Influence of Grazing Frequency on Biomass Production Using Several Selected Tropical Grasses

P. Mislevy
University of Florida

F. G. Martin
University of Florida

F. M. Pate
University of Florida

N. F. G. Rethman
University of Pretoria, South Africa

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INFLUENCE OF GRAZING FREQUENCY ON BIOMASS PRODUCTION USING SEVERAL SELECTED TROPICAL GRASSES

P. Mislevy[1], F. G. Martin[2], F. M. Pate[1], and N. F. G. Rethman[3]

[1]Range Cattle Research and Education Center, University of Florida, 3401 Experiment Station, Ona, FL 33865, USA.

[2]Department of Statistics, University of Florida, 532 McCarty Hall, Gainesville, FL 32611, USA.

[3]Department of Plant and Soil Sciences, University of Pretoria, 0002 Pretoria, South Africa.

Abstract

To provide commercial growers with forage grasses that produce well throughout the year, there is a constant need for screening and testing new germplasm. Two rhodesgrasses (*Chloris gayana* cv. Rhods and Callide), four stargrasses (*Cynodon nlemfuensis* Vanderyst var. *nlemfuensis* cv. Florona, Zimbabwe, Okeechobee, and Rhodesian No. 2), one bermudagrass (*C. dactylon* var. *dactylon* cv. Jiggs), and one creeping signalgrass (*Brachiaria humidicola* CIAT 6369) were tested under a mob-grazing system. Dry biomass yield increased linearly as grazing frequency (GF) was delayed from 2 to 7 weeks. The cultivars, Florona, Zimbabwe and Okeechobee stargrasses and Jiggs bermudagrass, yielded best during the warm season regardless of GF. However, during the cool season Rhods rhodesgrass, Florona stargrass and Jiggs bermudagrass were generally most productive. These grasses were also the most persistent, averaging better than 97% ground cover after 3 years of grazing.

Keywords: Mob grazing, tropical grasses, *Cynodon*, *Chloris*, *Brachiaria*.

Introduction

Perennial grasses are the backbone of the livestock industry around the world. However edaphic conditions, temperature and rainfall dictate what forages can be grown in specific regions. In peninsular Florida, USA, high temperatures, humidity, and wet soils exist during long days. However, during short days (October-March) moisture is generally limited (64 mm $month^{-1}$) and average low temperatures are 13 ^{o}C (Kalmbacher, 2000). In addition, cold fronts periodically traverse the state dropping temperatures to -6 ^{o}C. Perennial grasses like Pensacola bahiagrass (*Paspalum notatum* Flugge) tolerate variation in edaphic and environmental conditions but are susceptible to mole crickets (*Scapteriscus* spp), which have destroyed considerable hectarage (Adjei, 1997). Consequently the number of perennial grasses with good yield and quality are limited.

The purpose of this experiment was to use the mob-grazing technique to compare eight grass entries at 2, 4, 5, and 7 weeks (wk) grazing frequencies (GF) for warm and cool season biomass yield and persistence.

Material and Methods

The experiment was established in August 1996 and conducted from 1997 through 1999 on a sandy, siliceous, hyperthermic Ultic Haplaquod (Pomona fine sand) at the University of Florida Range Cattle Research and Education Center, Ona, FL (27^{o} 25' N, 81^{o} 55' W). Two rhodesgrasses, three stargrasses, a bermudagrass and creeping signalgrass were compared with the commercial standard Florona stargrass.

The experimental design was a split plot, with GF of 2, 4, 5, and 7 wk as main plots and eight grass entries as subplots. Each subplot measured 8 by 15 m. Whole plots were arranged in three randomized complete blocks. A 0.5 m border surrounding each subplot was maintained vegetation free using 3% glyphosate, N–(phosphonomethyl) glycine.

About 30 to 40 days (d) prior to initiation of grazing an annual application of 0-25-93 kg ha^{-1} N-P-K + 2.8 kg ha^{-1} Cu, Zn, Mn, Fe, and B and 5.6 kg ha^{-1} S were applied. A total of 224 kg ha^{-1} N was applied annually, with 61 kg ha^{-1} applied in March, June, and October and 40 kg ha^{-1} applied once during the rainy season (August). Soil Ca, Mg, and pH were adequate according to soil test results.

The grazing season was from July to December in 1997 and May to December in 1998 and 1999. A strip of forage 0.5 by 3.1 m was harvested from each subplot to a stubble height of 7.5 cm to determine DM yield prior to grazing. Each main plot was fenced, allowing cattle to randomly graze all entries. Twelve crossbred yearling steers (200 hd ha^{-1}) were allowed to consume (mob graze) forage to 7.5 to 12 cm stubble within a 1 to 3 d period. Cattle were then removed from each main plot and a 0.8 by 6.2 m strip was mowed again at 7.5 cm to remove residue from each subplot. This area was marked and then sampled for DM yield at the next harvest. This strip was rotated to a new sample site in each subplot for each harvest. Cool season (December-April) forage DM yields were determined after 12 wk regrowth in 1998 and 18 wk regrowth in 1999, following a 15 December clean mowing. Harvests were pooled over the warm season (May-December) for each GF to obtain total yield. Warm season data were pooled over 3 years (yr) and analyzed using PROC GLM (SAS, 1989).

Results and Discussion

Forage Yield and Grass Persistence. Grass entry x GF interaction was significant for total warm season biomass yield when pooled over 3 years (yr) (Table 1). No difference ($P>0.05$) was found in biomass yield between grasses when grazed at a 2 wk frequency (ranging 570 for Rhodesian No. 2 to 700 g m^{-2} for Florona stargrass). Delaying GF from 2 to 4 wk resulted in an average biomass yield increase of 60% (635 to 1020 g m^{-2}). Similar results were obtained with other *Cynodons* (Mislevy and Martin, 1998). Florona stargrass and Jiggs bermudagrass produced an average biomass yield of 1180 g m^{-2} (97% yield increase above 2 wk GF), which was higher ($P<0.05$) than Callide rhodesgrass and creeping signalgrass. All grasses continued to increase in dry biomass yield when GF was delayed from 4 to 5 wk, with Zimbabwe stargrass and Jiggs bermudagrass demonstrating a 20% biomass increase. Grazing all grasses at a 7 wk frequency resulted in an 18% yield increase above the 5 wk frequency, with Florona, Zimbabwe, and Okeechobee stargrasses and Jiggs bermudagrass producing the highest biomass yield averaging 1550 g m^{-2}. Delaying GF from 2 to 7 wk resulted in a linear increase in dry biomass for all grasses except creeping signalgrass (Table 1). Greatest dry biomass during the cool season was produced by Florona stargrass, Rhods rhodesgrass and Jiggs bermudagrass during both 1997-98 and 1998-99 (Table 2). Persistence of these grasses was also excellent averaging 100, 100 and 97% ground cover for Florona, Jiggs, and Rhods, respectively, after 3 yr of grazing with no effect due to GF.

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Table 1 - Average warm season (May-Dec.) dry biomass yield (g m^{-2}) as influenced by grass entry and grazing frequency (GF) 1997-1999.

Grass entry	Grazing frequency (wk)†				Regression equation†
	2	4	5	7	
Rhodesgrass					
Rhods	620 a‡	980 ab	1010 c-e	1190 b	452 + 110 W
Callide	620 a	840 b	860 e	1130 b	419 + 99 W
Stargrass					
Florona	700 a	1180 a	1290 ab	1510 a	452 + 160 W
Zimbabwe	630 a	1060 ab	1280 ab	1530 a	316 + 179 W
Okeechobee	660 a	1030 ab	1190 a-c	1510 a	337 + 170 W
Rhodesian No. 2	570 a	1010 ab	1100 b-d	1260 b	375 + 135 W
Bermudagrass					
Jiggs	600 a	1180 a	1410 a	1660 a	263 + 211 W
Creeping signalgrass					
CIAT 6369	680 a	850 b	880 de	850 c	NS
Average	635	1020	1130	1330	

†Average harvest number for 2 wk GF = 16, 4 wk GF = 8, 5 wk GF = 6, and 7 wk GF = 4. W = weeks, NS = not significant.
‡Means within a column followed by different letters are different at the 5% level (Waller-Duncan procedure, k=100).

Table 2 - Total cool season dry biomass yields (g m^{-2}) as influenced by grass entries, 1997-98 and 1998-99.

Grass entry	Year	
	1997-98†	1998-99
Rhodesgrass		
Rhods	69 ab‡	428 a
Callide	38 c	266 b
Stargrass		
Florona	72 a	428 a
Zimbabwe	40 c	403 a
Okeechobee	38 c	379 a
Rhodesian No. 2	20 cd	282 b
Bermudagrass		
Jiggs	54 bc	412 a
Creeping signalgrass		
CIAT 6369	13 d	69 c

†Data for 1997-98 represent 12 wk regrowth (15 Dec.-8 Mar.) and 1998-99 represent 18 wk regrowth (15 Dec.-19 Apr.).

‡Means within a column followed by different letters are different at the 5% level (Waller-Duncan procedure, k=100).