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Management of Drought Stressed Corn for Silage

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Nitrate Poisoning From Drought Stressed Forages

Many plants can accumulate nitrate under stressful conditions (excessive fertilization or water stress from rain after a drought). Sunflowers, corn, wheat, barley, rape, bromegrass, and sweet clover are some of the more common plants that do this. Consumption of high nitrates by ruminants can be detrimental because once absorbed into the blood stream, nitrates are converted to nitrites that bind to hemoglobin and reduce the oxygen carrying capacity of the blood. (Nitrites are the actual poisonous compound and the terms “nitrate poisoning” and “nitrate toxicity” are technically incorrect). Acute poisoning can be observed within 6 hours of consumption and is characterized by dark-brown blood, labored breathing, tremors, and weakness. The following information is primarily aimed at the management of drought stressed corn silage but general concepts are valid for other forages as well.

Harvesting Drought Stressed Corn

Drought stressed corn should be harvested at the same dry matter (DM) for normal corn: about 32-35% DM. *Determining whole plant dry matter or moisture is critical because visual assessments can be very inaccurate! Many plants that look dry contain a significant amount of moisture in the stalk.* Use of a microwave oven or Koster Moisture Tester is recommended. Under hot, dry conditions, plants may dry down at 1-2 points per day. Ensiling corn at less than 28-30% DM will result in excess nutrient runoff and extremely acidic silages. Harvesting corn too dry (greater than 40% DM) restricts fermentation, reduces the loss of nitrates (that occurs during ensiling), results in forage that is difficult to pack, and can result in excessive spoilage and poor bunk stability.

- Drought stressed forages should not be grazed or fed as green chop.
- Ensiling decreases concentrations of nitrates by 50 to 70% and is the best method to manage forages with potentially high levels of nitrates.

- During drought conditions, forages that have been heavily rained on should not be harvested for at least 4-5 d.
- Chop forage at a theoretical setting of 3/8 to 3/4 inch if harvested at the optimum DM. If you have already missed the optimum dry matter for harvest and the plants are very dry, (more than 40% DM) consider, chopping your forage finer to improve packing (but remember to balance the TMR for adequate effective fiber during feedout).
- If the forage is not well eared, mechanical processing may not be needed. Process if the amount and maturity of the kernels warrants it. Processing may be warranted in very dry plants as it may help with silo packing.
- Suspect corn plants or plants that have been tested and found to be high in nitrates should be cut high to leave 10-15 inches of stalk in the field as nitrates tend to accumulate in the lower third of the plant.
- As always, filling fast, packing tight and sealing immediately will help to ensure a good fermentation. For bunker and pile silos, adequate tractor weight is vital as drier forages are more difficult to pack. Allow silage to ferment for at least 4-6 weeks (longer would be preferable) prior to feeding and gradually introduce new silage to animals.

Silage Additives for Drought Stressed Corn

Recommended:

- ◆ Homolactic acid bacteria (microbial inoculants): Severely drought stressed corn forage may contain lower numbers of naturally occurring lactic acid bacteria and may need some help during fermentation. If forage is in the normal range for DM, consider using a research proven homolactic acid bacteria.

For consideration:

- ◆ Heterolactic acid bacteria – *Lactobacillus buchneri*: Drought stressed corn silage often has a high sugar content and can be highly prone to spoilage when exposed to air. *Lactobacillus buchneri* is an organism that safely produces acetic acid, which reduces aerobic spoilage organisms and improves bunk life. However, I suggest not using this additive if whole plant DM is less than 32%.
- ◆ Buffered propionic acid-based preservatives: Silage additives based on buffered propionic acid may be an acceptable additive for drought stressed forage especially if the DM% of the whole plant is high: greater than 40%. Addition of 2-4 lb/wet ton of forage can improve aerobic stability of the silage and reduce DM losses in the silo and during feedout. Higher application rates will increase the probability of effectiveness especially in drier forages.

- ◆ Water: Water can be added to increase the moisture level of overly dry forage, but the amounts needed to have a substantial impact are large. For example, to decrease the dry matter of forage at 50% to 45%, one would have to add 200 lb of water per ton of forage. In addition, added water can cause run off problems, as it is not absorbed efficiently in the forage mass.
- ◆ Sugars/molasses: Drought stressed corn forages usually contains moderately high concentrations of fermentable sugars. Thus, the addition of molasses or other fermentable substrates is usually not warranted if the forage is harvested at the proper DM content.

Not recommended:

- ◆ Non-protein nitrogen additives: Non-protein nitrogen (NPN) additives (urea and anhydrous ammonia) should not be used on very dry, drought stressed forages.

Testing for Nitrates and Safe Levels to Feed

During drought years, corn forage should be tested before chopping (if possible) and after ensiling (before feeding). If nitrates are very high in forages prior to harvest, cut high. If nitrates are very high in forages before feeding, feed less as needed. Nitrates and nitrites in water should also be determined as these can contribute to toxicity issues.

Representative samples should be sent to a lab for analysis. It is best if this material is chopped. (Do not send in large pieces of plants and stalks.)

Laboratories are not always consistent in how they report concentrations of nitrates. Some report the results as nitrate-nitrogen ($\text{NO}_3\text{-N}$) whereas others may report results as the nitrate ion (NO_3) or potassium nitrate (KNO_3). In addition, some labs will report concentrations as ppm whereas others may report as a percent of the dry matter. Because of these inconsistencies we are not publishing nitrate guidelines in this fact sheet and defer you to recommendations from your analytical lab based on their reporting scheme. To be cautious, calculate the entire potential intake of nitrate (water and feeds) to determine your risk of nitrate toxicity.

Silo Gas Caution

Forages with high levels of nitrates are also prone to produce highly toxic levels of silo gasses. ***Use extreme caution around silos because nitrogen oxide gasses that are generated during the first few days of ensiling are lethal to animals and humans!*** These gasses tend to accumulate in low areas and are colorless to reddish-brown. Run the blower for 15 to 20 minutes (or longer) before entering an upright silo and use caution around vents

in silo bags. Use a respirator before entering a silo. In severe cases, the gasses will stain forages and other items. In some instances patches of yellowish silage may be observed. If these spots of silage have a very low pH (1 - 3) it is possible that nitric acid was formed.