Diet composition of beef cows grazing stockpiled native range in southwestern North Dakota - Progress Report -

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Beef cows grazing stockpiled winter pastures typically lose body weight and condition indicating that dietary supplementation may be necessary. Nonetheless, cattle producers should use caution when designing supplementation strategies based entirely upon the composition of the forage available for grazing. Although forage and dietary composition are related, selective grazing may allow cattle to consume a diet higher in quality than the total forage offered.

Summary

Objectives of this study were to determine the effects of advancing season on the nutrient composition of forage available for grazing in stockpiled winter pastures and to determine the effects of supplementation and advancing season on fecal estimates of diet composition from cattle grazing winter pastures. Stockpiling refers to the practice of allowing forage to accumulate without grazing for use at a later time. Twenty-one mature crossbred cows grazed a predominantly stockpiled native range from mid November to late January. The cows were randomly allotted into four groups and then groups were assigned to one of four supplement treatments. Treatments included an unsupplemented control (CON) and either a barley-, pea- (PEA), or sunflower meal-based supplement. Forage available for grazing (FOR) was sampled every two weeks throughout the grazing period. Fecal samples were collected monthly from cows in the CON and PEA treatments and used to estimate dietary and fecal composition. Concentrations of total digestible nutrients (TDN), crude protein (CP), acid- and neutral-detergent fibers, Ca, P, Mg and K in FOR were not affected by advancing season. Although dietary supplementation did not affect estimates of dietary digestible organic matter (DDOM), dietary crude protein (DCP) or fecal nitrogen (FN), supplementation did increase fecal phosphorus (FP). Advancing season affected DDOM, DCP, FN, and FP. Dietary crude protein was highest in November, DDOM was lowest in December, and FP was lowest in January; while, FN declined across the season. There were no treatment by advancing season interactions for either dietary or fecal composition. A gross comparison of dietary to FOR composition implies that dietary estimates of energy and crude protein were higher than comparable components in FOR. Nonetheless, DDOM and DCP were positively correlated with TDN and CP, respectively. Although the nutrient composition of FOR did not change, estimates of dietary composition varied across the season. This may imply some level of dietary selectivity exhibited by beef cows when grazing stockpiled native range in the late fall and early winter. Producers should use caution when designing supplementation strategies based entirely upon the composition of the forage available for grazing.

Introduction

Traditional economic opportunities in natural resource-based economies tend to be decreasing due to lower profit margins particularly in agriculture. Ranchers are a viable part of North Dakota's economic future and, with proper management practices, they can become more profitable. Extended grazing seasons have been shown to be a viable mechanism for decreasing operational costs while maintaining overall production, thus increasing efficiency of the cow/calf producers. Stockpiling of forage from perennial plants during times of active growth for use at some other time of the year is one means of extending the grazing season. However, at times the forage available from stockpiling may not meet the nutritional requirements of livestock and dietary supplementation may be needed. Proper supplement formulation while grazing requires accurate knowledge of the nutrients supplied from a base forage.

Objectives

1. Determine the effects of advancing season on the nutrient composition of forage available for grazing in stockpiled pastures during the winter.

2. Determine the effects of supplementation and advancing season on fecal estimates of diet composition from cattle grazing winter pastures.

Materials and Methods

Twenty-one summer-calving cows (BW = 1386 ± 142 lb; BCS = 6.8 ± .64 units) grazed a pasture of stockpiled predominately native range in western North Dakota from November 14, 2001 until January 23, 2002. Stockpiling refers to the practice of allowing forage to accumulate without grazing for use at a later time. Cows were randomly allotted into four groups and

groups were then assigned one of four supplemental treatments. Treatments included an unsupplemented control (CON; six head) and three supplemented groups (five head/group). Supplemental treatments were a barley-, field pea (PEA)- and sunflower meal-based pellet. Supplemental treatments were chosen to supply additional energy and gradient levels of rumen-degradable protein. Supplements were provided to individual cows in the supplemental treatments three times a week. Supplemental intake was limited to 3.0 lb/hd per day or 7.0 lb/hd per feeding. Adjustments to supplement delivery based upon adverse environmental conditions were not necessary in this year.

Herbage available for grazing (FOR) was sampled at 14-day intervals (6 sampling times) to detect changes in dry matter available for grazing. For sampling purposes the pasture was divided into two halves (east and west) and 5 sample sites were chosen per pasture half to represent major range types. Two .25-m^2 areas were clipped per site per sampling date. At clipping, forage was physically separated into grasses (G) and others (F). All forage was dried (55° C) to a constant weight. Dry weights of G and F were then used to calculate forage production per acre (Smith et al., 2002). Total forage available for grazing (T) was the sum of G and F. Subsequently, all forage was pooled within pasture half and sampling date and submitted for chemical analysis. FOR was submitted to a commercial laboratory for determination of crude protein (CP), acid (ADF) and neutral (NDF) detergent fibers, calcium (Ca), phosphorus (P), magnesium (Mg) and potassium (K) using standard analytical techniques.

Fecal samples were collected from cows in CON and PEA treatments. Samples were collected at 28-d intervals starting with day 14 of grazing (3 sampling times). Near infrared spectroscopy (Texas A&M University; analysis supported by Jeff Printz, Natural Resource Conservation Service, USDA, Bismarck) was used to provide estimates of dietary digestible organic matter (DDOM) and crude protein (DCP) and fecal nitrogen (FN) and phosphorus (FP).

FOR composition was analyzed for the effects of sampling date using a completely random design. Dietary and fecal composition were analyzed using a split-plot design. Treatment was a whole plot factor with cow within treatment as an error term. Sampling date was a split-plot factor. Linear regression was used to test for relationships between DDOM and TDN and DCP and CP.

Results

Nutritional composition of FOR was not affected by advancing season ($P > .3$; Figures 1, 2 and 3). The average nutrient profile for FOR was 52.6 ± 1.29 % TDN, 4.9 ± .19 % CP, 47.5 ± 1.44 % acid detergent fiber, 70.8 ± 1.11 % neutral detergent fiber, 0.65 ± .12 % Ca, 0.10 ± .01 % Mg, 0.07 ± .01 % P and 0.34 ± .07 % K across the grazing period.

There were no treatment by sampling date interactions ($P > .5$) evident in fecal estimates of DDOM, DCP, FN or FP. Furthermore, DDOM, DCP and FN were not affected by supplementation ($P > .4$; Table 1). Supplementation ($P = .06$) did increase FP. Advancing season ($P < .01$) affected all fecal estimates of diet composition (Figures 4 and 5). Dietary crude protein was highest in November, DDOM was lowest in December, FP was lowest in January and FN declined across the season.

Correlation analysis was used to test for relationships among FOR composition and dietary estimates of energy and protein. Dietary digestible organic matter and TDN ($P = .02$; $R^2 = .15$; Figure 6) and DCP and CP ($P = .01$; $R^2 = .19$; Figure 7) were positively correlated. These relationships were present even though FOR composition did not vary, while dietary estimates declined, across the grazing period. This may imply some level of dietary selectivity was exhibited by beef cows when grazing stockpiled native range in the late fall and early winter. Although encouraging, the lack of stronger relationships between diet and FOR composition related to considerable variation amongst cows in dietary estimates within a sampling date and the lack of substantial variation across the season in FOR composition.

Conclusions

Stockpiling of forage from perennial plants during times of active growth for use at some other time of the year is one means of extending the grazing season. Although the nutrient composition of FOR did not change, estimates of dietary composition varied across the season. This may imply some level of dietary selectivity exhibited by beef cows when grazing stockpiled native range in the late fall and early winter. While dietary supplementation did not affect estimates of dietary energy or protein or fecal nitrogen, supplementation did increase fecal composition of phosphorus.

Table 1. Effect of dietary supplementation[a] on fecal estimates of dietary digestible organic matter and crude protein and fecal nitrogen and phosphorus.

	CON	PEA	SE[b]
Dietary			
Digestible organic matter (DDOM)	59.3	59.2	.29
Crude protein (DCP)	7.9	7.83	.153
Fecal			
Nitrogen (FN)	1.30	1.33	.022
Phosphorus (FP)	.203[x]	.258[y]	.018

[a] Unsupplemented and pea-based supplement treatments (CON and PEA, respectively).
[b] Standard error of a mean.
[x,y] Means within a row with different superscripts differ (P = .06).

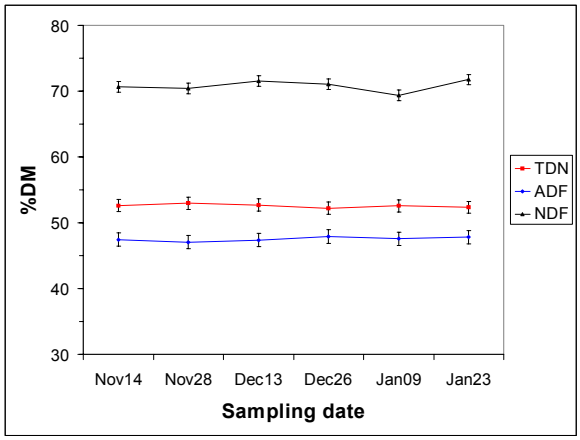

Figure 1. Effect of advancing season on concentrations of total digestible nutrients (TDN) and acid (ADF) and neutral (NDF) detergent fibers in forage available for grazing.

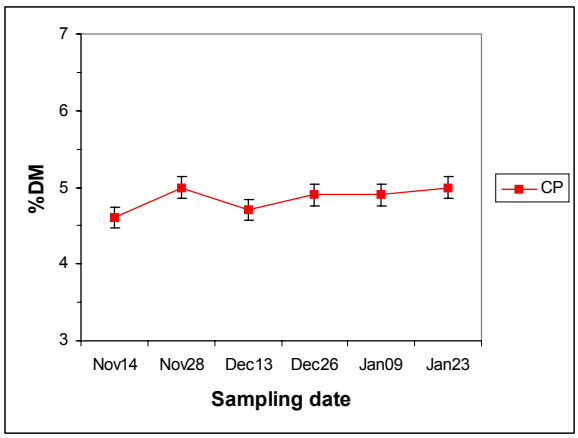

Figure 2. Effect of advancing season on concentration of crude protein (CP) in forage available for grazing.

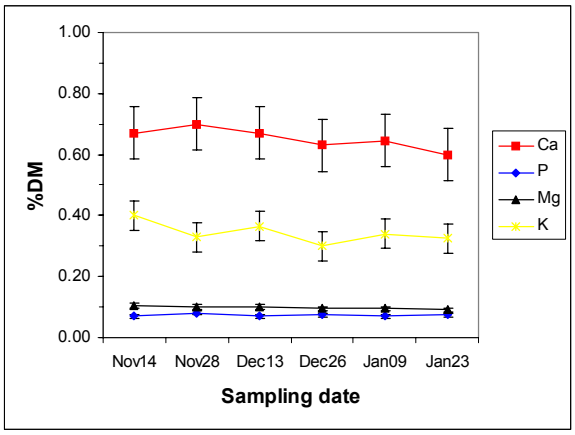

Figure 3. Effect of advancing season on concentrations of calcium (Ca), phosphorus (P), magnesium (Mg) and potassium (K) in forage available for grazing.

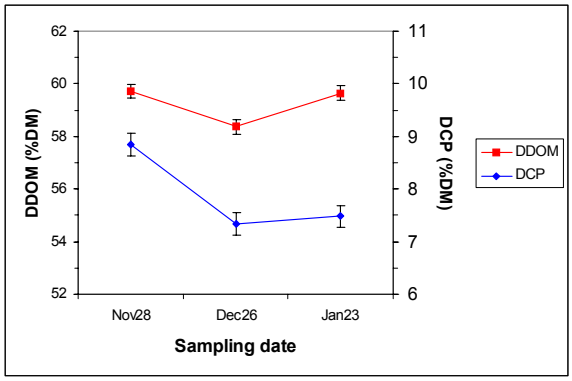

Figure 4. Effect of advancing season on fecal estimates of dietary digestible organic matter (DDOM) and dietary crude protein (DCP).

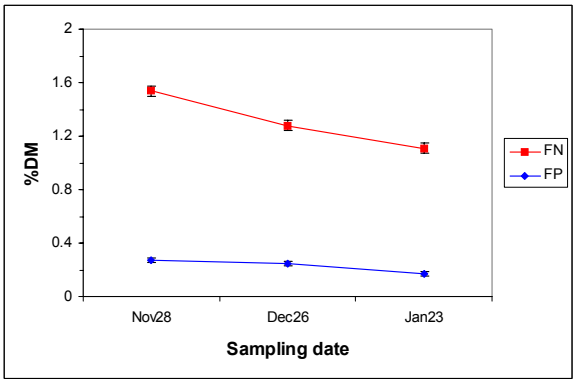

Figure 5. Effect of advancing season on estimates of fecal nitrogen (FN) and fecal phosphorus (FP).

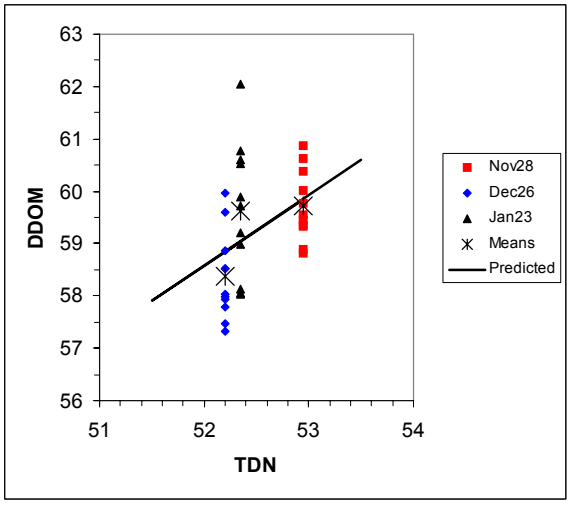

Figure 6. Relationship of dietary digestible organic matter (DDOM, % DM) and total digestible nutrients in forage available for grazing (TDN, % DM). DDOM = 11.46 + (1.35 * TDN); [P < .02; R^2 = .15].

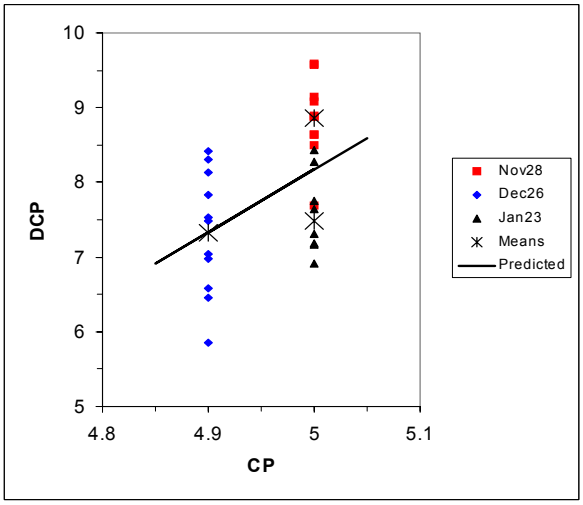

Figure 7. Relationship of dietary crude protein (DCP, % DM) and crude protein in forage available for grazing (CP, % DM). DCP = 34.05 + (8.45 * CP); [P < .01; R^2 = .19].