Fighting Moths With Pheromones Is Now Easier

Rather than place pheromone-emitting dispensers in trees by hand to disrupt codling moth mating, apple and pear growers could soon be spraying the pest's chemical sex attractant instead, thanks to ARS research.

For decades, growers have released synthetic forms of the female moth's sex attractant, or pheromone, in orchards to confuse the male moths and keep the insects from mating and spawning new generations of destructive caterpillar offspring.

STEPHEN AUSMUS (D849-1)

The new low-volume spray technique developed by ARS entomologist Alan Knight delivers active materials to a tree canopy in a stream and reduces water use from 100 gallons per acre (for the old method, air-blasting) to just 1.25 gallons.

Then, as today, growers hang the pheromone dispensers from tree branches, often as many as 200 to 400 devices per acre. It's a costly, labor-intensive affair, notes entomologist Alan L. Knight, with ARS's Yakima Agricultural Research Laboratory, at Wapato, Washington.

The relative ease of spraying pheromone has long tantalized growers. But serious attempts to develop a workable system, in the mid-1990s, stumbled on technical hurdles. In 2003, Knight decided to give it another go, based on a key observation he made in 1999 using a fluorescent dye from Suterra LLC, a Bend, Oregon, firm that had developed a sprayable, microencapsulated pheromone product.

Using the dye and a black light to study capsule densities on tree leaves, Knight determined that the pheromone's delivery could be improved using ultra-low-volume (ULV) spraying. In earlier investigations, company researchers tried spraying on the pheromone capsules with standard air-blast spray equipment that used 100 gallons of water per acre. With the ULV method, Knight cut that amount to 1.25 gallons while simultaneously increasing the amount of capsules deposited in trees by 6- to 10-fold.

"This way, we can turn leaves into pheromone dispensers," says Knight. "So instead of applying one or two plastic pheromone dispensers per tree, we can create hundreds or even thousands of these attractive leaves per tree,"—making them even more irresistible to amorous male moths.

Trials in grower apple and pear orchards since 2003 indicate that ULV spraying works as well as the dispensers when used four to six times a season. Knight based the treatment's effectiveness on captured-moth counts and diminished fruit damage.

In 2005, he expanded the ULV studies to include the insecticide esfenvalerate—applied alone or with the pheromone. Esfenvalerate alone proved best for preventing fruit injury and reducing (by 95 percent) egg laying by female codling moths.

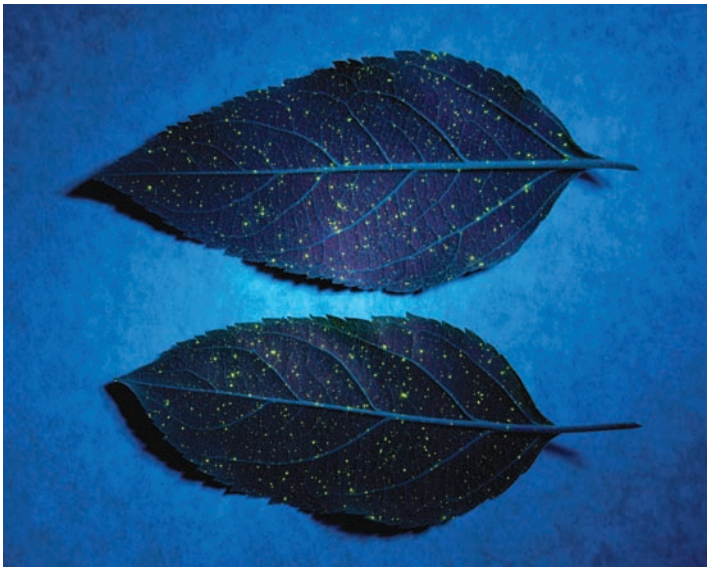
"We had tremendous success applying esfenvalerate as a ULV spray from the ground," says Knight. "This year, we're looking at reducing the frequency and testing two other insecticides."

He's also making adjustments to components of the ULV sprayer and fine-tuning the mixture used to spray the pheromone capsules. One adjustment calls for mounting an electronic eye on the sprayer so that it can direct pulses of insecticide or pheromone into the center of the trees' canopies, where moths will be hardest hit.—By **Jan Suszkiw,** ARS.

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

Alan L. Knight is with the USDA-ARS Yakima Agricultural Research Laboratory, 5230 Konnowac Pass Rd., Wapato, WA 98951; phone (509) 454-6566, fax (509) 454-5646, e-mail aknight@yarl.ars.usda.gov. ✷

STEPHEN AUSMUS (D850-1)



A fluorescent material viewed under a black light shows the distribution of sex pheromone-containing microcapsules on leaves after the microcapsules were sprayed from a low-volume spray applicator.