Table 5. Steer Ruminal Measurements.

	Ration		
Niacin added, ppm.	0	250	500
Ruminal level ammonia, mg N/100 ml	3.17	3.15	2.93
Potassium, ppm	1504	1497	1392
Acetate, % of total	46.4	48.8	46.9
Propionate, % of total	46.4	45.0	46.1
Butyrate, % of total	7.2	6.2	7.0
Volatile fatty acids, um/ml	69.8	74.2	69.7

Table 6. Steer and Heifer Feeding Results.

	Ration	
Niacin added, ppm.	0	250
Initial weight, lb.	549.5	547.0
First 28 days		
Daily gain, lb.	3.40	2.97
Daily feed, lb.	19.53	18.35
Feed/gain	6.01	7.83
First 56 days		
Daily gain, lb.	3.40	3.26
Daily feed, lb.	20.48	20.39
Feed/gain	6.04	6.25

Rumensin, Protein Levels and Urea for Feedlot Cattle[1]

Jerry Martin[2], F. N. Owens[3] and Donald Gill[3]

Story in Brief

One hundred ninety-two yearling steers were fed high moisture corn grain based rations for 117 days at Panhandle State University, Goodwell, Oklahoma. Cattle initially averaging 754 pounds were fed either 11.0% crude protein or 12.4% crude protein diets, with or without 0.50% urea and with or without Rumensin. Protein level did not in-

[1] Experiment conducted at Panhandle State University, Goodwell.
[2] Panhandle State University, Goodwell.
[3] Oklahoma State University, Stillwater.

fluence gains or feed efficiency. The replacement of soybean protein by urea depressed gain and final carcass weight by about 5%. Urea caused a larger depression in both feed intake and gain when added to the higher protein ration. Laboratory analysis of rumen contents, sampled 3 hours post-feeding showed low rumen ammonia values indicating that the depression in performance was not due to an excess of ammonia in the rumen.

Rumensin added to the diets at 27 grams per ton of air dry feed reduced feed intake more than 1 pound of dry matter per day while not affecting gains. Rumensin improved feed efficiency 4.1% across all treatments. With the exception of kidney, heart and pelvic fat, Rumensin did not affect any of the carcass characteristics.

Rumensin increased the percent of propionic acid relative to acetic and butyric acids. All rations provided 75 mg tylosin per head daily. Liver condemnations were less than 5%.

Introduction

Work with high moisture grains and silages has suggested that urea can be better utilized with high moisture corn than with dry corn (Prigge 1975). But cattle feeders who feed high moisture grains question the value of urea in their diets. This test was designed to evaluate the effect of protein level, urea addition and rumensin addition to a feedlot steer ration.

Rumensin improves the efficiency of energy utilization in feedlot rations. Because cattle fed diets containing Rumensin consume less feed but grow at an equal rate it is possible that the protein level of the diet should be increased to maintain an adequate protein to energy ratio.

Materials and Methods

One hundred ninety-two Hereford, Angus and Hereford-Angus crossbred yearling steers were allocated on the basis of weight and breed to twenty-four pens of eight head each. The cattle had been maintained on a 75% silage ration for 40 days prior to the beginning of the experiment. The cattle were weighed full initially and a 5% pencil shrink applied to calculate the starting weight for each animal. Average starting weight was 754 pounds.

Routine feedlot vaccinations and a grub control compound were given to each animal prior to the initiation of the trial. A 30 mg DES implant was also administered 14 days before the starting date. In addition, half the animals in each pen were implanted with Synovex S on day 56 of the experiment.

The rations used in this trial provided two protein levels and two urea levels, 11.0% crude protein with or without 0.5% urea, and 12.4% crude protein with or without 0.5% urea. Six pens of cattle were fed each of these rations. Within these six pens, rumensin was added to the rations for three. Composition of the experimental rations is presented in Table 1.

All rations contained 14% corn silage and 77% high moisture corn. Soybean meal and urea were used as the protein sources. Rumensin was added to the rations at the rate of 30 grams per ton of dry matter, or 27 grams per ton of air dry feed, sample assays averaged 26.1 grams per ton of dry matter. Tylosin was added to all rations at the rate of 10 grams per ton of dry matter sample assays averaged 6.1 grams per ton. All feed data in this trial are reported on a 100% dry matter basis. Adjusted final weights were calculated from hot carcass weight assuming a constant dressing percentage of 62%.

Rumen fluid samples were collected from two animals in each pen approximately 3 hr. post-feeding by stomach tube on day 56 of the experiment for volatile fatty acid, NH_3 and potassium analyses. Feed samples were also collected during the trial to determine the levels of monensin and tylosin in each supplement.

Table 1. Ration Composition, Protein, Rumensin, Trial 1975.

	11% Natural	11% 0.5% Urea	12.4% Natural	12.4% 0.5% Urea
Silage	13.95	13.95	13.95	13.95
HM Corn	77.05	77.05	77.05	77.05
Soybean meal	3.56	.06	7.14	3.63
Urea	----	.50	----	.50
Salt	.30	.30	.30	.30
Dicalcium phosphate	.05	.15	----	.06
Potassium chloride	----	.10	----	----
Dehydrated alfalfa	.40	.40	.40	.40
Calcium carbonate	1.09	1.08	1.10	1.10
Corn[1]	3.60	6.41	.06	3.01
CALCULATED COMPOSITION (dry matter basis)				
NEM	95.72	95.73	95.67	95.68
NEG	62.65	62.65	62.65	62.65
Crude protein	11.00	11.00	12.41	12.41
Digestible protein	8.70	8.42	10.01	9.72
Ether extract	4.44	4.52	4.33	4.41
Crude fiber	5.94	5.44	5.96	5.55
Potassium	.52	.50	.58	.51
Calcium	.50	.50	.50	.50
Phosphorus	.33	.33	.34	.33
Crude protein equivalent from urea	----	1.41	----	1.41

[1] Ground corn and additives.

One half the animals were slaughtered on the day 117 of the trial and remaining pens were slaughtered on the day 118. The cattle were fed in the experimental pens at Panhandle State University, Goodwell, Oklahoma from May 10, 1975 to August 7, 1975.

Results and Discussion

The health and performance of these cattle during the trial was considered excellent. No morbidity occurred and the gain and feed efficiency were quite satisfactory.

Rumensin Effect

Rumensin reduced average daily feed intake by 5.6% (P<.01) and improved feed efficiency by 4% (Table 2). Average daily gain was not influenced by Rumensin addition. Carcass measurements were not affected by Rumensin with the exception of KHP fat, which was lower (3.33 vs 3.15%) (P<.01) in the Rumensin fed cattle. Rumensin increased the level of propionic acid in the rumen from 45.0 to 48.7 molar percent (P<.01). Rumen acetate and butyrate were both lowered by the

Table 2. Rumensin Effect.

	Control	Rumensin
No. Animals	96	96
ADG, lb.	3.76	3.69
ADF, lb.	20.34	19.19**
Feed/gain	5.41	5.20 (+4.08%)
Ruminal volatiile fatty acids, molar %		
Proprionate	45.0	48.7**
Acetate	47.7	45.0*
Butyrate	7.3	6.3*
Rumen ammonia, mg%	2.89	2.71
Rumina potassium, ppm.	1375	1289

* = P<.01
** = P<.05

Table 3. Ration Protein Effect.

	11.0% protein	12.4% protein
No. animal	96	96
Daily Gain, lb.	3.79	3.67
Daily Feed, lb.	19.98	19.58
Feed/gain	5.27	5.34
Rumen ammonia, mg %	2.78	2.82

addition of Rumensin ($P<.05$), and rumen ammonia was 6.6% lower, but potassium levels were not affected.

Ration Protein Effect

Average daily gains were 3% lower with the higher crude protein level ($P<.09$), but feed efficiencies were unaffected. The reduced performance may be due to the 2% reduction in feed intake. These data suggest that the 11% crude protein diet was adequate in terms of providing absorbable protein for these test cattle, as might have been anticipated as the steers began the trial weighing 745 pounds. Rumen ammonia levels were low in all cases however, and not increased by protein addition. This suggests that the bacteria in the rumen were deficient in nitrogen. Levels above 5 mg% indicate that the bacteria in the rumen have an adequate supply of nitrogen (Satter and Slyter, 1974). But, despite a probable ammonia deficiency, the energy and protein supplied to the animal for absorption were not reduced so as to hinder performance.

Ration Urea Effect

Addition of non-protein nitrogen depressed feed intake by about 3%. Depression was greatest during the first 28 days (0.56 lb/day less gain) and this depression decreased as the cattle progressed toward market weight. All rumen ammonia levels were very low. Rumen samples taken from the cattle receiving soybean protein diets were higher in ammonia than those receiving urea ($P<.01$) but an ammonia deficiency remained.

Table 5 gives a summary of complete trial information.

References

Prigge, E. C., 1975. Animal Science and Industry Research Report, MP-94 pp. 63. Okla. Ag. Exp. Sta.

Satter, L. D. and L. L. Slyter. 1974. Brit J. Nutr. 32:199.

Table 4. Ration Urea Effect.

	No Urea	0.50% Urea
No. of Animal	96	96
Daily Gain, lb.	3.82	3.63
Daily Feed, lb.	20.07	19.47
Feed/gain	5.25	5.36
Rumen ammonia, mg %	2.98	2.63

Table 5. Trial Summary.

	11% Natural C.P.		11% C.P. with Urea		12.41% Natural C.P.		12.41% C.P. with Urea	
	Control	Rumensin	Control	Rumensin	Control	Rumensin	Control	Rumensin
No. of Steers	24	24	24	24	24	24	24	24
Days Fed	117.3	117.3	117.3	117.6	117.6	117.3	117.6	117.6
In. Shrunk Wt.	754	749	760	756	761	744	751	758
Final Shrunk Wt.	1160	1144	1153	1145	1156	1132	1111	1122
Final Adj. Wt.	1212	1197	1209	1182	1209	1190	1167	1174
ADG-Shrunk Wt.	3.46	3.37	3.36	3.31	3.38	3.31	3.06	3.09
ADG-Adj. Wt.	3.90	3.82	3.83	3.62	3.82	3.80	3.54	3.53
Ave. Daily Feed (abs)	20.70	19.56	20.38	19.17	20.52	19.49	19.77	18.55
F/G- Shrunk Wt.	5.98	5.81	6.07	5.80	6.07	5.89	6.45	6.00
F/G- Adj. Wt.	5.31	5.12	5.32	5.30	5.37	5.13	5.58	5.25
Hot Carcass Wt.	751.4	742.6	749.5	732.8	749.6	737.8	723.7	727.7
Dress. %	64.74	64.91	65.00	64.00	64.84	65.18	65.14	64.86
Marbling[1]	11.71	11.42	11.00	11.04	10.79	10.75	10.63	11.29
Ribeye Area	12.57	12.23	12.73	12.05	12.33	12.31	11.77	12.02
Fat Thickness	.60	.60	.60	.67	.73	.60	.67	.63
KHP Fat %	3.25	3.22	3.25	3.23	3.56	3.08	3.27	3.08
Grade, Fed.[2]	6.79	6.75	6.75	6.75	6.63	6.63	6.50	6.88
Cutability %	47.06	47.24	46.93	46.85	46.63	47.02	46.98	46.99
Liver Abcess (s)	1	0	1	2	0	1	3	1

[1] 10=small −, 11=small, 12=small +, 13=modest −.
[2] 5=good, 6=good +, 7=choice −, 8=choice, 9=choice +.