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Lime Filtrate as a Calcium Source for Finishing Cattle

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Lime filtrate can effectively replace limestone as a source of calcium in beef finishing diets. However, inclusion of excess calcium may depress animal performance.

Summary

Finishing diets containing wet corn gluten feed were fed to 128 yearling steers to evaluate inclusion of lime filtrate as the source of supplemental calcium. Lime filtrate supplied 0, 50, 100 and 150% of the base calcium level of .70%, with limestone supplying the remainder. While dry matter intake was reduced for the 100% level of calcium from lime filtrate (P<.10), average daily gain and feed efficiency were not different from the limestone control. The 150% level of calcium from lime filtrate did reduce average daily gain and feed efficiency (P<.10).

Introduction

The wet milling industry produces byproducts primarily used in livestock feeding operations and feed manufacturing. Steep liquor and distillers solubles are added to corn bran to manufacture wet corn gluten feed. Although wet gluten feed is high (.5 to .8%) in phosphorus, it is very low in calcium. Supplemental calcium, usually in the form of limestone, must be added to cattle diets including wet gluten feed to ensure adequate amounts of dietary calcium.

The corn milling process, on the other hand, utilizes large quantities of water treated with hydrated lime. This high-calcium residual lime filtrate is currently disposed of in landfills or applied to fields for pH adjustment. Addition of lime filtrate to wet corn gluten feed may replace limestone as the source of supplemental calcium in finishing diets.

The objectives of this trial were to evaluate lime filtrate as a calcium source for cattle finished on wet corn gluten feed and to determine the optimal inclusion level of lime filtrate in cattle finishing diets.

Procedure

A finishing trial was conducted using 128 yearling crossbred steers (850 lb) to evaluate lime filtrate as a source of calcium relative to limestone. Steers

Table 1. Lime filtrate as a calcium source, ration composition

	% Supplemental Ca from lime filtrate			
Ingredient, % diet DM	0	50	100	150
Corn gluten feed	45.00	45.00	45.00	45.00
Dry rolled corn	43.07	43.00	42.95	41.95
Alfalfa hay	7.50	7.50	7.50	7.50
Supplement[a]	3.00	3.00	3.00	3.00
Limestone	1.43	.72	—	—
Lime filtrate	—	.78	1.55	2.55
% Dietary Ca	.70	.70	.70	1.05

[a]Contains corn, salt, tallow, trace minerals, vitamins, Rumensin and Tylan.

Table 2. Animal performance response to inclusion of lime filtrate.

	% Supplemental Ca from lime filtrate				
Item	0	50	100	150	SE
Initial weight, lbs	849	850	852	852	1.7
Final weight[a], lbs	1268	1259	1264	1245	12.5
Average daily gain, lbs	3.41	3.33	3.37	3.19	.10
Dry matter intake, lbs	26.75[b]	25.93[bc]	25.51[c]	25.70[bc]	.47
Feed/gain[d]	7.81[bc]	7.75[bc]	7.58[b]	8.06[c]	.21
Backfat thickness, in.	.55[b]	.54[b]	.48[c]	.47[c]	.02
Quality grade[e]	19.28[b]	19.25[b]	19.00[bc]	18.88[c]	.12
Yield grade	2.66	2.53	2.53	2.59	.12

[a]Hot carcass weight divided by a common dressing percentage (62%).
[b,c]Values within a row with unlike superscripts differ (P<.10).
[d]Feed/gain analyzed as gain/feed. Feed/gain is the reciprocal of gain/feed.
[e]Quality grade of 20=average Choice, 19=low Choice, 18=high Select.

were blocked by weight into four replications and assigned randomly, within a block, to one of four pens (8 head/pen). Each pen within a block was assigned randomly to one of four dietary treatments based upon the inclusion level of lime filtrate. Lime filtrate supplied 0, 50, 100 and 150% of the dietary calcium level of .70%, with limestone supplying the remainder (Table 1). Although the dietary calcium requirement was .36% (850 lb steer gaining 3.4 lb/day at 26 lb DMI; 1996 Nutrient Requirements for Beef Cattle Computer Model), the .70% calcium level was used to maintain a calcium:phosphorus ratio greater than 1.2. Previous research has shown improved feed efficiency when .70% calcium was fed.

The dietary phosphorus content, .53%, was greater than the requirement of .18% (850 lb steer gaining 3.4 lb/day at 26 lb DMI; 1996 Nutrient Requirements for Beef Cattle Computer Model) due to the high level of phosphorus in wet corn gluten feed. Diets were formulated to contain a minimum of 12% crude protein, 6.8% degradable protein, .6% K, 25 g/ton Rumensin and 10 g/ton Tylan. Steers were implanted with Revalor-S at the initiation of the experiment. Initial weights were the average of weights collected on two consecutive days (October 14th and 15th, 1996) following a four-day period of limited intake to reduce weight variation due to fill. Final weights were calculated following slaughter by dividing hot carcass weight by 62% (common dressing percentage). Average daily gain, dry matter intake and feed/gain were performance criteria evaluated. Additionally, carcass criteria evaluated included fat thickness at the 12th rib, quality grade and yield grade.

Results

Two replications of steers were fed for 116 days; the remaining two replications were fed for 129 days. Inclusion of lime filtrate to supply 100% of the supplemental calcium reduced dry matter intake relative to limestone (P<.10). This did not appear to be a problem associated with palatability since intake was not significantly reduced for the 150% level of calcium from lime filtrate. More importantly, the 50 and 100% levels of calcium from lime filtrate were not detrimental to average daily gain or feed efficiency (Table 2). Actually, a numerical improvement in feed efficiency occurred when lime filtrate was the sole source of additional calcium.

Feeding lime filtrate to provide more than .70% calcium was detrimental; animal gains tended to be reduced when lime filtrate was fed to supply 150% of the .70% calcium level. Likewise, the 150% level of calcium from lime filtrate significantly reduced efficiency (P<.10). Quality grade was also significantly reduced when the 150% level was fed (P<.10). This difference in quality grade may be due to the numerical difference in final weight and average daily gain. Backfat thickness, measured between the 12th and 13th rib, was significantly reduced when the 100% and 150% levels of calcium from lime filtrate were fed (P<.10), although level of calcium from lime filtrate did not effect yield grade.

Lime filtrate appears to be equal to limestone as a calcium source for finishing cattle, as it supported animal performance equivalent to limestone when fed to replace 50% and 100% of the supplemental calcium. However, inclusion of lime filtrate in excess of the .70% calcium level depressed animal performance. This is consistent with previous research.

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