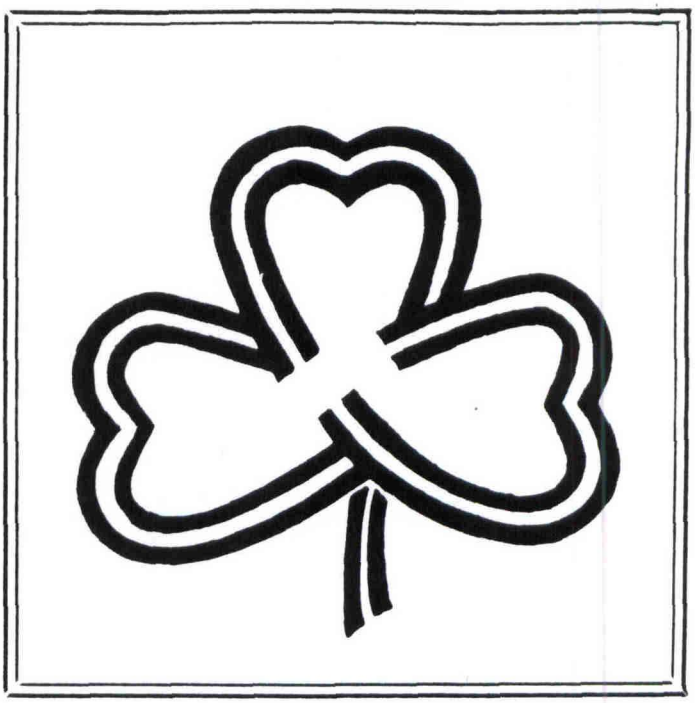
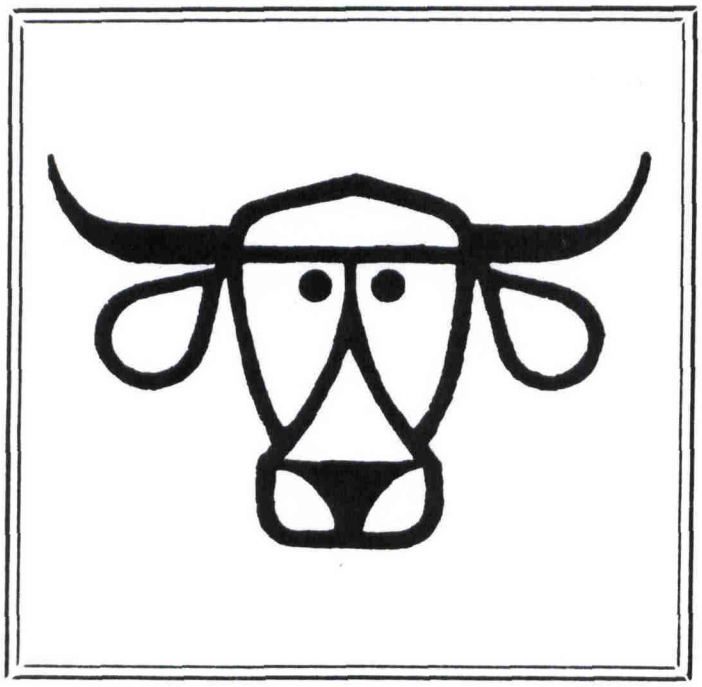
CPR—4253
October 1984





Forage Research in Texas

1984

The Texas Agricultural Experiment Station Neville P. Clarke, Director The Texas A&M University System, College Station, Texas

EFFECTS OF CLIPPING HEIGHT AND NITROGEN ON YIELDS AND PROTEIN CONTENT OF CALLIE BERMUDAGRASS

T. S. Harris, V. L. Jones and G. O. Akpobome[1]

SUMMARY

Callie bermudagrass was clipped at 3 different heights (1, 2 and 3 inches above the soil surface) to determine the effect of clipping height on dry matter yields and crude protein content. The study shows that yield increased as clipping height was reduced. Protein content was not affected by clipping height. During 1983, 35.2 percent more dry matter (3583 lbs/ac) was harvested from plots clipped 1 inch compared to plots clipped 3 inches above ground level. The 2-inch clipping treatment provided 29.1 percent more forage (2690 lbs/ac) than the 3-inch clipping treatment, and 4.6 percent less forage (623 lbs/ac) than the 1-inch clipping treatment. Yields were slightly reduced (by 580 lbs/ac or 11.0%) during the spring on 1-inch plots compared to 2-inch plots, but this slight depression was overcome after June. Findings in this study suggest that lower clipping heights result in greater yield increases under low soil nitrogen levels and longer harvest intervals. Findings also suggest that longer harvest intervals combined with low clipping heights and adequate soil moisture are more important to good late summer and fall production of Callie bermudagrass than additional nitrogen fertilization.

INTRODUCTION

Bermudagrasses are the most widely used cultivars for permanent pastures in most of the southern region of the U. S. In a continuing effort to further increase the efficiency of production and quality of these grasses, many new varieties are being developed and tested. Previous research and observations have shown that the production of some grasses may be improved by management practices such as fertilization, clipping frequency and clipping height. This study was designed to determine the effects of different clipping heights as a factor with nitrogen level on dry matter yield and crude protein content of Callie bermudagrass.

PROCEDURE

This study was initiated during August 1982 in an existing stand of Callie bermudagrass, established in 1977. The stand was divided

---

[1]Assistant professor, research scientist and former research assistant, respectively, Prairie View A&M University Cooperative Research Center, Prairie View, Texas 77446.

KEYWORDS: Callie bermudagrass/clipping height/nitrogen/yields/protein

into 16 main plots arranged in a randomized complete block design consisting of 4 replications of 4 nitrogen treatments. Each main plot (8 by 10 ft.) was subdivided into 3 subplots to accommodate the 3 clipping height treatments, which consisted of clipping the forage at 1, 2 and 3 inches above the soil surface during harvesting. Nitrogen treatments consisted of initial applications of 22.5, 45, 90 and 180 pounds of nitrogen per acre as ammonium nitrate, with additional applications of these amounts after each harvest except the last fall harvest in 1982. During 1983, nitrogen treatments were applied only in April (initially) and immediately following the harvest in May. Clipping was accomplished by using a sickle bar mower fitted with adjustable skids at each end of the 28-inch bar. Clippings were raked onto a canvas and weighed in the field. Approximately 1/2 pound of material from each harvested subplot was bagged, sealed and used for determination of percent dry matter, and percent crude protein using the Kjeldahl nitrogen procedure. Harvests during 1982 were taken monthly from September through November. In 1983, harvests were taken during May, June, August and November.

RESULTS AND DISCUSSION

Dry matter yields of Callie bermudagrass significantly increased as clipping height was reduced. The lower clipping height treatments (1 and 2 in.) provided more forage each harvest than the higher clipping height treatment (3 in.). During the 1982 fall season (a 90-day period), yields were 1932, 1689 and 1185 pounds of dry matter per acre for the 1, 2 and 3-inch treatments, respectively (Table 1). Results for the entire 1983 growing season (April through November) exhibited a similar trend to the previous autumn results except for the magnitude of yield. Total dry matter yields harvested over this season were 13,752, 13,129 and 10,169 pounds per acre, respectively, for increasing clipping heights (Table 2). The 3-inch clipping treatment provided significantly lower total yields than the 2-inch treatment which did not differ significantly from the 1-inch treatment. Forage harvested during the month of May was essentially the same amount for all treatments and was very low due to cool spring temperatures and an early harvest designed to evaluate previous fall treatments on early spring results. These data, along with that collected for the next 30-day period (June harvest), indicate a slight retardation in spring growth on plots clipped during the fall and spring at 1 inch above ground level. The second 1983 harvest, taken in June, provided the highest yields for the year which were 4680, 5260 and 3961 pounds of dry matter per acre, respectively, for the 1, 2, and 3-inch treatments. The 2-inch treatment provided significantly higher yields over this 30-day period than the 1 and 3-inch treatments. Dry matter yields decreased after the harvest in June due to a rust-like infestation of the grass and periods of moisture stress.

For the periods ending in August and November 1983, yields were significantly different for each of the three clipping height treatments. The distinct expression of each clipping height treatment on yields during these periods, compared to earlier in the season, may be related to nitrogen depletion in addition to season, since harvest

date interacted significantly with both nitrogen and clipping height treatments. The harvest date factor interaction with clipping height was probably influenced by nitrogen, as all nitrogen in 1983 was applied prior to June, and had only minor effects on yields after the harvest in June and no effect after August (Table 4). However, nitrogen alone or combined with harvest date did not significantly interact with the clipping height effect on yields. Harvest interval was found to affect clipping height treatment and total yields, as fall yields over a 3-month period taken in a single harvest in November 1983 were almost double those for each respective clipping height treatment in 1982 for the corresponding fall period, but taken in 3 separate monthly harvests (Tables 1 & 2). These 1983 fall yields were obtained when nitrogen effects were nil following the last nitrogen application in May, whereas, during 1982 nitrogen applications were 1.5 times greater and all applied after July (Tables 3 & 4). Although considerably more rainfall occurred during 1983, compared to 1982, these results suggest that lower clipping heights result in greater increases in yields under longer harvest intervals and lower soil nitrogen levels; and that these factors along with adequate soil moisture are more important for good late summer and fall production of Callie bemudagrass than nitrogen fertilization.

As shown in Tables 3 and 4, yields increased with increasing nitrogen application both years, but only through August in 1983 because the last nitrogen application for the year was made in May. Nitrogen rates ranging from 45 to 360 pounds per acre increased yields from 9,081 to 15,063 pounds per acre during the 1983 season (Table 4). Protein was also positively correlated with nitrogen. The r-values were 0.77 and 0.84 for 1982 and 1983, respectively. Protein content increased from 7.9 to 19.7 percent with increasing nitrogen during fall 1982, and from 7.7 to 20.7 percent with increasing nitrogen application for the first 2 harvests in 1983. Protein content was not influenced by clipping height treatments during either harvest and had a mean value of 13.5 percent during each year over all treatment factors.

Table 1. Mean dry matter yields of Callie bermudagrass by harvest month during fall as affected by clipping height, 1982

Clipping height above surface	[1]Dry matter yields, fall 1982			
	Sep	Oct	Nov	Totals
-- inches --	------ [2]pounds per acre ------			
1	962 a	398 a	572 a	1932 a
2	787 b	411 a	491 a	1689 b
3	656 b	326 a	203 b	1185 c

[1]Means within a column not followed by the same letter differ at the 0.05 level according to the Duncan Multiple Range test.

[2]Mean of 4 replications of 4 different nitrogen treatments.

Table 2. Mean dry matter yields of Callie bermudagrass by harvest month as affected by clipping height, 1983

Clipping height above surface	[1]Dry matter yields, 1983				
	May	Jun	Aug	Nov	Totals
-- inches --	------- [2]pounds per acre -------				
1	341 a	4680 b	5510 a	3221 a	13,752 a
2	324 a	5260 a	4806 b	2799 b	13,129 a
3	264 a	3961 b	3755 c	2129 c	10,169 b

[1]Means within a column not followed by the same letter differ at the 0.05 level according to the Duncan Multiple Range test.

[2]Mean value of 4 replications of 4 different nitrogen treatments.

Table 3. Mean dry matter yields of Callie bermudagrass by harvest month during fall as affected by level of soil applied nitrogen

Nitrogen level	[1]Dry matter yields, fall 1982			
	Sep	Oct	Nov	Totals
- lbs N per acre -	------- [2]pounds per acre -------			
540	1068 a	533 a	701 a	2302 a
270	901 ab	471 a	547 b	1919 a
135	667 b	317 b	294 c	1278 b
68	572 b	190 b	146 c	908 b

[1]Means within a column not followed by the same letter differ at the 0.05 level according to the Duncan Multiple Range test.

[2]Mean value of 4 replications of 3 clipping height treatments.

Table 4. Mean dry matter yields of Callie bermudagrass by harvest month as affected by level of soil applied nitrogen, 1983

Nitrogen level	[1]Dry matter yields, 1983				
	May	Jun	Aug	Nov	Totals
- lbs N per acre -	------- [2]pounds per acre -------				
360	560 a	6017 a	5500 a	2986 a	15,063 a
180	213 b	5064 ab	4994 ab	2926 a	13,010 ab
90	192 b	4442 b	4686 ab	2650 a	12,246 b
45	184 b	3012 c	3581 b	2304 a	9,081 c

[1]Means within a column not followed by the same letter differ at the 0.05 level according to the Duncan Multiple Range test.

[2]Mean value of 4 replications of 3 clipping height treatments.