Effect of Level of Supplement and Amount of Supplemental Crude Protein on Intake and Digestibility of Untreated Wheat Straw by Lambs

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Story in Brief

Sixty lambs with a mean initial weight of 64 pounds were individually fed untreated chopped wheat straw free-choice and increasing amounts of low- or high-protein supplements that supplied .128 or .256 lb supplemental crude protein per day. Straw DM intake and digestibility decreased ($P<.001$) with increased level of supplement. Feeding additional supplemental protein increased straw intake ($P<.05$) and straw DM digestibility ($P<.001$). The level of supplement by amount of supplemental crude protein interaction was not significant ($P>.35$). Straw DM intake of lambs fed .88 lb of the low- and high-protein supplements were 1.92 and 2.27 percent of body weight, respectively. Respective straw DM digestibilities at this level of supplement feeding were 40 and 46 percent.

Introduction

Crop residues represent a large potential feed resource for ruminant animals. They are characterized as having a low digestibility and, therefore, low feeding value. Treatment of crop residues to increase their feeding value has been a long-standing goal. Treatment of crop residues increases their cost and can result in a loss of competitiveness with other feedstuffs.

Supplementation of crop residue-based diets with concentrates increases total energy intake. The effect of supplementation on intake and utilization of crop residues is of concern. The objective of this trial was to determine the effect of amount of supplement and supplemental crude protein on intake and digestibility of untreated wheat straw by lambs.

Experimental Procedure

Sixty ram and ewe lambs with a mean initial weight of 64 pounds were randomly assigned, within sex, to six treatments. The lambs were individually fed untreated chopped wheat straw free-choice and .88 or 1.32 lb of supplement per day that supplied .128 (low-protein supplements) or .256 (high-protein supplements) lb crude protein. Two additional supplements that supplied .128 and .256 lb crude protein, respectively, were fed at levels of .44 and .66 lb per day, respectively. It was not possible to formulate (using 44 percent crude protein soybean meal and corn) a supplement that when fed at .44 lb per day would supply .256 lb crude protein. Therefore, supplement number 4 (Table 1) was included in the trial. Ingredient composition of the supplements is listed in Table 1. The 36-day trial consisted of a 15-day preliminary period for the lambs to adapt to the diets and a 21-day period in which straw consumption was measured. Total fecal excretion of four ram lambs per treatment was measured during the last 6

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days of the trial. Straw dry matter digestibility was calculated by "difference" (Schneider and Flatt, 1975) using calculated digestibilities of the supplements. The lambs were weighed at the beginning and end of the trial after feed and water were withheld for 30 and 8 hours, respectively.

Results and Discussion

The interaction between level of supplement fed and amount of supplemental crude protein was not significant (P>.35) for any of the lamb response criteria. Straw intake, averaged across levels of supplement, was increased (P<.05) by supplemental crude protein from 1.89 to 2.09 percent of body weight. Increasing the level of supplement fed decreased (P<.001) straw intake (Table 1 and Figure 1). The rate of reduction of straw intake with increasing supplement was similar (P>.77) for the low- and high-protein supplements (Figure 1). Straw DM consumption of lambs fed the low- and high-protein supplements was decreased by .45 and .50 lb per 1 lb of supplement fed as follows:

Table 1. Ingredient composition and crude protein content (% of DM) of supplements

Level of supplement fed,	Supplemental crude protein/lamb/day, lb (g)					
	.128 (58)[a]			.256(116)[b]		
lb/day: g/day:	.44 (200)	.88 (400)	1.32 (600)	.66 (300)	.88 (400)	1.32 (600)
Supplement #:	1	2	3	4	5	6
Soybean meal	61.34	18.01	3.56	87.86	59.57	31.28
Corn, ground	23.90	73.3	89.77	2.53	32.56	62.59
Molasses	3.00	3.00	3.00	3.00	3.00	3.00
Dicalcium phosphate	7.87	3.42	1.95	3.52	2.39	1.27
Calcium carbonate	2.88	1.77	1.39	2.42	1.98	1.53
Trace-mineralized salt	1.00	.50	.33	.67	.50	.33
Crude protein	32.5	16.2	10.8	43.3	32.5	21.7

[a]Low-protein supplements.
[b]High-protein supplements.

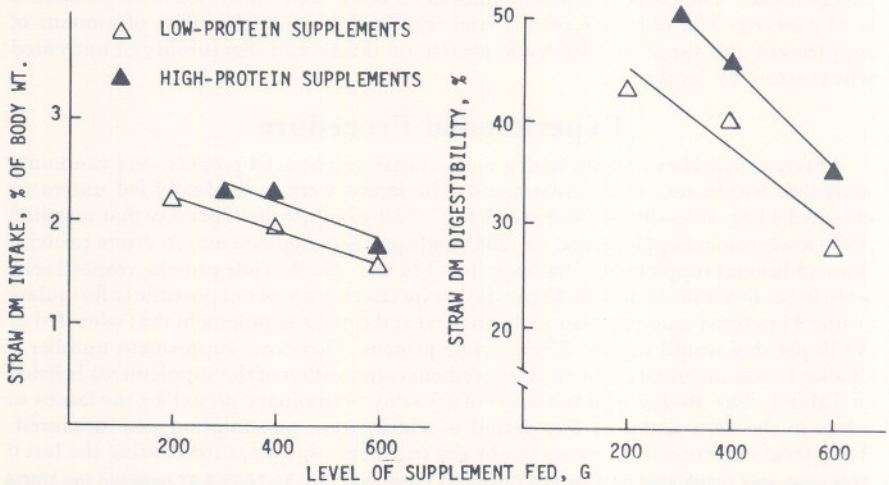

Figure 1. Effect of level of supplement on wheat straw intakes and digestibility

Table 2. Straw intake digestibility and gains of lambs

Level of supplement fed,	Supplemental crude protein/lamb/day, lb (g)					
	.128(58)[a]			.256(116)[b]		
lb/day:	.44	.88	1.32	.66	.88	1.32
g/day:	(200)	(400)	(600)	(300)	(400)	(600)
Mean lamb wt during trial, lb	66	67	67	68	64	69
Straw DM intake[c]						
lb/day	1.44	1.29	1.04	1.54	1.44	1.21
% of body wt	2.20	1.92	1.55	2.26	2.27	1.74
Lamb daily gains[d], lb	.038	.139	.250	.136	.182	.254
Straw DM digestibility[e], %	43.2	40.0	27.5	50.3	46.0	35.4

[a]Low-protein supplements.
[b]High-protein supplements.
[c]Significant protein level (P<.05) and supplement level (P<.001) effects.
[d]Significant supplement level (P<.001) effect.
[e]Significant protein level (P<.001) and supplement level (P<.001) effects.

Low-protein supplements: Straw DM intake = 1.65 lb - .45 (lb supplement fed)
High-protein supplements: Straw DM intake = 1.88 lb - .50 (lb supplement fed)

Straw dry matter digestibility (DMD) was decreased (P<.001) with increasing level of supplement (Table 1 and Figure 1), and feeding additional protein increased (P<.001) straw DMD. The rate of reduction of straw DMD with increasing supplement was similar (P>.19) for the low- and high-protein supplements (Figure 1) as follows:

Low-protein supplements: Straw DMD = 52.29 - 17.8 (lb supplement fed)
High-protein supplements: Straw DMD = 65.71 - 22.9 (lb supplement fed)

Gains of lambs were not increased (P>.25) by amount of supplemental crude protein indicating that the low-protein supplements met the protein needs for the low rates of gain that were achieved. Gains were increased (P<.001) with increasing levels of supplement, which would be attributable to increased energy intake.

Literature Cited

Schneider, Burch H. and William P. Flatt. 1975. The Evaluation of Feeds Through Digestibility Experiments. Univ. Georgia Press, Athens.

Ammoniation of Wheat Straw and Prairie Hay

G. W. Horn, C. L. Streeter, G. Manor,[1] D. G. Batchelder and G. L. McLaughlin

Story in Brief

Wheat straw and prairie hay were treated with ammoniated water (aqua-ammonia) during baling of large round bales. The effects which 1) crimping and 2)

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