Nitrates in Corn and Forages

Dry and/or droughty conditions in areas of the region are once again prompting concern for nitrate levels in the drought affected forages.

High levels of nitrates in the diet of animals can lead to methemoglobinemia, in which some of the blood hemoglobin is converted to methemoglobin. With methemoglobin the oxygen is bound so tightly to the compound that it no longer will act as an oxygen carrier. In humans this is know as “Blue Baby Syndrome”.

In Plants
Nitrates taken up by plants are reduced to organic compounds in the leaves. The first step in the process is the enzyme nitrate reductase, just as in the cow’s rumen. High temperatures and drought combine to reduce the activity of the enzyme; nitrate then accumulates in the plant. Other factors that can influence nitrate accumulation are: excessive soil N, low temperature, nutrient deficiencies other than N, shading, cloudiness, frost, hail damage and in some cases growth regulator herbicides like 2,4-D or Dicamba.

The problem becomes severe when drought (or frost) is severe enough to produce dead leaves. There is insignificant nitrate reductase produced to reduce the nitrates to organic N. Nitrates tend to be particularly high the first few days after a drought-breaking rain. Forage should not be fed green-chopped at this time. If the forage survives the drought, the nitrate level should drop to normal levels in about two weeks.

Nitrate in Feedstuffs

- Nitrate toxicity is greatest when the total ration lacks energy, minerals and vitamins.
- Usual dry matter intake of dry cows and heifers is 2 pounds per hundred pounds of body weight and 3-4 pounds per hundred for milking cows.
- Grains and legume forages are low in nitrate. The stalks and leaves of corn, sorghum, small grains and sudan grass grown on soils with excess N are also apt to be high in nitrate. Use low-nitrate feeds to dilute the high-nitrate feeds. High nitrate water adds to the problem.
- Nitrate is highest in the bottom of the stalk and is less in the top of the stalk and leaves. Chopping the total plant decreases the chance of the animal eating only the high-nitrate stalks. Pasturing on stalks can be a serious problem.
- Cutting high to leave the highest nitrate tissue in the field (+/- 10”), this lowers tonnage harvested significantly but it will also be lower in nitrates.
- Ensiling the crop decreases nitrate levels. Some nitrate is lost as silo gas. Between 30 and 60 days after ensiling, the nitrate level should have decreased to half of the original amount.
Guidelines for Use of Feedstuffs

<table>
<thead>
<tr>
<th>Nitrate-N Content</th>
<th>Guidelines – Feeding (DM Basis)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below 1000ppm</td>
<td>Safe</td>
</tr>
<tr>
<td>1000-2000ppm</td>
<td>Limit to 1/2 total ration</td>
</tr>
<tr>
<td>2000-3000ppm</td>
<td>Limit to 1/3 total ration</td>
</tr>
<tr>
<td>3000-4000ppm</td>
<td>Limit to 1/4 total ration</td>
</tr>
<tr>
<td>&gt; 4000ppm</td>
<td>Ensilage to reduce nitrate level</td>
</tr>
</tbody>
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Testing For Nitrates

If you suspect that your fresh-chopped forage or silage is high in nitrate as sample should be sent for testing. Most commercial labs that do feed analysis will also do nitrate testing!

How to Sample

Silage:
1. Take samples directly from silo or bunker.
2. Dig down 2-3 feet in 6 or more places; take a handful from each location.
3. Mix well and remove about ½ lb. for testing.

Green-Chopped Forage
1. Collect several handfuls from different loads or different parts of same load.
2. Mix well; take about ½ lb. for testing.

Standing Corn or Sorghum
1. Cut at least 15 whole plants taken at random
2. Cut plants at same height as you intend to chop
3. Chop plants in t ½ in lengths and mix well
4. Remove: ½ lb for testing

Packing and mailing samples

Fill out appropriate information sheet
Mail immediately, Monday or Tuesday only. DO NOT SEND OVER WEEKEND

OR

Pack sample in airtight plastic bag and freeze for 24 hours. Insulate with newspaper and mail to lab. Again don’t mail over a weekend!
OR

Spread sample on clean newspaper. Dry rapidly with artificial heat (not to exceed 160°F). Place in paper bag and mail to lab.

Yield Estimating

Based on Grain Yield

For moisture stressed corn, about 1 ton of silage per acre can be obtained for each 5 bushels of grain. For example if you expect a grain yield of 40 bushels/acre you will get about 8 tons/acre of a 30% DM silage or 2.4 tons/acre DM yield.

For corn expecting to yield more than 100 bushels: 1 ton of silage/acre for each 6-7 bushels of expected grain yield. Corn yielding 125 bushels of grain, silage yields will be in the 18-20 ton range giving a DM yield of 5-6 tons/acre.

Based on Plant Height

If little or no grain is expected, a rough pre-harvest estimate of yield can be made by assuming that 1 ton of 30% DM silage can be obtained for each foot of plant height (excluding tassel).

Waist high corn (3-4 foot) will produce approximately 3-4 tons, about 1 ton/acre DM.

Todd L. Cardwell
tlcardwell@landolakes.com
Agronomist
WinField Solutions, LLC
612-889-6358

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