EFFECT OF SIRE BREED ON STEER PERFORMANCE, CARCASS CHARACTERISTICS, BOXED BEEF YIELDS AND MEAT TENDERNESS

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Story In Brief

Steer calves sired by Angus (n = 16), Charolais (n = 16), Beef Machine (n = 8), Braunvieh (n = 7) or Belgian Blue (n = 6) bulls were placed in the feedlot as calves to evaluate performance and carcass characteristics. Boxed beef yields, ribeye tenderness and value were measured. Steers sired by Angus, Charolais and Belgian Blue bulls had the highest feedlot gains which resulted in heavier slaughter and carcass weights. Belgian Blue and Braunvieh steers had the highest dressing percentages. Angus steers yielded the fattest carcasses, the smallest ribeye area per hundred pounds of carcass weight and the least desirable yield grades; however, Angus sired steers had the highest percentage of U.S. Choice carcasses. Belgian Blue steers had the least fat (externally and internally) and the most desirable yield grade but the lowest quality grades. Although Beef Machine sired steers were similar to Charolais and Braunvieh in yield grade, lower percentages of boxed beef and major subprimals with more trimmable fat were yielded. Desirable yield grades in Belgian Blue carcasses resulted in the highest percentage of boxed beef and the least fat; Angus yielded the most trimmable fat. Interestingly, ribeye steaks from all carcasses involved in this study required less than 8.5 pounds of shear force; accordingly, they all were classified as very tender. Nevertheless, steaks from Angus and Belgian Blue carcasses required consistently less shear force than steaks from Charolais, Beef Machine and Braunvieh. Breed of sire is important as a determinant of feedlot performance, quality and yield grades, boxed beef yield and meat tenderness.

(Key Words: Boxed Beef, Performance, Sire, Yield.)

Introduction

To compete with other sources of food protein the beef industry must consistently produce tender, juicy and flavorful meat products with minimal trimmable fat (NCA, 1996). Since commercial cow-calf operators currently

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select from a large diversity of breeds to produce cattle, more information is needed about breed differences to improve commercial cattle breeding systems. With the inevitable move toward value-based marketing, cattle producers must profitably supply high quality, lean animals that can satisfy packer and, ultimately, consumer needs. Accordingly, this study was conducted to evaluate and characterize sire breed differences in feedlot performance, carcass characteristics, boxed beef yields and meat tenderness.

Materials and Methods

Animals. Fifty-three steer calves sired by Angus (n = 16), Charolais (n = 16), Beef Machine (n = 8), Braunvieh (n = 7) or Belgian Blue (n = 6) bulls were weighed and placed in pens according to sire breed. All calves were out of Angus dams, with the exception of the straightbred Beef Machine offspring. Upon arrival at the feeding facility, steers were implanted with Synovex-S® and were re-implanted with Synovex-S® and Revalor-S® on days 73 and 137 of the feeding period, respectively. Steers had access to a high concentrate diet ad libitum for the duration of the feeding period (average of 210 days) after which animals were harvested in a commercial meat packing facility. Following a 48 hour postmortem chill, carcass quality and yield grade data were collected (USDA, 1989).

Boxed beef and tenderness assessment. The left sides of 52 carcasses were fabricated initially into the major wholesale cuts (round, loin, rib, chuck) and subsequently into boneless subprimals to determine compositional and value differences at two levels of fat trim (1.00, 0.25 inch). Rib sections from the 52 carcasses were removed and shipped to the Oklahoma State University Meats Laboratory where steaks (1.0 inch thick) were cut, vacuum packaged, aged for 14 and 28 days at 34^{o}F and subsequently frozen (-22^{o}F). Later, steaks were thawed at 36^{o}F for a period of 24 hours and broiled to a medium degree of doneness (158^{o}F) using an impingement oven. Upon cooling to room temperature, an average of six 0.5 inch diameter cores were removed from each ribeye steak; shear force (tenderness) was measured using a Warner-Bratzler attachment to an Instron Universal Testing Machine.

Statistics. Due to the limited number of steers represented in this study, data were not analyzed for statistical differences. Sire breed comparisons were not meant to describe the respective breed population, but rather to characterize the steers from the breeding system used for the current study.

Results and Discussion

Live and carcass characteristics. Live and carcass characteristics for the various sire breeds are reported in Table 1. Initial feedlot weights were similar

for all sire breed groups, although Charolais and Beef Machine sired calves tended to be lighter than Angus, Braunvieh and Belgian Blue steers. Calves were fed for 202 to 216 days. Steers sired by Angus, Charolais and Belgian Blue bulls had higher daily gains than Braunvieh and Beef Machine calves; Belgian Blue and Charolais sired calves required less feed per pound of gain based on pen means.

Dressing percentage was highest for Belgian Blue and Braunvieh steers; Beef Machine steers had the lowest dressing percentage. Angus carcasses were the fattest and had the smallest ribeyes per hundred pounds of carcass weight; this resulted in the highest numerical yield grade. Nevertheless, Angus steers produced the highest percentage of U.S. Choice carcasses. Charolais, Beef Machine and Braunvieh carcasses were similar in fat thickness and yield grade; Braunvieh steers produced carcasses with higher marbling scores. Belgian Blue carcasses were the leanest both externally and internally. As a result, these cattle had the most desirable (numerically lowest) yield grade. Additionally, Belgian Blue carcasses had the lowest marbling scores with no U.S. Choice carcasses and one U.S. Standard carcass.

Boxed beef yields and tenderness assessment. Percentage boxed beef lean, fat trim and bone yields at 1.00 and 0.25 inch fat trim specifications for the various sire breeds are presented in Table 2. Belgian Blue carcasses, as a result of being leaner, yielded higher percentages of boxed beef, major and minor subprimals and lower percentages of fat at the 1.00 and 0.25 inch fat trim specifications. Interestingly, Beef Machine carcasses were similar to Charolais and Braunvieh in yield grade, yet the steers produced lower percentages of boxed beef and major subprimals. Angus carcasses had the lowest percentage of bone and, as a result of being over finished, yielded more trimmable fat and lower percentages of boxed beef and major subprimals than Charolais, Braunvieh and Belgian Blue carcasses.

Figure 1 depicts the mean Warner Bratzler shear force values (+/- 2 standard deviations) of ribeye steaks stratified by sire breed. Data from this study indicate that ribeye steaks from Belgian Blue and Angus carcasses were more tender than steaks from Charolais, Beef Machine and Braunvieh carcasses even though quality grade ranged from average Choice to average Standard. When shear force values are categorized into tender (8.5 to 10.0 lb) and very tender groups (8.5 lbs or less) as recommended by Shackelford et al. (1991), ribeye steaks from all breed groups in this study would be considered very tender (100% of the ribeye steaks required less than 8.5 lbs of shear force).

Implications

Results from this study indicate that sire breed differences exist in feed efficiency, daily gain, yield grade and quality grade, boxed beef yield and

tenderness for the breeding systems evaluated. As the U.S. beef industry adjusts to value-based marketing, choosing an appropriate breed to sire calves for a specific market will become more important. Although the current study suggests sire breed differences exist, further research focusing on the impact of breed type on performance, carcass characteristics, boxed beef yields and meat tenderness is needed.

Literature Cited

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Table 1. Live and carcass grade traits stratified by sire bred type.

Item	Angus	Charolais	Beef Machine	Braunvieh	Belgian Blue	SD
Steers	16	16	8	7	6	
Start wt, lb	479	443	441	471	487	18.7
Days fed	202	216	213	207	205	6
ADG, lb/day[a]	3.79	3.76	3.32	3.19	3.63	.23
Feed:Gain	5.18	4.85	4.98	5.50	4.68	.25
Final wt, lb	1243	1259	1149	1116	1233	101
Carc wt, lb	793	806	712	727	815	68
Dressing %	63.8	64.0	62.0	65.2	66.1	1.7
Fat tk, in.	.60	.37	.33	.38	.25	.15
REA, in^2	12.8	14.1	13.5	13.8	15.6	1.5
REA/cwt[b]	1.61	1.75	1.90	1.90	1.91	
KPH, %	2.2	1.9	2.2	1.3	1.1	.5
Yield grade	3.3	2.3	2.1	2.0	1.1	.8
Maturity[c]						
Skeletal	A^{54}	A^{63}	A^{43}	A^{40}	A^{52}	20
Lean	A^{44}	A^{36}	A^{35}	A^{33}	A^{25}	12
Overall	A^{49}	A^{49}	A^{39}	A^{36}	A^{38}	12
Marbling[d]	Sm^{49}	Sl^{92}	Sl^{98}	Sm^{43}	Sl^{23}	72
Prem Choice[e]	3 (19%)	--	--	2 (29%)	--	
Low Choice	8 (50%)	9 (56%)	4 (50%)	2 (29%)	--	
Select	5 (31%)	7 (44%)	4 (50%)	3 (43%)	5 (83%)	
Standard	--	--	--	--	1 (17%)	

[a] Single pen data.

[b] REA/cwt = ribeye area/(carcass weight/100).

[c] For skeletal, lean and overall maturities, "A" plus number represents position percentage within "A maturity"; approximately 9 to 30 months of chronological age (USDA, 1989).

[d] Marbling: "Sm" = small degree, the minimum required for U.S. Choice; "Sl" = slight degree, the minimum required for U.S. Select (USDA, 1989).

[e] Prem Choice: Modest and moderate marbling scores, the minimum required for U.S. Average and High Choice, respectively (USDA, 1989).

Table 2. Percentage boxed beef lean, fat trim and bone yields for 1.00 and 0.25 inch fat trim specifications stratified by sire breed type.

Item	Angus	Charolais	Beef Machine	Braunvieh	Belgian Blue
Sides, number	16	15	8	7	6
Boxed beef[a], %					
1.0 inch	71.4	72.4	71.5	73.4	76.2
.25 inch	67.8	69.4	68.4	70.5	73.7
Major[b], %					
1.0 inch	41.9	43.7	42.7	44.2	45.9
.25 inch	34.2	36.0	35.3	36.7	38.7
Minor[c], %					
1.0 inch	13.5	12.9	13.2	13.4	14.1
.25 inch	12.9	12.5	12.8	13.0	13.8
Lean trim[d], %					
1.0 inch	16.1	15.7	15.6	15.8	16.2
.25 inch	20.6	20.9	20.4	20.8	21.2
Fat trim, %					
1.0 inch	14.3	12.0	13.5	11.5	8.7
.25 inch	18.0	15.1	16.7	14.5	11.2
Bone, %	14.2	15.5	15.0	15.1	15.2

[a] Boxed beef = major subprimals + minor subprimals + lean trim.
[b] Major = major subprimals: Chuck roll, shoulder clod, ribeye roll, inside round, gooseneck round, knuckle, top sirloin butt, strip loin and tenderloin.
[c] Minor = minor subprimals (15).
[d] Lean trim = combined yields of 50 and 75% fat free lean.

Figure 1. Shear force variation (mean ± two standard deviations) for steaks aged 14 and 28 days stratified by sire breed.