Effects of Grazing on Nebraska Sandhills Meadow Forage Nutrient Content

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Summary

Nebraska Sandhills subirrigated meadow pastures were utilized to measure the effects of grazing on forage nutrient content in summer pastures. Pre-grazed pastures had greater protein and in vitro dry matter digestibility levels and lower neutral detergent fiber levels compared with post-grazed pastures early in the grazing season. By late July, post-grazed vs. pre-grazed pastures did not differ in in vitro dry matter digestibility and neutral detergent fiber levels. Observed results indicate the greatest differences in nutrient content between post-grazed and pre-grazed pastures occur early in the grazing season.

Introduction

Nebraska Sandhills subirrigated meadows are an excellent resource for grazing cattle. Most are dominated by cool-season grass species which have greater growth during early spring. However, as temperatures increase by mid-summer, forage quality decreases (*1997 Nebraska Beef Cattle Report*, p. 3-5). Previous research has shown the changes in forage nutrient composition throughout the year, but it is unclear how grazing affects the nutrient composition of Sandhills subirrigated meadows. Therefore, the objective of this research was to determine the difference in forage quality between post-grazed pastures vs. pre-grazed pastures in the Nebraska Sandhills subirrigated meadows.

Procedure

A total of eight subirrigated meadow pastures (161 ac ± 47 ac) in the Nebraska Sandhills were used. The meadow was divided into multiple pastures to allow rotational grazing. Of the eight sampled pastures, two adjacent pastures were sampled on one of four dates: early June, late June, early July, or late July. Of the two adjacent pastures sampled each date, one pasture was not previously grazed (pre-grazed), while the other pasture had been grazed (post-grazed) the previous four days, with the exception of the late July pasture which was grazed for three days. On each sampling date the pre-grazed pasture was sampled prior to introduction of cattle to the pasture and the post-grazed pasture was sampled after the allotted grazing had occurred. Stocking rates consisted of 15, 15, 30, and 19 animal unit days per acre for early June, late June, early July, and late July, respectively. Because of severe drought, stocking rate was reduced in late July. Three esophageally fistulated cows were used to sample each pasture on each date to determine forage quality. Prior to each diet sample collection, cows were withheld from feed, but not water, for 12 hours, then transported to pastures where diets were to be collected. Cows were fitted with solid bottom bags after removal of the esophageal plug and introduced to the pasture then allowed to graze for about 20 minutes.

Samples were separated into a liquid and fibrous portion for lab analysis. Immediately after separation, diet samples were frozen and stored at -20° C. Fibrous samples were lyophilized, ground to pass a 1-mm screen in a Wiley mill and analyzed for nitrogen. Neutral detergent fiber content was determined using the Van Soest et al. method, and IVDMD using the Tilley and Terry method with the modification of adding 1 g of urea to the buffer and adjusted to *in vivo* values. Results were analyzed using the PROC MIXED procedure of SAS (SAS Institute, Inc., Cary, N.C.).

Results

In early June, CP ($P < 0.001$) and IVDMD ($P = 0.03$) content were greater and NDF ($P = 0.07$) content was lower in pre-grazed compared with post-grazed pastures (Table 1). Late June pastures exhibited similar patterns such that pre-grazed pastures were greater in CP ($P = 0.03$) and IVDMD ($P = 0.09$) than post-grazed pastures. Late June NDF was numerically lower ($P = 0.11$) for pre-grazed compared with post-grazed pastures. The CP content of pastures in early July did not differ (P = 0.30) between pre-grazed vs. post-grazed treatments. Neutral detergent fiber ($P = 0.08$) was lower and IVDMD ($P = 0.09$) was greater for pre-grazed compared with post-grazed pastures in early July. With the higher stocking rate during this sampling period, it seems logical that this is when the greatest nutrient differences would have occurred. However, the results from this study could be due to the nature of the cool-season grass species being lower quality during July. Late July pre-grazed pastures had greater ($P = 0.05$) CP levels than post-grazed pastures. However, there were no differences between pre-grazed vs. post-grazed pastures for NDF ($P = 0.56$) or IVDMD ($P = 0.78$) in late July. These data suggest the greatest impact of grazing cool season grass meadows on forage quality occurs early in the grazing season in multi-pasture grazing systems.

Table 1. Crude protein, NDF, and IVDMD values of masticate samples.

Item	Pre-Grazed[1]	Post-Grazed[2]	SE	*P*-value
Early June[3]				
CP %	12.0	7.1	0.3	<0.001
NDF %	66.8	75.7	4.8	0.07
IVDMD %	66.7	58.1	2.3	0.03
Late June[3]				
CP %	9.8	7.2	0.3	0.03
NDF %	70.4	78.7	2.5	0.11
IVDMD %	63.5	57.0	1.4	0.09
Early July[3]				
CP %	8.7	8.3	0.2	0.30
NDF %	61.8	67.8	1.3	0.08
IVDMD %	58.2	54.1	1.4	0.09
Late July[3]				
CP %	10.0	8.0	0.5	0.05
NDF %	66.1	63.0	3.5	0.56
IVDMD %	54.6	54.0	1.4	0.78

*Significant differences (*P*-value ≤ 0.1).
[1] Pastures sampled prior to grazing.
[2] Pastures sampled after grazing.
[3] Date pasture was sampled using esophageally fistulated cows.

Severe drought during 2012 may have affected the quality of the July pastures. It also may be a possibility that as the season progressed and less water was present in the meadow the cattle would have been able to reach forage that was previously unavailable on an average precipitation year.

Cattle are selective grazers. When first introduced to a pasture, cattle eat the higher quality plants and plant parts, leaving lower quality plants and plant parts for later consumption. This creates a change in diet quality over time independent of change in nutrient content of the forage. With the decline in diet quality, it might be assumed the cow's requirements would not be met during the entire time she grazes a particular pasture. However, this is not always the case. A 1,200 lb cow consuming 2.5% of her body weight would eat 30 lb (DM) of forage, of which, about 18 lb would be TDN in early June. This exceeds the TDN requirements for a lactating cow. Even though a spring calving cow's nutrient requirements are highest early in the grazing season due to lactation, on average, the cow's TDN requirements would be met this entire time she grazes a pasture. However, her protein requirements may not be met. This is especially true for animals with relatively high requirements such as heifers and cattle at peak lactation. In this study, CP content of early June forage went from 12% before cattle were introduced to the pasture to 7.1% on the day they were removed from the pasture. Initially, the diet contained a relatively high amount of CP, but at the time cattle were removed from the pasture, CP content of the diet was much lower. This change in CP in the diet may be a result of the fact that when cattle are introduced into a pasture early in the grazing season, plants have not had sufficient time to accumulate sufficient current year's growth resulting in last year's growth becoming a major component of the diet toward the end of the time cattle are in the pasture. These data suggest strategic supplementation or more frequent rotation among pastures early in the grazing season could be beneficial. In July, after the plants had had more time to grow, the availability of current year's forage allowed the cattle to consume higher quality, current year's growth the entire time they grazed a pasture. Close management is key to success in multi-pasture rotation systems to manage the quality of the forage and ensure the cattle's requirements to be met.

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