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Betaine as a dietary supplement for finishing cattle

Abstract

One hundred seventy five steers (902 lb initial body weight) were used in a finishing study to determine the effect of betaine, provided either as feed-grade betaine (Betafin-S6, Finnsugar Bioproducts) or as concentrated separator by-product (CSB; desugared beet molasses), on animal performance and carcass characteristics. Steers were fed a finishing diet based on steam-flaked and dry-rolled corn. Treatments included 10.5 or 21 g/steer daily supplemental feed-grade betaine or 250 g (15.5 betaine) or 500 g (31 g betaine) of CSB per steer daily. Dry matter intakes increased (linear, $P < 0.1$) for steers supplemented with feed-grade betaine. Average daily gains and feed efficiencies were not affected by treatments. Dressing percent and twelfth rib back fat increased ($P < 0.1$) for steers that received feed-grade betaine. Rib-eye area decreased ($P < 0.1$) when steers were supplemented with either feed-grade betaine or CSB. Yield grades were significantly higher (linear, $P < 0.1$) for cattle receiving supplemental CSB or feed-grade betaine (quadratic, $P < .05$). Hot carcass weights, KPH, marbling scores, and percentage of carcasses grading USDA Choice were not affected by supplemental betaine. In this study, betaine supplementation did not markedly alter growth performance, but carcass fatness tended to increase for both supplements.

Keywords

Kansas Agricultural Experiment Station contribution; no. 97-309-S; Report of progress (Kansas State University. Agricultural Experiment Station and Cooperative Extension Service); 804; Cattlemen's Day, 1998; Beef; Betaine; Steers; Performance; Feedlot carcasses

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BETAINE AS A DIETARY SUPPLEMENT FOR FINISHING CATTLE

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R. D. Hunter, and R. H. Wessels*

Summary

One hundred seventy five steers (902 lb initial body weight) were used in a finishing study to determine the effect of betaine, provided either as feed-grade betaine (Betafin-S6, Finnsugar Bioproducts) or as concentrated separator by-product (CSB; desugared beet molasses), on animal performance and carcass characteristics. Steers were fed a finishing diet based on steam-flaked and dry-rolled corn. Treatments included 10.5 or 21 g/steer daily supplemental feed-grade betaine or 250 g (15.5 betaine) or 500 g (31 g betaine) of CSB per steer daily. Dry matter intakes increased (linear, $P < 0.1$) for steers supplemented with feed-grade betaine. Average daily gains and feed efficiencies were not affected by treatments. Dressing percent and twelfth rib back fat increased ($P < 0.1$) for steers that received feed-grade betaine. Rib-eye area decreased ($P < 0.1$) when steers were supplemented with either feed-grade betaine or CSB. Yield grades were significantly higher (linear, $P < 0.1$) for cattle receiving supplemental CSB or feed-grade betaine (quadratic, $P < .05$). Hot carcass weights, KPH, marbling scores, and percentage of carcasses grading USDA Choice were not affected by supplemental betaine. In this study, betaine supplementation did not markedly alter growth performance, but carcass fatness tended to increase for both supplements.

(Key Words: Betaine, Steers, Performance, Feedlot Carcasses.)

Introduction

Previous research has demonstrated that feedlot cattle fed finishing diets may respond positively to supplemental choline. However, choline is degraded extensively by ruminal bacteria, so it must be protected from ruminal fermentation. One function of choline is methyl donation via betaine. Ruminal degradation of betaine may be somewhat slower than that of choline; thus, betaine may yield results similar to those with rumen protected choline. In addition, betaine may possibly alter ruminal fermentation by serving as a source of either ruminally available nitrogen or methyl groups. Our objective was to investigate the effect of betaine, provided either as feed-grade betaine (Betafin-S6, Finnsugar Bioproducts) or as a concentrated separator by-product (CSB), on animal performance and carcass characteristics.

Experimental Procedures

One hundred seventy five steers (902 lb initial body weight) were used in a randomized complete block design. Steers were allotted to one of five blocks based on weight and stratified by breed and weight to one of five pens within each block. The three heaviest blocks had five steers per pen (open front barn), whereas the remaining two housed 10 steers per pen (uncovered). All steers were implanted with Revalor[®]-S and treated for external parasites using Boss[™] pour-on insecticide 8 days before starting the experiment. Steers were allowed ad-libitum access to a finishing diet based on a mix of steam-flaked and dry-rolled corn (Table 1). Treatments were 1) control (no added

betaine), 2) 10.5 g/steer daily supplemental feed-grade betaine, 3) 21 g/steer daily supplemental feed-grade betaine, 4) 250 g/steer daily CSB (supplied 15.5 g betaine), and 5) 500 g/steer daily CSB (31 g betaine). The treatments were top-dressed to the basal diet at feeding. Steers were weighed at the initiation and end of the finishing period, as well as at 28-day intervals. The heaviest four blocks were fed for 82 days, whereas the lightest block was fed for 113 days. Carcass data were collected at a commercial packing plant. All carcass traits, except for hot carcass weights, were measured after a 24-hour chill.

Results and Discussion

Feed intakes increased linearly ($P < 0.1$) for steers supplemented with feed-grade betaine. Supplemental CSB also tended to increase feed intake linearly ($P = 0.12$). Average daily gains and feed efficiencies were not affected by treatments. Hot carcass weights were not different among treatments; however, dressing percent increased linearly ($P < 0.1$) for steers receiving feed-grade betaine. Twelfth rib backfat increased (quadratic, $P < 0.1$) for steers fed 10.5 g/d feed-grade betaine. Rib-eye area decreased for steers receiving supplemental CSB (linear, $P < 0.01$) or feed-grade betaine (quadratic, $P = 0.1$). Yield grades were significantly higher for cattle receiving either supplemental CSB (linear, $P < 0.01$) or feed-grade betaine (quadratic, $P < 0.05$). Marbling scores tended to be increased linearly ($P = 0.16$) by both feed-grade betaine and CSB. However, differences were not large enough to

significantly alter the percentage of carcasses grading USDA Choice.

CSB is a byproduct of the sugar industry that results when additional sugar is extracted from molasses. Addition of CSB to finishing diets in amounts greater than 1 lb per day did not markedly alter steer performance and tended to improve carcass quality grades. Because CSB currently is relatively inexpensive, it may be an economical ingredient for use in finishing diets. Similarly, feed-grade betaine had only minor effects on performance, but tended to improve carcass quality grades. These observations need further study to determine if responses are consistent.

Table. Diet Composition

Item	% of DM
Corn, steam-flaked	39.2
Corn, dry-rolled	43.6
Alfalfa hay	8.0
Soybean meal (47.5% protein)	2.0
Urea	1.1
Vitamin/mineral premix ^a	2.2
Molasses (cane)	2.0
Bleachable tallow	2.0
Crude protein, calculated	14.0

^aFormulated for the complete diet to contain 0.68% Ca, 0.30% P, 0.63% K, 0.03 ppm added Co, 6.8 ppm added Cu, 0.43 ppm added I, 1.0 ppm added Fe, 41 ppm added Mn, 0.20 ppm added Se, 41 ppm added Zn, 1200 IU/lb added vitamin A, 30 g/ton Rumensin[®], and 10 g/ton Tylan[®].

Table 2. Effects of Feed-Grade Betaine (FGB) and Concentrated Separator By-product (CSB) on the Performance and Carcass Characteristics of Finishing Cattle

Item	Control	FGB		CSB		SEM
		10.5 g/d	21 g/d	250 g/d	500 g/d	
<u>Performance data</u>						
Beginning wt, lb	937	935	935	928	928	9.6
Ending wt, lb	1268	1271	1267	1248	1259	13.5
Feed intake, lb/day ^{ab}	21.0	22.1	21.7	21.2	21.7	.28
Gain, lb/day	3.75	3.85	3.83	3.65	3.79	.14
Gain:feed	.18	.17	.18	.17	.18	.006
<u>Carcass characteristics</u>						
Hot carcass wt, lb	765	767	773	760	762	6.2
KPH fat, %	2.14	2.17	2.08	2.04	2.07	.04
Dressing % ^a	62.9	62.8	63.5	63.4	63.0	.27
Backfat, in ^b	0.41	0.48	0.41	0.41	0.43	.03
Rib-eye area, sq in ^{bc}	14.12	13.36	13.80	13.53	13.38	.25
Yield grade ^b	2.34	2.78	2.45	2.48	2.59	.10
Marbling score	3.92	4.19	4.17	4.06	4.17	.12
% USDA Choice	51	70	68	56	62	9.4
Liver abscesses, % ^d	2	4	8	17	4	5.0

^aLinear effect of feed-grade betaine supplement (P < 0.1).

^bQuadratic effect of feed-grade betaine supplement (P < 0.1).

^cLinear effect of CSB supplement (P < 0.1).

^dQuadratic effect of CSB supplement (P < 0.1).