CHARACTERIZATION OF GRAZING PATTERNS IN COOL-SEASON ANNUAL AND WARM-SEASON PERENNIAL GRASS PASTURES

G.E. Aiken[1], M.S. West[2] and D.I. Bransby

[1]USDA-ARS, Booneville, AR 72927

[2]Research Data Analysis, and Agronomy and Soils Department, Auburn University, AL 36845

ABSTRACT

Pastures are often either under- or over-grazed, which can affect both pasture sustainability and livestock performance. Disk meter heights were measured for rye (*Secale cereale* L.) -ryegrass (*Lolium* L. *multiflorum* Lam.) pasture to characterize stocking rate (2.5, 3.7, and 4.9 steers/ha) effects on grazing patterns. In another study, grazing indices were calculated for bermudagrass [*Cynodon dactylon* (L.) Pers.] to describe pasture utilization over time for three stocking rates (3.0, 5.9, 8.9 steers/ha). Distributions of DMH for rye-ryegrass showed distinct grazing patterns for each stocking rate, with the distributions changing from bimodal to multi-modal from heavy to light stocking rates. Bermudagrass was not pattern grazed, but grazing indices showed that the extent that pastures were grazed was not consistent over time for any of the stocking rates.

KEYWORDS

Foraging behavior, grazing, cattle

ACRONYMS

DMH (disk meter height)

INTRODUCTION

Grazed pastures exhibit both vertical and horizontal heterogeneity, which can have major implications on livestock performance. Excessive forage mass causes livestock to graze certain areas of pastures and remain in these areas until forage mass is limited (Coleman et al., 1989). Pattern grazing, commonly called “patch” grazing, is evidently affected by grazing pressure. Patch grazing is due to a desire by grazing livestock to select a diet that is high in leaf tissue (Stobbs, 1973; Laredo and Minson, 1973; Chacon and Stobbs, 1976), which allows for maintaining a diet quality that is higher nutritionally than that of the overall forage. Patchiness of herbage further occurs from the accumulation of herbage in proximity to dung (Coleman et al., 1989). Although patch grazing appears to improve diet quality, livestock are eventually forced to move off the patches and graze portions of infrequently grazed forage, which can be low in quality.

Besides increasing the spatial variability of herbage mass and nutritive value, over-grazed areas are further susceptible to weed encroachment. Grazing patterns can therefore have implications on both livestock performance and forage productivity. Grazing patterns were characterized for different stocking in two grazing studies, one with a rye-ryegrass mixture to evaluate changes in grazing patterns mixture, and the other with bermudagrass to evaluate temporal changes in pasture utilization.

MATERIALS AND METHODS

Evaluations of grazing patterns were done for grazing studies with rye-ryegrass pastures located in southeast Alabama and with bermudagrass pastures located in northwest Arkansas. Compressed canopy height was measured in both studies using a 45-cm disk meter (Bransby et al., 1977). Cubic spline interpolation was performed on DMH data to graphically describe the nature of the distributions (Silverman, 1986).

Rye-Ryegrass. Data was collected in 1989 from an experiment that studied the performance of yearling steers on a continuously stocked mixture of rye (cv. Wintergrazer) and ryegrass (cv. Marshall). The pastures were 0.81 ha in area and had 2, 3, and 4 steers/paddock to provide stocking rates of 2.5 (light), 3.7 (intermediate), and 4.9 (heavy) steers/ha., respectively. Each stocking rate was replicated twice in a completely randomized design. Grazing was initiated on 5 Dec. and terminated on 9 Apr. after 125 days of grazing. Disk meter heights were recorded at two hundred randomly located sites within each pasture. Upon generation of the frequency distributions, it was evident the general nature of the distributions were similar between replicated stocking rates; thus, these distributions were pooled.

Bermudagrass. Groups of two, four, and six yearling steers were randomly assigned to three, .68-ha pastures of bermudagrass (cv. Tifton-44) to provide stocking rates of 3.0, 5.9, 8.9 steers/ha. On the day before placement of steers in pastures (21 July, 1994), 1000 disk meter heights were taken over the combined areas of the three pastures to determine the initial distribution. At 28-d intervals (18 Aug., 15 Sept., and 13 Oct.), DMH were taken at 1000 sites within each pasture.

A grazing index was calculated for sequential sample dates by taking the number of DMH at and below the mode for a sample date and dividing it into the number of DMH over the same interval of DMH for the next sample date. An index of less than one is due to a shifting of the distributions to the right, which is assumed to result from pasture growth being greater than pasture consumption. An index of one results from no shifting, suggesting a balance between pasture consumption and growth. Indices greater than one reflect a shift to the left, resulting from pasture consumption being greater than pasture growth.

RESULTS AND DISCUSSION

Rye-Ryegrass. Trends in density estimates for each of the three stocking rates showed the presence of more than one mode (Figure 1). All three stocking rates had modes at the 10-cm DMH, with these areas of the pastures representing intensely-grazed patches. The area covered by grazing patches generally increased as stocking rate increased, with grazing patches encompassing more than 60% of the total area for the heavy stocking rate. A second mode between 20 and 25 cm was also detected for each stocking rate, which likely represented areas next to patches that were being grazed. The light stocking rate further showed modality at 30 and 50 disk meter heights. These areas were dominated by the taller growing rye, which was in a reproductive stage of growth and infrequently grazed. The distribution of disk meter heights about the tallest mode likely represented herbage that was growing proximate to dung pats, with growth that was unhindered by grazing and further promoted by the higher fertility.

Gib and Ridout (1986) used a mixture of two normal distributions to fit pasture heights of continuously stocked ryegrass-white clover (*Trifolium repens* L.) pastures and concluded that the two distributions represented frequently and infrequently grazed herbage. Results of our study support this conclusion, but further showed that distributions of pasture height for multiple species mixtures under light grazing pressures can actually contain a family of distributions, with each distribution representing frequently and infrequently grazed portions of each species.

Bermudagrass. Each of the three stocking rates maintained normal distributions through the duration of the study, which indicated there were no distinct grazing patterns (Figure 2). Therefore, the pastures did not contain large areas of over- or under-grazing. There were shifts in the distributions, with changes in the grazing indices paralleling these shifts.

Indices over the three successive 28-day periods for the three stocking rates were 0.7, 1.0, and 1.2 for the light rate, 1.0, 1.4, and 1.2 for the intermediate rate, and 1.3, 1.1, and 1.3 for the heavy rate. Although the lack of replication precludes making valid inferences, trends in the indices suggested that the magnitude of the trends increased as stocking rate decreased. Consumption for light stocking did not appear to be greater than growth until the last 28-day period. Bermudagrass growth will generally decrease during September and October in southeastern United States when temperatures typically decline. Intermediate stocking showed to allow a balance between growth and consumption rates during the first period, but shifts in the distributions for the next two periods indicated higher consumptions relative to growth. Consumption for heavy stocking appeared greater than growth for all three periods.

Grazing indices could have some utility in determining shifts in the extent that pastures are grazed relative to growth. Animal performance is affected by the inter-relationship between forage quality and quantity (Duble et al., 1973; Guerrero, et al., 1984). Grazing indices could therefore be useful in studying relationships between herbage yield and livestock performance.

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Figure 1

Distributions of disk meter height for different stocking rates on a rye (*Secale cereale* L.)-ryegrass (*Lolium multiflorum* L.) mixture.

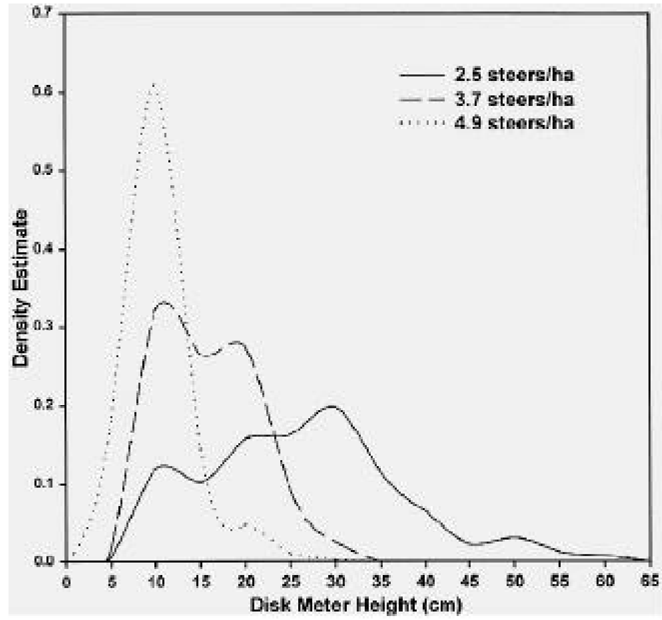

Figure 2

Distributions of disk meter height over time for different stocking rates on bermudagrass [*Cynodon dactylon* (L.) Pers.].