UNIVERSITY OF FLORIDA
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DS22

Managing Drought-Stressed Corn for Silage [1]

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Harvesting Guidelines

Occasionally a year's corn crop falls substantially short of the harvest we've become accustomed to. Still, valuable nutrients remain to be salvaged for feeding purposes. While yields may be reduced, the plants can still be harvested and utilized with some additional attention. In a normal year about one week after pollination has occurred, small white blisters will start to form on the cob. These early kernels will continue to develop to maturity if water is available. Delay the harvest if most of the stalks have ears, even if the leaves are turning brown. The extra water in stalks and leaves will allow the kernels to continue to increase in weight. If the stalks have only a few ears, don't delay the harvest once the leaves die and start to drop off.

Toxicity Danger

Animals

Some growers may be tempted to graze or greenchop the corn. This is not recommended because the risk of nitrate-nitrite toxicity is too great. Nitrates accumulate in the plant only if there is a large amount of nitrate in the soil (caused by fertilizing with nitrates) and something interferes with normal plant growth (drought). A good shower on droughted plants will cause the plant to take up soil nitrates quickly.

If it is harvested and fed to animals soon afterward, toxicity can occur. Ruminants consuming nitrates reduce them to nitrites which are absorbed and can cause toxicosis. Moderate levels of nitrite can be tolerated, but high concentrations overwhelm the animals' system, causing a decreased ability of the blood to carry oxygen.

Symptoms of nitrite toxicity include increased pulse rate, quickened respiration, heavy breathing, muscle trembling, weakness, staggered gait, blindness, and even death. If the blood is sampled, it will be a chocolate brown color rather than bright red.

If drought-stricken corn plants are to be used as feed, have them analyzed for nitrates. Laboratory analyses may be reported in several ways. Equation 1 shows how you can calculate nitrate nitrogen:

$$\text{Nitrate } (NO3) \times .23 = \text{nitrate nitrogen}$$
$$\text{Potassium nitrate } (KNO3) \times .14 = \text{nitrate nitrogen}$$
$$\text{Sodium nitrate}(NaNO3) \times .16 = \text{nitrate nitrogen}$$

Equation 1.

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Feeding guidelines for feedstuffs containing different concentrations of nitrates are in Table 1 . High energy feeds such as grains are best to feed in conjunction with high nitrate silages.

An excellent way to reduce the nitrate level in plants is to ensile them. One-fifth to two-thirds of the nitrate may be eliminated during the ensiling process. Wait three weeks after ensiling before feeding the silage so that the fermentation process can be completed. The amount of moisture in the plant will affect the length of fermentation. Corn ensiled at less than 55% moisture will undergo less fermentation and less nitrates will be converted. Dry corn doesn't pack well. Air is trapped, which causes heating and molding to occur, instead of proper fermentation. Adding water at ensiling may improve the fermentation process.

An additional way to reduce the nitrate levels is to harvest the corn a little higher from the ground than normal as the lower third of the stalk contains the highest concentration of nitrates. See Table 2 .

Humans

While nitrate-nitrogen may harm livestock at 4,000 parts per million (ppm), nitrogen dioxide levels as low as 25 ppm can be toxic to humans. Nitrogen dioxide comes from nitrate-nitrogen during fermentation. Most gases are produced 3-4 days after filling the silo, but the production of gases begins within 2 hours. Concentrations of 25 ppm are invisible and can't be smelled. When concentrations of nitrogen tetroxide reach 100 ppm, the gas appears yellowish brown and smells like laundry bleach. It will leave a yellow stain on most material it contacts. If inhaled, nitric acid forms in the lungs where it can quickly corrode the tissues. Do not enter a tower silo without first running the blower for at least 10-15 minutes. Follow this procedure for at least the first 2-3 weeks alter filling.

Feeding

Silage made from corn having no ears or partially filled ears have 65~80% the value of normal corn silage on a dry matter basis. Typical nutrient compositions of various weather-damaged corn silage is in Table 3 . As drought damage intensifies, energy content decreases and protein content increases. Be sure to test your corn for its chemical content in order to take advantage of its higher crude protein content.

Avoid feeding urea or urea-containing feeds with drought-stressed corn. Much of the nitrogen in the leaves and stalks is very soluble, similar to urea. This soluble nitrogen is converted to ammonia quickly in the rumen and can be excreted in the urine without providing any benefit to the animal.

Supplementing drought-stressed corn with plant or animal protein such as peanut or soybean meal will often result in better animal performance. Table 4 compares the feeding value of normal and droughted corn supplemented with either urea or soybean meal for steer gains.

Steers receiving normal corn silage performed similarly to those receiving drought-stressed corn silage. Urea was effective in improving daily gain when fed with normal corn silage but was ineffective when fed with droughted corn silage. Soybean meal supplementation was most beneficial.

Summary

1. Drought-stressed corn can usually be salvaged as a usable feed although nitrate toxicity can pose a serious problem for animals.
2. Ensiling the plants will usually reduce the amount of nitrate-nitrogen by one-fifth to two-thirds.
3. Properly sample and test the plants for nitrate-nitrogen. Adjust the ration to keep nitrate levels below 0.4% of ration dry matter.
4. Nutritive value of drought-stressed corn will generally be 65-85% of normal corn. Feed plant or animal protein sources with droughted corn rather than urea for optimum animal performance.

Table 1.

Table 1. Nitrate nitrogen levels and corresponding feeding guides		
Percent*	Parts per million	Feeding guide
0.0 to 0.3	3000	Gradually introduce feed
0.3 to 0.5	3000 to 5000	Limit silage to à of total ration dry matter
over 0.5	5000	Limit silage to 1/4 of total ration dry matter
* Dry matter basis		

Table 2.

Table 2. Nitrate in drought-affected corn	
Plant part	ppm of No_3-N
Leaves	64
Ears	17
Top 1/3 stalk	153
Mid 1/3 stalk	803
Lower 1/3 stalk	5524
Weighted average	978
Source: Walsh and Schulte. 1970. Soils Dept., Univ. of Wisconsin	

Table 3.

Table 3. Nutrient composition of various corn silages.				
	DM1	CP2	ADF3	TDN4
Type of silage	(%)	..... % dm basis		
Normal, dent stage	35	8.5	28	68
Drought-stressed, few ears	30	9.9	36	60
Drought-stressed, no ears	22	11.0	40	56
[1] Dry matter	[2] Crude protein	[3] Acid detergent fiber	[4] Total digestible nutrients	

Table 4.

Table 4. A comparison of normal and drought-stressed corn silage rations for growing steers.

Forage	Nitrogen Supplementation	**Daily Gain(lb. per day)**	lb. Of Feed per lb. of Gain
Corn silage	None	1.03	11.9
	Urea	1.64	8.3
	Soybean meal	1.81	7.7
Drought-damaged	None	1.08	12.4
Corn silage	Urea	1.18	11.9
	Soybean meal	1.47	9.8

Source: Krause et. al. 1976. Nebraska Beef Cattle Report.