

The benefits of growing citrus on UV-metalized reflective mulch

By Jawwad Qureshi, Lauren Diepenbrock and Davie Kadyampakeni

Protecting citrus trees from the Asian citrus psyllid (ACP) is critical to reducing the spread and severity of huanglongbing (HLB) or citrus greening disease. ACP, the vector of the pathogen responsible for causing HLB in citrus, needs young shoots to develop and reproduce. The frequent availability of viable shoots in young trees is attractive to psyllid colonization, feeding and oviposition events. The consistent presence of ACP adults and immatures on trees and multiple feeding events increase the disease inoculum and severity in groves.

In the HLB environment, currently available methods of pest control used in traditional open groves do not provide enough suppression of ACP to maintain the viability of the young trees until production. Only individual protective covers (IPCs) provide complete protection against ACP/HLB for two to three years after planting, and trees still may require insecticide applications for pests observed in these structures.

Soil drenches of neonicotinoid insecticides that used to provide six to eight weeks of ACP suppression are no longer a standalone option due to the propensity of the pest to develop resistance to this

class of insecticides. However, ACP suppression is needed for the young plants to survive in the HLB environment, particularly during the initial years of growth. Therefore, tools that provide psyllid suppression and ultimately help with plant growth and survival into the production phase are warranted.

LESS ACP, BETTER GROWTH

UV-metalized reflective mulches reflect ultraviolet light, which is disturbing for some insects and repels them from colonizing the plants growing on the mulch. This could be a useful tool for protecting young citrus trees against ACP, which is a day-flying insect that primarily relies on vision to locate a host.

Reduced colonization and pressure from ACP populations in trees planted on mulch, along with the increase in soil and canopy temperatures and efficiency of water and fertilizer use depending upon soil type, will likely result in better plant growth. The effectiveness of metalized mulch as a psyllid repellent is strongest on newly planted trees and gradually diminishes as trees become shaded



Figure 1. Valencia orange trees on Swingle rootstock growing on UV-metalized reflective mulch and bare ground at the Southwest Florida Research and Education Center in Immokalee

by the enlarging canopies. However, the cumulative effects of ACP protection and resource conservation in the initial years are likely to show impacts on plant health and yield.

EXPERIMENTAL DESIGN

In late 2019 and 2020, University of Florida Institute of Food and Agricultural Sciences (UF/IFAS) researchers established three replicated experiments with the support of the Citrus Research and Development Foundation. The goal was to determine the effects of 96-inch-wide UV metalized reflective mulch on newly planted citrus. This Shine N' Ripe XL mulch from Imaflex is a heavy-duty, impermeable film coated with aluminum that reflects more than 90% of solar radiation.

In Vero Beach, Ruby Red grapefruit trees on US-897 rootstock were planted in 2020. Valencia orange trees on Swingle and Carrizo rootstocks, respectively, were planted in Immokalee (Figure 1, page 14) and Lake Alfred in 2019. ACP control in trees on mulch and bare ground was implemented using two methods. These included sprays targeted at flush and a calendar-based program of rotating soil drench of neonicotinoids with a spray application of a different mode of action insecticide. The plots allocated for flush-timed sprays received irrigation-deficit treatment to help synchronize the flush in Immokalee and Lake Alfred. 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

Previously, UF/IFAS reported on the mulch suppression of ACP (citrusindustry.net/2021/11/29/acp-management-with-uv-reflective-mulch-and-flush-timed-sprays/) as well as the effects of deficit water treatments on plants (citrusindustry.net/2023/03/17/deficit-irrigation-in-hlb-affected-citrus-trees/) and initial benefits to soil moisture, nutrients and plant health. Funding for the project ended in 2021. However, researchers have continued observations of mulch effects on ACP populations and plant health and have started to obtain yield data. Unfortunately, trees at all locations suffered



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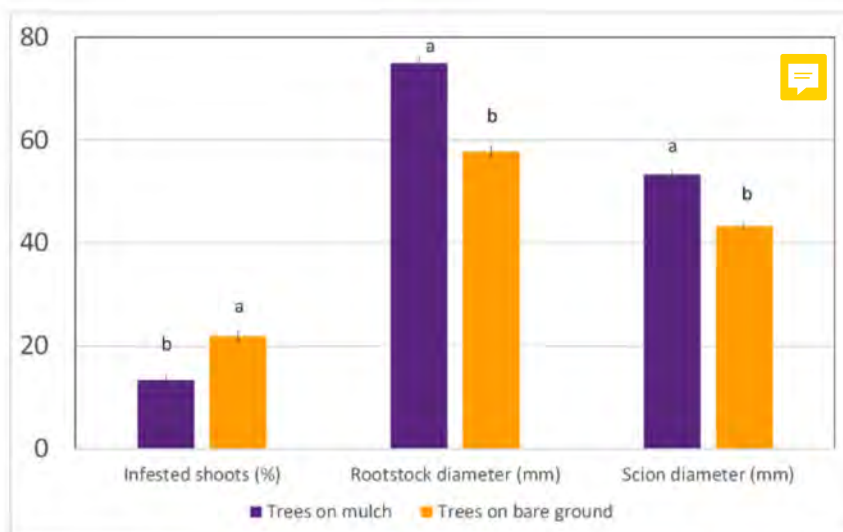


Figure 2. Shoot infestation with psyllid immatures and diameter of rootstock and scion of Ruby Red grapefruit tree on US-897 rootstock growing on UV-metalized reflective mulch and bare ground in Vero Beach

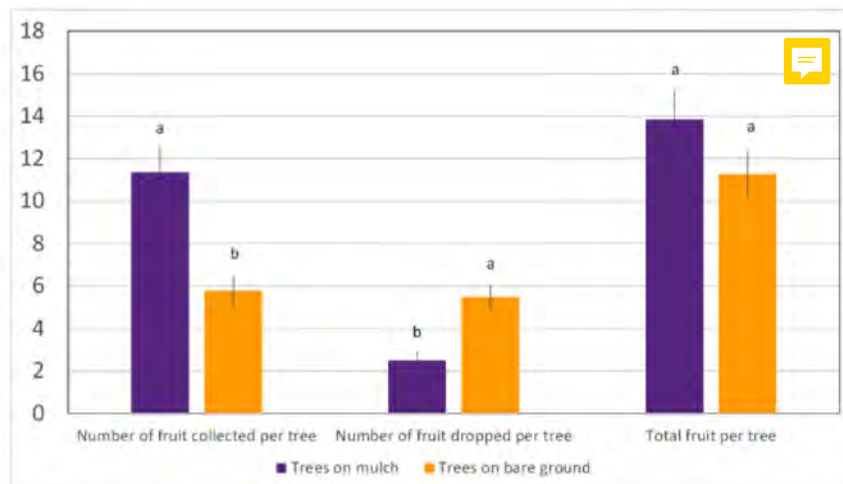


Figure 3. Yield per tree from Ruby Red grapefruit on US-897 rootstock growing on UV-metalized reflective mulch and bare ground in Vero Beach

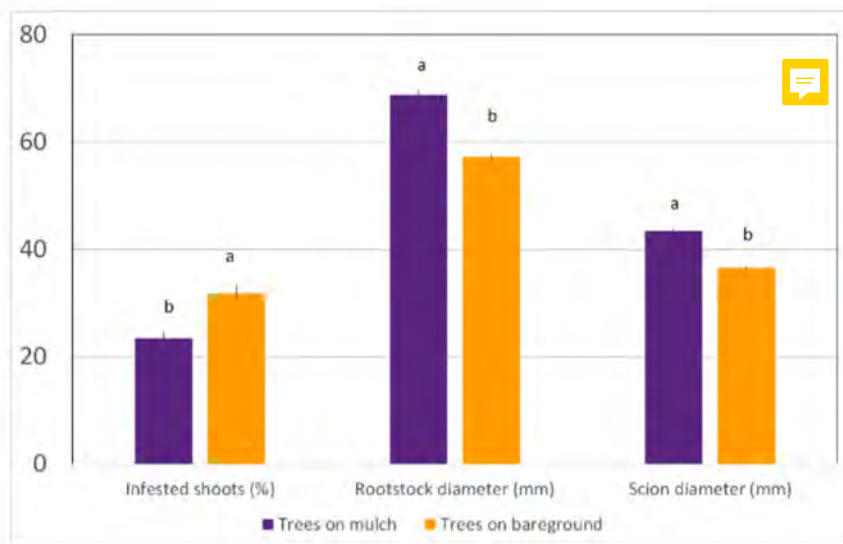


Figure 4. Shoot infestation with psyllid immatures and diameter of rootstock and scion of Valencia orange tree on Swingle rootstock growing on UV-metalized reflective mulch and bare ground in Immokalee

significant damage from Hurricanes Ian and Nicole in 2022, so meaningful yield data were only possible from Vero Beach and Immokalee locations.

The effects of mulch on ACP suppression were strong during the initial two years of planting. Adult ACP numbers reduced between Immokalee and Lake Alfred by 60% in 2020 and 44% in 2021. The effect of mulch on shoot infestation with psyllid immatures was observed for up to 65% at Vero Beach. With the increase in the canopy size, mulch effects on psyllids were reduced, and only 8% less shoot infestation in mulch than bare ground was observed at Vero Beach and Immokalee in 2022 (Figure 2 and Figure 4). However, the cumulative effects of mulch, including ACP suppression and water and nutrient conservation, continue to benefit and reflect in the overall plant health.

Vero Beach Grapefruit

In grapefruit at Vero Beach, an increase in the rootstock and scion growth of the trees on mulch compared to bare ground averaged 23% and 19%, respectively, in 2022 (Figure 2); and 17% and 16%, respectively, in Valencia orange at Immokalee (Figure 4). These effects further translate into increase in canopy density and were observed at 30% to 40% compared to the bare-ground trees between the two locations.

The number of fruit collected per grapefruit tree on mulch was almost double of what was collected from a tree on the bare ground, averaging 11 and six per tree, respectively (Figure 3). The weight of the fruit was 65% more on the mulch than on the bare ground.

There was less fruit drop in trees on the mulch than the trees on the bare ground. An average of 2.5 and 5.5 fruit dropped per tree on mulch and bare ground, respectively (Figure 3). The total fruit, including the number on the tree and fruit dropped, averaged 14 and 11 per tree, respectively.

Immokalee Oranges

In Valencia oranges at Immokalee, psyllid reductions in trees on the



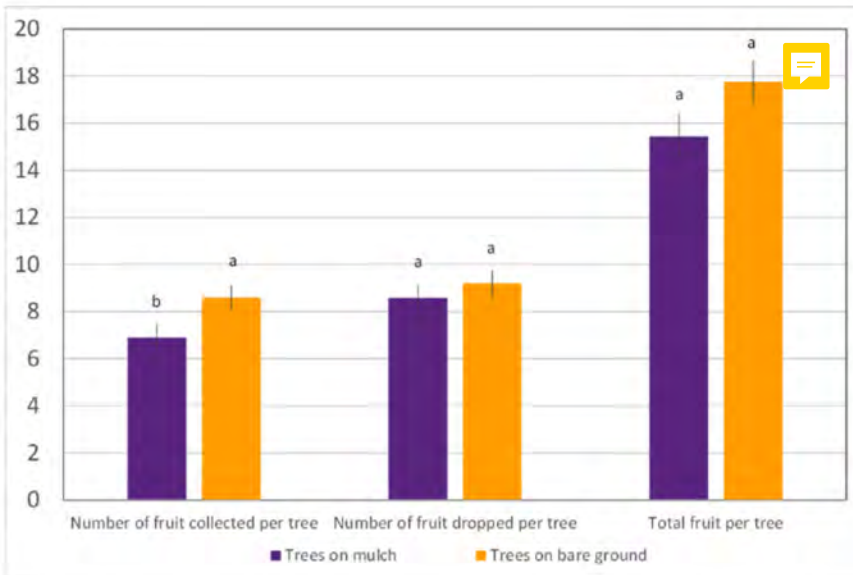


Figure 5. Yield per tree from Valencia orange on Swingle rootstock growing on UV-metalized reflective mulch and bare ground in Immokalee

mulch along with better soil moisture content and nutrient concentrations continue to contribute to better plant health. However, benefits in yield are not apparent yet. Fruit collected per tree averaged seven and nine on mulch

and bare ground, respectively (Figure 5). Fruit drop averaged nine per tree in both systems, while the total collected and dropped fruit was 15 and 18 per tree in mulch and bare ground, respectively. Juice quality did not differ

between treatments, with Brix averaging 8.6, solids at 4.09 pounds per box, and a Brix/acid ratio of 12.3.

SUMMARY

The positive outcomes of planting on mulch are reflected in both grapefruit and sweet oranges with healthier plants than on the bare ground. Significantly better yield is already observed in the grapefruit and will likely be seen in sweet oranges in the coming years. The benefits of planting on mulch are expected to increase in larger plantings by providing even greater protection against ACP. Benefits of moisture and nutrient conservation may vary with soil type. Heavy rains pose a serious threat to the viability of mulch and its benefits to plants. 🍊

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