

Forage Nitrate and Prussic Acid Screening Tests

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Nitrates and Prussic Acid

- 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 (NO_3) \longrightarrow Nitrite (NO_2) \longrightarrow Ammonia (NH_3) \longrightarrow Amino Acid \longrightarrow 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

- 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

The background of the slide is a photograph of a field with various green plants. A wooden ruler is visible in the upper center, showing measurements in inches (10, 11, 12, 13) and centimeters. The ruler has the name 'SCOTT' and the number '6' visible. The plants include broad-leafed species and narrow-leafed grasses.

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

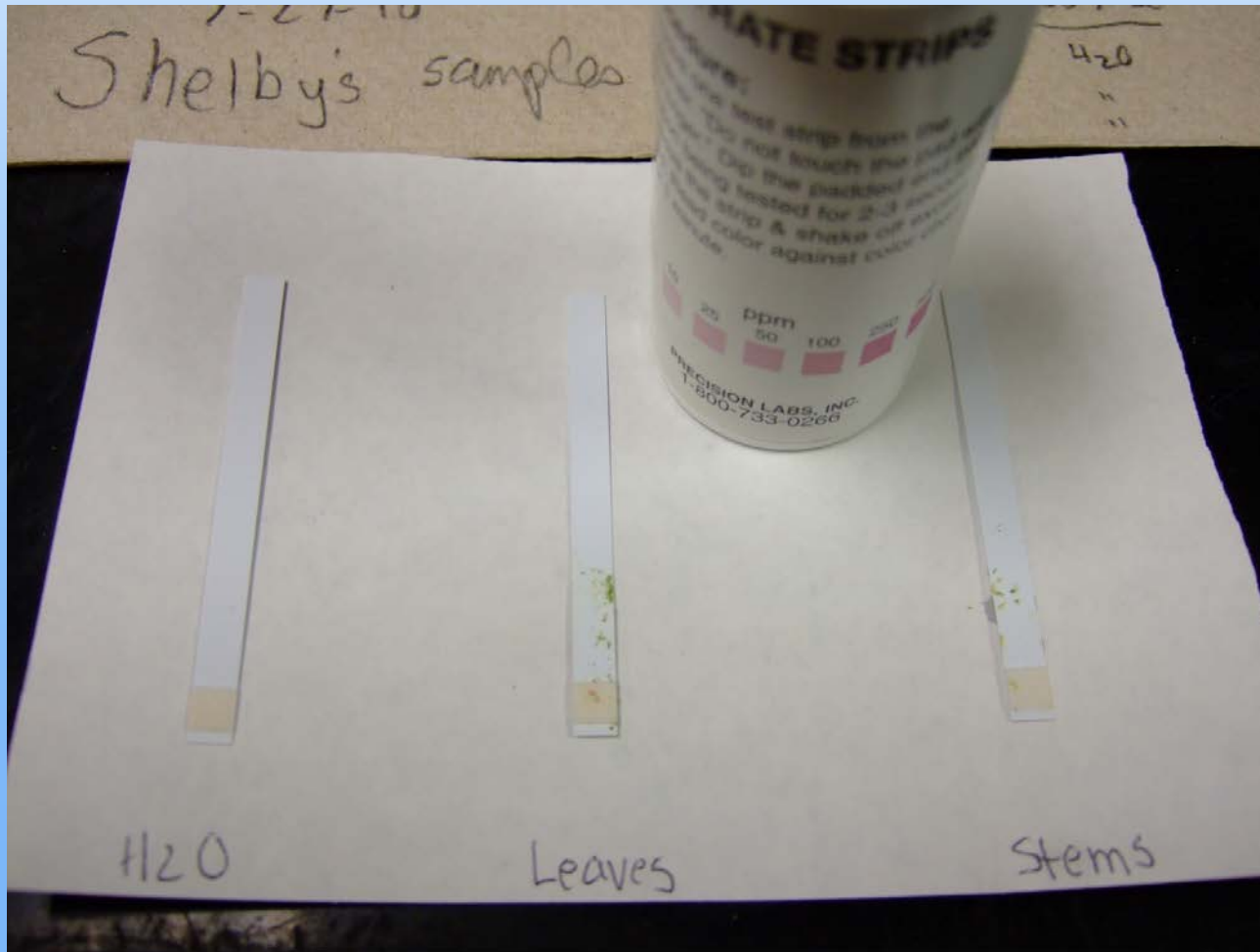


Nitrate Test

Soak sample in water for 30 min



Check for color reaction and compare strips to chart of nitrate concentration



Prussic Acid Test

Sample processing



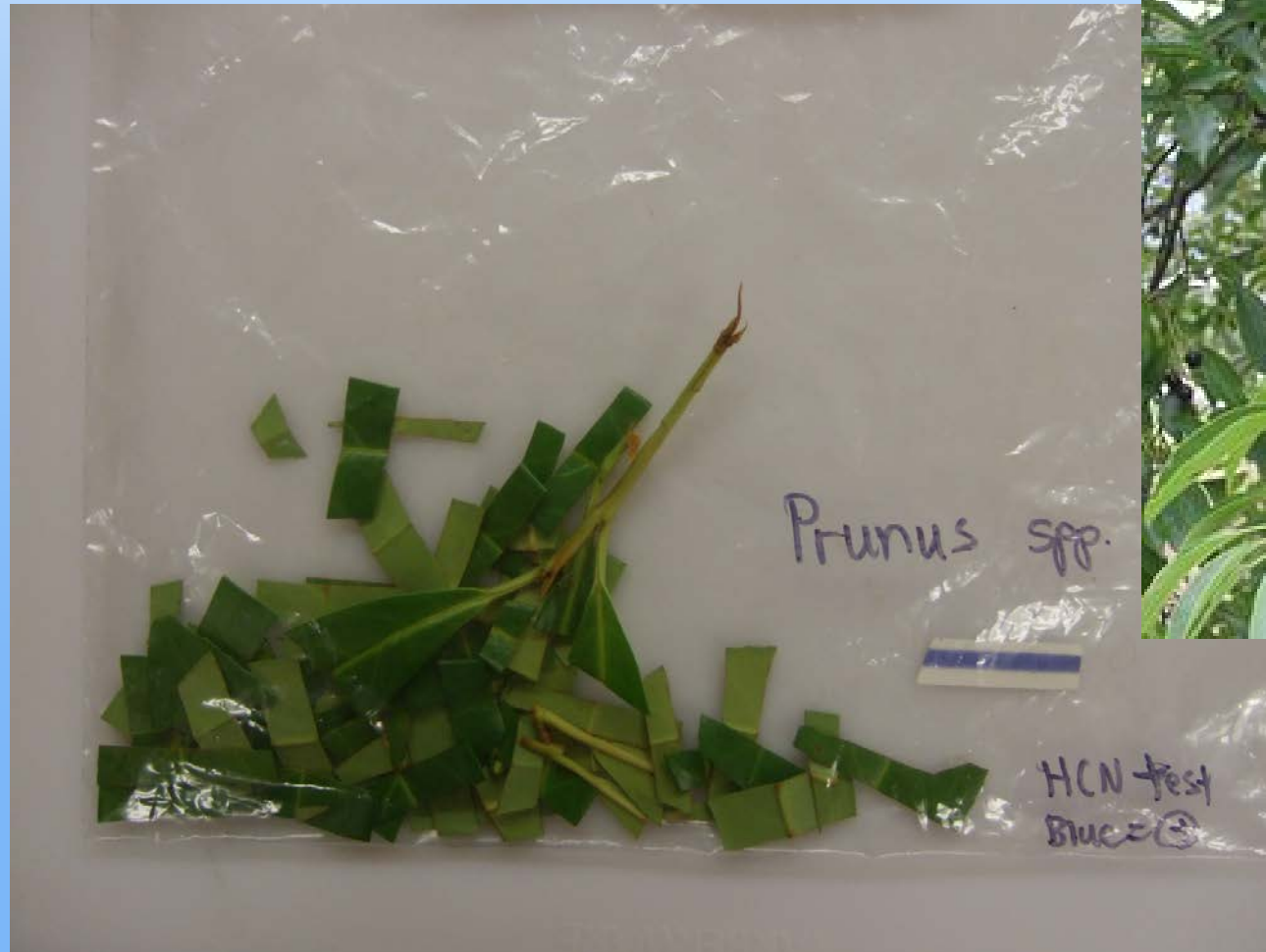
- With bag partially closed, use scissors to cut leaves into pieces
- Cut a short piece of the Cyantesmo test paper and add to the bag
- Close the bag
- Read the test strip within 5 minutes

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

References

- 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