

Alfalfa, Blister Beetles, and Cantharidin – A Toxic ABC

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Blister beetles are important due to a toxic substance produced to defend themselves against natural enemies – cantharidin. Unlike other Midwest alfalfa insect pests such as alfalfa weevil, potato leafhopper, aphids and grasshoppers, blister beetles are not known as significant consumers of alfalfa leaves or sap. Blister beetles feed on alfalfa flowers and pollen; this type of feeding does not normally harm tonnage, crude protein or relative feed value like other alfalfa insect pests. Thus, blister beetles are considered alfalfa pests, not because of direct crop harm, but because they are a source of a substance that can poison animals.

Horses are the main species affected. *Cantharidin toxicosis* or *cantharidiasis* are terms used by veterinarians to describe animal poisoning. *Cantharidin toxicosis* has also been reported in cattle, dogs, goats, poultry, rabbits, rats, mice and sheep.

Human skin is also very sensitive to cantharidin; if a single blister beetle is smashed and spread over the skin it can cause severe blistering. Due to its toxicity, synthetic cantharidin is used by dermatologists (prescription only) for removal of warts.

Toxicity of cantharidin to horses is well documented. The lethal dosage is 0.49-0.72 mg/kg body weight. Blister beetle cantharidin content varies widely, 0.01-11.13 mg/beetle, depending on species and individual beetles. In theory, a horse weighing 375 kg (826.7 lbs) can be killed by ingesting as few as 17 beetles in contaminated hay if the blister beetle species involved contained 11.13 mg cantharidin/beetle. Sub-lethal dosages of cantharidin can cause inflammation and ulceration of the gastrointestinal and urinary tracts of horses. Veterinarians classify cantharidin as a nephrotoxic (poisonous to the kidney) organic compound.

Blister beetles belong to the beetle family Meloidae. There are over 335 species in the U.S. It is not uncommon for a midwestern state to have up to 40 species of blister beetles in various crops. The most common species on alfalfa in the Midwest is the black blister beetle (*Epicauta pennsylvanica*) known to contain 0.01-0.68 mg cantharidin/beetle. By extrapolation, ~270-18,375 black blister beetles, ingested simultaneously, can kill a 825 lb horse. Beetles containing high contents of cantharidin such as the three-striped blister beetle (*Epicauta lemniscata*) and striped blister beetle (*Epicauta vittata*) are present but not as common as the black blister beetle. To date, the species reported to have the highest cantharidin content is *Epicauta immaculata*, 1.43-11.13 mg/beetle, associated mainly with sugar beets and potatoes but can migrate into nearby alfalfa fields.

Surprisingly, there is no widely available test for harmful levels of cantharidin on a batch of cured hay before being fed to horses. Ironically, there is a highly accurate test for diagnosing whether a toxic amount of cantharidin has been ingested by analyzing urine for cantharidin metabolites using mass spectrometry/gas chromatography. It would be desirable for alfalfa growers/consumers if laboratories could provide cantharidin testing similar to routine testing for crude protein and relative feed value.

Blister beetle management has to start on alfalfa fields. The most important thing to remember is they are highly attracted to alfalfa flowers so cutting must be done before flowering stage if blister beetle-free hay is desired. Previously, crimpers/conditioners were discouraged in blister beetle infested fields to avoid crushing and incorporating them in the bale. This recommendation may no longer be practical in the Midwest due to wide usage of crimpers at harvest to hasten drying. Another old practice was to set aside first cutting for horse feed. However, the most toxic blister beetle species (*Epicauta immaculata*) can be present in June and growers who cut alfalfa once per growing season tend to harvest later.

Insecticides may be the best tactic to manage blister beetles on alfalfa, however, timing is important. Insecticides must be applied before large numbers of beetles migrate into the alfalfa, otherwise dead beetles can still end up in the bales. Spraying (or cutting if insecticides are not planned for) must be done before the alfalfa flowering stages. Most insecticides give a maximum of three weeks of residual control.

When considering application of insecticide against blister beetles you must be aware of the pre-harvest interval (PHI). PHI is the number of days after application needed to elapse before the alfalfa can be cut for hay. Insecticides labeled for use against blister beetles on alfalfa include: Lambda T (2.56-3.84 fl. oz./acre, 7-day PHI); Proaxis (2.56-3.84 fl. oz./acre, 7-day PHI); Silencer (2.56-3.84 fl. oz./acre, 7-day PHI); and Warrior (2.56-3.84 fl. oz./acre, 7-day PHI). Always read and follow label directions.

