

Nitrate-Accumulating Plants

Species Affected: Sheep are the most affected, other ruminants such as cattle and wildlife (deer, elk, moose, antelope) are also affected, and other animals including humans are harmed by nitrates via a different biological mechanism. Most dangerous to pregnant/lactating animals.

Description: A wide variety of crops, wild plants, and weeds accumulate nitrates, including oat hay, sorghum, corn, sudangrass, Johnsongrass, beets, Palmer amaranth, kochia, pigweed, Russian thistle, nightshades, and many, many more. The soil type, the form of nitrogen present in the soil, and the nitrogen content of the water that plants take up all influence the quantity of nitrates accumulated by nitrate-accumulating plants. Drought, frost, and/or cloudy weather can increase nitrate accumulation. Use of the common herbicide 2,4-D can increase a plant's nitrate-accumulating tendencies. Plants which contain 1.5 percent nitrate or more (as dry weight) may be lethal to livestock, but negative effects are seen when livestock are fed on feed containing as little as 0.5% nitrate. Nitrate toxicity typically poses a greater risk to livestock in the fall than at other times of the year.

Toxin: Nitrates can be digested by ruminants when consumed in moderate quantities, but when animals eat feed that has an excessive amount of nitrate content, the excess nitrite byproducts produced inside the body cause blood hemoglobin to be converted into methemoglobin. Methemoglobin is unable to supply oxygen to the body, so the effects of nitrate poisoning are the result of suffocation/oxygen starvation.

Toxic Plant Parts: The highest concentration of nitrates in any given nitrate-accumulator plant tends to be in the stem. Leaves have about half the nitrate concentration of stems, and flower/seed head structures have about half as much as leaves. The seeds themselves typically do not accumulate nitrates. Livestock may be affected by eating both harvested and living plants. Fermenting feed/silage helps to reduce nitrate content by 50% or more.

Possible Effects on Livestock: A signature symptom of nitrate poisoning is dark, "chocolate-brown" colored blood. In cases of acute toxicity, death may occur within 1 – 2 hours of lethal dose ingestion, and animals are typically found dead. Other symptoms of acute toxicity include blue mucous membranes, shortness of breath, and staggering gait. In less severe cases, symptoms of poisoning may include watery eyes, infertility/abortion, difficulty in gaining weight, reduction in milk flow, and a generally unhealthy appearance.

Preventative Measures: Recommended best practices include fermenting silage feeds and performing routine nitrate tests on high-nitrate feed crops and forages. Supplementing animals' feed with low-nitrate feed is also recommended. Animals with moderate nitrate poisoning can recover under veterinary treatment.

Resources: [Nitrate Toxicity MontGuide.pdf \(montana.edu\)](#)

[01610.pdf \(colostate.edu\)](#)

[ISNT \(cornell.edu\)](#)

[Plants Causing Nitrate & Oxalate Poisoning in Pastures | OSU Extension Service \(oregonstate.edu\)](#)

[Nitrate Toxicity | UGA Cooperative Extension](#)

[Nitrate-accumulating plants : USDA ARS](#)