Cattle Diets on Rotation and Seasonlong Grazing Treatments

D.R. Kirby and H.E. Webb

Characterization of an animal's diet on native rangelands is complicated due to selectivity of animals, and fluctuations of that selectivity with regard to available forage, palatability, environmental conditions, nutritional needs and management. However, knowledge of the botanical composition and nutritional content of diets consumed by grazing animals is basic to improved range management and animal nutrition (Theurer et al., 1976).

The mixed grass prairie of North Dakota has traditionally been grazed by cattle. In western North Dakota, graminoid species dominated the botanical composition of cow diets (Kirby and Parman, 1986; Pessin et al., 1986). Graminoids were also consistently preferred (percentage in diet greater than available for grazing) by cows regardless of season and grazing treatment. Nutritionally, cow diets decreased seasonally in crude protein (CP) and in vitro dry matter digestibility (IVDMD) (Kirby and Parman, 1986); Pessin et al., 1986). Botanical composition and dietary quality of cow diets in the more mesic east-central mixed-grass prairie is lacking, hence the need for this research.

STUDY AREA AND METHODS

The study was conducted on the Central Grasslands Research Station during 1982 and 1983. Annual average precipitation is 17.9 inches with 80 percent received during the growing season, April through September. Above average precipitation was received in 1982 and 1983 with 23 and 19 inches recorded.

The 640-acre study area was divided into two equal-sized grazing treatments. One-half was grazed continuously seasonlong. Thirty cow-calf pairs were stocked in 1982 and 45 cow-calf pairs in 1983 on the repeated seasonlong grazing (SL) treatment. An eight-pasture, one-herd short duration grazing (SD) treatment was located on the remaining half with each equal-sized pasture radiating from a central watering facility. Forty and 60 cow-calf pairs in 1982 and 1983 were rotated on a five-day graze: 35-day nonuse period throughout the grazing season on the SD treatment. Each pasture was grazed three to four times a season. The trials were initiated in early June each year and ran for 139 (1982) and 153 (1983) days.

Kirby is associate professor and Webb is former graduate research assistant, Department of Animal and Range Science.

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Forage production and disappearance was determined utilizing portable cages and the paired-plot technique. Thirty paired, caged and uncaged plots were clipped on silty and overflow range sites at the beginning of trials and approximately every 40 days thereafter until termination of trials. The differences in forage between caged and uncaged plots were used to estimate forage disappearance (use).

Four to five esophageally fistulated cows were used to collect diet representative of grazing cows. Diets were collected during early summer (June), summer (July), early fall (August-September), and fall (October). Sampling was restricted to silty and overflow range sites in the SL treatment and two adjacent pastures of the SD system. Cattle were fasted overnight prior to diet collection to encourage grazing during half hour to hour grazing periods. Representative subsamples from each cow were then frozen and dried.

For nutrient analyses, diet samples were ground in a Wiley mill. Analyses included CP (AOAC, 1980) and IVDMD (Tilley and Terry, 1963). Botanical composition of diets was determined using microscopic analysis (Kothmann, 1968).

T-tests were used to compare grass, forb and herbaceous production on the two treatments. Analysis of variance and Duncan's multiple range test were used to analyze CP, IVDMD, and botanical composition of diets (SAS 1985).

RESULTS AND DISCUSSION

Herbage production was similar between treatments both years with one exception (Table 1). Forb production was higher on the SL treatment in 1982 when compared to the SD system. Total herbage production exceeded 1800 pounds per acre on both grazing treatments each year.

Disappearance of herbage was similar between grazing treatments each year as well (Table 1). Forb disappearance was greater on both grazing treatments in 1983 when compared to 1982 as was total herbaceous disappearance. This greater herbage use resulted from an increase in stocking rates from 1982 to 1983 on both grazing treatments.

Botanical composition of cow diets was similar between treatments and years (Table 2). Grasses dominated cattle diets in all seasons, ranging from 92 percent to 99 percent and 85 percent to 100 percent diets in 1982 and 1983, respectively. These results were expected as many others have reported cattle diets as being comprised mainly of grasses (Cook and Harris, 1986; Allison and Kothmann, 1979; Kirby and Stuth, 1982b; Kirby and Parman, 1986). Forb selectivity was greater in the early portion of the grazing

season though never exceeded 15 percent and generally was nearer 5 percent of total diets. Browse, though available in abundance, was generally avoided by grazing cattle. Both years were good herbage growing years, and with proper stocking, grass was always available. As a result, cattle were able to select preferred forages.

Cool-season grasses dominated the diets of cattle in every season of 1982 (Figure 1). *Poa pratensis* (Kentucky bluegrass)and *Stipa comata* (needle-and-thread) were major grasses selected by cattle in every season. In early season diets *Koeleria pyramidata* (Junegrass) and *Bromus inermis* (smooth brome) were also highly selected. One warm-season grass, *Bouteloua gracilis* (blue grama), contributed significantly to early fall diets.

In 1983, cool-season grasses again dominated seasonal cattle diets (Figure 1). As in 1982, the major species were Kentucky bluegrass and needle-and-thread in every season. No other species, cool- or warm-season, were selected in large amounts.

Differences in dietary CP were found between years and grazing treatments (Table 3). Dietary CP in early summer was higher while CP in summer and early fall diets were lower in 1982 when compared to 1983. Early summer diets from the SD treatment in 1982 were higher in CP, while fall diets selected in the SL treatment in 1983 had a higher CP content when compared to the SD treatment.

Dietary CP generally decreased with season in both years and treatments (Table 3). During 1982, percent CP in diets decreased each season on both grazing treatments. Early summer and summer dietary CP was similar in 1983, then percent CP in diets decreased in each of early fall and fall samplings. Early summer and summer dietary CP in 1982 and early summer through early fall dietary CP in 1983 exceeded lactating cow requirements (9.2 percent) (NRC, 1984). All seasonal diets in both years exceeded dry, pregnant cow requirements for CP (5.9 percent).

Dietary IVDMD was similar between years and grazing treatments with one exception (Table 3). Diets selected in early summer 1982 on the SL treatment had higher percent IVDMD when compared to the SD treatment in 1982 and both grazing treatments in 1983.

As with CP, percent IVDMD in diets decreased seasonally in both treatments each year with one exception (Table 3). Early fall and fall diets in 1983 had similar percent IVDMD. Dietary IVDMD generally met lactating cow requirements (57 percent) (NRC, 1984) through summer each year on both grazing treatments. Dry, pregnant cow requirements for percent IVDMD (48 percent) were met through early fall on both treatments. Each year, fall diets were deficient in energy (IVDMD) on both grazing treatments.

SUMMARY

Botanically, grasses dominated the composition of diets both years regardless of grazing treatment. Major grasses

Table 1. Herbage production (lbs/ac) and percentage disappearance in parenthesis for short duration (SD) and repeated seasonlong (SL) grazing treatments.

		Plant class[1]		
Year	Treatment	Grass	Forb	Total
1982	SD	1469 (54)	384A (15)	1853 (46)
	SL	1437 (54)	542B (14)	1979 (43)
1983	SD	1420 (48)	387 (66)	1807 (52)
	SL	1500 (54)	409 (63)	1909 (56)

[1]Means of forage production and disappearance within plant classes and years followed by a different letter differ at the 0.05 level.

Table 2. Botanical composition (%) of cattle diets on short duration (SD) and repeated seasonlong (SL) grazing treatments.

		Season			
Year	Treatment	Early summer	Summer	Early fall	Fall
		Grass			
1982	SD	93 ±2.2[1]B[2]	95 ±1.5AB	98 ±0.7A	96 ±1.3AB
	SL	92 ±3.9B	96 ±1.0AB	99 ±0.5A	98 ±0.4A
1983	SD	100 ±0.1A	96 ±1.0AB	97 ±0.9AB	98 ±0.6A
	SL	99 ±0.6A	85 ±4.0C	92 ±1.9B	96 ±0.9AB
		Forb			
1982	SD	6 ±2.0B	5 ±1.5BC	2 ±0.7CD	3 ±1.0CD
	SL	6 ±2.8B	3 ±0.9CD	1 ±0.5DE	1 ±0.3DE
1983	SD	0 ± 0E	4 ±1.0C	3 ±0.8CD	2 ±0.8D
	SL	1 ±0.4DE	15 ±4.0A	7 ±1.8B	2 ±0.5D
		Browse			
1982	SD	1 ±0.3	0 ± 0	0 ± 0	1 ±0.4
	SL	2 ±1.4	1 ±0.5	0 ± 0	1 ±0.1
1983	SD	0 ± 0	0 ± 0	0 ± 0	0 ± 0
	SL	0 ± 0	0 ± 0	1 ±0.4	2 ±0.6

[1]Standard error.

[2]Means within plant classes followed by a different letter differ at the 0.5 level.

Table 3. Crude protein and in vitro dry matter digestibility of seasonal cattle diets on short duration (SD) and repeated seasonlong (SL) grazing treatments.

		Season			
Year	Treatment	Early summer	Summer	Early fall	Fall
		crude protein (%)			
1982	SD	15.2 ±0.7[1]A[2]	10.2 ±1.2DE	8.4 ±0.4F	6.2 ±0.2G
	SL	14.7 ±0.8B	9.3 ±0.4E	8.2 ±0.2F	6.2 ±0.2G
1983	SD	11.0 ±0.2CD	11.6 ±0.3C	9.4 ±0.4E	6.0 ±0.4G
	SL	11.0 ±0.6CD	12.0 ±0.8C	9.2 ±0.6E	7.7 ±0.3F
		in vitro dry matter digestibility (%)			
1982	SD	65 ±2.1B	57 ±3.0C	47 ±2.3D	42 ±0.8E
	SL	74 ±2.0A	57 ±1.4C	48 ±2.0D	41 ±1.7E
983	SD	67 ±1.6B	55 ±1.4C	46 ±2.0DE	43 ±1.8DE
	SL	66 ±1.6B	53 ±2.4C	46 ±2.5DE	44 ±1.5DE

[1]Standard error.

[2]Means within nutrients followed by a different letter differ at the 0.5 level.

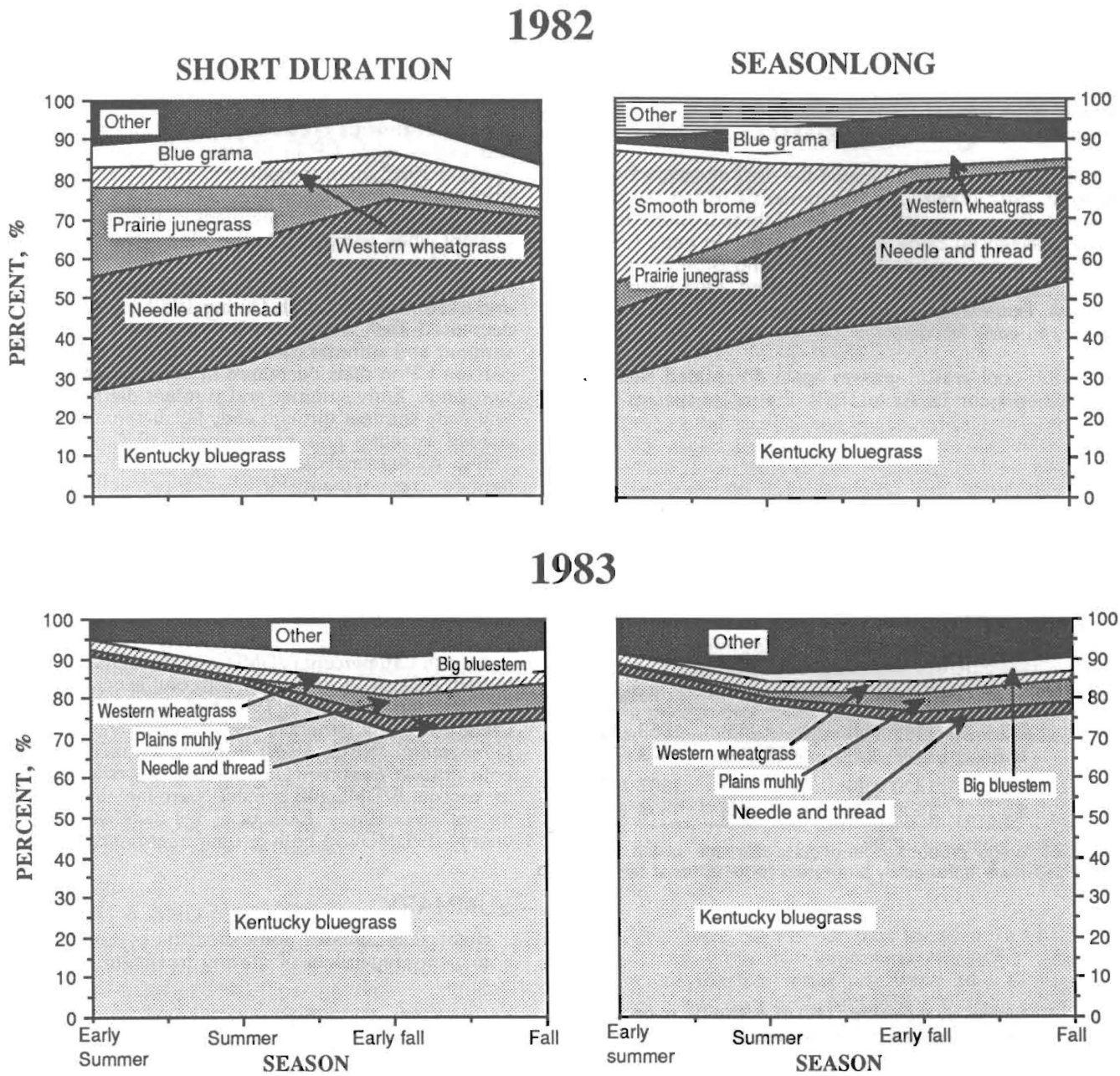

Figure 1. Grass composition (%) of seasonal diets selected by cattle on short duration and repeated seasonlong grazing treatments in 1982 and 1983.

selected were Kentucky bluegrass, needle-and-thread, Junegrass, smooth brome, and blue grama. Despite some selection of forbs and browse, these plant classes were not consistently utilized in either grazing treatment. These results agree with data reported from western North Dakota (Kirby and Parman, 1986; Pessin et al., 1986).

Nutritionally, dietary CP and IVDMD generally decreased as seasons progressed, which is in agreement with many other studies (Streeter et al., 1968; Scales et al., 1974; Kirby and Stuth, 1982a; Kirby and Parman, 1986). Following summer, CP and energy (IVDMD) contents of diets did not meet lactating cow requirements either year. Dry, pregnant cow requirements for energy (IVDMD) were deficient by early fall each year. Early weaning of calves and/or supplementation of cows or calves in the fall would help alleviate this nutritional deficiency in late season forage.

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Table 5. Oil and Protein Content of Varieties With More Than One Sample in the Survey.

Variety[1]	# of Samples	Oil Content (13.0% m.b.)			Protein Content (13.0% m.b.)		
		Mean	High	Low	Mean	High	Low
Ozzie	55	19.3	21.5	16.5	34.6	38.9	29.3
McCall	33	19.1	21.6	17.2	34.1	38.8	25.9
Evans	24	19.6	20.6	17.6	34.3	37.0	31.7
Dawson	12	19.6	20.3	17.8	33.0	36.3	29.2
Maple Ridge	7	17.6	19.0	15.8	37.5	41.0	33.2
Pioneer 9091	6	19.9	20.7	19.1	34.1	35.6	31.5
Glenwood	5	19.3	19.7	18.7	35.1	36.7	33.8
Baron	4	19.3	21.3	16.8	33.0	35.2	29.3
KG 20	4	18.1	18.5	17.4	34.5	35.2	33.5
Pioneer 9061	3	20.0	21.0	18.6	32.0	33.0	31.2
SeedTec 401	3	19.5	20.2	18.7	35.1	37.6	33.4
KG 30	2	20.1	20.3	19.9	33.5	34.0	33.0
KG 60	2	18.6	18.8	18.5	34.8	35.0	34.7
SeedTec 390	2	18.9	19.2	18.6	36.3	37.0	35.6

[1]Not included are 20 varieties with 1 sample and 3 samples of unknown variety.

oil and protein within samples of the same variety as observed in the 1987 survey. This again indicates that environment can significantly influence both oil and protein content in soybeans.

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