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Management of Drought Stressed Corn for Silage

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Harvesting Drought Stressed Corn

Some parts of the region are experiencing drought conditions. Here are some guidelines for dealing with this situation.

Drought stressed corn should be harvested at the same dry matter (DM) for normal corn: 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, results in forage that is difficult to pack, and can result in excessive spoilage and poor bunk stability.

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 you will have 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.

As always, filling fast, packing tight and sealing immediately will help to ensure a good fermentation. Be sure to have adequate tractor weight on the pile as drier forages are more difficult to pack. Allow silage to ferment for at least 3-4 weeks (longer would be preferable) prior to feeding and gradually introduce new silage to animals.

Silage Additives for Drought Stressed Corn

- 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 homolactic acid bacteria. Some strains of *Lactobacillus plantarum* may help with the reduction in nitrates.

- 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.

- 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 38 - 40%. Addition of 2-4 lb./ton of such products per ton of wet 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. Although this may seem costly, such preservation easily pays for itself by preventing drops in intake and milk production that would occur if cows were fed spoiled silage.

- 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 by the forage mass.

- Sugars/molasses: Drought stressed corn forage 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.

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

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 can accumulate high levels of nitrates. High nitrates cause toxicity because once they are absorbed into the blood stream, they are converted to nitrites that binds to hemoglobin and reduces the oxygen carrying capacity of the blood. Acute poisoning can be observed within 6 hours of forage 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.

- Do not graze or feed green chopped forages that have been drought stressed.

- Ensiling is the best method to manage forages with potentially high levels of nitrates.

- Wait at least 4 to 5 days before chopping drought stressed forage if it is heavily rained on.

- Although extremely high nitrate levels are rare, we recommend that you test your corn forage before chopping and after ensiling (before feeding).

Test for nitrates at chopping: If the levels of nitrates are extremely high (Table 1) you may want to raise your cutter bar during harvest and leave about 10-12 inches of stalk in the field (this is because nitrates tend to accumulate in the stalk of the plant). We realize this will further lower yields, but high yields with toxic levels of nitrates are undesirable.

When sending samples into the lab, you must obtain representative samples from the field. It is best if this material is chopped. (Do not send in large pieces of plants and stalks.) Labs like Cumberland Valley Analytical, UPS/FEDEX: 14515 Industry Drive, Hagerstown, MD 21742 Phone: 1-800-282-7522 can return results of a nitrate test back to you within a 24 h period.

Test for nitrates before feedout: Although ensiling will decrease nitrate levels by about 50 to 60% we would recommend that you test your drought stressed corn silage according to the guidelines (Table 1). If nitrate levels are high in feeds, check for nitrates and nitrites in water as these can also contribute to toxicity issues.

Table 1. Safe and toxic nitrate (NO_3) levels in feeds.

Nitrate ion, % dry matter basis	Recommendations
0 – 0.44	Safe to feed.
0.45 – 0.88	Usually safe to feed with balanced diet. Limit to 50% of DM intake in pregnant animals.
0.89 – 1.50	Limit intake to 20-25% of DM intake. Use caution. Do not feed to pregnant animals.
> 1.50	Toxic!

Silo Gas Caution

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 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.

Summer Extension Intern – Focus on Dairy

Lindsey Reich is our extension summer intern. She will be senior this Fall semester and has conducted research on silage quality with Dr. Kung. Lindsey has started to visit dairy farms in order to fill out a survey that we will use to create a data base of Delaware dairy farms. She is also collecting forage and TMR samples and measuring their particle size. We will return results from your farm and the state averages with recommendations in the near future. We appreciate your help with these projects!

Manage the Plastic on Your Silage Piles and Bunkers

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The primary purpose of covering silage with plastic and tires is to prevent air from interacting with the silage mass. Air allows for the growth of detrimental microbes that initiate a process leading to the destructing of nutrients and potential for increased loads of various toxins. Although bunker and pile silos are covered with “plastic and tires”, often times their management is less than desirable. Several scenarios are common. First, inadequate amounts of tires are used and/or the amount of weight provided by the tires (because they are sidewalls only) is insufficient to keep air from penetrating under the plastic. Billowing plastic or plastic that “ripples” is a good sign of this. Next, plastic is often torn from natural causes, equipment or animals and not repaired. Another common problem is that plastic is often cut in advance, too far back from the leading edge of the feeding face. This exposes the surface of the silage to air for too many days before feeding. Lastly, sidewall plastic has been used to help prevent water seepage into the silage mass but often times the silage is damaged by pack tractors or there is potential that the plastic is damaged with small holes as it lies on the wall during filling (plastic can be scraped on the sharp edges of a concrete wall as the plastic moves during filling).

To use the plastic and tires effectively we suggest the following. First, silos should be sealed with plastic and good weights as soon as possible after filling. This eliminates air and allows fermentation to proceed. Use more weights at the edges and at any seams. For example, use of whole tires, gravel bags, lime, or dirt around the perimeter of piles works well. Gravel bags have worked well at the walls (Figure 1). Overlap the plastic by about 4 to 5 ft at any major seam. Some people have actually glued or taped these seams together as they are lying the tarp down to keep them in place during sealing. If you are using plastic on the side walls, protect the draped plastic from being damaged by the sharp edges of the concrete wall. Placing thin strips of old carpet or cutting a ribbed plastic drain pipe down the center and fitting it on top of the wall (Figure 2) are some practices that have been used. During feedout, try to minimize the time that the top layer of silage is exposed to air (especially in hot weather) by cutting back only enough plastic to expose 1 to 2 days worth of feeding. This needs to be balanced with safety. Silage on the top of bunkers and piles is less tightly packed and prone to “cave ins” so use common sense and caution when deciding how much plastic to cut. It is also extremely important that the plastic at the leading edge of the feeding face be securely weighted down. Think of this edge as another “seam”. Use of heavier tires, split tires stacked 3 or 4 high (Figure 3) or gravel bags at this edge (Figure 4) will prevent air from penetrating under the plastic. We have found gravel bags work well since they can be rolled back prior to cutting the plastic. Start the heavier weights at this leading edge as soon as possible after opening the silo. Once a significant amount of air has been trapped under the plastic, placing heavier weights at that edge will trap some of that air under the plastic. Lastly, repair rips and holes in plastic as soon as possible. Assign someone to check for tears at least once to twice a week. The use of alcohol around the perimeter of the rip, to dry the plastic, and tape specifically for repairing bunker or bag plastic will work better than duct tape. Remember, the primary cause of hot, moldy silages and spoilage layers on the tops of silos is due to exposure to air. Thus, minimize this exposure by managing your plastic and weights effectively.

Figure 1. Gravel bags at the wall in a bunker silo.

Figure 2. Plastic drain pipe used to cover the top of the wall to prevent side wall plastic from being torn or punctured.

Figure 3. Split tires stacked at the feeding face to prevent air from penetrating under the plastic.

Figure 4. Gravel bags at the feeding face to prevent air from penetrating under the plastic.