Feeding Risks from Drought Impacted Feeds and Forages

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Topics for Today

• Overall forage quality
• Nitrate toxicity
  • Small grains, corn, sorghum/sudan, weeds
• Prussic acid poisoning
  • Sorghum family
### Drought-Stressed Forages: Overall Quality

- Inhibition of growth
- Legume quality may increase
  - Leaf growth decreases less than stem growth
- Grass quality may decrease
  - Stem:leaf increased

### Nitrate Toxicity
What Plants Accumulate Nitrate?

• Annual small grain crops – wheat, barley, millet, oats
• Corn
• Sorghum, sudangrass
• Weeds
  • Redroot pigweed, common lambsquarters, kochia, wild sunflower, Russian thistle, witchgrass, Canadian thistle, black nightshade

Where Do Plants Accumulate Nitrate?

• Highest concentration in stem or stalk
  • Especially lower portion
• For example, lower third of a corn stalk will have the highest nitrates compared to middle or top third
Plant Nitrate Metabolism

- Nitrate uptake is a normal part of plant metabolism
- Nitrate is converted to nitrite, which is then converted to ammonia for protein synthesis

\[
\text{NO}_3^- \rightarrow \text{NO}_2^- \rightarrow \text{NH}_4^+
\]

Nitrate and Drought

- Drought conditions favor nitrate accumulation
- Conversion to ammonia occurs in leaves
  - If leaves negatively impacted by drought, nitrate accumulates
Ruminant Nitrate Metabolism

• Nitrate conversion pathway is exactly the same in rumen as in plants
• High nitrate concentrations overwhelm conversion pathway from nitrite to ammonia

\[
\text{NO}_3^- \rightarrow \text{NO}_2^- \rightarrow \text{NH}_4^+ 
\]

Nitrate Toxicity

• Nitrite ion competes with oxygen for red blood cells
• Nitrite converts hemoglobin to methemoglobin
• Methemoglobin is incapable of oxygen transport
### Chronic Nitrate Toxicity Symptoms
- Reduced appetite
- Reduced milk production
- Rough hair, unthrifty appearance
- Weight loss or no weight gain
- Abortion

### Acute Nitrate Toxicity Symptoms
- Accelerated pulse rate
- Labored breathing
- Muscle tremors
- Weakness, staggering gait
- Cyanosis
- Death
Small Grains and Sorghum/Sudan

- Test suspect forages
- If concentrations are high
  - Dilute with other, low-nitrate forages
  - Avoid feeding to more susceptible animals
  - Find a feedlot full of steers
  - Worst case scenario: marshmallow roast

Considerations for Corn

- Highest nitrate accumulation where drought occurs during heavy uptake
  - Drought during or immediately after pollination → potential high nitrate
  - Drought before pollination → probably okay
Ensiling Drought-Stressed Corn

- Nitrate dissipates during fermentation of silage
  - Should wait at least 3 weeks to feed
- Moisture a concern
  - If ensiled at less than 55% moisture, less fermentation, less nitrate breakdown

Feeding Value of Drought-Stressed Silage

- Drought results in no or partial filling of the ear
  - 90-100% of feeding value of normal silage
- Higher cob:grain means increased fiber and decreased energy
### What About Shelled Corn?

- Drought-stressed shelled corn has 92-100% of normal feeding value
  - Lower test weight
  - Market discounts for low test weight may be greater than decrease in feed value

### Drought-Stressed Corn Stalks

- Cattle prefer grazing leaves and husk
  - Lower in nitrate
- Drought-stressed stalks may be stunted
  - Cattle will eat lower on the stalk where nitrate is higher
Drought-Stressed Corn Stalks

- Also a concern for corners and edges of drought-stressed irrigated corn
- Producers may leave cattle on stalks longer due to feed shortage
  - Forces stalk consumption

Suggestions for Grazing Drought-Stressed Cornstalks

- Don’t turn cattle in hungry
- Fence out pivot corners and edges where plants severely stressed
- Pull cattle as soon as they’ve eaten most of the leaves and husks
- Consider dosing with nitrate-utilizing bacteria bolus 7-10 d before turnout
What About Weeds?

- Nitrate peaks at pre-bud to bud stages
- Nitrate concentration decreases as weeds mature

Prussic Acid Poisoning
Prussic Acid Poisoning

- Drought-stressed plants produce cyogenic compounds
- In the rumen, converted to cyanide
- Concentrations greater than 0.1% of dry plant tissue considered highly dangerous

Prussic Acid Poisoning

- Symptoms can show within 5 minutes of consumption, death can occur within 15 minutes
- Salivation and labored breathing, followed by muscle tremors, incoordination, bloat, convulsions
- Death from respiratory failure
Prussic Acid Poisoning

- May be associated with periods of rapid growth
  - Shortly after rain or irrigation on previously drought-stressed plants

Preventing Prussic Acid Poisoning

- Don’t graze drought-stressed sorghums unless tested for hydrocyanic acid
- Graze second-growth sorghum with caution if poor conditions
- Wait 2 weeks after drought-ending moisture to graze
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