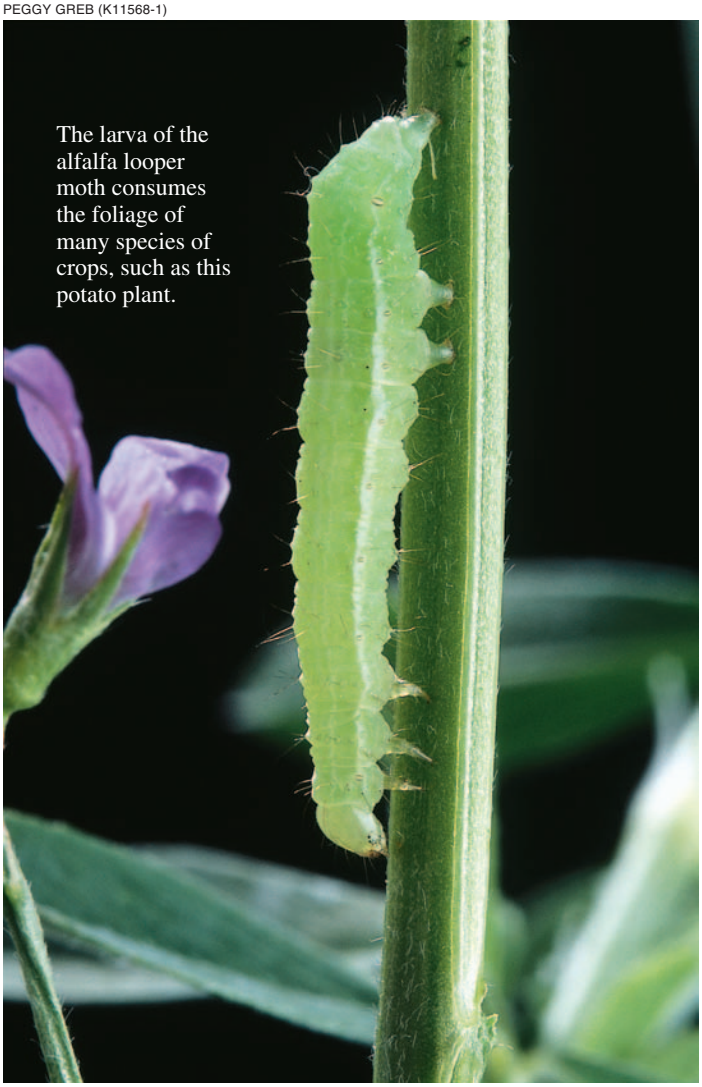
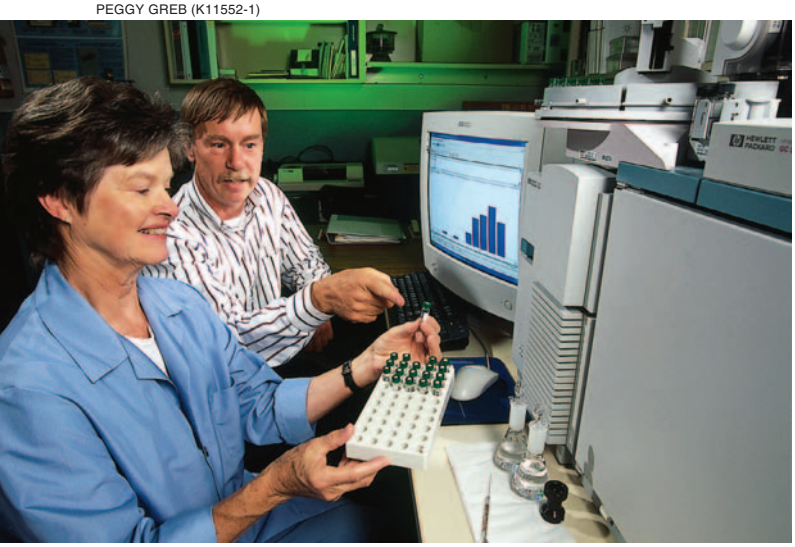
# New, Unisex Lure for Moths

PEGGY GREB (K11568-1)



The larva of the alfalfa looper moth consumes the foliage of many species of crops, such as this potato plant.

PEGGY GREB (K11552-1)



**Chemist Connie Smithhisler and research leader Peter Landolt review results from analyses of flower volatiles.**

Gardens may harbor fewer caterpillars this summer, thanks to new lures developed by Agricultural Research Service scientists in Wapato, Washington.

The lures, derived from molasses and floral odors, tantalize both male and female moths—the caterpillar's adult stage—with the promise of nectar. Instead, the insects fly into the opening of a lure-dispensing trap, never to return.

Peter Landolt, an entomologist who leads ARS's Fruit and Vegetable Insects Research Unit in Wapato, and Connie Smithhisler, a chemist there, have been investigating such lures since 1996 as an alternative to chemically controlling the pests—whether they be in backyard gardens or crop fields and fruit orchards. Among the top offenders: loopers, cutworms, fruitworms, armyworms, and corn earworms.

Most current moth lures act on the male insect's sense of smell. In the Pacific Northwest, for example, apple growers adorn their trees with dispensers that saturate the air with the chemical sex attractant, or pheromone, of female codling moths. The males find it irresistible. And it masks the females' true chemical "come hither," confounding the males' ability to meet and mate.

Lures are also used in monitoring stations that furnish growers with early warning of a moth species' whereabouts, concentration, and capacity to cause harm serious enough to warrant taking action. But most moth lures offer no way of keeping tabs on females. This makes it difficult to estimate the pest's population over a finite area and the timing of egg laying. Says Landolt, "The result can be a false positive—indicating a problem pest population when one doesn't exist—or a false negative—indicating no problem exists when mated females are present and laying eggs."

Nor can today's moth lures be used to round up females for mass trapping or elimination with lure-and-kill strategies. In pest control, that's a battle less than half won.

"If you're only killing off males, you're not having an immediate impact on the pest's reproduction," Landolt explains. Males of some species, like alfalfa loopers, are prodigious breeders, he adds. "A male will mate with lots of females. So if you have an attractant that lures and kills 75 percent of males, the impact on reproduction will be negligible, since the surviving 25 percent can pick up the slack. But every time you remove a female, you're killing up to 1,000 eggs."

This March, Sterling International, Inc., of Spokane, Washington, commercialized the ARS scientists' solution to these problems: a blend of volatile compounds (odors) from fermented molasses that attracts both male and female moths.

Sterling commercially licensed the sugar-derived lure and other ARS-patented attractants composing the company's SMARTrap dispenser product. Other patented lures used in this trap are based on moth responses to odors from flowers of

Oregon grape, honeysuckle, and gaura flowers. These floral attractants are particularly alluring to moths called loopers.

Marketed for garden use, Sterling's trapping product combines the attractants with an LED (light-emitting diode) to lure night-flying moths to their doom before they get a chance to mate and lay eggs.

One draw of using molasses-based lures for pest control, whether for male or female moths, is their relative specificity. Unlike synthetic insecticides, which can sometimes harm good-guy bugs, these lures are largely specific to moths. This means they're not likely to attract a ladybug or Monarch butterfly, for example.

**Anti-Aroma Therapy for Moths**

In April, the researchers began field testing another lure formulation that attracts alfalfa loopers, cabbage loopers, and corn earworms. Instead of sugars from molasses, this lure is a derivative of odors emitted by Oregon grape, an evergreen shrub whose flowers bloom at dusk.

Oregon grape's waxy, holly-shaped leaves; edible, blue berries; and low growth make the shrub a popular ornamental in Pacific Coast states. But that's not what drew Landolt's attention to the shrub in 1996, when he first arrived to work in Yakima, Washington. On returning to his hotel one evening, he spied a cluster of moths fluttering about the shrub's small, yellow flowers. The entomologist in him made a mental note, but he didn't act on the observation until 2000.

Along with Smithhisler, says Landolt, "We isolated and identified the chemical odors coming off the flowers and field tested them in blends of one, two, and three compounds at a time." Based on trap counts of captured alfalfa looper moths in corn, alfalfa, and potato fields, the most attractive blend proved to be a combination of two compounds: phenylacetaldehyde and beta myrcene.

Before the scientists published their findings, ARS filed for patent protection on the floral-based lure and the methods of using it for moth monitoring and trapping applications. In 2003, Leonardo Camelo, a Washington State University graduate student working in Landolt's lab, conducted tests of "killing stations" baited with this lure, reducing alfalfa looper numbers by 75 percent. That killing station was a modified badminton birdie coated with a pesticide. Camelo is now field testing its use in reducing looper reproduction as well as evaluating a commercial version of the killing station. Designed by a Bend, Oregon, firm collaborating with Washington State University and Landolt's lab, the station combines the lure with a panel coated with a small dose of permethrin to kill the moths. Besides alfalfa loopers, Camelo is conducting similar trials with corn earworms.

Insecticide spraying can sometimes be a farmer's only recourse against caterpillar pests. But luring insects to their doom can ease the need for such spraying. Says Landolt, "It's a way to reduce the overall amount of pesticide used. That means less contact between pesticide and the environment, food crops, agricultural workers, and beneficial insects."—By **Jan Suszkiw,** ARS.

PEGGY GREB (K11554-1)

**Graduate student Leo Camelo sets up a killing station for alfalfa looper moths in a potato field plot.**

*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.*

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