Ridin' Herd

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Ammoniating crop residues as a feed resource

This past winter and early spring in the Plains States were different than most years. For the most part, weather was great for calving. The concern was the lack of moisture.

Moisture, feeding concerns

The mild winter allowed producers to use stock-piled dormant range and crop residues extensively, and there appears to be a carryover of harvested forages.

Even if we get some moisture, it may be best for the grass resource to delay when cows are turned out to spring pastures. Extending the period of feeding harvested forages this spring may give pastures a chance to get going and respond to some late-spring moisture.

In drought conditions, forages that are typically harvested in the summer are not as productive, and yield is reduced. A practice that producers should consider is ammoniating low-quality forages to be used later as a feed resource to stretch other harvested forages when cows are not grazing.

Ammoniating low-quality forages

Ammoniating low-quality forages is a management technique that can be used to treat forages, like wheat and oat straw and baled cornstalks. It is not recommended for use on grass hay, summer annuals and alfalfa.

Ammoniating medium-quality forages can cause toxicity in cows and the calves whose dams consume the ammonia-treated forages. The toxic compound is transferred through the milk to the calf. Affected calves walk in circles; thus, it is commonly referred to as "circling disease." If toxicity occurs in the calves or cows, avoid working or moving the cattle, and remove the forage.

To my knowledge, circling disease has not occurred in cattle as a result of consuming ammoniated straws or crop residues.

Treating wheat straw with anhydrous ammonia can make straw almost as digestible as average-quality prairie hay. Ammoniating will increase digestibility of low-quality forages; therefore, intake will increase. Cattle don't quit eating straw because they don't like it; they stop eating because of its low digestibility and slow rate of passage — they can't stuff any more into their rumen.

The ammoniation process is temperature-dependent and occurs faster at higher environmental temperatures. It is important to keep the package sealed and not let the ammonia escape. If the temperature is 86° F, the ammoniated residue needs to be kept sealed for one week. If the temperature is between 59° and 86,° it needs to remain sealed for two to four weeks. If the temperature is below 59,° the ammoniated forage needs to be sealed for four to eight weeks.

Sometimes it's difficult to keep the package sealed for a long period of time because of wind, curious pets and wild animals.

Ammoniation instruction

For residues like wheat straw, bale the straw soon after grain harvest, preferably with some moisture on it, or bale early in the morning when there is some dew present. Scrape an area to provide 5 to 6 feet (ft.) on either side, in front and in back of a bale stack three big round bales wide and 10-12 bales long (see Fig. 1). Push the dirt to the sides of the area where the bales will be stacked. The dirt will be used to seal the plastic around the edges.

Gather bales into rows that are stacked in a pyramid (three bales on the base, two bales on the second level and one bale on the top, or three bales on the base and two bales on the second level), leaving a couple of inches between pyramids for the ammonia to filter around the bales. Cover the entire stack with one sheet of 6- to 8-millimeter (mm)-thick black plastic. If the plastic is 40 by 100 ft., you will be able to cover 10-12 pyramids in a row. Make sure the edges of plastic on the ground are sealed with loose soil to prevent leaking of ammonia. Any holes in the plastic can be patched using duct tape.

Insert a pipe 6 to 8 ft. long, placed on the ground, into the center of your stack, and attach the pipe to the anhydrous tank. Slowly leak anhydrous ammonia into the bales sealed with plastic. Ammonia can be dangerous, so be careful when working with this product. Don't inject ammonia too fast, or the plastic can rupture.

Continue to add anhydrous ammonia

Fig. 1: Scrape area to include a 5- to 6-ft. border around bale stack

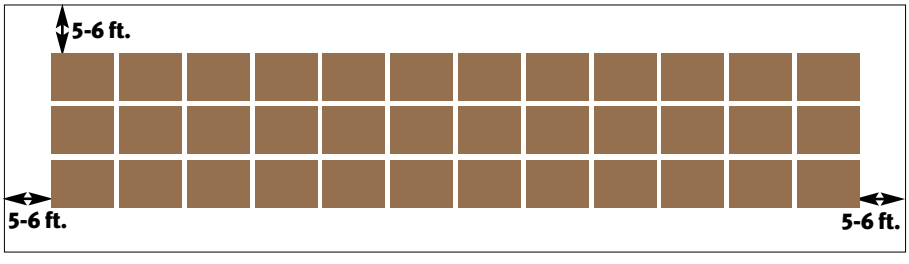

Table 1: Changes in forage digestibility, intake and crude protein after ammonia treatment

	% Digestibility, untreated	% Digestibility, treated	% Crude protein, untreated	% Crude protein, treated	% Increase in intake
Wheat straw	39	48	3.7	9.7	18
Corn stover	48	56	6.2	11.0	22
Milo stover	46	61	5.4	12	NA
Soybean straw	41	47	4.9	14	16

Table 2: Effect of treatment of straw on intake and performance of gestating beef cows

Treatment	Daily intake, lb.	Daily weight change, lb.
Straw + 7 lb. of alfalfa	14.8–19.4	-0.27–0.26
Treated straw + 7 lb. of alfalfa	19.7–23.1	0.40–0.88
Treated straw	26.1	0.1

Source: Ward, et al., *1982 Nebraska Beef Cattle Report.*

slowly until you have added 60 pounds (lb.) per ton of dry matter (DM) of residue. This process will take about 10 minutes for each ton of forage ammoniated. When completed, turn off the tank, remove the pipe, and seal the opening with dirt.

Keep the stack sealed to allow for the reaction to be completed. About a week before feeding, open one end of the stack to allow excess ammonia gas to escape.

Nutrition values, cost

If you sample treated straw and conduct a nutrient analysis, the crude protein (CP) content of the treated straw will be greater than the non-treated straw (see Table 1). To measure protein content of a feed/forage, the analysis measures the ammonia groups present in the sample. Because we added ammonia groups through the ammoniating process, it stands to reason that CP content of the treated straw will be higher. Some of the ammonia in the treated straw will be used by bacteria in the rumen to make their own protein.

More important than the increase in CP content is the near 10% increase in digestibility of the treated straw compared to the untreated straw (see Table 1). The increase in digestibility of the treated straw allows cattle to consume 19% more of the treated straw compared to non-treated straw. This allows the animal to meet a greater portion of its nutrient needs by consuming the treated forage.

It seems the best time to use ammonia-treated forage is prior to calving. How cattle respond to treated forage will depend on cow weight and milk production. Remember, cows with high milk potential have higher nutrient needs, even when they are not lactating.

Table 2 indicates that non-lactating pregnant cows will lose weight when offered untreated straw plus alfalfa compared to treated straw alone. The low intake of the straw plus alfalfa is probably due to the low digestibility of the straw causing a slow passage rate. Treated straw plus alfalfa seems to provide a nice combination, and cows experience weight gain.

To determine the cost of ammoniating forage, use your local prices. Earlier this year, I priced anhydrous ammonia at the local co-op. The price was $490 per ton, which converts to $0.245 per lb. Remember, treatment calls for 60 lb. of anhydrous ammonia per ton of straw DM.

The calculations would go something like the following: If you had 10 rows of pyramids (three bales as the base, two bales on top), there would be a total of 50 bales. If each straw bale weighed 1,000 lb., there would be 25 tons of straw. If the straw were 90% DM, there would be 22.5 tons (25 tons $\times$ 0.90 = 22.5 tons DM) of straw DM.

In this example, you would need 1,350 lb. of anhydrous ammonia. The cost of anhydrous ammonia ranges from $14 to $15 per ton, plastic would cost $5-$7 per ton, and the baling cost of your straw would be $12-$15 per ton. Total cost of the treated forages would range from $31-$37 per ton in this example.

Final thought

Have a management plan ready to implement in drought conditions. There are economical options to keep productive cows in the herd. If dry conditions reduce productivity of commonly harvested forages, consider ammoniating a residue, like straw, to include into your winter-feeding programs to stretch other harvested forages.

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Editor's Note: *"Ridin' Herd" is a monthly column written by Rick Rasby, professor of animal science at the University of Nebraska. The column focuses on beef nutrition and its effects on performance and profitability.*