AS1256 (Revised)

Stressed or Damaged Crops

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Stressed crops resulting from unfavorable weather conditions require special management considerations. Yield and quality of frost- and drought-damaged crops usually are maximized when harvested as silage.

This is also true for crops that are immature due to late planting or from poor growing conditions.

Frost-damaged

Frost-damaged corn for silage can be classified two ways:

- **Immature** – If the killing frost occurs before the plant is mature, it will appear drier than nonfrosted corn of the same moisture content. Although leaves may brown along the edges and dry rapidly after a few sunny days, the green stalk and ears do not. Make sure the moisture of the whole plant is not greater than the optimum range of 63 to 68 percent.
- **Mature** – If the killing frost occurs after the plant has reached maturity, indicated by the black layer on the kernel, the whole-plant moisture content will fall rapidly. A finer chop of ¼-inch should be considered and water added if the corn cannot be ensiled before the moisture drops below 60 percent. Although yield per acre is reduced, high-quality silage still can be harvested from frost-damaged corn.

Forage sorghum that is frost-damaged should be managed similarly to frost-damaged corn. Producers should be alert to the problem of prussic acid poisoning and the rapid drying of mature plants.

Alfalfa is more likely to cause bloat if it is grazed or fed as green chop immediately after a frost. However, alfalfa that is mowed, wilted and stored as haylage is not likely to cause bloat.

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Drought-damaged

Depending on severity, drought usually requires a choice between two management options:

- If the plant is not going to resume growth following a long drought, it should be ensiled as soon as possible. Delaying ensiling will lower quality and yield.
- A shorter, less severe drought usually will result in plant immaturity at harvest time. The plant will appear to be drier than it actually is, so check plant moisture.

Although yields of drought-damaged corn can be quite low, the feeding value of the silage is 75 to 90 percent of normal corn silage. Drought-stressed alfalfa generally will exhibit lowered yields with reduced stem growth and a higher leaf-to-stem ratio. This produces a crop with above-normal protein content and below-normal fiber levels. Ration adjustments may be required.

Moisture levels should not exceed recommended ranges and use caution concerning potential nitrate problems.

Nitrates

The potential for high nitrate levels occurs when crops, such as corn, sorghum and some grasses, are exposed to stress situations, including drought, hail, frost, cloudy weather and fertility imbalance. Nitrates accumulate in the lower portion of the plant when stresses reduce the crop yield to less than the supplied nitrogen fertility level. Nitrates are responsible for lethal silo gas and interfere with the ability of blood to carry oxygen when fed to animals.

When chopping stressed plants, a 12-inch stubble should be left. If rain falls during chopping, allow three days before resuming chopping.

Plants that recover from stress situations eventually will convert nitrates into a nontoxic form. As a general recommendation, feeding programs should be modified if silage contains more than 1,000 parts per million (ppm) of nitrate nitrogen. Feeding stressed crops as silage rather than green chop is best because fermentation can reduce nitrate levels by approximately 50 percent.

If the crop has been stressed or shows a marked reduction in grain content, a forage nitrate analysis is advised (Table 1).

Ruminants can be fed higher-nitrate feeds if the rumen bacteria are given time to adapt by gradually increasing the volume of high-nitrate feed in the ration. Problems also can be reduced by diluting the stressed silage with other feeds and avoiding the use of nonprotein nitrogen sources, such as urea or ammonia.

For a more detailed discussion on nitrate poisoning, see NDSU Extension Service publication V839, "Nitrate Poisoning of Livestock." It's available online at *www.ag.ndsu.edu/pubs/ansci/livestoc/v839.pdf.*

Table 1. Nitrate levels in forages for cattle.

Nitrate Ion	Nitrate Nitrogen	Recommendations
(%)	(ppm)	
0.0 - 0.44	<1,000	Safe to feed under all conditions.
0.44 - 0.66	1,000 - 1,500	Safe to feed to non-pregnant animals. Limit use for pregnant animals to 50% of total ration on a DM basis.
0.66 - 0.88	1,500 -2,000	Safely fed if limited to 50% of the total DM ration.
0.88 - 1.54	2,000 - 3,500	Feeds should be limited to 35 to 40% of the total DM in the ration. Feeds in excess of 2,000 ppm nitrate nitrogen should not be fed to pregnant animals.
1.54 -1.76	3,500 - 4,000	Feeds should be limited to 25% of total DM in the ration. Do not feed to pregnant animals.
Over 1.76	>4,000	Feeds containing these levels are potentially toxic. DO NOT FEED.

Adapted from: Cornell University

Prussic acid

Prussic acid accumulates in sorghum and sundangrass that grows rapidly following stress. Poisoning occurs when animals graze young sorghum plants, drought-stunted plants, or damaged or stressed plants.

Sorghum plants are poisonous after a frost that kills the tops but not the crown, or when new growth is brought on by a rain following a drought. If new shoots develop after a light frost, grazing should not occur until after a killing frost.

Minimum plant growth for safe grazing, green chopping or silage making is 18 inches for Piper sudangrass and 30 inches for sorghum-sudangrass. Forage sorghums should be headed out. If crops are hit by a frost at these stages, producers should wait three days before grazing or ensiling. If the plants are frosted before these maturity stages, two weeks should be allowed before ensiling.

The ensiling process does not decrease the prussic acid level in sorghum silage; however, field curing or drying will release 50 to 70 percent of the prussic acid.

For a more detailed discussion on prussic acid, see NDSU Extension Service publication V1150, "Cyanide Poisoning." It's available online at *www.ag.ndsu.edu/pubs/ansci/livestoc/v1150.pdf*.

Other Management Considerations for Stressed Crops Are:

- Soil fertility with high nitrogen/low phosphorus increases the risk of high nitrates and prussic acid.
- Drought or stressed silage should ferment a full three weeks before feeding.
- High-nitrate feeds cause fewer problems if cattle are fed more frequently than normal.
- Silo gas is most common in high-nitrate silage, but caution always should be exercised. Silo gas can be brownish, yellowish, reddish or colorless and is lethal to humans and livestock. Silo gas is heavier than air and it often descends silo chutes. The blower should be run for 15 minutes before entering a silo. If a person is exposed to silo gas, a doctor should be consulted immediately.
- Test-feeding a limited amount of suspected problem silage to less-valuable animals will prevent a major catastrophe, but a preferred course of action is to obtain a post-ensiling forage analysis and consult a nutritionist or Extension agent for feeding recommendations.
- Do not feed green chop that has heated after cutting or that has been held overnight. Heating favors the formation of nitrite, which is more toxic than nitrate.
- Drought-stressed small-grain forages and other forages suspected of being high in nitrates should be tested before feeding.

If you have questions about submitting samples to a laboratory for analysis, you can contact the North Dakota State University Veterinary Diagnostic Laboratory at (701) 231-8307 or visit the its website at www.vdl.ndsu.edu.

Other publications in the Quality Forage series

- AS1250 "Forage Nutrition for Ruminants"
- AS1251 "Interpreting Composition and Determining Market Value"
- AS1252 "Haylage and Other Fermented Forages"
- AS1253 "Corn Silage Management"
- AS1254 "Silage Fermentation and Preservation"
- AS1255 "Storage, Sampling and Measuring"

References

In addition to sources cited, materials were adapted with permission from Pioneer Forage Manual, which no longer is in print.

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