

## Test to Prevent Nitrate and Prussic Acid Poisoning

Rachael Brooke  
Phillips-Rooks District Extension Agent  
Agriculture and Natural Resources

Many Kansas cattle operations rely on some type of harvested feed to use in the winter months and common among those sources is forage sorghum, sorghum-sudangrass and sudan. Forages in the sorghum family are prone to two different problems for feeding cattle, nitrate poisoning and prussic acid (hydrocyanic acid, HCN) poisoning. They are easy to get confused because both result in a lack of oxygen availability to the animal and are more likely to occur when the plant is stressed (fertility, hail, and/or drought).

In dry areas of the state, cattle may be removed from pasture early. Bringing hungry cattle into pens with weeds can be very dangerous as the nitrate concentration may be elevated throughout the plant and animal intake high. Manure in corrals can contribute to the elevation of nitrates in the weeds. Elevated nitrates may not result in death but could cause abortions.

The current KSU forage fact sheet on prussic acid poisoning indicates that prussic acid potential dissipates as the forage dries. It goes on to say hay or silage that likely contained high cyanide concentrations at harvest should be analyzed before it is fed. We tend to forget this second statement and think that when the plant dries, all the cells are ruptured and any HCN is released. To confirm this, a study was completed in 2020 measuring dhurrin content in sorghum hay. The dhurrin content was stable from 1 to 10 weeks of dry storage. In the plant, dhurrin (the precursor to HCN in sorghum species) and the enzyme that converts it to cyanide are stored in separate compartments within the cell. When the plant is eaten, the compartments are ruptured, and the cyanide formed and released. Measurement of dhurrin directly is used in some research studies. However, commercial labs do not typically measure dhurrin directly. Rather the procedure includes something to stimulate cyanide release. If hay is made from forages in the sorghum family or other susceptible species, testing for prussic acid in forage that has suffered from drought, hail or fertility issues is advised. Testing is cheap compared to the cost of losing even one animal.

Management recommendations common to both prussic acid and nitrates include: Test first, don't gamble. Keep in mind; different labs use different tests that have different scales. Feed animals with a known safe feedstuff(s) before introduction to potentially problematic feeds. Don't turn in hungry. Ensiling will reduce concentrations of either by about half in well-made silage, but silage put up under less-than-optimal conditions could still contain very high levels. If extremely high before ensiling, a 50% reduction may not be enough to result in safe feed.

If testing before grazing, samples should reflect what the animals are expected to consume, generally leaves and upper portion of the plant. Sample a minimum of 15 sites across a given field. One method is to sample from each corner and the center by walking diagonal lines and sample plants every 50-100 steps or as appropriate for field size.

We expect levels of nitrates and prussic acid to be variable across a field, so more samples are better than less. A rule of thumb is to sample 10 to 20% of the bales per field or cutting as a minimum. Be aware of areas of the field that exhibited more plant stress than others did. If large enough areas, you may want to sample them separately. Your acreage size and feeding methods likely factor into this decision. Use a forage probe that cuts across all plant parts in a bale rather than a grab sample from individual bales or windrows.

For more information, please contact the local K-State Research and Extension Office. K-State Research and Extension is an equal opportunity provider and employer.