South Dakota State University
Department of Animal Science

Beef Day 2020

Meats & Human Nutrition

Effects of feeding brassica mixture cover crops during backgrounding on carcass traits and fresh meat quality

C. E. Bakker, A. D. Blair, J. K. Grubbs, C. W. Wright, D. W. Brake, A. J. Smart, K. R. Underwood

Objective

Determine effects of feeding brassica-based cover crops to cattle during backgrounding on carcass characteristics and tenderness, flavor, and juiciness of *longissimus dorsi* steaks.

Study Description

Thirty Angus steers were assigned to one of two dietary treatments during backgrounding: 1) ad libitum access to freshly cut brassica cover crop forage (CC) containing radish, turnip, rapeseed, and ryegrass and 2) common midwestern dry lot backgrounding diet (CON). Steers were assigned to electronic feed bunks where individual feeding data could be collected. Diets were formulated to be isocaloric and isonitrogenous, and steers were paired fed across treatment. To accomplish the pair feeding, dry matter intake was calculated daily for the CC treatment and the following day, steers in the CON treatment were allowed access to the amount of dry matter their partner consumed the previous day. Steers were backgrounded for 44 days before transitioning to a common finishing diet. The backgrounding phase was conducted until the cover crop could no longer be collected due to weather limitations. Steers were slaughtered at an average backfat thickness of 0.5 inch as predicted by ultrasound. Carcass data were measured, and striploins collected for analysis of objective tenderness, proximate analysis, subjective palatability.

Take home points

Treatment did not impact live weights or carcass characteristics. Steers in the CC treatment produced steaks that were more tender at 3 and 7 days postmortem compared to the CON treatment. A trained sensory panel and analysis of protein degradation will be conducted to further explore the observed differences of tenderness between treatments.

Acknowledgements

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Keywords: backgrounding, beef, brassica, cover crops, tenderness

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Effects of rumen-protected long-chain fatty acid supplementation during the finishing phase of beef steers on live performance, carcass characteristics, and tenderness

C. E. Bakker, A. D. Blair, J. K. Grubbs, A. R. Taylor, D. W. Brake, N. M. Long, K. R. Underwood

Objective

The effect of a rumen-protected long chain fatty acid supplement on live performance, carcass characteristics, and tenderness was evaluated in this study.

Study Description

Angus steer calves (n = 99, 12 pens, 8-9 head/pen) were fed a low energy diet for 77 days prior to finishing. Steers were transitioned from the low energy forage-based diet to a high concentrate diet containing high moisture ear corn, corn silage, dry rolled corn, soybean meal, and a liquid supplement containing monensin across 21 days. Megalac-R (RPFA) was fed to 6 pens at 2% of the diet dry matter. Control pens (CON; n = 6) received an additional 2% of diet dry matter as dry rolled corn and soybean meal. After a 147-day finishing phase, steers were transported to a commercial abattoir for slaughter. Carcass data and striploins were collected. Warner-Bratzler shear force (WBSF) was conducted to determine tenderness. Live animal performance, carcass characteristics, and WBSF were analyzed using PROC Mixed of SAS with fixed effect of treatment. Pen was used as the experimental unit. Significance was determined at $P \leq 0.05$.

Take home points

Long chain fatty acid supplementation, through feeding of RPFA, during the finishing phase did not increase marbling scores of the steers in this study but did increase final live weight, and hot carcass weight. These results suggest RPFA supplementation has the potential to increase tissue development within the body. However, it is likely that animal age during supplementation and duration of supplementation impact the effect RPFAs have on carcass characteristics.

Keywords: beef, finishing diet, live performance, meat quality, tenderness

Effects of rumen-protected long-chain fatty acid supplementation during the finishing phase of beef steers on live performance, carcass characteristics, and tenderness

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Abstract

The effect of a rumen-protected long chain fatty acid (LCFA) supplement on live performance, carcass characteristics, and tenderness was evaluated in this study. Angus steer calves (n = 99, 12 pens, n = 8-9/pen) were fed a low energy diet for 77 days prior to finishing. Steers were transitioned from the low energy forage-based diet to a high concentrate diet containing high moisture ear corn, corn silage, dry rolled corn, soybean meal, and a liquid supplement containing monensin across 21 days. Megalac-R (RPFA), a LCFA supplement, was fed to 6 pens at 2% of the diet dry matter. Control pens (CON; n = 6) received an additional 2% of diet dry matter (DM) as dry rolled corn and soybean meal. The final finishing diet net energy for gain (NEg) was 1.20 and 1.19 mega calories.kg-1 of DM for RPFA and CON treatments respectively. Steers were weighed every 28 days and used to calculate growth performance data. After a 147-day finishing phase, steers were transported to a commercial abattoir for slaughter. Long chain fatty acid supplementation during the finishing phase did not increase marbling scores of the steers in this study but did increase final live weight, and hot carcass weight. These results suggest RPFA supplementation has the potential to increase tissue development within the body. However, it is likely that animal age during supplementation and duration of supplementation impact the effect RPFAs have on carcass characteristics.

Introduction

Marbling, a primary factor used for quality grading in the U.S. beef industry has a strong relationship to beef carcass value (USDA, 2018). Consumers are willing to pay a premium for beef with increased marbling (Platter et al., 2005). Marbling positively influences beef flavor and juiciness, two major attributes that contribute to palatability (Mcbee and Wiles, 1967; Behrends et al. 2005; Brewer et al., 2007; Felderhoff et al., 2007). The supplementation of rumen-protected LCFA's (Mangrum et al., 2016) and rumen-protected polyunsaturated fatty acids (Cooke et al., 2011) has increased marbling in carcasses from early weaned steers and feeder cattle when compared with non-supplemented controls. The objective of this study was to determine the effect of feeding a rumen-protected LCFA fed during finishing on live performance, carcass traits, and tenderness. We hypothesized that supplementation of a rumen-protected LCFA during the finishing phase would increase marbling scores.

Experimental Procedures

Angus steers (n = 99; initial body weight 796 ± 1.34 lbs) from a single source were received at the South Dakota State University Ruminant Nutrition Center and fed for 77 days to achieve a weight gain of 2.65 lbs per day. On day 78, steers were adapted to a grain-based diet or a grain-based diet that contained high moisture ear corn, corn silage, dry rolled corn, soybean meal, and a liquid supplement containing monensin across 21 days. Megalac-R (RPFA) was fed to 6 pens at 2% of the diet dry matter (Table 1). Control pens (CON; n = 6) received an additional 2% of diet dry matter as dry rolled corn and soybean meal (Table 1). Due to feed availability, diet

ingredients were changed slightly at the beginning of weeks 4 and 9 of the finishing phase (Table 1).

After a 147-day finishing phase, steers were transported to a commercial abattoir for slaughter. Hot carcass weight, ribeye area, backfat thickness, and kidney, pelvic, heart fat, and marbling scores were collected. A subset of striploins (n = 24, 2 per pen) were selected for objective tenderness analysis. Subset selection was conducted by choosing the carcasses of the two steers with initial body weights, recorded at the beginning of the finishing phase, closest to the average initial weight of the pen. The strip loin was faced and then one 1-inch steak was cut, vacuum packaged, and aged for 14 days prior to freezing. Steaks were cooked to a target internal temperature of 160°F using an electric clam shell grill. Peak internal temperatures were recorded for each steak using a digital thermometer. Six cores were removed parallel to the muscle fiber direction and sheared perpendicular to the direction of the muscle fibers using a Warner-Bratzler shear machine and peak force was recorded for each core. Shear force value was determined by averaging the peak force values for all 6 cores for each steak. Live animal performance, carcass characteristics, and WBSF were analyzed using PROC Mixed of SAS with fixed effect of treatment. Pen was used as the experimental unit. Significance was determined at $P \leq 0.05$.

Results and Discussion

Animal performance data are presented in Table 2. Overall average daily gain was increased ($P = 0.02$) by RPFA compared to CON. Gain to feed ratio was also increased ($P = 0.01$) by RPFA vs CON. Live weight was increased for RPFA compared to CON ($P = 0.01$). Increased final live weight translated to an increased hot carcass weight ($P = 0.04$; Table 2). Ribeye area, fat thickness, kidney pelvic heart fat, marbling score, and yield grade did not differ ($P > 0.05$; Table 2) between treatments. In addition to similar carcass traits, WBSF values of steaks were not different between RPFA and CON carcasses ($P > 0.05$; Table 2).

Implications

Previous research has shown the impact of LFCA supplementation on carcass characteristics and meat quality. However, results appear to be dependent on a variety of factors such as stage of production, duration of feeding, and breed influence. This study determined that HCW and final weight was increased for steers fed the RPFA treatment compared to the control but did not alter other carcass traits or tenderness. Further research is warranted to determine if feeding rumen protected LCFA at a different stage of production or a longer feeding period would result in increased marbling scores and improved USDA quality grades.

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Table 1. Finishing diet for steers fed a control diet (CON) or control diet with 2% rumen protected long chain fatty acids (RPFA)[1]						
Item	**CON**	**RPFA**	**CON**	**RPFA**	**CON**	**RPFA**
Diet Identification[2]	1		2		3	
Weeks on diet[2]	3		5		12	
High moisture ear corn	34.52	34.52	34.77	34.75	35.15	35.22
Corn silage	-	-	-	-	8.25	8.25
Oatlage	11.57	11.57	5.80	5.80	-	-
Dry rolled corn	35.11	33.60	46.59	44.34	43.84	41.60
Soybean meal	-	-	7.78	8.03	7.71	7.96
DDGS	13.32	12.66	-	-	-	-
Liquid Supplement	6.15	5.65	5.06	5.06	4.98	4.98
Nutrient Composition						
$NE_{g,}$[3] Mcal / lb	0.59	0.60	0.59	0.60	0.60	0.61
Crude protein	12.48	15.50	13.84	13.76	13.19	13.14
Fat	3.68	3.61	2.97	2.88	2.95	2.87
NDF	15.40	21.10	15.40	15.23	14.22	14.05

[1] Percent inclusion: calculated on a dry matter basis; [2] Diet was altered to accommodate feed ingredient availability. Steers were fed diet 1 for 3 weeks, diet 2 for 5 weeks, and diet 3 for 12 weeks.; [3] Net Energy for Gain, mega calories / lb

Table 2. Live performance, carcass characteristics, and Warner-Bratzler shear force data of steers fed a control diet (CON) or diet with 2% rumen protected long chain fatty acids (RPFA)[1,3]				
Item	**CON**	**RPFA**	**SEM**	**P-Value**
ADG[4], lb/d	3.57	3.70	0.04	0.02
DMI[5], lb/d	20.97	21.10	0.15	0.54
G:F[6]	0.17	0.18	0.001	0.01
HCW[7], lbs	800	812	2.4	0.04
Ribeye area, in^2	12.64	12.83	0.16	0.18
Backfat, in	0.47	0.45	0.02	0.32
KPH[8], %	1.85	1.85	0.23	0.97
Marbling Score[9]	406	404	10.75	0.87
Yield Grade	3.14	3.09	0.09	0.57
WBSF, lbs	7.72	7.67	0.22	0.39

[1] Least square means; [3] Percent inclusion: calculated on a dry matter basis; [4] Average Daily Gain; [5] Dry Matter Intake; [6] Gain : Feed Ratio; [7] Hot Carcass Weight; [8] Kidney Pelvic Heart Fat; [9]Marbling Score: 300 = $Slight^0$, 400 = $Small^0$, 500 = $Modest^0$