Nitrate Toxicity Issues in Barren Corn

The risk of nitrate poisoning increases as pollination becomes poorer. **Nitrate problems are often related to concentration** (i.e. the greater the yield the less chance of high nitrate concentration in the forage). If pollination is poor only about half of the dry matter will be produced compared to normal corn forage.

Let the plant tell you whether nitrates are a problem. Nitrates absorbed from the soil by plant roots are normally incorporated into plant tissue as amino acids, proteins and other nitrogenous compounds. Thus, the concentration of nitrate in the plant is usually low. The primary site for converting nitrates to these products is in growing green leaves. In grasses, nitrates accumulate at the base of the main shoot. If nitrates are accumulating then new growth (tillers) will likely be visible near the base of the plant.

Under stressful growing conditions, especially drought, this conversion process is slowed, causing nitrate to accumulate in the stalks, stems, and other conductive tissue. If moisture conditions improve, the conversion process accelerates and within a few days nitrate levels in the plant returns to normal.

Check fields affected by drought that have plants stunted with significant firing. Nitrate toxicity will likely be a problem if growth is reduced to less than 50% of normal and/or high levels of nitrogen were applied.

Raising the bar

If you suspect an issue, then raise the cutter bar. The highest concentration of nitrates is in the lower part of the stalk or stem (Table 1), so raising the cutter bar on a corn silage chopper will leave most nitrates in the field. Depending upon farm forage needs, raising the cutter-bar on the silage chopper reduces yield but increases quality. For example, raising cutting height reduced yield by 15%, but improved quality so that Milk per acre of corn silage was only reduced 3-4% (Lauer, 1998). In addition the plant parts with highest nitrate concentrations remain in the field.

Table 1. Nitrate nitrogen of corn plant parts harvested for silage.	
Plant part	NO3N
	ppm
Leaves	64
Ears	17
Upper 1/3 of stalk	153
Middle 1/3 of stalk	803
Lower 1/3 of stalk	5524
Whole plant	978
derived from Hicks, Minnesota	

Nitrates are reduced through ensiling
Nitrate concentration usually decreases during silage fermentation by one-third to one-half, therefore sampling one or two weeks after filling will be more accurate than sampling during filling. If the plants contain nitrates, a brown cloud may develop around your silo. This cloud contains highly toxic gases and people and livestock should stay out of the area. The only way to know the actual composition of frosted corn silage is to have it tested by a good analysis lab.

It is prudent to follow precautions regarding dangers of nitrate toxicity to livestock (especially with grazing and green-chopping) and silo-gasses to humans when dealing with drought-stressed corn.

Nitrate testing
If drought-stressed corn is ensiled at the proper moisture content and other steps are followed to provide good quality silage, nitrate testing should not be necessary. It is always prudent to test or feed to a few cull cows.

Samples taken for nitrate test must be frozen or analyzed immediately as nitrate will decline in tissue over 3 to 4 hours. If above toxic, levels feed hay or some other forage in the morning and graze corn a couple hours in the afternoon.

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Literature Cited

Lauer, J. 1998. Silage Yield and Quality Trade-Offs When Changing Cutting Height. Agronomy Advice. December, 1998. Field Crops 28.47-20.