

EFFECT OF BRAHMAN BREEDING ON CARCASS CHARACTERISTICS AND MEAT QUALITY OF BEEF

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Overview

- Angus-Brahman study
- Current tenderness research
- Future research direction



Data - Steers Born 1989 to 2009

Pedigree and Breed Fractions {Calves, Sires, Dams}
Matings: Diallel Design of 213 Sires to 824 Dams

Data: {Date, weight, height, condition score, ...}
Files: n= 1367

Dataset

Dam BG	Sire BG						Total
	Angus	3/4 A 1/4 B	Brangus	1/2 A 1/2 B	1/4 A 3/4 B	Brahman	
Angus	116	16	34	17	27	32	242
3/4 A 1/4 B	47	23	30	26	29	32	187
Brangus	28	6	134	17	20	21	226
1/2 A 1/2 B	54	50	61	46	49	46	306
1/4 A 3/4 B	29	20	32	21	25	45	172
Brahman	28	15	26	11	10	144	234
Total	302	130	317	138	160	320	1367





Data Recording at FEF

Calves: Bulls, Heifers, Steers
Adj Period: 21 d; **Trial:** 70 d
Pens: 24; **Calves/pen:** 14 - 16

Intake: Feed, Water (Real time)
Growth: Dates, weights, Hip Ht (2 wk)
Temperament: Chute Score, Exit Velocity (2 wk)
Ultrasound: UREA, UIMF, UBF, UTend

Post-FEF Data Recording

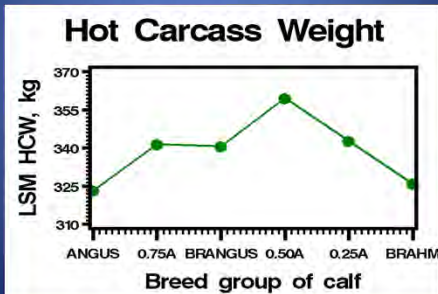
Carcass and Meat Quality Data

Growth: Date, Slaughter weight
Carcass: HCW, BF, REA, KPH, MAR, YG, QG
Meat Quality: Shear Force, Tenderness, Juiciness, Flavor, Cook Loss, Thaw Loss



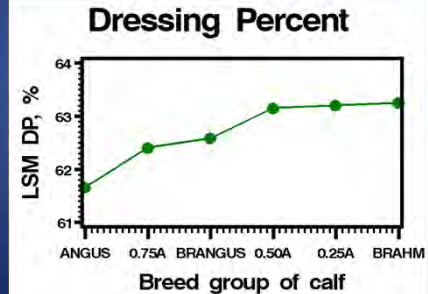
Breed Differences and Heterosis Effects for Hot Carcass Weight

Trait ^a	n	Effect	Estimate	Standard Error	Pr > t
HCW, kg	1359	Brah - Ang	2.65	3.44	0.44
		Heterosis	35.01	3.95	<0.0001



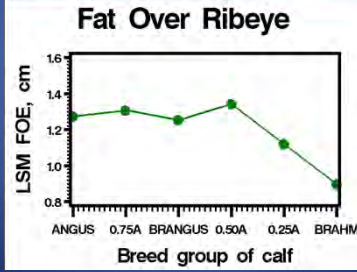
Breed Differences and Heterosis Effects for Dressing Percent

Trait ^a	n	Effect	Estimate	Std. Error	Pr > t
DP, %	1359	Brah - Ang	1.60	0.25	<0.0001
		Heterosis	0.69	0.29	0.017



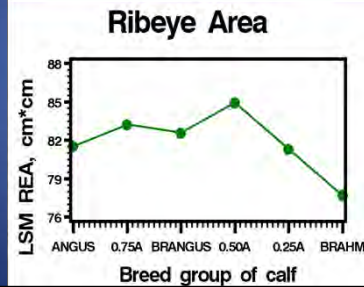
Breed Differences and Heterosis Effects for Fat Over Ribeye

Trait ^a	n	Effect	Estimate	Std Error	Pr > t
FOE, cm	1353	Brah - Ang	-0.38	0.05	<0.0001
		Heterosis	0.26	0.05	<0.0001



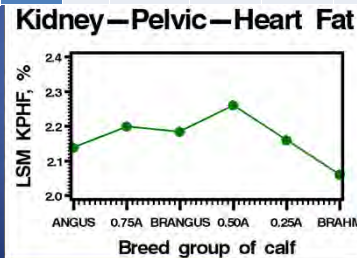
Breed Differences and Heterosis Effects for Ribeye Area

Trait ^a	n	Effect	Estimate	Std Error	Pr > t
REA, cm ²	1328	Brah - Ang	-3.82	0.93	<0.0001
		Heterosis	5.31	1.08	<0.0001



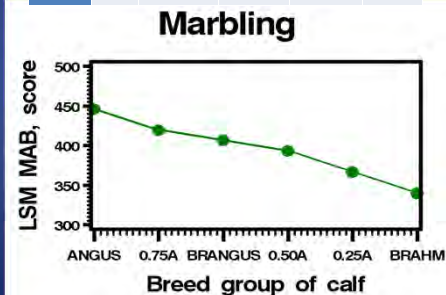
Breed Differences and Heterosis Effects for KPH Fat

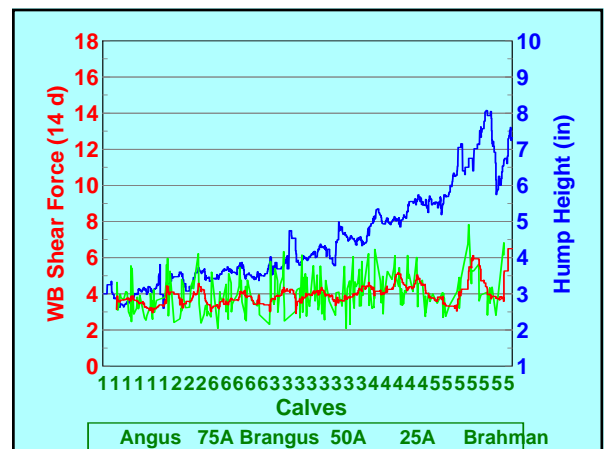
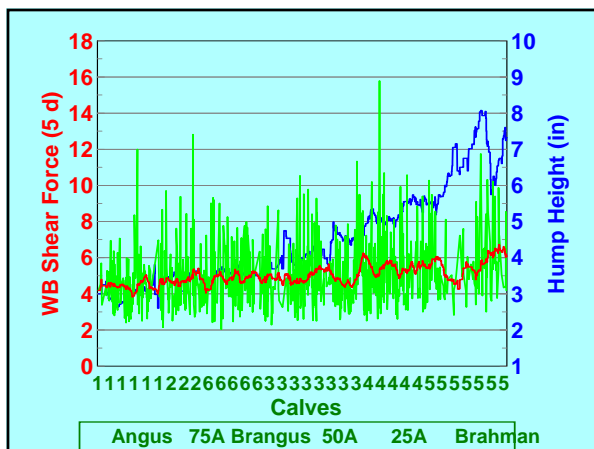
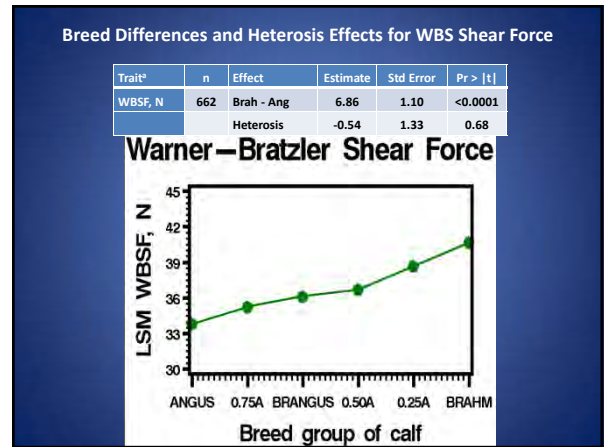
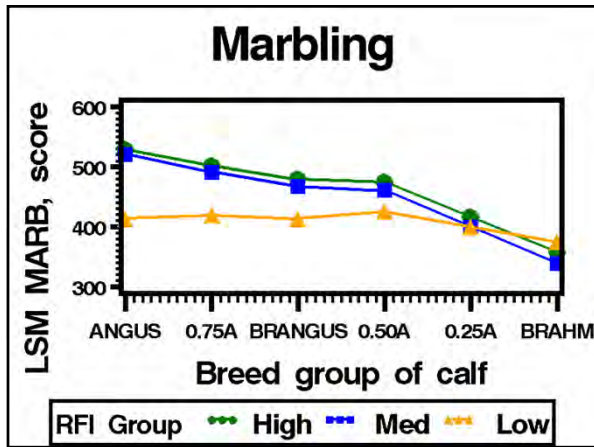
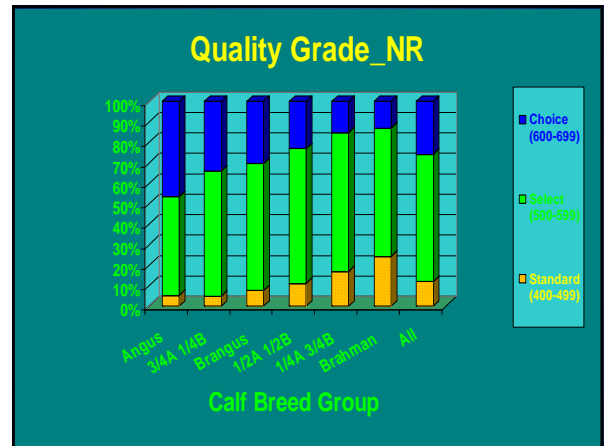
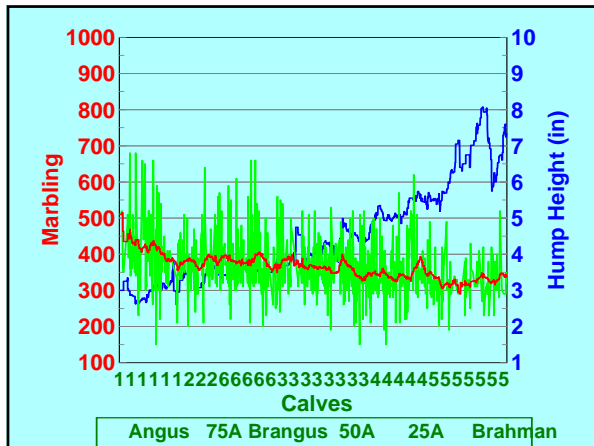
Trait ^a	n	Effect	Estimate	Std Error	Pr > t
KPH, %	1275	Brah - Ang	-0.08	0.05	0.15
		Heterosis	0.16	0.06	0.01

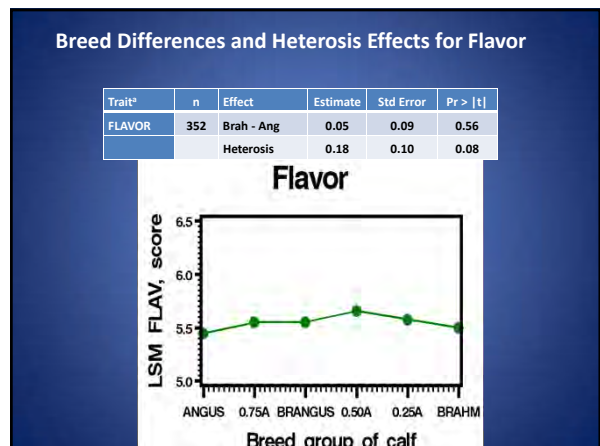
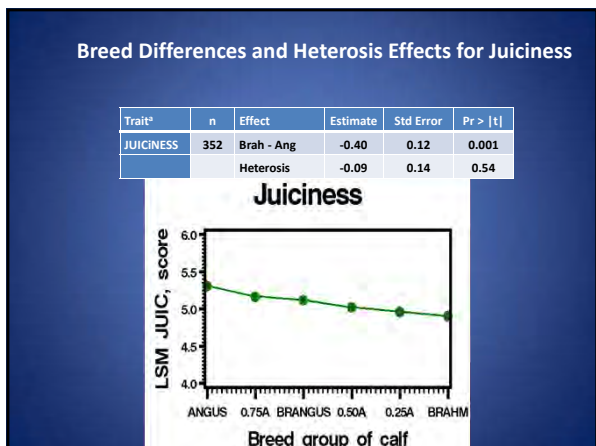
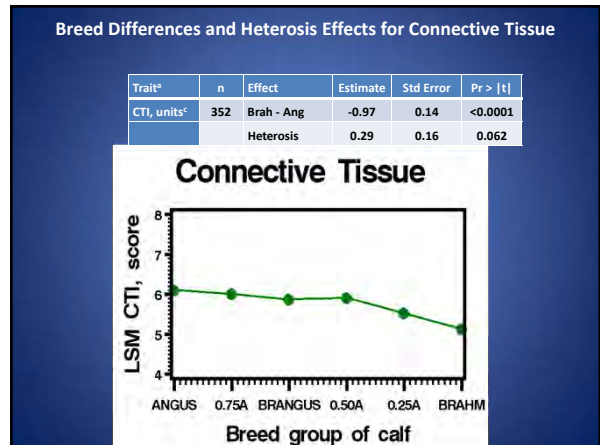
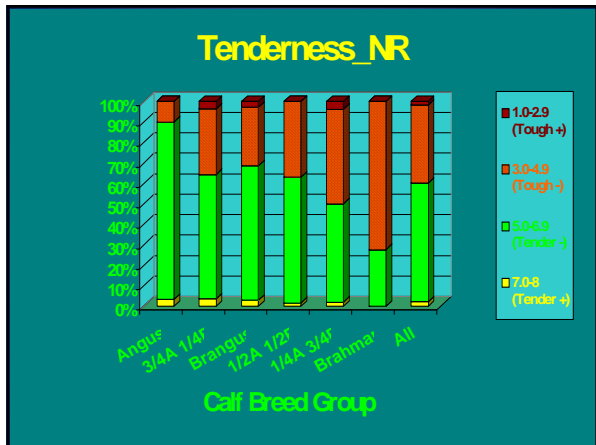
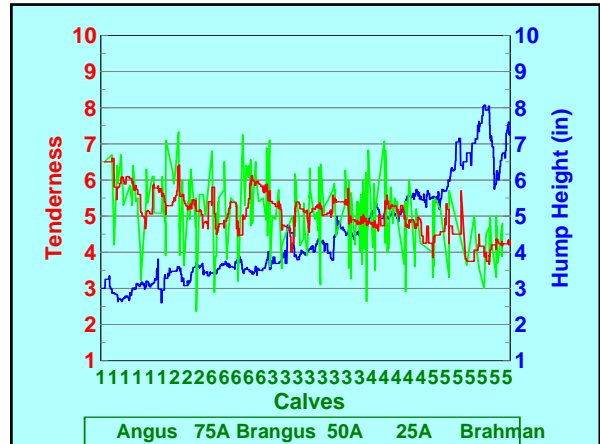
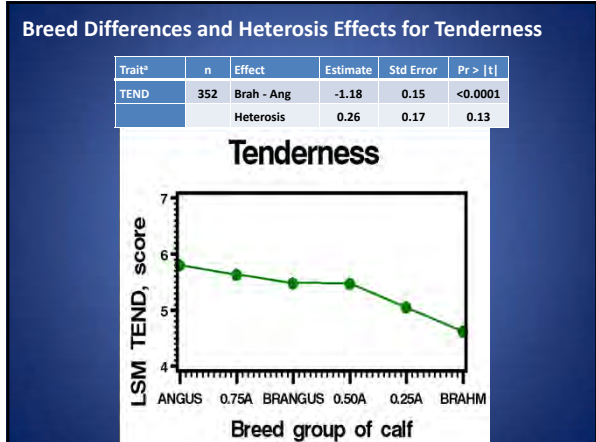


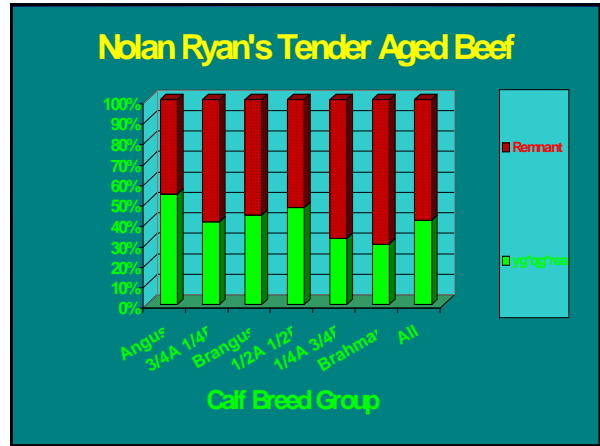
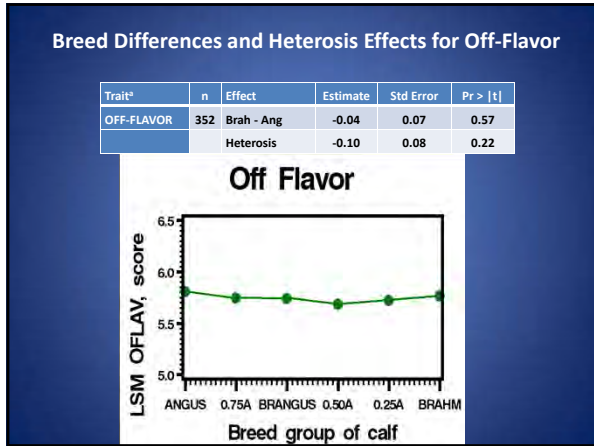
Breed Differences and Heterosis Effects for Marbling

Trait ^a	n	Effect	Estimate	Std Error	Pr > t
Marbling	1357	Bra - Ang	-105.97	7.68	<0.0001
		Heterosis	0.26	8.83	0.98

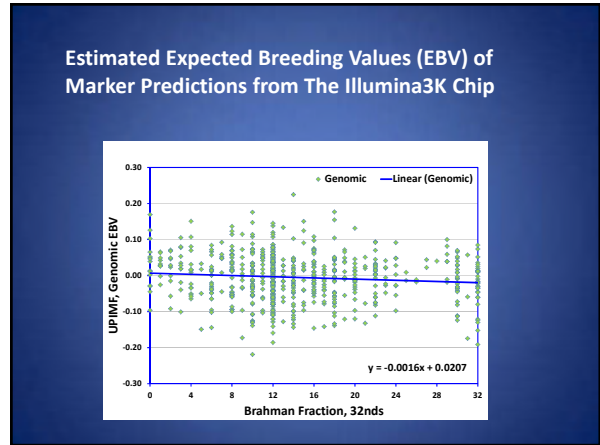








CURRENT TENDERNESS RESEARCH



- Riley et al. 2005 - Factors Influencing Tenderness in Steaks From Brahman Cattle

Table 2
Simple correlations of tenderness traits with other carcass and palatability traits of Brahman cattle

Days of aging	MFI			WBSF			OT
	7	14	21	7	14	21	
Carcass weight, kg	0.01	0.14	0.14	-0.21	-0.21	-0.15	0.04
12th rib fat thickness, mm	-0.02	0.11	0.07	-0.29	-0.25	-0.27	0.11
Ribeye area, cm ²	0.16	0.26	0.33	-0.18	-0.22	-0.19	0.01
Lean maturity	-0.03	-0.19	-0.06	0.07	0.10	0.15	-0.12
Skeletal maturity	-0.23	-0.19	-0.17	-0.28	-0.26	-0.24	0.03
Lean color	-0.30	-0.32	-0.37	-0.30	-0.18	-0.25	0.16
Lean texture	-0.13	-0.25	-0.28	0.19	0.18	0.20	-0.12
Lean firmness	-0.17	-0.20	-0.17	-0.12	-0.12	-0.13	0.09
Marbling score	0.08	0.15	0.11	-0.13	-0.18	-0.13	0.07
Hump height, cm	0.26	0.24	0.23	0.52	0.44	0.43	-0.21
Raw lipids, %	-0.06	-0.05	-0.12	-0.20	-0.12	-0.16	0.07
Collagen, mg per g muscle							
Total	0.19	0.02	0.05	0.66	0.56	0.82	-0.36
Insoluble	0.19	0	0.03	0.66	0.57	0.83	-0.37
Calpastatin, units/g muscle	-0.16	-0.09	-0.25	-0.12	-0.05	-0.06	-0.01
Sarcomere length, μm	0.12	0.12	0.18	-0.02	-0.07	-0.08	0.16

MFI = myofibril fragmentation index; WBSF = Warner-Bratzler shear force; OT = sensory panel overall tenderness.
 * > 0.07 differ from 0 (P < 0.05) and are bold type.

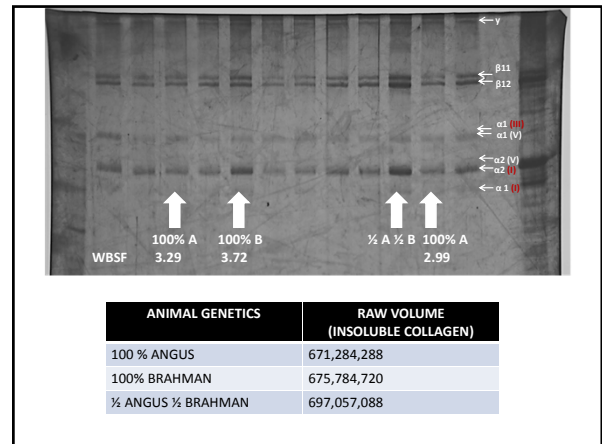
Table 3
Regression coefficient estimates, model R² values, and root mean square errors from models of traits related to tenderness of Brahman longissimus after 21 days aging

Variable	MFI	WBSF (N)
Intercept	123.10 ± 183.51	45.11 ± 6.38
Lean color	-29.12 ± 4.86	-1.08 ± 0.39
Lean texture	-19.13 ± 8.16	1.57 ± 0.39
Insoluble collagen		9.12 ± 0.29
Ribeye area	4.70 ± 0.75	
Lean firmness	-22.90 ± 8.99	-1.18 ± 0.59 ^a
Skeletal maturity		-0.10 ± 0.04
Fat thickness		-0.29 ± 0.10
Hump height	9.87 ± 1.99	
Total collagen	6.37 ± 3.35 ^a	
Calpastatin	-21.26 ± 4.59	
Sarcomere length	177.11 ± 83.24	
Slaughter age	-0.97 ± 0.21	
Marbling score	0.16 ± 0.11 ^b	
Model R ²	0.403	0.714
Root mean square error	111.1	8.43

MFI = myofibril fragmentation index; WBSF = Warner-Bratzler shear force.
 Empty cells indicate regressions that were among those that were excluded from final models (P > 0.15).
 Coefficient estimates are significant (P ≤ 0.05) unless superscripted.
^a Regression approached significance (0.05 < P ≤ 0.10).
^b Regression approached significance (0.10 < P ≤ 0.15).

Table 9
Regression coefficient estimates, model R^2 values, and root mean square errors from models of pre-adjusted traits related to tenderness of Brahman longissimus after 21 days aging

Variable	MF1	WBSF, N
Insoluble collagen	24.30 ± 3.03	7.06 ± 0.29
Sarcomere length		-14.42 ± 5.49
Raw lipids, %	4.43 ± 2.61 ^b	- 0.49 ± 0.29 ^b
12th rib fat thickness	2.18 ± 1.10	
Lean maturity	- 0.29 ± 0.17 ^b	
Lean firmness		- 0.98 ± 0.59 ^a
Ribeye area	0.91 ± 0.53	
Lean texture		0.98 ± 0.59 ^a
Lean color	- 5.78 ± 3.86 ^b	
Model R^2	0.148	0.544
Root mean square error	64.2	6.77



Future Meats Research

- The hardest thing to predict is the future
 - Yogi Berra
- The hardest part of predicting the future is knowing what is going to happen
 - Yogi Berra (or it should have been, if it wasn't!)

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Future Meats Research

- I don't skate to where the puck is, but rather to where the puck will be
 - Wayne Gretsky
- So ... where is the puck going to be?

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Research Areas

1. Safety
2. Sustainability
3. Health & Wellness
4. Quality/Value
5. Supporting Local Markets

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