



# FORAGE FACTS

*Publication Series*

## AMMONIA TREATMENT OF LOW QUALITY FORAGES

### INTRODUCTION

Millions of tons of crop residue and other poor quality forages are produced every year in the United States. However, because of their bulkiness, relatively low energy and protein contents and overall feeding value, relatively little of this abundant feed source is utilized for livestock. Ammoniation is a procedure designed to increase the energy availability of low quality forages such as wheat, barley and oat straw, corn or grain sorghum stover, and very mature warm-season grasses. Research over the last few decades has clearly demonstrated that ammonia treatment of low quality roughages will substantially improve digestibility, voluntary intake and cattle performance. Most forages less than 5 percent crude protein and 45 percent TDN on a dry matter basis are candidates for ammonia treatment.

#### HOW DOES AMMONIATION IMPROVE FORAGE FEEDING VALUE?

Ammoniation increases the digestibility of crop residues and grass hays by breaking lignin-cellulose bonds in plant fiber, thereby swelling the plant tissue to allow greater microbial activity, and improving dry matter digestion (TDN) 8 to 15 percentage units.

Ammoniation boosts feed intake 15 to 20 percent or more because of improved forage digestibility and increased rate of passage through the digestive tract.

Ammoniation usually doubles crude protein content by being a non-toxic source of non-protein nitrogen (NPN) and it is well utilized by calves and cows.

Ammoniation preserves forage that contains up to 25 to 30 percent moisture because it kills molds and fungi and prevents heating which reduces feed losses.

#### TECHNIQUES OF AMMONIA APPLICATION

The most common and consistently successful means of treating dry forages with ammonia has been to cover the material with 6 mil black plastic sheeting, sealing the plastic against the ground with dirt, crushed rock or other material. Enough fill should be placed to keep the plastic from being pulled loose by

winds and when the ammonia gas fills the stack cover like a balloon. Apply the ammonia slowly (for three to five hours) into the center of the stack at the rate of 3 percent (60 pounds of anhydrous ammonia per ton of dry forage). Producers should weigh a few bales to estimate gross weight of the stack. If the moisture content is 15 percent, dry matter weight will be 85 percent of the gross weight. A slow application of ammonia is best as it permits the liquid to fully volatilize, reducing the amount lost in the soil.

Producers should build the stack and estimate the total dry forage for treatment. The exact amount of anhydrous ammonia can be ordered, and the ammonia can be applied until the tank is empty. After starting the application, producers should check the cover for leaks and apply duct tape to any holes in the plastic.

For best results, crop residues and other forages should be covered and ammoniated as soon after harvesting as possible to minimize weathering and dry matter losses and to maximize feed value. The time needed for maximum treatment effect may range from only a few days in 90°F plus weather to 30 to 45 days during cold winter temperatures. Anhydrous ammonia will seek the moisture in the stacked forage which aids

in the uniform spread of the ammonia. Eight to 10 percent is an adequate forage moisture content, but 15 to 25 percent is preferred. The ammoniated stack should remain covered until two weeks prior to feeding when the cover is opened to allow bales to air out to reduce the concentration of residual ammonia.

#### SAFETY CONSIDERATIONS

Anhydrous ammonia is maintained under pressure and can be dangerous. If misused, it can burn skin, eyes or throat and can explode and burn. Follow these precautions:

- Wear goggles, rubber gloves and protective clothing.
- Work upwind when releasing anhydrous ammonia.
- Have fresh water available to wash off any anhydrous ammonia that comes in contact with the skin.
- Check all valves, hoses and tanks for leaks.
- Check the plastic cover on the stack for leaks and seal any holes with duct tape.
- Do not smoke near anhydrous ammonia.
- Keep children away from the treatment area.

The possibility of ammonia toxicity with cattle fed ammonia-treated forages appears remote. Studies have been conducted with application rates of over 6 percent ammonia to dry forages without illness or harmful side effects to ruminants. The ammonia odor of freshly uncovered treated forages also acts as a safety factor. Research has shown that animals will not eat ammonia-treated crop residues unless they are aerated or mixed with a fermented feed so that the silage acids neutralize the ammonia. Ammoniated forages should have the end of the plastic cover removed and allowed to aerate for two weeks prior to feeding.

#### SUMMARY

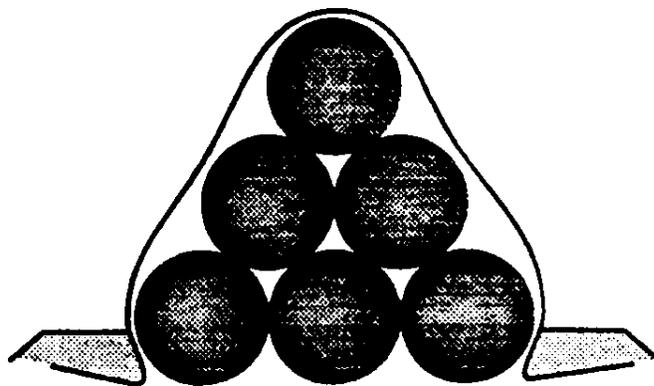
Ammonia treatment is a very effective means of markedly increasing the feeding value of poor quality forages. Large crop acreages offer an almost unlimited supply of crop residues which can be transformed into relatively nutritious forages with the potential of improving the economy of cattle production.

#### OTHER PUBLICATIONS:

Ammoniated Straw as an Emergency Feed  
(Available by calling 785-532-1267)

Ammoniation of Dry Forages for Beef Cattle  
(Available by calling 785-532-1267)

Emergency and Supplemental Forages (MF-1073)



*When treating big round straw bales, backfill over at least 12 inches of plastic cover.*

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