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Abstract

Crude glycerin is a byproduct of biodiesel production, and its use as a feedstuff for cattle has expanded in the last decade due to increased availability and favorable pricing compared with other energy concentrates such as cereal grains. Incorporation of glycerin into cereal-based finishing diets, at levels up to 8%, has been shown to improve cattle performance; however, it decreases activity of cellulolytic microorganisms in the rumen, ultimately decreasing fiber digestion. Most of the studies conducted to date have evaluated glycerin in finishing diets that contain relatively small amounts of fiber, but little is known of its value as an energy source for growing cattle that typically are fed diets containing greater proportions of fiber. Moreover, possible carryover effects from feeding glycerin in the growing phase and effects on finishing performance and carcass characteristics are unknown. In this study, we wanted to evaluate glycerin as a component of diets fed throughout a 90-day backgrounding phase to determine its impact on performance and carcass characteristics of heifers during the subsequent finishing phase when they were no longer fed glycerin.

Keywords

beef cattle

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C. Aperce and J.S. Drouillard

Introduction

Crude glycerin is a byproduct of biodiesel production, and its use as a feedstuff for cattle has expanded in the last decade due to increased availability and favorable pricing compared with other energy concentrates such as cereal grains. Incorporation of glycerin into cereal-based finishing diets, at levels up to 8%, has been shown to improve cattle performance; however, it decreases activity of cellulolytic microorganisms in the rumen, ultimately decreasing fiber digestion. Most of the studies conducted to date have evaluated glycerin in finishing diets that contain relatively small amounts of fiber, but little is known of its value as an energy source for growing cattle that typically are fed diets containing greater proportions of fiber. Moreover, possible carryover effects from feeding glycerin in the growing phase and effects on finishing performance and carcass characteristics are unknown. In this study, we wanted to evaluate glycerin as a component of diets fed throughout a 90-day backgrounding phase to determine its impact on performance and carcass characteristics of heifers during the subsequent finishing phase when they were no longer fed glycerin.

Experimental Procedures

We used 368 crossbred heifers (515 ± 7 lb body weight) that we randomly allocated to treatments and concrete-surfaced pens (7 to 8 heifers/pen). Heifers were fed once daily and had free-choice access to feed and water. During the growing period (days 0 to 90), the diet consisted of 60% corn silage and 40% concentrate (predominantly wet corn gluten feed). We added crude glycerin derived from soybean oil at 0, 4, or 8% of the diet dry matter, substituting for a portion of the corn gluten feed. All diets were formulated to contain similar amounts of protein (Table 1).

During the subsequent finishing period (days 91 to 210), all heifers were fed finishing diets containing 90% concentrate (30% wet corn gluten feed, dry rolled corn, 10% corn silage, and supplement). We weighed cattle at the beginning and end of each period and collected feed refusals throughout the experiment to assess dry matter intake, average daily gain, and feed:gain ratio. We collected carcass data at harvest. Data were analyzed using the MIXED procedure SAS (SAS Inc., Cary, NC).

Results and Discussion

Statistical analysis of the growing period data illustrate that gain and feed intake were not affected by the different levels of crude glycerin added to the diet (Table 2), but heifers fed crude glycerin were more efficient ($P < 0.05$). During the subsequent finishing period, heifers previously fed glycerin at 4 or 8% of the diet dry matter ate more, gained more weight, and were more efficient than heifers that were not previously exposed to glycerin (Table 2). At harvest, heifers receiving glycerin during the growing phase had heavier final body weights ($P < 0.01$), improved marbling scores ($P < 0.01$),

and heavier hot carcass weights ($P < 0.05$) compared with animals fed growing diets without glycerin.

Implications

Glycerin added to growing diets fed for 90 days improved average daily gain and efficiency in the subsequent 120-day fattening period. Marbling score, carcass weight, and final body weight also increased in response to feeding glycerin in the previous growing period. These findings suggest that carryover effects of glycerin feeding influence growth performance and carcass characteristics subsequent to its removal from the diet.

Table 1. Composition of diets fed during the background phase (dry basis)

Ingredient, % of dry matter	0% glycerin	4% glycerin	8% glycerin
Corn silage	60	60	60
Wet corn gluten feed	35	30.2	25.4
Crude glycerin	-	4	8
Soybean meal	-	0.8	1.6
Supplement ¹	3.0	3.0	3.0
Nutrient composition			
Crude protein, %	13.0	12.5	12.1
Neutral detergent fiber, %	36.2	34.7	33.2
Calcium, %	0.75	0.75	0.75
Phosphorus, %	0.51	0.47	0.42

¹ Formulated to provide (dry basis) 0.1 ppm cobalt, 10 ppm copper, 0.6 ppm iodine, 60 ppm manganese, 0.25 ppm selenium, 60 ppm zinc, 0.3% salt, 1,000 IU/lb vitamin A in the total diet. Also provided 300 mg of Rumensin (Elanco Animal Health, Greenfield, IN) per heifer daily in a ground corn carrier.

Table 2. Carryover effects of glycerin fed during the backgrounding phase on performance and carcass characteristics of feedlot heifers

Item	Glycerin fed during backgrounding phase, % of diet dry matter			SEM	<i>P</i> -values	
	0	4	8		Linear	Quadratic
Backgrounding phase						
Dry matter intake, lb/day	19.58	19.00	18.81	0.293	0.069	0.166
Average daily gain, lb	3.26	3.33	3.31	0.055	0.753	0.518
Feed:gain	6.06	5.81	5.75	0.069	0.005	0.271
Finishing phase						
Dry matter intake, lb/day	21.25	21.76	22.18	0.604	0.025	0.919
Average daily gain, lb	2.56	2.76	2.84	0.119	0.0003	0.367
Feed:gain	8.47	8.00	7.87	0.132	0.01	0.384
Final live weight, lb	1116	1142	1153	21.2	0.009	0.466
Carcass characteristics						
Hot carcass weight, lb	688	703	710	6.4	0.028	0.554
Ribeye area, in. ²	12.2	12.6	12.7	0.15	0.053	0.364
12th rib fat thickness, in.	0.622	0.598	0.630	0.049	0.738	0.270
Kidney, pelvic, and heart fat, %	2.33	2.31	2.39	0.043	0.340	0.373
Marbling score ^a	S166	S180	S199	8.4	0.009	0.845
USDA yield grade	2.74	2.67	2.72	0.093	0.896	0.614
Choice or better, %	82.5	81.0	87.1	0.034	0.4161	0.7566

^a S10 to S199 is equivalent to a Slight degree of marbling.