Forage Nitrate and Prussic Acid Screening Tests

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Substances that can accumulate in certain forages and cause poisonings in livestock.

Nitrate Accumulators (pigweed, Johnsongrass, Sorghums, .)

Prussic Acid (Sorghums, Johnsongrass)

This presentation reviews the toxins, animal response, and two testing options.
Nitrate metabolism in Plants

- Nitrates are a normal part of plant metabolism. However, stressful growing conditions can lead to abnormal levels.

- Nitrate absorbed by plants
- Reduced to nitrite
- Reduced to ammonia
- Used in amino acid formation
- Ends up as plant protein
Nitrate Metabolism in the Rumen

- Nitrate (NO₃) → Nitrite (NO₂) → Ammonia (NH₃) → Amino Acid → Protein

- Too much nitrate, nitrite builds up, is absorbed, causes hemoglobin to be converted to methemoglobin, which is unable to transport oxygen.
Oxygen deprivation causes a bluish color of the mucous membranes of stricken animals.

The blood is chocolate-brown in color due to methemoglobin formation.
Animal Handling

- Acclimate to nitrate level
- Older animals less sensitive
- Handle calmly
Prussic Acid

- Dhurrin is a cyanogenic glycoside in plants of the *Sorghum* genus.

- Dhurrin is broken down with cytosolic enzymes upon plant damage (wilting, drought, frost, trampling, etc).
Prussic acid (hydrocyanide, HCN) is released can build up in plants

Hydrocyanide interferes with the ability of animal cells to receive oxygen from the blood.
Sample Collection

Nitrate Test – stems and new growth
Prussic Acid Test – collect leaves
Nitrate Test
Dry, grind, and weigh the sample

- Microwave oven
- Coffee grinder
- Pencil scale
Nitrate Test

Soak sample in water for 30 min
Check for color reaction and compare strips to chart of nitrate concentration.
Prussic Acid Test
Sample processing

- With bag partially closed, use scissors to cut leaves into pieces
- Cut a short piece of the Cyantesmo test paper and add to the bag
- Close the bag
- Read the test strip within 5 minutes
Prussic Acid
Sample incubation
Positive Control – choke cherry
Results

- One of the 6 fields tested showed elevated levels of prussic acid (slight positive)

- None of the 6 fields tested showed elevated levels of nitrates
Conclusions: Field Tests...

- Easy to conduct and can be done with items commonly found on the farm
We learned more
Producers have testing options
Safe? Field tests said yes. Lambs agreed.
Improved confidence in grazing forages
Prussic Acid and Nitrate Poisoning Fact Sheets. Oklahoma State University.

Prussic Acid and Nitrate Testing
- Bob LaValle, Oklahoma State University
- Paul F. Vendrell, University of Georgia