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Growers could enlist RNAi technology to fight citrus psyllid

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By Renee Stern, Contributing Editor

Researchers seeking weapons in the fight against citrus greening are delving into the genetic code of the disease's pest vector—and arming the citrus tree.

The aim is to turn the Asian citrus psyllid's body against itself, shutting down critical systems such as digestion, through RNA interference (RNAi) technology.

Two different projects are zeroing in on specific gene sequences unique to the target pest, developing material to be applied to citrus trees. When the psyllid feeds, this material would latch onto the targeted genes—and only those sites—to disrupt their function.

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Wayne Hunter, research entomologist at the U.S. Agriculture Department's Agricultural Research Service lab in Fort Pierce, Fla., and Kerik Cox, assistant professor of tree fruit and small fruit at Cornell University in Geneva, N.Y., are leading the two RNAi projects.

Both are targeting the psyllid genes essential to producing enzymes necessary to digest the insect's food. Other possibilities include disrupting the psyllid's reproductive and nervous systems.

Borrowing from honeybee experience

Hunter's research builds on earlier work to help protect honeybees against viruses linked to colony collapse disorder, resulting in a vaccine now available from Miami-based Beeologics LLC.

"This is a new breakthrough in insect pest management and disease problems," Hunter says.

Applying it to citrus psyllid and greening means treating the tree like a patient, designing a vaccine that deals with a particular problem, he says. It's a technique that can be adapted to other pests and crops.

What's behind RNAi technology

RNAi technology makes use of a virus-fighting defense mechanism found in all organisms, from humans to insects, says Robert Shatters, a research molecular biologist at the ARS lab in Fort Pierce.

Viruses produce double-stranded RNA.

In an organism infected with a virus, that defense mechanism seeks out and disables any material with double-stranded RNA.

Giving the citrus psyllids such material that matches their genetic code means they essentially destroy themselves, Shatters says.

Hunter's approach doesn't involve transgenics.

Lab tests show a low persistence rate of the RNAi molecule, fading after a few months from detectable rates in the plant.

"The idea would be to treat the tree in winter when the food supply for the pest is limited," Hunter says. That period draws the greatest concentration of psyllids to citrus trees for feeding, which in turn should result in a larger impact on psyllid populations.

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