The Effect of Molasses Based Liquid Supplements Containing Fibrolytic Enzymes and Bypass Methinoine on the Performance of Growing Calves

Brad Austin
Deke Alkire
Todd Thrift
William Kunkle[1]

Supplementation with molasses based liquid supplements containing fibrolytic enzymes and bypass methinoine did not improve the performance of growing cattle.

Summary

Fibrolytic enzymes and bypass methionine were fed in molasses slurries in an evaluation of growing cattle performance. Eight fibrolytic enzyme treatments were offered and consisted of control (molasses only), 1.5 or 3.0 g/hd/d of Cattle-ase™ "HR" (C1X and C2X), 0.12 g/hd/d of Lodestar™ Biocellulase A20 (A20), 0.12 g/hd/d Lodestar™ Biocellulase A20 and 0.06 g/hd/d Lodestar™ Biocellulase X20 (A20X20), 2.0 or 4.0 g/hd/d of Promote N.E.T.™ (P1X and P2X), and 15 g/hd/d of Fibrozyme (FIB). Cattle were randomly assigned to 32 pens (2 ac) with 5 cattle/pen for the 112-d trial. Each treatment was randomly assigned to 4 pens. Additionally half of the pens (16 or 2 pens/treatment) received 12.5 g/hd/d of Alimet® providing about 4 g/d of bypass methionine. Calves averaged 627 lb at the start of the trial. Bermudagrass hay was offered ad libitum and and molasses slurries were limit fed at 6 lb/hd/d twice weekly. Effects of daily gain, hip height, and intake were monitored. Supplementation with fibrolytic enzymes had no effect (P=0.62) on gains as compared to control (0.49 kg/d vs 0.50 kg/d). Supplementation of cattle with Alimet® had no effect (P=0.58) on weight gains as compared to unsupplemented cattle (1.1 vs 1.08 lb/d). Supplementation with A20 and A20/X20 tended to increase (P=0.08) gains over cattle supplemented with CAT at 1.5 g/d and 3 g/d (1.19 vs 1.03 lb/d). Supplementation with A20 and A20/X20 also tended to increase (P=0.05) gains over cattle supplemented with PRO at 2 g/d and 4 g/d (1.19 vs 1.01 lb/d). Supplementation with enzymes had no effect (P=0.50) on change in height as compared to control (2.61 vs 3.35 in). Cattle not supplemented with Alimet grew more (P=0.04) in height than cattle supplemented (2.83 vs 2.31 in).

Introduction

A major challenge during the winter months is to provide the nutrients required to maintain or improve the performance of grazing cattle. Feeding protein and energy supplementation, to meet the cattle's requirements, are common practices during the winter. Sugarcane molasses, a high-energy, low-cost byproduct of the sugar industry, is often supplemented to cattle in the winter to help meet their energy needs. Research has shown that the addition of protein sources to the molasses, such as urea, cottonseed meal, soybean meal, and feather meal, have also helped to improve cattle performance. However, feeding these protein sources in molasses can become expensive. Recent studies have shown that the supplementation of bypass synthetic amino acids, specifically methionine, can help improve cattle performance.

Fibrolytic enzymes have been shown to increase the rate of breakdown of feeds in the rumen, increase nutrient availability, increase dry matter intake, and improve the performance of growing cattle.

The objectives of this study were to evaluate the effect of bypass methionine (88% 2-hydroxy-4-methylthio butanoic acid, Alimet®) and exogenous fibrolytic enzymes on the performance of growing cattle fed bermudagrass hay supplemented with molasses during the winter.

Procedure

The study was conducted at the SFBU, located near Gainesville in northern Alachua County from December 2001 to April 2002. Eighty Angus X Brahman steers and 80 Angus X Brahman heifers ranging from full blood Angus to full blood Brahman were used. Cattle averaged 627 lb and were 9-12 mo of age at the start of the trial. Cattle were assigned randomly within sex and breed type into 32 pens (5 hd/pen). Sixteen pens contained three steers and two heifers, while the other sixteen pens contained three heifers and two steers. Each pen was a 0.9 ha pasture of frosted-dormant bahiagrass at the start of the trial. Warm weather allowed for some growth of the early spring grass during March and April. The 32 pens were randomly assigned to eight treatments: a control which supplied no exogenous fibrolytic enzymes: 1.5 or 3.0 g/hd/d of Cattle-ase™ "HR" (C1X and C2X), 0.12 g/hd/d of Lodestar™ Biocellulase A20 (A20), 0.12 g/hd/d Lodestar™ Biocellulase A20 and 0.06 g/hd/d Lodestar™ Biocellulase X20 (A20X20), 2.0 or 4.0 g/hd/d of Promote N.E.T.™ (P1X and P2X), and 15 g/hd/d of Fibrozyme (FIB). In addition to Enzyme treatments, 16 pens of cattle (2 pens per treatment) received 12.5 g/hd/d of Alimet® (Novus International Inc., St. Louis, MO) a liquid source of bypass methionine. The supplements were hand mixed into molasses slurries (65% DM, 11.4% CP) that were fed at 6 lb/hd/d. The cattle had ad libitum access to bermudagrass hay (11.01% CP, 81.98% NDF), water, and a vitamin-mineral mix throughout the trial.

Full BW were taken on d 0, 28, 57, 84, and 112. Shrunk weights were taken on d 1 and 113. Hip heights were measured and averaged for d 0 and 1, and d 112 and 113, to determine changes in hip height.

Statistical analysis was conducted using the MIXED procedure of SAS®. The experimental unit was pen and the model statement included enzyme treatment, Alimet® or no Alimet®, sex, the interaction between treatment and sex, the interaction between sex and Alimet®, and the interaction between treatment, sex, and Alimet®.

Results

Supplementation with 4 g/d of

bypass methionine from 12.5 g/d of Alimet® had no affect on ADG (1.21 vs 1.19 lb/d, *P*=0.81) or shrunk ADG (1.10 vs 1.06 lb/d, *P*=0.58) over the trial as compared to the unsupplemented cattle (Table 1). Cattle on trial not receiving Alimet® had greater (*P*<0.05) gains in hip height as compared to cattle receiving Alimet® (2.83 vs 2.31 in), this value is however of no biological significance. Alimet® supplementation decreased (*P*<0.001) liquid supplement intake per animal throughout the entire trial (5.25 vs 5.92 kg/d; Table 2). Hay intakes were not affected (*P*=0.50) by Alimet® supplementation (13.7 vs 13.4 lb/d; Table 3).

The addition of exogenous fibrolytic enzymes to the diet did not affect any of the performance variables as compared to the control throughout the entire trial (Table 3). A20 cattle had increased (*P*<0.05) ADG over the entire trial as compared to FIB cattle (1.36 vs 1.08 lb/d). A20 cattle also tended to have increased ADG, for the entire trial, as compared to P1X (1.36 vs 1.12 lb/d, *P*=0.06) and P2X (1.36 vs 1.14 lb/d, P=0.07) cattle. A20X20 cattle tended (*P*=0.08) to have increased ADG, for the entire trial, as compared to FIB cattle (1.30 vs 1.08 lb/d). These differences did not carry over into shrunk ADG for the trial. A20X20 cattle tended (*P*<0.9) to have increased shrunk ADG over P1X cattle. Differences in ADG by period were only noted during Period 1. A20 cattle had increased ADG (*P*<0.05) as compared to P1X cattle. Control, C1X, C2X, and A20X20 cattle all tended (*P*<0.10) to have increased gains as compared to P1X cattle. The addition of fibrolytic enzymes to the diet had no effect (*P*>0.05) on hip height increases. The addition of fibrolytic enzymes to the diet had no affect (*P*>0.05) on supplement or hay DM consumption as compared to the control at any time during the trial (Table 4). The lack of a response to fibrolytic enzyme supplementation in our trial agrees with other studies. The enzymes may have lost activity when mixed with the liquid supplement or the rate of supplement consumption by the cattle may not have been ideal to maximize enzyme activity on forage. The enzymes may not have been ideally matched to their substrates, that is, different enzymes are needed to maximize breakdown of Florida forages. The variation in results as compared to previous studies may be due to breed differences, environmental differences, or lower nutrient content in the supplement and forage. The authors concluded that the addition of fibrolytic enzymes and Alimet® to molasses slurries did not improve animal performance in this study.

[1]Brad Austin, Former Graduate Student; Deke Alkire, Former Graduate Student; Todd Thrift, Assitant Professor; William Kunkle, Professor (deceased); UF/IFAS, Department of Animal Sciences, Gainesville, FL.

Table 1. Effect of supplemental bypass methionine from Alimet® on the performance of growing cattle.

Item	Control	12.5 g/d Alimet[a]	SEM
Number of pens	16	16	
Daily gain, lb/d			
0-28 d (full wt)	1.54	1.61	0.11
28-57 d (full wt)	1.41	1.43	0.09
57-84 d (full wt)	1.14	1.25	0.13
84-112 d (full wt)	0.66	0.53	0.11
0-112 d (full wt)	1.19	1.21	0.04
1-113 d (shrunk wt)	1.06	1.10	0.04
Height increase, in (0-112 d)	2.83[b]	2.31[c]	0.16

[a]Providing 4 g/d of bypass methionine.
[b,c]Means within a row with different superscripts differ (*P*<0.05).

Table 2. Supplement and hay DM consumption by period for the trial.

Item	Control	12.5 g/d Alimet	SEM
Number of pens	16	16	
Molasses supplement intake, lb/d			
0-28 d	3.85[a]	3.34[b]	0.11
28-57 d	3.85	3.70	0.11
57-84 d	3.87[a]	3.37[b]	0.15
84-112 d	3.87[a]	3.26[b]	0.22
0-112 d	3.85[a]	3.41[b]	0.11
Hay intake, lb/d			
1-112 d	12.06	12.36	0.31

[a,b]Means within a row with different superscripts differ (*P*<0.05).

Table 3. Effect of exogenous fibrolytic enzyme supplementation on the performance of yearling cattle.

Item	Treatment[a]								SEM
	Control	C1X	C2X	A20	A20X20	P1X	P2X	FIB	
Number of pens	4	4	4	4	4	4	4	4	
Daily gain lb/d									
0-28 d (full wt)	1.67[bc]	1.67[bc]	1.61[bc]	1.87[b]	1.69[bc]	1.06[c]	1.58[bc]	1.43[bc]	0.22
28-57 d (full wt)	1.47	1.12	1.50	1.45	1.54	1.52	1.34	1.32	0.20
57-84 d (full wt)	1.21	1.43	1.23	1.21	1.28	1.23	1.06	0.84	0.26
84-112 d (full wt)	0.42	0.37	0.53	0.90	0.62	0.70	0.59	0.68	0.24
0-112 d (full wt)	1.19[bc]	1.14[bc]	1.21[bc]	1.36[b]	1.30[bc]	1.12[bc]	1.14[bc]	1.08[c]	0.19
1-113 d (shrunk wt)	1.12	0.99	1.06	1.19	1.19	0.97	1.03	1.01	0.19
Height increase, in (0-112 d)	2.35	2.65	2.71	2.31	2.88	2.54	2.64	2.49	0.33

[a]C1X= 1.5 g/d Cattle-ase™ "HR"; C2X= 3.0 g/d Cattle-ase™ "HR"; A20=0.12 g/d Lodestar™ Biocellulase A20; A20X20=0.12 g/d Lodestar™ Biocellulase A20 and 0.06 g/d Lodestar™ Biocellulase X20; P1X= 2.0 g/d Promote N.E.T.™; P2X= 4.0 g/d Promote N.E.T.™; FIB= 15 g/d Fibrozyme.
[b,c]Means within a row with different superscripts differ (*P*<0.05).

Table 4. Supplement and hay DM consumption by period for the trial.

Item	Treatment[a]								SEM
	Control	C1X	C2X	A20	A20X20	P1X	P2X	FIB	
Number of pens	4	4	4	4	4	4	4	4	
Molasses supplement intake, lb/d									
0-28 d	3.54[bc]	3.63[bc]	3.43[b]	3.76[c]	3.50[bc]	3.59[bc]	3.74[c]	3.59[bc]	0.11
28-57 d	3.76	3.76	3.61	3.87	3.74	3.74	3.85	3.74	0.11
57-84 d	3.56	3.72	3.78	3.81	3.43	3.43	3.63	3.59	0.14
84-112 d	3.52	3.70	3.74	3.87	3.45	3.26	3.54	3.39	0.22
0-112 d	3.61[bc]	3.70[bc]	3.63[bc]	3.83[b]	3.54[bc]	3.52[c]	3.70[bc]	3.59[bc]	0.22
Hay intake, lb/d									
1-112 d	11.92	12.62	12.76	12.67	12.19	12.21	11.99	11.35	0.64

[a]C1X= 1.5 g/d Cattle-ase™ "HR"; C2X= 3.0 g/d Cattle-ase™ "HR"; A20= .12 g/d Lodestar™ Biocellulase A20; A20X20=0.12 g/d Lodestar™ Biocellulase A20 and 0.06 g/d Lodestar™ Biocellulase X20; P1X= 2.0 g/d Promote N.E.T.™; P2X= 4.0 g/d Promote N.E.T.™; FIB= 15 g/d Fibrozyme.
[b,c]Means within a row with different superscripts differ (*P*<0.05).