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Monensin has been shown to improve feed conversion by cattle when fed with a number of different feedstuffs in various types of rations. The resulting changes in rumen fermentation would suggest that the product might have a protein sparing effect and could improve the utilization of nonprotein nitrogen compounds such as urea.

The objectives of this experiment were to study the possible protein sparing effects of monensin in a growing ration composed primarily of corn silage and to determine its effects on the utilization of urea.

Procedures

One hundred ninety-two Hereford steer calves were purchased at a local auction for this experiment. After arrival at the feedlot, all animals were fed corn silage to appetite and a corn supplement with added minerals and vitamin A for 6 to 7 weeks before the trial was begun. No supplemental protein was fed before the experiment was initiated. All steers were treated with a pour-on grubicide and implanted with Synovex-S near the beginning of the experiment.

Following adaptation to feedlot conditions, the steers were weighed in early morning before feeding for an initial filled weight and again following an overnight stand without access to feed and water for an initial shrunk weight. The average initial shrunk weight was 495 pounds. Allotment based on shrunk weights was made at random within weight groups of 24 pens of 8 head each. Intermediate weights were taken at 21 days and every 4 weeks thereafter. Filled and shrunk weights were obtained in the same manner as initially at the termination of the 116-day growing experiment.

The steers were confined to outside, concrete-paved pens with water available from automatic waterers. They were fed corn silage and a top-dressed grain-supplement mixture.

The corn silage contained an average dry matter content of 32.8% and 10.4% protein, dry basis. Grain yield of the corn was low because of drought conditions during the crop year. The amount of grain in the silage determined by separating samples at harvest into chopped forage and grain was 24% of the dry weight.

In order to have rations more typical of silage from well-eared corn, the grain-supplement mixtures were fed in ratios with the silage to give silage with grain an equivalent of 50% of the dry matter. This amounted to a 34% grain-supplement mixture and 66% silage on a dry basis. As fed, the grain-supplement mixtures comprised 18% of the rations and corn silage the remaining 82%.

Three grain-supplement mixtures as follows were fed with corn silage:

1. Corn control
2. Corn-soybean meal
3. Corn-urea

Each grain-supplement mixture was fed with and without monensin to give six dietary treatments. Four pens each with 8 steers were fed each of the six rations.

The control grain-supplement mixture was composed of rolled corn grain with added ingredients to provide rations adequate in salt, calcium, phosphorus, trace minerals and vitamin A. Soybean meal or urea was included in the other grain supplements to test the need for supplemental protein and to compare the two sources in rations with and without monensin. Some adjustments were made in ingredients to provide rations similar in calcium, phosphorus and trace mineral contents. The monensin was added at 10 g/ton of air dry ration for the first 21 days and at 30 g/ton thereafter. Ingredient composition of the grain-supplement mixtures is shown in table 1.

Results

Feedlot performance is presented in table 2. The data are presented accumulated to date by weigh periods to show the effects of various treatments during the course of the experiment.

It was desired that the rations without supplemental protein be borderline or slightly deficient in protein while those supplemented with soybean meal or urea contain more than commonly recommended requirements. Average protein content of the rations without supplemental protein (corn) was about 10.5%. This is less than recommended requirements for growing-finishing steers up to about 750 lb. for gains of 2.5 lb. daily. Protein levels were increased approximately 2.8 and 2.2 percentage units by soybean meal or urea supplementation.

Feed Consumption

Feed consumption increased with increasing weights and time on experiment for all treatment groups. Without monensin, there appeared to be no effect of level of protein or the supplemental source on feed consumption.

Monensin depressed feed consumption with all supplements. During the first 21 days of the experiment when the level was 10 g/ton of air dry feed, the decrease in comparison to the no monensin controls amounted to 9.8, 8.6 and 11.2%, respectively, for the corn, soybean meal and urea supplements. There was essentially no change from this initial depression with the soybean meal supplement (9.0%) at the end of the experiment (30 g/ton after 21 days). The depression in feed intake was slightly greater for the total experiment with the corn supplement (14.7%) and the urea supplement (14.3%).

Weight Gain

Weight gains were exceptionally good for the rations fed. This likely can be attributed in part to the supplemental grain added to result in rations with about 50% of the dry matter as grain. The 116-day experiment was between weights of approximately 500 to 800 pounds. Rates of gain no doubt would have been at lower rates if the cattle had been continued on the rations for a longer period and to heavier weights.

Without monensin, comparisons between corn and soybean meal supplements indicate a beneficial effect from protein supplementation throughout the experiment. However, feeding urea resulted in an initial depression in weight gain in comparison to no supplemental protein. The cattle fed urea had more than compensated for this initial depression at the 49-day weight. Average daily gain exceeded the corn group at most periods after 21 days, and they had slightly higher gains upon termination of the experiment. The difference in average daily gain upon termination of the experiment between steers supplemented with soybean meal or urea resulted largely from the apparent initial depression from urea. The results indicate a need for supplementing the corn ration (10.5% protein, dry basis) with additional protein. There appeared to be little difference between soybean meal and urea after the initial 3 weeks of the experiment.

Monensin appeared to depress weight gains during the first 21 days of the experiment (10 g/ton feed) for steers fed the corn or urea supplements but not with soybean meal. Over the entire experiment, weight gains were essentially the same with and without monensin when steers were fed the soybean meal supplement. Gains were slightly more with monensin for those fed the corn (5.0%) or urea (4.0%) supplements.

Feed Efficiency

Treatment differences in weight gain and feed consumption during the initial 21 days of the experiment would have pronounced effects on feed requirements during this short period as shown in table 2. Since feed efficiency is a calculated value from feed consumption and weight gain, it is discussed only for the overall experiment on basis of shrunk weights.

Without monensin, protein supplementation improved feed efficiency. The improvement over the corn supplement treatment amounted to 11.4% for soybean meal and 5.4% for urea. As indicated for weight gain, the difference between soybean meal and urea would have resulted largely from a difference in performance during the first 21 days of the experiment.

Feed efficiency was improved with monensin. The improvement over no monensin amounted to 18.7, 9.9 and 17.0%, respectively, for steers fed corn, soybean meal and urea supplements. However, the advantage in feed efficiency from protein supplementation when rations contained monensin amounted to only 1.8% for soybean meal and 4.6% for urea.

Summary

Steers were fed a corn silage ration with added corn grain to provide about 50% grain in the silage dry matter (10.5% protein, dry basis) from weights of about 500 to 800 lb. (116 days). The rations were also supplemented with protein from soybean meal or urea with all comparisons being made with and without monensin.

Without monensin, supplemental protein had no apparent effect on feed consumption. Monensin at 10 g/ton of air dry feed for 21 days and then 30 g/ton reduced feed intake. The reduction amounted to 14.7, 9.0 and 14.3%, respectively, with corn, soybean meal and urea supplements.

Average daily gains were higher when rations contained supplemental protein. The advantage for soybean meal and urea over the corn supplement in rations without monensin amounted to 12.0 and 6.7%, respectively. The difference between soybean meal and urea resulted largely from the depression from urea during the first 21 days of the experiment. Steers fed monensin had slightly higher weight gains when fed the corn supplement (5.0%) and the urea supplement (4.0%) but essentially unchanged when fed soybean meal.

Without monensin, protein supplementation improved feed efficiency. The improvement over the corn supplement was 11.4 and 5.4%, respectively, for soybean meal and urea. As for weight gain, the difference between soybean meal and urea resulted largely from the initial depressed performance with urea.

Feed efficiency improved with monensin amounting to 18.7, 9.9 and 17.0%, respectively, with corn, soybean meal and urea supplements. Improvement in feed efficiency was less for protein supplementation when rations contained monensin but greater with urea than with soybean meal.

Results of the experiment indicate that monensin improves protein utilization when fed in rations slightly deficient in protein and that it results in improvement in utilization of nonprotein nitrogen from urea.

Table 1. Supplement Formulation--Monensin With Corn, Urea or SBOM Supplements for Calves Fed Corn Silage

Ingredient, %	Corn supplement	Soybean meal supplement	Urea supplement
Corn grain	95.69	75.71	92.82
SBOM	--	20.41	--
Urea	--	--	2.53
Limestone	1.70	1.73	1.30
Cyphos	1.66	1.26	1.72
Calcium sulfate	--	--	0.68
Trace mineral salt	0.89	0.89	0.89
Trace mineral premix	0.06	--	0.06

Vitamin A premix (30,000 IU/g)
added at the rate of 9.8 g/100 lb. supplement

Monensin primary premix (30 g/lb.)
added only to treated supplements at the rate of 24.8 g/100 lb. supplement for rations with 10 g/ton air-dry ration and at 74.4 g/100 lb. supplement for rations with 30 g/ton air-dry ration.

Table 2. Protein Levels and Sources with Monensin for Growing Cattle (January 30 to May 25, 1976--116 days)

	Corn supplement		SBOM supplement		Urea supplement	
	Control	Monensin	Control	Monensin	Control	Monensin
No. animals	32	32	32	32	32	32
Init. shrunk wt., lb.	496	495	496	497	494	494
Final shrunk wt., lb.	774	787	808	812	792	801
Avg. daily gain, lb.						
21 days	3.27	2.22	3.50	3.69	2.75	2.34
49 days	2.72	2.68	3.24	3.21	3.15	2.62
77 days	2.47	2.50	2.88	2.96	2.47	2.60
105 days	2.54	2.55	2.79	3.01	2.64	2.67
116 days (filled)	2.53	2.68	2.84	2.95	2.75	2.78
116 days (shrunk)	2.40	2.52	2.69	2.72	2.56	2.65
Avg. daily ration, lb.						
21 days	30.56	27.56	30.71	28.07	31.46	27.95
49 days	32.79	28.56	32.69	29.20	32.58	28.00
77 days	33.93	29.23	34.18	30.91	33.72	29.28
105 days	37.27	31.76	37.38	33.75	37.24	31.58
116 days	38.34	32.69	38.07	34.63	38.24	32.79
Feed/100 lb. gain, lb.						
21 days	936	1243	878	760	1154	1212
49 days	1208	1066	1010	909	1036	1069
77 days	1374	1169	1189	1045	1367	1126
105 days	1466	1246	1341	1122	1413	1183
116 days (filled)	1514	1219	1340	1173	1391	1181
116 days (shrunk)	1598	1299	1416	1276	1492	1239