A Volatile Idea for a Better Mexfly Trap

If you grow citrus or a dozen other fruit crops in California, Florida, or Texas, finding a Mexican fruit fly in a trap is bad news.

But you're better off getting the bad news as soon as possible, says ARS entomologist David C. Robacker.

Earlier detection allows quicker response and less need—and cost—for eradication and quarantines. But traps currently available are estimated to attract only about 1 percent of the flies within the trap's range.

Robacker's approach exploits the fruit fly's attraction to various bacteria. Recently, he synthesized a bacterial "perfume" that's a smorgasbord of gaseous chemicals called volatiles.

USDA estimates costs of $1.44 billion over 5 years if mexflies become established in states where they are adapted.

Bacteria give off volatiles while metabolizing food and producing waste. Scientists have identified a few bacterial volatiles, but Robacker is the first to produce a liquid mix that mimics their makeup and appeal to fruit flies. He conducts studies at ARS' Subtropical Agricultural Research Laboratory in Weslaco, Texas.

Green-eyed and larger than a housefly, the mexfly has less notoriety than its petite medfly cousin. But mexflies appear in south Texas each year, and eradication programs were required in California in 1992 and 1993.

What if mexflies set up year-round homes in the states where they're adapted? A USDA report estimates costs of $1.44 billion over 5 years in yield loss, insecticide and other treatments, lost markets, and export sanctions.

Today's mexfly trap is a bottle that holds water and torula yeast—used as an attractant since the 1930's.

A dry trap emitting a more sensitive attractant should be cheaper, less cumbersome, and more effective, Robacker says.

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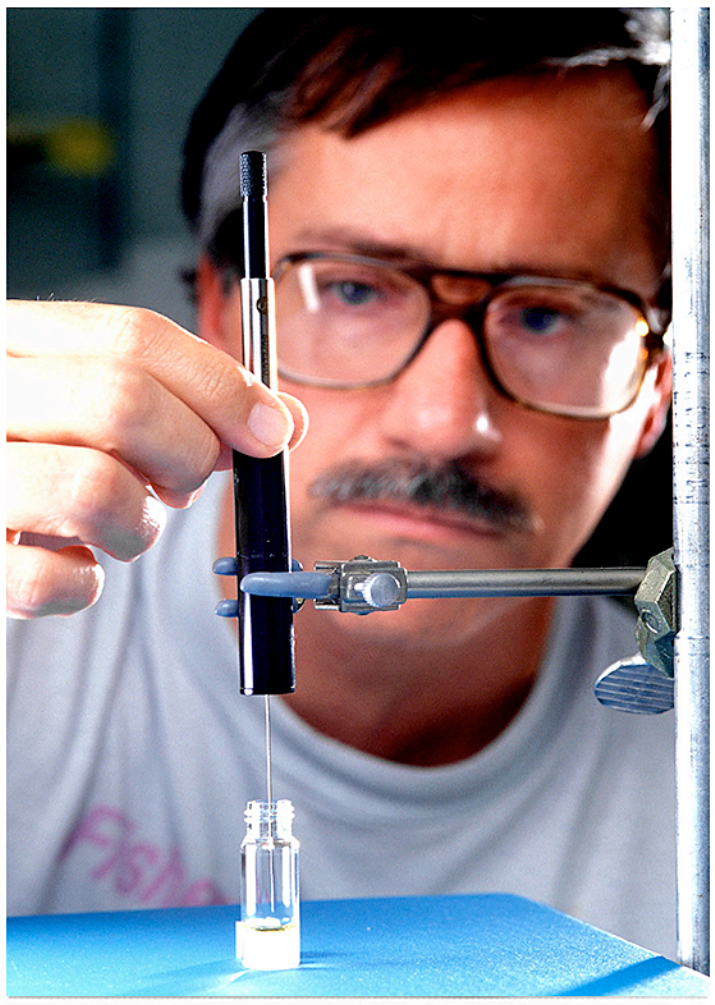

Entomologist David Robacker uses a solid-phase microextraction device to gather attractant chemicals from the air directly above bacterial culture. A special "plastic" fiber traps the chemicals that prove attractive to fruit flies. (K5947-1)

Scientists aren't sure why fruit flies yearn for bacteria. The microbes can grow on damaged fruit, so volatiles may signal food or egg-laying sites. Bacteria may also be a food source or help flies metabolize nutrients.

Robacker used a strain of *Staphylococcus aureus* bacterium in his studies. While it's primarily associated with people, he found it living in lab-reared mexflies.

To gather and analyze bacterial and experimental volatiles, Robacker first used a solid-phase adsorption extractor, available only in the past few years. Its heart is a gas collector, a thin silica fiber coated with polydimethylsiloxane. Chemical vapors rise above a liquid test sample and stick to the fiber.

With a gas chromatograph, Robacker "fingerprinted" the volatiles. This revealed their chemical whorls and ridges—but not their identities. For that step, he turned to chemist Robert A. Flath at ARS' Western Regional Research Center, Albany, California.

With a mass spectrometer, Flath could put chemical names on the fingerprints of the bacterial volatiles. They are ammonia, trimethylamine, isoamylamine, 2-methylbutylamine, 2,5-dimethylpyrazine, and acetic acid.

"We eventually came up with a liquid mix whose volatile fingerprints resembled those of the bacterial volatiles," says Robacker.

Mexflies in lab cages found the synthetic volatiles 89 percent as attractive as those of the real bacteria.

"The other 11 percent isn't worth chasing for this bacterium," he says. "Since we've proved the approach works, we'll try it now with bacteria we know are more attractive to fruit flies."—By **Jim De Quattro,** ARS.

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