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Nitrate risk for cattle from drought-stressed forages

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This issue explains how drought increases forage nitrate risk and how testing, harvesting, and feeding decisions can reduce the danger to cattle.

Drought reduces forage supply just when producers need more feeding options. Failed crops, emergency hay, and stressed annual forages may help fill the gap, but their nitrate content can make an otherwise useful feed dangerous. Plants normally convert absorbed nitrate into amino acids and protein. When growth slows and uptake exceeds utilization, nitrate accumulates, particularly in the lower stems. Nitrogen fertilization or manure can increase the risk, although drought alone does not establish that a forage is toxic. Appearance is equally unreliable: greener patches may contain more nitrate than the most visibly damaged plants.

In cattle, rumen microbes convert nitrate to nitrite and then ammonia. Trouble develops when nitrite forms faster than it can be cleared. Absorbed nitrite reduces the blood's capacity to carry oxygen, potentially causing rapid illness, abortion, or death. Risk depends on how much nitrate cattle consume, how quickly they eat, their adaptation, and nitrate supplied by water. Corn, oats, barley, forage sorghum, sudangrass hybrids, and pearl millet deserve particular attention. Some weeds also accumulate nitrate. The practical task is to identify suspect forage, measure its nitrate concentration, and decide whether its use can be controlled.

Rain can briefly increase risk

The first rain after drought can increase nitrate uptake before the plant regains sufficient capacity to use it. A greener field therefore does not establish that grazing or harvesting can resume. Extension recommendations commonly allow several days of active growth after effective rainfall, but recovery varies with crop, temperature, sunlight, and drought severity. Millet research has required 7–14 days. Use recovery and repeat testing to guide the decision; a fixed waiting period cannot certify safety. Frost or continued cloudy weather can delay improvement further.

Sample what cattle will receive

Ask the laboratory how to collect, preserve, and ship samples for nitrate analysis. Sample standing crops at the intended cutting height, taking plants from several locations. Keep contrasting field areas and suspect weeds separate where they could create different feeding lots. For hay, core multiple bales from each identifiable lot; one handful cannot represent a stack. Keep fresh samples cold and submit promptly. Quick field tests can screen for risk, but ration decisions require a quantitative result. Check drinking water as part of the same assessment. Label each sample so its result can be matched to the exact field, cutting height, and storage lot.

Read the laboratory units
Reports may express nitrate as NO_3 or nitrate-nitrogen as NO_3-N. Multiply NO_3-N by 4.43 to obtain NO_3; 1,000 ppm NO_3-N equals approximately 4,430 ppm NO_3. Compare forage results on a dry matter basis. Below 1,000 ppm NO_3-N is commonly considered a low-risk range, but it is not a universal guarantee. Higher results require interpretation against the complete ration, water exposure, and cattle class. Pregnant cattle need particular caution. Never apply a threshold without checking what the laboratory measured. For the same analyte, 0.10% equals 1,000 ppm. Convert all values before comparing them.

Harvesting changes the options
Drying forage into hay does not reliably reduce nitrate. Raising cutting height can exclude the most concentrated stem material, at the expense of yield. Proper ensiling can reduce nitrate substantially, but the reduction varies and cannot be assumed when calculating inclusion. Allow fermentation to finish and test the silage before feeding. Poor packing or unsuitable moisture compromises this option. High-nitrate crops can also generate lethal silo gases during fermentation; follow established silo-safety procedures and keep people and livestock away from gas accumulation areas.

Control intake and dilution
Where use is justified, calculate inclusion on a dry matter basis and mix thoroughly with tested low-nitrate feeds. Offering separate bales does not ensure that each animal consumes the intended dilution. Introduce the ration gradually and prevent hungry cattle from gorging after interruptions. Before grazing fields assessed as suitable, provide low-nitrate forage and avoid forcing cattle to consume lower stems. Adaptation can improve nitrate tolerance, but it cannot compensate for uncontrolled intake or highly variable forage. Include nitrate from every ration ingredient and from water when calculating total exposure.

Recognize trouble and act
Rapid or difficult breathing, weakness, tremors, staggering, or sudden deaths after feeding suspect forage require immediate veterinary attention. Stop further access to the suspected source without driving or stressing affected cattle. Prompt treatment can save animals, but waiting for unmistakable signs can lose valuable time. Retain feed and water samples for investigation. In forage sorghum and related grasses, consider prussic acid as a separate hazard: a nitrate result does not measure cyanide risk, and management suitable for one hazard may not control the other.

In Brief, drought-stressed forage may retain feeding value, but its use must follow testing and a workable feeding plan. Check the reporting units, include water exposure, and control both dietary concentration and intake. Haymaking does not remove nitrate, ensiling requires verification, and rain does not immediately make a stressed crop safe.

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