2013

Effects of Feeding Microbial Feed Additives on Growth Performance and Carcass Traits of Steers Fed Steam-Flaked Corn-Based Diets with Wet Distillers Grains Plus Solubles

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Summary

An experiment was conducted to determine the effects of feeding two commercially available direct-fed microbials (DFM) on finishing steer performance fed steam-flaked corn based diets. Dietary treatments included a control diet without DFM, and two commercially available products (10-G and Bovamine). No significant differences were observed among treatments for animal performance or carcass characteristics. However, numeric advantages were observed for ADG and feed efficiency when cattle were fed a DFM.

Introduction

Microbial feed additive products are available for use by the feedlot industry. They are commonly referred to as direct-fed microbials (DFM). These products may include viable cultures of bacteria and/or fungi, and feeding them may improve F:G and ADG in beef cattle (*Journal of Animal Science,* 81:E120-E132). There are two modes of action often reported for DFM's. One mode of action is the competitive exclusion of pathogenic organisms in the lower gut, the second may be mitigation of ruminal acidosis by altering ruminal fermentation endproducts (reducing lactic acid). Several dietary and management factors may have an influence on the effect of DFM's: corn processing method, dietary energy content, byproduct inclusion, use of ionophores. Additionally, cattle type (calf-fed vs. yearlings) may increase or decrease the response of the DFM. Many individual DFM products have been evaluated but direct comparisons of these products are limited. Therefore, we conducted an experiment to evaluate the effect of two different commercially available DFM products, and a control diet without DFM on performance and carcass characteristics of finishing cattle.

Procedure

Yearling crossbred steers (n = 174; BW = 890 ± 63 lb) were blocked into two BW blocks, stratified by BW within block, and then assigned randomly within strata to a total of 18 pens (six replications/treatment). Steers were limit fed a diet that consisted of 50% corn silage, 25% WDGS, and 25% alfalfa hay (DM basis) at 2% of BW for five days to reduce variation in gut fill. Steers were individually weighed for two consecutive days (days 0 and 1) after the limit feeding period and the average of the two weights was used as initial BW. Steers in the heavy BW block were implanted with Component TE-S on day 0, steers in the light BW block were implanted with Component TE-IS on day 0 and reimplanted with Component™ TE-S on day 49 (Elanco Animal Health; Greenfield, Ind.). The three dietary treatments included 1) control (CON), 2) 10-G, which includes five strains of lactic acid bacteria (*Enterococcus faecium, Lactobacillus acidophilus, Lactobacillus brevis, Lactobacillus plantarum* and *Pediococcus acidilactici*; Life Products, Inc., Norfolk, Neb.), and 3) Bovamine® (*Lactobacillus acidophilus* and *Propionibacterium freudenreichii*; Nutritional Physiology Co., Overland Park, Kan.). To apply the dietary treatments, all pens were fed 0.79 lb DM of fine ground corn, or fine ground corn containing the DFM. The fine-ground corn carrier was top-dressed in the bunk immediately after feeding. The 10-G was fed to achieve a target of 650 million colony forming units (cfu)/head/day and Bovamine was fed at 1.3 billion cfu/head/day. The amount of DFM product fed in this study represents 130% of label directions to ensure adequate bacterial counts were offered. Original packets of DFM were opened and weighed into vials for daily feeding. Original product and vials containing product were stored frozen at -5°C until fed. During mixing and feeding the DFM, separate color-coded mixing containers and gloves were used to prevent cross-contamination of treatments.

Cattle were adapted to the finishing diet in 20 days with corn replacing corn silage and alfalfa hay. The finishing diet consisted of (DM basis) 62% steam-flaked corn (29 lb/bu), 25% wet distillers grains plus solubles, 7% alfalfa hay, and 6% liquid supplement. Supplement was formulated to provide 30 g/ton Rumensin and a minimum of 90 mg/head/day Tylan® (Elanco Animal Health; Greenfield, Ind). Ingredient samples were collected weekly and composited for nutrient analysis. Samples of each DFM were enumerated at a commercial laboratory before the experiment began, and again on day 35 and day 89.

Cattle were harvested at a commercial abattoir (Cargill Meat Solutions, Fort Morgan, Colo.) on day 97 (heavy BW block) and 114 (light BW block). Hot carcass weight and liver abscess scores were obtained on the day of slaughter. Following a 48-hour chill, USDA marbling score, 12th rib fat depth, and LM area were recorded.

Table 1. Bacterial counts of direct fed microbials.

	Direct Fed Microbial[1]	
	10-G	BOV
Pre-trial		
Lactic acid bacteria[2]	3.6×10^9 cfu/g	5.8×10^7cfu/g
Total propionibacteria[3]	—	$1.6 \text{ E} \times 10^{10}$cfu/g
day 35		
Lactic acid bacteria	3.7×10^9 cfu/g	8.5×10^7cfu/g
Total propionibacteria	—	1.6×10^{10}cfu/g
day 89		
Lactic acid bacteria	3.2×10^9 cfu/g	5.9×10^7 cfu/g
Total propionibacteria	—	1.7×10^{10} cfu/g

[1]10-G = 5 strains of lactic acid bacteria (10-G®), BOV = *L. acidophilus* plus *propionibaterium freudenreichii* (Bovamine).
[2]Lactic acid bacteria counts using MRS agar.
[3]Propionibacteria counts using sodium lactate agar.

Table 2. Performance and carcass characteristics of cattle fed direct fed microbials.

	Dietary Treatments[1]				
Item	CON	10-G	BOV	SEM	*P*-value
Performance					
Initial BW, lb	892	890	890	2	0.77
Final BW, lb[2]	1422	1427	1424	8	0.80
ADG, lb[2]	4.87	4.94	4.91	0.07	0.60
DMI, lb/day	28.4	28.4	28.3	0.2	0.72
F:G[2]	5.83	5.75	5.76	0.09	0.56
Carcass					
HCW, lb	896	899	898	5	0.80
12th Rib fat depth, in	0.57	0.60	0.57	0.02	0.27
Marbling[3]	541	524	523	10	0.17
Calculated yield grade	3.42	3.49	3.42	0.04	0.25
Liver abscess, %	10.8	14.5	19.3	7.0	0.49
LM area, in[2]	12.9	12.8	13.0	0.3	0.65

[1]Dietary treatments: 10-G = 5 strains of lactic acid bacteria (10-G®), BOV = *L. acidophilus* plus *propionibaterium freudenreichii* (Bovamine), CON = control.
[2]Calculated using hot carcass weight and 63% dressing percent.
[3]Marbling score: 500 = Small00, 600 = Modest00.

Yield grade was calculated using HCW, 12th rib fat depth, LM area, and KPH (2.5 + (2.5 x 12th rib fat) + (0.2 x KPH) + (0.0038 x HCW) – (0.32 x LM area)). Carcass weight was adjusted to a common dressing percentage (63%) to calculate final BW, and then daily gain and feed efficiency were determined. Data were analyzed as a randomized block design using the MIXED procedure of SAS (SAS Inst. Inc., Cary, N.C.). Pen was the experimental unit with BW block as a random effect.

Results

The nutrient composition of the finishing diet used in this experiment was 14.5% CP, 5.4% ether extract, 0.81% K, 0.58% Ca, 0.38% P, and 0.20% S. Bacterial counts for the DFM products analyzed on day 35 and 89 were similar to the original counts before trial initiation (Table 1). Therefore, the feeding rate of the DFM would have achieved targeted levels throughout the duration of the experiment. There were no significant differences ($P > 0.55$) for DMI, final BW, ADG, and F:G among treatments (Table 2). However, there were numeric advantages for ADG and feed efficiency when a DFM was fed, which is similar to previous observations when more replicates are used. Compared to steers fed the control diet, feeding 10-G and Bovamine resulted in a 1.8% and 1.2% improvement in feed efficiency (respectively; calculated based on G:F). Hot carcass weight, marbling score, 12th rib fat depth, incidence of liver abscesses, yield grade, and LM area were not different ($P \geq 0.16$) among treatments.

In summary, there were no significant differences for performance among treatments. However, the numerical differences observed in the current experiment support previous research that show small improvements in animal performance when a DFM is included in finishing diets.

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