K-STATE Kansas State University Research and Extension

FORAGE FACTS

Publication Series

BLISTER BEETLES

INTRODUCTION

Blister beetles are elongated, narrow, cylindrical, generally soft-bodied insects that may measure up to 1½ inches in length. A constriction in the area between the back of the head and the rest of their leg-bearing thoracic body region makes it appear as if they have a well-defined neck. Color and size vary among the nearly 60 species known to occur in Kansas. Only about half a dozen of these species were found to infest alfalfa in a recent series of studies.

Although small areas within soybean and alfalfa fields may sometimes experience noticeable leaf-feeding damage from dense congregations of adults, these insects most often are a concern to livestock producers when their bodies become trapped within stored forage, particularly alfalfa, during harvesting. Defoliation or flower feeding by adults rarely causes economic damage outside of vegetable gardens. Immatures generally are considered beneficial in that the larvae of many species feed on grasshopper eggs.

THREAT TO LIVESTOCK

The bodies of blister beetles contain a toxic substance called cantharidin. Horses are particularly sensitive to this material, but cattle also are affected. Death of an affected animal can occur if the problem is severe and not adequately diagnosed, and prompt treatment is not administered. Spiking cattle rumen fluid with cantharidin in one K-State Research and Extension study resulted in reduced digestion of forage substrates. Ruminants eating cantharidin-contaminated hay might exhibit lessened rates of gain, even if they suffer no long-term health risks.

Cantharidin is an irritating compound which can cause blistering of external and internal body surfaces. In horses, colic, diarrhea, blood in the stool and urine, and sloughed intestinal mucosal linings may be observed following ingestion of contaminated hay. Animals may experience pain while urinating, passing frequent and small quantities of blood-tinged urine with each effort. Affected horses place their muzzles in water without drinking, exhibit elevated temperatures, and have increased pulse rates, dehydration, depression and shock. Body tremors, congested mucosal membranes, odd breathing patterns, including a fluttering of the diaphragm that is synchronized with the heartbeat, may develop. Blood chemistry analysis may show that a lowered blood calcium level has developed. If poisoning is suspected, examine recent feed sources, looking for beetle bodies, wing covers and other body fragments. Consult a veterinarian immediately for advice on treating your animal.

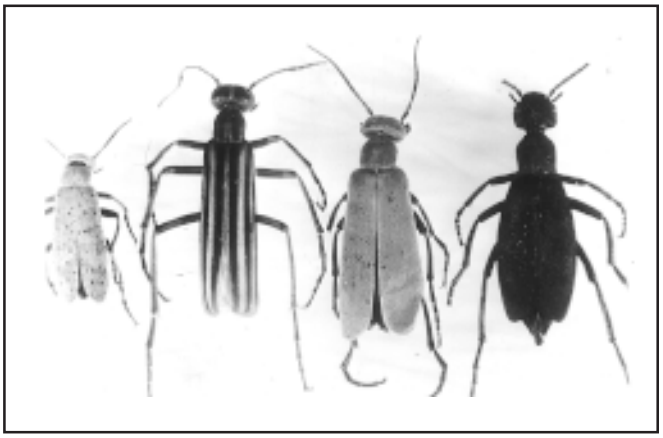

Figure 1. Common species of blister beetles found in Kansas.

A FORAGE FACTS Publication of the KANSAS FORAGE TASK FORCE
Kansas State University Agricultural Experiment Station and Cooperative Extension Service

Figure 2. Part of a swarm or aggregation of three-striped blister beetles within standing alfalfa

HOW DO THE INSECTS GET INTO THE HAY?

Blister beetles of several species regularly inhabit alfalfa across Kansas. Because each insect contains only a small quantity of toxin, the risk of livestock poisoning is largely confined to one species, the three-striped blister beetle, which tends to congregate and form large aggregations or swarms. Aggregations of 60,000 or more individuals have been observed in Kansas alfalfa.

During the harvesting process, blister beetles can be crushed and killed as hay is swathed. Side-mounted, pull-type, or self-propelled mowers or swathers with conditioning rollers are frequently blamed for causing virtually all of the blister beetle contamination in processed hay. However, research at Kansas State University showed that wheel traffic drive over from tractors employing sicklebar mowers can kill about the same percentage of blister beetles as hay conditioners.

Although raking and pickup tines on a baler may cause many dead insects to drop to the ground, significant quantities of cantharidin may remain in the hay if body fluids were transferred from smashed beetles to the forage.

Since the area occupied by a single swarm of striped blister beetles is frequently wider than the width of the haying equipment, harvesting machinery frequently moves into and out of each aggregation several times as the hay is swathed. The process of loading and stacking the hay on trucks or trailers and restacking it in piles adds to the redistribution process, serving to scatter infested bales rather than keeping the risk clustered in well-defined areas.

HOW MANY INSECTS DOES IT TAKE TO CAUSE ANIMAL HEALTH RISK?

Virtually all the available data relate only to horses. Size and health of the animal combine with amount of toxin ingested as major components in predicting risk. Beetle species vary in terms of amount of cantharidin contained. Reliable reports indicate that somewhere between 25 and 300 or more beetles may result in horse mortality following a single feeding. One 5-pound flake of hay collected from the site of a massive swarm contained 145 grams of dead blister beetles. This quantity of blister beetles, if distributed evenly, would be enough to kill more than 25 horses. In reality, a single animal probably would have consumed the entire flake of hay.

WHAT CAN BE DONE TO MINIMIZE THE RISK?

Scouting for the insects within a field of standing hay is not likely to be reliable. The largest swarm of blister beetles we have ever discovered was encountered in a field that had been intensively scouted by trained individuals earlier that same day. When the scouts initially left the field they were confident there were no swarms of beetles present. A few hours later, as we were releasing small groups of color-marked beetles in preparation for a series of equipment evaluation experiments, we encountered tens of thousands of beetles in a large aggregation which was dense enough to bend over the standing hay. The beetles infesting this 500- to 600-square foot area must have flown into the field during the short time the scouts were out of the field—illustrating the dynamic and unpredictable nature of this pest problem.

The least lethal harvesting equipment we studied was a self-propelled swather with conditioning rollers fully open or, better yet, completely removed from the machine. This relatively low-risk machine also was equipped with a windrowing attachment so wheel traffic run over did not occur while the equipment was moving up and down the field cutting the alfalfa. With one important exception, relatively few blister beetles were killed with this machine during our studies. Hay in turn areas at the ends of the field should be segregated and fed to non-cantharidin-sensitive animals because aggregations of beetles in these areas might be crushed beneath the wheels of the swather, trapping them in the hay, as it was turned around for another pass down the field. Some beetles were killed using this device, so completely blister beetle-free hay could not be guaranteed.

Experiments involving many brands and types of chemical desiccants failed to identify a nontoxic substitute which could speed drying and replace mechanical conditioning. Many of these products killed blister beetles quite rapidly, thereby possessing the same disadvantages associated with the use of insecticides.

WHAT ABOUT INSECTICIDES?

Insecticides are not recommended as a means of eliminating blister beetles from infested fields. Killing the insects only serves to trap the poison within the field. Living beetles are not highly attracted to fallen hay and soon take flight, leaving mown areas of the field generally within 24 hours. If the field is cut in sections, expect that many of the blister beetles that were in the first areas to be cut will simply move to the standing hay—thereby increasing the cantharidin contamination risk, particularly in the outer sections of the standing forage.

ARE SOME CUTTINGS AT GREATER RISK THAN OTHERS?

Yes, although generally the most weed-infested alfalfa, the first cutting is the least likely to possess blister beetles which form aggregations. However, even the first cutting is not blister beetle-free since some non-aggregating species can be found in some areas. Cuttings two, three, and four have shown the greatest likelihood to contain striped blister beetles. Populations of striped blister beetles generally peaked from late June through the month of July, with risks still evident into August and even September.

RISK OF POISONING FROM DEHYDRATED, PELLETED, OR LONG-TERM STORED HAY

We have been unable to find alfalfa processors willing to let us run blister beetles and alfalfa through their mill and dehydration equipment to determine whether high temperatures and the mixing/chopping process would dilute the risk represented by a trapped swarm of beetles. However, laboratory studies indicate that cantharidin is a relatively stable compound, retaining its identity and toxicity in the presence of significant heat. Studies of air-dried cantharidin contaminated hay indicate that the toxin can still be identified at threatening levels for nearly one year after the harvest process occurred.

IS PRAIRIE HAY FREE OF BLISTER BEETLES?

Many horse owners rely exclusively on prairie hay as their forage source, believing that blister beetle contamination is unknown in these forage species. We do not have data to support or deny this supposition; however, most horse poisoning reports have been associated with the feeding of contaminated alfalfa hay.

DO HIGH GRASSHOPPER POPULATIONS FORETELL LARGE BLISTER BEETLE RISKS?

Because many blister beetle species rely on grasshopper eggs as a food source for their immatures, it seems likely that the risk of blister beetle contamination will be greater the year after significant grasshopper populations are present.

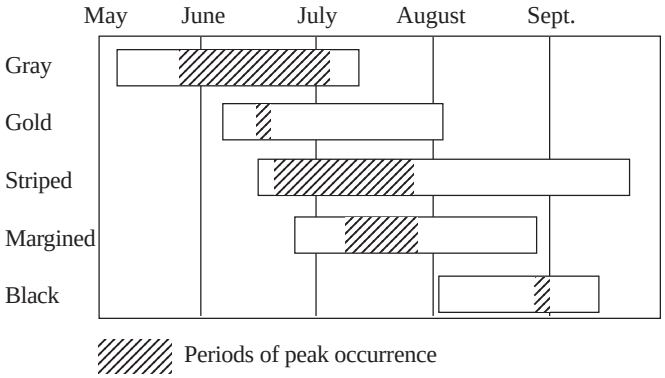

Figure 3. Seasonal and peak occurrence of blister beetles in Kansas alfalfa.

HOW EASILY ARE BLISTER BEETLES OBSERVED IN CONTAMINATED BALED HAY?

Blister beetle body parts are difficult to locate within contaminated hay. All flakes within all bales would need inspection, which is impractical. Furthermore, most of the bodies may have been knocked free during the harvest process, leaving only body-fluid contaminated hay. In the future, devices which detect blister beetle bodies or cantharidin may be developed. It also might be possible to train dogs to detect blister beetles through volatile odors given off from the beetles' bodies. These latter two detection methods, while conceivable, have unproven value at this time.

SUMMARY

Alfalfa producers selling hay as horse feed and horse owners buying alfalfa hay for their animals probably have the most need to become familiar with blister beetles.

Signs of poisoning are varied. Consult a veterinarian promptly if blister beetle poisoning is suspected.

The greatest risk is posed by blister beetle species that form dense aggregations, thereby concentrating the amount of cantharidin. In Kansas, the most common aggregating species is the three-striped blister beetle. Second through fourth cuttings are the most likely to have infestations of this blister beetle present.

Harvesting equipment and the way it is employed can greatly influence the likelihood that blister beetles present in the field will be killed.

Actively try to reduce the chances of killing blister beetles in forage fields. Beetles tend to rapidly leave mown hay if they have not been injured or crushed, thereby taking the cantharidin out of the field before the forage is baled.

Contact: Randall A. Higgins
Extension State Leader and Research Entomologist
Telephone: 785-532-5891
FAX: 785-532-6258
E-mail: rhiggins@oz.oznet.ksu.edu

Contact: Fred Oehme
Research Toxicologist
Telephone: 785-532-4334
FAX: 785-532-4481
E-mail: oehme@vet.ksu.edu

Kansas State University Agricultural Experiment Station and Cooperative Extension Service