Forage Selection Preferences of Experienced Cows and Naïve Heifers Grazing Native Tallgrass Range During Winter

N.A. Aubel, K.C. Olson, J.R. Jaeger, D.A. Blasi, L.N. Edwards, G.J. Eckerle, L.A. Pacheco, and L.W. Murray

Introduction

Estimating the nutritive value of a grazing animal's diet is a significant challenge. Description of the botanical composition of a grazed diet is vital in that regard. Microhistological analysis of fecal material has been used for estimating the botanical composition of wild and domestic ungulate diets since first described by Baumgartner and Martin in 1939.

Little research has been conducted on the diet selection preferences of multiparous beef cows compared to primiparous beef cows. We hypothesized that foraging strategies change as cows age. To that end, our objective was to characterize differences in diet selection between experienced multiparous and naïve primiparous beef cows grazing dormant, native tallgrass pastures during winter.

Experimental Procedures

The study was conducted on 8 pastures (approximately 69 acres each) located at the Kansas State University Beef Stocker Unit. These native range pastures were dominated by big bluestem (*Andropogon geradii*) and little bluestem (*Schizachyrium scoparium*), which were grouped together for the purposes of microhistological analysis; sideoats grama (*Bouteloua curtipendula)*; blue grama (*Bouteloua gracillis*); switchgrass (*Panicum virgatum*); indiangrass (*Sorghastrum nutans*); leadplant (*Amorpha canescensi*); heath aster (*Symphyotrichum ericoides*); dotted gayfeather (*Liatris punctata*); and purple prairie clover (*Dalea purpurea*). Pastures were grazed from February 21 to March 1, 2009.

Treatments consisted of non-pregnant multiparous cows (n = 18; average initial body weight = 1299 ± 110 lb; average initial body condition score = 4.9 ± 0.5) that were 9 years of age and had grazed dormant, native tallgrass pastures during each winter of their lives and non-pregnant primparous cows (n = 20; average initial body weight = 664 ± 55 lb; average initial body condition score = 4.1 ± 0.4) that were 11 months of age and had never grazed dormant, native tallgrass pastures. Cows were grouped randomly into grazing cohorts by treatment (i.e., experienced cows or naïve heifers). Cows were allowed to adapt to their cohort groupings and to graze separate dormant, native tallgrass pastures for 9 days before the study began. The grazing cohorts were then assigned randomly to graze 4 of the 8 pastures in sequence during 4 consecutive, 48-hour periods; cohorts were never commingled before or during the study. No supplemental feed or mineral was offered to cows during the study.

In keeping with previous research comparing diets grazed by dissimilar classes of beef cattle, grazing cohorts were gathered into a corral at the end of each 48-hour collection period and fecal grab samples were collected from each animal for analysis. Samples

were prepared by soaking in 50% ethanol (volume/volume) solution overnight, then homogenized and washed with deionized water to remove contaminants. Samples were then dried and ground to pass a 1-mm screen for slide preparation.

For slide preparation, subsamples were soaked to soften them, rinsed with deionized water, homogenized, and rinsed again. The subsample was placed on a slide with 1 to 3 drops of Hertwig's solution and placed over a propane flame until dry; 1 to 2 drops more of Hoyer's solution was added to mount a cover slip. Slides were dried before viewing.

Slides were viewed on a compound microscope at 10× magnification. The microscope was equipped with a digital camera; each slide field was photographed for comparison with standard slides. Twenty fields per slide were selected randomly from the entire slide view and were used to measure the frequency with which plant fragments appeared. Plant fragment prevalence in slide fields was assumed to be equivalent to prevalence in fecal samples and in grazed diets on a dry matter basis. Plant fragments that were not among the 10 predominant range plants for which standards were prepared were classified as either an unknown grass or an unknown forb.

Results and Discussion

Relatively few plant species comprise the majority of diets selected by beef cows grazing the Kansas Flint Hills in winter. The prevalence of unidentifiable grasses and forbs in each grazing cohort observation within each period was ≤0.14% in our study; moreover, we observed no effects ($P \geq 0.32$) of parity or period on the amounts of unidentified grasses or forbs in beef cow diets (Table 1).

Primiparous cows selected more ($P=0.09$) forbs and fewer ($P=0.09$) grasses than multiparous cows (Table 2). The average difference between multiparous cows and heifers was modest (4.0%) but typical of previous reports comparing botanical composition of diets grazed by dissimilar classes of beef cattle. Greater consumption of forbs by primiparous cows compared with multiparous cows was unexpected. Previous research indicated that preference for broadleaf plants generally increases with grazing experience; however, these conclusions were based on research with forages of greater quality than those evaluated in our study.

Multiparous cows ate more ($P=0.07$) bluestem and less ($P=0.05$) dotted gayfeather than primiparous cows (Table 2). Grass consumption by the cows in our study was less and forb consumption greater than that reported for spring and summer grazing seasons in the northern United States; however, similar grass:forb ratios have been reported in cattle diets in the southern United States. Kansas researchers reported that forbs comprised only 2.5 to 6% of all range plants on Kansas tallgrass prairie. In contrast, forb consumption in our study ranged from a high of 39.6% in period 1 to a low of 27.1% in period 4 (Table 3). Consumption of total forbs, purple prairie clover, leadplant, and dotted gayfeather by both classes of cows declined ($P \leq 0.04$) over time, whereas consumption of total grasses, bluestem, and blue grama increased ($P \leq 0.02$) over time. The cattle in our study appeared to actively seek certain forb species during foraging. The decline in forb consumption over time may have indicated that forb availability diminished during the study.

Occasional differences in consumption of indiangrass, switchgrass, sideoats grama, and heath aster between primiparous and multiparous cows occurred; however, differences were inconsistent (parity × period effect; $P \leq 0.02$) over time and we consider these effects to be of little importance (Table 1).

Implications

Differences observed in diet selection patterns between multiparous and primiparous cows during a short-term winter grazing period could be indicative of differences in long-term foraging strategies.

Table 1. Effects of collection period on botanical composition of diets selected by multiparous or primiparous beef cows grazing the Kansas Flint Hills in winter

						P-value		
% of diet dry matter	Period 1	Period 2	Period 3	Period 4	SEM	Parity	Period	Parity × period
Grasses								
Multiparous	61.7	66.5	73.0	74.6	2.5	0.09	<0.01	0.55
Primiparous	59.0	64.6	64.8	71.4				
Bluestem								
Multiparous	27.2	15.2	19.6	17.8	1.5	0.07	<0.01	0.58
Primiparous	26.4	10.5	17.0	16.0				
Indiangrass								
Multiparous	19.4	34.2	37.2	40.9	1.7	0.24	<0.01	<0.01
Primiparous	16.4	44.7	36.2	41.8				
Switchgrass								
Multiparous	10.0	11.8	11.6	10.1	1.2	0.01	0.60	0.03
Primiparous	9.3	5.1	7.0	7.5				
Blue grama								
Multiparous	3.6	3.9	2.6	4.3	0.5	0.79	0.02	0.13
Primiparous	4.6	2.9	2.8	3.6				
Sideoats grama								
Multiparous	1.47	1.64	1.84	1.57	0.24	0.82	0.22	0.04
Primiparous	2.23	1.06	1.48	1.60				
Unknown grasses								
Multiparous	0.03	0.05	0.03	0.02	0.055	0.32	0.74	0.60
Primiparous	0.04	0.09	0.10	0.14				
Forbs								
Multiparous	38.3	33.5	27.0	25.4	2.5	0.09	<0.01	0.55
Primiparous	41.0	35.4	35.3	28.7				
Purple prairie clover								
Multiparous	14.2	13.7	11.7	10.0	1.1	0.15	<0.01	0.22
Primiparous	15.9	16.2	10.1	12.1				
Leadplant								
Multiparous	10.8	10.3	5.6	6.2	1.6	0.42	0.04	0.14
Primiparous	10.6	9.1	10.6	7.4				
Dotted gayfeather								
Multiparous	7.1	6.5	6.2	5.4	1.1	0.04	0.01	0.28
Primiparous	11.2	8.4	7.8	5.6				
Heath aster								
Multiparous	6.2	3.0	3.7	3.9	0.9	0.88	<0.01	<0.01
Primiparous	3.2	2.0	6.9	4.2				
Unknown forbs								
Multiparous	0.03	trace	0.01	0.01	0.014	0.58	0.60	0.38
Primiparous	trace	trace	trace	0.02				

Table 2. Effect of parity status on botanical composition of diets selected by beef cows grazing the Kansas Flint Hills in winter

% of diet dry matter	Primiparous	Multiparous	SEM	P-value
Grasses	64.9	69.0	1.4	0.09
Bluestem matter	17.5	20.0	0.8	0.07
Forbs	35.1	31.0	1.4	0.09
Dotted gayfeather	8.3	6.3	0.6	0.05

Table 3. Effect of collection period on botanical composition of diets selected by beef cows grazing the Kansas Flint Hills in winter

% of diet dry matter	Period 1	Period 2	Period 3	Period 4	SEM	P-value
Grasses	60.4	65.6	68.9	73.0	1.8	<0.01
Bluestem	26.8	12.9	18.3	16.9	1.0	<0.01
Blue grama	4.1	3.4	2.7	4.0	0.4	0.02
Forbs	39.6	34.5	31.1	27.1	1.8	<0.01
Purple prairie clover	15.1	14.9	10.9	11.0	0.8	<0.01
Leadplant	10.7	9.7	8.1	6.8	1.1	0.04
Dotted gayfeather	9.2	7.5	7.0	5.5	0.7	0.01