EVALUATION OF PERFORMANCE AND CARCASS QUALITY OF FINISHING BEEF WITH NATURAL FEEDING PRACTICES IN NORTH DAKOTA

V. L. Anderson and J. P. Schoonmaker

Carrington Research and Extension Center, Carrington, ND
North Dakota State University

Abstract

One hundred twenty eight mixed breed steers (initial BW 720.0 ± 10.4 lb) were used to determine the effect of natural feeding practices on steer performance, carcass characteristics and cost of production. Cattle were allotted by weight and source to one of four diets: a conventional 85 % concentrate diet containing Rumensin® (Elanco, Greenfield, IN) – C85, and 3 natural diets (85, 70, and 55 % concentrate) containing Bovi-Sacc® (Alltech; Nicholasville, KY) – N85, N70, and N55, respectively. The concentrate portion of the diet consisted of dry-rolled barley and peas, the roughage portion of the diet consisted of oat hay and corn silage. Cattle were fed at the Carrington Research and Extension Center (CREC) in 16 open drylot pens (8 steers per pen; 4 pens per treatment), and were slaughtered when body weight for the treatment was estimated to be 1175 lb. Slaughter weight did not differ among treatments ($P > 0.40$). Steers fed the C85 and N85 diets spent the least ($P < 0.01$) amount of time in the feedlot (154 days), and gained the fastest ($P < 0.01$) overall (3.07 and 2.93 lb/d, respectively). Steers fed the N55 diet spent the most amount of time in the feedlot (210 days), and gained the slowest (2.26 lb/d) overall. Cattle fed the N70 diet spent an intermediate amount of time in the feedlot (180 days) and gained 2.51 lb/d. Steers fed the N55 diet consumed the most DM per day ($P < 0.03$) and were the least efficient ($P < 0.01$). Steers fed the N85 diet consumed the least DM per day. Cattle fed the N85 and C85 diets were the most efficient ($P < 0.01$). Hot carcass weight did not differ among treatments ($P > 0.15$). Marbling score tended to be ($P = 0.06$), and fat thickness was ($P < 0.01$) greater for cattle fed the C85 and N85 diets. Rib-eye area and tended ($P = 0.07$) to be greatest for cattle fed the N85 diet and lowest for cattle fed the N55 diet. Yield grade tended ($P = 0.06$) to be greatest for cattle fed the C85 diet, and lowest for cattle fed the N70 diet. Cost per head per cwt of gain was $36.00, $37.66, $42.55, and $44.63 for cattle fed the C85, N85, N70, and N55 diets, respectively. To profitably raise beef without antibiotics, producers need alternatives to keep their animals healthy. Bovi-Sacc was effective in the 85 % concentrate diet; however a modest premium would be required to offset increased feed and yardage costs.

Introduction

Based on consumer preferences and a growing concern over the use of antibiotics and other growth promoters in the animal feed industry, natural beef programs have expanded in recent years. “Natural” is a widely used label that does not carry legal connotations or infer specific production practices. To some people, natural means cattle are fed only on grass, to others, natural may mean non-genetically modified grains are fed; to most, natural means no antibiotics, ionophores, or implants used. To profitably raise beef without these products, producers need alternatives to keep their animals healthy. Several different additives have been developed that meet the “natural” criteria including yeasts, enzymes, probiotics and fermentation products.

Some of the potential benefits associated with yeast include improved rumen fermentation and increased feed digestion. Bovi-Sacc (provided courtesy of Alltech, Nicholasville, KY) is a yeast product that also contains mannan oligosaccharides. The exact mechanism of mannan oligosaccharide is unknown, but it is possible that it binds to cell walls of bacteria preventing the bacteria from attaching to the intestinal cell wall and infecting the animal, or it may enhance the immune system by evoking a direct antibody response.

Because North Dakota has abundant supplies of non-GMO grains including barley, field peas, and sunflower meal, as well as a number of non-GMO forages, producers in the state have an excellent opportunity to profit from the expanding natural beef market. The objective of this study was to compare performance, carcass quality, and economics of cattle fed non-GMO based diets containing yeast to cattle fed a non-GMO based diet containing ionophores.

Procedures

One hundred twenty eight mixed breed steers (initial BW 560.2 ± 40.9 lbs) were allotted by weight and source to one of four diets (Table 1): conventional (85 % concentrate, rumensin in the diet), natural 85 (85 % concentrate, Bovi-Sacc in the diet), natural 70 (70 % concentrate, Bovi-Sacc in the diet), and natural 55 (55 % concentrate, Bovi-Sacc in the diet). The concentrate portion of the diet consisted of barley and peas, the roughage portion of the diet consisted of oat hay and corn silage. Cattle were fed at the Carrington Research and Extension Center (CREC) in 16 open drylot pens (8 steers per pen; 4 pens per treatment). Each pen was equipped with automatic waterers and fenceline bunks, which allowed for 2 feet of bunk space per head. Feed was delivered as a totally mixed ration once daily to appetite.

Prior to feedlot entry, cattle were vaccinated for protection against IBR, BVD, BRSV, PI3 (Bovishield-4; Pfizer, Exton, PA), and clostridia (7-way + somnus; Pfizer, Exton, PA). Health status of the cattle was monitored daily. Rectal temperatures were measured in animals that were visibly anorexic, or had severe nasal mucous drainage and rapid or labored breathing. Any animal with a rectal temperature > 103.0^{o}F was treated with one of two antibiotics according to label instructions (Micotil, Elanco, Indianapolis, IN; Baytril, Bayer, Shawnee Mission, KS). Micotil was used on first and second pulls, followed by Baytril (single day therapy), if cattle were unresponsive. Antibiotic treatment continued until rectal temperature was below 103.0^{o}F. Research protocols regarding animal care followed guidelines recommended in the Guide for the Care and Use of Agricultural Animals in Agricultural Research and Teaching (FASS, 1998).

Cattle were slaughtered at Tyson Foods (Dakota City , NE) when body weight for the treatment was estimated to be 1175 lbs. Hot carcass weight, fat thickness, percentage kidney, pelvic and heart fat, longissimus muscle area, and USDA quality and yield grades were determined by qualified personnel 48 h after slaughter.

Data was subjected to a one-way analysis of variance as a completely randomized design using the GLM procedures of SAS (Version 8.0; SAS Inst. Inc., Cary, NC). Planned pair-wise comparisons (least significant difference) were used to separate treatment least squares means when the F-test was significant ($P < 0.05$). The model included effects due to diet, and pen was the experimental unit.

Results and Discussion

Cattle fed 85 % concentrate diets (conventional and natural) spent the least ($P < 0.01$) amount of time in the feedlot (154 days), followed by cattle fed a 70 % concentrate natural diet (180 days). Cattle fed the 55 % concentrate natural diet spent the most amount of time in the feedlot (210 days). Cattle weight did not differ among treatments ($P > 0.53$) until the February 19, 2004 weigh day. Every weigh day from February 19 to April 29, 2004 cattle fed the conventional 85 % concentrate diet weighed the most and cattle fed the natural 55 % concentrate diet weighed the least ($P < 0.02$). Cattle fed the natural 70 and 85 % concentrate diets had intermediate weights. Average daily gain in period 1 did not differ among treatments ($P > 0.28$). Except for period 3, cattle fed the conventional 85 % concentrate diets gained the most ($P < 0.01$). Cattle fed the natural 85 % concentrate diet gained the most in period 3, but gain did not statistically differ from gain of cattle fed the conventional 85 % concentrate diet. Cattle fed the 85 % concentrate diets (conventional and natural) gained the most overall ($P < 0.01$). Cattle fed the conventional 85 % concentrate diet gained 4.8 % more than cattle fed the natural 85 % concentrate diet (3.07 vs 2.93 lb/d), but gains did not differ statistically. Cattle fed the natural 55 % concentrate diet gained the least in each period ($P < 0.01$), and overall ($P < 0.01$).

Daily dry matter intake varied from period to period. Overall, cattle fed the natural 55 % concentrate diet consumed the most dry matter per day, and cattle fed the natural 85 % concentrate diet consumed the least dry matter per day ($P < 0.03$). In every period, cattle fed the conventional 85 % concentrate diet were the most efficient, and cattle fed the natural 55 % concentrate diet were the least efficient ($P < 0.04$). Overall, cattle fed the 85 % concentrate diets (both conventional and natural) were the most efficient ($P < 0.01$), followed by cattle fed the 70 % concentrate diet. Cattle fed the natural 55 % concentrate diet were the least efficient overall.

Hot carcass weight did not differ among treatments ($P > 0.15$). Marbling score tended to be ($P < 0.06$), and fat thickness was ($P < 0.01$) greater for cattle fed the 85 % concentrate diets (both natural and conventional) compared to cattle fed the natural 70 and 55 % concentrate diets. Rib-eye area and tended ($P < 0.07$) to be greatest for cattle fed the natural 85 % concentrate diet and lowest for cattle fed the natural 55 % concentrate diet. Yield grade tended ($P < 0.06$) to be greatest for cattle fed the conventional 85 % concentrate diet, and lowest for cattle fed the natural 70 % concentrate diet.

Cost per hundredweight of gain was based on a 5 year historical average (Haugen et al., 2004) of North Dakota feed prices (rolled barley - $1.74/bu and grass hay - $36.40/ton) or an average of price paid for feedstuffs (rolled peas - $3.00/bu, corn silage - $25.00/ton supplement - $275.00/ton, Bovi-Sacc - 29.71/cwt. Yardage was calculated as $0.25/hd/day. Cattle fed the conventional 85 % concentrate diet cost $36.00/hd/cwt of gain compared to $37.66/hd/cwt of gain for cattle fed the natural 85 % concentrate diet. The added cost is primarily due to a lower rate of gain for cattle fed the 85% concentrate natural diet. Cattle fed the natural 70 and natural 55 diets cost $42.55 and $44.63 per head per cwt of gain, respectively. Higher forage diets, although creating a cheaper diet on a daily basis, contributed to lower gains, more days on feed, and as a result a higher total cost.

To profitably raise beef without antibiotics, producers need alternatives to keep their animals healthy. Results of this study indicate that yeast is nearly as effective as rumensin at enhancing performance of cattle fed 85 % concentrate diets; however a modest premium would be required to offset increased feed and yardage costs. Decreased performance seen in natural diets containing 55 and 70 % concentrate may be primarily due to high roughage content. It is unclear what effect the yeast product had in these diets.

Table 1. Diets

	Conventional 85	Natural 85	Natural 70	Natural 55
Ingredients	---------- % DM basis ----------			
Barley	59.16	59.01	38.73	29.30
Field peas	12.91	12.88	12.67	8.27
Corn silage	15.30	15.27	22.53	22.06
Oat hay	9.40	9.36	23.06	37.63
Barley malt sprouts	1.39	1.40	1.38	1.35
Potassium chloride	0.20	0.20	0.20	0.20
Salt	0.12	0.12	0.12	0.11
Dicalcium phosphate	0.05	0.05	0.05	0.05
Vitamin A	0.01	0.01	0.01	0.01
Vitamin D	0.01	0.01	0.01	0.01
Vitamin E	0.01	0.01	0.01	0.01
Rumensin	0.017	----------	----------	----------
Bovi-Sacc	----------	0.267	0.267	0.257
Nutrient composition, %				
Crude protein	13.75	13.80	13.23	12.59
Calcium	0.52	0.52	0.44	0.42
Phosphorus	0.37	0.37	0.31	0.25

Table 2. Effect of natural feeding on performance and carcass characteristics of steers.

	Conventional 85	Natural 85	Natural 70	Natural 55	SE	P-value
Days on feed	154[a]	154[a]	180[b]	210[c]	0.0	0.01
Weight, lb						
December 10, 2003	725.1	717.5	722.4	714.9	10.4	0.89
January 15, 2004	828.5	812.6	820.1	806.8	11.2	0.53
February 19, 2004	941.1[a]	915.6[ab]	916.5[ab]	890.5[b]	11.6	0.02
March 25, 2004	1056.4[a]	1033.1[ab]	1024.6[b]	985.9[c]	13.4	0.01
April 29, 2004	1168.1[a]	1134.4[b]	1104.3[b]	1059.7[c]	13.5	0.01
Slaughter	1198.5	1168.2	1173.8	1190.1	14.3	0.40
Average daily gain, lb/d						
Period 1	2.87	2.64	2.71	2.55	0.12	0.28
Period 2	3.22[a]	2.94[b]	2.75[b]	2.39[c]	0.11	0.01
Period 3	3.30[a]	3.36[a]	3.09[a]	2.73[b]	0.13	0.01
Period 4	3.19[a]	2.89[b]	2.28[c]	2.11[c]	0.10	0.01
Overall	3.07[a]	2.93[a]	2.51[b]	2.26[c]	0.07	0.01
Dry matter intake, lb/d						
Period 1	19.6[a]	18.9[ab]	18.9[ab]	18.3[b]	0.2	0.01
Period 2	20.2[a]	19.4[b]	20.8[c]	19.7[ab]	0.2	0.01
Period 3	21.4[a]	22.0[b]	21.6[ab]	20.5[c]	0.2	0.01
Period 4	24.3[a]	23.9[a]	23.0[b]	22.8[b]	0.2	0.01
Overall	21.7[ab]	21.4[a]	21.8[ab]	22.0[b]	0.1	0.03
Feed efficiency, lb/lb						
Period 1	6.8	7.1	6.9	7.2	0.6	0.85
Period 2	6.3[a]	6.6[a]	7.6[b]	8.2[b]	0.4	0.01
Period 3	6.5[a]	6.5[a]	7.0[ab]	7.5[b]	0.5	0.04
Period 4	7.6[a]	8.3[a]	10.1[b]	10.8[b]	0.5	0.01
Overall	7.0[a]	7.3[a]	8.7[b]	9.7[c]	0.5	0.01
Cost/cwt of gain, $[d]	36.00	37.66	42.55	44.63		
Hot carcass weight, lb	707.4	690.6	690.5	678.0	9.7	0.15
Marbling score[e]	454.7[ab]	482.7[a]	424.4[b]	421.6[b]	18.9	0.06
% Choice	75.0	70.0	59.3	62.5	9.1	0.57
Fat thickness, in	0.46[a]	0.43[a]	0.36[b]	0.32[b]	0.02	0.01
Rib-eye area, in^2	11.9[a]	12.1[a]	11.8[ab]	11.4[b]	0.2	0.07
Kidney, pelvic, heart fat, %	2.3[a]	2.2[a]	1.8[b]	2.3[a]	0.1	0.01
Yield grade	2.97[a]	2.78[ab]	2.62[b]	2.70[b]	0.1	0.06

[abc]Means within a row without common superscripts differ.

[d]Rolled barley ($1.74/bu), rolled corn ($2.05/bu), rolled peas ($3.00/bu), corn silage ($25.00/ton), grass hay ($40.00/ton), supplement ($275.00/ton), Bovi-Sacc (29.71/cwt), Yardage ($0.25/hd/day).

[e]Slight = 300 to 399, small = 400 to 499, modest = 500 to 599.