INFLUENCE OF AMMONIATED WHEAT STRAW ON RUMINAL AMMONIA-NITROGEN AND pH PATTERNS IN SHEEP

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Story in Brief

Twenty-one rumen cannulated wether lambs (50 lb) were individually fed ad libitum once a day untreated (U-S) or ammoniated wheat straw (A-S) in combination with different proportions of either alfalfa hay (ALF) or dehydrated alfalfa pellets (DEHY) (100:0; 67:33; 33:67 and 0:100 for U-S/A-S:ALF/DEHY) in two separate experiments. Ruminal fluid samples were obtained at 1, 2, 4, 8, 12 and 24 hr after feeding for measurement of pH and ammonia-nitrogen (NH_3) concentrations. Patterns of change in ruminal NH_3-N concentrations and pH values of lambs fed U-S and A-S diets suggest that ammoniated roughages provide an available source of ammonia which is released in a more synchronous manner with dietary energy, for growth of ruminal bacteria. Moreover, ammoniated roughages appear to "buffer" ruminal contents, reducing fluctuations in ruminal pH to aid in maintenance of ruminal pH values more favorable to growth of cellulolytic bacteria.

Introduction

Most cereal straws are characterized by low crude protein, high lignin and low availability of energy. Both physical processing and chemical treatment have been used to improve the feeding value of low quality roughages such as wheat straw (Streeter and Horn, 1980). Under particular conditions, oilseed meals such as cottonseed and soybean meal, which are frequently sources of supplemental protein, may become expensive and/or scarce. High nitrogen forages such as alfalfa are alternative sources of supplemental protein to improve voluntary intake and nutritive value of straws (Paterson et al., 1982). The objective of this study was to determine the effect of combining alfalfa hay (ALF) or dehydrated alfalfa pellets (DEHY) with untreated (U-S) and ammoniated (A-S) wheat straw in different proportions on ruminal ammonia-nitrogen (NH_3-N) and pH changes, as indicators of ruminal fermentation activity, in sheep.

Materials and Methods

Twenty-one rumen cannulated wether lambs (50 lb) were housed in individual pens and randomly assigned to 7 treatments in two separate experiments (three lambs/treatment/experiment) (Table 1). In experiment 1, U-S was blended with either ALF or DEHY, while A-S was used in experiment 2. Straws and ALF were ground through a 1 1/2-inch screen and stored separately until appropriate quantities were mixed for each lamb immediately before feeding once a day. Diets of straw and ALF or DEHY were fed ad libitum and all lambs were supplemented daily with 45 g of the mineral-vitamin supplement shown in Table 1. Lambs that received

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Table 1. Diet composition for Experiment 1 and 2 (% as fed basis).

Ingredient	Dietary treatments													
	Experiment 1							Experiment 2						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
ALF	--	33	67	100	--	--	--	--	33	67	100	--	--	--
DEHY	--	--	--	--	33	67	100	--	--	--	--	33	67	100
U-S	100	67	33	--	67	33	--	--	--	--	--	--	--	--
A-S	--	--	--	--	--	--	--	100	67	33	--	67	33	--
Vit & Min suppl.[a]	+	+	+	+	+	+	+	+	+	+	+	+	+	+

[a]Supplement level and composition: 45 g/head/day; molasses 20.25 g, dicalcium phosphate 18.18 g, trace-mineralized salt 2.0 g, potassium sulfate 4.46 g, plus vitamins A,D and E to supply, respectively, 970, 21 and .05 IU/head/day.

the 100 percent U-S diet also received 5 g of urea daily. Each experiment consisted of a 10-day adaptation period. On day 11, ruminal fluid samples were collected at 1, 2, 4, 8, 12 and 24 hours after feeding. Ruminal pH was measured immediately after collection, and NH_3-N concentrations were determined colorimetrically after acidification and centrifugation by modification of the procedure of Chaney and Marbach (1962).

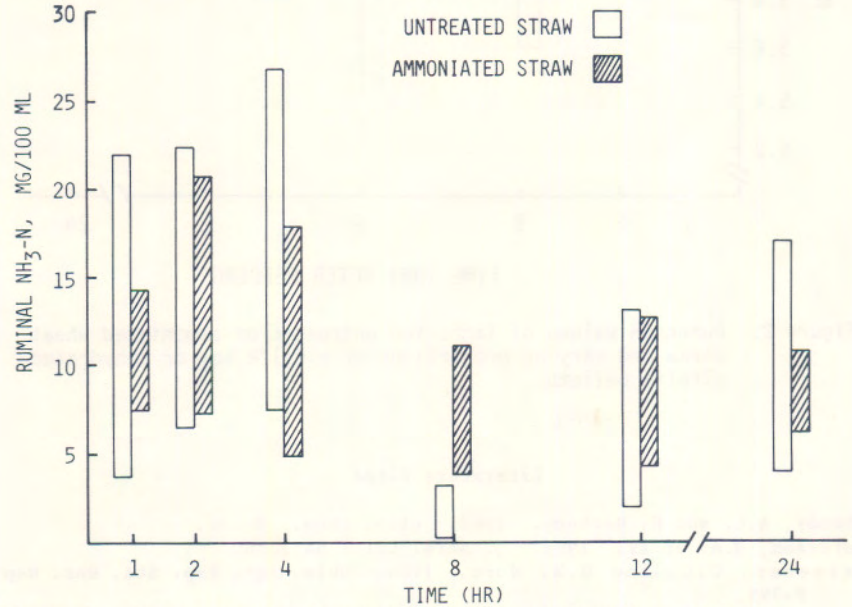

Figure 1. Rumen ammonia-nitrogen (NH_3-N) concentrations of lambs fed untreated or ammoniated wheat straw and varying proportions of alfalfa hay or dehydrated alfalfa pellets.

Results and Discussion

Ruminal NH_3-N concentrations (Figure 1) of lambs fed A-S diets fluctuated less over the 24-hour feeding cycle and were higher at 8 hr after feeding (time of lowest ruminal NH_3-N concentrations) as compared with those of lambs fed U-S diets. Concentrations of ruminal NH_3-N at 8 hr after feeding ranged from 0.1-3.07 and 3.92-11.0 mg/100 ml, respectively, for lambs fed U-S and A-S diets. Fluctuations in ruminal pH (Figure 2) were much greater for lambs fed U-S diets, and reached values below 6.0 at 2, 4 and 8 hr after feeding. In contrast, ruminal pH values of lambs fed A-S diets were only slightly below 6.0 at 8 hr after feeding.

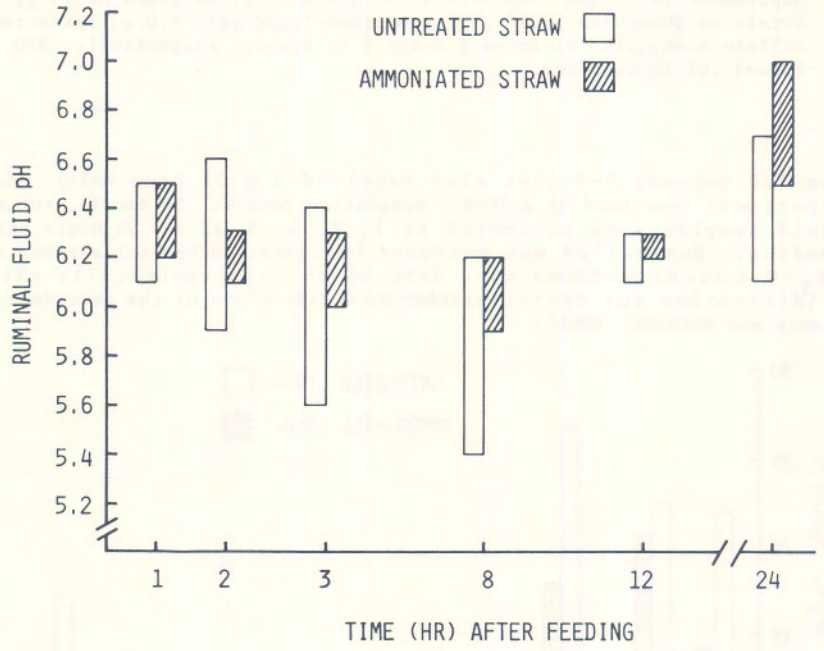

Figure 2. Rumen pH values of lambs fed untreated or ammoniated wheat straw and varying proportions of alfalfa hay or dehydrated alfalfa pellets.

Literature Cited

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