



**COLORADO STATE UNIVERSITY
EXTENSION**

Colorado State University Extension
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Nitrate Testing Only as Good as the Sample

The dry conditions of summer 2020 has produced an abundance of high nitrate forages. These hays, crop residues (stover) and even weeds with high nitrates leave many producers utilizing Extension and other commercial vendors to help determine the toxicity of the forage.

Forage samples brought into the Extension offices will usually be given an initial diphenylamine test. A few drops of the diphenylamine solution are placed on the forage sample and observed for an intense dark blue or purple color change. This color change can indicate the presence of nitrate above a level of 5,000 part per million (ppm). If the results are positive (blue color), the forage should be then sent to a laboratory for quantitative analysis before feeding. Occasionally, false positive reactions occur with diphenylamine tests. However, any sample resulting in a positive reaction should be tested at a competent laboratory.

Understanding the results of a quantitative analysis completed by a competent laboratory is imperative. The results are based on the sample provided for testing. For the most accurate possible test results, samples should be taken from various parts of a field or from multiple bales of hay. The test will give a quantitatively averaged result from the sample provided. Producers should understand there could still be outlier plants, parts of a field or bales that are higher in nitrate than the test results show.

Caution should always be used when making feeding and grazing decisions when test results show the presence of high nitrate levels. The total amount of nitrates of all feedstuffs consumed and

even the nitrate level of water consumed should be considered in the decision process. A feed that does not test high using diphenylamine does not mean it is without nitrates. The feed may be used to help lower the overall nitrate level of the diet, but how much it lowers the nitrate level depends on its nitrate level. Knowing the nitrate level of all forage feedstuffs in the ration is the only way to accurately mix ration components to lower the total nitrate level of the ration.

There are three types of commercial laboratory tests for forage nitrates. The nitrate (NO₃) test shows parts per million (ppm) of nitrate and is the easiest to interpret. The other two commercial tests provide some slightly different numbers. Nitrate-nitrogen (NO₃-N) and potassium nitrate (KNO₃) tests gives different result numbers but can be converted to equate to the nitrate (NO₃). Colorado State University Range Extension has a calculator that can be used to make the conversions. It can be found at: www.range.colostate.edu/nitratecalc.shtml.

Colorado State University Extension has the following recommendations based on the results of a nitrate (NO₃) test:

Nitrate Level (Maximum)	Recommendations Based on the Maximum Nitrate Level
0-4400 ppm	Considered safe to feed under all conditions
4,500 ppm	Generally safe for non-pregnant animals under all conditions. Limit pregnant animals to 50% of the total dry matter in the ration.
6,700 ppm	Do not feed without rationing. Limit to 50% of the total dry matter in the ration.
8,900 ppm	Do not feed without rationing. Limit to 35-40% of the total dry matter in the ration.
15,000 ppm	Do not feed to pregnant animals. Do not feed without rationing. Limit to 25% of the total dry matter in the ration.
17,700 ppm +	Do not feed. Even with rationing, this feed is toxic. Feeds over 1.76% nitrate are toxic.

For more information on nitrate testing of forage and nitrate poisoning of livestock visit CSU

Fact Sheet No. 1.610 – Nitrate Poisoning at <https://extension.colostate.edu/topic-areas/agriculture/nitrate-poisoning-1-610/>

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