



Photo by Jawwad Qureshi

**Figure 1.** Trees were planted on UV-reflective mulch and on bare ground at locations in Immokalee (above), Lake Alfred and Vero Beach.

# ACP management with UV-reflective mulch and flush-timed sprays

By **Jawwad Qureshi, Lauren Diepenbrock and Davie Kadyampakeni**

**T**he future of the Florida citrus industry depends on successfully replacing the present bearing tree inventory with new plantings and transitioning them into crop production. This would be a relatively routine process were it not for the ubiquitous presence of huanglongbing (HLB) and its vector, Asian citrus psyllid (ACP).

Early infection can spell economic disaster because young trees are especially susceptible to HLB. Effective and consistent psyllid control is the key to protecting young trees from HLB. Unfortunately, conditions have been conspiring to make this a difficult process. ACP populations steadily increase every year for reasons that include availability of new flush coupled with

psyllid ability to lay hundreds of eggs, resistance to some classes of insecticides, and a general reduction in control efforts.

The increase of ACP in Florida means an increase in the proportion of ACP infected with the HLB pathogen because most trees are infected with the disease. The greater the number of infected ACP, the harder it is to grow a healthy tree. Therefore, new and improved methods of reducing ACP populations are critical to reducing the spread of HLB. One such method for reducing ACP in young trees is UV-reflective mulch.

ACP is a day-flying insect that primarily relies on vision to locate host plants for feeding and egg-laying. The reflection from the mulch interferes with the ACP's ability to land on the plant and perform its feeding and reproductive activities, which ultimately affects its interactions with the HLB pathogen and plant health.

Foliar sprays of insecticides are critical and commonly used for reducing ACP, but their frequent use is costly and damaging to the environment. Adjusting the timing of spray applications for flush will reduce the opportunity for ACP to develop and reproduce. ACP adults prefer to feed and reproduce on newly developing buds and shoots, which their progeny nymphs also need to develop, and as such are a key target for management actions.

## STUDY SETUP

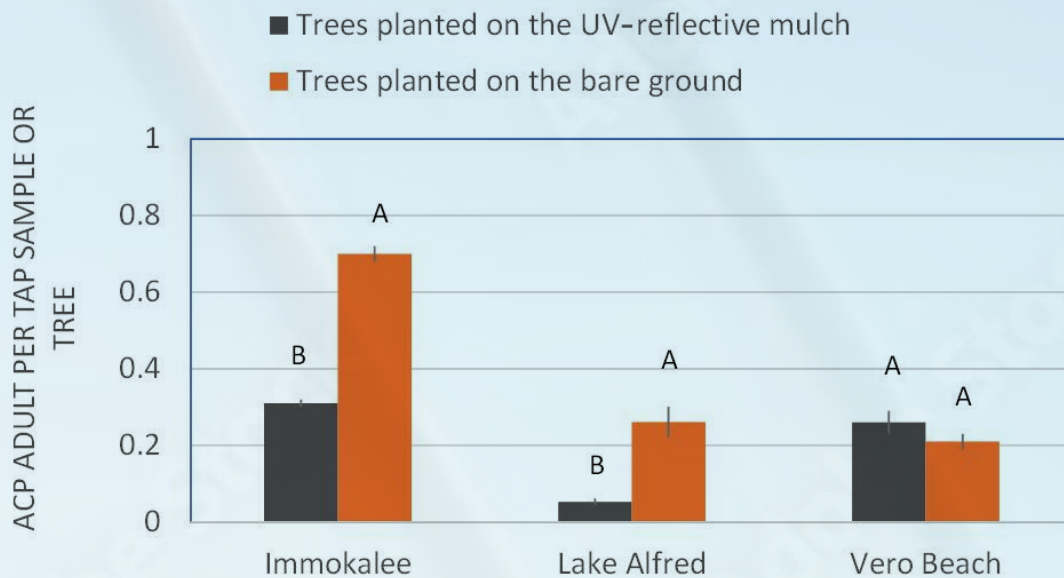
Replicated experiments (Figure 1) have been established in the Gulf (Immokalee), Ridge (Lake Alfred) and River (Vero Beach) regions of the state. The experiments are evaluating the effects of mulch and flush-timed sprays on ACP and HLB, tree growth, yield and cost-benefit analysis. The Gulf and Ridge locations are planted with Valencia oranges on Swingle and Carrizo rootstocks, respectively. The River location

is planted with Ruby Red grapefruit on US-897 rootstock.

At all three locations, mulch beds were established using 96-inch-wide metalized reflective mulch. The product used is Shine N' Ripe XL manufactured by Imaflex. It is a heavy-duty, 3-mil, totally impermeable film coated with aluminum that reflects more than 90% of solar radiation.

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Two ACP management programs were followed on the trees, on mulch and on bare ground at the Immokalee and Lake Alfred locations. These included sprays targeted at flush (eight applications) and a calendar-based program which included rotating a soil drench of neonicotinoids or a spray application of a different mode of



**Figure 2.** Mean number of ACP adults per tap sample or plant at three locations. Letters indicate significant differences between columns representing means for each location ( $p \leq 0.05$ ).

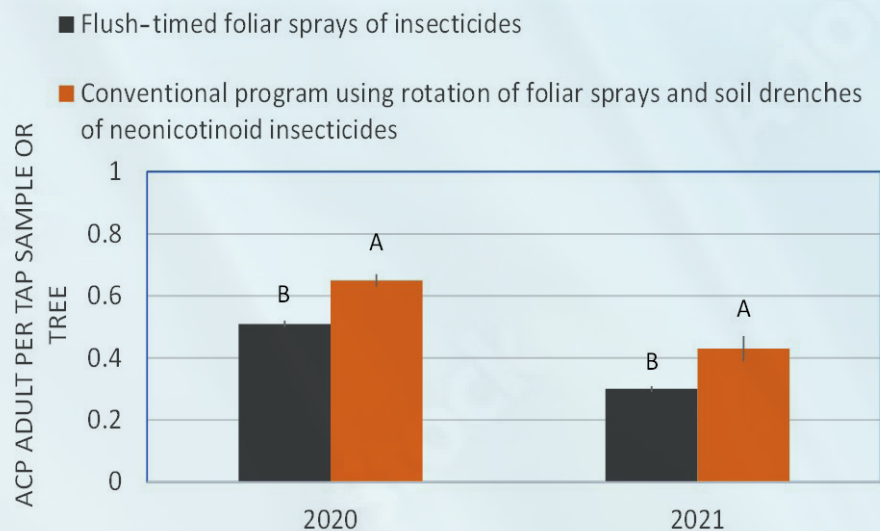
action insecticide (12 applications). The plots allocated for flush-timed sprays received irrigation-deficit treatment to help synchronize the flush. All the trees were drip-irrigated with two emitters. A separate irrigation treatment using microsprinkler irrigation was also evaluated at the Lake Alfred location.

## RESEARCH RESULTS

### ACP Populations

A significant reduction in ACP from UV-reflective mulch was observed. The adult numbers on the plants with mulch compared to those on the bare ground were reduced by 60% in 2020 and 44% in 2021. The overall reduction at the Immokalee location was 56% (Figure 2). An even larger reduction, averaging 81%, was observed at the Lake Alfred location. Such difference was not apparent at the Vero Beach location, but mulched trees had a 65% reduction in the flush infestation rate. This location was planted in 2020 and suffered significant damage from the rains. However, most damaged plants were replaced.

Flush infestation with ACP immatures averaged 29% to 32% on mulch compared with 36% to 46% on the bare ground at the Immokalee location. The trees with mulch produced 7% to 14% more flush than the trees on the bare ground, thus there are more opportunities for the adults to reproduce on those trees, which may have played a role in reducing the



**Figure 3.** Mean number of ACP adults per tap sample or plant at Immokalee. Letters indicate significant differences between columns representing means for each year ( $p \leq 0.05$ ).

impact on the infestation rate compared to huge reductions observed in the adult numbers.

ACP populations at the Immokalee location were much higher than at the Lake Alfred and Vero Beach locations. This was likely influenced by missed insecticide applications due to COVID-19 restrictions. The flush infestation also varied with the sampling date and was significantly reduced by a large magnitude with mulch on several dates. In September 2020, HLB incidence determined using qPCR was 58% in the trees sampled on the bare ground and 25% in the trees on mulch at the Immokalee location. The numbers increased to 95% on the bare ground

and 77% on mulch in March 2021.

The trees on irrigation-deficit treatments produced less flush compared to those on the full or conventional treatment; this trend persisted on the mulch or bare ground. A significant reduction of 21% to 30% in ACP adults in the flush-timed spray program compared with the calendar-based program was observed at Immokalee (Figure 3). However, only a 13% reduction in the flush infestation was observed. The preliminary findings of reduced adults or flush infestation among locations suggest that the flush-timed spray tactic is sufficient for ACP population reduction. Researchers are working on modifying the deficit-irrigation



treatments to further improve flush management and treatment.

### Soil And Nutrient Analysis

Data from April 2021 showed higher soil moisture averages with mulch treatment at all layers (8, 15 and 45 centimeters) compared with the bare ground. However, these differences were masked by rains in summer 2021. Soil analysis from the Immokalee location showed that except for magnesium, potassium and boron, all the other nutrient concentrations were higher in the mulch plots, suggesting better nutrient distribution within the root zone and minimal leaching threat.

### Tree Growth

Trees with UV-reflective mulch are starting to show significant differences in growth indicators at all three locations. An increase in rootstock and scion growth averaged 18.8% and 16.9%, respectively, at Immokalee; 14.2% (scion) at Lake Alfred; and 16.5% and 12.1%, respectively, at Vero Beach (Table 1). Overall, tree canopy density appears to be greater on

**Table 1.** Mean stem diameter of rootstock and scion of the trees on UV-reflective mulch and bare ground at three locations, 2021.

Location	Rootstock/Scion	Stem diameter (millimeters)		
		UV-reflective mulch	Bare ground	Percent increase
Immokalee	Swingle	51.5 A	41.8 B	18.8%
	Valencia	33.7 A	28.0 B	16.9%
Lake Alfred	Carrizo	—	—	—
	Valencia	16.9 A	14.5 B	14.2%
Vero Beach	US-897	33.8 A	28.20 B	16.5%
	Ruby Red	24.0 A	21.12 B	12.1%

mulched than bare ground trees at all locations and increased by 40% at the Lake Alfred location and 30% at the Immokalee location.

ACP populations and HLB incidence at all three locations are continuing to be monitored to gain a better understanding of the impact of mulch and flush-timed treatments on tree growth and yield. 🍊

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