

Management of Blister Beetles in Alfalfa

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Adult blister beetles (*Epicauta* spp.) feed on a variety of broadleaf plants, including alfalfa, soybeans, and multiple weedy plants including lambsquarters and pigweed. Adult blister beetles are often noticed because they are gregarious, and several may be observed feeding on the same plant. They feed primarily on leaves and flowers, and usually are most abundant on field borders.

On alfalfa they are primarily a concern because adults contain cantharidin, a chemical which is toxic to horses, who may be injured if they feed on alfalfa containing dead blister beetle adults. If you intend to market hay to horse owners, pay attention to the presence of blister beetles in your fields.

Identification

Adult blister beetles vary in size and color but can be recognized by their elongated, narrow, cylindrical, and soft bodies. Individuals of the same species may vary in size depending on nutrition during the larval stages. When viewed from above, they have a narrow segment behind the head where it attaches to the narrowed anterior end of the thorax. This restricted “neck” segment, which is narrower than the head, distinguishes blister beetles from most other beetles. There are at least 13 species of *Epicauta* blister beetles reported from Nebraska (<https://nebreccs.unl.edu/>). In Nebraska, the striped, gray, and black blister beetles are common species.

The striped blister beetle (*Epicauta vittata*) is long,



Figure 1. The striped blister beetle (*Epicauta vittata*) Photo credit; James Kalisch, University of Nebraska-Lincoln

slender, brown and yellowish-gray with yellowish stripes. Adults may range from 0.47–0.71 inch (12–18mm) in length. It prefers to feed on plant foliage.

The ash gray blister beetle (*Epicauta fabricii*) is a larger beetle that is 0.39–0.59 inch (10–15 mm) long. The gray coloring is due to a thick covering of small setae.

The black blister beetle (*Epicauta pensylvanica*) is more robust and is 0.28–0.59 inch (7–15 mm) long. Black blister beetle adults primarily feed on pollen and nectar from flowering plants, usually on plants with yellow flowers, e.g., goldenrod. They may form feeding aggregations on crops but typically do not damage foliage, but feed on flowering crops or weeds. They may be active as late as October.



Figure 2. The ash gray blister beetle (*Epicauta fabricii*) Photo credit; James Kalisch, University of Nebraska-Lincoln



Figure 3. The black blister beetle (*Epicauta pensylvanica*) Photo credit; James Kalisch, University of Nebraska-Lincoln

Life Cycle

Most *Epicauta* species blister beetle larvae feed on grasshopper eggs, so often their numbers may be higher the year following high grasshopper numbers. The life cycle of the blister beetle is complex and includes several different immature forms. Females deposit clusters of eggs in depressions in the ground. Newly hatched larvae move through the soil, searching for grasshopper egg pods. This larval stage is termed a “triungulin”. Within a month, the larvae pass through three more growth stages with each becoming more sedentary. Finally, they change to a pseudopupa, which is the overwintering stage. As temperature and moisture increase in the spring, they enter the final immature pupal stage from which adults emerge. There is usually one generation per year. In Nebraska, adult blister beetles can generally be found in alfalfa through the second and third cuttings and some years into the fourth cutting.

Damage

Feeding by blister beetles does not usually directly impact yield of alfalfa and other crops. The major impact of blister beetles is the potential injury to horses (or less commonly to cattle and sheep) if they ingest blister beetles with harvested forage. After emergence, blister beetles are strongly attracted to alfalfa and broadleaf weeds during bloom, and feed on foliage, blossoms, nectar, and pollen. Beetle numbers at a site can increase rapidly, with the three striped blister beetle tending to congregate and move in swarms. High numbers in alfalfa or other hay crops should concern producers and horse owners because of the potentially large amounts of cantharidin contained in these congregations.

Cantharidin is a colorless fatty substance of the terpenoid class that blisters skin or other tissue upon contact. Horses are very susceptible to blister beetle poisoning. A horse’s digestive tract can be severely irritated, leading to secondary infections and bleeding. Cantharidin is excreted through the kidneys, irritating the kidneys, ureter, bladder, and urethra. The substance also lowers serum calcium levels and causes damage to heart muscle tissue. Animals can die within 72 hours, so it is important to contact a veterinarian as soon as blister beetle poisoning is suspected.

Lethal doses to horses have not been experimentally determined, but an estimated minimum lethal dose is 1 milligram of cantharidin per 2.2 lb of horse body weight. The number of beetles necessary to provide a lethal dose depends on the species of beetle and how much cantharidin it retains. Table 1 provides data on three of the most common blister beetles in Nebraska. Male blister beetles have a higher concentration of cantharidin than females, especially the striped blister beetle, a very common species in Nebraska. Table 2 provides data on lethal doses of cantharidin depending upon the amount in the beetle and the weight of the horse.

Clinical signs of cantharidin poisoning may include blisters and ulcers in the mouth, gastritis, colic, diarrhea, and bloody feces. Other signs include frequent attempts to urinate but producing little urine and blood in the urine. Poisoned horses may place their muzzle in water without drinking. Oral and intestinal ulcerations may be observed in cattle and sheep. Again, if cantharidin poisoning is suspected, switch to a different source of hay and consult a veterinarian.

Table 1. Cantharidin levels present in common species of blister beetles

Species	Sex	Milligrams of cantharidin per beetle	
		Average	Range
Black	Male	0.40	0.03–0.70
	Female	0.08	0.07–0.30
Ash gray	Male	1.25	0.06–3.38
	Female	0.49	0.14–0.75
Striped	Male	5.21	1.43–11.13
	Female	4.52	2.18–8.50

From Hutchison, William D., Murphy, Michael J. and Tufte, Greg N. (1990). Blister beetles in alfalfa: Management options to minimize poisoning in horses. University of Minnesota. Agricultural Extension Service.

Reducing Impact of Blister Beetles

Damage to livestock by blister beetles is related to simultaneous cutting and crimping of hay when beetles are present. If hay is cut with a sickle bar or rotary mower and not crimped, the beetles can leave the hay after it is cut. If the beetles are not allowed to escape, the trapped beetles die and are incorporated into the hay. In Nebraska, the first cutting of alfalfa usually occurs before blister beetle adults are present so horse owners could be fairly safe in using first cutting alfalfa. Use hay harvested before mid-May or after early September when blister beetles are less apt to be present.

Reducing the chance of blister beetle poisoning requires focused scouting and good management practices. A significant step is to harvest hay/alfalfa before flowering of alfalfa and weeds which attracts beetles to the fields. Cutting hay before 5 percent bloom reduces the risk of blister beetle contamination. Blister beetles are most commonly found within field borders unless there is a population of flowering weeds in the field. Scout for blister beetle activity two to three days prior to harvest. If sizeable beetle populations are discovered, producers should not harvest until beetles have moved out of the field. Research has shown that dead blister beetles contain toxic levels of cantharidin, so applying an insecticide treatment within the field is not recommended. Dead beetles in the field could be incorporated into the hay during harvest and animals might be poisoned by ingesting beetles in cured hay. Since many species of blister beetles feed on grasshopper egg pods, alfalfa fields adjacent to rangeland or roadside ditches may have a greater risk of blister beetle infestations.

Scout fields, particularly in border areas for the presence of blister beetles and if found, treat borders with a

Table 2. Estimated number of blister beetles necessary to provide a lethal dose to horses (assumes 1mg/kg lethal dose)

Cantharidin (mg) per beetle	Horse weight (lb)			
	275	155	835	1200
1.0	125	250	375	545
2.0	63	125	188	273
3.0	41	83	124	182
4.0	31	63	97	136
5.0	25	50	75	109

From Hutchison, William D., Murphy, Michael J. and Tufte, Greg N. (1990). Blister beetles in alfalfa: Management options to minimize poisoning in horses. University of Minnesota. Agricultural Extension Service.

short residual insecticide before cutting to prevent further movement into the field. Hay from portions of the field previously infested with blister beetles should not be fed to horses. Insecticides approved for use on alfalfa and non-crop areas can be found in Nebraska Extension Circular 130, which is updated annually. When selecting a pesticide, read the label to determine harvest restriction intervals.

It is difficult to eliminate the possibility of blister beetles in alfalfa. Examining hay bales prior to purchase is difficult because the beetles tend to congregate, so most bales may be free of beetles, but a few may contain enough beetles to cause toxicity in horses. Careful examination when feeding alfalfa may allow detection of beetles if present.

RESOURCES

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