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Abstract

Three hundred and fifty-eight crossbred beef steers (average initial weight 701 lb) were fed finishing diets containing 0, 5, 10, or 15% full-fat corn germ to evaluate effects on growth performance and carcass characteristics. Steers were placed into dirt-surfaced feedlot pens (12 to 16 head each) in December 2000 with a total of six pens per diet. Average daily gains during the 155-day finishing period were 2.83, 2.99, 3.01 and 2.93 lb/day for cattle fed 0, 5, 10, and 15% corn germ, respectively. Dry matter intakes decreased linearly ($P<0.05$) with increasing concentrations of full-fat corn germ in the diet. Relative to cattle fed no corn germ, efficiencies were improved by 8, 11, and 9% for cattle fed 5, 10, or 15% germ, respectively. Feeding corn germ also reduced the incidence of liver abscesses ($P<0.05$) compared to cattle fed the control diet. Dried, full-fat corn germ can be used successfully in cattle finishing diets to increase energy density and animal performance.

Keywords

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PERFORMANCE AND CARCASS CHARACTERISTICS OF FINISHING STEERS FED DRIED, FULL-FAT CORN GERM

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Summary

Three hundred and fifty-eight crossbred beef steers (average initial weight 701 lb) were fed finishing diets containing 0, 5, 10, or 15% full-fat corn germ to evaluate effects on growth performance and carcass characteristics. Steers were placed into dirt-surfaced feedlot pens (12 to 16 head each) in December 2000 with a total of six pens per diet. Average daily gains during the 155-day finishing period were 2.83, 2.99, 3.01 and 2.93 lb/day for cattle fed 0, 5, 10, and 15% corn germ, respectively. Dry matter intakes decreased linearly ($P<0.05$) with increasing concentrations of full-fat corn germ in the diet. Relative to cattle fed no corn germ, efficiencies were improved by 8, 11, and 9% for cattle fed 5, 10, or 15% germ, respectively. Feeding corn germ also reduced the incidence of liver abscesses ($P<0.05$) compared to cattle fed the control diet. Dried, full-fat corn germ can be used successfully in cattle finishing diets to increase energy density and animal performance.

(Key Words: Corn Germ, Fat Supplementation.)

Introduction

Fats and oils are commonly added to cattle finishing diets to increase energy density and to improve efficiency of gain. However, use of liquid fats and oils is generally limited to operations with suitable equipment, such as pumps and heated storage tanks. Dried, full-fat corn germ may be a viable alternative to liquid fat sources when specialized handling and storage equipment is not available. Corn germ is a high-fat byproduct recovered during the production of corn sweeteners and(or) fuel ethanol. The wet germ is dried to a final moisture content of 3 to 5% and typically contains 46 to 54% fat and 12 to 15% protein (dry matter basis). Dried, full-fat corn germ is free-flowing and can be handled easily with conventional bins, augers, and pneumatic conveying systems. It has a bulk density of 22 to 26 lb/ft^3 and, as a result of its low moisture content, can be stored for extended periods without risk of oxidative rancidity. Our objectives were to measure the effects of dried, full-fat corn germ on growth performance and carcass attributes of cattle fed diets containing dry-rolled corn and wet corn gluten feed.

Materials and Methods

In December 2000, three hundred and fifty-eight crossbred yearling steers with an average initial weight of 701 lb were used in a feeding experiment conducted at the Kansas State University Beef Cattle Research Center in Manhattan. Steers were blocked by previous dietary regimen and assigned randomly, within blocks, to each of four dietary treatments (Table 1). They were fed in dirt-surfaced pens of 12 to 16

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animals each with a total of six pens per treatment. Pens provided approximately 175 ft^2 surface area per head. Using a common series of transition diets, steers were stepped up from a concentrate level of 60% to a final concentrate level of 97% (equivalent to the 0% germ diet, Table 1) over a period of 18 days. They were then weighed, implanted with Synovex Plus, returned to their pens, and placed onto their respective dietary treatments. Bunks were read at 7:00 a.m., and rations were delivered once daily at approximately 9:00 a.m. Feed deliveries were recorded daily, and compositional analyses of ration ingredients were performed weekly. Dry matter intake was corrected to reflect feed refusals that were removed from the bunks throughout the experiment. At the end of the 155-day finishing period, each pen was weighed prior to being transported to a commercial slaughter facility in Emporia, Kansas. Hot carcass weight and incidence of liver abscesses were recorded at slaughter. Yield grade, quality grade, marbling, incidence of dark cutters, 12th rib fat thickness, ribeye area, and percentage of kidney, pelvic, and heart fat were recorded following a 24-hour chill.

Results and Discussion

Growth performance, feed consumption, and carcass characteristics of steers fed varying levels of corn germ are shown in Table 2. Adding corn germ to the diet had a quadratic effect (P=0.02) on daily gain. The maximal rate of growth was achieved when germ was included at 10% of the diet dry matter and decreased slightly when additional germ was added. Feed intake decreased linearly (P=.02) as the proportion of germ in the diet increased. Efficiency improved dramatically (Linear, P<0.01; Quadratic P=0.04) with addition of germ. Relative to cattle fed no germ, gain efficiencies were improved by 8, 11, and 9% for cattle fed diets containing 5, 10, and 15% corn germ, respectively. Early in the experiment, feed intake was dramatically lower for cattle fed the high level (15%) of corn germ (Figure 1), suggesting that the shift from 0 to 15% germ on day 1 was too abrupt, and that a more gradual transition may have been beneficial. Steers ultimately acclimated to the high level of germ, and their intakes during the final 60 days were approximately equal to those of steers fed the other diets.

Adding corn germ to the diet also decreased incidence of liver abscesses. Cattle fed the control diet had 8.8% liver abscesses, whereas those fed diets containing germ were 2.3% or less. We would anticipate more liver abscesses when fat level in the diet increases due to the propensity for lower ruminal pH. Results of this study, however, are consistent with our observations in other experiments in which corn oil contributed significant amounts of lipid to the diet. This might be attributed either to effects of corn germ on feed intake, or to an effect of corn oil on bacteria that cause liver abscess.

Dressing percentage tended (P=0.08) to increase in a quadratic manner as the level of germ increased from 0 to 15%. Dressing percentage was greater when any level of germ was added to the diet. Adding corn germ also increased fat deposition, as indicated by changes in subcutaneous fat thickness; kidney, pelvic, and heart fat; and USDA Yield Grade. These factors indicate that cattle fed corn germ simply finish more quickly due to greater energy intake, and that the length of the finishing period should be adjusted accordingly.

In summary, including full-fat corn germ in the diets of finishing cattle provides a viable method for improving diet energy density, daily gain, and feed efficiency. Furthermore, it can be handled readily in conventional storage systems, and is relatively stable over extended storage intervals. Adding germ to finishing

diets at 10% or less of dry matter can be done without incident. However, higher levels of inclusion may require gradual transitions to avoid exaggerated feed intake depression.

Table 1. Diet Composition (% of Dry Matter)

	Dried Full-Fat Corn Germ, % of Diet Dry Matter			
Ingredient	0	5	10	15
Dry-rolled corn	51.0	46.3	41.5	36.8
Wet corn gluten feed	35.0	35.0	35.0	35.0
Alfalfa hay	3.0	3.0	3.0	3.0
Full-fat corn germ, dried	0.0	5.0	10.0	15.0
Corn steep liquor	6.0	6.0	6.0	6.0
Dehulled soybean meal	0.79	0.53	0.27	-
Limestone	1.50	1.50	1.50	1.50
Salt	0.30	0.30	0.30	0.30
Vitamin/mineral premix[a]	2.39	2.39	2.39	2.39
Crude protein, actual %	13.0	13.0	13.1	13.1
Crude fat, actual %	3.9	6.2	8.4	10.7

[a]Formulated to provide 0.1 ppm cobalt, 10 ppm copper, 0.6 ppm iodine, 60 ppm manganese, 0.25 ppm selenium, 60 ppm zinc, 1200 IU/lb vitamin A, 300 mg/day Rumensin, and 90 mg/day Tylan.

Table 2. Performance and Carcass Characteristics of Finishing Steers Fed Diets Containing 0, 5, 10, or 15% Dried Full-Fat Corn Germ

	Dried Full-Fat Corn Germ, % of DM				P-Value	
Item	0	5	10	15	Linear	Quadratic
Number of head (pens)	92(6)	91(6)	88(6)	87(6)	--	--
Initial weight, lb	701.3	703.7	694.3	706.3	0.83	0.40
Final weight, lb	1140.4	1166.4	1161.0	1161.1	0.17	0.16
Daily gain, lb (carcass adjusted)[a]	2.83	2.99	3.01	2.93	0.11	0.02
Dry matter intake, lb/day	18.80	18.34	18.04	17.80	0.02	0.71
Feed:gain[a]	6.63	6.13	5.99	6.06	<0.01	0.04
Liver abscess, %	8.8	2.2	2.1	2.3	0.02	0.05
Dressing percentage	61.25	61.81	61.89	61.69	0.14	0.08
Hot carcass weight, lb	718.4	734.9	731.4	731.5	0.17	0.16
12th rib fat thickness, in	0.31	0.33	0.35	0.36	0.04	0.81
Kidney, pelvic & heart fat, %	1.86	1.98	2.07	2.12	<0.01	0.43
USDA Choice & Prime, %	35.9	42.8	36.4	46.4	0.24	0.74
USDA Select, %	57.8	49.4	58.0	48.1	0.37	0.88
USDA Standard, %	5.3	4.5	5.6	5.5	0.85	0.86
Dark cutter, %	1.0	3.3	0.0	0.0	0.11	0.20
USDA Yield Grade	1.70	1.76	1.92	1.92	0.04	0.71

[a]Average daily gain and efficiency were determined using carcass adjusted final weights. Final live weight in these calculations was computed as hot carcass weight divided by a common dress of 63%

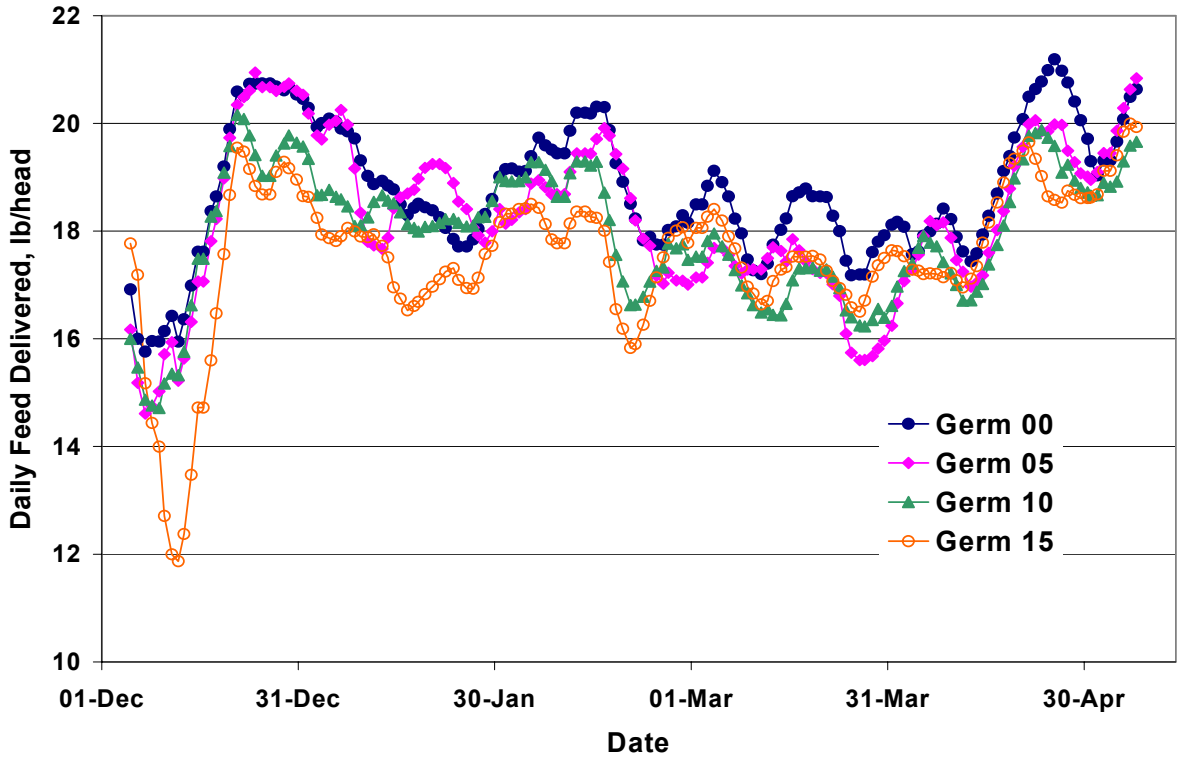

Figure 1. Daily Feed Deliveries for Yearling Steers Fed Diets Containing 0, 5, 10, or 15% Full-Fat Corn Germ.