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Going Beyond the Barnyard To Stop Stable Flies

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Livestock producers may not be able to see the difference between stable flies and other flies at a distance, but they can definitely see the stable flies' effect on their cattle as the animals stop grazing and bunch together to minimize the number of bites they're getting.

Stable flies are among the most important arthropod pests of cattle in the United States. Their painful bites can reduce milk production in dairy cows, decrease weight gain in beef cattle, and reduce feed efficiency.

Generally, insecticide sprays are used to help keep stable flies off animals, especially their legs, where the flies mainly bite. But as cattle walk through wet grass or wade through water, the spray washes off—making the treatment ineffective. Management of this pest is further complicated by the fact that larval development sites exist for only a short time, are difficult to find, and can produce huge numbers of the aggravating flies.

Scientists at the Agricultural Research Service's Agroecosystem Management Research Unit (AMRU) in Lincoln, Nebraska, are looking at better methods to locate stable fly habitats, finding easier and more efficient ways to control them, and assessing the damage they cause.

On the research farm at the University of Nebraska, ARS entomologist Jerry Zhu checks stable fly captures from a trap baited with his newly designed attractant, or lure, in a cattle feedlot.

A Heavy Cost for Cattle Producers

What's the cost of stable fly damage? It's something livestock owners need to know.

"If you tell a producer that a site is the source of lots of flies and needs cleaning up, that producer wants to know if it is worth the time and expense," says AMRU entomologist David Taylor. "We wanted to provide a cost-benefit analysis."

Taylor and his colleagues developed a model to assess the economic impact of stable flies using four classes of production: dairy, cow/calf, pastured and range stocker, and animals on feed. They found that each year, stable flies cost the U.S. cattle industry more than $2.4 billion, making them the most damaging arthropod pest of U.S. cattle.

As their name implies, stable flies have historically been associated with stables and barnyards. But over the last 30 years, they have become a significant pest in pastures too. Research indicates that the problem is partly due to the large bales of hay placed in fields as supplemental feed for cattle during the winter.

"The accumulation of wasted hay, manure, and urine at these feeding sites creates an ideal habitat in the pasture for stable fly larval development," Taylor says. "We identified hay-feeding sites as producing a lot of flies, but we wanted to know how the timing of the flies coming off the sites correlates with adult population levels."

In Nebraska, stable fly populations peak twice a year—in mid-June to July and again in September or October. Scientists determined that the hay-feeding sites are the primary sources of flies in the June-July peak.

Stopping Stable Flies Before They Mature

Cleaning up infested sites has been the main stable fly control method for about 100 years, Taylor says. The problem is that hay-feeding sites are often in remote locations.

As for insecticide use, says Taylor, "This kind of habitat has an active microbial community that can break down most traditional insecticides very quickly. You might get a couple of days of control before the effectiveness wears off."

The team found that using an insect growth regulator to interrupt the development of stable flies can be effective. In one study, Taylor used cyromazine to control immature stable flies. Cyromazine, a commercial product, has been used to control other species of flies, mainly in poultry production. It interferes with molting and inhibits proper development of the insect's external skeleton.

"We wanted to develop a method where the producer could apply a single treatment and be done," Taylor says.

Scientists found that a single application of granular cyromazine sprinkled on a hay-feeding site reduced the number of adult stable flies emerging by 97 percent. Treatments took about 10 minutes, cost $10 per site, and remained effective for 10 to 20 weeks.

"It's something producers can put in a pickup truck and don't have to mix or spray," Taylor says. "They can quickly treat sites while doing other chores or checking on cattle."

A "Push and Pull" Strategy

Identifying the attractants or substances that lure females to a particular site to lay their eggs may help scientists find ways to reduce their populations.

"When gravid females—flies with eggs—reach an egg-laying site, we believe they use the olfactory sensors on their antennae to gather information related to nutrition," says AMRU entomologist Jerry Zhu. "They then make a decision as to whether it is the right area to lay their eggs."

Zhu is using what he calls a "push and pull" strategy to control stable flies. The "push" involves driving stable flies or other filth flies, like house flies and horn flies, away from livestock with a repellent. Plant-based chemicals that are low in toxicity, such as those found in catnip, are being used as experimental treatments.

"Catnip oil and its active compounds—nepetalactones—are powerful repellents against stable flies," Zhu says. "Catnip is probably the best repellent identified, so far, for flies that bite. Catnip oil is also a good larvicide," meaning it can be used for reducing stable fly larval development, he adds.

Zhu and his colleagues developed several sprayable catnip oil formulations for reducing stable fly field populations. Through a cooperative research and development agreement, Zhu partnered with Microtek Laboratories, Inc., to test a novel granular catnip product that can deter egg-laying.

The "pull" part of Zhu's strategy involves developing attractants to lure stable flies into a trapping system that can be combined with a low-toxicity insecticide or a sticky substance.

Zhu and Taylor are also working with AMRU entomologist Kristina Friesen, who is studying microbial communities associated with stable fly larval development sites.

"In my mind, the long-term solution to stable fly control is a cultural solution," Taylor says. "Even though we're developing strategies such as chemical control, our long-term objective is to provide producers with methods to raise cattle without providing larval developmental sites for flies. That's the real goal."—By **Sandra Avant,** ARS.

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Entomologist David Taylor adjusts the settings on a sprayer used to automatically treat cattle with a stable fly repellent.

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David Taylor checks a stable fly emergence trap near a hay-feeding site. The trap is used to evaluate the effects of chemical and physical treatments on stable flies.

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