The leafminer larva burrows or mines between the cell layers in the leaf, creating entryways through which the canker bacteria can enter.

Photo by Jeffrey Lutz, Florida Department of Agriculture and Consumer Services; bugwood.org

SPLAT technology involves a glob that contains female pheromone. The scent confuses the male, preventing him from finding a mate.

Photo by Stephen LaPointe, U.S. Department of Agriculture Agricultural Research Service

New solutions to an old problem

Pheromone-based materials combat citrus leafminers without hurting beneficials

Photo by Jeffrey Lutz, Florida Department of Agriculture and Consumer Services; bugwood.org

BY TOM BURFIELD

Attempts to eliminate the dreaded Asian citrus psyllid, the pest responsible for the spread of citrus greening in Florida, may be playing a role in the resurgence of a pest that can set the stage for citrus bacterial canker.

It was around 1993 that the citrus leafminer first turned up in Florida.

The tiny worm burrows between cell layers of the citrus leaves as it feeds.

The openings it creates provide an entryway for the bacteria that cause citrus canker disease, which can render fruit unmarketable.

The leafminer itself can affect yields and stunt tree growth, says Lukasz Stelinski, assistant professor of entomology at the University of Florida's Institute of Food and Agricultural Sciences Research and Education Center at Lake Alford.

Within a couple of years, scientists were able to control the citrus leafminer by introducing predatory wasps together with native wasp species in affected areas.

All was well until the Asian citrus psyllid appeared in 1998. When growers used insecticides to control psylla, they also killed the predatory wasps that fed on leafminers. The result was increased numbers of leafminers and a resurgence of citrus canker.

Weather and other conditions also may have played a role in the uptick in incidents of citrus canker, experts say. But most agree that decimating the predatory wasp population was a leading cause.

New solutions

Until now, growers have relied on conventional pesticides, such as soil-applied imidacloprid, to combat the leafminer. But researchers recently have come up with two new, pheromone-based materials that specifically target the pest.

Researchers work out kinks in pheromone application machine

Pheromone-based SPLAT-CLM and MalEx appear to be promising materials for controlling citrus leafminer, which can aid in the transmission of citrus canker disease. But applying the materials may be a challenge, since neither can be applied with standard insecticide spray rigs, researchers say.

Stephen LaPointe, research entomologist at the U.S. Horticultural Research Laboratory in Fort Pierce, Fla., hopes to solve that problem.

He has set out to develop an effective delivery system under a specialty crops block grant from the state.

LaPointe's objective is to develop a simple, mechanized delivery system and to determine the optimal release rate and frequency required to effectively control the citrus leafminer.

Working in collaboration with Dave Robinson, president of Fort Pierce-based International Fly Masters Inc., LaPointe already has made significant progress. He tested an application device April 5 with good results.

"The machine performed as it was supposed to," he says. "We got the SPLAT dollops into the tree where we wanted them and at the rate that we wanted to put them out."

Robinson, too, was pleased with the test results.

"The field test conducted with our equipment delivered a consistent, high-quality droplet size of the SPLAT material that successfully exceeded field test and delivery performance requirements," he says. "The field test validated our equipment for use in the commercial application of SPLAT."

Building a machine to apply SPLAT wasn't easy.

Since SPLAT is formulated with air, air pockets form in the toothpaste-like material and voids appear in the stream when it's applied using a conventional pump.

"You don't get a consistent flow of material," LaPointe says.

Another challenge is that SPLAT needs to be delivered in 1-gram dollops.

"We're not trying to put out a spray," he says. "It has to be kind of spat out."

LaPointe describes the device as "a couple of small pumps attached to a blower," and says it will be fairly cheap and simple to manufacture.

It will be attached to a tractor or all-terrain vehicle, and the speed of the applicator will match the vehicle's speed.

A global positioning system will create a map at the end of the day showing where the material was applied.

Patent issues remain to be explored, and other details must be worked out before production of the machine moves forward, LaPointe says.

The machine should be able to be easily converted to apply MalEx, he says.

Photo by Stephen LaPointe, U.S. Department of Agriculture Agricultural Research Service

Photo by Vicky Boyd

(Top) Applicator machines essentially spit out globs of paste that contain female leafminer pheromone.
(Bottom) Leafminers and the associated citrus canker are on the upswing, partly because of the Asian citrus psyllid battle.

One, called SPLAT-CLM, is manufactured by Riverside, Calif.-based ISCA Technologies Inc. The other, MalEx, is made by Portland, Ore.-based Alpha Scents Inc.

The two products are based on different technologies, Stelinski says.

SPLAT is a mating disruptor that is not yet registered.

"We can prevent the male from finding the female, and prevent the male from mating with them and prevent egg laying," Stelinski says.

The Environmental Protection Agency accepted comments on the SPLAT registration through April 13. The Florida Department of Agriculture and Consumer Services has been working to expedite its registration.

MalEx also uses pheromones, but in a different way.

"Each droplet acts as an attractant for males that mimics a very attractive female, but each droplet has a small dose of toxicant," Stelinski says. When the male touches the droplet, he dies "and is effectively removed from the breeding population."

Both formulations are different from traditional insecticides in that they're deployed onto the crop as "discrete blobs of paste," Stelinski says.