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Roughly 120 years ago, an inconspicuous pest took a ride on a ship from Europe bound for the United States carrying livestock and landed on our Eastern shores.

Today, the little fly has become a top competitor for “major livestock pest of the year.” Horn flies have proven to be resilient and an opponent worthy of battle. Traditional methods can offer limited control and only focus on one pest, the horn fly. Our research on Thaler Land and Livestock ranch lands east of Chugwater in southeastern Wyoming seeks to determine whether the same insecticide control for grasshoppers could also be effective against the horn fly.

The original concept of possibly killing two birds with one stone by using a grasshopper treatment to also control horn flies originated in Texas several years ago. After completing a master’s of science degree with an emphasis in ruminant nutrition, I contacted Associate Professor Alexandre Latchininsky in the Department of Renewable Resources because I had heard he needed a Ph.D. student. As we discussed the projects he had available, the horn fly project fit best with my background.

### Horn Fly First Noticed in 1886

The horn fly (Photo 1) was first noted in Philadelphia between 1886 and 1887. Due to a high reproductive rate and large wings, which allow it to fly long distances, five years later the horn fly was found throughout the Rocky Mountain region from Canada to Texas. Horn flies are a major pest of livestock (mostly cattle) and cost the industry close to \$1 billion a year in



Photo 1. Horn Fly



Photo 2. Beak

control and production losses. Several methods of control have been developed; however, success of these methods is short-lived because the multiple generations per year the horn fly has allows them to quickly build resistance.

Normal seasonal infestation rates range from 500 to 1,500 flies per animal (see photo page 4). They got their name – horn fly – because they are typically found feeding and resting on heads as well as shoulders of cattle. During the heat of the day, they will move to the mid-line and underbelly of the animal to escape the heat. Being obligate blood feeders, they feed 20 to 30 times a day by using a stout “beak” (Photo 2) that punctures the animal and then sucks up a bellyful of blood.

In attempts to relieve some of the irritation, the cattle use costly energy meant for growth to rid themselves of the flies. Some of the behavioral changes include increased tail whipping, head throwing, bunching with

other animals, and rubbing against each other; however, the flies have caught on to these attempts and just merely fly straight up and land right back on the same host.

Cattle behaviors and internal physiology are changed. When exposed to as few as 150 flies, an animal’s heart rate, respiration rate, and urinary output increase. As the number of flies rises, the animals increase internal temperature and fecal output and decrease feed consumption and conversion.

Infested heifers and cows give birth to lighter calves and produce, on average, 10- to 12-pound lighter calves at weaning. Animals destined for the slaughterhouse are lighter, which leads to yet another financial loss to the producer.

### Spends Life on Single Host

The horn fly’s evolution has made it a perfect ectoparasite (lives on the outside of host) for cattle. The flies spend the majority of their lives on a single host. Females are able to mate a couple of days after maturity and then lay their eggs in fresh cow dung. Being able to detect when the animal is going to defecate, they move to the udder and inside hind leg area to wait. As soon

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as the animal defecates, they immediately fly to the patty. Upon arrival, they lay from one to multiple eggs on the underside edge of the pile. Females only spend a few minutes on the patty and then return to the host to continue blood feeding. Larvae take a couple of weeks feeding on the organic matter in the dung to reach maturity. The adult fly emerges from the patty and seeks a host (Photo 3).

Horn fly populations peak in late spring, decrease during the hottest part of summer, then increase again in early fall. Populations die off after the first hard frost so, depending on the region, horn fly populations can linger for a long time. Horn flies overwinter as pupa a few centimeters down in the soil. As the temperature increases in the spring, adult horn flies emerge from their pupal case and go in search of a host.

Over a season, there are multiple generations, which has allowed for the development of chemical resistance to many commonly used insecticides.



Photo by Bryan Stevens

**Photo 3.** Emergence holes.

Current control methods use insecticide-filled back rubbers, ear tags, and sprays. Each method targets the adult fly and requires the livestock producer to use valuable time and money in maintenance.

### The Horn Fly-Grasshopper Connection

Rangelands grazed by cattle are commonly attacked by pest grasshoppers. In a normal year, a grasshopper population can consume as much as 25 percent of the aboveground forage; in

an outbreak year, they can consume as much as 100 percent. This puts grasshoppers in direct competition with cattle for available forage.

In the 1970s, a compound called diflubenzuron became commercially available as an insecticide. This product acts as an insect growth regulator (IGR). IGRs are designed to prevent an insect from forming a proper exoskeleton when it molts and leads to deformities and death. As an insect consumes diflubenzuron-treated vegetation, the insecticide acts on the protein matrix that makes up the new cuticle at the time of molting. Adult insects are not affected since they are fully grown and do not molt. Diflubenzuron has been successfully used against grasshopper outbreaks worldwide since the early 1980s.

A question arose as to whether an application of diflubenzuron for grasshopper control could also help with the suppression of horn flies.

Horn fly hosts.



Photo by Bryan Stevens

## Thaler Ranch Research

The answer is being examined on the Thaler ranch. A group of 600 cow-calf pairs was grazed from mid-May to mid-August on improved pastures. The pastures were irrigated and contained native grass, orchard grass, and alfalfa. In 2008, horn fly emergence was delayed by an estimated month and a half due to cold and snowy late spring weather. Near the end of June, a sizeable horn fly population finally appeared, and two pastures were aeri-ally treated with diflubenzuron a day before the cattle were brought on to feed. The cattle were rotated between six pastures throughout the summer, feeding about a week at a time on each. Within 24 hours of the cattle leaving a pasture, emergence traps (Photo 4) were placed over 10 fresh manure patties. Eight fresh patties were collected, placed in five-gallon buckets, and brought back to the insect rearing laboratory at the University of Wyoming in the College of Agriculture and placed in an emergence chamber for 10-14 days.

After 30 days in the field, the emergence traps were collected and emerging horn flies counted (Figure 1). The patties from the emergence chamber in the lab were placed in a freezer for later inspection and analysis of emerged flies. Preliminary results are positive that diflubenzuron, when applied for grasshopper control, can also help control emerging horn fly populations.

A lot of nuts and bolts of this research were quite new to me. I had to develop the design of the traps to capture the horn flies emerging from cow dung and the method of extracting the flies' pupae from the collected manure. These were trial-and-error approaches, but, finally, I developed methods that work.

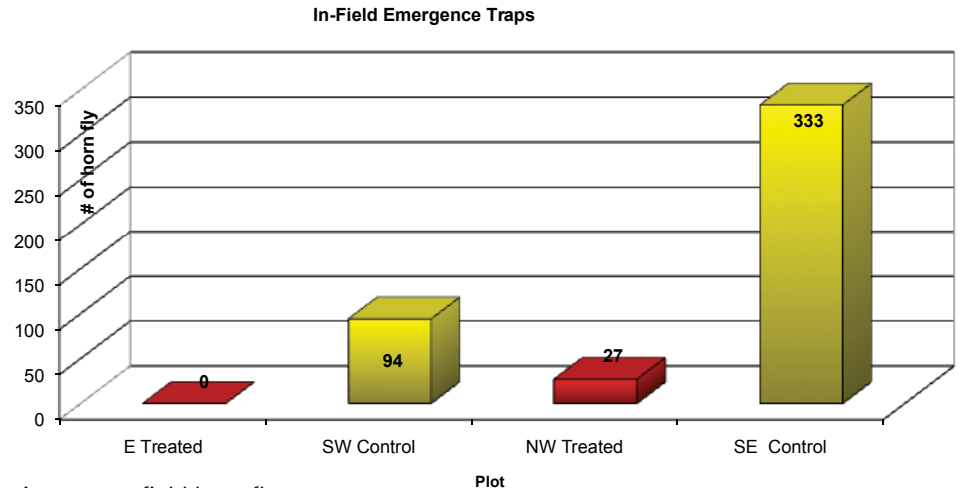


Figure 1. In-field horn fly emergence.



Photo by Bryan Stevens

Photo 4. Emergence trap.

Our experiment brings with it hope that by killing two birds with one stone, a more efficient and environmentally sound strategy to control the evasive horn flies can be developed. We are in the process of determining the spraying's impact on beneficial insects. We know that diflubenzuron can kill any immature arthropod that ingests

enough of it; however, the main focus is whether we can gain some control of the horn fly. *sm*

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