

## VETERINARY MEDICAL DIAGNOSTIC LABORATORY QUICK NITRATE FACTS 7/13/2012

**Nitrate Accumulation in Plants:** Nitrate accumulation is a major concern in drought-damaged corn and species of *Sorghum*, as well as various noxious weeds growing in pastures. In addition to drought stress, high rates of fertilization, plant immaturity, and even excessive rain can influence nitrate concentrations in corn and other plants. Usually, nitrate concentrates in the bottom 12 to 18 inches of the stalk, but much of the drought-damaged corn currently being tested at the Veterinary Medical Diagnostic Laboratory (VMDL) at the University of Missouri, using the diphenylamine nitrate “spot” test, is showing high nitrate concentrations all the way up the stalk, without the usual decrease in nitrate content 18 to 24 inches above the base.

**Potential Adverse Health Effects in Animals:** Nitrate in forage→Nitrate in rumen→Nitrite in rumen→Nitrite in blood. Nitrite in the blood converts hemoglobin to methemoglobin, which doesn't bind oxygen. Methemoglobin formation is associated with “chocolate brown” blood, lethargy, and exercise intolerance, as well as, potentially, abortion and, even, sudden death in cattle & other susceptible ruminants.

**“Spot” Tests:** Preparations of diphenylamine in concentrated sulfuric acid can be obtained in person by MU Extension personnel from the VMDL, after completion of appropriate paperwork. Several cornstalks from the same field should be tested at 6 inch increments, starting at the base, until there is a dramatic decrease in the amount of nitrate present from one height to the next. “High” nitrate concentrations ( $\geq 1\%$  nitrate) are indicated by a rapid (<20 seconds) change in color to dark blue. Diphenylamine “spot” testing is also available at the VMDL for \$16.25/sample of several stalks. If fields differ in varieties of corn being grown, severity of drought damage, and/or amount of nitrogen fertilizer being applied/acre, more than one sample (sample = 3 to 5 plants) should be tested. Results from the VMDL are generally available within 24 hours.

**Quantitative Nitrate Analyses:** The VMDL recommends that samples of corn or other plants with uniformly high nitrate concentrations throughout the stalks/stems, as determined by the “spot” test, be chopped up and submitted to the VMDL for quantitative nitrate analyses of the green chop. Quantitative nitrate analyses are particularly important prior to feeding “spot” test-positive forages to cattle. This method provides a more accurate estimate of the nitrate content in green chop, because it takes into account any dilution effects of leaves and ears, which are often lower in nitrate content than stalks or stems. Recently submitted samples of green chop have generally contained quantitatively-determined nitrate concentrations between 0.3 and 0.6% (3,000 to 6,000 ppm). These analyses cost \$23.00/sample, with results available within 72 to 96 hours.

**VMDL Sample Submission Information:** <http://vmdl.missouri.edu/> **Sample = 1 quart minimum**

**Interpretation of the Results:** Accurate interpretation of the results of quantitative nitrate testing is best done in cooperation with extension personnel and veterinarians. Nitrate concentrations equal to or greater than 1% (10,000 ppm) on a dry-matter basis have been associated with acute death of cattle from nitrate/nitrite poisoning. In order to prevent nitrate-associated abortions, pregnant cattle should not be fed forage containing greater than 0.5% (5,000 ppm) nitrate, and some references have suggest concentrations as low as 0.25% (2,500 ppm) to compensate for differences within fields and between samples.

**Management:** Green chop containing “safe” concentrations of nitrate should be fed as soon as possible after chopping, and fed cattle (as opposed to hungry cattle waiting to be fed) should be adapted to this new forage, with gradual introduction of the green chop in association with careful observation. Dilution of high-nitrate-containing forages with low-nitrate containing forages can decrease the overall nitrate concentration in feedstuffs, and this can be verified by subsequent retesting prior to feeding. Ensiling high-nitrate forages is another means by which nitrate concentrations can be decreased 25 to 50% in forage, and nitrate concentrations should be rechecked in ensiled high-nitrate forages prior to feeding. There are products available, some containing “probiotics”, which reportedly decrease nitrite production in the rumen. The utility of such products for a given management system should be assessed in consultation with a veterinarian.

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**See also:** <http://extension.missouri.edu/index.aspx>