

Blister Beetles in Alfalfa



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Several valuable horses and other livestock have died after being fed alfalfa hay contaminated with bodies or parts of blister beetles. This publication provides information on the veterinary and agronomic importance, distinguishing features, biology, and the distribution and control of this group of insects. Recommendations for the purchase and use of alfalfa hay by horsemen and other livestock owners are also given.

Veterinary Significance of Blister Beetles

Blister beetles get their common name from the irritating reaction of their body fluids with animal skin or delicate membranes. These fluids contain cantharidin, a potent blistering agent, present in varying amounts in most blister beetle species. Fluids are released when the beetle is crushed or handled roughly. Cantharidin is a stable chemical and a long-term health threat to nearly all livestock, particularly horses, that are fed contaminated hay. Storing infested hay does not significantly reduce the amount of cantharidin in the hay.

Research reports indicate cantharidin toxosis can be induced in dairy and beef cattle, goats and sheep; other reports include rabbits, hedgehogs, rats, mice, and dogs. Cases of human death also have been reported. However, horses appear to be more susceptible to the toxic effects of this potent chemical than other livestock.

Cantharidiasis (cantharidin poisoning) in horses has been studied by experimental exposure to pure cantharidin and to powdered beetles containing known quantities of cantharidin. These studies show symptoms such as colic cannot, alone, confirm cantharidin poisoning. The best diagnostic method appears to be chemical analysis of urine, ingesta from the upper gastrointestinal tract, and perhaps liver tissue. Researchers use a high-pressure liquid chromatographic method to determine the presence and amount of cantharidin in these samples. However, if an animal ingests large numbers of beetles, a trained person can confirm the presence of the beetles

by direct examination of ingesta. Other studies indicate blood analysis of horses experimentally fed lethal levels of cantharidin showed heavily depressed levels of calcium and magnesium in the blood. Post-mortem examination usually shows blistering of the mouth, esophagus, stomach, and bladder. Death can occur in 24 hours after a heavy dose.

Laboratory studies have been conducted to determine the amount of cantharidin contained in various species of insects. Reports on beetles in several genera indicate a cantharidin content of 1% to 11.3% of their dry weight. Studies on a common blister beetle species indicate widely varying amounts of cantharidin from less than 1% to more than 5% of dry weight. With such a variation in cantharidin content of beetles within the same species, it is difficult to determine the number of beetles to make a lethal dose. The cause of this variation is unknown but partially relates to sex of the beetles (males have more than females), time of year, and food source.

The high variability in cantharidin content partially explains the wide range of beetles reported to cause death in horses. A single beetle or as many as 150 to 200 beetles have been reported as a lethal dose. Doses of cantharidin used to experimentally cause death in horses range from 0.45 to 1 mg. per kg. (2.2 lbs.) of body weight. The highest reported cantharidin content of the striped blister beetle is 5.4% of the beetle's dry weight. Calculations based on these figures for a 1000-lb horse indicate a fatal dose would be between 81 to 128 beetles of one of the most common blister beetles found in New Mexico. This is a small *Epicauta* species, gray in color with small black dots, especially on the wing covers (elytra).

If the cantharidin content of the beetles is known, the information in table 1 can be used to determine the approximate number of beetles it takes to kill the average horse. For example, if the beetle contains 3 mg. of cantharidin and the horse weighs 1000 lbs., it takes 161

beetles to be a lethal dose, based on the threshold of 1 mg./2.2 lbs. of body weight.

Table 1. Estimated number of beetles for a lethal (1 mg./kg.) dose of cantharidin.

Beetle Content (mg.)	Horse weight (pounds)		
	275	550	1,000
1	125	250	455
2	63	125	244
3	41	83	161
4	31	63	122
5	25	50	97

After Campinera et al. 1985.

Although the larvae of blister beetles parasitize bees or feed on egg masses of other insects such as grasshoppers, adult blister beetles feed principally on various plant flowers and foliage. The beetles can enter lush alfalfa fields as their primary weedy hosts mature and dry. Data from the Cooperative Extension Service alfalfa scouting program and survey in New Mexico, indicate blister beetles are found sporadically in alfalfa, usually in low numbers, from June through August. However, blister beetle swarms have been reported in isolated alfalfa fields in several counties in New Mexico as early as May and as late as October, requiring constant grower vigilance

Distinguishing Features of Adult Blister Beetles

Blister beetles in the Southwest vary considerably in sizes and shapes. General characteristics include antennae that are thread-like and are composed of a long series of similar, gradually tapering segments. Although visible from above, the compound eyes do not bulge, but follow the contours of the head. The head is often bent down. Legs are relatively long, and the claws on each tarsus often have extra blades, teeth or spines (figure 1, use a 10 X hand lens to see this feature on an actual beetle). The tarsi (figure 2) have five segments on the first and second pairs of legs, but have four segments on the hind legs. Six abdominal plates are visible on the underside of the insect.

Two features are fairly consistent for most species of blister beetles:

1. The first portion of the thorax, just back of the head, is narrower than either the head or wing covers (figure 3).
2. The first pair of wings is soft and flexible; they may be extremely short and scale-like (*Meloe* and *Megetra*, figures 3 and 4); narrow and elongate (*Epicauta*, figure 5, *Pyrota*, figure 6),

or inflated, but covering the entire abdomen (*Cysteodemus*, figure 7). In *Epicauta*, rounded tips of this first pair of wings form a figure 3 where they come together at the tip of the abdomen.

Blister beetles range from 1/2 to 1-1/2 inches long. Primary body colors include black, brown, or gray; different species have spots or stripes of yellow, red, brown, orange, black, or white (figure 8). A few species are metallic green or turquoise.

Blister beetles are frequently confused with several similar-looking beetles such as tiger beetles, checkered beetles, ground beetles, and darkling beetles (figure 8.L). Care should be taken to properly identify the insect before control practices are initiated.

Biology

Blister beetle eggs usually are laid in the soil during summer. The first stage larvae of many species of *Epicauta* are active, long-legged insects called triungulin larvae, that forage for grasshopper eggs. Young larvae of other blister beetles lurk in flowers where they hitch rides on visiting bees, and are carried back to nests where they can feed on bee eggs and stored food.

Whether they feed on grasshopper egg pods or infest bee nests, older blister beetle larvae become increasingly sedentary as they molt and mature (figure 9). They overwinter as mature larvae, pupate in spring and usually emerge as adult beetles in early summer.

Adult blister beetles usually emerge from the soil about mid-May in New Mexico and begin to search for food and mates. Dates are difficult to predict because emergence depends on temperature. Adults feed on plant materials, particularly flowers and foliage of such plants as alfalfa, carelessweed (pigweed), puncturevine (goathead), peanuts, soybeans, and many other species of plants, both wild and domestic.

Distribution

There are more than 300 blister beetle species in the continental United States. New Mexico has at least 28 species in 8 genera. Some blister beetles in the state that are found in alfalfa are shown in figure 8. Some blister beetle species are gregarious, congregating in large numbers, especially near field margins. Livestock poisoning cases probably are a result of baling parts of these swarms into alfalfa hay. It is unlikely that individual beetles will fatally poison livestock.

New Mexico is fortunate that swarms of blister beetles are not very common and are the exception rather than the rule. The frequency of swarms in New Mexico is much less than swarms in some neighboring

Common blister beetles in New Mexico and their distinguishing features.

The lines next to each figure show actual length of that beetle.

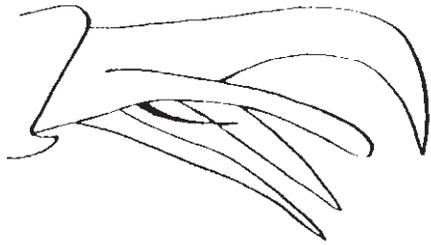


Fig. 1. Close-up of tarsal claws from a blister beetle. The paired claws are each divided into two blades.

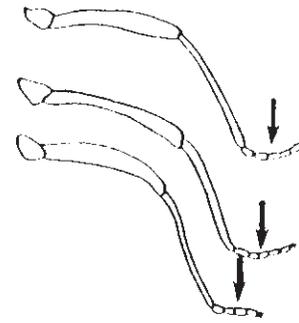


Fig. 2. Close-up of the legs of a blister beetle. The tarsi (see arrows) have a 5-5-4 arrangement on legs 1, 2 and 3, respectively.

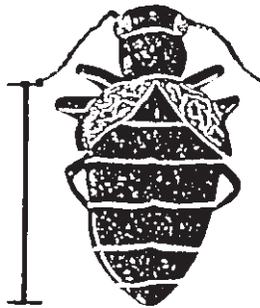


Fig. 3. *Meloe*, a black blister beetle with very short wings.

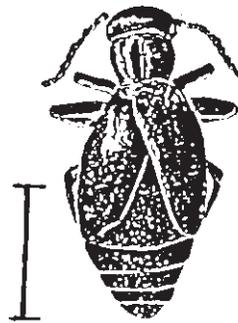


Fig. 4. *Megetra*, a black and orange, short-winged beetle commonly seen in desert areas in late summer.



Fig. 5. *Epicauta*, a narrow, long-winged blister beetle. These are widely distributed; different species are solid colors or marked with tiny black spots.

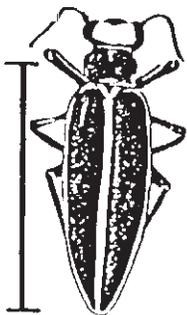


Fig. 6. *Pyrota*, another narrow, long-winged blister beetle. *P. akhurstiana* is about 1 inch long, and is black with narrow red stripes on the wing margins. Other species in this group are yellowish with moderately large brown or black spots.

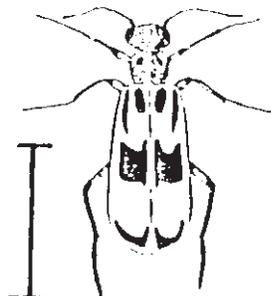


Fig. 7. *Cysteodemus* is a metallic blue-black blister beetle commonly seen in desert areas. The wing covers appear inflated and cover the entire abdomen.

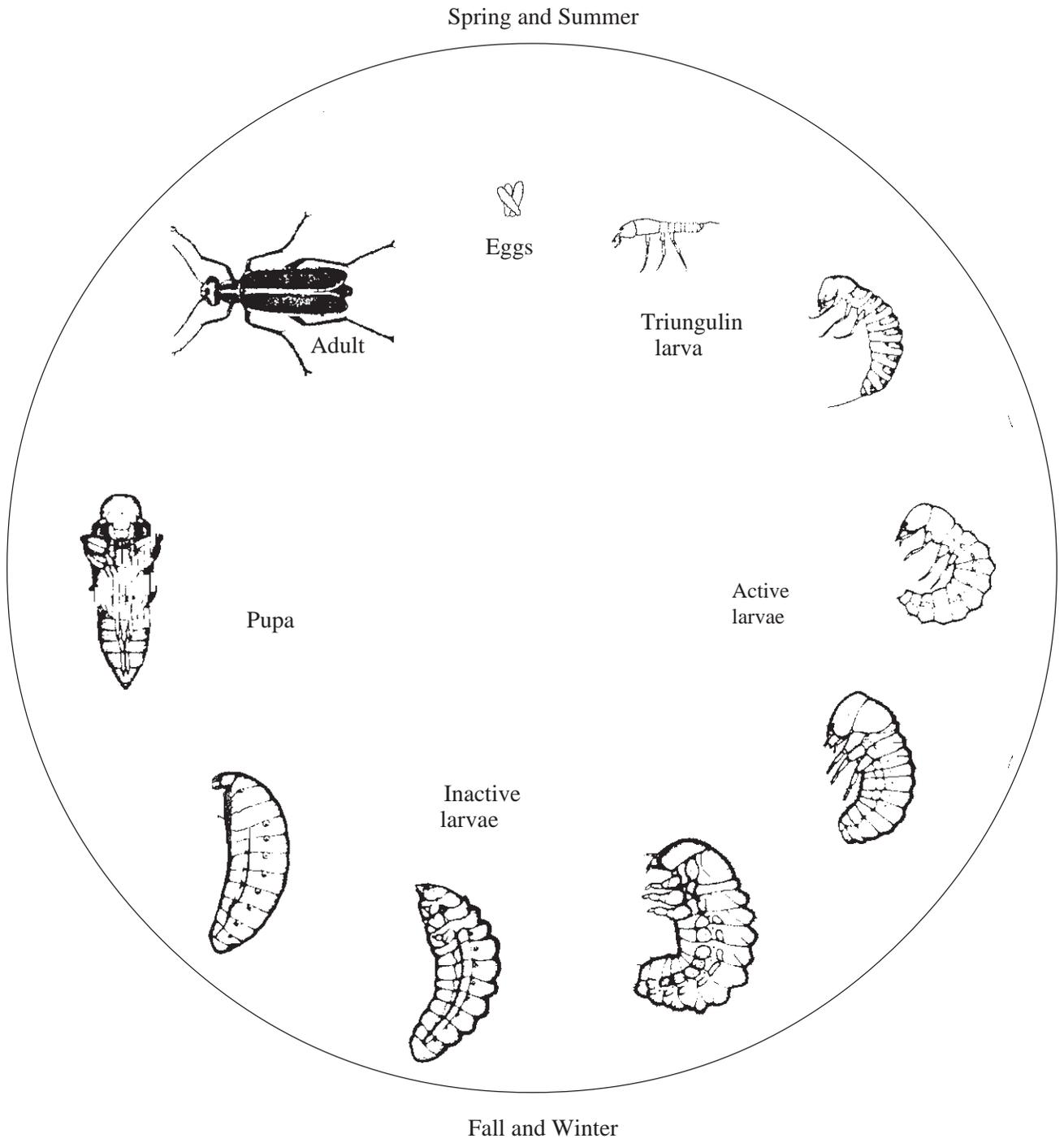


Fig. 9. Typical life cycle of an *Epicauta* sp. blister beetle. (After Sorensen and Baker 1983).

states. Therefore, buyers of New Mexico alfalfa hay are much less likely to encounter large numbers of blister beetles in hay.

Recommendations for Control of Blister Beetles

Alfalfa fields should be scouted regularly for blister beetles from early spring to the end of the growing season. Correct identification is essential because blister beetles can be confused with tiger beetles, darkling beetles (figure 8.K) and similar insects found in alfalfa (figure 8.L). For help with identification, collect a sample of the insects and take them to the county Extension agent.

The importance of scouting alfalfa fields cannot be overemphasized. Through sampling, heavily-infested fields can be detected and treated before cutting. However, as an additional precaution, fields should be surveyed after chemical treatment, just before cutting, to assure beetle-free hay. Also, an alert operator during cutting can avoid cutting in areas where beetles are high in number, especially if swarms are present. Observations indicate that live beetles or beetles killed by insecticides do not remain in the cut hay, instead they fall to the ground where they cannot be picked up by the baler. Most beetles in baled hay probably were killed as they went through the harvester. Differences in beetle kill rates may be found among types of harvesters and may be related to the type and setting of the crimper. Hay raked before baling, as is commonly done for large bales, may allow more dead beetles to fall to the ground. This can reduce the number of beetles in the finished product.

Cultural Control Recommendations for Alfalfa Producers

1. Cut alfalfa at 10% or less bloom. This lessens the chances for field invasion by blister beetles because they are attracted to flowering plants.
2. Control primary weeds in and around alfalfa fields. This reduces the likelihood of blister beetles establishing themselves along field margins, then migrating into alfalfa fields.
3. Control grasshoppers by chemical or cultural methods, and control grassy weeds preferred by grasshoppers. This can reduce the numbers of both grasshoppers and blister beetles in and around alfalfa fields.
4. Sample fields just prior to cutting, and avoid cutting any areas infested with large numbers or swarms of beetles. Beetles are generally more

numerous on the side of fields nearest to rangeland.

Blister beetle infested hay that has been baled should be destroyed by burning or burial. Do not sell or feed blister beetle infested hay to any livestock. The New Mexico alfalfa hay market is at risk when blister beetle poisonings occur.

Chemical Control Recommendations for Alfalfa Producers

Limited insecticides screening has been done for blister beetles in New Mexico. If these pests are found before cutting, one of the following treatments may be used:

1. Sevin XLR, 1/2 to 1 quart/acre.
2. Sevin 80S, 2/3 to 1-1/4 pounds/acre.
CAUTION: This material should not be applied when foliage is wet, rain is imminent, or humidity is high.
3. Sevin 50W, 1 to 2 pounds/acre.
4. Sevin 4F, 1/2 to 1 quart/acre.
Sevin (carbaryl) is highly toxic to honey bees. Before applying Sevin, warn beekeepers to relocate hives beyond the bee flight range until 1 week after application, or take other equally effective precautions. **CAUTION FOR ALL FORMULATIONS OF SEVIN:** The prescribed waiting period for cutting after using Sevin at recommended rates on alfalfa is 7 days. Scout treated fields again for blister beetles at least once before cutting.
5. Parathion 8E, 1/4 to 1/2 pint/acre.
6. Parathion 4E, 1 to 1-1/2 pints/acre.
CAUTION: Do not apply this material on forage crops within 15 days of cutting or forage use. Parathion is a restricted-use pesticide. The lower use rate is suggested to help preserve beneficial arthropods. Use the same precautions as with Sevin to conserve honey bees.

Several other products are being tested for blister beetle control in alfalfa. Consult the county Extension agent for the latest information on insecticides registered in alfalfa for blister beetle control. It is the users' responsibility to read all pesticide labels carefully and to follow all instructions on application, safety, and other restrictions.

Fig. 8. Color photographs of selected species of blister beetles and some insects frequently confused with blister beetles. (Photos by C.R. Ward. Color separations and funds for reproduction provided by the New Mexico Hay Association)



A. Large gray blister beetle.



B. Small gray with small black spots.



C. Small black and yellow striped.



D. Pair of small gray with large black spots.



E. Large black and white striped.



F. Large mustard colored.



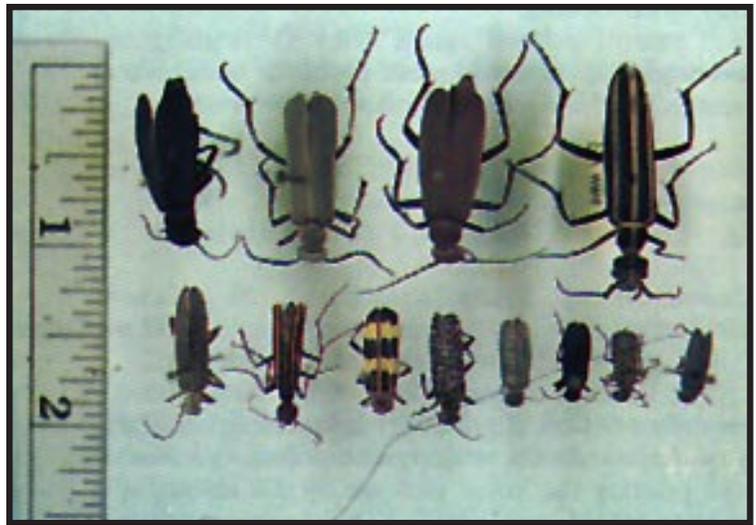
G. Medium-sized solid black.



H. White with black stripes.



I. Large red and black.



J. Size comparison of blister beetles.



K. Darkling or bombardier beetle.



L. Other insects confused with blister beetles.

Recommendations for Purchase and Use of Alfalfa Hay by Horsemen

Horsemen can avoid some problems with blister beetles by considering the following:

1. Buy alfalfa hay from a reputable dealer or grower. In the latter case, give preference to alfalfa hay from fields that are scouted regularly as part of an integrated pest management (IPM) program.
2. Cuttings of New Mexico alfalfa made before mid-May and after late August are least likely to have blister beetles in them.
3. Inspect alfalfa hay for blister beetles as it is removed from the bale. Do not feed infested material to livestock, regardless of how long the hay has been stored. Unfortunately, most newer hay swathers have crimpers to crush fresh alfalfa stems so the hay cures faster. This makes detection of blister beetle bodies or parts almost impossible because the blister beetles can be crushed beyond recognition. Thorough inspection can take several hours per bale of hay.
4. Do not use blister beetle infested hay to feed to other livestock. It should be destroyed by burning or burial.

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