SOYBEAN MEAL+MILO, ALFALFA HAY, AND DEHYDRATED ALFALFA PELLETS AS PROTEIN SOURCES FOR STEERS FED DORMANT, NATIVE TALLGRASS FORAGE IN DRYLOT

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Summary

Sixteen ruminally-cannulated steers consuming dormant tallgrass-prairie forage were randomly assigned to one of four treatments: 1) control, no supplement; 2) soybean meal (SBM)+sorghum grain; 3) alfalfa hay; or 4) dehydrated alfalfa pellets. Forage dry matter (DM) intake was at least doubled by all three supplemental protein treatments ($P<.01$). In addition, steers supplemented with dehydrated alfalfa pellets displayed 15% higher forage DM intakes than steers supplemented with SBM+sorghum grain or alfalfa hay. Total DM digestibility did not differ ($P>.10$) among treatments; however, fiber (NDF) digestibility was depressed in steers supplemented with SBM+sorghum grain or dehydrated alfalfa pellets, compared with controls. Results from this study reinforce the concept that supplemental protein improves forage intake and utilization. Additionally, alfalfa hay and dehydrated alfalfa pellets appear to be at least as effective as SBM+sorghum grain when fed on an equal protein and energy basis.

Introduction

Previous research at Kansas State University has indicated that moderate (26% CP) and high (39% CP) crude protein levels in winter supplements increase dormant, tallgrass-prairie forage intake and utilization. In addition, mature cows on such supplements during the winter grazing period lost less weight and body condition than cows supplemented with a low CP (13%) supplement. Although there is little doubt about the benefit of supplemental protein during the winter grazing period, there is a lack of information regarding specific supplemental proteins. The objective of this study was to evaluate SBM+sorghum grain, alfalfa hay, and dehydrated alfalfa pellets as supplemental protein sources for beef cattle consuming dormant, tallgrass-prairie forage.

Experimental Procedures

Sixteen ruminally-cannulated steers were blocked by weight (avg wt = 570 lbs) and randomly assigned to four treatments: 1) control, no supplement; 2) 2.5 lbs soybean meal (SBM)+sorghum grain; 3) 3.6 lbs alfalfa hay; 4) 3.5 lbs dehydrated alfalfa pellets per head per day. The supplemental protein and energy were equal in all treatments. Supplemented steers received 57% of the protein required by a 600 lb steer gaining .5 lb per head per day. Alfalfa hay and dehydrated alfalfa pellets came from third cutting, mid-bloom hay harvested on an alternate windrow basis to ensure equal forage quality in the original material before processing. Dehydration of alfalfa slightly increased the concentration of crude protein (CP) and decreased the fiber component (Table 17.1).

Steers were housed in 6' by 18' pens and had free access to water and trace-mineralized salt. At 8 A.M. daily, refused feed was removed from feed bunks, weighed, and subsampled just prior to feeding supplements. Immediately following consumption of the supplements, dormant, tallgrass-prairie forage was offered at 150% of the previous 5-day average intake. The dormant, tallgrass-prairie forage was harvested in early March and consisted of big bluestem (*Andropogon gerardii*), little bluestem (*Andropogon scoparius*), indiangrass (*Sorghastrum nutans*), and numerous other grasses and forbs. Its composition is shown in Table 17.1.

The 30-day digestion study consisted of 16-day adaptation, 7-day intake, and 7-day fecal collection periods. Ruminal contents were evacuated on day 31 at 0 and 5 hours post-supplementation.

Results and Discussion

Steers supplemented with protein at least doubled ($P<.01$) their forage dry matter (DM) intake (Table 17.2). In addition, steers supplemented with dehydrated alfalfa pellets consumed 15% more forage ($P<.10$) than steers supplemented with SBM+milo or alfalfa hay. Likewise, total DM intake was highest for supplemented steers ($P<.01$), and within supplementation treatments, total DM intake was highest ($P<.01$) for the dehydrated alfalfa group followed by alfalfa hay and SBM+milo. Total DM digestibility did not differ ($P>.10$) among treatment groups. Fiber (NDF) digestibility, however, was highest ($P<.10$) for control steers and alfalfa hay supplemented steers.

Differences in forage intake and NDF digestibility may have been related to changes in the fill and passage of digesta (Table 17.3). Dry matter fill just prior to supplementation (0 h) was higher for steers receiving dehydrated alfalfa pellets ($P<.10$) than for steers on all other treatments. By five hours post-supplementation, however, rumen DM fill was at least 75% larger in all supplemented groups compared with the unsupplemented steers ($P<.05$). Indigestible fiber (IADF) fill was similar for the 0 and 5 hour evacuations. Both alfalfa hay and dehydrated alfalfa-supplemented steers had higher ($P<.10$) IADF fills than unsupplemented steers. In contrast, IADF passage did not differ ($P>.10$) among treatment groups. The total quantity of indigestible fiber leaving the rumen per day was doubled ($P<.01$) in steers receiving supplemental protein. In addition, steers supplemented with dehydrated alfalfa displayed a 20% increase in the outflow of indigestible fiber ($P<.10$) compared to steers supplemented with SBM+sorghum grain.

Results from this experiment reinforce the concept that supplemental protein improves the intake and utilization of dormant tallgrass-prairie forage. Additionally, alfalfa hay and dehydrated alfalfa pellets appear to offer at least the same potential as SBM+sorghum grain supplements in eliciting a supplemental protein response. However, approximately 40% more of the alfalfa hay products had to be fed to offer the same level of protein as that in the SBM+sorghum grain supplement used in this study.

Table 17.1. Chemical Composition[1] of Dormant, Tallgrass-Prairie Forage and Protein Supplements

Item	Component (%)[2]				
	OM	CP	NDF	ADF	IADF
Dormant forage	93.6	2.67	80.82	52.14	33.75
Treatment supplements:					
SBM+milo	96.3	25.0	14.03	5.94	1.06
Alfalfa hay	90.3	17.0	49.45	36.77	25.41
Dehydrated alfalfa	89.8	17.4	46.16	33.44	21.32

[1]Dry matter basis.
[2]OM = organic matter, CP = crude protein, NDF = neutral detergent fiber, ADF = acid detergent fiber and IADF = indigestible acid detergent fiber.

Table 17.2. Effect of Supplemental Protein Source on Forage Intake and Digestibility in Ruminally-Cannulated Steers

Item	Control	SBM+milo	Alfalfa hay	Dehy. alfalfa	SE[1]
DM intake, lb/d:					
Forage	2.62[a]	5.94[b]	5.94[b]	6.94[c]	.33
Supplement		2.49	3.63	3.54	
Total	2.62[a]	8.43[b]	9.57[c]	10.49[d]	.33
DM intake, % body wt:					
Forage	.49[a]	1.07[b]	1.05[b]	1.21[c]	.05
Supplement	---	.45	.64	.62	
Total	.49[a]	1.52[b]	1.69[c]	1.83[d]	.05
DM digestibility, %	42.7	46.3	49.6	44.2	2.8
Fiber digestibility, %[2]	57.3[a]	48.5[bc]	52.7[ac]	45.8[b]	2.3

[1]Standard error of the means (n=4).
[2]Neutral detergent fiber digestibility.
[abcd]Row means without common superscript differ ($P<.10$).

Table 17.3. Effect of Supplemental Protein Source on Ruminal Fill, Passage and Flow Rates in Ruminally-Cannulated Steers

Item	Control	SBM+milo	Alfalfa hay	Dehy. alfalfa	SE[1]
Rumen DM fill, lb					
0 h PS[2]	5.97[a]	8.82[a]	8.87[a]	11.71[b]	1.11
5 h PS	6.71[a]	11.91[b]	12.45[b]	14.90[b]	1.23
Indigestible fiber fill, lb[3]					
0 h PS	2.44[a]	3.44[ac]	3.87[bc]	4.80[b]	.47
5 h PS	2.68[a]	3.81[ac]	4.82[bc]	5.66[b]	.48
Indigestible fiber passage, %/h[3]					
0 h PS	2.66	3.51	3.36	3.05	.30
5 h PS	2.55	3.16	2.71	2.57	.28
Indigestible fiber[3] Flow, g/h	26.2[a]	53.8[b]	58.8[bc]	64.9[c]	3.8

[1]Standard error of the means (n=4).
[2]Post supplementation.
[3]Indigestible acid detergent fiber (IADF) was used to describe an indigestible fiber component of the diet. Rumen DM fill, IADF fill, IADF passage and IADF flow were obtained from ruminal content evacuations 0 and 5 h post-supplementation (PS).
[abcd]Row means without common superscripts differ (P<.10).