

Study Materials

Step 2

Introduction

High levels of nitrate can accumulate in forage crops grown in Montana. This is a frequent problem in cereal crops like oat or barley that are cut for hay, certain weeds like pigweed and kochia, and in rare cases even alfalfa. The use of cereal crops as an alternative forage has risen dramatically in the past few years. Coupled with drought conditions the frequency of nitrate accumulation has increased in Montana. The Nitrate Quiktest provides a quick, reliable method to detect potential toxic nitrate levels in Montana's forages.

Protocol

REAGENT:

The reagent is a solution of diphenylamine (5g/L) in 82% sulfuric acid. IT MUST BE HANDLED WITH CAUTION. Use the safety gloves and goggles provided with the QuikTest Kit. It will burn the skin severely, char most clothing, and dissolve most metals if allowed to come in contact with them. If the reagent is accidentally spilled, FLUSH WITH WATER IMMEDIATELY, and if possible neutralize the acid with a weak solution of baking soda. (About a tablespoon to a pint of water). Also, baking soda can be sprinkled onto the area directly and moistened with water, then sponged.

Discard reagent if it becomes contaminated. (Turns brown or black in color). Avoid direct contact between the sample and the tip of the dropper bottle at all times. Use distilled water to keep work area, razor blades, etc. uncontaminated.

TESTING FORAGES (SPOT TEST):

The QuikTest is a QUALITATIVE SCREENING MECHANISM. Samples believed toxic should be sent to a laboratory.

Green forages should be tested by splitting the stem longitudinally and dropping a few (two or more) drops of the reagent on the lower nodes. The most probable place for nitrate to concentrate is at the leaf nodes, so these should be tested. Several stalks or stems from various areas in the field should be tested to obtain a representative test of the entire field.

Dry forages can be tested by placing a crushed portion of the stem onto a clean white porcelain surface (a white saucer will do). Add a few drops of water to the sample until wet; then drop a few drops of reagent onto the sample.

INTERPRETATION OF TEST:

A light blue to blue-black coloration developing where the reagent has been dropped onto the forage indicates the presence of nitrate. Rapid, intense color development indicates high levels of nitrate. The rate of color development (which sometimes takes up to 1 minute) and the intensity of color (ranging from very light blue to blue-black) depend on the nitrate concentration and other conditions in the individual sample.

Whenever a blue color develops rapidly, a possible nitrate hazard exists and a representative sample should be submitted to a laboratory for a quantitative analysis. It is recommended that all samples showing any detectable blue color be submitted to a laboratory to determine the exact nitrate concentration. For samples testing positive, a delay in harvest will usually reduce the nitrate levels and the forage can be re-tested. For all hay samples with detectable blue color, obtain a representative hay core sample for lab analysis. Samples submitted to the laboratory should not be fed with until quantitative results are obtained.

Only blue or blue-black color indicates nitrate. Brown to black coloration indicates carbohydrate and may occur anywhere in the plant. If carbohydrate is fairly high, the brown coloration may cover up a slow development of blue from low nitrate concentration.

LABORATORY NITRATE TEST

Refer to Table 7 of EB150 "Soil, Plant and Water Analytical Laboratories for Montana Agriculture" for a current listing of laboratories. Carefully convert nitrate results (5 vs. ppm, NO₃ vs. NO₃-N) to help producers develop safe rations based on animal type, condition and body weight. Feel free to call the livestock or forage specialists for assistance.

IMPORTANT Note: The nitrate QuickTest must be used by certified, trained individuals in Montana. Follow the written protocols for safety and procedures. Montana State University (MSU), the MSU Extension Service, Animal & Range Sciences Department, Montana Counties, and Certified/trained Individuals are not liability for any losses due to improper handling or interpretation of the results.

Checklist

Complete kits are available for \$20 (payable: MSU Extension Service - Nitrate QuikTest), 235 Linfield Hall, MSU, Bozeman, MT 59717. Complete or partial kits will only be distributed to trained certified individuals.

MSU Extension Service Nitrate QuikTest:

- Training Materials (hard-copy version of this website = \$5): Protocol, study guide, pre-test questions, Nitrate Poisoning in Cattle, Sheep and Goats (University of Wisconsin), Soil, Plant and Water Analytical Laboratories for Montana Agriculture (MSU Extension Service EB 150) and Material Safety Data Sheets for diphenylamine and sulfuric acid.
- Complete box (\$15): test reagent (\$1 per refill or \$2 per new bottle); box, goggles, gloves, razor blades, laminated protocol, etc. available at cost. With your kit, keep a supply of baking soda and distilled water for clean-up of spills. NOTE: the kits cannot be mailed (secondary to the acid content). Therefore, after certification we will arrange for delivery.