Watch out for the good guys

Biological control is probably more important than people realize.

PHOTO BY GERALDINE WARNER

New monitoring tools are providing a window into the biological control taking place in orchards, and it looks like there are far more natural enemies of pests than anyone imagined, even in sprayed orchards.

Dr. Vince Jones, entomologist with Washington State University, said the importance of biolgical control has probably been underestimated, simply because there's been no good way to monitor ?beneficial insects.

A standard monitoring method is a beating tray sample. This involves holding a tray beneath a branch and tapping on the branch with a stick so that the insects fall onto the tray. This method does not catch very many adult insects that fly. Other drawbacks are that only a small part of the tree is sampled and at a specific time of day, when a natural enemy might not be active.

As a result, growers only realize how important biological control is when it's not working, Jones said. For example, integrated mite control, developed by Dr. Stan Hoyt at WSU 50 years ago, is taken for granted until it is disrupted by the use of certain harsh pesticides. "People notice biocontrol more by its absence than by its presence," he said.

Jones is heading a five-year, $4.5-?million research project to improve the long-term sustainability of the apple, pear, and walnut industries in the western United States by enabling growers to take full advantage of biological control of pests. The project involves scientists in ?Washington, Oregon, and California.

Jones and his colleagues are testing insect attractants as lures to more accurately monitor natural enemies in orchards. The attractants they are using are known collectively as herbivore-induced plant volatiles, which are given off by a plant when an insect feeds on it. These volatiles alert natural enemies to where a potential host or prey is feeding, and make them more efficient at finding them.

Beneficials

Jones said he's been amazed by the abundance and diversity of beneficial insects he's finding with the lures. He and U.S. Department of Agriculture entomologist Dr. David Horton sampled five apple orchards with a beating tray two to three times a week and found only 12 green lacewings the whole season long, which gave the impression that this generalist predator was not that important. But trap catch in the same orchards using an insect attractant as a lure was 25,600 lacewings during the season.

"It's a huge difference," said Jones, who has counted 178 different species of natural enemies in orchards where he's been using attractants.

Traps with lures capture insects continually and attract them from a larger area, he said. "You're getting a sample that gives you a better feel for what's happening in the orchard." He added that it was by accident that he and his colleagues ?discovered that one of the volatiles, ?squalene, was highly attractive to the green lacewing Chrysopa nigricornis. WSU doctoral student Nik Wiman was looking for a way to monitor tachinid flies, which are parasites of leafrollers, and tested lures containing either benzaldehyde or squalene. He put out sticky traps with the lures and found the squalene-baited traps covered with lacewings.

Jones's research team is looking at different attractants and blends of attractants to monitor specific natural enemies, and testing different types of traps. They have tested 54 possible blends of compounds in apples alone. A blend containing geraniol, methyl salicylate, and 2-phenylethanol (known as GMP) is proving highly attractive to a broad range of natural enemies, including syrphid flies, parasitic wasps, and the green lacewing Chrysoperla plorabunda.

Mating disruption for codling moth and other key pests has opened the door for more alternative pest control strategies, Jones said, but he does not foresee a future without insecticides. Ideally, though, growers would be able to reduce rates, change timings, and apply fewer sprays to allow natural enemies to do their jobs.

The ability to monitor natural enemies has enabled Jones and his colleagues to develop phenology models for important natural enemies so that growers can tell when a natural enemy is in the orchard at a vulnerable stage and time sprays to have the least possible impact on them. Just shifting a spray by a week might make a big difference in terms of natural enemy survival.

"What we're trying to do is expose the natural enemies to as few of these pesticides as possible at the times when they are the most active and most likely to be impacted by these pesticides," Jones said.

Developmental stages

Many parasites attack their hosts when they're at specific stages of development. For example, leafroller parasites attack only larger larvae that are in the fourth to sixth instars. So, Jones recommends that growers don't spray leafrollers when the phenology model shows that they are in that stage of their life cycle, otherwise, the spray will also wipe out the natural enemies.

Jones said reducing the number of pesticides and application rates will reduce residues on fruit and help growers maintain their markets and reduce costs.

"The fewer materials you use and the lower the rate, the lower the residue on fruit and the lower the cost," he said.

Pesticides often have unintended side effects, Jones noted. If you apply a harsh pesticide to control a pest, you might wipe out an important natural enemy of another pest and end up with a different problem.

"Any time you use insecticides, it's just like a drug you take," Jones said. "There are potential side effects."

The natural enemy phenology models will be posted on WSU's Decision Aid System Web site (www.das.wsu.edu) as they are completed.?

This is the first in a series of articles on the various aspects of the project.