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Effects of supplemental degradable intake protein on intake and digestibility of low-quality brome hay

Abstract
The effects of increasing levels of degradable intake and digestion of low-quality brome hay were evaluated using 16 ruminally fistulated beef steers. Trends were evident for small, positive changes in total intake and digestion with increasing level of DIP supplementation. As a result, total digestible to feeding forage to provide .041, .082, and OM intake (TDOMI) increased with DIP supplementation but tended to plateau below the highest supplementation level.

Keywords
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EFFECTS OF SUPPLEMENTAL DEGRADABLE INTAKE PROTEIN ON INTAKE AND DIGESTIBILITY OF LOW-QUALITY BROME HAY

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Summary

The effects of increasing levels of degradable intake protein (DIP) on intake and digestion of low-quality brome hay were evaluated using 16 ruminally fistulated beef steers. Trends were evident for small, positive changes in total intake and digestion with increasing level of DIP supplementation. As a result, total digestible OM intake (TDOMI) increased with DIP supplement-ation but tended to plateau below the highest supplementation level.

(Key Words: Steers, Forage, Intake, Digestion, Degradable Intake Protein.)

Introduction

Beef cattle in midwestern and plains states are commonly fed brome hay. When harvested at advanced stages of maturity, the quality of brome hay is similar to a number of low quality forages (such as winter range). Previous research with low-quality, tallgrass-prairie forage has demonstrated that supplementation with degradable intake protein (DIP) dramatically improves forage intake and utilization. In addition, the amount of DIP needed to maximize total digestible forage intake has been defined. Because information pertaining to the effects of DIP supplementation on low-quality brome hay is limited, our study was conducted to provide that information.

Experimental Procedures

Sixteen ruminally fistulated beef steers (average body weight, 675 lb) were blocked by weight and assigned to one of four increasing levels of DIP. Each steer was offered brome hay at 130% of the average voluntary intake for the preceding 5-day period. Supplemental DIP (sodium caseinate; 91.6% CP, 100% DIP) was ruminally infused at 7:00 AM, immediately prior to feeding forage to provide .041, .082, and .124% BW/day; controls received none. The forage contained 65.4% NDF and 5.9% CP, of which 49% was DIP. DIP was estimated using an in situ technique. Following a 10-day adaptation, feed offered, feed refused, and total fecal output were measured for 7 days to calculate digestibility coefficients and determine the intake response.

Results and Discussion

Total feed intake tended ($P \leq .15$) to increase in proportion to increasing level of DIP supplementation (Table 1). Because total diet organic matter digestion also exhibited a weak tendency to increase, when intake and digestion were combined, there was a linear increase (P=.06) in total digestible organic matter intake (TDOMI) as level of DIP supplementation increased. However, the DIP effect on TDOMI tended (P=.17) to diminish at the highest DIP intake. Peak TDOMI was observed at the .082% BW supplementation level, which is likely to be close to the amount of DIP needed to maximize TDOMI. Assuming that 49% of total

forage CP was DIP, total DIP consumed by steers on the .082% treatment was approximately 10% of TDOMI.

Table 1. Effects of Increasing Amounts of Degradable Intake Protein on DM and OM Intakes and Digestibilities in Beef Steers Fed Brome Hay

	DIP (% BW)					Contrasts[a]		
Item	0	.041	.082	.124	SEM[b]	L	Q	C
DM[c] intake	- - - - - - - - - - % BW - - - - - - - - - -							
Forage	2.69	2.89	2.97	2.84	.14	.42	.27	.88
Total	2.69	2.93	3.06	2.98	.14	.27	.27	.90
DM intake	- - - - - - - - - g/kg $BW^{.75}$ - - - - - - - -							
Forage	112.0	120.1	123.8	119.1	5.3	.32	.26	.87
Total	112.0	121.9	127.5	124.7	5.3	.10	.26	.87
OM[d] intake	- - - - - - - - - % BW - - - - - - - - - -							
Forage	2.55	2.72	2.80	2.68	.13	.45	.28	.88
Total	2.55	2.77	2.88	2.81	.13	.15	.27	.88
OM intake	- - - - - - - - - g/kg $BW^{.75}$ - - - - - - - -							
Forage	106.0	113.4	116.7	112.3	5.0	.34	.26	.87
Total	106.0	115.2	120.3	117.7	5.0	.10	.26	.87
Total DOMI[e]								
% BW	1.49	1.66	1.75	1.69	.08	.09	.18	.83
g/kg $BW^{.75}$	61.9	69.0	73.1	70.8	3.1	.06	.17	.81
Total OMD[f], %	58.4	60.0	60.8	60.1	.9	.19	.25	.88
Total NDFD[g], %	52.5	51.1	54.7	53.4	1.1	.55	.22	.85
Total DIPI[h]								
% BW	.081	.128	.172	.209	.004	<.01	.26	.82
g/kg $BW^{.75}$	3.38	5.34	7.19	8.77	.16	<.01	.27	.86

[a]L = Linear, Q = Quadratic, C = Cubic.
[b]Standard error of the mean (n=4).
[c]DM = dry matter.
[d]OM = organic matter.
[e]DOMI = digestible organic matter intake.
[f]OMD = organic matter digestion.
[g]NDFD = neutral detergent fiber digestion.
[h]DIPI = degradable intake protein intake.