A Modification of the Oklahoma Green Gold Supplementation Program: Supplement Intake and Performance of Wheat Pasture Stocker Cattle

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Story in Brief

An experiment was conducted to evaluate a modification of the existing recommendations for the Oklahoma Green Gold Supplementation program. Seventy-eight predominantly Angus-crossbred steers (initial BW = 529 lb) were grazed on six different pastures at two different locations (Stillwater, OK and Marshall, OK; 4 pastures at Stillwater and 2 pastures at Marshall). The current experiment was initiated on November 13, 2002 and completed on March 13, 2003. Average stocking rate was 1.70 acres/steer. Dietary treatments were either a mineral mixture or a monensin-containing energy supplement. The supplement was formulated according to the Green Gold specifications with the exception of containing 160 mg of monensin per lb of supplement (as-fed). The supplement was offered every other day at a rate of 2 lb/steer, to achieve a target daily monensin intake of 160 mg/steer. Cattle receiving the mineral mixture were given free-choice access to mineral at all times. Steers receiving the monensin-containing supplement gained .25 lb/steer/day more than those receiving mineral alone, 3.19 vs 2.94, respectively. Daily supplement intake averaged .89 lb/steer over the length of the trial, resulting in a daily monensin intake of 143 mg/steer. Daily mineral consumption during the trial averaged .29 lb/steer. Despite supplement intakes slightly less than targeted, this data indicates that a dose of monensin capable of eliciting a positive gain response can be provided to cattle in a supplement fed every other day at a rate of 1 lb/steer/day.

Key Words: Steers, Wheat Pasture, Monensin, Supplement, Daily Gain

Introduction

The Oklahoma Green Gold Supplementation program is intended to improve gains of cattle grazing wheat pasture. The program calls for feeding a monensin-containing energy supplement at a rate of 2 lb/steer/day or 4 lb/steer fed every other day. The supplement should be comprised of 80 to 90% energy feedstuffs such as corn, milo, wheat midds, or soybean hulls. In addition, the ionophore monensin should be included at a concentration of 90 – 100 mg/lb as-fed to improve supplement conversion and daily gains. The inclusion of monensin has been shown to not only improve daily gains and supplement conversion, but has also decreased the incidence and severity of bloat in cattle grazing winter wheat pasture (Paisley and Horn, 1998). Research trials leading up to the above recommendations showed that daily gains were improved by .4 - .55 lb/steer compared with unsupplemented cattle (Horn et al., 1990, 1992; Andrae et al., 1994; Paisley et al., 1998). When used by producers, one of the most common questions posed is whether or not a smaller amount of supplement could be fed and still get the desired dosage of monensin into the cattle and elicit a positive performance response. With this in mind, this trial was conducted to determine the effects of increasing monensin concentration in an energy supplement on supplement intake and the resulting effect on cattle performance.

Materials and Methods

Study site. Four winter wheat pastures near Stillwater, OK, and two winter wheat pastures at the Wheat Pasture Research Unit near Marshall, OK, were assigned to one of two treatments, with each treatment being represented at each site. Treatments were: 1) free choice access to a mineral mixture (Wheat Pasture Pro Mineral; Land O□Lakes Farmland Industries, Inc., Fort Dodge, Iowa) designed for cattle grazing wheat pasture, and 2) feeding of a monensin-containing energy supplement fed every other day at the rate of 2 lb/steer. Pastures were periodically hand-clipped to ground level inside 2 ft^2 quadrants randomly selected in each pasture for determination of standing forage DM per acre. Clipping dates at Marshall were: January 13, February 5, and March 7. Stillwater clipping dates were: January 14, February 11, and March 13.

Cattle. Seventy-eight predominantly Angus-crossbred steers from two different sources were used in this experiment. Fifty-six steers originating from the OSU Range Herd were stratified by weight and randomly assigned to treatments at Stillwater. The remaining 26 head of privately owned cattle were allotted in a similar manner and assigned to the pastures at Marshall. This resulted in 13 head per pasture and 39 head per treatment. Average stocking rate was 1.70 acres/steer, with no adjustments made during the trial. Steers were weighed at Marshall following an overnight shrink without feed or water on the following dates: November 13, January 28, and March 8. Steers at the Stillwater location were weighed following a 6-h shrink without feed or water on the following dates: November 13, December 17, January 14, February 11, and March 13. Duration of grazing was 120 and 115 days at the Stillwater and Marshall locations, respectively. On December 20, one steer in the supplement pasture at Marshall was removed due to lameness and replaced with a different steer, which resulted in only 12 steers being used to calculate daily gain for this pasture.

Supplement. Steers began receiving either the mineral mixture or energy supplement on November 13, 2002 at both locations. In order to adapt the steers to the feeders, those pastures receiving the energy supplement were fed 1 lb/steer/day for the first four days of the trial. Beginning on the fifth day, and through the remainder of the trial, steers were fed 2 lb/steer every other day. Prior to each feeding, all remaining supplement was removed, weighed, and replaced with fresh supplement. In the event that the supplement had gotten wet, the wet material was removed and weighed, then sampled for DM analysis to determine the actual air-dry intake of supplement. Supplement was fed in a 12-ft long round bottom feeder, with one feeder per pasture located near the water source. Mineral was fed in a covered mineral feeder, also with one feeder per pasture. Diet and nutrient composition of the monensin-containing energy supplement is detailed in Table 1. Supplement was manufactured as an 11/64-inch pellet to reduce the potential for sorting and ease handling.

Table 1. Diet and nutrient composition of supplements[a]

Ingredient	% As-fed	Nutrient[b]	DM Basis
Ground Corn	42.0	NE_m, Mcal/cwt	80.0
Wheat Midds	44.1	NE_g, Mcal/cwt	44.5
Cane Molasses	5.0	TDN, %	72.9
Salt	1.25	Crude Protein, %	12.2
Rumensin 80[c]	.20	Potassium, %	.94
Dicalcium Phosphate, 18.5% P	2.20	Calcium, %	2.63
Limestone	4.50	Phosphorus, %	1.12
Magnesium Oxide	.50	Magnesium, %	.60

Copper Sulfate	.025	Sulfur, %	.21
Vitamin A-30,000	.184	Cobalt, ppm	.12
		Copper, ppm	82
		Iron, ppm	454
		Manganese, ppm	98
		Selenium, ppm	.16
		Zinc, ppm	55

[a] Wheat Pasture Pro Mineral; Land O Lakes Farmland Industries, Inc. Fort Dodge, Iowa. Guaranteed analysis: Calcium 15.0-17.0%; phosphorus, 4.0%; salt, 18.5-22.0%; magnesium, 5.5%; potassium, 0.1%; zinc, 2,350 ppm; manganese 2,000 ppm; copper, 650 ppm; iodine, 65 ppm; selenium, 22 ppm; vitamin A, 100,000 IU/lb

[b]Nutrient composition calculated based on tabular values (NRC, 1996)

[c]To result in 160 mg monensin/lb of supplement. Analyzed concentration was 163 mg monensin/lb

Statistical Analysis. The ADG for each steer was calculated by regressing the observed shrunk weight on the day of the trial the weight was taken using the REG procedure of SAS. The slope of this regression is the ADG. As stated previously, 5 observations of steer weight were used for the regression on Stillwater steers, while 3 observations were used for the Marshall steers. Individual steer ADG data was averaged by pasture and analyzed using the MIXED procedure of SAS as a randomized complete block design. Pairs of pastures receiving each of the treatments (4 pastures at Stillwater, and 2 pastures at Marshall) were used as the blocking factors. By treating block as a random effect, data were pooled across blocks and reported as least squares means by treatment. Raw means and standard deviations for supplement and mineral intakes are presented without further statistical analysis.

Results and Discussion

Supplement Intake. Supplement intake across all pastures averaged .89 lb/steer/day, resulting in daily monensin intakes of 143 mg. Mineral intake averaged .29 lb/steer/day. Individual pasture means and intake patterns are shown in Figures 1, 2, and 3. While little difference was observed in the mean average daily supplement intake among pastures, intake patterns across the length of the trial varied among pastures. Despite the difference in intake patterns, the performance response was consistent across all pastures. One potential drawback to this supplementation program is dealing with weather hazards when putting two days of feed out at a single feeding. When supplements were not fully consumed over the course of two days, in some instances it may have been due to the supplement getting wet from rain or snow. However, this can be avoided if covered feeders are available. Feed bunks were checked daily to monitor supplement consumption. Out of 173 times supplement was fed across all pastures during the trial, on only 10 occasions was the supplement completely consumed during the first day it was offered. This suggests that during times of inclement weather feeding daily to prevent feed wastage may be beneficial.

Figure 1. Pasture 2 Supplement and Monensin Intake (Stillwater)

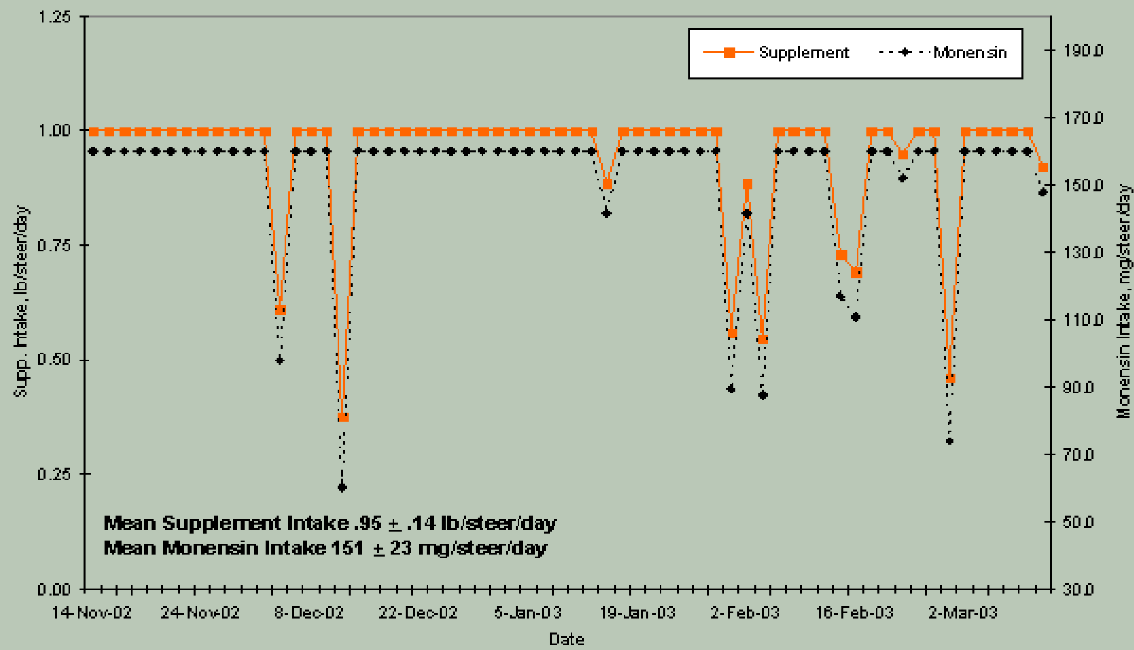


Figure 2. Pasture 4 Supplement and Monensin Intake (Stillwater)

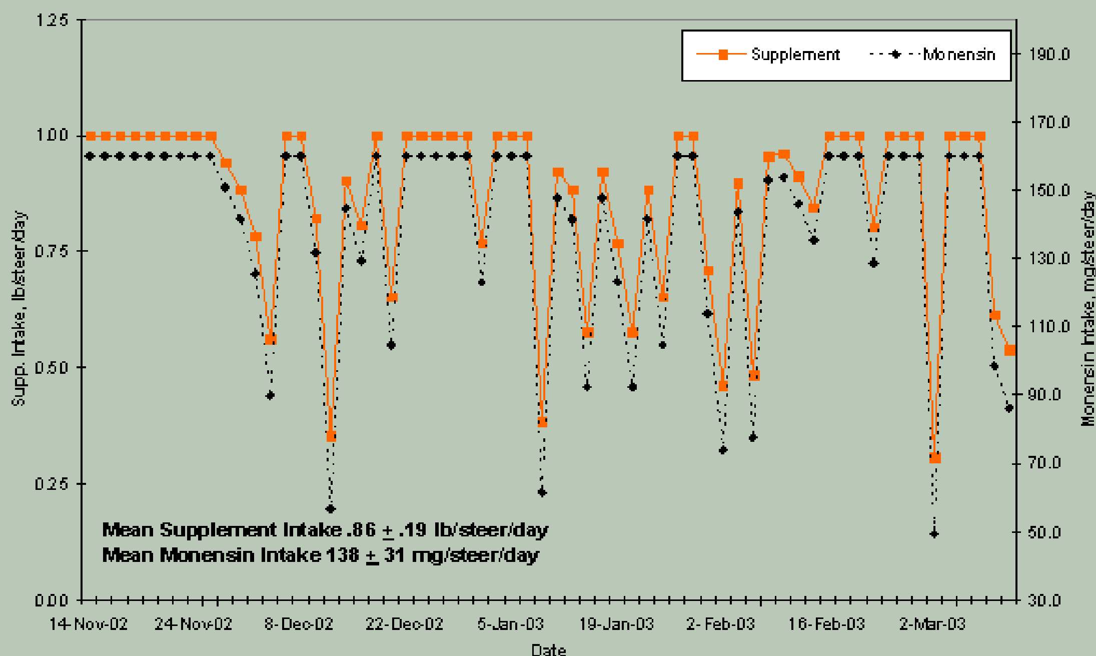
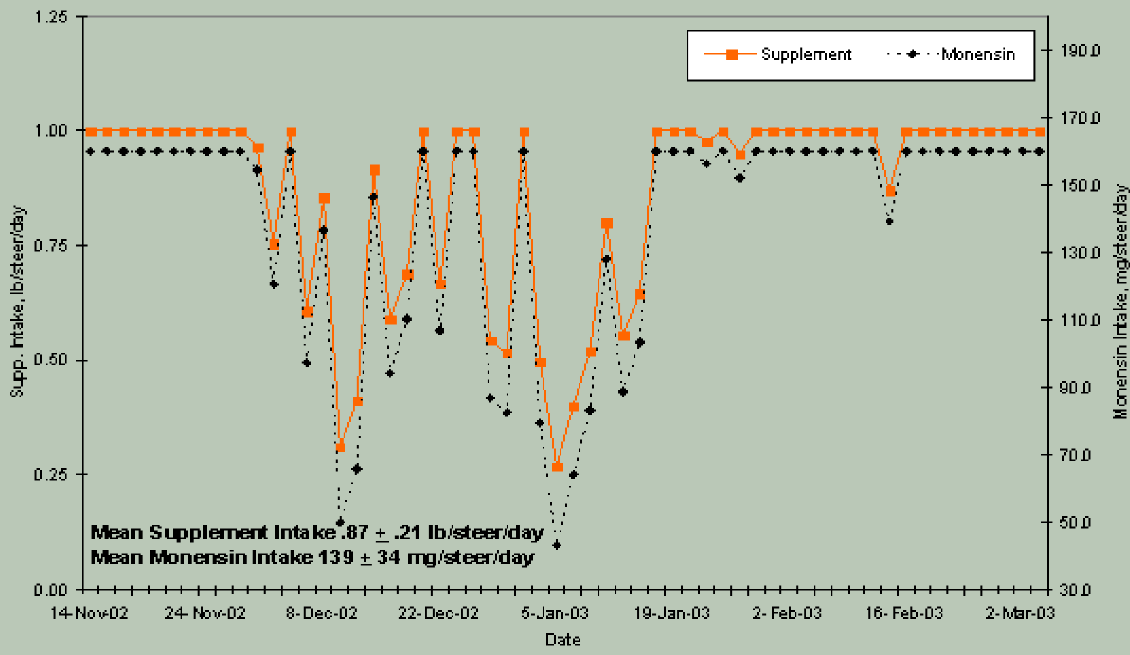


Figure 3. Pasture 17 Supplement and Monensin Intake (Marshall)



Animal Performance. Initial steer weights were not different (P=.81) between treatments, and averaged 529 lb (Table 2). While ADG was excellent for both treatments, steers receiving the monensin-containing supplement gained .25 lb/steer/day more than those receiving mineral alone (P=.03). As a result of the increased ADG and similar start weights, both total gain (P=.03) and final weight (P=.03) were greater for steers fed the monensin-containing supplement compared with steers fed the mineral mixture. On average, steers receiving the monensin-containing supplement gained 33 lb more than those steers receiving the mineral mixture. This positive performance response to monensin supplementation is in accordance with those trials that led to the construction of the Green Gold program. The amount of improvement in ADG with a monensin supplement observed in this trial is less than has been observed in similar trials (Horn et al., 1990, 1992; Andrae et al., 1994; Paisley et al., 1998). However, in previous trials performance of control and supplement steers was not as great as that observed in this trial, allowing for the potential to increase gains to a greater degree. In addition, steers in previous trials were receiving nearly twice the amount of the monensin-containing energy supplement, while daily intake of monensin was slightly lower. Furthermore, some of the larger ADG responses (greater than .5 lb) to a monensin-containing energy supplement were found in comparison to steers on a negative control treatment that provided no supplemental nutrients of any kind, including no mineral supplementation (Andrae et al., 1994).

Table 2. Growth performance of steers grazing winter wheat pasture and receiving either a monensin-containing supplement or a mineral mixturea

Item	Mineral	Monensin Supplement	SEM	P-value[b]
Pastures	3	3		
No. of steers	39	38		

Initial wt., lb	529	529	8.9	.81
Final wt., lb	864	897	5.3	.03
Gain per steer, lb	335	368	13.7 .	.03
ADG, lb/steer	2.94	3.19	.244	.03
[a]Least squares means by treatment [b]Probability of a greater F-value for the main effect of treatment				

Supplement Conversion. Overall conversion of supplement (lb of supplement consumed per lb of additional gain over steers receiving mineral mixture) was 3.62. This conversion is similar to conversion efficiencies previously reported with supplements of a similar composition fed on alternate days (Andrae et al., 1994; Paisley et al., 1998). Within each pair of pastures (block), supplement conversions ranged from 2.72 to 5.06. At this conversion efficiency, when feeding a $120/ton supplement it will cost $.214 for each lb of improved gain over steers receiving only a mineral mixture.

Forage Availability. As evidenced by the excellent cattle performance, conditions during the 2002-03 winter wheat grazing season were excellent. Forage DM mass per acre and forage DM allowance per cwt of BW are reported in Table 3 for both Marshall and Stillwater locations. McCollum et al. (1992) found that intake of wheat forage was depressed when standing crops were less than 1100 lb of forage DM/acre. As the values in Table 3 indicate, forage availability was abundant for the duration of this experiment.

Table 3. Standing forage DM and forage allowance		
	Location	
Month	Marshall[a,b]	Stillwater[c]
<u>January</u>		
Standing crop, lb DM/acre	1940	2467
Forage allowance, lb forage DM/100 lb BW	421	612
<u>February</u>		
Standing crop, lb DM/acre	1712	2778
Forage allowance, lb forage DM/100 lb BW	344	599
<u>March</u>		
Standing crop, lb DM/acre	1429	2296
Forage allowance, lb forage DM/100 lb BW	269	447
[a]Marshall cattle weighed: 11/13/02, 1/28/03, 3/8/03. Clipping dates: 1/13/03, 2/5/03, 3/7/03 [b]Marshall forage allowances calculated based on 1/28/03 weight and adjusted to weight on clipping date based on ADG [c]Stillwater cattle weighed: 11/13/02, 12/17/02, 1/14/03, 2/11/03, 3/13/03. Clipping dates: 1/14/03, 2/11/03, 3/13/03		

Implications

Our findings suggest that an energy supplement containing 160 mg monensin/lb can be fed at the rate of 2 lb every other day to growing steers grazing winter wheat pasture and still achieve improved weight gains. However, the targeted supplement intake of 1 lb/day was not achieved, and the improvement in daily gain (.25 lb) was substantially less than the .42 lb improvement observed with the Oklahoma Green Gold supplementation program.

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