Protein Levels With and Without Monensin for Finishing Steers

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Summary

Ration crude protein levels of 9%, 11%, 15%, 12 declining to 10.5% and 13% declining to 11% and finally to 9% were fed with and without Monensin.[1] Steers fed 9% protein continuously gained the least and were the least efficient. Steers fed the other four protein levels had similar performances.

Averaged across protein levels, Monensin had no significant effect on steer performance but it improved feed efficiency 7.4% with the 11%, 12-10.5% and 13-11-9% rations.

Introduction

Protein requirements of finishing cattle have been the subject of much recent research; most has concerned decreasing crude protein as steer weight and time on feed increased. Monensin, which improves feed efficiency, has recently been suggested to have a "protein-sparing" effect. We conducted this trial to obtain more information on protein requirements, the effect of Monensin on steer performance, and its effect on the protein requirement of finishing cattle.

Experimental Procedure

Thirty yearling Hereford steers initially averaging 617 lbs. were individually fed twice daily. Six were assigned to each of the following crude protein levels: 9%, 11%, or 15% fed continuously; 12% for 63 days (815 lb. average wt.), then 10.5%; or 13% for 42 days (772 lbs.), 11% for 42 days (880 lbs.), then 9% to slaughter.

Rations were 15% ground prairie hay, 4% vitamin-mineral supplement, and the rolled corn and soybean meal necessary for desired protein levels. The 9% crude protein rations included no soybean meal. Three steers in each protein treatment were fed 200 mg of Monensin each daily; three received no Monensin.

Jugular blood and rumen fluid was taken 4.5 hours postfeeding on days 21, 42, 63, 84, 126, 147, and 168 of the trial. Plasma was analyzed for urea nitrogen and the rumen fluid for volatile fatty acids.

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[1]Monensin, tradename Rumensin, is a product of Elanco Division, Eli Lilly and Co., Indianapolis, IN.

One steer in poor health on the 13-11-9% crude protein treatment with Monensin was removed from the test.

Individual beginning and ending weights were taken after steers were fed 10 lbs. (dry matter basis) of their respective rations daily for four days then withdrawn from water for twelve hours. Steers were slaughtered when their live weights reached approximately 1000 lbs., except that those on the 9% crude protein rations performed so poorly that they were slaughtered at an average of 891 lbs. Individual carcass data obtained are given in table 13.5.

Results and Discussion

Effects of protein treatment, averaged across Monensin treatments, on steer performance and average daily crude protein intake are shown in Table 13.1. Steers fed the 9% crude protein rations gained the least and were the least efficient ($P<.05$). Gains and efficiencies were similar for the other four rations. Daily feed intake was not affected by protein level.

Effects of Monensin, averaged across protein levels, are shown in Table 13.2. Monensin did not effect performance.

Individual treatment effects also are shown in Table 13.2. Though the interaction between protein level and Monensin was not significant, Monensin improved feed efficiency (avg. of 7.4%) with the 11%, 12-10.5%, and 13-11-9% rations. Feed efficiency of steers fed the 9% and 15% crude protein rations was not improved by Monensin. Within the 11% crude protein rations Monensin increased average daily gain (14.2%).

Effects of protein level and sampling day on plasma urea nitrogen (PUN) are shown in Table 13.3. PUN has been used as a criteria for establishing protein requirements. PUN levels of 8 to 9 mg/100 ml indicate adequate protein intake during the last 30 to 60 days on finishing rations. PUN was lower ($P<.05$) for cattle fed the 9% rations at each sampling period except the 168-day period when PUN for the 9% and the 13-11-9% rations were similar. PUN was highest ($P<.05$) on the 15% ration at each sampling period except at 21 days. All PUN values within each protein treatment were affected ($P<.05$) by sampling day, however only values for steers fed the 13-11-9% rations followed any trend; with that ration PUN decreased ($P<.05$) as protein in the ration decreased.

Steers fed Monensin had slightly higher ($P<.05$) PUN levels (12.21 vs. 12.66 mg/100 ml) than steers not fed Monensin. There were no Monensin-protein or Monensin-sampling time interactions (Table 13.4).

Effects of protein level and Monensin on the ratio of acetic and propionic volatile fatty acids (A:P ratio) are shown in Table 13.4. Monensin lowered the A:P ratio with all rations except the 15% crude protein. Carcass characteristics were not affected by protein or Monensin. Steers fed the 9% crude protein rations tended to have less backfat, probably because of light slaughter weights.

Table 13.1. Effects of protein levels on steer performance and daily protein intake.

	9	11	12-10.5	13-11-9	15
No. steers	6	6	6	5	6
Initial wt., lb.	623	634	613	612.75	602
Avg. daily gain, lb.	1.48^{b}	2.48^{a}	2.30^{a}	2.31^{a}	2.26^{a}
Avg. daily feed, lb.	17.75	17.85	17.84	17.35	17.54
Feed eff., lbs. feed/lb gain	12.19^{a}	7.27^{b}	7.77^{b}	7.51^{b}	7.82^{b}
Avg. daily protein intake, lbs.	1.57^{a}	1.99^{b}	1.90^{bc}	1.82^{c}	2.63^{a}

^{a,b,c}Means in the same row with different superscripts differ significantly (P<.05).

Table 13.2. Effects of Monensin and protein levels on steer performance.

	No. steers	Init wt., lb.	Avg. daily gain, lb.	Avg. daily feed, lb.	Feed/lb. gain, lb.
	----------Averaged across protein treatments----------				
Control	15	608.2	2.12	17.72	8.63
Monensin	14	625.7	2.21	17.63	8.45
	----------Individual treatments----------				
Control					
9%	3	610	1.47	17.69	12.14
11%	3	622	2.32	17.54	7.57
12-10.5%	3	616	2.27	18.19	8.03
13-11-9%	3	608	2.29	17.64	7.70
15%	3	585	2.27	17.51	7.70
Monensin					
9%	3	636	1.49	17.81	12.24
11%	3	646	2.65	18.15	6.96
12-10.5%	3	610	2.33	17.48	7.50
13-11-9%	3	617.5	2.34	16.91	7.24
15%	3	619	2.25	17.56	7.94

Table 13.3. Effects of protein levels and sampling days on plasma urea nitrogen (mg/100 ml).

	Protein level				
Day	9%	11%	12-10.5%	13-11-9%	15%
21	7.77^{dg}	12.04^{cgh}	14.32^{bg}	16.03^{ag}	15.97^{ah}
42	8.75^{eg}	11.66^{dh}	12.99^{cgh}	16.34^{bg}	18.85^{ag}
63	7.73^{dgi}	11.47^{ch}	12.06^{bchi}	j----- 13.21^{bh}	18.85^{ag}
84	7.82^{cgi}	13.12^{bg}	j----- 12.34^{bhi}	12.04^{bh}	18.98^{ag}
126	7.01^{dhi}	11.17^{bh}	12.01^{bhi}	j----- 8.82^{ci}	19.06^{ag}
147	7.09^{chi}	11.64^{bh}	11.09^{bi}	8.93^{ci}	19.01^{ag}
168	7.57^{cgi}	10.93^{bh}	12.07^{bhi}	8.79^{ci}	18.71^{ag}

^{a,b,c,d}Means in the same row with different superscripts differ significantly (P<.05).

^{g,h,i}Means in the same column with different superscripts differ significantly (P<.05)

^{j}Indicates when protein was reduced.

Table 13.4. Effect of protein level and Monensin on the A:P ratio.

	Protein level				
	9%	11%	12-10.5%	13-11-9%	15%
Control	2.25^{ac}	2.01^{ac}	2.06^{ac}	2.07^{ac}	1.59^{ad}
Monensin	1.72^{bc}	1.51^{bc}	1.65^{bc}	1.55^{bc}	1.79^{ac}

^{ab}Means in same column with different superscripts differ significantly (P<.01).

^{cd}Means in same row with different superscripts differ significantly (P<.01).

Table 13.5. Effects of Monensin and indicated protein levels on carcass characteristics.

Control	No. steers	Backfat in.	Loin eye area sq. in.	USDA Grade No. choice	USDA Grade No. good	Yield grade	Dressing percentage
Control	15	.437	11.34	9	6	2.67	60.56
Monensin	14	.589	11.25	8	6	2.86	60.82
9%	6	.36	11.33	2	4	2.33	60.86
11%	6	.53	11.12	2	4	2.83	60.28
12-10.5%	6	.48	11.62	3	3	2.83	60.43
13-11-9%	5	.58	11.04	4	1	2.60	59.93
15%	6	.62	11.32	6	0	3.17	61.80

Monensin sodium (RUMENSIN^{R} 60) has been cleared by FDA for feedlot cattle to improve feed efficiency and for pasture cattle over 400 pounds to increase rate of gain. Feedlot cattle are fed Rumensin at not less than 5 nor more than 30 grams per ton of total air dry (90% D.M.) ration so that each animal receives not less than 50 nor more than 360 mg per head per day. Rumensin is cleared for pasture cattle at not less than 50 nor more than 200 mg per head per day fed in at least 1 pound of supplemental feed. During the first 5 days, pasture cattle should receive no more than 100 mg Rumensin per day. Rumensin improves efficiency of gain in feedlot cattle by about 10.6% and increases daily gain of pasture cattle by about 16.3%. Rumensin can be purchased in commercial supplements or as premixes containing up to 1200 grams per ton. Higher concentrations require a form FD 1800. The only antibiotic presently cleared for simultaneous use with Rumensin is Tylan. No withdrawal is required prior to slaughter. Rumensin must be fed only according to its specific FDA clearances. It may not be fed to dairy cattle, and is toxic to horses.