A growth-enhancing pest management option

By Christopher Vincent

Red-dyed kaolin reduces the ultraviolet and blue light that Asian citrus psyllids are attracted to.

Particle films can both increase tree growth and reduce Asian citrus psyllid populations. University of Florida (UF) research has found particle films delay infection with the *C*Las bacterium, which causes HLB. They also enhance growth rates and yield. Particle films do have limitations to efficacy, including being washed off in frequent or heavy rains. Overall, particle films offer an important pesticide alternative, which growers should consider integrating into their production practices.

Particle films are solid particles that can be sprayed in a water suspension onto plants to form a coating over leaf surfaces. These films are commonly used in horticultural crops to manage insect pests, reduce sunburn or enhance growth. People often ask me whether the film plugs up the plant's pores. It turns out that they do not. Rather, the particles sit around the pores (stomata) reflecting light in different directions. Particle films do not keep gases from moving in an out of the leaf. This is important because it means they do not prevent the plant from photosynthesizing or from cooling itself.

An ongoing trial was treated beginning on the first day of the planting with either no foliar insecticides, foliar insecticides, white kaolin or red-dyed kaolin. The white kaolin is Surround WP, a commercially available particle film. Red kaolin is not yet commercially available. Treatments are made whenever rain washes the kaolin product off, which has been every two weeks on average over the first two years of the planting.

HOW EFFECTIVE ARE PARTICLE FILMS AGAINST PSYLLIDS?

Particle films reduce Asian citrus psyllid (ACP) populations by reflecting light. The film covers up the natural color of the leaves that attracts the

insects. The red dye gives an additional boost by reducing ultraviolet and blue light that also attract ACP. The insects are not attracted to red. Both red and white kaolin have greatly reduced ACP populations, by more than 80 percent compared to the insecticide control. The insecticide control only reduced ACP by about 20 percent relative to the untreated control over the course of the year, though it did reduce peak populations by about half.

The reduction in ACP that insecticides caused was not enough to delay infection with CLas, but particle films did delay infection. Two years after planting, both treatments with no particle films are very close to 100 percent infected. The two treatments with particle films are approximately 60 percent infected. Infection in the red-dyed treatment was not detected until more than one year after planting. Some infections were found in the other treatments by six months after planting.

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HOW DO PARTICLE FILMS AFFECT GROWTH?

Growth results have been overwhelmingly positive. The white particle film increased growth by 20 percent, while red film saw a 40 percent increase. At 17 months after planting, fruit was harvested from treated Hamlin trees. Though the quantity of fruit was small, the treatments without particle film produced almost no fruit. Higher yields in the first complete season indicate much better growth status in the particle film treatments. Much higher yields are expected in the coming season.

What causes the increased growth? Delaying infection with CLas is certainly helping the trees in the trial, but particle films increase growth even when not considering the effects of

HLB. So far, the effects on growth rate hold for both infected and uninfected trees. This has to do with the fact that full sunlight is too much for a citrus leaf. The leaves on the outside of the canopy are overwhelmed by so much light that they must expend energy to protect themselves from the damage caused by the light. This is seen in leaf temperature measurements. On summer days, citrus leaves in full sun reach nearly 120 degrees in the afternoon, but particle films reduce the afternoon leaf temperature to about 104 degrees.

The biggest challenge with using particle films is that frequent rains wash the particles off.

At the same time, without particle films, leaves deeper in the canopy are often shaded too much and are not able to photosynthesize at their full potential. Particle films help the tree by reflecting the light in different directions. This means that the films shade the outer leaves, reflecting the light away. Some of that reflected light is directed into the rest of the canopy, giving the inner leaves greater light. This leads to a light distribution that is closer to optimum for the whole tree canopy.

WHAT ARE THE LIMITATIONS OF PARTICLE FILMS?

Particle films have several limitations for use in the field. The red particle film is currently not a registered commercial product, but there are several white kaolin products available. Only Surround WP is labeled for pest management in citrus. The biggest challenge with using particle films is that frequent rains wash the particles off. Thus, particle films can require frequent reapplication depending on rainfall. In the UF field study, reapplications have been made every two weeks, on average. Frequent application drives up the cost of using particle films.

Although small amounts of flush do not appear to interrupt the effects

Kaolin applied to citrus can delay HLB infection.

of particle films on ACP, a major flush, especially in young trees, can cover up a particle film underneath the new foliage. The particle film can only have its intended effect if it is on the outside of the canopy. Ironically, in the UF study, the increased growth of the particle film treatments caused larger spring flushes. For this reason, insecticidal options may provide better pest management during major flushes.

Particle films also do not affect all important citrus pests. For example, no effects of particle films on citrus leafminers have been found. Although mite problems have not been found in the UF field trial, other researchers have observed spider mite outbreaks in particle-film-treated plants.

CONCLUSIONS

Particle films can be an effective pest management tool and a valuable growth enhancer. In the HLB era, both benefits are important. Delaying infection and reducing ACP feeding increases the likelihood that a new planting will reach a productive state. Increasing the growth rate means that the plants will become more productive. Of course, every approach has its cost, and need for frequent reapplication increases the cost of particle films. Growers should weigh the costs versus the benefits when considering whether to include particle films in their production systems.

A Good Horse

By Rick Dantzler, CRDF chief operating officer

As the late great Pete Clemons once told me, "If you find a good horse, ride him." The same could be said of nurseryman Phil Rucks and his industry leadership. Four years as president of the Florida Citrus Nursery Association and eight years as chairperson of the Florida Nursery, Growers and Landscape Association's Citrus Nursery Division is like the good horse that was ridden hard.

These leadership roles put Rucks on the front lines of many issues, including the effort to mandate that trees be grown from registered budwood, an unpopular position with many nursery growers. "I was accused of being a communist and supporting a government takeover of our industry, but we had to do it," explains Rucks. "People were cutting budwood from any tree on the side of the road that looked good, and young plantings with disease were on the rise."

Soon thereafter, in 1997, Rucks went into business for himself. But if it hadn't been for longtime nurseryman Bill Adams challenging him to do so, he might never had done it, and North America's largest citrus nursery under cover — with 350,000 square feet — might never have been built. "He told me I had learned the business and it was time," says Rucks.

HLB changed everything, Rucks says. "We were told that no industry had ever survived it, so we became more efficient wherever we could. We gained 30 percent more space by utilizing benches on rollers for the trees to sit on, eliminating aisles throughout the nursery. We implemented a Dutch-style rail system, workstation and head house with tunnels to the greenhouses, saving 50 percent in labor costs. We designed a new tree container for our trees to maximize space on the benches, and installed irrigation mats that were water efficient. We also began mixing our own custom blend of potting soil."

This helped, but his most prescient decision was to screen-in budwood trees in 2000, initially to prevent severe tristeza strains, but unknowingly making him ready when HLB hit. "I realized I could get one million trees from just what I had under cover, but I was also stuck with 650,000 contracted trees that were in jeopardy of not being able to be sold, a situation many were in when HLB hit," Rucks says. The issue was resolved when he and others negotiated a resolution with the Division of Plant Industry (DPI).

The industry's relationship with DPI is a source of pride for Rucks because it hasn't always been so good, he says, reflecting on the early days of leaf spot and canker. "The relationship is better than it has ever been; they work with us, not against us."

Rucks and his wife of 33 years, Tina, have built quite a business. He credits many people for his success.

"I wouldn't be here if it weren't for a lot of other people," Rucks concludes. "It always seemed like when one door closed, another opened. It's divine intervention."

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