Vanquishing a Virus

When it comes to controlling one of the world's most troublesome insect pests – and the deadly plant virus it spreads – University of Florida researchers say pesticides are out and new environmentally friendly management programs are in.

During the past two decades, tomato spotted-wilt virus has been spread around the world by tiny insects called thrips, causing millions in "losses to a variety of vegetable, ornamental and agronomic crops.

"Epidemics of tomato spotted-wilt have been troublesome throughout the southern United States, cutting yields by 20 percent to 30 percent on tomatoes," said Steve Olson, a professor of horticulture at UF's North Florida Research and Education Center in Quincy. "In Florida and Georgia, where tomatoes and peppers are valued at about $1 billion annually, farmers have been hit hard. The virus also affects peanuts, tobacco and other crops."

It can turn leaves brown, purple or bronze and frequently kills the stem tips on plants. The virus also can cause brown or yellow spots and rings on tomatoes and other produce, making them unappealing to consumers and therefore unmarketable.

The virus is transmitted from plant to plant almost exclusively by several species of thrips. Western flower thrips (*Frankliniella occidentalis*) and tobacco thrips (*F. fusca*) are the major species of concern in Florida.

Until now, growers responded by spraying toxic, broad-spectrum insecticides in an attempt to control thrips, but the chemicals do not prevent transmission of the virus.

The solution, according to researchers at Quincy center, is to use a variety of new environmentally friendly strategies known as integrated pest management, or IPM.

IPM includes the use of new cultural practices, natural insecticides, biocontrol agents or natural predators and a new treatment that boosts the plant's immune system against viruses and bacterial diseases.

"In North Florida and South Georgia, the incidence of tomato spotted-wilt virus on tomato plants has been reduced by as much as 75 percent with a new plastic bed cover that reflects ultraviolet (UV) light and repels thrips," said Tim Momol, an assistant professor of plant pathology at the Quincy center.

"Instead of covering tomato plant beds with the standard black plastic mulch, many growers have switched to the UV-reflective mulch, boosting tomato yields by as much as 600 25-pound boxes per acre and increasing profits by as much as $4,000 per acre," Momol said.

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Joe Funderburk, left, Steve Olson and Tim Momol check young tomato seedlings at UF’s North Florida Research and Education Center in Quincy. They said reflective mulch in combination with Actigard® and insecticides can significantly reduce the incidence of tomato spotted-wilt on tomatoes. (Photo by Eric Zamora)

“While the reflective mulch costs an extra $200 per acre, yield increases and higher returns justify its use,” Momol said.

Dale and Greg Murray, owners of Murray Farms in Bainbridge, Ga., started using the UV-reflective mulch on a 32-acre tomato field in 2000. Dale Murray said the incidence of tomato spotted-wilt virus was reduced from as much as 45 percent to 11 percent, boosting farm income by about $1,000 per acre.

Joe Funderburk, a professor of entomology at the Quincy center, said a recent survey showed that about 30 percent of the growers in North Florida and Georgia are using the UV-reflective mulch. Its use is expanding to other production areas in the Southeast in 2003.

He said a natural insecticide called spinosad, which poses little threat to field workers or the environment, is also helping growers control thrips on tomatoes. And, a new immune-boosting treatment, which is marketed under the Actigard® trademark, is now being used by about 45 percent of all tomato growers in the region.

“To control the virus on peppers, we’re recommending the use of a naturally occurring predator called the minute pirate bug that attacks thrips,” Funderburk said.

Hank Dankers, left, Paula Bernsen and Tim Momol measure the soil temperature under UV-reflective plastic mulch at the Quincy center, which is part of UF's Institute of Food and Agricultural Sciences. Dankers is a senior biological scientist at the center, and Bernsen is a former biological scientist. (Photo by Eric Zamora)

"Nearly 100 percent of all pepper growers in North Florida and South Georgia are using the beneficial bug, cutting pesticide costs by $100 per acre and boosting crop yields by as much as 40 percent."

Unfortunately, the minute pirate bug is not effective against thrips on tomatoes because the plants are toxic to the natural predator, he said.

Tommy Smith, owner of Thomas Smith Farms in Quincy, was the first pepper grower in the state to use the minute pirate bug in 1997. Before he began using the natural predator, Smith lost two consecutive crops to thrips and tomato spotted-wilt virus. Use of the biological control has reduced thrip populations by "at least 75 percent" in his pepper fields and eliminated the need for insecticides, he said.

Glades Crop Care Inc. in Jupiter, Fla., the largest consulting company in the Southeast, also uses the pest control program on all of their acreage in Georgia and Florida. Adoption of the program is expanding rapidly throughout much of the southern United States and many other regions of the world, said Madeline Mellinger, president of the firm.

Olson, Momol and Funderburk developed and promoted the new IPM control measures, and the researchers are collaborating internationally so that the program is adopted in other countries.

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– *Chuck Woods*

Joe Funderburk (850) 875-7146
jefunderburk@mail.ifas.ufl.edu
Tim Momol (850) 875-7154
tmomol@mail.ifas.ufl.edu
Steve Olson (850) 875-7144
smolson@mail.ifas.ufl.edu