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Influence of Long-Term Grazing Pressures on Root-Rhizome Mass of Common and Coastal Bermudagrass Pastures

F. M. Rouquette, Jr. and M. J. Florence

Summary

Pastures of common and Coastal bermudagrass had each been stocked at three levels of grazing intensity for a 15-year period. All pastures had been overseeded with ryegrass and/or clovers and grazing was continuous from about mid-February through early October during each year. Forage available from February-May during this period approximated 50, 100, and 250 lb forage dry matter per 100 lb animal body weight, respectively, for high (H), medium (M), and low (L) stocking rates. From June through September, in which pastures were primarily exclusive bermudagrass, forage availabilities have approximated 25, 75, and 200 lb forage dry matter per 100 lb animal body weight, respectively, for H, M, and L stocking rates. At termination of a 15-year period, root-rhizome mass at the 0 to 6-inch depth from H, M, and L stocking rates, respectively, was 1,957, 2,034, and 2,480 lb/A for common bermudagrass and 3,111, 3,485, and 4,167 lb/A for Coastal bermudagrass. Root-rhizome mass at the 6 to 18-inch depth from H, M, and L stocking rates, respectively, was 308, 308, and 303 lb/A for common bermudagrass and 316, 501, and 537 lb/A for Coastal bermudagrass.

Introduction

Defoliation by clipping of above-ground plant parts has been shown to reduce root mass. The influence of defoliation due to grazing has not been as clearly delineated primarily because of multiple forage species involved and the various grazing pressures used. This study was initiated to determine the root-rhizome mass of Coastal and common bermudagrass pastures which had been continuously grazed at three grazing pressures during a 15-year period.

KEYWORDS: Long-term grazing/root-rhizome mass/Coastal bermudagrass/common bermudagrass.

Procedure

Coastal and common bermudagrass pastures used in this trial had received identical annual fertilizer treatments of 200-100-100 lb/A of N-P_2O_5-K_2O during the past 15-year period. Each species had been oversown with ryegrass and/or clover and had been grazed at three different grazing pressures or stocking rates. Relative forage availabilities are shown in Table 1 at the time of sampling. The put-and-take technique of grazing was used during the study period to maintain desired levels of available forage. Pastures were overseeded with annual, cool-season forages in mid-October and not grazed until mid-February when sufficient forage was available to maintain full-time, continuous grazing of cows and calves. Grazing continued through the summer until late September or early October in most years. Average stocking rates for common bermudagrass would be approximately 1.75, 1.25, and 0.75 cows and calves per acre, respectively, for H, M, and L stocking rates. With a cow-calf equivalent equal to 1,500 lb, total body weight per acre would be 2,625, 1,875, and 1,125 lb. Coastal bermudagrass supported average stocking rates of 3.0, 2.0, and 1.25 cow-calf equivalents per acre, respectively, for H, M, and L stocking rates. In general, stocking rates from mid-February to mid-May were not as great as stocking rates during the exclusive bermudagrass period from mid-May to early October.

Soil cores, 4 inches in diameter × 18 inches in depth, were taken from 20 locations within each pasture on May 21, 1985. Pasture size was from 2.3, 3.2, and 5.3 acres, respectively, for H, M, and L stocking rates. Each core was partitioned into a 0 to 6-inch section and a 6 to 18-inch section. Soil was washed by spraying a water mist over a fine-mesh wire screen. The root-rhizome mass was then collected from the wire screen and non-bermudagrass roots and other materials removed from the sample. Root-rhizome portions were ovendried and weighed to calculate pounds per acre mass produced.

Results and Discussion

Table 1 shows the available forage or forage-on-offer from all pastures on May 21, 1985. Forage availability ranged from 1,786 to 3,526 on H to L stocked common bermudagrass pastures and from 2,212 to 4,172 on H to L stocked Coastal bermudagrass pastures. Expressed as pounds of forage dry matter per 100 lb animal weight, an indicator of grazing pressure revealed 67, 100, and 257, respectively, for H, M, and L stocked common bermudagrass; and 71, 125, and 309, respectively, for H, M, and L stocked Coastal bermudagrass. These conservative grazing pressures were necessary to prevent a complete "graze-out" of the oversown ryegrass-clover. As the season progressed, the indices of grazing pressure increased to approximately 20, 80, and 215, respectively, for H, M, and L stocked pastures. Actual stocking rates (cow-calf equivalent = 1,500 lb) during the time of root sampling was 1.75, 1.5, and .85 cow-calf units, respectively, for H, M, and L stocked common bermudagrass; and 2.0, 1.5, and .85, respectively, for H, M, and L stocked Coastal bermudagrass. However, the stocking rates increased during the summer period on the H, M, and L pastures to

TABLE 1. FORAGE AVAILABLE PER UNIT AREA (LB/A) AND PER UNIT ANIMAL BODY WEIGHT (BW) OF PASTURES GRAZED AT THREE INTENSITIES

Forage	Stocking Rate					
	High		Medium		Low	
	lb DM A	lb DM 100 lb BW	lb DM A	lb DM 100 lb BW	lb DM A	lb DM 100 lb BW
Common bermudagrass	1,786	67	2,307	100	3,526	257
Coastal bermudagrass	2,212	71	2,885	125	4,172	309

2.25, 1.25, and .9 cow-calf units, respectively, for common bermudagrass and 3.7, 2.0, and 1.4 cow-calf units, respectively, for Coastal bermudagrass.

Coastal bermudagrass pastures had more ($P<.01$) root-rhizome mass at the 0 to 6-inch depth than common bermudagrass pastures when stocked at three levels of grazing pressure (Table 2). Root-rhizome mass ranged from approximately 2,000 to nearly 2,500 lb/A on H to L stocking rates of common bermudagrass. Root-rhizome mass ranged from about 3,100 to more than 4,100 lb/A on the H to L stocked pastures. Since Coastal bermudagrass produces nearly twice as much forage on these sites as does common bermudagrass, the root-rhizome weight advantage for Coastal was anticipated. The influence of grazing pressure was more evident with Coastal as compared to common bermudagrass. Root-rhizome mass was greater from low stocked pastures than from high stocked pastures ($P<.10$).

Table 3 shows the root-rhizome mass present in the 6 to 18-inch depth of the various stocked bermudagrass pastures to be greater in Coastal than in common bermudagrass ($P<.06$). The rooting mass remained very consistent at about 300 lb/A across all stocking rates of common bermudagrass. This was about a 7- to 8-fold reduction in rooting density as compared to root-rhizome mass in the 0 to 6-inch depth. The influence of stocking rate was again more visible with Coastal bermudagrass as the root-rhizome mass was 316, 501, and 537 lb/A from H, M, and L stocked pastures. However, root mass was not different among stocking rates at this depth. This represented an 8- to 10-fold reduction in rooting mass as compared to the 0 to 6-inch depth.

TABLE 2. ROOT MASS (LB/A) AT A 0 TO 6-INCH DEPTH FROM BERMUDAGRASS PASTURES STOCKED AT THREE INTENSITIES

Forage	Stocking Rate			
	High	Medium	Low	Avg.
	Pounds per Acre			
Common bermudagrass	1,957	2,034	2,480	2,157 a[1]
Coastal bermudagrass	3,111	3,485	4,167	3,588 b
Average	2,534 a[2]	2,760 ab	3,324 b	

[1]Means within a column, followed by a different letter, are significantly different ($P<.01$).

[2]Means within a row, followed by a different letter, are significantly different ($P<.10$).

TABLE 3. ROOT MASS (LB/A) AT A 6 TO 18-INCH DEPTH FROM BERMUDAGRASS PASTURES STOCKED AT THREE INTENSITIES

Forage	Stocking Rate			
	High	Medium	Low	Avg.
	Pounds per Acre			
Common bermudagrass	308	308	303	303 a[1]
Coastal bermudagrass	316	501	537	451 b
Average	312 a[2]	405 a	420 a	

[1]Means within a column, followed by a different letter, are significantly different ($P<.06$).

[2]Means within a row, followed by a common letter, are not significantly different ($P<.10$).

Preliminary root-rhizome data from bermudagrass pastures which had been grazed continuously from mid-February to early October suggested differences between forage species and a more detrimental effect due to stocking rate on the Coastal bermudagrass pastures. Time of sampling (May 21), however, may need to be taken into account before implications are finalized. Additional soil-root cores are scheduled to be taken in July-August when bermudagrass above-ground growth reaches maximum proportions. An earlier study (1) on small plots showed a root-rhizome mass of Coastal bermudagrass to be in excess of 5,500 lb/A in the 0 to 6-inch depth in mid-July at College Station. These soils, however, had considerably higher percent organic matter than the soils used in this grazing study, and supplemental irrigation was also used on the small plots.

Literature Cited

1. Holt, E. C., and F. L. Fisher. 1960. Root development of Coastal bermudagrass with high nitrogen fertilizer. Agronomy J. 52:593-596.