Environmental Stewardship

PHOTO: Chris "Paco" Camino

Sustainable Pest Control

Managing pests is essential to healthy, safe, productive agricultural, urban, residential and natural areas. However, chemical pesticides can cause air and water pollution and unintended harm to non-target organisms. Exposure to pesticides has also been linked to human health problems. In addition, many pests eventually develop resistance to commonly used chemicals, rendering them ineffective. Researchers at land-grant universities across the United States are developing alternative pest control methods that are safer and more sustainable.

Successful examples include:

- Extension educators in **Georgia** teamed with the Georgia Department of Agriculture to create a large-scale classroom and on-farm training program to encourage better decisions when applying pesticides. In addition to developing better methods for pesticide applications, the Using Pesticides Wisely program reached 153 classrooms and conducted one-on-one trainings for over 1,000 pesticide applicators in 2021. Since its creation in 2014, the program has led to a 78% reduction in pesticide drift complaints.
- Research and Extension in **Oklahoma** has led to more sustainable roadside vegetative management. Extension educators train more than 700 Oklahoma Department of Transportation employees each year in better mowing practices and effective, reduced-risk pesticide selection and use. These techniques have saved time, energy, labor, fuel, and funds. The program saves Oklahoma taxpayers at least $500,000 and as much as $3.8 million per year.
- Japanese beetles are a major pest in urban landscapes and turf grass (such as lawns, city parks, stadiums, and golf courses). In **Alabama**, Auburn University researchers found ways to silence specific genes in adult Japanese beetles and larvae, making the pest less destructive. Controlling beetles in this way would reduce chemical insecticide use. Non-chemical alternatives like these are especially useful for organic growers or growers in Europe, where many insecticides are banned.
- Emerald ash borer is an invasive insect that has killed millions of ash trees throughout the eastern half of the United States. In **Vermont**, Extension educators created toolkits that were used by 11 towns to create news articles, presentations, community displays, event booths, guided ash tree walks and ash

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tree tagging events. Many townspeople learned about emerald ash borer for the first time and took home instructions for monitoring yards, forests, and municipal areas. Early identification helps prevent tree loss and the expenses required to remove and replace infested trees.

- A study by researchers in **California** and **Pennsylvania** showed that soil management practices like cover crops and organic amendments can improve plant defenses against insects by changing the soil's bacterial and fungal composition.
- In **Alabama**, Auburn University researchers found that plant growth-promoting rhizobacteria (a naturally occurring beneficial microbe) can be applied to grass roots to make the grass more resistant to root-feeding insect pests. Rhizobacteria can be used in place of insecticides for more effective and sustainable management of pests like white grubs and mole crickets.
- Controlling aquatic vegetation helps ensure ponds, lakes, and reservoirs in **Arkansas** can be used for their intended purposes. In the past, mistakes in herbicide selection and application and failure to use other available control methods has led to wasted money and impaired bodies of water. University of Arkansas Extension educators developed fact sheets and publications that provide research-based information for controlling excessive aquatic vegetation in the state's ponds, lakes and reservoirs. This information has led to less total herbicide use and saved thousands of dollars that would have been wasted on improper or ineffective herbicide use.

Harnessing Chemical Ecology to Control Pests

Plants naturally emit chemicals that slow insect feeding, inhibit infections, call beneficial insects to their aid, or warn other plants. Researchers from **17 land-grant universities** are collaborating to harness and enhance this natural plant defense as an alternative to pesticide use.

The multistate approach has enabled efficient, reliable research. For example, ties between Cornell University in **New York** and **Pennsylvania** State University fostered funding for a facility where scientists from multiple states can easily access the equipment and technical expertise needed for "chemical ecology" research, and collaborations with Extension and the Northeast Integrated Pest Management Center have facilitated widespread adoption of the team's findings and tools.

In order to develop chemical ecology tools, scientists first needed to understand how chemical cues affect pest behavior. Scientists in **Delaware** found that when corn plants are damaged by fall armyworm caterpillars, they emit chemicals, which attract birds that eat the caterpillars. In **Louisiana**, scientists identified rice compounds that attract stink bugs. Scientists at Cornell University in New York showed that temperature and humidity influence chemical information transfer by plants.

Researchers also developed new pest control methods based on chemical ecology. For example, scientists at Rutgers University in **New Jersey** developed traps that use chemical stimuli to lure and kill fruit flies, keeping them from infesting blueberries. In Pennsylvania, researchers found that beneficial nematodes can be introduced to plants to prime chemical responses that make the plants resistant to pests.