Nitrate Levels in Drought Damaged Forages

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July 6, 2007

Dry conditions often cause nitrates to accumulate at high levels in forages. Nitrate levels need to be checked in drought damaged forages before feeding to livestock or horses.

Sample Technique

A proper sample must be taken for accurate determination of nitrate levels. The following are some guidelines to follow.

Harvest at least one (1) pound of fresh weight for each sample. The plants should be cut at the intended harvest height. We would suggest cutting the plants at no less than three (3) inches above the soil surface. Nitrates tend to accumulate in the lower stems. By keeping the cutting height above three inches, nitrate levels in the harvested plant should be reduced.

Collect a representative sample from each field. Usually five or more locations across a field will serve as a representative sample. Plants from the five or more locations in the field should be combined into one sample for nitrate testing.

If multiple fields are in question, wheat or other crops at different growth stages should be submitted as separate samples. Growth stage, the date when fertilizer nitrogen was applied, and the extent of freeze damage all could affect nitrate levels in the plants.

Cut plants should be stored in paper bags and mailed in cardboard boxes overnight to the testing laboratory. The better option is to put the plant samples in a cooler with ice and drive them directly to the laboratories the same day the plants were harvested. If the plant samples will be stored overnight, then they should be stored in a freezer in paper bags.

When collecting the plant samples, DO NOT put them in plastic bags. Plant samples stored in plastic bags at room temperature will lower nitrate levels, resulting in inaccurate results.

During the handling process, nitrate levels could decrease in the plant sample, especially if they are stored overnight at room temperature. If a period of time has occurred between harvesting and testing the samples, then you could expect that nitrate levels reported would be less than nitrate levels in the field.

Testing Laboratories

Murray State University Breathitt Veterinary Laboratories in Hopkinsville, KY will return an answer within 24 hours. The Kentucky Livestock Disease Diagnostic Center (LDDC) will return an answer within 3 or more days. Both labs charge $10 per sample. Kentucky LDDC does not require a veterinarian to submit these samples. County ANR Agents and private farmers from Kentucky CAN submit samples directly to LDDC. Breathitt does require a veterinarian to submit the sample. If county ANR agents

include an email with the samples that the veterinarian submits, then the lab will send the results to the agent as well as the veterinarian. Several commercial laboratories may conduct the nitrate testing as well.

Contact Information

Murray State University Breathitt
Veterinary Center PO Box 2000
715 North Drive Hopkinsville, KY 42241-2000
Phone (270) 886-3959

Livestock Disease Diagnostic Center
1490 Bull Lea Road
Lexington, KY 40512
Phone (859) 253-0571
Fax (859) 255-1624

Different Feeding Recommendations

The University of Kentucky LDDC has the cut-off at 0.44% nitrate (Table 1), while the Breathitt Laboratory has the "safe to feed" cut-off level at 0.20% nitrate (Table 2). The Breathitt Laboratory does not recommend mixing feed for any forage with nitrate levels above 0.20%, while the LDDC offers recommendations for blending forages with higher nitrate levels.

The UK LDDC recommendations were based on a committee of scientists evaluating the best data available for nitrate levels in corn. The values in Table 1 assume that vitamin A levels are adequate in the overall feed ration and no other non-protein nitrogen (NPN) is in the feed ration. If the overall ration has vitamin A deficiency and/or NPN, then the safe to feed cut-off should be lowered to 0.30% nitrate.

The Breathitt recommendations are based from a case of nitrate toxicity occurring from a forage sample that tested about 0.23% nitrate several years ago. We do not know if the forage sample was handled properly before it was submitted to the laboratory. However, by having the cut-off at 0.20% nitrate, the personnel at the Breathitt lab know that they will prevent any cases of nitrate toxicity.

Table 1. Nitrate Levels and Feeding Options (University of Kentucky Recommendations)

Nitrate (NO_3) in dry matter		Feeding Instructions
0.0 – 0.44%	0 – 4,400 ppm	Safe to Feed*
0.44 – 0.88%	4,400 – 8,800 ppm	Limit to 50% of total dry ration for pregnant animals.
0.88 – 1.50%	8,800 – 15,000 ppm	Limit to 25% of total dry ration. Avoid feeding pregnant animals.
Over 1.50%	Over 15,000 ppm	Toxic. Do not feed.

*assumes sufficient vitamin A and no non-protein nitrogen supplement in the overall feed ration.

Table 2. Nitrate Levels and Feeding Options (Breathitt Laboratory Recommendations)

Nitrate (NO_3) in dry matter		Feeding Instructions
0.0 – 0.20%	0 – 2,000 ppm	Safe to Feed
Over 0.20%	Over 2,000 ppm	Toxic. Do not feed.

Both laboratories are conducting similar methods for nitrate testing, such that a sample reading of 0.20% should be the same for both laboratories. Both laboratories should provide accurate readings of nitrate, assuming that the forage samples were handled properly before arriving to each laboratory. At this point in time, the discrepancy between the two laboratories will remain in the recommendation and not the results.

POINTS:

- Place the samples in a brown paper bag and not in plastic to send to the diagnostic laboratory. Get the sample to the laboratory immediately. This avoids the possibility to reduce the nitrate level during transportation.
- Use 0.30% (3,000 ppm) nitrate for safe feeding if uncertain about the vitamin A and/or supplement.