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Abstract

The addition of feed additives [rumen modifiers or non-protein nitrogen (NPN)] to mineral supplements may improve health and performance of grazing beef cattle. The objective of this experiment was to evaluate the inclusion of NPN (biuret) with and without Bovatec (Zoetis, Parsippany, NJ) in a commercial mineral mix on growth performance of yearling beef calves grazing in the Kansas Flint Hills. Three hundred ninety-five crossbred steers [initial body weight (BW) 612 ± 77.8 lb] were assigned to one of three mineral treatments (control, biuret, or biuret + Bovatec). Mineral treatments were randomly assigned to one of 18 pastures for a total of six pastures per treatment. Steers were grazed for 90 days from May to August. Individual BW were collected at the start and end of the grazing period. Mineral feeders were placed in each pasture and filled once weekly, and the respective mineral treatment amount was added to target a daily consumption of 4 oz per head. Feeders were weighed weekly and checked daily to estimate the number of days until an individual feeder was empty and in need of refilling (days-to-empty). Total BW gains, average daily gains, final BW, and mineral consumption did not differ ($P \geq 0.31$) between treatments. Conversely, there was an interaction ($P = 0.02$) between days-to-empty and week of the experiment; mineral consumption appeared to be influenced by temporal environmental conditions.

Introduction

Providing a mineral supplement to cattle grazing during summer months in the Kansas Flint Hills can improve growth rate, overall profitability, and provide an opportunity to add nutrients or growth-promoting feed additives to the diets of grazing cattle. The addition of non-protein nitrogen (NPN) or ruminal modifiers to a mineral supplement may be an effective way to improve overall productivity during the grazing season. The objective of this experiment was to measure the effects of NPN (biuret) or NPN + ruminal modifier (biuret + lasalocid) inclusion in a commercial mineral mix on growth performance of yearling beef calves grazing in the Kansas Flint Hills.

Experimental Procedures

Three hundred ninety-five crossbred steers (initial BW 612 ± 77.8 lb) of Texas origin previously backgrounded at the Kansas State University Beef Stocker Unit were used in this experiment. Steers were stratified by BW and then randomly allocated to 18 pastures. Steers were grazed for 90 days from May to August at a targeted stocking density of 250 lb of live-weight per acre. Mineral treatments were randomly assigned to one of 18 pastures for a total of six pastures per treatment. Three mineral treatments consisted of basal supplement (control), basal supplement with biuret (biuret; 0.6 oz/head daily), and basal supplement with biuret and Bovatec (Zoetis, Parsippany, NJ; 180 mg/head/day). Biuret was included in the supplement at 300 lb/ton dry matter (DM) basis to provide 0.6 oz of biuret when mineral was consumed in an intended 4 oz per head daily. Bovatec was included in the supplement at 15.5 lb/ton DM basis to allow a daily consumption of 180 mg/head/day lasalocid when mineral was consumed at 4 oz per head daily. Identical supplement feeders (Bullmaster; Mann Enterprises, Inc., Waterville, KS) were placed in each pasture.

Prior to turnout, steers were individually weighed, assigned a pasture tag, treated for internal (Valbazen, Zoetis, Parsippany, NJ) and external (Standguard, Elanco, Greenfield, IN) parasites, and implanted (Revalor-G, Merck, Kenilworth, NJ). Following initial processing, cattle were sorted and allocated to pastures over a three-day period.

Initially, mineral feeder flaps were folded up for approximately two weeks to help cattle locate mineral. In the event of inclement weather, flaps were unfolded to prevent rain from getting into the mineral. Once mineral consumption increased, flaps were left down for the remainder of the grazing period. Each week mineral tubs were weighed to determine weekly mineral consumption. After the mineral tub was weighed, mineral was added to allow for a daily consumption of 4 oz/head for the following 7 days. Mineral tubs were checked daily for cleanliness, to monitor rate of consumption, and visually estimate the number of days until each mineral feeder was empty (days-to-empty). Mineral tubs were refilled the same day each week. At the completion of the 90-day grazing period, calves were gathered and individually weighed to determine final BW, total BW, and average daily gains (ADG).

Results and Discussion

At the conclusion of the grazing period, final BW, total BW, ADG, and mineral consumption did not differ ($P \geq 0.31$; Table 1) between mineral treatments; however, there was an interaction between days-to-empty and week of the experiment ($P = 0.02$; Figure 1). At the initiation of the experiment, mineral consumption was low. However, it increased rapidly such that days-to-empty for all treatments reached 2 to 4 days by week 3 of the experiment. In late June, mineral consumption decreased, coinciding with elevated ambient temperatures. After the elevated ambient temperatures, normal mineral consumption resumed and all treatments were consistently between 2 to 4 days-to-empty at each observation.

Implications

The data from this first year suggest that the addition of biuret or biuret and Bovatec to a commercial mineral supplement did not affect growth performance of yearling beef cattle grazing in the Kansas Flint Hills. A second year of this study will be conducted to fully evaluate the impact of these mineral supplementation strategies.

Brand names appearing in this publication are for product identification purposes only. No endorsement is intended, nor is criticism implied of similar products not mentioned. Persons using such products assume responsibility for their use in accordance with current label directions of the manufacturer.

Table 1. Mineral ingredients and nutrient composition¹

Item	Mineral treatment		
	Control	Biuret	Biuret + Bovatec
Ingredient, lb/ton			
Salt	485	485	485
Monocalcium phosphate 21%	385	385	385
Calcium carbonate	350	300	300.25
Dried distillers	310	310	310
Microlite	200	15.75	---
Dried molasses	120	120	120
Soy hulls	85	-	-
Soy oil	20	20	20
Magnesium oxide	15	30	30
Zinc oxide	15	15	15
Copper sulfate	8	8	8
Sulfur flour	---	4.25	4.25
Vit A 60,000	6	6	6
Ethylenediamine dihydroiodide	1	1	1
Biuret	---	300	300
Bovatec ²	---	---	15.5
Total	2000	2000	2000

continued

Table 1. Mineral ingredients and nutrient composition¹

Item	Mineral treatment		
	Control	Biuret	Biuret + Bovatec
Calculated nutrient composition			
DM, ³ %	96.46	97.14	97.14
Crude protein, %	5.4	42.9	42.9
Crude fat, %	2.27	2.18	2.18
Crude protein, NPN, ⁴ %	---	37.95	37.95
Total digestible nutrients, %	21.03	18.05	18.05
Calcium, %	10.35	9.28	9.27
Phosphorus total, %	4.24	4.2	4.2
Salt, %	24.23	24.23	24.23
Sodium, %	9.71	9.66	9.66
Chloride, %	14.74	14.74	14.74
Potassium, %	0.66	0.43	0.41
Magnesium, %	1.38	1.06	1
Sulfur, %	0.33	0.542	0.542
Manganese, ppm	197.8	137.9	132.8
Zinc, ppm	5485.6	5439.6	5435.6
Iron, ppm	1061.2	1024.3	1021.2
Copper, ppm	1019.3	1013.7	1013.3
Cobalt, ppm	52	5.93	2
Iodine, ppm	495.1	495.1	495.1
Selenium, ppm	0.056	0.056	0.056
Vitamin A, total KIU/lb	81.65	81.65	81.65
Bovatec, ² mg/lb	---	---	705.3

¹Designed for 4 oz intake per day; Dr. Frank Brazle, 2021, personal communication.²Zoetis, Parsippany, NJ.³Dry matter.⁴Nonprotein nitrogen.**Table 2. Inclusion of biuret with or without Bovatec on stocker cattle performance grazing native grass**

Item	Mineral treatments			SEM ¹	P-value
	Control	Biuret	Biuret + Bovatec		
Initial BW, ² lb	610	613	623	11.1	0.48
Final BW, lb	816	829	830	11.1	0.40
Total BWG, ³ lb	206	216	206	7.8	0.32
ADG, ⁴ lb/day	2.29	2.41	2.29	0.090	0.32
Daily mineral intake, oz/head	3.96	3.96	3.85	0.081	0.31

¹Standard error of the mean.²Body weight.³Body weight gain.⁴Average daily gain.

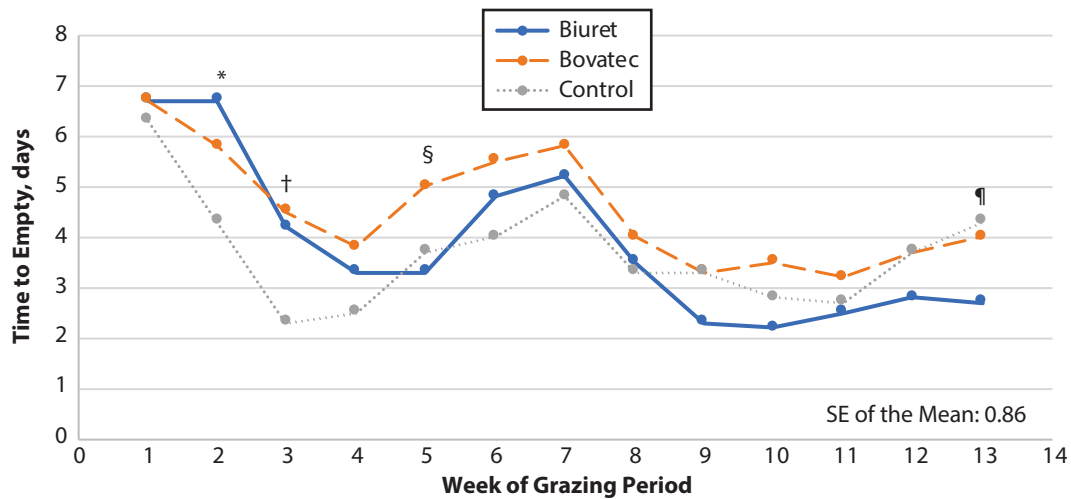


Figure 1. Effects of biuret and Bovatec on weekly mineral consumption rate of yearling cattle grazing native grass pasture, mixed model standard error of the mean associated with comparison of treatment $\times$ week interaction effect means ($P = 0.02$).

*Week 2 Biuret > Control ($P = 0.007$), Biuret = Bovatec ($P = 0.33$), Bovatec vs. Control ($P = 0.08$).

†Week 3 Biuret = Bovatec > Control ($P \leq 0.05$).

§Week 5 Bovatec > Biuret ($P = 0.05$), Biuret = Control, Bovatec = Control ($P \geq 0.12$).

¶Week 13 Control > Biuret ($P = 0.05$), Biuret = Bovatec, Bovatec = Control ($P \geq 0.12$).