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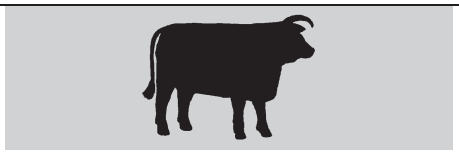

Case Study: Carcass characteristics of Angus steers finished on grass or grain diets at similar quality grades

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ABSTRACT

Research comparing grain- and grass-finished steers usually compares steers at the same chronological age. Because fat depots develop slowly in grass-finished steers, results are biased for greater fat and muscle development in grain-finished steers. The purpose of this study was to compare carcass characteristics and profitability between grain- and grass-finished steers at a minimum level of fat development (high-Select). Twenty-nine Angus steers (15 mo of age) with similar initial traits were finished on irrigated annual ryegrass (Lolium multiflorum) and white clover (Trifolium repens) pasture (CP = 14.3%, ME = 2.58 Mcal/kg of DM) for 303 d (n = 15) on average or finished on an 80% cracked-corn (CP = 9.70%, ME = 3.07 Mcal/kg of DM) diet for 168 d (n = 14). At slaughter, grain-finished steers exhibited greater final BW, ADG, ultrasound i.m. fat percentage, ultrasound backfat thickness, HCW, DP, KPH, calculated LM area, and retail yield than did grass-finished steers ($P < 0.0001$). Percent muscling was smaller, but percent fat was greater for grain-finished compared with grass-finished steers ($P \leq 0.0010$). Taste-panel judges did not detect differences ($P \geq 0.14$) in juiciness, flavor intensity, flavor quality, or overall palatability. Furthermore, there was no difference in shear force or cooking loss between steaks from grass- or grain-finished steers. There was a difference in profitability, if a premium of 8% for grass-finished beef was considered ($P = 0.010$). Therefore, both groups had similar sensory qualities and profitability per steer, but grain-finished cattle yielded more muscle and fat.

Key words: beef cattle, carcass characteristic, meat quality, sensory trait

INTRODUCTION

Consumer demand for grass-finished beef has increased largely because of the perceived health benefits associated with consuming leaner beef with increased proportions of conjugated linoleic acid and n-3 fatty acids (Fincham et al., 2009). Grass-finished beef is generally sold directly to consumers by producers in smaller amounts via specialty markets. Producers are concerned about how to select steers that will finish quickly on high-quality grass pasture and how to identify steers that have reached adequate fat deposition for high carcass quality and palatability. The goal of these producers is to have an appropriate number of steers ready for market year round. However, most studies comparing grain-finish to grass-finish production focus on comparing carcass characteristics from steers at the same chronological age and not physiological maturity or body fat content (Owens et al., 1995). This leads to mixed results in comparisons of carcass characteristics of grain- to grass-finished steers.

Using chronological age as an end point will result in reduced final BW, ADG, HCW, LM area, backfat (**BF**) thickness, KPH, DP, and USDA YG and QG for grass-finished steers compared with grain-finished steers (Neel et al., 2007). Fat deposition can continue up to 24 or 30 mo of age (Albrecht et al., 2006; Okumura et al., 2007) if empty body fat is less than 25% (Owens et al., 1995). Therefore, using end-point criteria not based on fat deposition will cause grass-finished cattle to exhibit lighter, leaner, or both carcasses and reduced carcass quality when compared with grain-finished steers because grass

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Table 1. Composition (DM basis) of grain and grass diets

	Grain-finished diets			Grass-finished diets		
Item	Feedlot starter	Feedlot intermediate	Feedlot finish	Grass—foothill	Grass—rye, clover	Alfalfa hay[1]
Days on experiment	1–28	29–56	57–140	1–84	85–421	44–84
Ingredient, %						
Cracked corn	40	57	80	—	—	—
Alfalfa hay	35	25	5.0	—	—	—
Oat hay	20	10	5.0	—	—	—
Molasses	1.5	2.5	3.0	—	—	—
Fat	1.5	2.0	2.5	—	—	—
Monosodium phosphate	0.5	0.25	—	—	—	—
Sodium bicarbonate	—	1.0	1.25	—	—	—
Urea	0.5	0.75	1.0	—	—	—
Oyster shell	—	0.25	0.5	—	—	—
Trace mineral salt	1.0	1.0	0.5	—	—	—
Ammonium chloride	—	0.25	0.25	—	—	—
Potassium chloride	—	—	1.0	—	—	—
Analyzed composition, %						
DM	91	91	91	20	22	92
CP	10.8	10.8	9.70	17.3	14.3	16.8
NDF	38.3	35.9	18.1	50.8	57.6	35.4
ADF	21.5	13.0	7.15	30.2	37.4	22.3
Lignin	0.63	0.73	0.51	2.3	3.6	0.66
Ash	6.0	5.8	5.4	14	11	10
Calculated energy,[2] Mcal/kg of DM						
ME	2.94	3.02	3.07	1.67	2.58	2.63
NE_m	1.99	2.05	2.09	0.834	1.67	1.76
NE_g	1.32	1.44	1.51	0.804	0.61	1.04

[1]Alfalfa hay was supplemented to grass-finished steers on foothill pasture.

[2]Dietary ME values were calculated using the NRC (1996) equation.

finishing takes longer to deposit i.m. fat (Fincham et al., 2009). Studies have also used BF thickness measured by ultrasound as an end point (Berthiaume et al., 2006; Faucitano et al., 2008), which is highly correlated with LM marbling (McPhee et al., 2006), but ultrasound measurements of BF may not be correlated with grader measurements of BF (Berthiaume et al., 2006). Therefore, results of studies that compare carcasses from grass- and grain-finished cattle using ultrasound and do not slaughter based on fat deposition (LM marbling) or estimated carcass quality can be biased to favor grain-finished cattle. The objectives of this study were to compare carcass characteristics, organ weight, meat quality, sensory traits, and profitability between grass- and grain-finished steers slaughtered at a minimum QG of high-Select.

MATERIALS AND METHODS

Animals and Diets

All procedures involving animals were approved by the Animal Care and Use Committee of the University of California–Davis. Twenty-nine Angus steers (14 to 15 mo, fall 2007 calf crop) were obtained from a local ranch (Yolo Land and Livestock Cattle Company, Woodland, CA). All steers were raised on the same pasture under similar conditions until assigned to treatment. None of the steers in this study received growth promotants or ionophores. Steers were randomly distributed between grain (14 steers) or grass (15 steers) dietary treatments (Table 1). Grain-finished steers remained at the University of California–Davis feedlot, and grass-finish steers were moved approximately 32 km to pasture. All steers started the study at similar body conditions based on ultrasound measurements in Table 2. Initial BW, initial ultrasound LM area, initial ultrasound BF, and initial ultrasound rump fat (**RF**) were similar between grain- and grass-finished steers.

At the beginning of the study and every 28 d, all steers were weighed and subjected to ultrasound scanning by a technician using a SONOVET 2000 (Universal Medical Systems Inc., Bedford Hills, NY) with a 3.5-MHz, 17-cm linear array transducer and image interpretation software (Biosoft Toolbox II for Beef v. 1.2.012, Biotronics Inc., Ames, IA) at the same time of day. Because all steers were weighed at the campus feedlot, grass-finished steers were gathered in the morning and transported 13 km to the feedlot. Both grass- and grain-