applied PGRs can potentially improve the health of HLB-affected trees. However, the right timing and concentration of the PGR are critical to achieve the desired effect. This article will discuss two ongoing field trials that will highlight the concept of the right PGR at the right time.

Previous research shows that multiple applications of GA in late summer and early fall can improve the growth characteristics and yield of Valencia trees. Many growers feel encouraged to adopt GA to promote vegetative growth, especially when trees have a natural flushing cycle, i.e., spring (March) and summer (July and August).



Figure 1. Healthy vs. HLB leaves and shoots

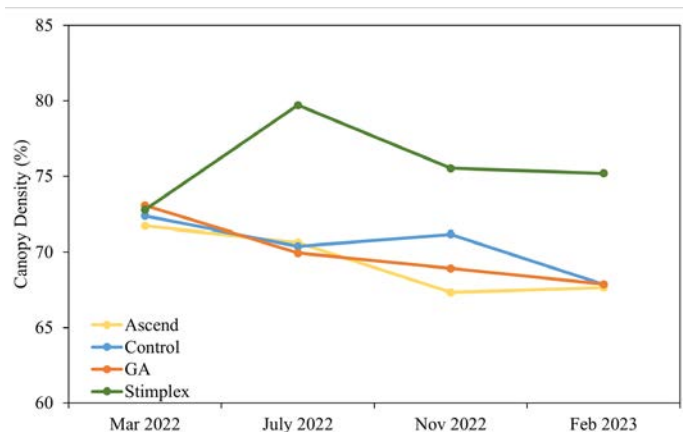


Figure 2. Canopy density of PGR-treated Valencia trees from March 2022–February 2023. Over time, seaweed extract-treated trees gained the most canopy density.

## TRIAL 1

Cytokinin, a plant hormone group that is known to promote cell division, can enhance spring and summer growth. A trial was set up at in an experimental grove at the Citrus Research and Education Center (CREC). Trees with severe HLB symptoms (canopy density less than 80%) were selected and treated with one of the following:

- Untreated
- GA
- A commercial PGR blend

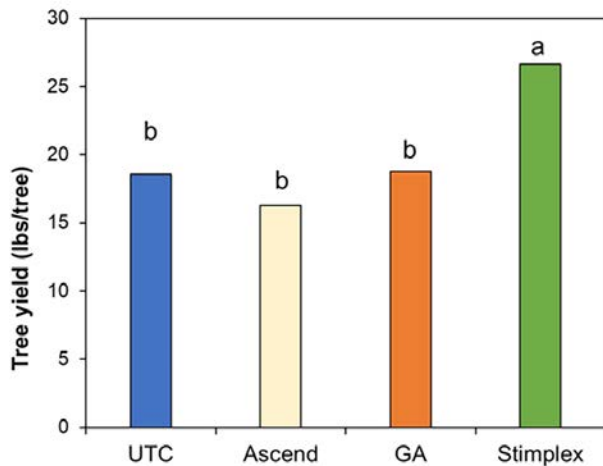


Figure 3. Average yield of PGR-treated Valencia trees compared to the untreated control (UTC).

(Ascend, containing auxin, cytokinin and GA)

- A seaweed extract (Stimplex, rich in natural cytokinin).

The treatments were applied every 45 days from March to October. After one year of treatment, seaweed-treated trees increased in canopy density whereas the rest of the treatments decreased (Figure 2, page 15). GA-treated trees decreased in canopy

density, especially after spring. This is probably because GA treatment at the time of flowering (March) resulted in an increased fruit set, leading to poor vegetative growth. The cytokinin-rich product, as expected, increased vegetative growth without any effect on fruit set. Cytokinin-treated trees developed a better canopy to support crop load.

As expected, the increase in canopy equaled an increase in yield. Stimplex-

Table 1. Average yield, fruit detachment force (FDF) and fruit quality data from Hamlin trial where PGRs were applied as per tree phenology.

	Yield (pounds/tree)	Brix	Acid	Size	FDF
Treatment 1 U	378 b	10.9	0.68	61.1 b	6.9 b
Treatment 2 C	402 ab	10.3	0.73	63.1 a	7.6 a
Treatment 3 C + GA	469 a	10.4	0.69	63.3 a	7.3 ab
Treatment 4 C + GA + A	402 ab	10.1	0.64	62.7 ab	7.1 b

treated trees produced a 40% higher yield than untreated trees and the rest of the treatments (Figure 3). GA sprays were repeated from March to October every 45 days and still did not achieve the desired benefit. It is likely because the imbalance in the source-to-sink ratio caused higher fruit set at the expense of canopy growth early in the season. This was enough to offset any desirable benefits of treatment. Thus, application timing is very important as PGRs can affect several physiological processes at any given time.

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## TRIAL 2

In another study that started in July 2022, researchers employed the idea of the right PGR at the right time based on the tree phenology and desired goal. In this Hamlin study, four treatments were evaluated:

1. Untreated control (U)
2. Cytokinin April/May (C)
3. Cytokinin April/May + GA July/September/November (C + GA)
4. Cytokinin April/May + GA July/September/November + Auxin July/September/November (C + GA + A)

Within the first year of application, treatment number 3 (cytokinin in spring + GA) was found to have yielded about 20% more fruit and bigger fruit (Table 1, page 16) than the control.

**The commercial product and rate for each of the PGRs used in the studies**

PGR Type	PGR Commercial Name	Rate (oz/acre) at each application
Gibberellic acid	ProGibb	10
Cytokinin	Validate	12
Auxin	Citrus Fix	1.2
Seaweed extract	Stimplex	20
PGR blend	Ascend	6

## IMPLICATIONS

Both of these studies are ongoing, but the first-year findings suggest that using cytokinin in the spring to promote growth and using GA in the summer and fall is beneficial for invigorating HLB-affected trees. The use of GA from January to June should be avoided as it can affect flowering and fruit set, leading to undesirable effects on tree growth. Also, the benefit of synthetic auxin (such as 2,4-D) seems to be limited to cases where fruit drop is a major issue. If the groves don't drop more than 25% to 30%, the use of 2,4-D can be avoided. 🍊

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# Hurricane and Harvest Predictions



By Rick Dantzer, CRDF chief operating officer

My earliest memory in life was when Hurricane Donna came through Florida in 1960. I was not quite 5 years old. My family huddled in a room of our concrete block home in Winter Haven, waiting for the storm to pass. When I went outside the next morning, trees were down everywhere, including a giant pecan tree in our backyard. In the decades that followed, hurricanes weren't much of an issue for us until 2004 when Hurricanes Charley, Frances and Jeanne crossed paths southeast of Bartow.

Why do I say this? At the recent Citrus & Specialty Crop Expo, I heard growers talking about the prospect of hurricanes, and while they do seem to be coming with more frequency and intensity, they are still rare occurrences. Granted, they can be devastating when they hit, and Hurricane Idalia is churning off the coast of Cuba as I write this. But the likelihood is that we get through this season without a big storm affecting us.

What is easier to predict is our harvest, and I believe it will be far better than last season. Hundreds of thousands — perhaps millions — of trees have been treated with antimicrobials, and the applications are working. Nearly every grower is reporting a positive effect on trees, and this should translate into more, bigger and better fruit.

Inserting oxytetracycline (OTC) is a practice that will probably continue for a few more years, so the Citrus Research and Development Foundation is already funding OTC research on:

- Whether CLAs is killed in the gut of the psyllid when the pest feeds on an HLB-infected tree
- If insertions in large branches provide comparable coverage
- If trees older than 20 years old can be brought back into profitable production
- The effect on root growth
- Inserting at rates lower than the recommended dosages
- How long OTC stays active in the tank and whether different water can change efficacy
- What other antimicrobials can be mixed with OTC to increase efficacy

What other practical questions do you have? Here are some thoughts:

1. Are there ways to mitigate possible negative effects on the tree from the insertion of the product? Ute Albrecht of the University of Florida Institute of Food and Agricultural Sciences has some data on this already, and companies continue to refine injection devices.
2. Is there a mixing solution for OTC that is pH neutral, thereby allowing other compounds to be added for additional positive effects?
3. What is the tipping point beyond which the tree can't recover?
4. How much is spring bloom increased by fall applications of OTC?

I'm bullish on the industry regardless of the threat of hurricanes and believe the march back to higher production and industry stability has started.



Column sponsored by the Citrus Research and Development Foundation