

EFFECT OF LASALOCID AND STAGE OF MATURITY OF WHEAT FORAGE ON RUMINAL FERMENTATION OF STEERS GRAZING WHEAT PASTURE

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Story in Brief

The effect of supplementing the ionophore, lasalocid, and stage of maturity of wheat forage on ruminal fermentation of steers grazing wheat forage was studied in eight rumen fistulated steers. Lasalocid supplementation reduced ($P < .08$) the acetate:propionate ratio but had no effect on total volatile fatty acid concentrations, ruminal pH or concentrations of ammonia-nitrogen. Lasalocid seemed to have no influence on the extent of deamination of wheat forage protein in the rumen.

Ruminal ammonia nitrogen, total volatile fatty acids and butyric acid concentrations were higher in steers grazing the immature wheat forage as compared with mature forage. Ruminal pH of steers was lower for steers grazing the immature wheat forage. The data indicate that wheat forage organic matter and protein are extensively degraded in the rumen. Lasalocid may increase weight gains of stocker cattle on wheat pasture by mechanisms other than shifting the amounts of acetic and propionic acid produced in the rumen.

Key Words: Wheat Pasture, Stage Maturity, Lasalocid, Rumen Fermentation, Steers.

Introduction

Wheat forage is a high quality forage. The crude protein content and dry matter digestibility of wheat forage will commonly range, respectively, from 25 to 30 percent and 65 to 80 percent. Little data is available relative to the extent of ruminal digestion of the nutrients of wheat forage at different stages of maturity.

Reduced ruminal proteolysis of plant protein by cattle supplemented with monensin has been reported (Poos et al., 1979). Therefore, amounts of nonammonia nitrogen reaching the small intestine might be increased. Similar information is not available for cattle grazing wheat pasture at different stages of maturity and supplemented with ionophores.

The objective of this study was to obtain information on ruminal fermentation of steers grazing wheat pasture as influenced by stage of forage maturity and lasalocid supplementation.

Materials and Methods

During the period of March through May 1984, eight rumen fistulated Hereford steers (average body weight 1000 lb) grazed a single paddock of wheat forage (var. TAM-105) with free access to a commercial salt

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block. Four steers were ruminally dosed twice a day (0700 and 1900), 300 mg/head.d⁻¹ of lasalocid. The other four steers remained as controls. During each of two distinct stages of maturity of wheat forage, immature (March 7-27) and mature (April 22-May 14), rumen samples from all steers were obtained once at 1000 h, 3 h after the am dose, corresponding to 27 and 67 days after the dosing of lasalocid started. Strained rumen fluid was used for measurement of pH, ammonia-nitrogen concentrations (NH₃-N) by direct distillation of acidified strained rumen fluid over MgO, and volatile fatty acids (VFA) concentrations by standard chromatograph analysis. Samples of wheat forage grazed at each stage of maturity were obtained by hand clipping and were freeze-dried for further analysis. Total nitrogen was determined by the Kjeldahl method; soluble N by Kjeldahl analysis of the filtrate obtained after extraction of wheat forage in a buffer (Ohio buffer, pH 6.5) solution, for 1 h at 39 C. In vitro dry matter digestibility (IVDMD) measurements were conducted by incubation of wheat forage for 48 h in buffered rumen fluid obtained from the same steers grazing wheat pasture, followed by a further 48 h exposure to HCl-pepsin digestion.

Results and Discussion

Chemical composition of wheat forage for each stage of maturity is listed in Table 1. Soluble N in buffer solution was 27.0 and 34.0 percent of total N for the immature and mature wheat forage, respectively. Advance maturity in wheat forage reduced the concentration of total N and soluble N by 44 and 39 percent, respectively, while IVDMD decreased 13 percent. Measurements of rumen fermentation are shown in Table 2.

Table 1. Chemical composition of wheat forage (var. TAM-105) at two stages of maturity.

Nutrient	Stage of maturity ¹	
	Immature	Mature
Observations	3	4
Dry matter, %	24.3	22.7
Organic matter, % of DM	92.5	93.7
Nitrogen, %		
Total	4.39	2.03
Soluble	1.184	.691
Non-protein	.438	.201
Ratios		
Soluble N/total N	27.0	34.0
NPN/total N	10.0	9.9
In vitro dry matter digestibility, %	75.6	66.4
Forage in offer, lb/acre	1642	1565

¹Immature: March 7-27; Mature: April 22-May 14.

Table 2. Effect of stage of maturity of wheat forage and lasalocid supplementation on ruminal fermentation of steers.

Variable	Maturity Stage			Lasalocid ₁ (mg/head.d ⁻¹)			Level of Significance	
	Immature	Mature	SE	0	300	SE	Maturity	Lasalocid
Observations	8	8		8	8			
pH	6.06	6.36	.11	6.15	6.28	.11	.10	NS
Ammonia-N (mg/dl)	43.0	19.8	2.6	27.5	35.3	2.6	.01	NS
Volatile fatty acids								
Total (mMoles/L)	146.2	113.0	6.76	127.82	131.39	6.76	.01	NS
Individual (Molar, %)								
Acetate (Ac)	60.35	66.83	.69	64.84	62.34	.69	.01	.08
Propionate (Pr)	20.78	20.00	.47	19.89	20.89	.47	NS	NS
Butyrate	12.75	8.97	.44	10.48	11.23	.44	.01	NS
Valerate	1.79	1.07	.07	1.35	1.51	.07	.01	NS
Isobutyrate	1.96	1.40	.04	1.58	1.78	.04	.01	.08
Isovalerate	2.37	1.66	.08	1.85	2.19	.08	.01	.04
Ac/Pr	2.92	3.36	.10	3.27	3.01	.10	.02	.08

NS = Not significant ($P > .10$).

Maturity of wheat forage influenced ($P < .05$) all rumen measurements, except for pH and propionate concentrations (Table 2). Ruminal pH during the grazing of immature wheat forage might be borderline for optimum cellulolytic activity at certain periods of the feeding cycle.

The high ruminal $\text{NH}_3\text{-N}$, total VFA and branched-chain fatty acid concentrations observed at both stages of maturity of wheat forage, are indicative of the high ruminal degradability of wheat forage organic matter and protein, particularly when immature. Observations on the extent and rate of in situ disappearance of wheat forage dry matter and nitrogen at both stages of maturity further support this observation (Zorrilla-Rios et al., 1985).

Lasalocid supplementation decreased ruminal concentrations of acetate ($P < .08$), and increased the concentrations of isobutyrate and isovalerate ($P < .08$ and $P < .04$, respectively). Although no effect of lasalocid on ruminal propionate concentrations was observed, the acetate:propionate ratio was decreased ($P < .08$). Ruminal ammonia nitrogen concentrations were not significantly ($P > .10$) affected by lasalocid supplementation, a response that cast doubt on a possible inhibitory proteolytic effect of lasalocid within the rumen, on wheat forage protein.

The beneficial effect of lasalocid on weight gains of stocker cattle grazing wheat forage supplemented with lasalocid reported by Horn et al. (1984), may be due to effects other than a significant shift in the amounts of acetic and propionic acid produced in the rumen.

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