

Ross Mosteller

District Extension Agent
Livestock & Natural Resources

Nitrates and Prussic Acid

Fall is finally in the air and officially on the calendar! I've pulled my vests out of the closet, appreciate the freshness of mornings/evenings and enjoy fall colors dotting the landscape. As I write this, a freeze warning popped up on my phone, so it's a perfect time to discuss the subject of Nitrates and Prussic Acid in our annual forage crops, as it applies to the grazing animal.

If you've grazed livestock at all, you know those two terms can bring fear and anxiety, especially in times of plant stress - like dry weather and frost events. Although they are not specifically related to each other and have different management approaches, both can cause serious issues in livestock including reduced performance, abortions and death. The causative effect is due to the reduced oxygen carrying capacity of red blood cells in both cases. Prussic Acid is most often discussed in sorghums, Sudan grasses and the hybrids of those two. Nitrates may accumulate in these annual plants, but can accumulate in a wide range of both cultivated and wild species.

Prussic acid is likely the more toxic issue, but probably easier to manage. Prussic acid, also known as Hydrocyanic acid or hydrogen cyanide (HCN), is a compound that is released when the cells of plant species mentioned, burst under stressful conditions. The highest management intensive times are: 1) during new plant growth - such as after planting, tillers after harvest or flush of growth following rain and 2) after a killing frost. Management for new growth should allow the plant to regrow to a height of 18-24 inches, as the concentrations tend to dilute to safe levels. Waiting a week after a killing frost should nearly completely remove prussic acid concerns, as hydrogen cyanide dissipates in dead plant tissues in that amount of time.

Nitrate poisoning is a bit misleading, as it is actually nitrites within the rumen causing issues. Many more factors come into play with nitrates, but stressed plants are still the indicator. As adequate to excessive soil nitrogen is available, and stunted plants are unable to convert nitrates to plant proteins, nitrates will accumulate in the forage plant. This starts in the lower plant portions, but can be present throughout. The same two major time periods mentioned for HCN are also key for nitrates, but any condition that prevents normal healthy growth is suspect. Unlike prussic acid, once accumulated in a plant, nitrates will not dissipate after plant death.

Testing is always the best idea to know exactly where these levels are within plants. Costs to test can run from around \$6-\$7 individually to \$20 in combination, for nitrates and Hydrogen cyanide. As discussed, cured or dead forages will dissipate HCN, so most tests are run for nitrates. If nitrate levels are found to be high in a plant, there are really three management options. First, if the plant can be ensiled, the ensiling process will reduce nitrates - somewhere in the neighborhood of half. Secondly, probably the most applicable, is to dilute high nitrate feed with safe feed, to reduce the total nitrate concentration. Feeding to different classes of livestock is also an option, as some animals can tolerate nitrates better. Finally, do not use the feed!

I think you can see that there are similarities with these two issues, but also important differences. Although we've experienced the dry condition stressor, the majority of nitrate samples ran through our offices have shown relatively safe results. The impending killing frost of fall signals another time to be vigilante in testing and grazing management. Additional information on both issues can be found in KSRE publications: [MF3040](#), [MF3244](#) and [S115](#). Please reach out to your local Extension office for additional information and support as well.