EFFECT OF A SELF-LIMITED MONENSIN-CONTAINING ENERGY SUPPLEMENT AND SELENIUM BOLUS ON PERFORMANCE OF GROWING CATTLE GRAZING WHEAT PASTURE[1]

P.A. Beck[2], G.W. Horn[3], M.D. Cravey[2] and K.B. Poling[4]

Story in Brief

Seventy-six Brahman crossbred steers (mean initial weight of 594 lb) were used in a 120-day trial to determine intake of a self-limited monensin/energy supplement fed in the meal form, and the effect of the supplement and the Dura Se-120 bolus on performance of growing cattle grazing wheat pasture. Mean daily intake of the monensin/energy supplement was limited to 2 lb/head by cattle of two pastures. This was well within the target range of 2 to 3 lb. The selenium bolus tended to increase gains of nonsupplemented cattle but tended to decrease gains of cattle fed the monensin/energy supplement. Therefore, the supplement by selenium interaction was significant. The selenium bolus had no overall effect on performance. The monensin/energy supplement increased daily gains by .45 lb/head. This is similar to results found in past research with this supplement fed in the pelleted form in which daily gains were increased by about .50 lb.

(Key Words: Monensin, Wheat Pasture, Growing Cattle, Selenium.)

Introduction

Wheat forage in the fall and early spring commonly contains crude protein (CP) levels in excess of 25% and digestible organic matter (energy) levels in excess of 75%. The energy:CP ratio is less than optimum for efficient microbial protein production as discussed by Hogan (1982). Monensin increases daily gains of growing cattle on wheat pasture (Horn et al., 1981) and

---

[1]This material is based upon work supported by the Cooperative State Research Service, U.S. Department of Agriculture, under Agreement No. 89-34198-4288. Any opinions are those of the author(s) and do not necessarily reflect the view of the U.S. Department of Agriculture.
[2]Graduate Assistant [3]Professor [4]Herd Manager

decreases the incidence and severity of bloat (Branine and Galyean, 1990; Grigsby, 1984; Bagley and Feazel, 1989).

Horn et al. (1990; 1992) found a self-limited monensin/energy supplement fed in the form of 3/16 inch pellets increased daily gains by .53 and .48 lb, respectively. Daily intake of the supplement was targeted at 2 to 3 lb/head and cattle of one pasture in each trial consumed supplement within the desired range, but cattle of another pasture consumed greater than desired levels of supplement. The objectives of this research were to measure intake of a self-limited monensin/energy supplement fed in the meal form with a target level of daily intake of 2 to 3 lb/head and determine the effect the monensin/energy supplement and the Dura Se-120 bolus on performance of wheat pasture stocker cattle.

Experimental Procedures

Seventy-six Brahman crossbred steers (mean initial weight 594 lb) were randomly allotted to four groups of 18, 20, 22 and 16 head per group according to breed and initial weight. The steers were placed on four pastures of 2157 wheat pasture for a 120-day trial beginning November 7, 1991 and ending March 6, 1992.

The trial was designed as a split-plot experiment with treatments, consisting of control (no energy supplement) or the self-limited monensin/energy supplement assigned to pastures and one-half of the steers in each pasture was administered a selenium bolus. Blood samples were collected at 3 times during the trial from six cattle (3 non-bolused and 3 bolused) from each pasture and analyzed for whole blood selenium by Schering-Plough Animal Health Technical Services.

The supplement consisted primarily of ground milo and wheat middlings (Table 1), and contained 4.00% salt, magnesium oxide and Rumensin as intake limiters. The calculated monensin concentration was 75 mg/lb. The supplement was fed in covered feeders with 20 feet of total bunk space in each pasture with intake measured twice weekly (i.e., at 3- and 4-day intervals). Cattle in control pastures were offered free-choice access to a commercial mineral mixture throughout the trial in weather vane type mineral feeders located near the water source in each pasture. Guaranteed analysis of the mineral mixture was: calcium, 15 to 17%; phosphorus, not less than 4%; salt, 18.5 to 21.5%; and magnesium, not less than 5.5%. Intake of the commercial mineral mixture was measured weekly. All cattle had free-choice access to medium quality grass hay throughout the trial. The cattle were weighed 3 times during the trial. All cattle weights were measured after 16 to 18 hour shrinks without feed and water.

Estimated forage availability was measured before the trial and periodically throughout the trial, by hand clipping ten .5 square meter quadrats

Table 1. Composition of monensin/ energy supplement fed to cattle on wheat pasture trial.

Ingredient	% As-fed basis
Ground milo, %	62.78
Wheat middlings, %	20.99
Sugarcane molasses, %	4.80
Calcium carbonate, %	4.00
Dicalcium phosphate, %	2.55
Magnesium oxide, %	.75
Salt[a], %	4.00
Rumensin 60 Premix, %	.125
Calculated nutrient content, as-fed basis	
NE_{gain}, Mcal/cwt	37.9
Crude protein, %	9.2
Calcium, %	1.94
Phosphorus, %	1.17
Magnesium, %	.63
Monensin content, mg/lb	75

[a] Fine mixing salt (99.5% NaCl).

per pasture to ground level. Initial cattle numbers were allotted to pastures by equalizing available forage per steer in each pasture.

The data were analyzed by least squares ANOVA using the GLM procedures of SAS. The performance trials were analyzed as a split-plot experimental design using pasture as the experimental unit and steers as the sampling unit. In the presence of a significant supplement x selenium interaction, standard errors for the split plot design were calculated to find the LSD and proper t-values for comparison of two subunit means at different main units as described by Steel and Torrie (1980).

Results and Discussion

Mean daily supplement intake was limited to 2.0 ± .70 lb/head in pasture one and 2.0 ± .77 in pasture 2, as shown in Table 2. The mean daily intake was within our targeted range of 2 to 3 lb/head, and the daily intake ranged from .78 to 3.34 lb/head in pasture 1 and from .70 to 3.94 lb/head in pasture 2.

Table 2. Supplement, monensin and mineral consumption by steers grazing wheat pasture.

	Mean	Standard deviation	Minimum[a]	Maximum[a]	Obs.[b]
Pasture 1					
Supplement, lb/hd/day	2.00	.70	.78	3.34	34
Monensin, mg/hd/day	150	53	58	251	
Pasture 2					
Supplement, lb/hd/day	2.00	.77	.70	3.94	34
Monensin, mg/hd/day	150	58	52	296	
Pasture 3					
Mineral mixture, lb/hd/day	.24	.06	.14	.34	19
Pasture 4					
Mineral mixture, lb/hd/day	.24	.08	.12	.51	19

[a] Minimum or maximum for 3- or 4-day periods (pastures 1 and 2) or weekly periods (pastures 3 and 4).
[b] Number of observations.

Even though the ranges of intake were outside the targeted range, the supplement consumption was better limited by feeding the supplement in the meal form as compared to feeding a similar supplement in the pelleted form. Mean daily consumption of the commercial mineral mixture by control steers was .24 lb/head in each pasture, which is very close to the target level of intake (.25 lb/day) for this mineral mixture.

Performance of the cattle is shown in Tables 3 and 4. Problems with bloat were encountered during the trial and four steers that were observed to be frequently bloated were deleted from the data set due to poor performance. The

Table 3. Effect of monensin/energy supplement and selenium bolus on performance of steers grazing wheat pasture[a].

	Treatment				Comparisons			
	Control		Supplement					
	No selenium (1)	Selenium (2)	No Selenium (3)	Selenium (4)	1 vs 2	3 vs 4	1 vs 3	2 vs 4
Daily gain, lb	2.22	2.40	2.86	2.67	.16	.13	.10	.20

[a] Supplement by selenium interaction (P<.08).

Table 4. Overall effect of the monensin/energy supplement or selenium bolus on performance of steers grazing wheat pasture.

	Treatment				Observed significance level	
	Control	Energy Supplement	No Bolus	Se Bolus	Supplement	Selenium
Number steers	36	36	36	36		
Initial weight, lb	596	592	584	604		
Final weight, lb	873	924	888	908		
Daily gain, lb	2.31	2.76	2.54	2.53	.15	.80

supplement by selenium interaction was significant (P=.08). The selenium bolus tended to increase daily gains of control cattle (2.22 vs 2.40; P=.16), while the selenium bolus tended to decrease average daily gain in supplemented cattle (2.86 vs 2.67; P=.13). The interaction is due to the change of direction of the effect of the selenium bolus depending on the supplement treatment, yet we have no biological explanation for the interactions.

Overall, the monensin/energy supplement increased daily gain by .45 lb (2.31 vs 2.76 P<.15). In past trials (Horn et al., 1990; Horn et al., 1992) the monensin/energy supplement increased daily gain of steers by .53 and .48 lb, respectively. Therefore the weight gain response to the monensin/energy supplement has been very consistent from year to year. Supplement conversion, expressed as lb of supplement/lb of added gain was 4.5 (2.0 lb of supplement divided by .45 lb added gain). The selenium bolus had no overall effect on performance of the steers (2.54 vs 2.53; P=.80) and whole blood selenium concentrations were not changed by the selenium bolus (P>.16).

Literature Cited

Bagley, C.P. and F.I. Feazel. 1989. Influence of a monensin ruminal bolus on the performance and bloat prevention of grazing steers. Nutr. Rep. Int. 40:707.

Branine, M.E. and M.L. Galyean. 1990. Influence of grain and monensin supplementation on ruminal fermentation, intake, digesta kinetics and incidence and severity of bloat in steers grazing winter wheat pasture. J. Anim. Sci. 68:1139.

Grigsby, M.E. 1984. Effects of grain and monensin on daily gains and the incidence of bloat in steers grazing wheat pasture. Proc. West. Am. Soc. Anim. Sci. 35:309.

Hogan, T.P. 1982. In: J.B. Hacker (Ed). Nutrition Limits to Animal Production from Pastures. p 245. Commonwealth Agricultural Bureaux, Farham House, UK.

Horn, G.W., et al. 1992. A self-fed monensin-containing energy supplement for stocker cattle grazing wheat pasture. Okla. Agr. Exp. Sta. Res. Rep. MP-136:301.

Horn, G.W., et al. 1990. Intake of a self-fed monensin-containing energy supplement by stocker cattle on wheat pasture and effects on performance. Okla. Agr. Exp. Sta. Res. Rep. MP-129:209.

Horn, G.W., et al. 1981. Effect of monensin on ruminal fermentation, forage intake and weight gains of wheat pasture stocker cattle. J. Anim. Sci. 52:447.

Steel, R.G.D. and J.H. Torrie. 1980. Principles and Procedures of Statistics. A Biometrical Approach. p 381. McGraw-Hill Book Publishing.