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We've been assisting farmers and ranchers with testing forages. The tests have been coming back from non-toxic to very toxic.

Nitrates accumulate in the lower portion of the plant when stresses reduce the crop yield to less than that expected based on the supplied nitrogen fertility level. When fed to livestock, nitrates interfere with the ability of the blood to carry oxygen.

Nitrate toxicity is a misnomer because nitrite (NO<sub>2</sub>), not nitrate (NO<sub>3</sub>), is poisonous to animals. After a plant is eaten, rumen bacteria rapidly reduce nitrates in the forage to nitrites. Normally, the nitrites are converted to ammonia and used by rumen microorganisms as a nitrogen source. However, if nitrite intake is faster than its breakdown to ammonia, nitrites will begin to accumulate in the rumen. Nitrite is rapidly absorbed into the blood system where it converts hemoglobin to methemoglobin. Red blood cells containing methemoglobin cannot transport oxygen and the animal dies from asphyxiation.

Animals under physiological stress (sick, hungry, lactating, or pregnant) are more susceptible to nitrate toxicity than healthy animals. Toxicity is related to the total amount of forage consumed and how quickly it is eaten, but, generally, if forages contain more than 6,000 ppm nitrate, they should be considered potentially toxic.

Symptoms of nitrate toxicity may appear within a few hours after eating or not for several days. Signs of toxicity include reduced appetite, weight loss, diarrhea and runny eyes. However, these are nonspecific symptoms of numerous disorders and are not a reliable diagnosis of nitrate poisoning. Lower nitrate levels can cause abortion without any other noticeable symptoms.

Acute toxicity usually is not apparent until methemoglobin approaches lethal concentrations. Symptoms include cyanosis (bluish color of mucus membranes), labored breathing, muscular tremors and eventual collapse. Coma and death usually follow within two to three hours. Postmortem confirmation of nitrate toxicity is chocolate-colored blood; however, the color will change to dark red within a few hours after death.

Nearly all plants contain nitrate, but some species are more prone to accumulate nitrate than others. Crops such as forage and grain sorghums, sudangrass, sudan-sorghum hybrids and pearl millet are notorious nitrate accumulators. Weed species such as kochia, lambsquarters, sunflower, pigweed and Johnsongrass also are often high in nitrate. Under certain environmental and managerial conditions, corn and cereal grains like wheat and oats, and other plants can accumulate potentially toxic levels of nitrate. Under extreme stress, legumes like alfalfa and soybean also can accumulate nitrate.

Nitrates accumulate in plants during periods of moderate drought because the roots continually absorb nitrate, but very high daytime temperatures inhibit its conversion to amino acids. During a severe drought, lack of moisture prevents nitrate absorption by plant roots. Following a rain, however, the roots rapidly absorb nitrate and accumulate high levels. After a drought-ending rain, it requires at least two weeks before the nitrates will be metabolized to low levels, provided environmental conditions are optimum.

Silages made from stressed forages should be analyzed after ensiling because the fermentation process usually converts about 50 percent of the nitrates to a nontoxic form. If forages are harvested as hay, nitrate concentrations remain virtually unchanged over time.

High nitrate forages may be grazed, but a dry roughage should be fed first to limit intake. Light to moderate stocking rates should be used because overgrazing forces cattle to eat the stems which contain the highest nitrate levels. Cattle should be removed from potentially susceptible forage for at least seven to 14 days after a drought-ending rain. Lush regrowth of heavily fertilized grasses can contain high nitrate levels and should not be grazed. If plants are fed as green chop, the harvested forage should be fed immediately after cutting and not allowed to heat.

We would be able to help you testing your forages for nitrates.