Forage Nitrate Testing and Making Feeding Recommendations Based on the Results

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The normal process for conversion of nitrate (NO_3) into plant proteins can be slowed when plants are subjected to stress such as lack of moisture. As a result, excess nitrate can accumulate. Forages such as corn, sorghum, and sudangrass are most likely to accumulate nitrate followed by oats and other small grain crops, followed by grasses. Legumes are less likely to accumulate nitrate. In all cases, the lower stem of plants is where the greatest nitrate levels are found. Forage feeding method influences the degree of risk from nitrate toxicity. Feeding greenchop forage is the highest risk followed by grazing, followed by hay. Silage feeding is the least risk, as significant amounts of nitrates are lost or converted to other compounds during the ensiling process.

Fresh, dry or ensiled samples may be submitted for assay. Submit one to two quarts of chopped forage in unsealed paper or plastic bag(s)

Cattle Feeding Guidelines for Forages Containing Varying Levels of Nitrate[1]

Method of Reporting Nitrate Level			
Nitrate (NO_3)	**Nitrate Nitrogen (NO_3-N)**	**Potassium Nitrate (KNO_3)**	**Recommendations For Feeding**
Percent of Forage Dry Matter			
0.0 - 0.44	0.0 - .10	0.0 - 0.73	Safe to feed in all situations.
0.44 - 0.66	0.10 - 0.15	0.73 - 1.10	Safe for non-pregnant animals. Limit to 50% of diet dry matter for pregnant animals.
0.66 - 0.88	0.15 - 0.20	1.10 - 1.47	Limit to 50% of diet dry matter.
0.88 - 1.54	0.20 - 0.35	1.47 - 2.57	Limit to 35-40% of diet dry matter. Avoid feeding to pregnant animals.
1.54 - 1.76	0.35 - 0.40	2.57 - 2.93	Limit to 25% of diet dry matter. Avoid feeding to pregnant animals.
over 1.76	over 0.40	over 2.93	**DO NOT FEED**

To convert from parts per million (ppm) to percent, move the decimal point four places to the left (i.e. 8800 ppm = 0.88%).

[1] Source: Sniffen, C.J. and L.E. Chase. 1981. Nitrates in Dairy Rations, Department of Animal Science, Cornell University.

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Prussic acid poisoning in sorghum-sudangrass

A potential problem with sorghum-sudangrass is prussic acid, or cyanide poisoning. When sorghum-sudangrass plants are injured or under stress, enzymes that convert glycosides to sugar and prussic acid are released. Levels of cyanide greater than 2 milligrams per kilogram (2 ppm) of dry plant tissue are considered potentially dangerous. Prussic acid is readily absorbed into the bloodstream and causes toxicity by blocking normal cellular respiration in the animal.

The environmental conditions that favor toxic levels of prussic acid are drought stress and frost damage. If sorghum-sudangrass is under drought stress, avoid grazing until the plants have recovered and exhibit at least 24 inches of regrowth. Following a severe frost, avoid grazing sorghum-sudangrass for 14 days or until the leaves turn brown, whichever is longer.

In addition, prussic acid levels are highest in young, leafy tissue, whether it is initial growth after planting or regrowth after clipping. Since it is the young, fast-growing tissue that contains dangerous levels of prussic acid, avoid grazing until the plant reaches a height of at least 24 inches to allow prussic acid to dissipate. Unlike nitrates, which are persistent, prussic acid disappears during the hay curing or ensiling process.

Prussic acid can be detected through the use of picrate strips. Filter paper that has been treated with a solution of picric acid and allowed to dry is suspended in a test tube over a sample of plant material that has been treated with a few drops of chloroform. The test tube is then incubated for several hours. If prussic acid is present, the yellow sodium picrate paper will turn increasingly red in direct proportion to prussic acid concentration.

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