EFFECT OF NITROGEN RATE AND TIMING OF APPLICATION ON STOCKPILED BERMUDAGRASS

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ABSTRACT

Feeding hay through the winter contributes a large portion of the costs associated with cow-calf production. Forage management strategies to lengthen the grazing season and reduce hay consumption would be beneficial in increasing profitability. Stockpiling bermudagrass for livestock consumption in late fall and winter has not been thoroughly evaluated in southern Oklahoma. This study was initiated at Burneyville, Oklahoma in 2000 to determine the effect of N rate and timing of application on forage yield and crude protein content of fall stockpiled bermudagrass. N rates included 0, 50, 100, and 150 pounds per acre applied Aug 15, Sept 1, Sept 15, Oct 1, and Oct 15. Dry-matter yield was measured by harvesting ten days after the first killing frost. A 400g sample was collected during initial harvest and every 15 days there after to evaluate forage quality over time. A total of five samples were collected. The fall of 2000 was dry. Yields were low averaging less than 200 pounds per acre. However, forage quality was high with CP levels above 18 percent. In 2001, yields averaged over 3000 pounds per acre and CP levels ranged from 7 to 10 percent. Yields averaged over 4000 pounds per acre in 2003 including the check. CP levels ranged from 6 to 9 percent in 2003. Obviously weather has an effect on fall growth. However, results indicate that stockpiled bermudagrass can support a pregnant, non-lactating cow in well into winter while not sacrificing animal performance. It also documents the reduction in cost in supporting a spring calving cowherd through the winter as a direct result of feeding less hay.

INTRODUCTION

Feeding hay through the winter contributes a large portion of the costs associated with cow-calf production. Forage management strategies to lengthen the grazing season and reduce hay consumption would be beneficial in increasing profitability. Bermudagrass (*Cynodon dactylon*) is used extensively throughout the region for spring/summer grazing and hay production. However, stockpiling bermudagrass for livestock consumption in late fall and winter has not been thoroughly evaluated in our region. Bermudagrass has a high production potential, it is extremely responsive to nitrogen fertilizer and has a good grazing tolerance (Ball et al., 1996). Late summer and fall rainfall patterns in southern Oklahoma and north Texas along with added nitrogen fertilization should provide the potential for excellent bermudagrass production to be utilized as dry-standing forage well into the winter. Eichhorn (1989) observed increased forage yields and crude protein as nitrogen rates increased. Altom and Rogers (1982) reported crude protein levels as high as 13% in mid-October when 50-lbs. nitrogen was applied in late August. Johnson (1999) found increases in nitrogen content in forage grown in September of 16, 40, 71 and 90 percent as nitrogen rates increased from 0 to, 39, 79, 157 kg/ha, respectively. Wheeler (1999) reported bermudagrass forage protein concentrations ranging from 11-15 percent in November. The forage protein values reported above should be adequate to support a pregnant, non-lactating mature cow to at least January 1 annually. In addition, fall fertilized bermudagrass forage with a high relative feed value should be able to support growing animals from September through October prior to grazing winter pasture. The objective is to evaluate the effect of N rate and timing of application on forage yield and the crude protein content of fall stockpiled bermudagrass.

MATERIAL AND METHODS

Location:

Noble Foundation Red River Research and Demonstration Farm, Burneyville, OK.

Treatments:

N Rates: 0, 56, 112, 168 kg ha^{-1}

Application Dates: 8/20, 9/1, 9/15, 9/30, 10/15

Experimental Design: Split-plot

Whole plot: Application Date

Subplot: N rate

Plot size: 4 meters x 6.67 meters

Soil Type: Minco fine, sandy loam

Plot management:

1. 112 kg N ha^{-1} applied in the spring for hay production
2. P and K applied as needed from soil test
3. Hay in June and mow to a 7.6 cm stubble height prior to first treatment in August.
4. Soil sample prior to treatment application and at the end of the season.

Measurements/Sample collection:

1. Measure dry-matter yield by harvesting a 1.67 meter x 6.67 meter swath from each plot using a sickle mower (Hege Forage Harvester) 10 days after the first killing frost. Collect a 400g sample for quality analysis.
2. Hand-clip approximately 400 g (to a 7.6 cm) every 15 days from the first harvest date to evaluate forage quality into winter (4-6 samples collected).
3. Forage analyzed for % crude protein, ADF, NDF, TDN, calcium and phosphorus (Ward Laboratories, Kearney, NE).

RESULTS AND DISCUSSION

Yield

Nitrogen rate and date of application had no effect on yield in 2000 (Figure 1). Yields were low due to the lack of rainfall and excessive heat through September (Figure 2). In 2001 and 2002 nitrogen rate had a linear effect on yield, but there was no effect from date of application (Figures 3 and 4). It is important to note the difference in yield from 2000 and 2001. Mean temperature and accumulative rainfall was favorable in 2001 (Figure 2). Weather data was not reported for 2002, but it was similar to 2001 as observed in yield.

Figure 1. Dry matter yield by nitrogen rate. 2000.

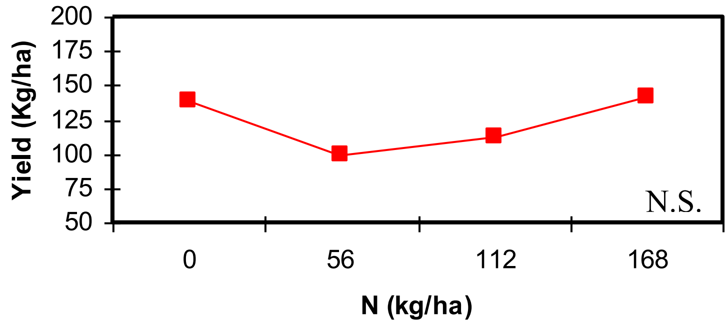


Figure 2. Temperature and accumulative rainfall for September and October, 2001 and 2002.

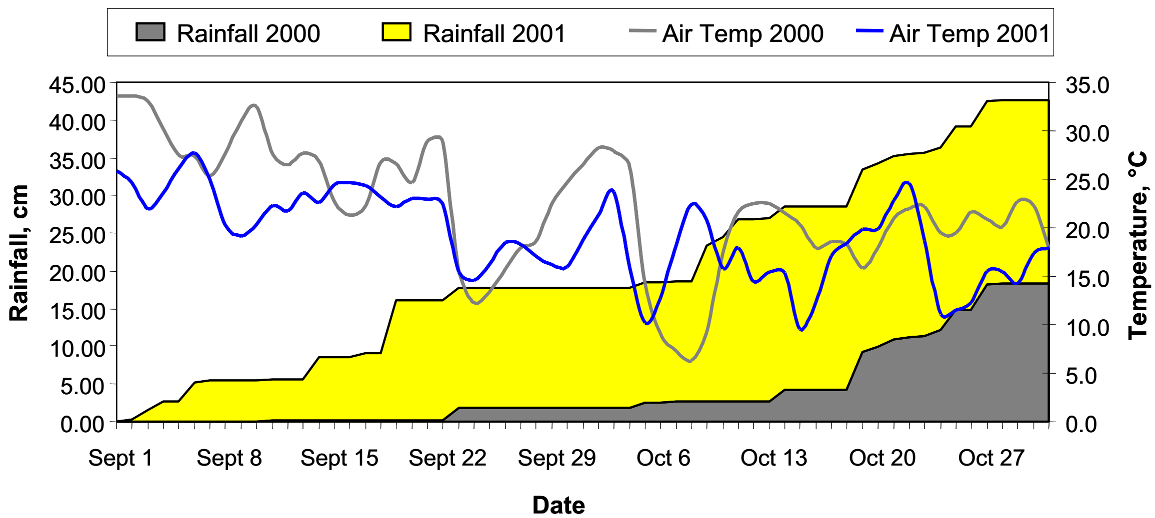


Figure 3. Yield by nitrogen rate 2001.

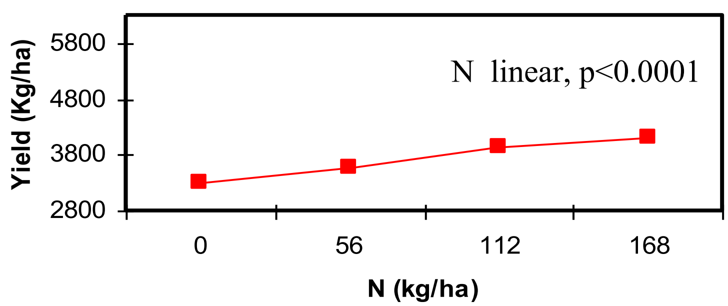
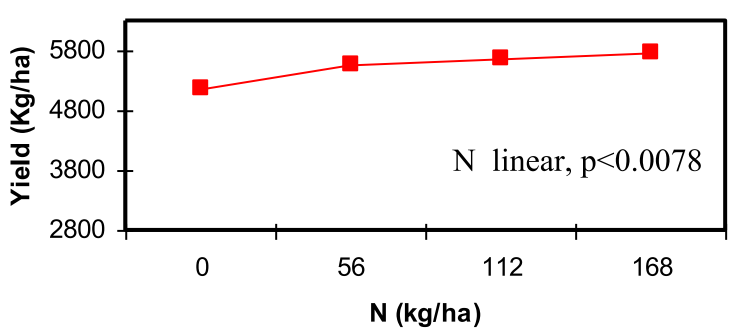


Figure 4. Yield by nitrogen rate 2002.



Crude Protein

Both nitrogen rate and date of application had no effect of crude protein in 2000. In 2001 and 2002, there was a nitrogen rate by date of application interaction on crude protein (Figures 5and 6).

Figure 5. Crude protein by nitrogen rate and date of application in 2001.

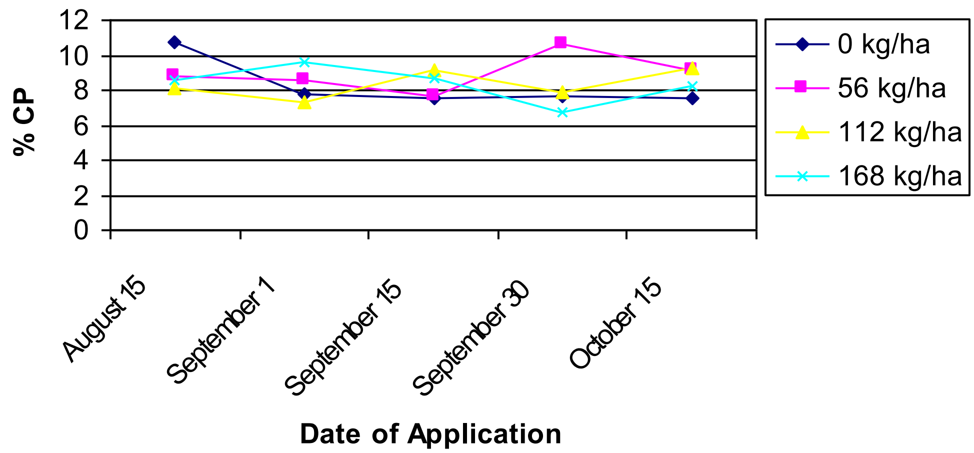
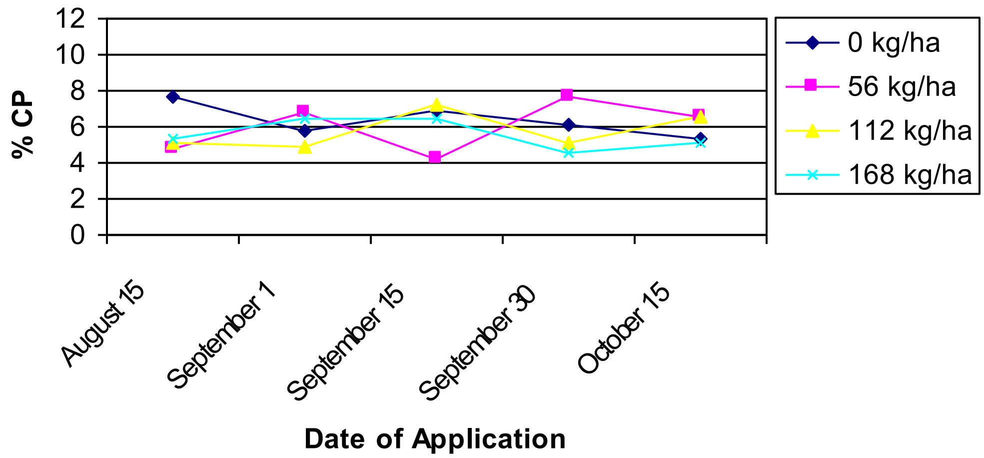


Figure 6. Crude protein by nitrogen rate and date of application in 2002.



It is obvious that weather has an influence on both yield and quality of fall stockpiled bermudagrass. However, it is interesting to find that no matter the nitrogen rate or time of application crude protein levels remained relatively high well into the dormant season (Figure 7). Crude protein levels remain well above the NRC's critical value for a spring calving cow through the months of December and January.

Figure 7. Average percent crude protein over time as affected by nitrogen rate.