Scientists Sharpen Strategies To Sabotage

Glassy-Winged Sharpshooter

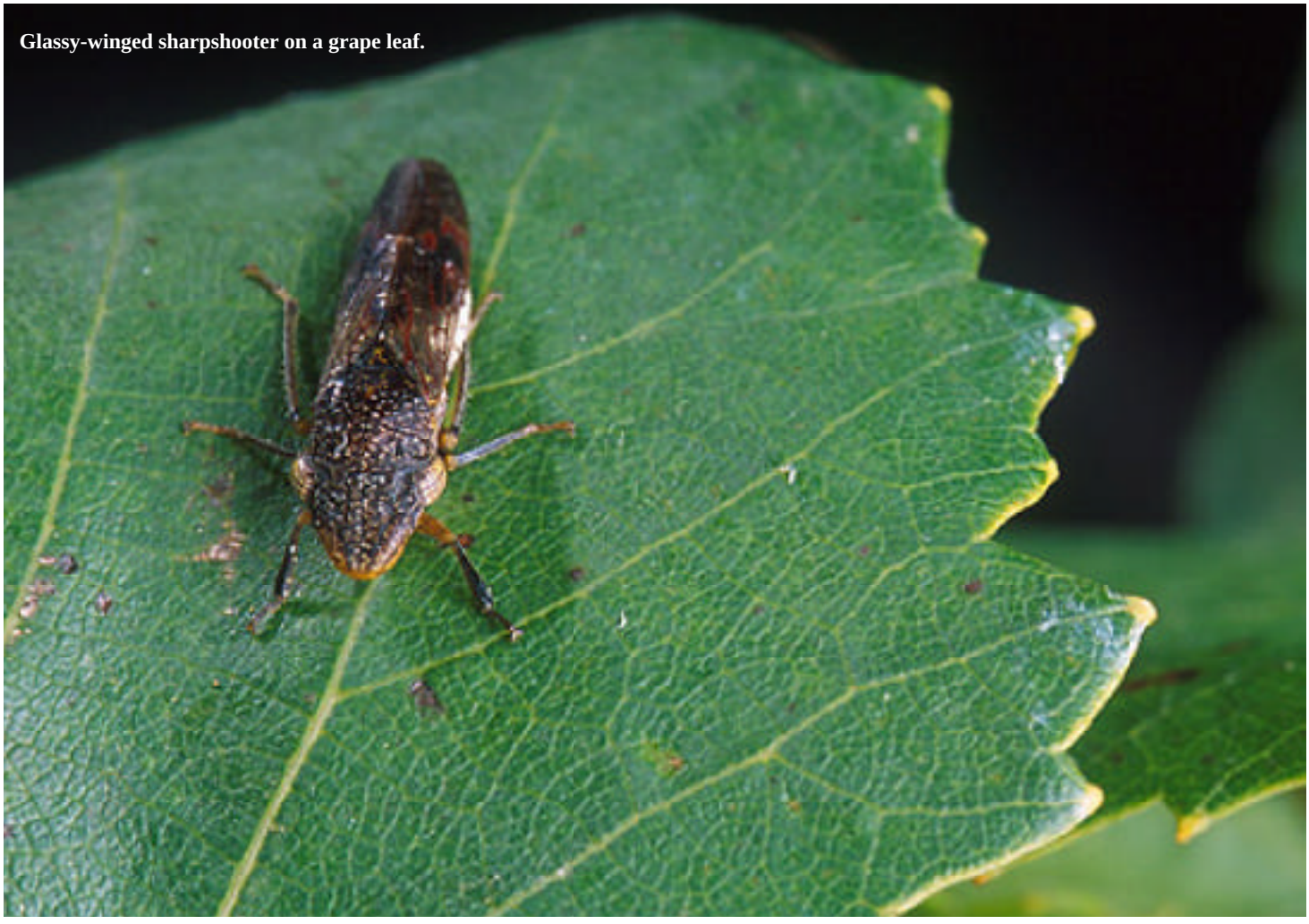
PATRICK TREGENZA (K5633-46)

Grape vines are a favorite target of the glassy-winged sharpshooter.

A half-inch-long insect called the glassy-winged sharpshooter has wreaked havoc in southern California wine vineyards, causing an estimated $14 million in damage during the past several years. The sharpshooter carries the *Xylella fastidiosa* bacterium, the cause of the incurable Pierce's disease of grapevines. Known to scientists as *Homalodisca coagulata*, the lively leafhopper is now set to attack other grape-growing regions in the Golden State as well.

To rout this pest, scientists at ARS labs from coast to coast—and in South America—are making the sharpshooter and the *Xylella* microbe the focus of ambitious new studies. The researchers are investigating promising particle films, insecticides, and biological control agents that might sabotage the sharpshooter. They're delving into the basic biology of both the insect and the bacterium. And they're pursuing new

PEGGY GREB (K9664-1)



Glassy-winged sharpshooter on a grape leaf.

ways to quickly and easily detect the microbe in sharpshooters and in afflicted plants.

Here's a look at some of those investigations.

A Particle Spray Keeps Sharpshooters Away

A coating of white kaolin particles, co-developed by ARS entomologist Gary J. Puterka, can make grapevines inhospitable to sharpshooters.

"The specially shaped and sized particles stick to the sharpshooters' legs and wings when they land on treated foliage, making it a very uninviting place for dining on or laying eggs," explains Puterka. He is with the ARS Appalachian Fruit Research Station in Kearneysville, West Virginia.

The product, sold by Engelhard Corporation under the trade name Surround WP Crop Protectant, has been very successful in protecting pears and apples from insect pests.

"Given a choice between treated and untreated foliage, glassy-winged sharpshooters are highly unlikely to settle on Surround-treated foliage," says Puterka, who tested it this year on table grapes growing in central California's Kern County. The vineyards he used border citrus groves, which can harbor the sharpshooter.

Puterka and collaborators wanted to see if Surround would prevent the six-legged varmints from moving into the vineyards after wintering in citrus. After three treatments from mid-March through mid-April 2001, the scientists found that the number of sharpshooter trap catches and eggs was far lower in the Surround-treated areas than in the pesticide-treated areas.

Puterka got similar results from a larger pilot study in Kern County. It is the first project aimed at developing an economically feasible, areawide strategy to quell the pest. Specialists from California state and county agencies, along with 30 growers and numerous advisors, are part of the study, which is coordinated by USDA's Animal and Plant Health Inspection Service (APHIS).

"Participating growers use products that have minimal toxicity, whenever possible, in order to spare beneficial insects," says APHIS entomologist Matthew A. Ciomperlik. "Surround, which is completely nontoxic, clearly outperformed insecticides and is proving to be very economical and effective at preventing the insect's spread. Growers needed to use only three applications of Surround versus six of insecticides. So Surround might help them cut costs. Some growers who were reluctant to try Surround changed their minds when they saw how effective it was."

PEGGY GREB (K9660-3)

At the University of California at Riverside, ARS technician Doug Diaz (left) and field worker Vince Lyons count glassy-winged sharpshooters on a grapevine treated with Surround WP.

Donald A. Luvisi, a Kern County farm advisor with the University of California's Cooperative Extension Service, sees Surround as very promising for early-season use. But after the vines bloom, he notes, table grape growers would have to switch to insecticides. "The Surround treatment, if continued, would leave a white residue on the stems," Luvisi explains. "The residue is harmless, but it probably would be unacceptable to consumers."

Insecticides Investigated

To learn more about insecticides that can safely and effectively zap the sharpshooter, ARS researchers David H. Akey and Thomas J. Henneberry of the Western Cotton Research Laboratory in Phoenix, Arizona, have teamed up with entomology professor Nick C. Toscano of the University of California at Riverside to scrutinize some of the most promising compounds.

In one series of experiments, they took sharpshooters that were living on citrus trees and moved them to a southern California vineyard of Chardonnay grapes. On one vine in each plot, the scientists enclosed 25 sharpshooters in an improvised cage made of soft netting. They then sprayed an insecticide in two applications, spaced 1 week apart. They repeated this procedure in their tests of about two dozen different insecticides.

The researchers inventoried the cages for dead sharpshooters at 6 hours and at 1, 2, and 6 days after spraying. Then, for the next 15 to 29 days, they periodically restocked the cages with new sharpshooters to determine whether the aging residue of the chemicals had any effect on the insects.

"We were particularly concerned with how fast the insecticides knocked down the sharpshooter," says Henneberry. "That's especially important if an insecticide is used for stopgap protection when a new infestation is discovered. Not all scientists agree about exactly how fast a feeding sharpshooter can transmit the bacterium into a grapevine. But, in the ideal scenario, the insecticide would kill the sharpshooter before the bacterium could enter the plant."

In general, compounds known as pyrethroids and neonicotinoids were the best performers, according to the researchers. One pyrethroid killed all the caged sharpshooters within 6 hours. Based in part on the team's studies, the pyrethroid cyfluthrin is already approved for sharpshooter control. Pyrethroid and neonicotinoid residues were still killing sharpshooters after 28 days.

Seeking Egg Parasitoids

One of the trickiest aspects of using these or other insecticides is making sure that the chemicals don't clobber beneficial insects, such as natural enemies of the sharpshooter. Among the sharpshooter's most formidable foes, for example, are egg parasitoids—insects that unabashedly lay their eggs inside sharpshooter eggs. Parasitoid young hatch inside the sharpshooter eggs, then proceed to feast on them.

One egg parasitoid, a tiny, stingless wasp called *Gonatocerus triguttatus,* has already been released in California by researchers at the University of California at Riverside and APHIS. Now, ARS-sponsored studies may uncover other promising parasitoids.

PEGGY GREB (K9662-1)

Matthew Blua, entomologist at University of California at Riverside, beats an orange tree to shake loose glassy-winged sharpshooters.

At the ARS South American Biological Control Laboratory in Hurlingham, Argentina, researchers are investigating the parasitoids that emerge from the eggs of a native South American sharpshooter, *Tapajosa rubrimarginata.*

"In field experiments so far, we've found that parasitoids emerged from 66 to 71 percent of the eggs. That's a fairly impressive rate of parasitization for an experimental situation," says Guillermo Logarzo. He is based at the Hurlingham laboratory.

Serguei V. Triapitsyn, a wasp expert from the University of California at Riverside, is collaborating with the Hurlingham scientists. Some of the Argentine species of wasps that he has identified so far are very different from parasitoids that beleaguer the sharpshooter in North America.

The ARS Beneficial Insects Research Unit in Weslaco, Texas, is helping fund the Hurlingham studies. Says Walker A. Jones, who leads the Weslaco research unit, "Parasitoids or other sharpshooter natural enemies from subclimates similar to the grape-growing regions of California might outperform natural enemies imported from other climates. Our survey of areas where sharpshooter species occur showed that subclimates in some areas of Argentina match those of California. In addition, Chile has some exact matches, so it's being included in explorations for new biological control agents."

But researchers aren't ruling out potential biological control agents from other regions. For instance, the Weslaco scientists and their colleagues are hot on the trail of an egg parasite found in south Texas and in northeastern Mexico. Notes Jones, "We think this parasitoid is at least partly responsible for the lack of glassy-winged sharpshooters in that region."

—By **Marcia Wood** and **Judy McBride,** ARS.

REYES GARCIA III (K9667-1)

This parasitic wasp, *Gonatocerus triguttatus,* lays its eggs in glassy-winged sharpshooter eggs embedded in a leaf.

This research is part of Crop Protection and Quarantine, an ARS National Program (#304) described on the World Wide Web at http://www.nps.ars.usda.gov.

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