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KANSAS STATE UNIVERSITY CATTLEMEN'S DAY

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Introduction

Intensive-early grazing of yearling beef steers or heifers in Kansas allows beef producers to maximize growth and production per acre during the period of the year associated with elevated forage quality in the Flint Hills. The noxious weed sericea lespedeza (*Lespedeza cuneata*) threatens this long-used and successful production practice. Cattle are highly sensitive to condensed tannins in sericea lespedeza. Experienced beef cattle show strong aversions to grazing sericea lespedeza. It is unknown to what degree that naive yearling cattle may select sericea lespedeza during normal grazing activities.

Microhistological analysis of feces has been used to estimate botanical composition of the diets of domesticated and wild herbivores. Plant fragments in feces are evaluated under a microscope to identify and count individual plant species. Our objective was to use microhistological analysis of feces to characterize the diets of yearling steers managed under an intensive-early stocking regime on native tallgrass pastures with significant infestations of sericea lespedeza.

Experimental Procedures

The experiment was conducted on eight native tallgrass pastures located in Woodson County, KS, at the Kansas State University Bessner Range Research Unit during the 2015 and 2016 growing seasons. Pastures were burned annually in April and stocked with yearling steers (n = 281/year; initial body weight = 582 ± 75 lb) at a relatively high stocking rate (2.7 acres/steer) from April 15 to July 15. Steers were sourced from various commercial cattle growers in southeastern Kansas and assigned randomly to pastures. Basal frequency of sericea lespedeza was 2.9 ± 2.43% during the period of our experiment.

Four 328-ft transects were laid out in a north-south gradient in each pasture. Following a 2-week adaptation period, fecal samples were collected bi-weekly from fresh fecal pats along each transect from May 1 to July 15 annually. Care was taken to avoid contaminating fecal material with soil or vegetation and samples were frozen at -4°F pending processing and analysis.

Seventeen plant species native to the study site were collected for use as comparison standards for microhistological analyses. These plant species consisted of eight grass or grass-like plants (big bluestem (*Andropogon gerardii*), little bluestem (*Schizachy-*

rium scoparium), switchgrass (*Panicum virgatum*), indiangrass (*Sorghastrum nutans*), blue grama (*Bouteloua gracilis*), sideoats grama (*Bouteloua curtipendula*), buffalograss (*Buchloe dactyloides*), and sedges (*Carex* spp.)). Additionally, this included nine forb or forb-like plants (purple prairie clover (Dalea purpurea), leadplant (*Amorpha canescens*), dotted gayfeather (*Liatris punctata*), heath aster (*Symphyotrichum ericoides*), sericea lespedeza, Baldwin's ironweed (*Vernonia baldwinii*), western ragweed (*Ambrosia psilostachya*), annual broomweed (*Gutierrezia dracunculoides*), and common ragweed (*Ambrosia artemisiifolia*)). Each standard sample was derived by hand clipping 10 to 20 individual plants from a homogeneous stand of each plant type. Fruiting culms were discarded whereas leaves, flowers, and vegetative stems were dried in a forced-air oven at 131°F for 96 hours. Dried samples were ground to a fine particle size using a cyclone-style sample mill.

Fecal samples were dried in a forced-air oven at 131°F for 96 hours then finely ground. Following grinding, samples were composited by transect within sampling date and mixed for 120 minutes to achieve homogenization.

Individual subsamples (0.017 to 0.035 oz) of fecal composites and comparison standards were soaked in 50% ethanol solution overnight, then washed for 5 minutes with de-ionized water through a No. 200 US-standard sieve. Samples were then soaked in 0.05 M sodium hydroxide for 20 minutes and washed again with de-ionized water. A small amount of each sample or standard was placed on a microscope slide (5 slides/fecal sample and 3 slides/standard sample) with a dissecting needle. One to 3 drops of Hertwig's solution was applied to each slide, and then slides were held over a propane flame until dry.

Slides were viewed under a compound microscope equipped with a digital camera (DC5-163, Thermo Fisher Scientific, Asheville, NC) at 100 × magnification. Twenty slide fields from each slide were randomly selected, photographed, and stored. Individual plant fragments on each sample-slide field of view were counted and identified by plant species. The total number of fragments of each plant species on a given slide were converted to frequency of occurrence using the following equation: (total of individual species ÷ total of all species) × 100. Plant fragments not similar to the 17 range plant standards were classified as either unknown forb or unknown grass.

Results and Discussion

Selection of individual plant species by steer was not influenced ($P \geq 0.09$) by pasture or by the interaction between pasture and time of collection (i.e., period); therefore, period sums of squares were partitioned using orthogonal polynomial contrasts (Table 1). The proportions of total grass and grass-like plants and total forbs and forb-like plants in the diets of grazing steers were not different ($P=0.37$) between sampling periods and were interpreted to indicate steer diets were strongly dominated by grasses (≥ 88.4% of diets). More than 99% of grass plants selected by steers were represented by the 8 grass reference standards, whereas more than 97% of forbs selected by steers were represented by the 9 forb reference standards.

Steer selection of big bluestem, common ragweed, western ragweed, sericea lespedeza, dotted gayfeather, annual broomweed, and heath aster were also not influenced

($P \geq 0.07$) by sampling period. Conversely, steer selection of little bluestem decreased ($P < 0.01$) linearly with advancing season, whereas selection of switchgrass, indiangrass, and Baldwin's ironweed increased ($P \leq 0.04$) linearly with advancing season. Proportion of all other reference plants in steer diets were influenced ($P \leq 0.05$) by sample collection period, likely affected by plant availability, plant growth cycle, or plant palatability. The dietary proportion of sericea lespedeza selected by freely-grazing yearling beef steers was small (trace amounts to 0.1% of the diet). Naive steers evidently learned to avoid sericea lespedeza early during the grazing period.

Implications

In this experiment, grasses comprised not less than 88.4% of steer diets, whereas forbs comprised not more than 11.6% of steer diets. Selection of grasses by steers was somewhat greater than that reportedly selected by beef cows at the same time of year. Major grasses in steer diets were big and little bluestem, switchgrass, and indiangrass. Sericea lespedeza comprised only a minor proportion of grazing steer diets. In fact, sericea lespedeza consumption was less than the detection threshold of our analyses in 4 out of 5 sampling periods. This finding highlights the difficulty in achieving control over sericea lespedeza using yearling cattle grazing alone.

Table 1. Botanical composition of yearling steer diets in the Kansas Flint Hills: orthogonal polynomial contrasts by period

	Botanical composition (Percent of diet dry matter)						P-value			
Item	Early May	Late May	Early June	Late June	Early July	Standard error	Linear	Quadratic	Cubic	Quartic
Grass and grass-like										
Big bluestem	21.4	23.9	23.3	18.4	20.5	2.51	0.21	0.45	0.08	0.40
Little bluestem	27.0	23.6	19.7	16.0	16.9	1.76	<0.01	0.07	0.21	0.76
Switchgrass	11.5	13.4	15.7	17.0	18.0	1.53	<0.01	0.52	0.85	0.82
Indiangrass	9.8	11.1	14.0	15.1	14.1	1.87	<0.01	0.19	0.36	0.78
Blue grama	9.7	9.0	7.4	9.3	10.5	1.13	0.46	0.02	0.93	0.21
Sideoats grama	3.6	3.4	1.4	3.1	2.4	0.81	0.16	0.24	0.72	0.02
Buffalograss	5.8	3.4	4.1	6.8	4.7	0.92	0.62	0.29	<0.01	0.33
Sedge spp.	1.9	2.0	2.4	3.4	2.9	0.35	<0.01	0.44	0.03	0.28
Unidentified grass	0.3	0.4	0.3	0.9	0.3	0.19	0.33	0.08	0.02	0.02
Forb and forb-like										
Purple prairieclover	1.8	2.0	3.0	2.8	2.1	0.54	0.26	0.05	0.27	0.43
Dotted gayfeather	0.4	0.8	0.6	0.6	0.5	0.20	0.75	0.16	0.21	0.29
Leadplant	0.1	0.2	trace	0.1	trace	0.07	0.09	0.17	0.18	<0.01
Heath aster	trace	trace	trace	0.1	trace	0.03	0.73	0.30	0.19	0.07
Sericea lespedeza	trace	trace	trace	0.1	trace	0.04	0.58	0.69	0.44	0.10
Baldwin's ironweed	1.0	1.6	2.2	2.0	2.2	0.59	0.04	0.35	0.77	0.57
Western ragweed	2.4	2.0	2.3	2.1	2.3	0.54	0.94	0.58	0.83	0.54
Annual broomweed	0.2	0.1	0.2	0.2	0.2	0.08	0.45	0.39	0.36	0.56
Common ragweed	1.2	0.9	1.0	0.9	1.0	0.30	0.56	0.41	0.90	0.58
Unidentified forb	1.8	2.0	2.4	1.1	1.3	0.21	<0.01	<0.01	<0.01	<0.01
Total grass and grass-like	91.1	90.2	88.4	90.1	90.3	1.77	0.68	0.25	0.89	0.37
Total forb and forb-like	8.9	9.8	11.6	9.9	9.7	1.77	0.68	0.25	0.89	0.37