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(Marisol Berti, NDSU)

# Blister Beetle Management in Forages and Field Crops

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**Blister beetles (Coleoptera: Meloidae)** get their name from the cantharidin toxin in their body fluids, which can cause blisters on people's skin if handled (Figure 1) and life-threatening inflammations in horses and livestock. Blister beetles are occasional pests of field crops including alfalfa, sweet clover, canola, dry beans, faba beans, soybeans, potatoes and sugarbeets. They also are injurious to a wide variety of vegetables and many flowers (Figure 2) and other ornamentals. Blister beetles are gregarious and are often found in high numbers in localized areas of the field. Blister beetles are not normally major insect pests and only cause occasional crop damage when conditions are favorable. However, when they occur in alfalfa and other forage crops where they may be ingested by horses or other livestock, serious illness or even death may result.

## Description

**Blister beetles are common throughout the United States.** Some common species of blister beetles in North Dakota include:

- **Ash-gray blister beetle** (*Epicauta fabricii*) (Figure 3) – medium, about ½ to ¾ inch long, gray body  
Hosts: alfalfa, Baptisia, beans, peas, sweet clover; sometimes attacks potato
- **Black blister beetle** (*E. pensylvanica*) (Figure 4) – medium, about ½ inch long, dull black body  
Hosts: Asteraceae (goldenrods and asters), beets, potatoes, tomatoes
- **Striped blister beetle** (*E. vittata*) (Figure 5) – medium, about ½ to ¾ inch long, dull yellow head and pronotum with two black stripes on each wing cover, black legs and underside of body  
Hosts: Solanaceae (potatoes, tomatoes), Amaranthaceae (sugarbeets and weeds such as pigweeds and waterhemp), soybean, other crops
- **Nuttall's blister beetle** (*Lytta nuttalli*) (Figure 6) – large, about 1 inch long, brilliant purple-green iridescent sheen on body  
Hosts: legumes, other forbs, canola, soybeans



**Figure 1. Blister on skin from blister beetle**

(James Kalisch, University of Nebraska Lincoln)



**Figure 2. Ash-gray blister beetle feeding on Baptisia (flower) causing defoliation**

(Janet Knodel, NDSU)



**Figure 3. Ash-gray blister beetles mating**

(Patrick Beauzay, NDSU)



**Figure 4. Black blister beetle feeding on weed seeds**

(Veronica Calles-Torrez, NDSU)



**Figure 5. Striped blister beetle on sugarbeet**

(Jordan Sang)

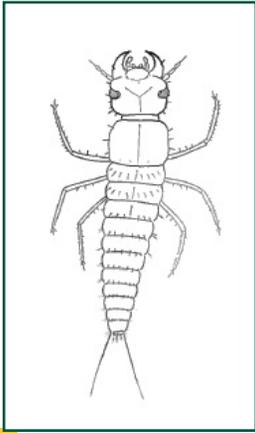


**Figure 6. Nuttall's blister beetle**

(Brandon Aldinger)



**Figure 7. Ash-gray blister beetle on alfalfa, note neck-like area between head and prothorax** (Marisol Berti, NDSU)



**Figure 8. Larva or triungulin of blister beetles** (Wikimedia.org)



**Figure 9. Ash-gray blister beetle feeding on leaves, stems and flowers of alfalfa** (Shelby Hewson, NDSU)



**Figure 10. Damaged growing point of alfalfa from blister beetle feeding** (Patrick Beauzay, NDSU)

Adults range from ½ to 1 inch long and have a characteristic narrow, elongate, soft body with a ‘neck’ formed by the tapering of the pronotum between the head and abdomen (Figure 7). The flexible wing covers are rounded over the abdomen and the color varies from black to gray to brown. Some species have a metallic sheen like the large purplish-green color of the Nuttall’s blister beetle.

The larvae of *Epicauta* are considered beneficial, since they feed on grasshopper eggs in the soil. Problems associated with *Epicauta* blister beetles have traditionally been in those areas where environmental conditions (drought) favor frequent outbreaks of grasshoppers. This is especially true in the relatively arid states of the western, central and northern Great Plains. Other species in the genus *Lytta* feed on solitary ground bees’ nests where they feed on bee eggs and food stored in the nest.

## Biology

Most blister beetle species have one generation per year. Adults become active in early to mid-summer. Females will deposit eggs in the soil in clusters of about 100-200 eggs. Eggs hatch in about two weeks into larvae called triungulins (Figure 8), which actively prey on grasshopper egg pods (*Epicauta* spp.) or bee nests (*Lytta* spp.). Larvae continue to feed and pass through three to five instars. The final instar larva loses its legs and becomes sedentary. In late summer, it transforms into the pseudo-pupae for overwintering in the soil. Next spring, pupation occurs in about 10 days, and it transforms into an adult.

Adult blister beetles are most active during the morning and late afternoon. Adults are attracted to blooming forage or field crop fields, where they are ravenous feeders, devouring leaves, stems, flowers, pollen and pods. Blister beetles are mobile and gregarious, and often congregate in certain spots like field edges with flowering weeds.

## Crop Damage

Adult blister beetles are attracted to blooming fields of alfalfa, field crops and weeds (goldenrods, dandelions). Adults can cause severe clipping of leaves and stems and may completely destroy flowers and buds (Figure 9), which could negatively impact crop yield and quality. The sudden appearance of large swarms of blister beetles with voracious appetites often alarms farmers. During drought, crop damage from blister beetles can be more severe by feeding on the growing points of the plants which can stunt or kill plants (Figure 10).

## Forage Crops — Effects on Horses and Other Livestock

All species of blister beetles produce a poison called cantharidin, which is toxic to people and livestock, especially horses. This toxin is a well-known vesicant (blister-causing substance) that is quickly absorbed upon contact and causes inflammation and blistering of internal and external body tissues. Cantharidin oil is released when beetles are crushed, and even dead beetles have high levels of the toxin that does not weaken over time. Cantharidin is highly toxic and irritates the gastrointestinal and urinary tracts, which can lead to death in horses. The amount of toxin produced varies considerably between species. The

ash-gray, black, striped and margined blister beetles are a few of the more common species which produce levels of cantharidin capable of poisoning livestock.

Livestock come in contact with blister beetles when they consume infested alfalfa hay. Horses are most susceptible to the toxin, while sheep and cattle are more tolerant. The reaction to the toxin depends upon the relative dose; enough ingested beetles can be lethal to any animal.

Researchers have determined the lethal dose of cantharidin to be approximately 1 milligram per kilogram of horse body weight. This means that about **200 blister beetles** could have levels of toxin sufficient to kill an adult horse. However, an average of 5 mg of cantharidin has been found in striped blister beetles, which indicates that **only 30 to 50 adults** could be potentially lethal. Other sublethal symptoms include sores or blisters on tongue and mouth, colic, diarrhea, bloody feces, depression, elevated temperatures, increased heart rate and breathing rates, and dehydration. Poisoned horses often place their muzzles in water without drinking.

Cantharidin can also be lethal to cattle and sheep. Little information or research exists on the levels of toxicity to beef cattle or the effects of cantharidin on lactating dairy cows. Although less susceptible than horses, they may experience sub-lethal symptoms if enough beetles are consumed. Symptoms of sublethal poisoning include depression, diarrhea, elevated temperatures, increased pulse and breathing rates, and dehydration. There is also frequent urination, especially after the first 24 hours.

If cantharidin poisoning is suspected, a veterinarian should be contacted immediately. The toxin is extremely stable. Crushing or chemically killing the beetles will not diminish the toxin's activity. Even the remains or dried juices from crushed beetles on the hay may cause severe digestive and urinary tract ailments in domestic animals. Unfortunately, cantharidin poisoning has no cure except supportive care including mineral oil, intravenous fluid therapy, activated charcoal and anesthetics.



**Figure 11.**  
**Ash-gray blister beetles on faba beans causing severe defoliation**

(T.J. Prochaska, NDSU)

## Integrated Pest Management

### Scouting

Blister beetles are easy to observe in fields because they are large and gregarious beetles that often congregate in high densities in localized areas of the field, such as field edges with flowering weeds. However, blister beetles also have a strong tendency to disperse, and in some instances, they feed for a short period of time and then move to other areas of the field or to new fields. Blister beetles are easily disturbed and will drop off plants and hide or scamper away. These factors can make scouting for blister beetles more difficult, so frequent scouting of fields is necessary.

### Recommended strategies for IPM of Blister Beetles

#### Canola

Adult feeding on foliage is typically not significant enough to warrant an insecticide treatment. The “High Plains Integrated Pest Management Guide” recommends treatment when there are **10 adult blister beetles per plant feeding on the flowers or pods**. Spot treatment with a foliar insecticide registered in canola usually is recommended.

#### Other Field Crops

Blister beetles usually are not economic insect pests of field crops, so there is no established threshold in most field crops. Blister beetles damage crops by eating the foliage, so the established defoliation threshold for other insects in beans [dry edible beans, faba beans (Figure 11) and soybeans (Figure 12)] is suggested for blister beetle control. **Control in bean crops is warranted when 30% of the foliage is destroyed prior to bloom or when 20% of the foliage is destroyed after bloom, pod set or fill.**

#### Forage Crops

Alfalfa is a preferred host of blister beetles. Several management options are available, which can reduce the number of blister beetles found in forage crops, but none will eliminate the problem. **There is no treatment threshold for blister beetles in alfalfa hay.**



**Figure 12. Ash-gray blister beetles on soybean** (Adam Spelhaug)

### **Adjust harvest dates and maintain weed-free alfalfa.**

Since blister beetles are readily attracted to flowering plants, controlling the number of flowering weeds in the field and cutting alfalfa prior to bloom stage (10% bloom) will reduce the potential for infestation. Blister beetles often feed for a short period of time and then disperse to other areas of the field or to new fields. After the alfalfa is cut, they often move out into blooming field crops nearby. Hay fields adjacent to rangeland pastures are often at higher risk for infestations of *Epicauta* species of blister beetles, since their host, grasshopper egg pods, are common in rangeland pastures.

**Immediately prior to harvest, fields should be thoroughly scouted for new swarms of blister beetles, and if blister beetles are present in the field, the harvest should be delayed for several days.** If large populations of blister beetles are observed, producers should not harvest until beetles have moved out of field or an insecticide could be applied. In many instances, the beetles will move. However, they may disperse to another part of the field, so careful and frequent scouting is necessary throughout the field. If beetles are present in the field at the time of harvest, avoid using mowers with hay conditioners or crimpers that may crush and kill blister beetles in hay and prevent them from moving out of the hay as it dries. Sicklebar mowers are no longer recommended for reducing blister beetles in baled forage. Research found that using sicklebar mowers increased blister beetles in the harvested hay because blister beetles were crushed when driving over the cut hay and then raked into windrows and baled. These implements increase the numbers of blister beetles located in hay and underneath the windrow. Even tractor tires can crush blister beetles in hay when turning equipment around. **A self-propelled harvester which has wide-set wheels and no conditioner or crimping equipment is the best implement to use to cut and windrow the hay, resulting in fewer dead blister beetles in the hay.** If large numbers of blister beetles are observed in spots during harvesting, stop tractor and go around blister beetles or allow them to move out of the way.

**Scout harvested hay and underneath windrows closely for blister beetles and allow blister beetles to move out of drying hay before baling.** Turning the windrow may be helpful to get blister beetles to move out. Although raking may dislodge some dead beetles from hay, it does not get rid of the problem of the cantharidin toxin in the hay if they are crushed.

**Insecticides are not the best option for blister beetle management** because dead beetles can still end up in hay and pose a serious toxicity risk to livestock. If high densities of blister beetles are present, an insecticide may be applied for

control. Most beetles killed by the insecticide will most likely fall to the ground and should not be picked up by the harvesting equipment. However, dead beetles could be incorporated into cured hay, so it is **important to not feed any contaminated hay to livestock.** Remember, dead blister beetles still have a toxic level of cantharidin.

**In all cases, contaminated hay should not be fed to horses or other livestock, and removal of the beetles from the hay will not make it safe.** Cantharidin is a stable compound, and toxic levels will not be reduced during storage. Grinding hay only dilutes the toxin when the hay is mixed into a final ration with other non-toxic feedstuffs. Cantharidin concentration in hay can only be measured by certain labs, such as the Texas A&M Veterinary Medical Diagnostic Lab (<https://tvmidl.tamu.edu/tests/cantharidin-lc-ms/>).

**It is to farmers' advantage to minimize harvest operations which kill blister beetles, thereby minimizing the possibility of feed contamination.** Pest management practices can only reduce the number of blister beetles present and the potential risk of cantharidin poisoning.

## **Insecticides**

Pyrethroid insecticides, such as bifenthrin, esfenvalerate, lambda-cyhalothrin, and alpha- and zeta-cypermethrin registered for use on alfalfa, canola, dry edible beans, soybeans, potatoes and sugarbeets provide good control of blister beetles. Carbaryl also provides blister beetle control. Please consult the most recent version of the NDSU Extension E1143 North Dakota Field Crop Insect Management Guide for insecticides registered by crop. Observe label directions for rates, pre-harvest intervals, restrictions and precautions, including pollinator safety. Remember, insecticides should only be used when necessary. Spot treatment with a foliar insecticide is usually recommended.

Disadvantages of using foliar insecticides include:

- Foliar insecticides may prevent cantharidin-toxic blister beetles from leaving the crop.
- Most insecticides only provide a short-term residual, <7-10 days, so any field re-infested with blister beetles later in season will not have adequate protection.

**Most insecticides used in field crops are toxic to pollinators, especially honey bees.** Fields should not be treated during flowering, especially peak bloom, to avoid bee kills. Late evening or early morning is the preferred timing of insecticide applications, as bees are not actively foraging then.



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