

Better control of red flour beetles and other costly, stored-product insect pests could be on hand, thanks to a new pitfall trap designed by Agricultural Research Service scientists.

Commercial traps now used are typically dome-shaped devices baited with pheromones or other attractants that lure the beetles into pits or onto glue strips. The new design, dubbed the “Terrestrial Arthropod Trap” and patented in October 2012 by ARS on behalf of the U.S. Department of Agriculture, takes this “fatal attraction” to a new level.

In addition to a pheromone dispenser, the pyramid-shaped trap sports three slender fins along each edge of its base to coax inquisitive beetles into crawling towards the opening of a central pit, where they can be captured, counted, and discarded. The new trap also features light-emitting diodes (LEDs), set to wavelengths of 390 nanometers. The LEDs attract beetles from long distances, ensuring that they get a whiff of pheromone the closer they approach. This can be especially useful in well-ventilated warehouse areas, where the ubiquitous odor of food can dilute or mask the scent of pheromone emanating from a trap.

“Once the beetles are close enough for a lure to be effective, there is a further need for a trap designed specifically to appeal to the tactile and behavioral traits of the targeted pests,” write the inventors in a patent description of their new trap design. Peter Teal leads the ARS Chemistry Research Unit in Gainesville, Florida. Lee Cohnstaedt is in ARS’s Arthropod-Borne Animal Diseases Research Unit in Manhattan, Kansas. Adrian Duehl and Richard

Patented New Trap Irresistible to Insect Pests

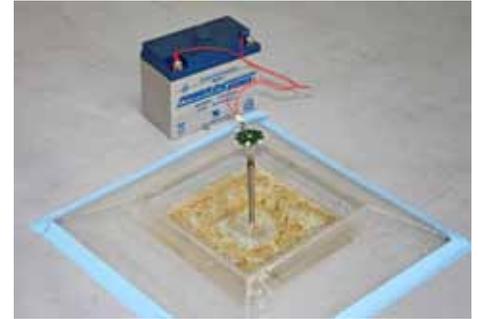
Arbogast were both formerly with ARS in Gainesville.

In timed laboratory trials, red flour beetles visited LED traps set to 390 nanometers 16 times versus 2 to 5 times for traps set to other wavelengths. Positioning the LEDs at the trap’s top captured more beetles (55 total) than placing the diodes at the bottom (12 captured). Combining the LEDs with an attractant made the pyramid design even more effective, capturing 70 beetles versus 4 using a standard dome design.

The red flour beetle, *Tribolium castaneum*, is a primary target of the team’s research because it eats both raw and processed cereal grains. It commonly infests flour mills but can also be found in warehouses, storage bins, and household food pantries, causing millions of dollars in losses annually.

The pyramid trap’s success in laboratory trials is a testament to the researchers’ efforts to study and exploit the beetle’s natural behaviors and tendencies—from identifying optimal wavelengths that cue it visually to creating a crawl space between the trap’s lid and base that appeals to the furtive pest’s instincts, luring it to enter and fall into the pit inside.

Above: LED lights near the top of the new trap lure the pest. **Bottom left:** Different wavelengths and colors of light were tested to see which best attracted insects. **Below right:** The trap’s exterior has an inner and outer layer with an opening at the bottom, where insects enter, crawl up between the layers, and fall into a trap at the top.



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Small hive beetles, which can weaken honey bee colonies, were also attracted to the trap. In tests, researchers observed a 10- to 20-fold increase in captures of hive beetles compared to conventional traps used against the pest. Changes to the trap’s design and to the combination of attractants and LED wavelengths can also be made to effectively target fleas, ticks, bed bugs, and mosquitoes.—By **Jan Suszkiw**, ARS.

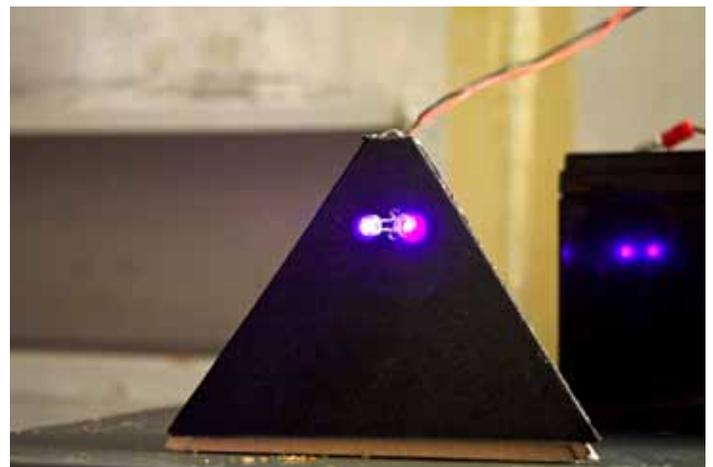
This research is part of Crop Protection and Quarantine, an ARS national program (#304) described at www.nps.ars.usda.gov.

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