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Abstract

A study was conducted to evaluate effects of virginiamycin and monensin plus tylosin on ruminal fermentation characteristics in steers fed dry rolled corn-based finishing diets with or without wet corn gluten feed. Ruminal pH was higher, concentrations of volatile fatty acids were lower, and ciliated protozoal numbers were higher in steers fed diets with wet corn gluten feed. Including virginiamycin or monensin plus tylosin had few effects on the ruminal fermentation characteristics we measured. Including wet corn gluten feed appeared to stabilize the ruminal fermentation.

Keywords

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EFFECTS OF VIRGINIAMYCIN OR MONENSIN PLUS TYLOSIN ON RUMINAL FERMENTATION CHARACTERISTICS IN STEERS FED DRY-ROLLED CORN WITH OR WITHOUT WET CORN GLUTEN FEED

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Summary

A study was conducted to evaluate effects of virginiamycin and monensin plus tylosin on ruminal fermentation characteristics in steers fed dry rolled corn-based finishing diets with or without wet corn gluten feed. Ruminal pH was higher, concentrations of volatile fatty acids were lower, and ciliated protozoal numbers were higher in steers fed diets with wet corn gluten feed. Including virginiamycin or monensin plus tylosin had few effects on the ruminal fermentation characteristics we measured. Including wet corn gluten feed appeared to stabilize the ruminal fermentation.

(Key Words: Steers, Rumen Fermentation, Virginiamycin, Monensin, Corn Gluten Feed.)

Introduction

Feed-grade antibiotics are commonly used in feedlot diets to increase performance and reduce morbidity. Virginiamycin (V-Max®) is labeled to increase average daily gain, improve feed efficiency, and reduce liver abscess incidence in feedlot cattle. Monensin (Rumensin®) and tylosin (Tylan®) are cross-cleared for feedlot diets to improve feed efficiency and reduce the incidence of liver abscesses, respectively. Wet corn gluten feed, a fibrous by-product of the corn wet milling process, is used commonly in feedlot diets in areas where this milling industry exists. Our objectives were to compare ruminal fermentation products and protozoal counts in cattle fed dry-rolled corn-based finishing diets with or without wet corn gluten feed, virginiamycin, and monensin plus tylosin.

Experimental Procedures

Six ruminally cannulated Holstein steers with an initial body weight of 760 lb were used in a 6 × 6 Latin square design to evaluate a 2 × 3 factorial arrangement of treatments. Treatments consisted of two diets: 1) CORN+SBM diet containing (% of dry matter) dry rolled corn (72), soybean meal (12), alfalfa hay (10), and molasses (4) and 2) CORN + WCGF diet containing dry rolled corn (63), wet corn gluten feed (30), and alfalfa hay (5). The remaining 2% of the diets were minerals and vitamins. Antibiotic treatments included: 1) control (no antibiotic), 2) virginiamycin at 175 mg daily, and 3) monensin plus tylosin at 250 and 100 mg daily, respectively. Steers were fed approximately 2.4% of their empty body weight daily in two equal portions. Each period consisted of 18 days of adaptation to the diet and antibiotics followed by 2 days of ruminal fluid collections at the morning feeding and 2, 4, 6, 8, and 10 hours after. Ruminal fluid samples were analyzed for pH, volatile fatty acids, ammonia, lactic acid, and ciliated protozoa counts.

Results and Discussion

Inclusion of virginiamycin or monensin plus tylosin had no significant effects on the remen metabolites measures or protozoa numbers (data not shown).

Including wet corn gluten feed had significant effects on ruminal fermentation (Table 1). Ruminal pH was higher; total VFA, propionate, and butyrate were lower; and the acetate to propionate ratio and molar percent acetate were higher for steers fed diets containing wet corn gluten feed.

Ruminal protozoal counts were higher in steers fed the wet corn gluten feed diet (Table 2), primarily because of increased numbers of *Entodinium* sp., but numbers of *Isotricha* sp. and *Polyplastron* sp. were lower. Wet corn gluten feed had no effect on ruminal ammonia, lactate, and acetate concentrations or molar percentages of propionate and butyrate.

The increased ruminal pH could have been due to lower ruminal VFA concentrations or to the increased ruminal protozoal counts. Ruminal protozoa are thought to stabilize rumen fermentation by sequestering starch, the primary substrate for fermentation in high grain diets, from the rumen bacteria and by reducing the rumen bacterial numbers through predation. The increases in acetate: propionate ratio and molar percent acetate were expected, because wet corn gluten feed is fibrous. Fiber is known to increase the proportion of acetate in rumen fermentation end products when compared to the fermentation of starch.

Our study indicates that dietary inclusion of wet corn gluten feed has a stabilizing effect on ruminal fermentation. This is supported by the observed increases in ruminal pH, reductions in volatile fatty acid concentrations, and increases in protozoal populations.

Table 1. Effects of Wet Corn Gluten Feed on Rumen pH and Metabolites

Metabolite	Corn + Soybean Meal	Corn + Wet Corn Gluten Feed	SEM
pH[a]	5.77	5.99	.047
Ammonia, mM	7.8	8.1	.74
Lactate, mM	.19	.20	.009
Total VFA[a], mM	111.2	96.3	2.6
Acetate, mM	54.2	51.6	1.8
Propionate[a], mM	33.4	26.0	2.4
Butyrate[b], mM	18.0	13.8	1.7
Acetate:propionate ratio[a]	1.78	2.16	.11
Molar % acetate[a]	49.4	54.0	1.2
Molar % propionate	29.5	26.4	1.6
Molar % butyrate	16.2	14.4	1.6

[a]Diet effect (P<.05).
[b]Diet effect (P<.10).

Table 2. Effects of Wet Corn Gluten Feed on Rumen Protozoal Counts (× 10^3/g Ruminal Content)

Item	Corn+ Soybean Meal	Corn+Wet Corn Gluten Feed	SEM
Dasytricha sp.	1.8	2.1	.68
Isotricha sp.[a]	2.9	1.8	.39
Entodinium sp.[a]	337	1063	129
Polyplastron sp.[a]	1.2	.30	.32
Total Protozoa[a]	343	1068	129

[a]Diet effect (P<.05).