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Forage Quality and Cattle Performance on Ammoniated Coastal Bermudagrass Hay

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Summary

Three years of feeding studies have been completed utilizing mature Coastal bermudagrass hay feed with and without ammonia treatment. In 1983-84 seven crossbred steers in each of two pens were fed ammonia treated and untreated hay with 2 lb of whole shell corn/hd/day. The average daily gains (ADG) were 0.50 and 1.35 lb for the untreated and treated hay groups, respectively. In 1984-85 and 1985-86, cattle were fed in groups of five Brahman x Hereford (F₁) heifers per pen. Four feeding regimes were used with the heifers: 1) untreated hay only, 2) ammonia treated hay only, 3) untreated hay and 4.1 lb of a mixed supplement, and 4) ammonia treated hay and 4.1 lb of a mixed supplement. The mixed supplement consisted of 2.4 lb of whole shell corn and 1.7 lb of guar meal (protein supplement) per hd/day. In the 1984-85 study there were two pens of cattle fed each feeding regime, and

the ADG were 0.76, 1.17, 1.60, and 1.57 lb/day for the untreated hay, treated hay, untreated hay plus supplement, and treated hay plus supplement, respectively. In the 1985-86 study only one pen of five heifers was fed each feeding regime. The ADG were 0.85, 1.03, 1.40, and 1.60 lb for similar treatments.

Introduction

The perennial forages used for hay in the southern United States, 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 and crude protein. If the protein level of the hay is below 7 percent, 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

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crude protein. The treatment breaks lignin-cellulose bonds, solubilizes hemicellulose, swells plant fibers, increases the rate and extent of digestion, and increases palatability. The objectives of this research were to determine the effect of ammonia treatment of mature Coastal bermudagrass hay feed with and without supplements on the performance of young growing cattle.

Procedures

Hay for the three feeding studies was produced from the same field in each of 3 years (1983, 1984, and 1985) at TAES-Beeville. Each year mature Coastal bermudagrass (fertilized in February with 250 lb 28-14-0) was cut and baled in large round bales. In 1983 and 1984 a New Holland model 852 round baler was used, and the average bale weights were 1,287 and 1,347 lb (85 percent dry matter basis), respectively. In 1985, a Vermeer model 605H round baler was used and the average bale weight was 1,514 lb. Each year the bales were weighed, sampled, and arranged in single-row (end-to-end) stacks. Hay to be treated was covered with 6 mil black plastic (20 × 100 ft) and sealed at the base by applying fence posts and soil to weigh down the edges of the plastic. A 55 gallon drum with the top cut out was placed under the plastic at each end of the stack. Sufficient fertilizer grade anhydrous ammonia was dispensed into the barrels at each end of the stack to provide about 3 percent by weight of anhydrous ammonia. Hay was treated at least 5 to 6 weeks before the start of each feeding trial, with the plastic removed about 1 week prior to the start of feeding. Hay that was to be fed untreated, was stacked in a similar manner, but was not protected from the environment in any way. Each bale was reweighed and sampled for quality and dry matter determinations just prior to feeding. Hay was fed in slant-bar round bale feeders each year.

The cattle for the 1983-84 study were crossbred steers weighing about 500 lb. Fourteen steers were assigned to two groups of seven on October 18, 1983. The animals were treated for internal parasites and implanted with Ralgro. Each group of cattle was fed 2 lb of corn/hd/day for the 111 days of the study. Cattle were weighed at approximately 28-day intervals.

The 1984-85 and 1985-86 feeding studies were similar to each other, but quite different from the 1983-84 study. The differences between the 1984-85 and 1985-86 studies were that the 1984-85 study used 40 Brahman x Hereford (F₁) heifers for 72 days, and the 1985-86 study used 20 Brahman x Hereford (F₁) heifers for 92 days. Most all other aspects of the 1984-85 and 1985-86 studies are similar. Both years had four feeding regimes as follows: (1) untreated hay only, (2) treated hay only, (3) untreated hay plus 2.4 lb of whole shell corn and 1.7 lb of guar meal/hd/day, and (4) treated hay plus 2.4 lb of whole shell corn and 1.7 lb of guar meal/hd/day. Each year cattle were fed in groups of 5 hd/pen, thus in 1984-85, eight pens (two pens per feeding regime) were utilized, while in 1985-86 only four pens were used.

In 1984-85 the heifers were grouped into heavy (495 lb) and light (435 lb) groups when the experiment started on November 7, 1984. In 1985-86 the heifers averaged 532 lb when the experiment started on November 14, 1985. In

both years heifers were given body condition scores (scale of 1 to 9) before the experiment started, and these scores along with weights were used for assigning animals to groups. Cattle were weighed weekly for the first 4 to 5 weeks, then every 2 weeks until the end of the study. All heifers received an injection of Vitamins A and D during the first few weeks of the experiment. Body condition scores were assigned to each animal at the conclusion of each study.

Results and Discussion

The quality changes as a result of treating the mature Coastal bermudagrass hay with ammonia are given in Table 1. Generally, the increases in crude protein (CP) of 2.5 to 3.5 percentage units and in vitro dry matter digestibility (IVDMD) of 10 to 14 percentage units is similar to what others have reported.

During the first study when steers were fed untreated hay plus corn or treated hay plus corn, ADG were 0.50 and 1.35 lb/day, respectively. Average condition scores were one unit higher for those fed treated hay. Actual hay consumed was not possible to measure, because it was impossible to measure hay rejected. However, visual estimates indicated less hay was wasted following ammonia treatment. Hay disappearance (consumed plus wasted hay) averaged 15.0 lb/hd/day (85 percent dry matter basis) for untreated hay compared to 17.3 lb for steers fed ammoniated hay (Table 2).

During the second year, heifers gained 0.76 and 1.17 lb/day when fed untreated and treated hay without supplement, respectively. When fed a corn and protein supplement, there was no difference in ADG (1.60 and 1.57) for heifers fed untreated and treated hay. Condition scores generally reflected the observed weight gains with cattle receiving untreated hay alone generally scoring a four, and those receiving supplement generally scoring four to five. Hay disappearance (85 percent dry matter basis) averaged 14.8, 16.4, 12.7, and 13.9 lb/hd/day for untreated hay alone, treated hay alone, untreated hay plus supplement, and treated hay plus supplement, respectively.

During the third year, heifers gained 0.85, 1.03, 1.40, and 1.60 lb/hd/day when fed untreated hay, treated hay, untreated hay plus supplement, and treated hay plus supplement, respectively. Condition scores were not greatly different between treatments in this final year's experiment, with all averaging close to a five. The small differences in gain between cattle fed untreated or treated

TABLE 1. FORAGE QUALITY OF UNTREATED AND AMMONIA TREATED COASTAL BERMUDAGRASS HAY

	CP ¹			IVDMD ²		
	83-84	84-85	85-86	83-84	84-85	85-86
	Percent					
Untreated	7.02	8.10	7.14	50.28	49.92	47.23
Treated	11.02	11.57	11.55	64.12	59.46	60.24

¹Average crude protein of samples taken from each bale immediately prior to feeding.

²Average in vitro dry matter digestibility of samples taken from each bale immediately prior to feeding.

TABLE 2. HAY DISAPPEARANCE AND AVERAGE DAILY GAINS (ADG) OF THE THREE YEARS OF FEEDING STUDIES UTILIZING UNTREATED AND TREATED (ANHYDROUS AMMONIA TREATMENT) MATURE COASTAL BERMUDAGRASS HAY

Hay Feeding Regime	Hay Disappearance			ADG		
	83-84	84-85	85-86	83-84	84-85	85-86
	Pounds					
Untreated alone	—	14.8	20.1	—	0.76	0.85
Treated alone	—	16.4	21.4	—	1.17	1.03
Untreated + Supp ²	15.0	12.7	16.7	0.50	1.60	1.40
Treated + Supp ²	17.3	13.9	20.8	1.35	1.57	1.60

¹Calculated sum of hay consumed plus hay wasted per head per day.

²Supp = Supplement. In 1983-84, supplement was 2 lb whole shell corn. In 1984-85 and 1985-86, supplement was 2.4 lb whole shell corn plus 1.7 lb guar meal. Both supplements were fed daily.

hay alone or with a supplement may not be large enough to pay for the treatment of the hay. A more critical factor that was observed only at the beginning of the 1985-86 study was that three of the five heifers receiving only treated hay exhibited the "crazy cow syndrome" that has been associated with ammoniated hay. Nothing was done to treat this severe nervous reaction, and it did not recur. This nervous condition, likely, had a detrimental effect on the performance of these heifers. Hay disappearance (85

percent dry matter basis) averaged 20.1, 21.4, 16.7, and 20.8 lb/hd/day for untreated hay alone, treated hay, untreated hay plus supplement and treated hay plus supplement, respectively.

Our data indicates that a small amount of supplement (i.e., 2 lb of corn), likely, will result in significant animal responses. However, when a larger quantity of concentrate is fed, it appears that there is little or no advantage in treating hay with ammonia.