

Vet Call

by Bob L. Larson, DVM



Precautions When Feeding Sorghum/Sudan Crops to Cattle

Cattle producers in many parts of the United States utilize sudangrass and forage sorghums in their feeding programs. Two risks are possible, however, when feeding or grazing these forages—nitrate toxicity and cyanide or prussic acid toxicity.

Nitrate Toxicosis

Nearly all plants contain nitrate, but some species are more likely to accumulate nitrate than others. Forage sorghum, grain sorghum, sudangrass, and pearl millet are notorious nitrate accumulators. Weed species such as kochia, lambsquarters, sunflower and pigweed are routinely high in nitrate. Under certain environmental conditions, wheat, corn, soybeans, Johnsongrass and other plants accumulate toxic levels of nitrate.

Nitrate content generally is highest in young plant growth and decreases with maturity. Sorghums and sudangrass are exceptions because concentrations remain high in mature plants.

Nitrate will accumulate due to excessive nitrogen fertilization or if the plants are stressed due to drought, frost, hail or disease. Nitrates accumulate at night, on cloudy days and when temperatures are cool. Rain following a drought will also cause a rapid buildup of nitrate levels. After a drought-ending rain, one to two weeks are required for nitrate concentrations to be reduced to safe levels. Nitrate levels are highest in the roots and stems, levels are lower in the leaves, and almost no nitrate accumulates in the flower and seed.

Ensiling will reduce nitrate levels by 40 to 60 percent, however, forages with extremely high nitrate concentrations at harvest may still be dangerous and should be analyzed before feeding. Nitrate concentrations do not decrease over time in forage harvested as hay.

If forages contain more than 6,000 ppm (parts per million) nitrate, they should be considered potentially toxic. A simple test is to gather several plants from around the field and make a cut in the lower 6 inches of the stem and place a drop of a sulfuric acid solution on the cut surface (most veterinary clinics will have this solution). The cut surface of plants with high levels of nitrate will turn purple in color.

A more accurate determination of nitrate levels can be obtained by sending a sample of the suspected forage to a reliable laboratory.

Nitrate levels of hay will not change once the hay is cut, but grazed forages will change concentrations on a daily basis.

ppm Nitrate	Effect on Cattle
0-3,000	Considered safe
3,000-6,000	Moderately safe in most situations; limit to 50% of the total ration for stressed animals
6,000-9,000	Potentially toxic depending on situation; should not be the only source of feed
9,000 and above	Dangerous and will often cause death

Nitrate is changed to nitrite in the rumen. Nitrite is rapidly absorbed into the blood stream where it changes hemoglobin so that it can no longer carry oxygen. The signs of nitrate toxicity include depression, muscle tremors, staggering, weakness and a blue tint to

the gums and vulva. Affected animal's blood will be a chocolate-brown color. Exercise will make the signs worse.

Treatment is available by intravenous administration of an antidote if the diagnosis can be made in time.

Guidelines to follow to reduce risk of nitrate toxicity include:

1. Avoid excessive application of manure or nitrogen fertilizer.
2. Do not graze potentially dangerous forage on cool, cloudy days.
3. When harvesting forage sorghum and sudangrass, raise the cutter bar 6 to 12 inches to exclude the base of the stalk. This will also minimize harvesting many weed species that accumulate nitrate when shaded.
4. Delay harvesting any stressed forages. A week of favorable weather is required for plants to reduce accumulated nitrate.

Cyanide/Prussic Acid Toxicosis

Rapidly growing sorghum, Johnsongrass and shattercane produce a sugar which can be converted to prussic acid and then cyanide. Sudangrass does not produce as much prussic acid as other plants in this class. Stress that retards plant growth (including drought or frost) causes a buildup of the building blocks of prussic acid in the plant. Rapid regrowth will then increase the level of prussic acid within the plant.

Prussic acid is released rapidly from frozen leaves. This is the reason frosted sorghum is dangerous to feed until it dries. Prussic acid poisoning is most commonly associated with regrowth following a drought-ending rain or the first autumn frost.

Prussic acid concentrations are higher in fresh forage than in silage or hay because cyanide levels will decrease as the forage dries. Still, if the forage had an extremely high cyanide content before cutting, or if the hay was not properly cured, hazardous concentrations could remain.

ppm Prussic Acid	Effect on Cattle
0-500	Generally safe
600-1,000	Potentially toxic; should not be the only source of feed
1,000 and above	Dangerous to cattle and usually will cause death

Cyanide is rapidly absorbed into the blood stream where it acts to tie up oxygen. This causes the blood to be a very bright red in color. The signs of prussic acid toxicity include rapid and difficult breathing, muscle tremors, and convulsions. Treatment is available by intravenous administration of an antidote if the diagnosis can be made in time.

Guidelines to follow to reduce risk of prussic acid toxicity include:

1. Do not graze or green chop dangerous forages before plants are 18" tall
2. Wait at least four to six days after a killing frost before grazing to allow time for the cyanide to dissipate.