

Sex Potion Ensnares Mealybugs

The pink hibiscus mealybug (PHM) has a dainty name, but don't let it fool you. This insect pest can destroy more than 200 plant species by injecting them with toxic saliva while sucking their sap. The exotic insect pest recently invaded California and Florida, and has proven difficult to monitor. The mealybugs are also hard to kill, partly because their waxy outer coating, or cuticle, resists penetration by conventional insecticides.

But ARS scientists have now found a way to lure male mealybugs, making them easier to detect. A team of researchers led by chemist Aijun Zhang at the Chemicals Affecting Insect Behavior Laboratory, in Beltsville, Maryland, has discovered two compounds that together make up the female PHM's sex pheromone. The compounds provide a timely method with which to monitor and ultimately reduce infestations.

The scientists carefully reared thousands of PHMs, using an insect growth regulator that prevents development of males. Then they painstakingly isolated more than 6,000 virgin females from which they collected pheromone chemicals.

After pooling seven collections of airborne sex-chemical extracts from the females, the scientists exposed them to male mealybugs' antennae, which consistently responded



DAVID HALL (D081-1)

Female pink hibiscus mealybug.

to two attractant compounds. The previously unknown natural chemicals were found to be (R)-lavandulyl (S)-2-methylbutanoate and (R)-maconelliyl (S)-2-methylbutanoate.

The researchers then prepared a synthetic version of the pheromone and further demonstrated that the processed mixture was immensely attractive to PHM males. They found the most potency when they mixed one part of the first compound with five parts of the second.

"In many cases, just a few micrograms of the one-to-five blend placed in a single sticky trap captured thousands of males," says Zhang. This blend is effective for monitoring the mealybug's population densities and geographical distribution to help scientists determine where to release natural enemies.

"Pheromones decompose relatively quickly, without leaving a harmful residue or damage to the environment," says Zhang. Chemical insecticides, however, break down at

a very slow rate, so they tend to linger in soil for decades, which can add to pollution. So biological control methods—where natural predators and parasitoids are "weaponized" against agricultural pests—are more desirable.

Officials with USDA's Animal and Plant Health Inspection Service, headquartered in Riverdale, Maryland, have introduced two exotic wasps to control PHM infestations in the United States and Caribbean. But their efforts had been stalled by an inability to detect the mealybug's presence and prevalence. Now, APHIS officials are using the new pheromone blend as a sex lure to survey the degree of mealybug pest infestations in Florida and California and to track the effectiveness of biological control efforts against the pest.

USDA-ARS has applied for patent protection for the invention and has already received requests to license the technology. The new blend

of synthetic pheromones could help crop producers safely manage the pests with either mass-trapping or disruption of mating activity.

These natural compounds have good staying power: Just 1 microgram lures the pest for 6 months, and 10 micrograms lures it for 1 year, Zhang says.

The discovery was published in the *Proceedings of the National Academy of Sciences*.—By **Rosalie Marion Bliss**, ARS.

This research is part of Crop Production, Product Value, and Safety, an ARS National Program (#304) described on the World Wide Web at www.nps.ars.usda.gov.

Aijun Zhang is with the USDA-ARS Chemicals Affecting Insect Behavior Laboratory, 10300 Baltimore Ave., BARC-West, Bldg. 007, Room 312, Beltsville, MD 20705-2350; phone (301) 504-5223, fax (301) 504-6580, e-mail zhanga@ba.ars.usda.gov. ★