

# Pest control in the urban environment

Strategies focus on biological methods

By Joanne Littlefield



Turkestan cockroaches collected for laboratory observation

Pest management usually brings to mind cans of chemical sprays or striped tents draped over buildings. Yet, by understanding more about an insect's life cycle; where it lives, what it eats, when and how it reproduces, entomologists can also understand the best ways to manage it when it gets out of control. This can lead to more environmentally friendly ways of controlling pests, but both the public and pest control

professionals need to be taught how to use these new methods.

Teaching certified pest control operators different ways to reduce pesticide sprays while keeping bug populations in check is one of Dawn Gouge's main goals. As a research entomologist with the University of Arizona's Department of Entomology in the College of Agricultural and Life Sciences (CALs), she is focusing on Integrated Pest Management (IPM), a pest management strategy that provides long-term management of pest problems with minimum impact on human health, the environment and non-target organisms. Her studies in mosquito, termite and cockroach control are yielding results that are changing the way people fight pests.

## MOSQUITOES

According to Gouge, the management of urban mosquito populations using novel organic acids could lead to alternatives to costly chemical sprays. Her mosquito research is an applied project using organic acids to reduce turf compaction on school grounds, increasing drainage and eliminating mosquito breeding reservoirs (see sidebar for pest management program in schools).

"I consider the mosquito research we are conducting to be of most importance," Gouge says. "Optimizing management of bugs that compromise human health is our highest priority."

## TERMITES

Arizona termite species thrive in dry, hot weather. When they become established in an area the damage they do often poses serious structural problems that can halt construction

and delay home sales. Current control methods might include wrapping the entire home in a circus-like tent and inundating the home with a pesticidal fumigant, or a pre-treatment consisting of digging narrow trenches along walls and drilling through horizontal surfaces and into voids, applying materials where they will kill termites within the home and block the colony's re-entry.

Entomologists based at the UA's Maricopa Agricultural Center in central Arizona are studying alternative methods of eliminating termite colonies. Gouge is investigating the use of biological pest control agents, in this case, worms from the nematode genera *Steinernema* and *Heterorhabditis*. These tiny worms, called entomopathogenic nematodes, are placed in the soil of a termite colony. When eaten by the termite, they go to work breaking down the termites' body using digestive enzymes and toxins.

"It is not known for sure if nematodes are able to penetrate directly through the cuticle (hard outer coating) of termites or ants," Gouge says. "The insects do definitely ingest them, but it is likely that nematodes in the genus *Heterorhabditis* are also capable of entering the insect's body directly, since they have a terminal tooth and have been photographed entering other insect species directly through intersegmental membranes."

A possible disadvantage is that Gouge says termites have been documented conducting certain behavioral activities which could minimize nematode/termite contact. "Termites can detect an individual which has become infected and will remove it from the nest, or wall that termite up in a remote part of the colony. Both ants and termites groom themselves furiously when the nematodes crawl over them," Gouge says.

This research is just one of the projects Gouge is conducting. By assessing the potential use of various microbial species as bioinsecticidal agents, she says there can often be a decrease in the use of pesticides sprayed throughout the environment.

## THE TURKESTAN COCKROACH

Compared to other parts of the country, urban areas in the Sonoran Desert may have a different spectrum of insect pests. But once these non-native populations become

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established they can cause economic as well as health concerns to humans. An insect pest new to Arizona is the Turkestan cockroach (*Blatta lateralis*). The Turkestan cockroach was first found in the United States at a military supply center on the West coast, and has migrated to arid regions of Texas, New Mexico and Arizona.

This medium-sized cockroach was discovered in Phoenix during inspections for a school IPM program, in sticky traps placed in the school buildings. Because it was believed to live primarily outdoors, its discovery led researchers on a hunt to see how and why they were coming indoors. Cockroaches will eat almost anything but are especially fond of starchy materials such as cereals, sweetened or sugary substances, and meat products. Many areas in schools offer the perfect habitat for pest insects.

Not much research has been done on the Turkestan cockroach in the urban areas of the Sonoran Desert, so Gouge and her colleagues have captured live specimens to observe in the lab. Once trained to look for them, school

maintenance personnel have been able to take the necessary steps in pest proofing the buildings. Taking a close look at reducing the cockroach's habitat allows for an alternative to monthly spray regimes, according to Gouge.

#### EDUCATION MAKES THE DIFFERENCE

Gouge says while IPM is fairly well understood by agricultural producers, making it work in the urban environment sometimes requires re-education in pest management strategies for homeowners, pest control operators, and other people who routinely deal with pest control. "IPM programs are educationally based—they focus on knowing pest biology, habits and habitats," Gouge says. A quick check of the yellow pages in any community will show listings for many pest control operators. Educating them in new management methods could make the difference in helping them stay in business while offering safer alternatives to potentially harmful chemical residue. w



Turkestan cockroach

## UA-LED TEAM CUTS BOTH PESTICIDES AND PESTS IN ARIZONA SCHOOLS

By Jeff Harrison, UA News Services

The Kyrene School District in the metropolitan Phoenix area routinely sprayed its facilities to control an assortment of pesky creatures: fire ants, cockroaches, mosquitoes and bark scorpions. Each month the pesticide treatments were repeated, but pest populations remained at what district officials considered to be unacceptable levels. More significantly, while the poisons were being applied and reapplied, children were being pulled out of school for a day or two each month by their parents to avoid pesticide exposure.

In April 2000, Kyrene tried another approach and brought in a team of specialists that included entomologists from the University of Arizona led by Dawn Gouge, an expert in urban entomology. The new program initially came from Indiana University (IU). IU entomologist Marc Lame had done a pilot study in the Midwest and wanted to try a similar program in the desert southwest. "We thought Lame's proposal was a winner from the start," said Gouge.

Three Kyrene schools (Cielo, Paloma and Pueblo) were chosen for the pilot project, which used Integrated Pest Management (IPM) techniques for controlling pests while avoiding reliance on chemical pesticides. The schools concentrated their efforts (and capital resources) on identifying what the pests were, finding where they came from and denying their entry into buildings. The custodial and kitchen staffs also were mobilized to learn how to spot trouble.

All of the openings around pipes and conduits were sealed. Crawl spaces in portable classrooms—great living quarters for rodents and feral cats and their fleas, ticks and lice, as well as black widow spiders—were closed off. Drains and building slabs were repaired to inhibit cockroaches. Trees were trimmed back and birds were encouraged to roost where their droppings wouldn't contaminate walkways and other high traffic areas.

The IPM midterm evaluation showed that the schools reduced their pesticide applications by 90 percent and kept pest populations below 85 percent of their original levels. The program has been expanded to 22 sites in the Kyrene School District.

UA faculty also are currently working with the Arizona Structural Pest Control Commission on ways to provide pest control companies with certification that will recognize those that practice IPM techniques.

"We hope that the kids will also take their new-found philosophy home with them and encourage their parents to adopt IPM practices there also," Gouge said. "I think our IPM model will expand statewide within schools and also be adopted by other institutions (such as) child care centers, municipal parks and buildings, hospitals, etcetera. We are hoping to start another pilot program soon for the Navajo Nation."



Nematodes used for biological control are so small they must be viewed through a microscope.

Joanne Littlefield