

# Frost-Damaged Forages Can Be Deadly

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When plants freeze, changes occur rapidly in their metabolism and composition that can be toxic to livestock. Two problems need to be considered – prussic acid poisoning and bloat. However, many of these problems can be prevented, or at least minimized with proper management.

Some summer-annual grasses contain cyanogenic glucosides, which are converted to prussic acid (hydrogen cyanide) when the plants are damaged by frost. The concentrations of cyanogenic glucosides vary among plant species: sorghum contains the highest concentrations, followed by sorghum-sudangrass crosses, and sudangrass contains the lowest concentrations. Pearl millet is virtually free of cyanogenic glucosides. The concentrations of these compounds are highest in immature plants and decrease as plants mature. Leaves also contain much higher concentrations than do stems. Plants growing under high nitrogen levels or in phosphorus or potassium deficient soils will be more likely to have high cyanide potential. After frost damage, cyanide levels will likely be higher in fresh forage as compared with hay or silage, because cyanide is volatile and dissipates as the forage cures and dries or is ensiled.

Light frosts that stress the plant, but do not kill it entirely, are often associated with prussic acid poisonings. Removing livestock from pastures for several days after a frost is the best preventative management strategy to reduce prussic acid poisoning in sudangrass and sorghum-sudangrass pastures. Livestock can be returned to frost-injured sudangrass that are 18" tall or taller and sorghum-sudangrass that's at least 30" tall after about three or four days. If the grass is shorter than those heights when frost damage occurs, the recommendation is to stay off the pasture for 10 days to two weeks. Producers need to watch for new shoot regrowth (tillers or suckers) on partially frost-killed plants. Direct grazing of these fresh new shoots can be toxic. Where new shoots appear following frost, avoid grazing for two weeks after the freeze that kills the new shoots."

When animals consume forage with high levels of cyanide-producing compounds, prussic acid is absorbed into the bloodstream, where it binds hemoglobin and interferes with oxygen transfer. Prussic acid acts rapidly, frequently killing animals by asphyxiation within minutes. Symptoms include excess salivation, difficult breathing, staggering, convulsions, and collapse. Ruminants are more susceptible than other species because cud chewing and rumen bacteria increase the release of cyanide.

Precautions when grazing or green chopping sorghum species this fall:

- Grazing should be avoided on nights when frost is likely. High levels of prussic acid are produced within hours after a frost on susceptible species.
- Following a killing frost, avoid grazing suspect forages until the plants are dry. Wait at least 5 to 7 days to allow the released cyanide to dissipate.
- Following a non-killing frost, grazing should not resume until 5 to 7 days after a killing frost.
- Following a frost, do not graze wilted plants or plants with young tillers.
- Green-chopping frost-damaged plants lowers the risk compared with grazing directly, because animals have less ability to selectively graze damaged tissue. However, the forage can still be toxic after green chopping, so proceed with great caution.
- Frost-damaged annual sorghum grasses can be made into hay with little or no risk of cyanide toxicity. Plants that are dry enough to make hay will have dissipated most of the volatile cyanide gas.
- Normal silage making allows a majority of the cyanide to dissipate from frost damaged annual sorghum grasses. Delay feeding suspect silage for 6 to 8 weeks after ensiling. Be careful when working in the feed room, around silos and inside silos. Cyanide is heavier than air and will migrate downward as it is released from silage. Make sure ventilation is adequate.
- Suspect silages should be sent to a lab and analyzed for cyanide content before feeding.
- Cattle that must be grazed on sorghum pastures that have not been totally killed should have access to another type of hay, have full rumens before turning in on the field, and should be watched closely for the first few hours after turn in. If signs of labored breathing, such as would be found in asphyxiation, are noted, remove the cattle immediately. Call your local veterinarian for immediate help for those animals that are affected.

Pasture bloat should be a concern to cow-calf operators and stocker operators as we experience the first frost. Frothy bloat, or legume bloat, is the most common type of pasture bloat. It results from the formation of a stable foam in the rumen that minimizes the animal's ability to expel rumen gases. This foam can cover the cardia (esophageal entrance from the reticulorumen) and prevent eructation of gases. Consumption of forages containing high levels of soluble protein (such as alfalfa, winter wheat, and white clover) can contribute to stable foam production.

Cattle suffering from bloat swell rapidly on the left side and can die within an hour. Cattle may exhibit early signs of discomfort by kicking at their sides or stomping their feet before going down.

Grazing alfalfa following a killing frost can still cause bloat if the alfalfa remains green and succulent. Following a frost, plant cells rupture producing small plant

cell wall fragments and increasing the amount of  $K^+$ ,  $Ca^{2+}$ ,  $Mg^{2+}$ , all of which can increase the risk of bloat. The incidence of bloat declines as the alfalfa dries. At least one week is usually required to dehydrate or dry down frost-killed alfalfa before the risk of bloat is significantly reduced.

There are several recommendations to reduce the incidence of bloat, especially on pastures that have a high percentage of legume species:

- In general, if pastures contains over 50 percent grass, there will be minimal danger of bloat. If pastures contain more than 50% legume, be prepared to use bloat control measures.
- Bloat can be reduced by supplementing grass hay to cattle grazing bloat-provoking pasture. Significant amounts of hay must be consumed for this to be effective.
- Allow cattle to graze legume pasture continuously rather than removing them during the day or at night to reduce the risk of bloat.
- The risk of bloat will be reduced by waiting until the dew is off the alfalfa before placing cattle into a new pasture. Moving cattle that have full rumens to new pasture in the afternoon reduces the predisposition of cattle to bloat.
- The stage of legume maturity is an important factor in preventing pasture bloat. Bloat potency is highest in young vegetative plants and decreases progressively as the plants mature.
- To treat bloat, there are oral compounds that will break down the stable foam in the rumen. In subacute cases, a rubber hose can be used as a stomach tube to relieve the accumulation of gases. A trocar should be used as a last resort on acute cases. Contact your veterinarian as soon as possible to treat advanced bloat.