Rumensin Effects on Energy Losses at Three Fiber Levels

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Story in Brief

The effect of rumensin on energy losses via feces, urine, heat, and methane was measured in digestion and gas collection trials with six steers. Rations contained 12, 27, and 40 percent fiber. Rumensin had no effect on loss of energy in urine, feces or heat, but energy loss as methane was depressed more than 10 percent at all three fiber levels. Reduction in methane losses of this magnitude can explain half or more of the improvement in feed efficiency expected from rumensin feeding. Similar effects at different fiber levels indicate rumensin will prove beneficial with a wide range of feedstuffs. As methane loss is a higher percent of net energy with high roughage rations than with high concentrate rations, monensin may prove more useful with higher roughage rations than with high concentrate rations.

Introduction

Data from numerous trials have shown that rumensin addition to feedlot rations improves efficiency of feed use. Improvement in feed efficiency could result from decreased energy losses from one or more of four areas: 1) fecal losses, 2) urinary losses, 3) gaseous products of digestion (methane), and 4) heat production.

The objectives of this study were to determine the effect of rumensin on energy losses in feces, in urine, as heat production, and as methane. Three trials were conducted with rations containing different levels of fiber to determine if rumensin action was influenced by type of feedstuff.

Materials and Methods

Six steers were used in a series of digestion and respiration gas collection trials. Cottonseed hulls and soybean meal were varied to achieve 12, 27, and 40 percent fiber, and approximately 12.5 percent crude protein in the rations. Steers received nine lb./day when fed the 12 percent fiber ration, and 12 lb./day when fed the 27 and 40 percent fiber rations. Steers were fed once daily, and rumensin, when fed, was mixed with the ration at feeding time at the rate of 200 mg. per steer daily.

Digestion trials were conducted in three periods with one ration fed to all six steers, and rumensin to three of the six steers. Following a nine day adjustment period, feces and urine were collected for five days.

Respiration gas trials used face masks, and expired gas was analyzed hourly during six-hour trials, and bi-hourly during 24-hour trials. Two steers were used in each trial with one receiving rumensin. Six trials were conducted with animals receiving the 27 percent fiber diet, and three trials with animals receiving 12 and 40 percent fiber diets. In all trials, gases were monitored for approximately six hours beginning immediately following consumption of the daily ration, and in three trials, one at each fiber level, gases were monitored for 24 hours.

Results and Discussion

Fecal energy losses tended to be less when rumensin was fed, as shown by the slightly higher digestible energy values (Table 1). Urinary energy losses (Table 2) were not changed by rumensin feeding. Likewise, heat production (Table 3), calculated from carbon dioxide and methane production, and oxygen consumption, was not affected by rumensin feeding. However,

Table 1. Digestible energy

Fiber	Control		Monensin	Sig.
	--------	%	--------	
Low	78.7		79.6	NS
Medium	65.8		66.8	NS
High	61.1		63.4	NS

Table 2. Urinary energy, percent of gross

Fiber	Control		Monensin	Sig.
	--------	%	--------	
Low	3.7		3.8	NS
Medium	2.5		2.3	NS
High	2.9		3.3	NS

Table 3 Heat production

Fiber	Control		Monensin	Sig.
	---	Kcal/hr $Kg^{-.75}$	---	
Low	6.02		5.57	NS
Medium	5.88		6.25	NS
High	6.18		5.94	NS

methane production during the six hours after feeding (Table 4) was reduced considerably when rumensin was added to each of the three rations. Depression in methane production from rumensin diminished over the 24-hour period between feedings (Figure 1). This effect was similar at all three fiber levels. Although higher fiber levels reduced energy digestibility and increased methane production, rumensin effects were similar at all three fiber levels used in this study. Thus rumensin benefits should be exhibited across a wide range of feedstuffs.

To place methane production in perspective, the energy value of methane produced when rumensin was not fed averaged 7.9 percent of the gross energy intake for the three fiber levels. Rumensin decreased this energy loss by 10.7 percent, to 7.0 percent of gross energy intake over the 24-hour period. Energy savings of this magnitude would increase net energy values of rations sufficiently to cause a 5.5 percent improvement in feed efficiency for animals gaining two lb./day or a 2.2 percent boost for animals gaining three lb./day. If

Table 4. Methane production

Fiber	Control		Monensin	Sig.
	--------	l/hr	--------	
Low	7.69		6.44	P<.10
Medium	8.99		7.50	P<.05
High	10.15		7.55	P<.05

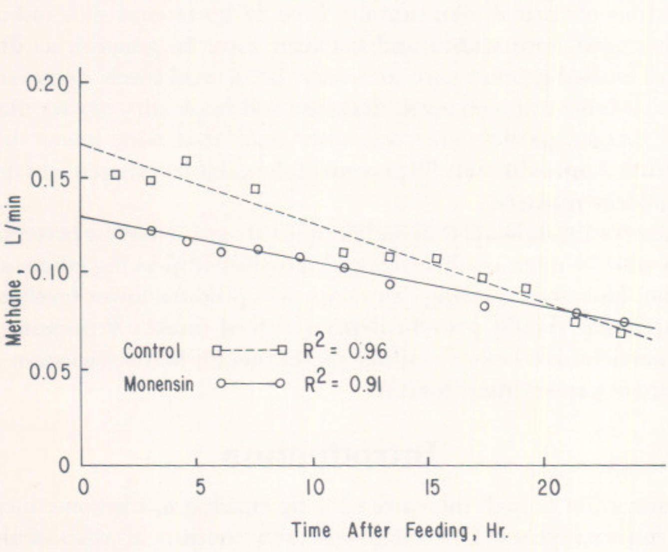

Figure 1. Effect of monensin and time after feeding on CH_4 production by steers fed a 27 percent fiber diet.

these calculations had been based upon the methane reductions witnessed the first six hours following feeding, instead of over the 24-hour period, energy savings would boost feed efficiency approximately twice that stated above. Thus energy conservation from reduced methane production can explain much of the improvement in animal performance reported from feeding of rumensin.

Chemical Characterization of Ensiled Ground High Moisture Corn Grain

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Story in Brief

Analysis of ensiled corn samples from 12 horizontal silos indicate large differences exist both within and between silos. In general, as dry matter content of ensiled ground corn increases, lactic acid levels decrease and pH increases, soluble nitrogen levels decrease and *in vitro* dry matter digestibility declines. Larger particle size was also associated with lower dry matter digestibility. Approximately 90 percent of the soluble nitrogen was in the form of non-protein nitrogen.

These results indicate that higher moisture grain may be better preserved and may also be more readily digested, possibly improving efficiency of feed utilization. However, ensiling drier corn will produce lower levels of soluble nitrogen, which should prevent depressed feed intake. Processing grain to smaller particle size before ensiling should insure better digestion and may also improve preservation quality.

Introduction

Preservation of high moisture corn by ensiling has become increasingly popular in recent years. This trend will likely continue as costs of alternative methods of grain preservation, such as drying with fossil fuels, continue to increase. Some producers are hesitant to adopt high moisture grain storage