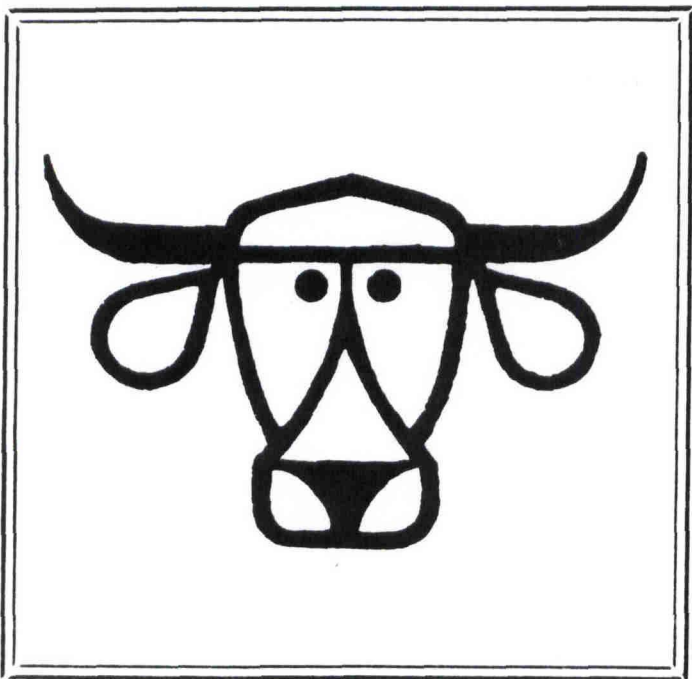
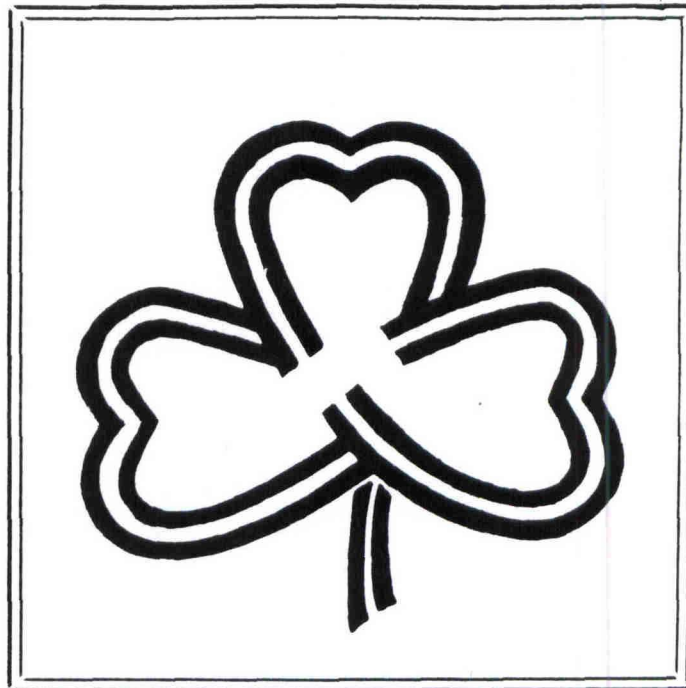


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STEER PERFORMANCE ON AMMONIA TREATED COASTAL BERMUDAGRASS HAY

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Summary

A 111-day feeding study was conducted during the autumn and winter of 1983-84 to determine the effect ammonia treated hay would have on cattle performance. Seven steers (average weight 507 lbs) in each of two groups were fed mature coastal bermudagrass hay free choice and two pounds of whole shell corn per head per day. One group was fed untreated hay, the other group was fed the same hay which had been treated with 4% anhydrous ammonia about three weeks before the feeding study started. The amount of hay consumed and/or wasted per head per day was 14.7 lbs and 12.8 lbs dry matter for the treated and untreated groups, respectively. The steers offered treated hay wasted less than those offered untreated hay. The average daily gains were 1.35 and 0.50 lbs for the treated and untreated groups, respectively. Condition scores were determined on each animal, and the average score was approximately one unit higher for the treated group. Treating the hay increased the in vitro dry matter digestibility from about 50% to over 64% and the crude protein from 6.6% to 11%.

Introduction

The perennial forages used for hay in the southern U.S., and particularly in South Texas, are inherently low in quality unless harvested at an immature stage. Thus, a large proportion of the hay produced in South Texas is low in digestibility (TDN) and crude protein. If the protein level of the hay is below 7%, the rate of digestion may be reduced even further, resulting in lower than expected intake rates. Because of this, livestock cannot consume enough of the low quality hay to make reasonable gains without costly supplementation.

Recent research has shown that hay treated with anhydrous ammonia results in higher digestibility, crude protein, improved voluntary intake, and cattle performance as compared to untreated hay. Anhydrous ammonia is absorbed by the forage and is available as a non-protein nitrogen source. This process usually results in an increase of 10 to 12 units in digestibility, and 4 to 6 units in crude protein. The treatment breaks lignin-cellulose bonds, solubilizes hemicellulose, swells plant fibers, increases the rate and extent of digestion, and increases palatability.

Anhydrous ammonia may be applied at a rate of from 2 to 4% (40 to 80 lbs/ton), 3% being the optimum rate, with only 30 to 40% retained. Treatment time varies with air temperature. The higher the temperature the less treatment time is required (85°F, less than one week; 40°F, eight weeks or more). Treatment procedures call for stacking the hay, covering it with 6 mil black plastic, and sealing the edges with soil and/or posts. The ammonia is then injected under the plastic as a gas or liquid. If applied as a liquid, it must be placed in a container (i.e. 55gal barrels with tops removed).

Anhydrous ammonia is potentially dangerous. It will burn skin, eyes, or throat; is volatile; and is maintained under pressure. This product is commonly used as fertilizer for crops. The same safety precautions should be used when treating hay as when applying fertilizer.

The objectives of this research were to determine the effect of ammonia treatment on (1) the forage quality of mature coastal Bermudagrass hay and (2) the performance of weaned steer calves.

Procedure

A 111-day feeding study was conducted to determine the performance of weaned crossbred steers on Coastal bermudagrass hay treated with anhydrous ammonia. Mature Coastal hay was cut and baled in large round bales in July of 1983. In September, uniform bales were selected, weighed, labeled, and sampled for moisture, laboratory analysis, and randomly allotted into two groups. On September 22, 640 lbs (4%) of anhydrous ammonia was applied to a total of 16,070 lbs of hay that was sealed under 6 mil black plastic. The anhydrous ammonia was applied as a liquid by placing two (2) 55 gallon drums under the plastic and dispensing the liquid into the drums. The drums were placed in two locations such that the ammonia only had to diffuse the distance of 3 to 5 bales from the drum. This procedure allows the ammonia to be released for 4 or 5 days. On October 14, the seal was broken and one bale was allowed to "air out". Each time a bale was fed, the next bale was allowed to "air out". On October 17 a group of 14 crossbred (7/treatment) were treated for internal parasites, implanted with Ralgro, and assigned to two groups. On October 18, the feeding study was started. Each bale was weighed and sampled again for moisture and laboratory analysis on the day it was fed. The steers were fed one bale of hay at a time in round bale feeders in an open corral. In addition to the hay, all steers received 2 lbs of whole corn fed daily and free choice minerals and water. A fresh bale was fed as needed when the previous bale was consumed. An attempt was made to quantify the rejected hay, but the degree of trampling and mixing with feces and urine made it an impossible task. The steers were weighed every 28 days. When the experiment was terminated on February 6, 1984, the steers were weighed, given a condition score and taken directly to the local auction sale where each animal was sold individually. Subsequently an average price per pound and an average net revenue per treatment was determined.

Results and Discussion

Forage Data

The bale weights and laboratory quality analysis data are shown in Table 1. The weights shown are adjusted oven dry weights. This was done to reduce difference due to rainfall that may have occurred prior to any sampling date. As can be seen less treated hay was lost between the Sept. weight and the weight taken on the day of feeding. This difference is probably due to the reduced weathering of the treated hay, because it was covered with plastic. Some of the difference could also be due to the added weight of the ammonia. Nearly 40 lbs of anhydrous ammonia was

added per bale, but calculations indicate that only 10 to 12 lbs were retained. (Please note that other research has shown that 2 to 3% anhydrous ammonia is considered sufficient. We applied more than we anticipated, our target was 3%).

The in vitro dry matter digestibility (IVDMD) was increased from about 50% to over 64% on the hay treated with ammonia. The quality of the untreated hay showed a drop of about one unit, and although small, was consistent over the entire lot of hay.

The crude protein (CP) was increased from about 6.6% to 11% on the treated hay. There was a small (about $\frac{1}{2}$ unit) but consistent increase in the CP of the untreated hay from the September sampling until the "at feeding" sample. This is often observed, because the protein does not degrade as fast as does the energy component of forage. Thus, the observed response is an increase in protein.

These observed responses are within the limits of those reported by others that have treated hay and measured the responses in the laboratory.

Cattle Data

The average weights for each treatment for each weigh period are shown in Table 2. The total gain was 56 lbs per head for 111 days for the group fed untreated hay, while those fed treated hay gained an average of 150 lbs. The average daily gain was 0.50 lbs for untreated compared to 1.35 lbs for steers fed ammonia treated hay.

Average hay consumed and/or wasted was 12.8 lbs per head per day for untreated hay compared to 14.7 lbs for steers fed ammonia treated hay. Even though it could not be quantified, less treated hay was wasted. The average condition score was nearly one grade higher for those fed treated hay. Due to the higher degree of finish and heavier weights, the average price per pound was less on the group fed treated hay (\$0.57 vs \$0.61). However, the net per head value after paying all fees etc. was \$32.64 greater for steers fed treated hay (\$353.63 vs \$320.99 per head).

TABLE 1. BALE WEIGHTS AND FORAGE QUALITY DATA BEFORE AND AFTER TREATMENT WITH ANHYDROUS AMMONIA

| Sampling time | Bale weight | | IVDMD* | | Crude protein | |
|---------------|-------------|-----------|---------|-----------|---------------|-----------|
| | Treated | Untreated | Treated | Untreated | Treated | Untreated |
| | lbs | | | | % | |
| September | 1085 | 1092 | 50.28 | 49.92 | 6.59 | 6.57 |
| At feeding | 1057 | 1015 | 64.12 | 48.91 | 11.02 | 7.02 |

*IVDMD = in vitro dry matter digestibility

TABLE 2. STEER WEIGHTS FOR EACH WEIGH PERIOD FOR CATTLE FED TREATED AND UNTREATED HAY

| Treatment group | Weigh date | | | | |
|-----------------|------------|--------|--------|--------|-------|
| | Oct 17 | Nov 15 | Dec 12 | Jan 10 | Feb 6 |
| Treated | 502 | 533 | 572 | 605 | 652 |
| Untreated | 513 | 514 | 536 | 540 | 569 |