SEASONAL DISTRIBUTION OF FORAGE YIELD FROM A "NATURAL" PASTURE UNDER ROTATIONAL GRAZING

V.R. Kanneganti, T.R. Dhiman, R.P. Walgenbach, L. Massingill, M.P. Russelle and L.D. Satter

ABSTRACT

A 2-yr grazing study was conducted to quantify forage available daily for cattle intake from a natural pasture managed under rotational grazing. Grazing was initiated around 1 May, and was managed with a rotation length of about 17 d each for cycles 1 and 2, and 30 d each for the rest. In 1994, under adequate moisture conditions, forage availability during 5/1-6/1, 6/1-8/15, 8/15-9/15, and 9/15-10/15 was 77, 66, 38 and 14 kg DM ha^{-1} d^{-1}, respectively, resulting in a total yield of 8580 kg ha^{-1} in 175 d. In 1995, a prolonged period of dry summer reduced the grazing season to 150 d. Forage supply dropped to 46 kg ha^{-1} d^{-1} during 6/1-8/15. Natural pastures in northcentral U.S. have the potential to provide significant amount of forage for 5-6 months per year under rotational grazing, but additional feed may be needed for a month or two during periods of stress.

KEYWORDS

Pasture growth, growth rate, yield distribution, pasture management

INTRODUCTION

Temperate "natural" pastures constitute a large and under-utilized resource on livestock farms in northeastern and northcentral U.S. They are often dominated by Kentucky bluegrass (*Poa pratensis* L.), quackgrass (*Elytrigia repens* (L.) Nevski) or smooth bromegrass (*Bromus inermis* Leyss.) with varying amounts of white clover (*Trifolium repens* L.). Under good grazing management, natural pastures have the potential to persist indefinitely while producing forage profitably (Blaser *et al.*, 1986; Fales *et al.*, 1993; Murphy *et al.*, 1991; Rayburn, 1987).

Grazing is a daily activity, and successful integration of natural pastures into a grazing program requires estimates of daily supply of forage to grazing animals. This information is needed for feed budgeting and stocking rate calculations on a daily or seasonal basis (Lile and George, 1993). Such data are not readily available for natural pastures managed under rotational grazing with dairy cattle. The objective of this study was to provide quantitative estimates of forage available to cattle for daily intake from a natural pasture managed under rotational grazing.

METHODS

Grazing Management. A 50-acre natural pasture located in Prairie-du-Sac, Wisconsin, on a silt loam soil was managed under rotational grazing with dairy cattle during 1993-95. Year 1 (1993) was treated as a transition year, and data collected during 1994 and 1995 are reported. Grazing was initiated around 1 May. The first and second grazing cycles were rotated on an average interval of 17 d each, while the other cycles were on a 30 d rotation. Grazing was managed such that the duration of animal stay on a paddock was 1 d, which resulted in varying size and number of paddocks for a grazing cycle depending upon forage availability and intake requirement. Species composition by weight of the pasture sampled before grazing was 12% white clover, 55% grasses, 8% weeds and the rest dead matter. Average pre- and post-grazing sward heights measured with a "rising plate" meter (Gonzalez *et al.*, 1990) were 0.18 and 0.10 m, respectively. The plate was made up of Styrofoam material, measuring 0.3 m x 0.3 m in area and exerting a pressure of 2.5 kg m^{-2}. Fertilizer N application was limited to 67 kg N ha^{-1} yr^{-1} in two equal split applications during the third and fifth grazing cycles.

Pasture Growth Rate and Forage Supply. Two one-acre paddocks were selected at random for forage sampling following a double sampling technique (Gonzalez *et al.*, 1990) before and after grazing during each cycle. In a 30-d rotation, the two paddocks were grazed about 15 days apart. Pasture height (using the plate meter) and biomass in 10 quadrats areas (1.0 m x 0.3 m, each) per paddock were measured, from which a regression relationship between mass and height was developed. In the next step, a representative sward height for the paddock was obtained by averaging 75 plate-meter heights measured at random across the paddock. Forage biomass corresponding to the average height of the paddock was derived using the regression equation. Pasture growth rate for a paddock was calculated as:

$$G_i = (W_s - W_o) / T_r,$$

where,

G_i is the average rate of pasture dry matter accumulation for cycle, i (kg ha^{-1} d^{-1}), W_o is the initial forage mass (forage cut after grazing, kg ha^{-1}), W_s is the forage harvested just before grazing (kg ha^{-1}) following a rest period of T_r (d). Pasture growth rate, as calculated here, represents forage available for daily intake during a cycle, because (W_s-W_o) represents regrowth accumulated above the grazing height.

RESULTS AND DISCUSSION

Estimates of daily supply of forage dry matter to grazing animals across the season are presented in Fig. 1. Rate of forage supply during May was not very different between years or between paddocks within a year. Forage was available during this period at an average rate of 78 kg ha^{-1} d^{-1}. Later in the season, a prolonged period of dry weather during much of the summer in 1995 lowered forage availability significantly. During the grazing period of 1 June to 15 August in 1995, forage was available at an average rate of 46 kg ha^{-1} d^{-1} compared to 66 kg ha^{-1} d^{-1} for the same period in 1994. After 15 August, forage availability declined gradually to about 10 kg DM ha^{-1} d^{-1} by 15 October in both years (Fig 1).

Using these daily estimates of forage availability, season total yield and its distribution were computed by multiplying the rate and the corresponding rotation length per cycle minus 1 d for duration of stay on a paddock. During 1994, forage yield available for intake during 5/1-6/1, 6/1-8/15, 8/15-9/15, and 9/15-10/15 was 2220, 4800, 1150 and 410 kg ha^{-1}, respectively, resulting in a season total yield of 8580 kg ha^{-1}. Yield estimates for the corresponding periods in 1995 were 2290, 3310, 560 and 0 kg ha^{-1}, resulting in a total yield of 6160 kg ha^{-1}. Much of the variation in forage supply between years occurred during 15 June-15 August (Fig. 1), primarily due to lack of moisture.

Under adequate moisture conditions, natural pastures in northcentral U.S. can be very productive when managed under rotational grazing. Summer drought, likely to occur during mid-June to mid-August, has the potential to reduce forage availability significantly. During periods of stress, additional feed may be needed for a month or two, or stocking rate needs to be lowered.

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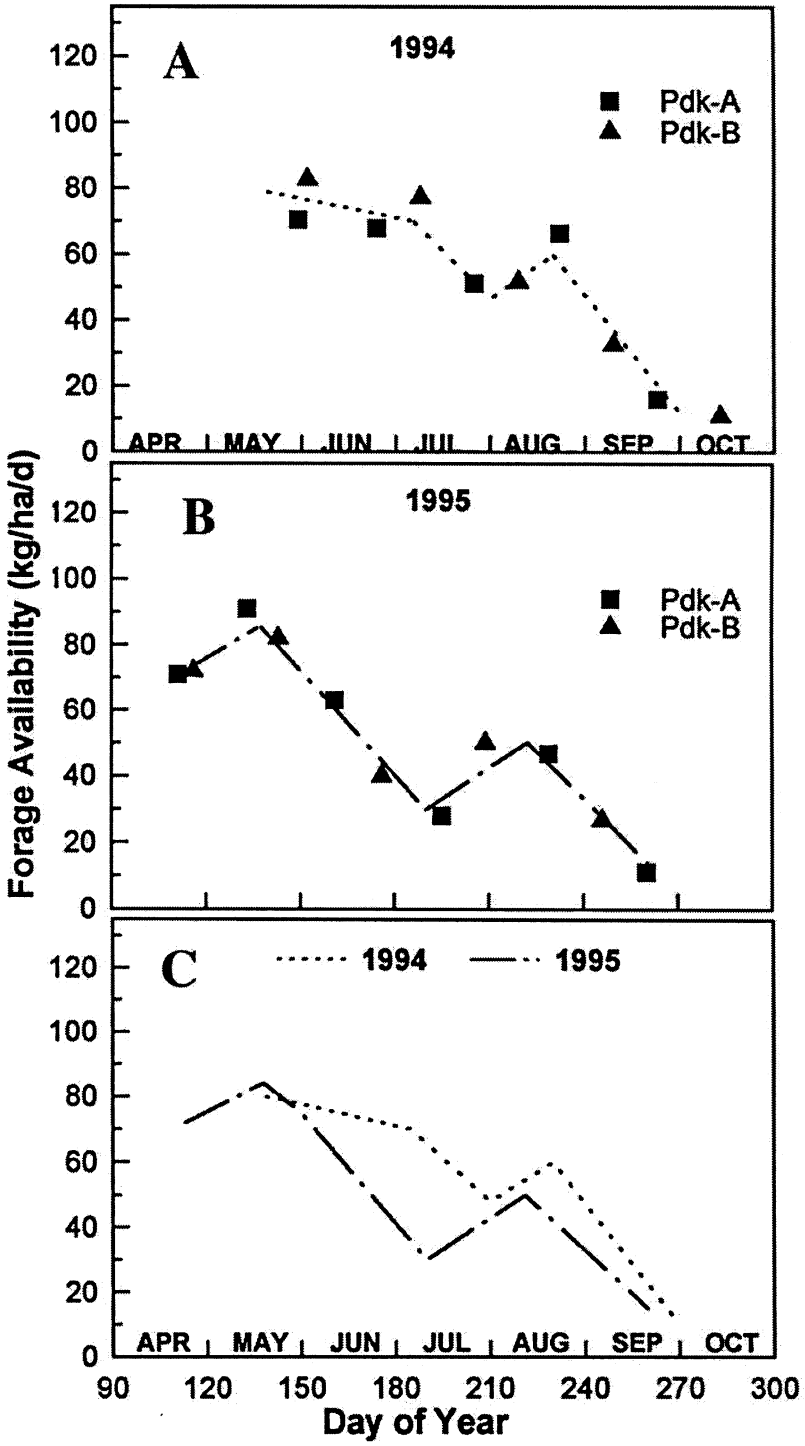

Figure 1
Daily supply of forage dry matter to cattle under rotational grazing during 1994 and 1995. (Lines in **(a)** and **(b)** are fitted to data by eye; lines in **(c)** are redrawn from **(a)** and **(b)** for comparison.)