Abstract W43

Carcass and meat palatability trends in cattle ranging from 100% Angus to 100% Brahman

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SUMMARY

The objective of this research was to estimate additive genetic differences between Angus (A) and Brahman (B), heterosis, and least squares means (LSM) for six carcass and six meat palatability traits for groups of cattle ranging from 100% Angus (A) to 100% Brahman. Carcass traits were hot carcass weight (HCW), dressing percent (DP), ribeye area (REA), fat over the ribeye (FOE), kidney, pelvic and heart fat (KPH), and marbling score (MAB). Meat palatability traits were Warner-Bratzler shear force (WBSF), and tenderness (TEND), connective tissue (CTI), juiciness (JUIC), flavor (FLAV), and off-flavor (OFLAV) scores. Data came from 1367 steers from the Angus-Brahman multibreed herd of the University of Florida collected from 1989 to 2009. Estimates of additive genetic breed differences indicated that B carcasses had higher DP (P < 0.0001), lower MAR (P < 0.0001), smaller REA (P < 0.0001), and less FOE (P < 0.0001) than A carcasses. Brahman beef was also tougher (P < 0.0001), had more connective tissue (P < 0.0001), and it was less juicy (P < 0.001) than A beef. Heterosis increased HCW (P < 0.0001), DP (P < 0.017), REA (P < 0.0001), FOE (P < 0.0001), and KPH (P < 0.01) in crossbred steers. ***The LSM for HCW, REA, FOE, and KPH increased from A to ½ A ½ B, and then they decreased towards B. The LSM for MAB, TEND, CTI, and JUIC decreased whereas the LSM for WBSF increased from A to B. Results indicated that crossbred steers with % B up to 50% showed limited negative impact on meat quality while maximizing meat yield due to heterosis.***

INTRODUCTION

Carcass and meat palatability characteristics constitute key factors for the success of beef cattle operations. Consumers prefer meat that has desirable levels of tenderness, marbling, juiciness, and flavor. Cattle in the Southern region of the US contain some Brahman to enable them to cope with hot and humid climatic conditions, thus decreasing meat tenderness and affecting the desirability of these animals for branded beef products. ***The objective of this research was to estimate additive genetic differences between Angus (A) and Brahman (B), heterosis, and least squares means (LSM) for six carcass and six meat palatability traits for groups of cattle ranging from 100% Angus (A) to 100% Brahman.***

MATERIALS AND METHODS

Animals and Data. Cattle were from Angus (A), Brahman (B), and Angus × Brahman crossbred cattle from the multibreed herd of the University of Florida. Cattle were assigned to six breed groups according to their breed composition: Angus = (1.0 to 0.80) A (0.0 to 0.20) B, ¾ A ¼ B = (0.79 to 0.60) A (0.21 to 0.40) B, Brangus = (0.625) A (0.375) B, ½ A ½ B = (0.59 to 0.40) A (0.41 to 0.60) B, ¼ A ¾ B = (0.39 to 0.20) A (0.61 to 0.80) B, and Brahman: (0.19 to 0.0) A (0.81 to 1.00) B. The mating design used in the multibreed herd was diallel, where sires from the six mating groups (Angus, ¾ A ¼ B, Brangus, ½ A ½ B, ¼ A ¾ B, and Brahman) were mated across to dams from these same six mating groups. Carcass and meat palatability data were from 1367 calves born from 1989 to 2009 (216 Angus, 182 ¾ A ¼ B, 224 Brangus, 341 ½A ½B, 206 ¼ A ¾ B, and 198 Brahman). Calves were the progeny of 213 sires (44 Angus, 27 ¾ A ¼ B, 42 Brangus, 26 ½ A ½ B, 26 ¼ A ¾ B, and 48 Brahman) and 824 dams (145 Angus, 119 ¾ A ¼ B, 127 Brangus, 174 ½ A ½ B, 107 ¼ A ¾ B, and 152 Brahman). **Table 1** shows numbers of calves by breed-group-of-sire × breed-group-of-dam combination.

Reproduction. Cows were synchronized in March with an intra-vaginal progesterone device for 7 d (CIDR, Pfizer Animal Health, Hamilton, New Zealand), and subsequently injected with 5 ml of PGF2α (LUTALYSE, Pfizer Animal Health, Hamilton, New Zealand) after removal of CIDR. Cows were artificially inseminated twice, and then exposed to a natural service sire for 60 days (six single-sire natural service groups, one for each breed group of sire). Calves were born from mid December to mid March, and weaned in September.

Table 1. Number of steers by breed group of sire x breed group of dam combination

Breed group of dam	Breed group of sire						
	Angus	¾ A ¼ B	Brangus	½ A ½ B	¼ A ¾ B	Brahman	All
Angus	116	16	34	17	27	32	242
¾ A ¼ B	47	23	30	26	29	32	140
Brangus	28	6	134	17	20	21	245
½ A ½ B	54	50	61	46	49	46	280
¼ A ¾ B	29	20	32	21	24	45	197
Brahman	28	15	26	11	10	144	235
All	302	130	137	138	160	320	1367

Feeding and Management. Cows and calves were kept on bahiagrass (Paspalum notatum) pastures throughout the year with free access to a complete mineral supplement. Winter supplementation consisted of bermudagrass hay, cottonseed meal, and molasses. After weaning steers were either taken directly to a contract feeder (1989 to 2005; King Ranch Feedyard, Kingsville, Texas; Suwannee Farms, O'Brien, Florida), or to the UF Feed Efficiency Facility (FEF) in Marianna, Florida for 100 d, and then transported to a contract feeder (2006 to 2009). Steers were slaughtered at an FOE of approximately 1.27 cm.

Traits. **Carcass traits** were: hot carcass weight (**HCW**, kg), dressing percent (**DP**, %), ribeye area (**REA**, cm^2), fat thickness (**FOE**, cm), kidney, pelvic, and heart fat (**KPH**, %), and marbling score (**MAB**; USDA scores: 200 = traces, 300 = slight, 400 = small, 500 = modest, 600 = moderate). **Meat palatability traits** were: Warner-Bratzler shear force (**WBSF**, kg), tenderness score (**TEND**; 1 = extremely tough to 8 = extremely tender), connective tissue (**CTI**; 1 = abundant amount to 8 = none detected), juiciness (**JUIC**, 1 = extremely dry to 8 = extremely juicy), flavor (**FLAV**, 1 = extremely bland to 8 = extremely intense), and off-flavor ((**OFLAV**, 1 = extreme off-flavor to 6 = none detected).

Statistical Analysis. Traits were analyzed using single-trait mixed models (SAS Proc Mixed). Fixed effects were year of birth, age at slaughter, B fraction of steer, and heterozygosity of steer. Random effects were sire and residual (zero mean, common variance, uncorrelated). Procedure GPLOT of SAS was used to graph **LSM** by breed group of calf.

RESULTS AND DISCUSSION

Estimates of breed differences and heterosis are shown in **Table 2** for carcass traits and in **Table 3** for meat palatability traits. Figures show trends for carcass and meat palatability traits across groups of animals ranging in breed composition from 100% Angus to 100% Brahman.

Carcass Traits. Brahman carcasses had similar HCW and KPH to, but higher DP (1.60 ± 0.25 %; P < 0.0001), lower MAB (-105.97 ± 7.68 units; P < 0.0001), smaller REA (-3.82 ± 0.93 cm2; P < 0.0001), and thinner FOE (-0.38 ± 0.05 cm; P < 0.0001) than Angus carcasses. Heterosis effects increased HCW, DP, REA, and KPH, but it did not affect MAB.

Meat Palatability Traits. Brahman steaks were tougher based on WBSF and sensory panel TEND, and sensory panel members perceived them to have more connective tissue, be less juicy, and to have similar levels of FLAV and OFLAV. Heterosis effects had no effect on meat palatability traits.

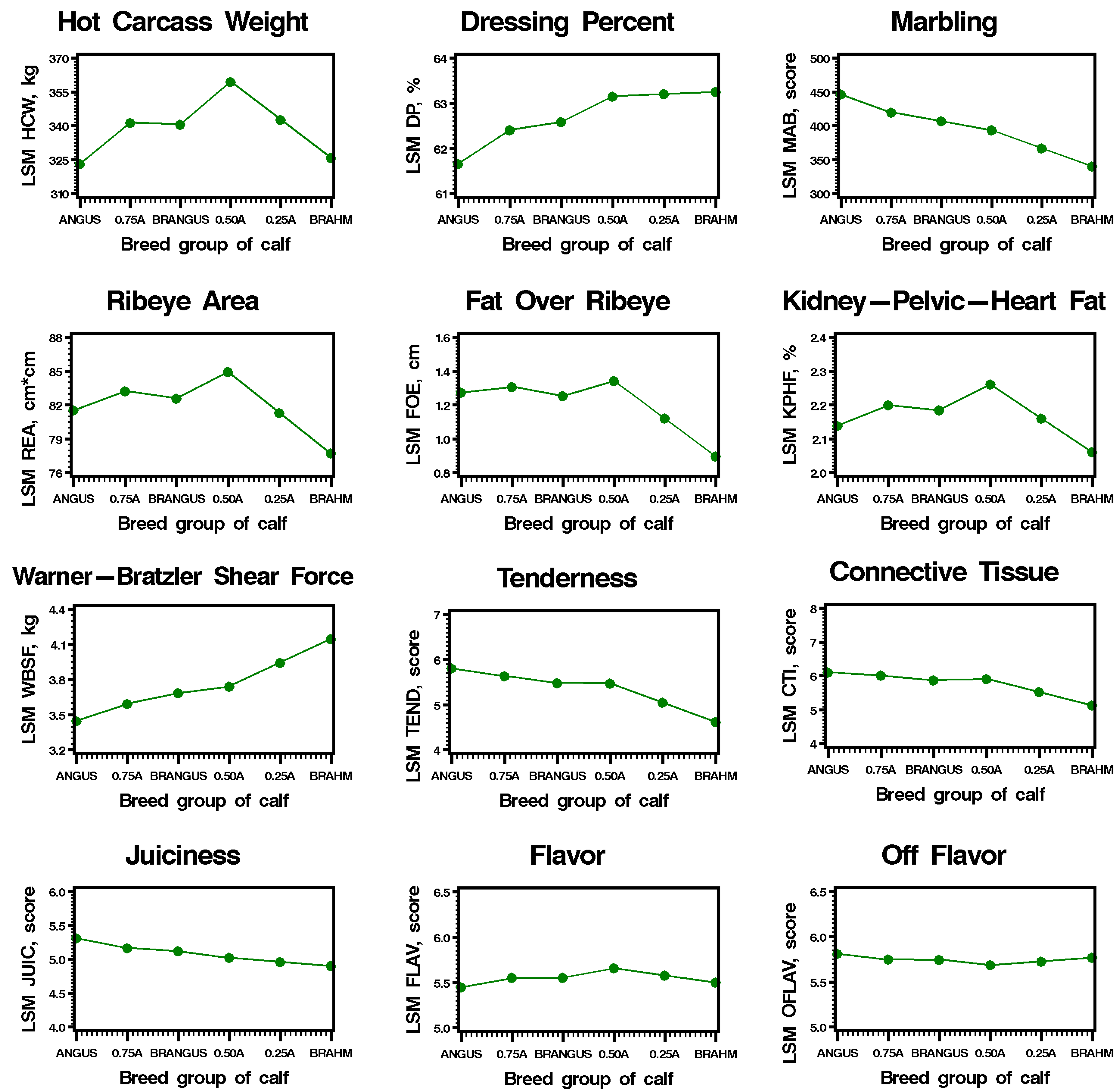
LSM Trends. The LSM for HCW, REA, FOE, and KPH increased from A to ½ A ½ B, and then they decreased towards B. The LSM for MAB, TEND, CTI, and JUIC decreased whereas the LSM for WBSF increased from A to B.

Table 2. Breed differences and heterosis effects for carcass traits

Trait	n	Effect	Estimate	SE	Pr > |t|
HCW, kg	1359	B – A	2.65	3.44	0.44
		Heterosis	35.01	3.95	<0.0001
DP, %	1359	B – A	1.60	0.25	<0.0001
		Heterosis	0.69	0.29	0.017
MAB, units	1357	B – A	-105.97	7.68	<0.0001
		Heterosis	0.26	8.83	0.98
REA, cm^2	1328	B – A	-3.82	0.93	<0.0001
		Heterosis	5.31	1.08	<0.0001
FOE, cm	1353	B – A	-0.38	0.05	<0.0001
		Heterosis	0.26	0.05	<0.0001
KPH, %	1275	B – A	-0.08	0.05	0.15
		Heterosis	0.16	0.06	0.01

Table 3. Breed differences and heterosis effects for meat palatability traits

Trait	n	Effect	Estimate	SE	Pr > |t|
WBSF, kg	662	B – A	0.70	0.11	<0.0001
		Heterosis	-0.06	0.14	0.68
TEND, units	352	B – A	-1.18	0.15	<0.0001
		Heterosis	0.26	0.17	0.13
CTI, units	352	B – A	-0.97	0.14	<0.0001
		Heterosis	0.29	0.16	0.062
JUIC, units	352	B – A	-0.40	0.12	0.001
		Heterosis	-0.09	0.14	0.54
FLAV, units	352	B – A	0.05	0.09	0.56
		Heterosis	0.18	0.10	0.08
OFLAV, units	352	B – A	-0.04	0.07	0.57
		Heterosis	-0.10	0.08	0.22



FINAL REMARK

Crossbred steers with percentage Brahman up to 50% showed limited negative impact on meat quality while maximizing meat yield due to heterosis.