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Abstract

Seven ruminal and esophageally fistulated crossbred beef cows were used to monitor changes in chemical composition of tallgrass-prairie forage selected during November of 1989 and January, March, June, and August of 1990. Quality of forage selected by beef cows was lowest during the period just before calving (cows calved in early February) but had begun to improve by the March sampling (postpartum period) and reached its peak during June sampling period (breeding season). Observed variability in the fiber and protein components of grazed forage highlights the dynamic nature of forage quality and emphasizes the importance of using such information when assessing the nutritional adequacy of range diets.

Keywords

Cattlemen's Day, 1992; Kansas Agricultural Experiment Station contribution; no. 92-407-S; Report of progress (Kansas State University. Agricultural Experiment Station and Cooperative Extension Service); 651; Beef; Beef cows; Range; Forage; Protein; Fiber; Selection

VARIATION IN THE QUALITY OF FORAGE GRAZED BY PREGNANT/LACTATING BEEF COWS AT KEY PERIODS IN THE YEAR[1]

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Summary

Seven ruminal and esophageally fistulated crossbred beef cows were used to monitor changes in chemical composition of tallgrass-prairie forage selected during November of 1989 and January, March, June, and August of 1990. Quality of forage selected by beef cows was lowest during the period just before calving (cows calved in early February) but had begun to improve by the March sampling (postpartum period) and reached its peak during June sampling period (breeding season). Observed variability in the fiber and protein components of grazed forage highlights the dynamic nature of forage quality and emphasizes the importance of using such information when assessing the nutritional adequacy of range diets.

(Key Words: Beef Cows, Range, Forage, Protein, Fiber, Selection.)

Introduction

To satisfactorily meet the nutrient needs of grazing beef cows, one must be aware of the balance between nutrient input (i.e., forage quality and forage intake) and the cow's changing nutrient requirements. By knowing the nutrient profile of the forage, periods that deserve special nutritional consideration are highlighted and a producer can develop supplementation strategies or special rations that address unique requirements. However, without reliable information regarding levels of forage intake and quality of diet selected, such calculations have little value. Because information was limited regarding seasonal variation in intake, diet selection, grazing behavior, and digestive physiology of pregnant/lactating beef cows grazing tallgrass prairie, we designed an experiment in which those factors were monitored at critical stages in a beef cow's production cycle. The current paper reports seasonal variation in the chemical composition of grazed forage.

Experimental Procedures

Seven mature, Angus × Hereford cows with esophageal and ruminal fistulas were used to monitor seasonal changes in quality of forage selected. Cows were synchronized with prostaglandin and pasture-mated to a single bull. They calved in early February over a period of approximately 2 weeks. All cows grazed a common pasture of tallgrass-prairie forage. Samples of grazed forage were collected via the esophageal fistulas during five 3-4 day periods, as follows (stage of production cycle in parentheses): 11/2 to 11/4/89 (mid-prepartum); 1/24 to 1/26/90 (late prepartum); 3/29 to 3/31/90 (early postpartum/early lactation); 6/14 to 6/16/90 (breeding/mid-lactation); 8/19 to 8/22/90 (early prepartum/late lactation). To minimize regurgitation effects on esophageal collections, cows were gathered during the evening on the day before each collection and withheld from grazing (with access to water) until early morning. Samples of grazed forage were collected in the early morning during a grazing period of approximately 30 minutes.

[1]Appreciation is expressed to Gary Ritter, Wayne Adolph, and the student workers at the Range Research Unit for their invaluable assistance in conducting this trial.

Collection bags were lined with plastic to allow collection of both grazed forage and saliva. Samples were placed on ice, transported to the laboratory, frozen immediately, and freeze-dried later. The pasture used for sample collection was burned during late April.

Results and Discussion

During January, protein concentration was lowest ($P < .05$) (Table 1) and the percentage of the crude protein (CP) that was unavailable to the animal (acid detergent insoluble nitrogen = ADIN) was highest ($P < .05$). Similarly, the amount of fiber that was indigestible (indigestible acid detergent fiber = IADF) was highest ($P < .05$) during this period, as were ash-free acid detergent fiber (ash-free ADF) and ash-free neutral detergent fiber (ash-free NDF). Acid detergent lignin (ADL) is an indigestible component of forages that is believed to limit the extent to which forages can be digested. The ADL content was also highest ($P < .05$) during the fall/winter sampling periods. The warm-season perennial grasses that dominate the tallgrass prairie typically are in the early stage of their growth cycle in late March. However, some temperate species (for example, Kentucky bluegrass) can grow actively during that period. During the late-March sampling period, enough new growth was available and selected that a rise ($P < .05$) occurred in CP concentration and declines ($P < .05$) occurred in ash-free ADF, ash-free NDF, ADL, ADIN, and IADF, compared with the late-January sampling period. A beef cow's nutrient requirements are typically highest during that period (early postpartum/early lactation). In spite of improvements in late-March forage quality compared with late January, quality of the diet available and selected remained below that necessary to meet nutrient requirements. In general, the highest forage quality (highest CP and lowest fiber) was selected during June ($P < .05$). Similarly, this period was characterized by the lowest ($P < .05$) IADF and a low concentration of ADIN. Compared with the June samples, grazed forage quality declined significantly during late summer (August). Further declines would be expected following cessation of growth and with continued weathering. The variability in chemical composition of forage selected by grazing beef cows agrees with research reported for other forage types and highlights the importance of factoring in changes in forage quality when attempting to assess the nutritional adequacy of range beef cows.

Table 1. Seasonal Variation in the Chemical Composition of Forage Selected by Esophageally Fistulated Beef Cows Grazing Tallgrass Prairie at Different Times of the Year

	Month					
% of OM	November	January	March	June	August	SE
Crude protein	8.27[f]	5.82[g]	8.73[fi]	14.01[h]	9.40[i]	.2
Ash-free ADF[a]	41.64[f]	46.85[g]	43.16[h]	39.05[i]	41.03[f]	.48
Ash-free NDF[b]	65.65[f]	75.47[g]	71.78[h]	67.28[f]	66.71[f]	.87
ADL[c]	7.06[f]	7.15[f]	5.56[g]	4.55[g]	5.39[g]	.42
IADF[d]	14.71[f]	17.36[g]	12.30[h]	8.06[i]	12.44[h]	.71
ADIN, % of total N[e]	17.67[f]	21.22[g]	16.79[f]	12.64[h]	10.63[h]	.77

[a]Ash-free ADF = ash-free acid detergent fiber. [b]Ash-free NDF = ash-free neutral detergent fiber. [c]ADL = acid detergent lignin. [d]IADF = indigestible acid detergent fiber. [e]ADIN = acid-detergent insoluble nitrogen. [f,g,h,i]Means within a row without common superscripts differ ($P < .05$).