SS AGR 274

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Using Drought Stressed Corn for Silage, Hay or Grazing [1]

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Anytime drought occurs during the growing season, corn grain yields will be affected. The extent of the loss will depend on stage of growth and the length of time the crop is subjected to droughty conditions. During times of extended drought when grain yield potential is severely limited or nonexistent, the plants may still offer a valuable source of nutrients for livestock provided careful attention is given to how it is harvested and fed. Basically, there are 4 options for using drought stressed corn: (1) hand feeding as green chop or cut stalks, (2) baling for hay, (3) limited grazing in the field, and (4) ensiling to feed as silage. The growth stage of the corn at the time of the drought stress is a major factor to consider when determining which option to use.

Nitrate poisoning is the primary concern when feeding drought stressed corn plants to livestock. Poisoning occurs when animals eat too much forage that is high in nitrates. Elevated nitrate levels can also occur in summer annual forages subjected to drought stress. Weeds commonly found in corn fields such as pigweed, ragweed, lambsquarter, nightshade, and Johnsongrass can also accumulate toxic levels of nitrates under drought conditions. Special attention should be paid to weeds if corn is chopped or cut for hay and is mixed in with the corn. When grazed, cattle may select corn over weeds with less chance of nitrate toxicity from weeds.

Nitrate concentration is highest in the lower part of the stalk or stem. For example, the bulk of the nitrate in drought-stricken corn plants can be found in the bottom third of the stalk. Nitrates levels usually decrease as you move up the stalk toward the ear. Leaves, tassels and the upper stalk are usually within acceptable levels, and safe for feeding. If drought stressed corn is to be cut for cattle feed and nitrate levels are known to be high, leave the bottom 1/3 of the stalk to eliminate the part highest in nitrates.

If moisture conditions improve and the corn begins to green up and resume growth, the nitrate conversion to proteins accelerates rapidly and ultimately, nitrate levels will return to normal. DO NOT harvest or graze corn plants for 5 to 7 days after a heavy rain has stimulated renewed growth! When the plant begins to grow again, nitrate levels will increase for a few days, creating very high concentrations in the plant.

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Green chop/hand feeding stalks.

When drought occurs early in the growing season, hand feeding drought stressed corn as green chop or cut stalks is a risky, but feasible option provided caution is used in harvesting and feeding. If drought stressed corn is green-chopped, it should be tested for nitrate concentration prior to feeding. It is best to select plants or parts of the field with the lowest nitrate levels and cut above the 12 to 15 inch level to avoid the highest nitrate concentrations. Do not hold green chop overnight or let it go through a heat or spoil. A delay in feeding corn forage after it has been chopped will increase the conversion of nitrates to nitrites. Start cattle on green chop slowly, do not feed more than cattle will eat in a few hours. Cattle can be conditioned to eat larger amounts of feed with higher nitrate content if the increase is gradual. Cattle consuming carbohydrates can tolerate more nitrates and should have free access to hay before feeding. This will help limit intake as well as dilute the percentage of nitrates in the total ration being consumed.

Baling for hay.

If drought occurs early in the growing season, baling may be the preferred and more practical method of harvesting. When haying, you should condition or shred the stalks to enhance drying, curing and storage. As with green chop, cut the stalk high to reduce inclusion of the high nitrate containing portions of the stalk. *Haying high nitrate corn will not reduce the level of nitrates in the fodder*. A crop that is high in nitrates prior to cutting and baling will be higher in nitrates after baling and storage. It is strongly recommended that the hay be tested for nitrates before feeding. To properly sample baled corn hay, use a core sampler to take samples from several randomly selected bales. The more accurately the feed is sampled, the more reliable the nitrate analysis. Knowing the nitrate levels will help determine the proportion of the high nitrate hay to include in the daily ration.

Hay will be better utilized if ground prior to feeding, this will eliminate sorting during feeding. If feeding by the bale, feed hay with low nitrate levels before feeding the high nitrate hay to reduce the total daily intake of nitrates. Knowing the nitrate levels in the hay will help determine the proportion of high nitrate hay that can be safely fed. **Feeding high nitrate corn hay free choice is dangerous.**

Grazing.

Allowing cattle to graze free choice, drought damaged corn is risky, but it is less labor intensive and eliminates the need for equipment for harvesting or storage facilities. Grazing is becoming more common for corn in the mid west and Mississippi State University has conducted research in recent years on grazing corn in the south. Do not turn hungry cattle into a suspect field. Although cattle will usually selectively graze leaves, tops and ears, hungry cattle will eat anything. Cattle should have access to good hay before turning into suspect corn fields. This permits a slower introduction to nitrates as well as reducing the total nitrate level in the daily feed intake. Limit grazing time to an hour or less for two or more periods a day. With frequent intake of small amounts of high nitrate feed, concentration of nitrate in the rumen does not become high at any one time. Do not over graze because this will force the cattle to eat the lower parts of the stalk. Fencing and water for livestock may be the limiting factor in many fields, but may be worth the effort.

Ensiling.

When drought occurs later in the growing season and yield is sufficient for proper fermentation, ensiling is the preferred option for using corn high in nitrates. One fifth to two thirds of the nitrate accumulated in plant may be dissipated during fermentation. Because fermentation takes up to 21 days, drought-stressed corn silage should not be fed for at least 3 weeks after putting the harvested material in the bunker. Before chopping drought stressed corn for silage, test for moisture. The minimum moisture content for ensiling corn suspected to be high in nitrate is 55%. Even though lower leaves may be brown, plants can contain 75 to 90% water which is too wet for acceptable silage. Moisture content influences the length of fermentation with the optimum being 60 to 65%. If drought stressed corn has pollinated, it is best to delay harvest as long as some green leaf and stalk

tissue remains and the "black layer" has not formed on the kernels. In drought-stressed situations, the corn kernels may be small or absent. If sufficient rainfall occurs for growth to resume during ear fill, the milk line will develop quickly improving grain yield and overall quality of the silage. The ideal time to harvest is when the milk line is 1/2 to 3/4 down the kernel, which occurs during the dent stage.

Nitrate Testing

"A quick field test of forage nitrate concentration can be a useful tool in deciding whether significant risk exists for harming livestock. A widely available field test kit uses 0.5 grams of diphenylamine in 20 milliliters of distilled water with concentrated sulfuric acid added to make a total volume of 100 milliliters. Nitrate test kits based on this solution are often distributed in amber dropper bottles to protect the solution from light. To test for nitrate, drop some solution onto the suspect tissue. placeSplit stems of corn and other coarse grasses and drop the solution on the inner portion near the base. Nitrate tends to accumulate there, so low levels in the lower stem generally indicate low levels throughout the shoot. Development of a blue color indicates the presence of nitrate. If a dark blue color develops within a few seconds, dangerous levels of nitrate may be present. Test multiple locations within a field to account for normal variability in plant composition. A positive response on this qualitative test should be followed up by collecting a sample for laboratory testing." Information on this test can be found at http://msucares.com/pubs/publications/p2426.pdf.

Test kits can be purchased to give a ball park estimate of the level of nitrates in the corn before harvest or in the corn after ensiling. If the kit indicates a high level of nitrates, a sample should be sent to a reputable lab for further analysis prior to feeding. Kits from several companies can be found on the internet or contact your extension office.

Different kits can report in different manner and limits as shown below. Read all instructions.

Table 1.

Nitrate (NO3) in dry matter	Feeding Instructions (summary from several sources)
0.0-0.44% or 0-4400 ppm	Safe to Feed
0.44 – 0.88% or 4400 -8800 ppm	Limit to 50% of total dry ration for pregnant animals by either mixing, dilute, or limit use of forages.
0.88 – 1.50% or 8800 to 15,000 ppm	Limit to 25% of total dry ration by mixing, dilute or limit use of forages. Avoid feeding pregnant animals.
Over 1.50% or over 15,000 ppm	Toxic. Do not feed. Plow corn under.

Table 2.

NECi Test Kits NO_3-N	Feeding Instructions
0-1500 ppm	Safe to feed
1500-4500 ppm	Caution: mix, dilute, limit forage
Over 4500 ppm	Do not feed
Nitrate N as used by US EPA	

Nitrate Elimination Co., Inc.
http://www.nitrate.com

Moisture determination for silage (Microwave Method)

This method provides a fairly accurate estimate of crop moisture but requires scales, a microwave, and being at ease with the smell of burnt corn in the microwave.

Collect a representative sample of fresh plants.

Chop the plants in 1 to 2 inch pieces.

Weight a sample (about 3 to 4 oz or 100 g). This will be referred to as the fresh weight.

Spread the sample uniformly and thinly over a microwave safe dish and place in microwave oven. Place a small amount of water in a large open vessel or cup in the microwave with the sample. This will prevent damage to the microwave and decrease the risk of the sample catching fire.

Heat for 1 to 2 minutes and weigh. Heat for 30 seconds and reweigh. Repeat until two weight recordings are similar. If the sample chars, use the previous weight. This is referred to as the dry weight.

Calculate the percent moisture. Percent moisture = [(fresh weight – dry weight)/fresh weight] x 100.

Be cautious when feeding any drought stressed forages for grazing, hay or silage.