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Technical Note: Repeated grazing affects quality and sampling strategies of 'WW B. Dahl' old world bluestem

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ABSTRACT

Selective grazing can exaggerate the difference between quality of standing forage in the pasture as a whole, and quality of forage actually consumed. In research paddocks near Lubbock, TX, repeated grazing by steers caused spatial heterogeneity in the nutritive value of *Bothriochloa bladhii* ('WW B. Dahl' old world bluestem) that was not accounted for by standard sampling techniques. Forage in repeatedly grazed and avoided areas was sampled on Sept. 1, 2010. Entire plants sampled at the standard clipping height in avoided areas had greater acid detergent fiber (ADF), neutral detergent fiber (NDF), cellulose, and lignin, and lower net energy for maintenance (NE_m) and crude protein (CP) than tops of plants had in both areas. Crude protein differed between tops of plants in avoided (5.3%) and repeatedly grazed (7.4%) areas. Thus, *B. bladhii* sampling strategies should account for animal-imposed variation in pastures when herbage allowances exceed those required by grazing animals.

KEY WORDS: crude protein, selectivity, repeated grazing, fiber

INTRODUCTION

Interactions between plants and grazing animals can introduce spatial variation in forage nutritive value within pastures (Soder et al. 2009). Selective grazing can exaggerate the difference between standing forage quality in the pasture as a whole, and quality of forage actually consumed, making obtaining representative samples difficult (Weir and Torell 1959). In late summer 2010, it was observed that replicated 'WW B. Dahl' old world bluestem (*B. bladhii*) pastures near Lubbock, TX (101° 47' W, 33° 45' N; 3258 ft. elevation) were developing distinct patches of moderately grazed and non-grazed areas due to selective grazing (Fig. 1). *Bothriochloa bladhii* is an introduced warm-season grass that has been used in grazing systems in the Texas High Plains (Allen et al. 2012; Zilverberg et al. 2014). The quality of this forage has been reported under a variety of management conditions (Zilverberg 2012; Cui et al. 2013; Philip et al. 2005), but to date there is no known published work on selective grazing effects on *B. bladhii* nutritive value.

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Figure 1. Adjacent patches of *B. bladhii* that were avoided (left) or repeatedly grazed (bottom center).

MATERIALS AND METHODS

Three pastures, one in each of three blocks of a larger experiment (Zilverberg et al. 2014), were of uniform size (5.1 ac) and shape. Each was stocked with 10 Angus and Angus crossbred steers (*Bos taurus*; approximate bodyweight 821 lbs.). Unusually high precipitation during 2010 resulted in excess grass growth that outpaced consumption by steers and resulted in repeated defoliation of preferred areas and avoidance of others. On Sept. 1, at six subsample locations distributed across the length of each pasture, adjacent grazed and avoided patches were sampled. Avoided patches were sampled at the "standard" cutting height for the larger experiment, (~6 in. above ground level; Zilverberg 2012), to stay above the dense and decadent material in crowns of this bunch-grass. Additionally, avoided and repeatedly grazed patches were both sampled to remove leafy material at the top of plants, which was the top 6 in. for avoided areas and top 2 in. for repeatedly grazed areas. For each of the three treatments, the six subsample locations in each pasture were composited for analysis. Thus, 54 subsamples were composited to form nine samples that were analyzed for CP and fiber components using near infrared spectroscopy (NIRSystems, Inc., Model #5000, Silver Spring, MD and NIRSystems' software NIRS 2, Version 3.10). Net energy for maintenance was calculated from ADF (Linn and Martin 1999). Results were analyzed with a mixed model including the random effect of pasture and fixed effect of treatment using the lme4 package of R (Pinheiro et al. 2009) and a significance level of $p \leq 0.05$.

RESULTS AND DISCUSSION

Entire plants sampled at the standard clipping height had greater ADF, NDF, cellulose, and lignin, and less NE_m and CP than tops of plants in grazed and avoided areas

(Table 1). Only CP differed between tops of plants in avoided (5.3%) and repeatedly grazed (7.4%) areas. Despite greater CP concentration associated with selective grazing, repeatedly defoliated areas remained below the estimated CP required (~10.5%; NRC 1996) for steers' observed weight gain, which was 2.2 lb./day from May 24 to Aug. 31 and 1.8 lb./day from Sept. 1 to Sept. 29 (Zilverberg 2012). This discrepancy may be partly explained because steers grazed forages other than *B. bladhii* for 49 days of the 128-day grazing season.

Eight days later (Sept. 9), when entire pastures were sampled using the standard technique, CP was 5% and NE_m was 0.48 Mcal/lb. - values that were more similar to the avoided areas than the repeatedly grazed areas.

Table 1. Nutritive value of *B. bladhii* that was avoided by steers or repeatedly grazed, and harvested at the standard cutting height or by taking only the tops of plants.

Grazing	Sampling method	ADF, %	NDF, %	Cellullose, %	Lignin, %	NEm, Mcal/lb	CP, %
Avoided	Standard	46 a	78 a	35 a	6.5 a	0.49 a	4.1 a
Avoided	Top only	43 b	74 b	32 b	5.6 b	0.53 b	5.4 b
Repeatedly grazed	Top only	43 b	74 b	33 b	5.7 b	0.52 b	7.5 c

Within a column, values followed by the same lowercase letter do not differ ($p > 0.05$).

CONCLUSIONS

Repeated grazing by steers caused spatial heterogeneity in *B. bladhii* nutritive value that was not accounted for by standard sampling techniques. Thus, sampling strategies for this important forage species should account for animal-imposed variation in pastures. To estimate actual diets from standing forage, only those patches of pasture that are repeatedly grazed should be sampled. Alternatively, fecal samples might improve estimation of diet quality when it is difficult to obtain representative forage samples.

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