Gibberellic acid shows promising results on Hamlin

By Tripti Vashisth and Taylor Livingston

Grower-led trials in 2022 showed positive results of gibberellic acid (GA) treatment on Hamlin trees in Florida. This article primarily discusses two growers' trials in detail. Both sites showed improvement in fruit production from the GA application.

Many growers have adopted GA applications in the past year as part of their grove management strategy. The results of repeated GA applications on Valencia have been encouraging for the Florida citrus industry.

Last year, several grower trials were initiated to gather information on the use of GA in early- and late-maturing sweet orange varieties. The preliminary information on Hamlin was promising. The data suggests that three applications of GA are better than two. It is also better to conduct GA sprays earlier in the season. Last year, the grower who saw the maximum benefit of the GA application on Hamlin started the applications in August and continued them through November.

This year, the growers were encouraged to apply GA from August to November in 45-day intervals, for a total of three applications in the fall. This is a different application regimen than the previous application pattern. Five monthly applications of GA were found to improve yield and canopy growth in Valencia trees. The suggestions on the use of GA are constantly evolving. The newly suggested GA application regimen was based on grower feedback and preliminary observation from other Hamlin trials.

The trials discussed herein are from two Hamlin sites in Central Florida. The same sites, and trees within each site, were also followed in 2021. That year, researchers collected data on five Hamlin sites. However, due to Hurricane Ian, three sites in Southwest Florida were extensively compromised, and data couldn't be collected from them.

In these grower trials, the entire block was divided into two halves. One side was treated with GA using an air-blast sprayer. The GA was applied at 10 fluid ounces per acre with an adjuvant, and no other chemicals were mixed in the tank. In 2021, these blocks received two GA sprays about 30 days apart, on Oct. 19 and Nov. 24. In 2022, the GA was applied at approximately 45-day intervals starting in August (Aug. 12, Sept. 26 and Nov. 18).

HIGHER YIELD EFFICIENCY

The current season's fruit was harvested on Dec 5. A significant improvement in yield was observed in Site 1 (Table 1). The GA-treated trees produced about 50% more fruit on average than untreated

	Site 1			Site 2		
	Year 1 (Yield)	Year 2 (Yield)	Percent Difference in Yield From Year 1 to 2	Year 1 (Yield)	Year 2 (Yield)	Percent Difference in Yield From Year 1 to 2
GA	310.54 lbs.	161.39 lbs.	-46.84%	225.30 lbs.	167.44 lbs.	-26.61%
Control	292.86 lbs.	80.04 lbs.	-72.33%	302.82 lbs.	156.21 lbs.	-47.66%

Table 1. Yield from 2021–22 and 2022–23 for GA-treated and untreated trees as pounds of fruit per tree.

	Site 1			Site 2		
	Year 1 Canopy Volume	Year 2 Canopy Volume	Percent Difference in Canopy Volume	Year 1 Canopy Volume	Year 2 Canopy Volume	Percent Difference in Canopy Volume
GA	59.13	53.46	-9.52%	39.12 b	37.39 b	-4.24%
Control	62.31	55.06	-10.85%	51.01 a	47.64 a	-5.07%

Table 2. Canopy volume in 2021 and 2022 for GA-treated and untreated trees

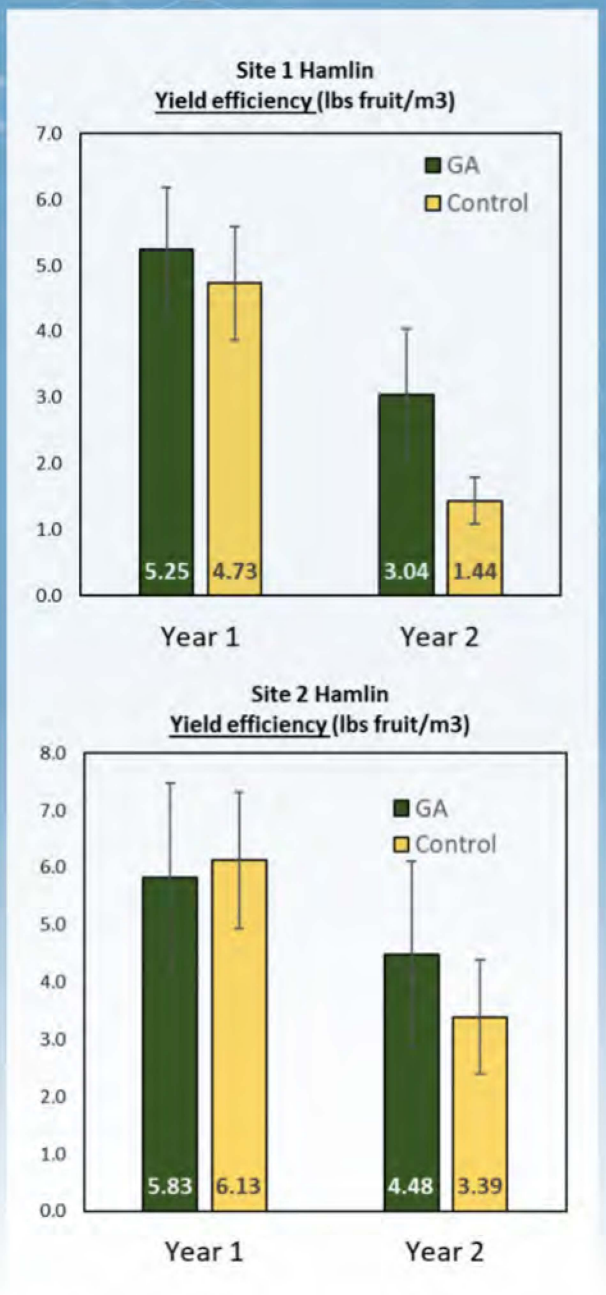

Figure 1. Yield efficiency from 2021–22 and 2022–23 for GA-treated and untreated trees as pounds of fruit per tree.

trees. In the 2021–22 season (previous year), both untreated and GA-treated trees produced on average 300 pounds of fruit per tree. However, when comparing the past year's yield data to this year, the yield in untreated trees was reduced by 72%. The GA trees had significantly less reduction in yield than untreated trees (47%). This overall reduction in yield can be attributed to crop loss from Hurricane Ian.

In the 2021–22 season, untreated trees in Site 2 produced significantly more yield than GA-treated trees (Table 1, page 20) because the untreated trees were larger in canopy volume than GA-treated trees (Table 2, page 20). A large canopy volume can mean more bearing volume, leading to a higher yield. Both untreated and GA-treated trees had similar yields in the current harvest (2022), even though the GA-treated trees are still smaller in canopy volume than untreated trees. Overall, compared with last year's yield, untreated trees had a 47% reduction in yield and GA-treated trees had a 26% reduction.

Altogether, the harvest data from these trial sites concludes that repeated application of GA resulted in significant improvement in the yield efficiency of trees (Figure 1). Yield efficiency is a term used to describe fruits

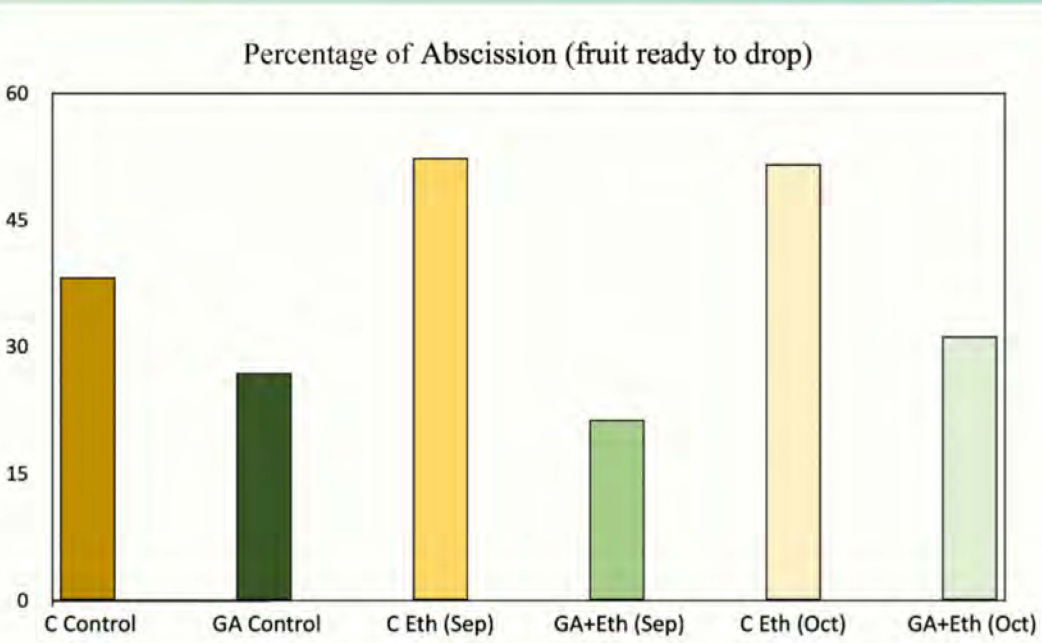

Figure 2. Fruit abscission in gibberellic acid (GA)-treated and untreated trees. Fruit within each tree were exposed to ethylene (Eth) in either September or October.

produced per canopy volume. Therefore, yield efficiency considers the total bearing volume. High yield efficiency means higher fruit production from a small volume of the canopy. High yield efficiency is desirable. The yield efficiency in HLB trees has decreased.

In both sites, GA-treated trees had a higher yield efficiency than untreated trees. Therefore, this data boosts confidence in the use of GA for Hamlin. A late summer start of GA sprays, repeated every 30 to 45 days, is beneficial for the early-maturing variety. There was no difference in juice Brix between GA-treated and untreated trees.

ETHYLENE EXPERIMENT

In another trial, we exposed GA-treated and untreated fruit to ethylene to understand the effect GA treatment has on tree response to stress. Ethylene is a naturally occurring plant hormone that increases as the tree responds to stress. It can also induce fruit drop.

In this experiment, the trees were sprayed with GA or left untreated. In September (pre-hurricane) and October (post-hurricane), a subset of fruit within each tree was exposed to ethylene (via a 1-minute-long dip). Basically, on both GA-treated and untreated trees, there was fruit that was either exposed to ethylene in September, exposed in October and was not exposed.

As expected, GA-treated fruit resisted the ethylene-induced drop better than untreated fruit. After the hurricane, a significant fruit drop was observed in both GA-treated and untreated fruit. After a lapse of a few weeks, GA-treated fruit showed a decrease in fruit drop as compared to untreated fruit. Overall, GA-treated fruit was observed to fare fruit drop (induced by ethylene or hurricane) better than untreated fruit (Figure 2).

While GA applications are promising, growers are strongly recommended to *not apply GA from mid-January to May*. Application during this time can mess up flowering as well as the physiological process of "June drop," where the tree adjusts its crop load.

TANK-MIXING

Moving forward, many growers are adopting GA use as a part of their grove management plan. It is recommended to not tank-mix GA with other chemicals since phytotoxic responses or GA incompatibility with other chemicals is not fully known. However, some growers have successfully mixed GA with other chemicals without phytotoxicity on trees.

Therefore, growers are requested to share information on chemicals they have tank-mixed with GA. No other information will be requested, and all shared information will be kept anonymous. This will help University of Florida researchers to create a database on tank-mixing GA. The database will be publicly available and boost confidence among fellow citrus growers on tank-mixing GA and reducing its application cost. Use this link (ufl.qualtrics.com/jfe/form/SV_0TCUjWzerKsDCNU) or scan the QR code below to get to the form to fill in information about tank-mixing.

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