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Feather Meal as a Source of Sulfur Amino Acids for Growing Steers

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Feather meal, which can provide a portion of the sulfur amino acids required by growing cattle, is an excellent source of escape protein. However, additional methionine may further improve performance.

Summary

One-hundred twenty individually fed steer calves were used to evaluate feather meal as a source of sulfur amino acids. Treatment proteins included a urea control and meat and bone meal (6.4% of dietary DM) plus 0, 1, or 2% feather meal with incremental levels of rumen protected methionine. Adding feather meal to meat and bone meal resulted in a linear increase in gain. Likewise, rumen-protected methionine also improved gain. These results indicate feather meal can provide a portion of the sulfur amino acids lacking in meat and bone meal. However, additional methionine may further improve performance.

Introduction

To optimize production in growing calves, escape protein is often supplemented to meet the animal's metabolizable protein requirement. However, ruminants, like all animals, have requirements for metabolizable amino acids rather than protein. Sources of escape protein vary markedly in amino acid content, ultimately affecting protein utilization efficiency. Meat and bone meal (MBM), a good source of escape protein (55% of CP), is deficient in the sulfur amino acids. Additional methionine in a rumen protected form improved daily gain and protein efficiency in growing steers supplemented with MBM (1995 Nebraska Beef Report, pp. 9-11). Feather meal (FTH) is an excellent source of escape protein (60% of CP) and sulfur amino acids. However, feather meal contributes primarily cysteine rather than methionine.

While methionine is an essential amino acid, cysteine is not. Cysteine used for normal protein synthesis can be supplied from the diet or synthesized from methionine. When dietary cysteine intake is insufficient to meet the body's needs, methionine is converted to cysteine to meet this need. The reverse reaction, however, the conversion of cysteine to methionine, does not occur. Therefore, providing adequate levels of dietary cysteine may spare methionine from the cysteine biosynthetic pathway. Because of this, using supplements which satisfy the needs for cysteine allows expensive methionine supplements to be used with greater efficiency. The objective of this research was to evaluate FTH as a source of sulfur amino acids for growing cattle.

Procedure

A calf growth trial was conducted using 120 steer calves (502 lb) individually fed diets (DM basis) of 44% sorghum silage, 44% corncobs and 12% supplement (Table 1). The steers were assigned randomly to one of four treatments, which consisted of: 1) urea (control); 2) MBM; 3) MBM plus 1% FTH; and 4) MBM plus 2% FTH. The level of MBM (6.4%) was equal among the three supplements and formulated to supply 70 g/day of metabolizable protein. The low level of FTH (1%) was formulated to provide 30 g/day of metabolizable protein or 1.5 g/day of metabolizable sulfur amino acids. The high level of FTH (2%) was formulated to provide 60 g/day of metabolizable protein or 3.0 g/day of metabolizable sulfur amino acids. Feather meal replaced urea, corncobs and tallow so all steers consumed a diet containing 11.5% crude protein (DM basis).

Within each of the non-urea treatment proteins, steers were assigned randomly to amount of supplemental rumen protected methionine. These amounts were 0, 1, 2, 3, 4 and 6 g/day. Rumen protected methionine was supplied as Smartamine M™ (Rhône-Poulenc Animal Nutrition, Atlanta, GA). All steers were implanted with Compudose on day 1. Steers were fed individually (at an equal percentage of body weight) once daily using Calan electronic gates. Weights were collected before feeding on three consecutive days at the begin-

Table 1. Diet composition (% of DM).

Ingredient	Urea	MBM[a]	MBM+ 1% FTH[a]	MBM+ 2% FTH[a]
Base mix				
Sorghum silage	44.00	44.00	44.00	44.00
Corncobs	44.00	44.00	44.00	44.00
Supplement				
Meat and bone meal	—	6.43	6.43	6.43
Feather meal	—	—	1.02	2.03
Soybean hulls	2.06	2.06	2.06	2.06
Corncobs	4.80	1.20	.65	.10
Tallow	1.40	.50	.36	.22
Urea	2.16	1.22	.89	.57
Sodium chloride	.30	.30	.30	.30
Ammonium sulfate	.20	.20	.20	.20
Dicalcium phosphate	.99	—	—	—
Trace mineral premix	.05	.05	.05	.05
Vitamin ADE premix	.03	.03	.03	.03
Selenium premix	.01	.01	.01	.01

[a]Meat and bone meal, meat and bone meal plus 1% feather meal and meat and bone meal plus 2% feather meal.

Table 2. Average daily gain of growing steers fed treatment proteins (lb/day).

Supplemental methionine level (g/day)	Treatment Protein			
	Urea	MBM[a]	MBM+ 1% FTH[a]	MBM+ 2% FTH[a]
0	.59	.74	.88	1.03
1	—	.80	.88	1.04
2	—	.89	.89	1.14
3	—	.85	.92	1.07
4	—	.90	.94	1.17
6	—	.88	1.05	1.22
SEM	—	.04	.04	.04

[a]Meat and bone meal, meat and bone meal plus 1% feather meal and meat and bone meal plus 2% feather meal.

ning and end of the 84-day trial. Efficiency of sulfur amino acid utilization was calculated for each treatment as gain versus supplemental methionine intake, using the slope-ratio technique.

Results

Average daily gain increased in growing steers as metabolizable protein supply increased. Steers fed the urea control supplement gained .59 lb/day; addition of MBM improved gains to .74 lb/day (Table 2). Consistent with previous research, supplementation of rumen protected methionine to MBM further improved gains. Nonlinear analysis predicted a maximum gain for MBM of .89 lb/day with the addition of 1.5 g methionine.

Inclusion of 1% and 2% FTH to MBM improved daily gains linearly (.88 and 1.03 lb/day, respectively; Table 2). The 1% FTH, which was formulated to supply 1.5 g of sulfur amino acids, promoted gains similar to MBM plus 1.5 g rumen protected methionine. Although the improvement due to 1% FTH can be attributed to the additional sulfur amino acids, the greater response to 2% FTH may be due to a greater overall supply of metabolizable protein and amino acids.

The addition of rumen-protected methionine to the treatments containing FTH also improved daily gain. This suggests the additional metabolizable protein from FTH may be deficient in the amino acid methionine, rather than total sulfur amino acids.

These results indicate feather meal can provide a portion of the sulfur amino acids not available in meat and bone meal. However, additional methionine may further improve performance.

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