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C.A. Löest

C.M. Coetzer

Evan C. Titgemeyer

See next page for additional authors

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Peroxide treatment of feather meal for finishing cattle

Abstract

Heifers (756 lb, 312 head) were used in a finishing study to evaluate the effects of peroxide-treated feather meal on animal performance and carcass characteristics. Diets contained 3.0% of peroxide-treated or untreated feather meal, and were fed ad libitum. Treatment of feather meal with hydrogen peroxide increased in situ protein degradabilities by 56%, but did not significantly alter feed intake or feed efficiencies. Although not statistically different, gains were 2.1% greater for heifers fed peroxide-treated feather meal. Hot carcass weights also averaged 6 pounds heavier for heifers fed diets containing peroxide-treated feather meal. Marbling tended to be lower, but carcasses grading USDA Choice tended to be higher for heifers fed diets containing peroxide-treated feather meal.

Keywords

Cattlemen's Day, 2002; Kansas Agricultural Experiment Station contribution; no. 02-318-S; Report of progress (Kansas State University. Agricultural Experiment Station and Cooperative Extension Service); 890; Beef; Peroxide; Feather meal; Finishing cattle

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Authors

C.A. Löest, C.M. Coetzer, Evan C. Titgemeyer, and James S. Drouillard

PEROXIDE TREATMENT OF FEATHER MEAL FOR FINISHING CATTLE

*C. A. Löest, E. C. Titgemeyer,
J. S. Drouillard, and C. M. Coetzer*

Summary

Heifers (756 lb, 312 head) were used in a finishing study to evaluate the effects of peroxide-treated feather meal on animal performance and carcass characteristics. Diets contained 3.0% of peroxide-treated or untreated feather meal, and were fed ad libitum. Treatment of feather meal with hydrogen peroxide increased in situ protein degradabilities by 56%, but did not significantly alter feed intake or feed efficiencies. Although not statistically different, gains were 2.1% greater for heifers fed peroxide-treated feather meal. Hot carcass weights also averaged 6 pounds heavier for heifers fed diets containing peroxide-treated feather meal. Marbling tended to be lower, but carcasses grading USDA Choice tended to be higher for heifers fed diets containing peroxide-treated feather meal.

Introduction

Supplementation of high-grain diets with rumen-degradable, true protein can improve performance of finishing cattle, whereas adding ruminal escape protein is generally ineffective. This suggests that the metabolizable protein supplied by the basal diet is adequate. Improved performance in response to rumen degradable, true protein supplementation is likely due to improvements in dietary energy utilization rather than to metabolizable protein supply. Because feather meal is high in ruminal escape protein (70%), our objective was to find if

increasing its ruminal degradation would improve its value in finishing diets.

Experimental Procedures

Three hundred twelve crossbred heifers (756 lb) were used in a randomized block design experiment to evaluate the effects of peroxide treatment of feather meal on animal performance and carcass characteristics. Heifers were individually weighed and allotted to one of three blocks based on weight and previous treatment and, within each block, were stratified by weight to one of eight pens (12 to 13 heifers per pen). Treatments were two finishing diets containing untreated or peroxide-treated feather meal (Table 1), which were fed to heifers once daily on an ad libitum basis. The three blocks of heifers were fed for 117, 127, and 159 days before final pen weights were obtained and heifers were shipped to a commercial slaughter facility.

Feather meal was treated by adding 14.3 lb of 35% feed-grade hydrogen peroxide solution to 100 lb of feather meal (as received basis) while being continuously mixed. This supplied approximately 5 grams of hydrogen peroxide per 100 grams of feather meal. After mixing for 15 minutes, the treated feather meal was allowed to cool by spreading it to a depth of 12 inches on a clean concrete surface.

Protein degradabilities were measured using an in situ bag technique. Duplicate polyester bags (5 × 10 cm; pore size = 50 µm), containing either no sample (blank) or 1.25 g of soybean meal (standard), feather meal, or peroxide-treated feather meal, were sealed using an impulse heat sealer

and soaked in warm tap water before being suspended for 12 hours in the rumen of a cannulated Holstein steer fed a 50% concentrate diet. Bags were rinsed, dried in a forced-air oven at 55°C, and analyzed for nitrogen.

Results and Discussion

Chemical treatment of feather meal with hydrogen peroxide increased *in situ* protein degradability from 32% to 50%, a 56% increase. Replacement of untreated with peroxide-treated feather meal in the finishing diet of heifers had no effect on feed intakes (Table 2). Average daily gains, although not statistically different, were 2.1% greater for heifers fed diets containing peroxide-treated feather meal. Feed efficiencies were not greatly affected by treatment. Hot carcass weights for heifers fed the diets containing peroxide-treated feather meal were numerically, but not significantly, heavier (6 lb increase). Dressing percent was not different between diets. Kidney, pelvic and heart fat and twelfth rib back fat were not different between diets, but marbling tended to be lower ($P=.16$) for heifers fed peroxide-treated feather meal. The percentage of carcasses grading USDA choice also tended ($P=.06$) to be higher for heifers fed peroxide-treated feather meal diets, but carcasses grading USDA prime were numerically lower. As a result, there were no large differences in carcasses grading USDA choice or better.

Treating of feather meal with peroxide increased *in situ* protein degradability, and tended to improve performance and carcass characteristics of cattle.

Table 1. Ingredient and Nutrient Composition of the Finishing Diets

Item	% of Dry Matter
Ingredient	
Steam-flaked corn	81.61
Chopped alfalfa hay	7.00
Cane molasses	4.00
Feather meal	3.01
Bleachable tallow	2.00
Limestone	1.27
Urea	.55
Salt	.30
Potassium chloride	.15
Trace mineral mix ^a	.06
Rumensin-80 ^b	.02
Tylan-40 ^c	.01
Vitamin A premix ^d	.01
Nutrient, calculated	
Crude protein	13.0
Calcium	.65
Phosphorus	.28
Potassium	.65

^aTo provide (dry basis): 60 ppm Zn, 60 ppm Mn, 10 ppm Cu, 1.1 ppm Fe, .63 ppm I, .25 ppm Se, and .05 ppm Co to diet.

^bTo provide (dry basis): 30 g monensin per ton of diet.

^cTo provide (dry basis): 10 g tylosin per ton of diet.

^dTo provide (dry basis): 1200 IU vitamin A per lb of diet.

Table 2. Effect of Peroxide-Treatment of Feather Meal on the Performance and Carcass Characteristics of Finishing Heifers

Item	Feather Meal		SEM
	Untreated	Peroxide-treated	
No. of heifers	156	156	-
<u>Performance data</u>			
Initial weight, lb	755	756	1.1
Final weight, lb ^a	1080	1088	5.4
Dry matter intake, lb/day	17.8	17.9	.21
Average daily gain, lb ^a	2.42	2.47	.041
Gain:feed ^a	.136	.138	.0023
<u>Carcass Characteristics</u>			
Hot carcass weight, lb	698	704	3.7
Dressing percentage	64.6	64.7	.12
Ribeye area, in ²	14.0	14.2	.16
Fat thickness, in	.41	.40	.015
KPH ^b fat, %	2.2	2.3	.047
Yield grade 1, %	19	16	2.6
Yield grade 2, %	37	40	3.7
Yield grade 3, %	36	41	4.0
Yield grade 4 & 5, %	8	4	1.8
Marbling score ^c	SI ⁶⁶	SI ⁴⁷	8.9
USDA Prime, %	8	3	2.2
USDA Choice, %	66	76	3.3
USDA Select, %	21	19	3.2
USDA Standard, %	5	2	1.1
Liver abscesses, %	5	6	1.9

^aComputed by applying a 4% shrink to the final weights.

^bKPH = kidney, pelvic & heart.

^cSI = Slight.