sparing effect, the forage quality was much higher during the first 56 days than in the last. Bermuda hay made up a large part of the total dry matter intake during the last 47 days of the trial. Daily intake of protein should have been very adequate in the early part of the test, but would have declined to marginal levels during the last 56 days due to the weather related failure to grow green forage.

The overall response to providing 200 mg. of monensin to cattle grazing fescue, later supplemented with bermuda hay, was excellent in a 112-day test conducted in southeast Oklahoma. Some question remains as to the response on high vs. low quality forage, but it appears that the response was larger as the forage quality was lowered.

Monensin for Range Beef Cows

R.P. Lemenager, F.N. Owens, E.L. Ferrell, D.B. Belcher, K.S. Lusby and R. Totusek

Story in Brief

Seventy-two mature Hereford cows were employed to evaluate the supplemental value of monensin for beef cows grazing low quality dry winter range grass. The two treatments were 30 percent natural crude protein supplements with zero or 200 mg of monensin/cow/day.

Cow weight change during the dry grass portion of the trial was not affected by monensin, although weight gain of cows grazing green grass tended to be higher when monensin was fed.

Monensin supplemented cows did not differ from control cows in pounds of milk produced, percent milk solids, butterfat or solids-not-fat. However, addition of monensin to the supplement decreased ruminal molar percent acetate and butyrate, and increased ruminal propionate.

This experiment indicates that the addition of monensin to range supplements: (1) does not affect cow weight change during the dry winter grass portion of the year, but it may increase cow weight grain when green grass appears in the spring; (2) decreased grazing time about 15 percent during the dry winter grass portion of the trial; (3) increases propionate and decrease

acetate and butyrate, and (4) does not alter milk production or milk composition.

Introduction

Monensin (trade name Rumensin), a biologically active compound produced by a strain of *Streptomyces cinnamonensis,* has been shown to increase the molar proportion of rumen propionate and decrease rumen acetate. The product is now used widely with feedlot cattle and has been shown to increase feed efficiency of cattle fed high concentrate rations.

Cattle on lush forage have shown improved gains and feed efficiency when monensin was fed. Monensin has not been shown to have deleterious effects on lactation or early calf performance when cows were fed hay.

The purpose of this study was to further evaluate the addition of monensin to supplements for lactating cows.

Procedure

A 152-day winter trial was conducted in central Oklahoma on native tallgrass range with climax vegetation of little bluestem, big bluestem, Indian grass, and switch grass.

Seventy-two mature lactating Hereford cows were randomly allotted, after blocking by weight and calving date, to two treatments with two replications per treatment. Cows were placed on four pastures, and rotated among pastures at 14 day intervals to minimize pasture and location effects. The two treatments were 30 percent natural crude protein supplement with zero or 200 mg of monensin added per cow per day. Table 1 shows the ingredient make-up of the supplement. The supplements were self-fed at a rate of 3.2 lb/cow/day with salt added to limit intake.

Cows calved from October 11 to December 3 with a mean calving date of November 1 and November 2 for the control and monensin supplement, respectively.

Table 1. Ingredient makeup of protein supplement

Item	% in Supplement
Corn	22.77
Soybean meal (44%)	58.25
Ground alfalfa hay	10.00
Molasses	5.00
Monosodium phosphate	2.50
Dicalcium phosphate	.75
Sodium sulfate	.68
Trace mineral mix	.05
Vit. A	22,000 IU/kg

Four 24-hour pasture observations were conducted to estimate grazing time and frequency of supplement intake. Grazing time was estimated by observing each cow every 15 minutes, and recording whether she was grazing or not grazing. The supplement feeder was under continuous observation, and frequency and duration of supplement intake were recorded. Each of the treatment replications were observed twice during the winter supplementation period. Immediately following the pasture observations, rumen samples were taken from 10 randomly selected cows per treatment to determine the effect of monensin on molar porportions of acetate, propionate, and butyrate.

Four milk productions were taken by the calf weigh-suckle-weigh technique on all cows on days 62, 83, 110, and 150 of the trial to determine the effect of monensin on milk production. Two milk compositions were taken on all cows on days 95 and 139 of the trial to determine the effect of monensin on butterfat. Cows were injected with eight cc of Sparine (a tranquilizer) IM approximately 45 minutes prior to milking, and injected with one cc of oxytocin in the jugular vein immediately preceeding milking. Cows were milked out with the use of a milking machine, and samples were taken for butterfat analysis. Samples on day 139 were analyzed for butterfat, milk solids, and solids-not-fat.

Results and Discussion

Cow performance results are shown in Table 2. Average daily supplement intakes were approximately equal on the two treatments. Weight change of cows was similar during the dry grass portion of the trial, but cows fed monensin appeared to gain faster when green grass appeared in the spring.

Grazing observation results are shown in Table 3. Cows on the monensin supplement tended to graze about 15 percent less than control supplemented cows during the first three grazing observations. After green grass appeared (grazing observation 4) cows on the monensin supplement grazed about 6 percent more than control supplemented cows. This could partially explain

Table 2. Cow performance

	Monensin, mg/cow/day	
Item	**0**	**200**
Cows, number	36	36
Ave. daily supplement, lb.	3.3	3.2
Ave. daily salt, lb.	1.27	1.13
Ave. calving date	Nov 1	Nov 2
Initial cow wt., lb.	942.7	940.3
Total cow weight change, lb.	-13.2	+1.8
Dry grass weight change, lb.	-90.2	-97.3
Green grass weight change, lb.	+77.0	+99.1

Table 3. Pasture observations (cows)

Item	Monensin, mg/cow/day	
	0	200
Grazing observation 1		
Grazing time, %	30.5[1]	28.4[2]
Freq. of supp. intake, times/day	5.5	5.2
Duration of supp. intake, min.	7.6	10.3
Grazing observation 2		
Grazing time, %	36.2[1]	26.0[2]
Freq. of supp. intake, times/day	5.2	5.2
Duration of supp. intake, min.	11.1	7.8
Grazing observation 3		
Grazing time, %	29.8	28.0
Freq. of supp. intake, times/day	4.2	3.3
Duration supp. intake, min.	4.6	7.5
Grazing observation 4		
Grazing time, %	41.0	43.3
Freq. of supp. intake, times/day	5.1	4.7
Duration of supp. intake, min.	6.0	6.5

[1,2]Values with different superscripts are significantly different ($P < .1$).

the increased weight gain of monensin supplemented cows after green grass appeared.

Cows on both supplements tended to go to the supplement feeder with an equal frequency during the grazing observations. The overall mean for control cows was 5.0 time/day and for monensin fed cows was 4.6 times/day. Cows on both supplements tended to consume supplement an average of 37.0 minutes per day.

Total and molar percentages of volatile fatty acids are shown in Table 4. The addition of monensin significantly decreased acetate and butyrate and significantly increased propionate. This suggests an increased efficiency and may partially explain the 15 percent reduction in grazing time without adversely affecting cow performance or lactation.

Table 4. Total and molar percentage Volatile fatty acids in rumen fluid of cows

Item	Monensin, mg/cow/day	
	0	200
Acetate, molar %	78.1[1]	68.9[2]
Propionate, molar %	16.5[2]	26.6[1]
Butyrate, molar %	5.3[1]	4.4[2]
Total, mM/l	39.2	41.7

[1,2]Values with different superscripts are significantly different ($P < .01$).

Table 5. Milk parameters

Item	Monensin, mg/cow/day	
	0	200
Milk production, lb[1]	8.8	8.8
Milk production, lb[2]	13.6	13.2
Butterfat, %	3.2	3.1
Milk solids, %	12.8	12.9
Solids-not-fat, %	9.6	9.8

[1]Mean of four 24 hour milk productions by calf weight-suckle-weight technique.
[2]Mean of milk production by milking machine technique.

Milk production and milk composition results are shown in Table 5. Milk production was not affected by the addition of monensin when estimated by either the calf weigh-suckle-weigh technique or the complete milk out with milking machine. Estimated milk production is somewhat lower by the calf weigh-suckle-weigh technique, but it is believed to be a more accurate estimate of what calves are actually consuming than is the milking machine estimate. Butterfat, solids, and solids-not-fat were not affected by the addition of monensin to the range supplement.

Calf performance from cows fed monensin is shown in Table 6. Total calf gain was significantly increased in calves reared by cows fed the monensin supplement. Calves reared by monensin fed cows gained 0.08 lb./day faster than calves reared by cows fed the control supplement over the entire trial. The dry grass and green grass gain of calves was not significantly affected by the addition of monensin; however, calves reared by monensin fed cows tended to gain faster in both phases of the trial.

During the first grazing observation it was noted that some calves from each treatment were consuming supplement; therefore, in second and subsequent grazing observations calves were also observed. Pasture observation results are shown in Table 7. In grazing observation two, 17 out of 17 calves were consuming control supplement, while 16 out of 18 were consuming monensin supplement. In grazing observation three, 17 out of 17 calves were consuming control supplement and 16 out of 18 were consuming monensin supplement, respectively. In grazing observation four, nine out of 18, and 16

Table 6. Calf performance from cows fed monensin

Item	Monensin, mb/cow/day	
	0	200
Initial calf wt., lb.	234.3	234.5
Total calf gain, lb.	197.8^{2}	210.5^{1}
Dry grass gain, lb.	115.3	123.1
Green grass gain, lb.	82.5^{4}	87.4^{3}

[1,2]Values with different superscripts are significantly different ($P< .05$).
[3,4]Values with different superscripts are significantly different ($P<.10$).

Table 7. Pasture observations (calves)

Item	Monensin, mg/cow/day 0	200
Grazing observation 2		
No. of calves eating supplement	17	16
Freq. of supp. intake, times/day	3.5	3.0
Duration of supp. intake, min.	3.6	3.1
Grazing observation 3		
No. of calves eating supplement	17	13
Freq. of supp. intake, times/day	2.6	1.8
Duration of supp. intake, min.	4.0	3.4
Grazing observation 4		
No. of calves eating supplement	9	16
Freq. of supp. intake, times/day	1.3	2.6
Duration of supp. intake, min.	3.0	3.4

out of 18 were eating control and monensin supplements, respectively. Calves consuming both supplements went to the supplement feeder an average of 2.5 times/day. Calves consuming supplement ate an average of 8.6 and 8.1 minutes/day on the control and monensin supplements, respectively.

Increased calf gains during the trial can be partially, if not totally, explained by calves consuming supplement. This seems likely since milk production and milk composition were not altered by the addition of monensin.

Monensin in this trial appears to have increased the efficiency of forage utilization by decreasing grazing time 15 percent without adversely affecting cow performance or lactation. Calf gains were increased 6.4 percent, presumably by altering efficiency of utilization of milk and/or forage.