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Effect of Defoliation Practices on Quality of Buffelgrass (*Cenchrus Cilliaris* L.)

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Summary

Buffelgrass (*Cenchrus ciliaris* L.) is an erect, tufted, perennial grass which is native to Africa, India, and Indonesia was introduced into Australia and America in the early 20th century. This research addressed the influence of defoliation intervals and height of clipping on nutritive value (digestibility and crude protein). The results showed significant differences due to frequency of harvest and cutting heights on quality. Crude protein content reached its maximum value at a 21-day cutting interval and a cutting height of 4 inches and decreased with increasing interval and height of cutting. IVDDM exhibited highest values at a frequency of 21 days and 12 inches cutting height, but with little actual differences due to height of cutting. IVDDM declined with age and season.

Introduction

Cenchrus ciliaris L. is a perennial grass that forms spreading tufts and sends out rhizomes. It is widely distributed in Africa, India, and Indonesia and it was introduced into Australia and America in the early 20th century. It is grown extensively in southern Texas.

Buffelgrass is known for having a high rate of growth under favorable conditions resulting in high forage yield and with generally acceptable forage quality characteristics.

If the essential objective in all grassland management practices is to maintain the grassland in highest rate of production and quality for an indefinite period, the frequency or interval and the closeness or intensity of utilization assume high significance in the management of grassland.

The main objective of this study was to determine the effects of different defoliation practices on quality of buffelgrass.

Materials and Methods

Selection 18-35 buffelgrass was planted at the Texas A&M University Plantation in the Brazos River Bottom, near College Station, Texas. This experiment was conducted for 2 consecutive years (1982 to 1983) and consisted of six treatment combinations of two intervals of cutting (21 and 42 days) and three intensities of cutting (heights of 4, 8, and 12 inches), in a factorial design in randomized blocks with four replications. Individual plots consisted of 40-inch rows, 32.8 ft long. Harvest was with a flail mower from a 16.4 ft length of row, but the remainder of the row was cut at the designated height and frequency. The field was fertilized and irrigated to maintain active growth during the experiment.

KEYWORDS: Buffelgrass/cutting height/cutting frequency/crude protein/IVDDM.

Samples were taken from each plot at each harvest, dried at 140°F, weighed, and ground in a Wiley mill to pass a 1 mm screen. Subsequently, the samples were analyzed for nitrogen content using a Technicon Autoanalyzer (Industrial Method No. 334-74A/A+) and converted to crude protein (CP) (CP = N X 6.25) and for in vitro digestible dry matter (IVDDM) by the method of Goering and Van Soest (1970).

Results and Discussion

The crude protein data are summarized in Table 1 and shown by harvest date in Table 2. Crude protein tended to decrease as the growing season progressed in both 1982 and 1983. Average mean protein value across years and heights of cutting was highest when clipping was every 21 days (7.57 percent) and lowest with clipping each 42 days (5.51 percent). A similar result was reported by Shankarnarayan (1977), Asare (1970), and Combellas and Gonzalez (1972). In addition, a study by Rodriguez and Garcia (1980) demonstrated that crude protein content decreased with age, independent of the part of the plant studied.

Crude protein content decreased from 1982 to 1983 with a 21-day harvest interval while there was essentially no change at the 42-day harvest interval.

Also, pooled data for the 2-year period showed that the average crude protein content was affected by height of cutting. Crude protein content decreased significantly with each increase in cutting height above 4 inches in both years though the actual changes were small. One possible explanation for this may be the greater amount of stem material at greater heights due to more rapid growth, but actual leaf and stem percentages were not determined. There are controversial reports in the literature on the response of buffelgrass to cutting height. Osman and Abudiek (1982) reported that more severe clipping resulted in generally higher protein content compared with moderate clipping. On the contrary Asare (1970) and Watkins (1951) indicated that clipping height is not important in crude protein in tropical grasses.

The maximum value of crude protein content was with a harvest interval of 21 days and cutting height of 4 inches, the lowest value was with a 42-day interval and cutting height of 12 inches.

The effect of cutting interval and height of clipping on in vitro digestible dry matter (IVDDM) is presented in Tables 3 and 4. Digestibility was affected by age and sampling dates within a season. This effect was very consistent during both years, digestibility being inversely related to age and declining from spring to fall. IVDDM decrease as harvest interval increased from 21 days to 42 days. The decrease amounted to 10.5 digestible units in 1982 and 3 digestible units in 1983. Rodriguez and Gar-

TABLE 1. CRUDE PROTEIN CONTENT OF BUFFELGRASS AS INFLUENCED BY DEFOLIATION TREATMENTS

	CP(%)			
Frequency	Height (in.)			
(days)	4	8	12	Average
		1982		
24	8.53	7.20	7.75	8.16 a[1]
42	5.90	5.40	5.30	5.53 b
AVERAGE	7.21 a	6.80 b	6.53 c	
		1983		
21	7.48	6.93	6.53	6.97 a
42	5.73	5.53	5.25	5.50 b
AVERAGE	6.60 a	6.23 b	5.89 c	
		1982-83		
21	8.01	7.27	7.17	7.57 a
42	5.82	5.46	5.28	5.51 b
AVERAGE	6.89 a	6.52 b	6.21 c	

[1]Mean values on the same line or in the same column within a year followed by the same letter are not significantly different at the .05 probability level, Duncan's Multiple Range Test.

TABLE 2. CRUDE PROTEIN CONTENT BY DATE AS INFLUENCED BY FREQUENCY AND HEIGHT OF CUTTING

		1982						
Frequency	Height	June	June	July	Aug.	Sept.	Sept.	Nov.
days	in.	9	30	22	12	2	21	3
		Percent						
21	4	9.71	9.23	8.71	8.40	8.25	8.10	7.25
21	8	9.60	8.93	8.54	8.18	7.86	7.63	6.80
21	12	9.61	8.58	7.99	7.48	7.20	6.93	6.48
42	4	—	6.73	—	6.15	—	5.55	5.13
42	8	—	6.35	—	5.75	—	4.98	4.65
42	12	—	6.03	—	5.68	—	4.93	4.50
		1983						
Frequency	Height	June	June	July	Aug.	Aug.	Sept.	Oct.
days	in.	2	23	13	3	25	16	7
		Percent						
21	4	8.63	8.14	7.00	7.14	7.05	6.50	7.68
21	8	8.53	7.84	6.25	6.84	7.08	5.15	6.83
21	12	8.40	7.54	5.93	6.78	6.65	4.49	6.20
42	4	8.13	—	4.55	—	5.53	—	4.63
42	8	8.05	—	4.38	—	5.18	—	4.38
42	12	8.00	—	4.03	—	5.00	—	3.95

TABLE 3. IVDDM OF BUFFELGRASS AS INFLUENCED BY DEFOLIATION TREATMENTS

	IVDDM(%)			
Frequency	Height (inches)			
(days)	4	8	12	Average
		1982		
21	64.8	65.4	65.9	65.4 a[1]
42	54.3	54.9	55.4	54.8 b
AVERAGE	59.5 c	60.1 b	60.7 a	
		1983		
21	61.7	62.4	62.9	62.3 a
42	58.8	59.1	59.7	59.1 b
AVERAGE	60.2 c	60.7 b	61.3 a	
		1982-83		
21	63.3	63.9	64.4	63.8 a
42	56.5	57.0	57.6	56.9 b
AVERAGE	59.9 c	60.4 b	61.0 a	

[1]Mean values on the same line or in the same column within a year followed by the same letter are not significantly different at the .05 probability level, Duncan's Multiple Range Test.

TABLE 4. IVDDM BY DATE OF HARVEST AS INFLUENCED BY FREQUENCY AND HEIGHT OF CUTTING

Freq-uency days	Height inches	June 9	June 30	July 22	Aug. 12	Sept. 2	Sept. 21	Nov. 3
				1982				
				Percent				
21	4	69.46	68.75	67.63	65.90	62.33	60.43	58.75
21	8	70.10	69.08	68.30	67.10	63.20	60.80	59.13
21	12	70.88	70.10	68.65	67.18	64.05	61.35	59.40
42	4	—	59.80	—	56.55	—	51.95	48.58
42	8	—	60.83	—	57.23	—	52.38	48.80
42	12	—	61.03	—	57.40	—	53.70	49.35
				1983				
Freq uency days	Height inches	June 2	June 23	July 14	Aug. 4	Aug. 25	Sept. 16	Oct. 7
				Percent				
21	4	65.13	69.64	68.57	62.34	59.34	56.08	52.07
21	8	64.60	70.11	68.89	62.80	60.20	56.70	53.21
21	12	64.96	70.13	68.92	64.41	61.13	57.03	53.95
42	4	64.85	—	63.40	—	57.33	—	48.80
42	8	64.62	—	63.98	—	58.20	—	49.26
42	12	64.63	—	64.62	—	59.92	—	49.48

cia (1980), Combellas and Gonzalez (1972), and Fiano (1978) observed that in vitro digestibility decreased with an increase in the age of the grasses, independent of the part of the plant studied.

One possible explanation for the rapid decline of digestibility of buffelgrass with age may be closely related to increase in cell wall content. This could have been due in part to the rapidly increasing proportion of dead leaf tissue and perhaps to higher temperature and water stress, thereby accelerating the maturation processes of still green leaf tissue and the associated lignification of the cell walls.

In vitro dry matter digestibility percentages in each of the 2 years and the average of the 2 years decreased as the height of cutting increased though the actual differences were small.

Average digestibility for each of the 2 years differed very little. However, digestibility of 21-day material was less the second year than the first and the opposite was true for 42-day material. This may be accounted for partly by the reduced vigor in the second year resulting in less differences in yield between the two frequencies and likely less stem elongation at 42-days in the second than the first year. Since stems are generally less digestible than leaves, the smaller differences in stem content in the second year could account for some of the differences between the first and second year.

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