Performance and Carcass Quality of Finishing Beef with Natural Feeding Practices

V. L. Anderson[1] and J. P. Schoonmaker[2]
[1]NDSU Carrington Research Extension Center and [2]Sun Prairie, WI

Summary
One hundred twenty-eight crossbred steers (initial BW 720.0 ± 10.4 lbs.) were used to compare conventional vs. 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 Animal Health, Greenfield, IN) (C85), and three natural diets (N85, N70, and N55) at respective concentrate levels of 85, 70 and 55% containing Bovi-Sacc® (Alltech; Nicholasville, KY). 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 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 lbs. 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 ($P < 0.01$, 3.07 and 2.93 lbs./d, respectively). Steers fed the N55 diet spent the most amount of time in the feedlot (210 days), and gained the slowest (2.26 lbs./d). Cattle fed the N70 diet spent an intermediate amount of time in the feedlot (180 days) and gained 2.51 lbs./d. Steers fed the N55 diet were the least efficient ($P < 0.01$). 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 greater ($P = 0.06$) and fat thickness was greater ($P < 0.01$) for cattle fed the C85 and N85 diets. Ribeye area tended to be greatest ($P = 0.07$) for cattle fed the N85 diet and lowest for cattle fed the N55 diet. Yield grade tended to be greatest ($P = 0.06$) for cattle fed the C85 diet, and lowest for cattle fed the N70 diet. Feed cost 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 ionophores, producers can use Bovi-Sacc in the diet which was effective in the 85% concentrate diet. Lower energy diets would require a premium price for the animals for equal income.

Introduction
Based on consumer preferences and a growing concern over the use of 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 and to promote growth. 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® (Alltech, Nicholasville, KY) contains a proven yeast product as well as enzymes to enhance rumen function in cattle.

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 crossbred steers (initial BW 720.0 ± 10.4 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 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 two feet of bunk space per head. Feed was delivered as a totally-mixed ration once daily to appetite.

Table 1. Conventional and natural diets used in evaluating feeding systems for feedlot steers.

	Conventional 85	Natural 85	Natural 70	Natural 55
Ingredients		---------- % DM basis ----------		
Barley	60.58	60.42	39.70	30.04
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	0.2	0.2	0.2	0.2
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

Prior to feedlot entry, cattle were vaccinated for protection against IBR, BVD, BRSV, PI3 (Bovishield-4; Pfizer Animal Health, Exton, PA), and clostridia (7-way + somnus; Pfizer Animal Health, 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 higher than 103.0°F was treated with one of two antibiotics according to label instructions (Micotil, Elanco Animal Health, Indianapolis, IN; Baytril, Bayer Animal Health, 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°F. Cattle treated with antibiotics were disqualified from receiving any “natural” premium. 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 Fresh Meats (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 hours after slaughter.

Data were 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).

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) (Table 2). Cattle fed the 55% concentrate natural diet spent the most amount of time in the feedlot (210 days).

Final weight did not differ among treatments (P > 0.06). Average daily gain in period 1 did not differ among treatments (P > 0.28). Cattle fed the 85% concentrate diets (conventional and natural) gained the most overall (P < 0.01). 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 did not differ at any point during the trial (P > 0.29).

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

	C-85	N-85	N-70	N-55	SE	P-value
Days on feed	154[a]	154[a]	180[b]	210[c]		0.01
Weight, lbs.						
December 10, 2003	725.1	715.5	718.0	714.9	10.4	0.99
January 15, 2004	828.5	811.2	812.5	806.8	11.2	0.94
February 19, 2004	941.1	913.1	908.3	890.5	11.6	0.61
March 25, 2004	1056.4	1030.3	1017.2	985.9	13.4	0.37
April 29, 2004	1168.1	1129.4	1098.3	1059.7	13.5	0.06
Slaughter	1198.5	1166.6	1171.0	1190.1	14.3	0.78
Average daily gain, lbs./d						
Period 1	2.87	2.66	2.63	2.55	0.12	0.43
Period 2	3.22[a]	2.91[b]	2.74[b]	2.39[c]	0.11	0.01
Period 3	3.30	3.35	3.11	2.73	0.13	0.14
Period 4	3.19[a]	2.83[a]	2.32[b]	2.11[b]	0.10	0.01
Overall	3.07[a]	2.93[a]	2.51[b]	2.26[c]	0.07	0.01
Dry matter intake, lbs./d						
Period 1	19.6	18.9	18.9	18.3	0.2	0.49
Period 2	20.2	19.4	20.8	19.7	0.2	0.57
Period 3	21.4	22.1	21.6	20.5	0.2	0.31
Period 4	24.3	23.9	23.0	22.8	0.2	0.29
Overall	21.7	21.4	21.7	22.0	0.1	0.80
Feed efficiency, lbs./lbs.						
Period 1	6.8	7.1	7.1	7.2	0.60	0.84
Period 2	6.3[a]	6.7[a]	7.6[b]	8.2[b]	0.40	0.01
Period 3	6.5	6.6	6.9	7.5	0.50	0.31
Period 4	7.6[a]	8.4[a]	9.9[b]	10.8[b]	0.50	0.01
Overall	7.0[a]	7.3[a]	8.6[b]	9.7[c]	0.50	0.01
Carcass Traits						
Hot carcass weight, lbs.	707.4	690	687.3	678	9.70	0.62
Marbling score[e]	454.7	481.2	421.4	421.6	18.90	0.16
% Choice	75.0	69.8	59.3	62.8	9.10	0.67
Fat thickness, in	0.46[a]	0.43[a]	0.36[b]	0.32[b]	0.02	0.02
Rib-eye area, in^2	11.9	12.1	11.8	11.4	0.20	0.08
Kidney, pelvic, heart fat, %	2.3[a]	2.2[a]	1.8[b]	2.3[a]	0.10	0.01
Yield grade	2.97	2.77	2.58	2.70	0.10	0.27
Cost/cwt of gain, $[d]	36.00	37.66	42.55	44.63		
Cattle treated, %	6.3	9.7	6.5	6.3		

[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).

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 ($P > 0.62$). Fat thickness was greatest ($P < 0.02$) for cattle fed the 85% concentrate diets (both natural and conventional) compared to cattle fed the natural 70 and 55% concentrate diets. Ribeye area tended to be greatest ($P < 0.08$) for cattle fed the natural 85% concentrate diet and lowest for cattle fed the natural 55% concentrate diet. Yield grade did not differ among treatments ($P > 0.27$).

Feed and yardage cost per hundred weight of gain was based on a 5-year historical average (Haugen et al., 2004) of North Dakota feed prices (rolled barley - $1.74/bu.; grass hay - $36.40/ton) or an average of price paid for feedstuffs (rolled peas - $3.00/bu.; corn silage - $25.00/ton; feedlot 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 numerically lower rate of gain for cattle fed the 85% natural concentrate 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, higher cost per pound of gain.

All treatments had cattle that were treated because of sickness (from 6.3 to 9.7% of cattle in all treatments).

Results of this study indicate that a commercial product containing yeast is as effective as an ionophore at enhancing performance of cattle fed 85% concentrate diets; however, a modest premium would be required to offset increased feed and yardage costs for lower energy diets. Decreased performance seen in natural diets containing 55 and 70% concentrate is due to the higher forage content.

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