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AMINO ACID SUPPLEMENTATION TO GROWING AND FINISHING STEERS

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Summary

One hundred British and British cross steers, averaging 631 lb (initial wt) were used in a growing and finishing study to evaluate the effects of unprotected amino acid supplementation on cattle performance and carcass characteristics. All diets contained 1% of a nonprotein nitrogen source, and treatments were: no additional supplemental protein (UREA), 2) supplemental protein from soybean meal (SBM), 3) 13 grams/day of an amino acid supplement (Low AA), and 4) 26 grams/day of an amino acid supplement (High AA). The Low AA treatment supplied 2 grams methionine, 8 grams lysine, 2 grams threonine, and 1 gram tryptophan per day, whereas the High AA treatment provided twice those amounts. The grower diet was based on whole-plant sorghum silage, and the finishing diet was based on rolled corn and corn silage. During the growing period, gains were higher (P<.05) for SBM-supplemented steers than for UREA steers and intermediate for amino acid-supplemented steers. Intakes were higher for steers supplemented with Low AA than for those supplemented with UREA or High AA. Few significant differences among treatments were observed in cattle performance during the finishing period. Hot carcass weights, dressing percentage, KPH fat, and yield grade were unaffected by amino acid supplementation. In this study, supplementing growing and finishing cattle with unprotected amino acids did not significantly improve steer performance or carcass characteristics, suggesting either that these amino acids were not limiting in these steers or that not enough of these supplemented amino acids escaped ruminal degradation to affect steers' performance.

(Key Words: Amino Acids, Steers, Feedlot, Performance.)

Introduction

The type of cattle fed in feedlots has changed considerably in recent years. Improvements in cattle nutrition , management, and genetics, along with newer feed additives and hormonal implants have resulted in average daily gains in the feedlot that can exceed 4 lb. Further, the composition of gain has shifted from fat to protein, and this has led some researchers to suggest that certain amino acids may be limiting performance. Supplementing protected amino acids to growing cattle in commercial situations is often cost prohibitive. However, if similar performance could be obtained by feeding higher levels of unprotected amino acids, then amino acid supplementation to growing and finishing cattle might be economical. Additionally, those supplemental amino acids might supply the rumen ecosystem with an essential nitrogen source, thereby enhancing ruminal fermentation.

Experimental Procedure

One hundred British and British cross steers averaging 631 lb initial weight were used in a randomized block design. Steers were allotted to one of five blocks based on initial weight and stratified into one of four pens within each block (five steers/pen). All growing diets contained 1% urea. Treatments were: 1) no supplemental protein (UREA) , 2) 4.7% soybean meal (SBM), 3) 13 grams/day of an amino acid supplement (Low AA), and 4) 26 grams/day of an amino acid supplement (High AA). All finishing diets contained .8% urea and .2% ammonium sulfate, and treatments were the same as in the growing phase. The Low AA treatment supplied 2 grams methionine, 8 grams lysine, 2 grams threonine, and 1 gram tryptophan per day, whereas the High AA treatment supplied 4, 16, 4, and 2 grams/steer/day of methionine, lysine, threonine, and tryptophan, respectively. It has been suggested that these amino acids most limit growth in cattle. The levels used were based on estimates of the amount of each amino acid that would be required to meet the steers' supplemental amino acid requirement, assuming 25% escaped ruminal destruction. Steers remained on the same treatment throughout the trial. For the growing phase, the diet was based on whole-plant sorghum silage (Table 1) and was fed for 85 days prior to a 13-day step-up to a finishing diet based on rolled corn and corn silage (Table 1). Steers remained on the finishing diet for 89 days prior to slaughter. Steers were weighed on 2 consecutive days at the initiation and end of the growing and finishing periods. During the step-up period, steers were moved into one of four dirt lots and remained on their respective treatments. All steers were implanted with Synovex-S at the initiation of the growing period and reimplanted with Revalor-S at the initiation of the finishing phase.

Results and Discussion

During the growing period, dry matter intakes were higher (P<.05) for steers fed SBM than for steers fed the UREA diet and also tended to be higher for steers fed the Low AA diet (Table 2). During the finishing period, however, intakes were similar across treatments. The higher intakes during the growing period and the higher intakes observed during the step-up period for SBM fed steers resulted in higher intakes for SBM fed steers for the whole study. For the whole study, intakes were higher for steers fed the Low AA diet than for steers fed the UREA or High AA diets. During the growing phase, average daily gains were higher (P<.05) for SBM-supplemented steers than for UREA steers. Gains were intermediate for amino acid-supplemented steers. During the finishing period and the total study, no significant differences were observed among nitrogen sources for daily gains. However, for the total study, daily gains were numerically (but not statistically) higher for SBM-supplemented steers than for steers fed UREA or supplemented with amino acids.

During the growing phase, feed to gain conversions were numerically better for SBM-fed cattle than UREA-fed steers. However, during the step-up and the finishing periods, the UREA-fed steers had numerically improved efficiencies relative to SBM-supplemented steers, which probably represents a compensation for poorer gains during the growing period. For the whole trial, conversion efficiency was poorer for steers on the Low AA diet than for steers fed the UREA or High AA diets. Marbling score and 12th rib back fat were higher for SBM-supplemented steers than for steers supplemented with only UREA (P<.10). Marbling score was higher for steers supplemented with the Low AA treatment than for steers fed UREA or High AA. Quality grade was poorer for UREA-supplemented steers than for SBM-supplemented steers. Quality grade was similar for amino acid-supplemented steers and SBM-supplemented steers. No differences were observed between treatments for hot carcass weight; dressing percentage; or percents kidney, pelvic, and heart fat.

The lack of significant response to amino acid supplementation in this study suggests that either the supplemented amino acids were not limiting growth in these cattle or that not enough of these amino acids escaped ruminal degradation to alter cattle performance. If these amino acids stimulated ruminal fermentation, their effect on steer performance was not apparent.

Table 1. Composition of Diets Fed to Steers (% of Diet DM)

	Treatment			
Item	UREA	Low AA	High AA	SBM
Grower period				
Whole-plant sorghum silage	83.5	83.5	83.4	78.9
Rolled milo	9.3	9.2	9.1	9.2
Soybean meal				4.7
Molasses	3.0	3.0	3.0	3.0
Vitamin and mineral mix [a]	2.2	2.2	2.2	2.2
Urea	1.0	1.0	1.0	1.0
Rumensin and Tylan premix [b]	1.0	1.0	1.0	1.0
Amino acid mixture		.1	.3	
Crude protein	10.8	10.8	10.9	12.6
Finishing period				
Dry-rolled corn	79.7	79.7	79.6	75.5
Corn silage	10.1	10.1	10.1	10.1
Soybean meal				4.2
Ground sorghum	3.6	3.5	3.4	3.7
Vitamin and mineral mix [a]	2.5	2.5	2.5	2.4
Molasses	2.2	2.2	2.2	2.2
Rumensin and Tylan premix [b]	.9	.9	.9	.9
Urea	.8	.8	.8	.8
Ammonium sulfate	.2	.2	.2	.2
Amino acid mixture		.1	.3	
Crude protein	11.2	11.3	11.4	13.1

[a]To supply complete diets containing .8% Ca and .4% P.
[b]To supply 275 mg Rumensin and 90 mg Tylan/steer/day.

Table 2. Effects of Unprotected Amino Acids on Growing and Finishing Steer Performance and Carcass Characteristics

Item	Treatment: UREA	Low AA	High AA	SBM	SEM
Grower period (85days)					
Beginning wt, lb	632	631	630	630	1.1
Ending wt, lb[a]	834	846	840	860	9.2
Dry matter intake, lb/d[bc]	20.2	21.5	20.8	21.8	.41
Gain, lb/d[c]	2.37	2.53	2.47	2.70	.10
Feed:gain	8.51	8.55	8.43	8.15	.30
Step-up period (13 days)[d]					
Dry matter intake, lb/d	22.9	23.0	22.5	25.5	
Gain, lb/d	3.09	2.78	2.54	3.04	
Feed:gain	7.41	8.27	8.85	8.40	
Finishing period (89 days)					
Beginning wt, lb[ae]	874	882	873	899	9.4
Ending wt, lb	1223	1225	1226	1242	13.3
Dry matter intake, lb/d	22.9	23.4	23.1	23.5	.71
Gain, lb/d	3.92	3.85	3.97	3.85	.08
Feed:gain	5.84	6.09	5.85	6.12	.14
Total feeding trial (187 days)					
Dry matter intake, lb/d[bc]	21.6	22.6	22.0	22.9	.33
Gain, lb/d	3.16	3.17	3.19	3.27	.07
Feed:gain[b]	6.85	7.11	6.93	7.04	.11
Carcass					
Hot carcass wt, lb	742	735	742	747	9.8
KPH, %	2.12	2.08	2.12	2.16	.04
Dressing %	60.6	60.0	60.5	60.1	.31
Backfat, in[a]	.43	.47	.47	.50	.03
REA, sq in[b]	12.48	11.82	12.10	12.14	.19
Yield grade	2.8	3.3	3.0	3.1	.12
Marbling score[abf]	2.7	3.2	2.9	3.1	.14
Quality grade[cg]	2.8	2.3	2.4	2.3	.14

[a]Effect of UREA vs SBM (P<.10).
[b]Quadratic effect of amino acid supplement (P<.11).
[c]Effect of UREA vs SBM (P<.05).
[d]No statistics because steers were grouped by treatments into a single pen per treatment.
[e]Effect of amino acid supplement vs SBM (P<.09).
[f]2 = slight, 3 = small.
[g]2 = choice, 3 = select.