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Nitrates: Drought & Rain

Besides limiting forage production, dry weather can create another problem for producers to deal with, nitrate toxicity. With drought stricken areas of the state receiving some much needed moisture lately, does the risk of nitrate poisoning go away? If we still have high nitrate forages, is there a safe way to use them in our operations? Let's look at both of these questions today.

With the return of precipitation and additional plant growth, nitrates once again have a place to go as plants recover. While this imbalance will eventually correct itself, the process will take time; and it is recommended to wait at least 3 days (after a significant drought ending rain event) before harvesting forage. This may allow the stressed plants to convert the potentially toxic nitrate levels into usable carbohydrates. Plants still displaying characteristics of stress will most likely still be carrying a higher than normal nitrate load. If you have any doubts, it's better to be safe and send a sample to a reputable lab for testing.

If we still have forages testing hot, Dr. Mary Drewnoski, UNL Beef Specialist shares some options:

Most recommendations for the level of nitrates in forages that cause issues are based on hay, with levels above 2,100 ppm $\text{NO}_3\text{-N}$ considered toxic. Often grazing cattle can tolerate greater concentrations of nitrates than those consuming hay. *The amount of nitrates cattle can consume without an issue depends a lot on the situation and management.*

A few things to understand about risks when grazing higher nitrate forages:

1. If the forage to be grazed is high moisture it is often lower risk. Fresh forages release nitrates into the rumen at a slower rate than dry forages. This allows rumen microbes that convert toxic nitrite to ammonia, to better keep up with nitrate inflow. If the forage is mature and dried out, the rate of release of nitrate and thus the risks would be greater, more like hay.
2. The capacity of the microbial population in the rumen to detoxify nitrite will increase with exposure to nitrate. Nitrates tend to be greatest in the bottom of the stem and with the least nitrates in the leaf. If given the opportunity, cattle tend to select leaf material first and work their way down the plant, slowly increasing their nitrate exposure over the grazing period. Therefore, the microbial population in the rumen of grazing cattle may have time to adapt to higher nitrate concentrations by the time the animal consumes the stem and lower portions of the plant. Thus, gradual adaptation is a key management strategy. *Producers should not strip graze high nitrate forages, but allow cattle to be selective.* Losses from nitrate toxicity are more likely in cattle not adapted to nitrate. The bacteria in the rumen capable of converting the toxic nitrite to ammonia will increase in numbers when nitrate is available to them. To adapt the cattle, start by grazing the lowest-nitrate fields and then work up to the highest, or graze higher nitrate fields lightly to allow animals to selectively graze the plant parts that are lower in nitrate concentration.
3. Grazing cattle often have a slower rate of dry matter intake than when eating harvested forages. Again, this means that the microbes can better keep pace with the nitrate inflow. *Feeding cattle prior to turnout can help slow initial intake of high nitrate feed.* Also, if intake becomes restricted at any point (forage runs out or weather impedes grazing) producers should fill them up on lower nitrate hay again before they go back to grazing the high nitrate forage.

4. Higher dietary energy increases the rate of detoxification. Thus, cattle grazing immature forages can have lower risk than mature forages with the same amount of nitrate. *Previous research found that feeding a couple pounds of corn to cattle when feeding mature high nitrate forages can lower risk.* So, if the forage is not young/immature, producers should consider grain supplementation. This will supply energy for rumen microbes to convert nitrate into bacterial protein and minimizes the accumulation of the intermediate nitrite. Grain feeding may be of limited benefit for high quality annual forages but is a good idea when grazing more mature forages.

Another harvest option to consider is ensiling. *If done right, ensiling can decrease nitrate content of the forage by 40 to 60%.* Ensiling is one of the best ways to decrease the potential nitrate toxicity of a forage, so this is an option worth considering. *The nitrate content of poorly ensiled forages will not be decreased to the same extent as well-made silage. Producers need to let the silage ferment for at least 21 days for maximal effect.* Silage should be sampled and analyzed before feeding to ensure the amount of the silage in the ration provides acceptable nitrate levels in the diet. Producers should target an initial diet content of less than 1000 ppm NO₃-N. Animals can then be adapted to higher levels by slowly increasing the inclusion of high nitrate silage in the diet. Over time cattle can be adapted to consume diets up to 4,000 ppm NO₃-N.

Finally, for some situations, harvesting for hay may be the only option. The drying process does not decrease nitrates and thus, this hay may need to be diluted in the diet with other forages low in nitrates. Grinding and blending of low and high nitrates hay is best to reduce risk. As mentioned before, feeding a couple pounds of grain per cow each day can also help reduce risk. If blending of hays is not possible, producers should unroll the low nitrate hay first, then after they have consumed most of the low nitrate hay, roll out high nitrate hay. Be sure animals are not hungry when eating the high nitrate hay (slow intake is key to reducing risk). To adapt the cattle, start by feeding the lowest-nitrate hay and then work up to higher levels. Even with adaptation, feeding hay free-choice is risky when the hay has higher than 2,100 ppm NO₃-N. This is because there are likely to be “hot spots” in the hay with high nitrate content that could result in a cow consuming a much higher load of nitrate. Do not feed hay, straw, or fodder suspected of being high in nitrate when it is damp. Damp hay tends to be more toxic because some of the nitrate already has been converted to the more toxic nitrite before being consumed.

Even though the potential for nitrate toxicity exists, planning and cattle management can be used to eliminate cattle losses. Ultimately, the decision to use high nitrate forages is a judgement call and a question of how much risk one is willing to take.

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