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REVIEW: Preweaning, Postweaning, and Carcass Trait Comparisons for Progeny Sired by Subtropically Adapted Beef Sire Breeds at Various US Locations[1,2,3]

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ABSTRACT

This review, which represents a summarization of research results generated during an approximately 22-yr period, involves preweaning, postweaning, and carcass trait comparisons of progeny sired by Bos indicus (Brahman, Boran, Nellore, Indu-Brazil, Gir, Sahiwal), B. indicus-derivative (Brangus, Beefmaster, Santa Gertrudis, Gelbray, Simbrah), non-B. indicus (Tuli, Romosinuano, Bonsmara, Senepol) subtropically adapted, and traditional Bos taurus (Angus, Hereford, Charolais, Gelbvieh, Red Poll) sire breeds. Relative to Brahman-sired progeny, preweaning (weaning weight) and postweaning (postweaning ADG, feedlot ADG, final feedlot BW) performance is expected to be less for progeny

[1] This review represents the summarization of results generated at locations that participated in Hatch Act multistate beef cattle genetics research projects S-243 [Evaluation of Beef Cattle Germplasm Resources Involving Additive and Non-Additive Genetic Effects], S-277 [Breeding to Optimize Maternal Performance and Reproduction of Beef Cows in the Southern Region], and S-1013 [Genetic (Co)variance of Parasite Resistance, Temperament and Production Traits of Traditional and Non-*Bos indicus* Tropical Adapted Breeds].

[2] Mention of a trade name, proprietary product, or specific equipment does not constitute a guarantee or warranty by the USDA and does not imply approval to the exclusion of other products that may be suitable.

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sired by non-B. indicus subtropically adapted sire breeds. The non-B. indicus subtropically adapted sire breeds do contribute to less dystocia and appear to improve carcass merit, especially carcass tenderness, over the Brahman breed. Other B. indicus sire breeds, such as the Gir and Sahiwal, but not the Indu-Brazil, contribute to less dystocia compared with the Brahman breed. Relative to B. indicus and non-B. indicus subtropically adapted sire breeds, B. taurus sire breeds, especially Angus and Hereford, express superior carcass merit in regard to marbling score, QG, and tenderness.

Key words: beef cattle, subtropical adaptation, *Bos indicus*, *Bos taurus*

INTRODUCTION

Considerable effort has been directed toward evaluating the Brahman breed, primarily for crossbreeding, in a wide array of environments. Results indicate that in the hot, humid Southeast and Gulf Coast areas, and even in more temperate areas of the United States, the weaning productivity of Brahman × *Bos taurus* cows is virtually unequaled; however, problems have been identified with the Brahman breed. Specifically, 1) subpar reproductive performance of Brahman bulls, 2) increased dystocia or reduced survival rate expressed by Brahman-sired calves, 3) price discounts for Brahman-sired steers and surplus heifers contemporary to Brahman-sired replacement heifers, 4) unfavorable carcass attributes, especially tenderness, and 5) nondocile temperament expressed by Brahman-influenced cattle are problems associated with the Brahman breed that have served as a major impetus to evaluate alternative sources of subtropically adapted beef cattle germplasm at locations primarily in the Southeast and Gulf Coast areas (Thrift and Thrift, 2005).

MATERIALS AND METHODS

This review represents a summarization of comparisons involving preweaning, postweaning, and carcass traits of progeny sired by *Bos indicus* (Brahman, Boran, Nellore, Indu-Brazil, Gir, Sahiwal), *B. indicus*-derivative (Brangus, Beefmaster, Santa Gertrudis, Gelbray, Simbrah), non-*B. indicus* (Tuli, Romosinuano, Bonsmara, Senepol) subtropically adapted sire breeds, and traditional *B. taurus* (Angus, Hereford, Charolais, Gelbvieh, Red Poll) sire breeds.

Because of its wide-scale usage in the Southeast and Gulf Coast areas, the Brahman was the primary sire breed with which most other sire breeds were compared. When available for specific traits, the sire breed comparisons summarized were as follows: 1) Brahman versus traditional *B. taurus* sire breeds; 2) Brahman versus other *B. indicus* sire breeds; 3) Brahman versus *B. indicus*-derivative sire breeds; 4) Brahman versus non-*B. indicus* subtropically adapted sire breeds; 5) *B. indicus*-derivative versus traditional *B. taurus* sire breeds; 6) *B. indicus*-derivative versus non-*B. indicus* subtropically adapted sire breeds; and 7) non-*B. indicus* subtropically adapted versus traditional *B. taurus* sire breeds.

Where available for each study, sire breed comparisons were summarized for preweaning (percentage of unassisted births, gestation length, birth weight, weaning weight), postweaning (postweaning ADG, feedlot ADG, final feedlot BW), and carcass (hot carcass weight, YG, QG, marbling score, Warner-Bratzler shear force value, LM area) traits.

Most studies summarized contributed to at least 1 of 3 multistate beef cattle genetic research projects (S-243, S-277, S-1013) that collectively spanned an approximately 22-yr period. Although not contributing to the multistate research projects, results were also summarized from 3 early studies (Gregory et al., 1979; Koch et al., 1982; Crouse et al., 1989) that evaluated 2 subtropically adapted sire breeds in Cycle III of the MARC Germplasm Evaluation Program (Clay Center, NE).

Most sire breed comparisons summarized involved mating schemes resulting in production of either 2- or 3-breed-cross progeny that express 100% direct heterosis; however, some sire breed comparisons involved straightbred and crossbred matings (Brown et al., 1993a,b; Chase et al., 1998; Riley et al., 2007) and some sire breed comparisons involved only straightbred matings (DeRouen et al., 1992; Thrift et al., 1999; Bidner et al., 2002; Phillips et al., 2006). As indicated by Paschal et al. (1991), in studies in which sires of 2 (or more) different breeds are mated to dams of a third genetic type, sire breed differences represent one-half the difference in direct breed effects plus differences attributed to direct heterosis of the different sire breeds with the dam genetic type.

Typically, for studies that involved crossbreeding, it was assumed that direct heterosis was the same for all breed crosses. This assumption is probably valid when different *B. indicus* or different *B. taurus* sire breeds are compared. However, in situations in which *B. indicus* (or *B. indicus*-derivative) and *B. taurus* sire breeds are compared when mated to dams of a third genetic type, the assumption that the *B. indicus* (or *B. indicus*-derivative) × *B. taurus* and *B. taurus* × *B. taurus* crosses express equal direct heterosis probably is not valid, especially for preweaning traits (Franke, 1980; Gregory and Cundiff, 1980; Koger, 1980; Long, 1980). Thus, sire breed differences when *B. indicus* (or *B. indicus*-derivative) versus *B. taurus* or when *B. indicus* (or *B. indicus*-derivative) versus non-*B. indicus* subtropically adapted sire breeds are involved should be interpreted with this in mind.

RESULTS AND DISCUSSION

Preweaning Traits

Preweaning trait (percentage of unassisted calvings, gestation length, birth weight, weaning weight) comparisons involving progeny sired by subtropically adapted beef sire breeds are summarized in Table 1. Results are summarized by comparing sire breed means for each trait.

Table 1. Preweaning trait comparisons involving progeny sired by subtropically adapted beef sire breeds

Sire breed comparison	N	%UC	N	GL	N	Birth wt, kg	N	Weaning wt, kg
	Trait[1]							
Brahman vs. traditional *Bos taurus* sire breeds								
Gregory et al. (1979)								
Brahman	349	87.0	349	291.9	349	40.6	330	215.0
Angus/Hereford	358	94.1	358	284.2	358	35.4	346	203.0
Difference		−7.1**		7.7**		5.2**		12.0**
Roberson et al. (1986)								
Brahman					1,387	34.1	1,191	146.8
Hereford					2,085	31.8	1,742	155.6
Difference						2.3**		−8.8**
Sanders et al. (1987)[2]								
Zebu			250	289.6	249	34.7	224	210.2
Angus			94	281.3	93	30.3	85	198.8
Difference				8.3 NT		4.4 NT		11.4 NT
Neville et al. (1988)								
Brahman					94	33.6	94	192.0
Angus					88	30.1	88	177.0
Difference						3.5**		15.0**
Paschal et al. (1991)								
Gray Brahman	48	87.0	48	291.0	48	37.1	44	212.9
Angus	40	95.0	40	282.0	39	31.8	36	198.7
Difference		−8.0*		9.0*		5.3*		14.2*
Brown et al. (1993b)								
Brahman					213	36.9	193	202.2
Angus					273	33.1	261	198.4
Difference						3.8**		3.8 NS
Browning et al. (1995)								
Brahman			99	293.7	99	31.2	99	198.8
Angus			68	284.0	68	30.3	68	220.9
Difference				9.7**		0.9 NS		−22.1**
Thrift et al. (1999)								
Brahman					889	27.7	786	191.5
Angus					2,365	25.0	2,274	174.0
Difference						2.7*		17.5*
Cundiff (2005)								
Brahman	436	89.4	436	291.4	436	44.3	436	245.9
Angus	1,021	97.6	1,021	282.5	1,021	38.7	1,021	240.0
Difference		−8.2*		8.9*		5.6*		5.9*
Riley et al. (2007)								
Brahman					427	34.3	394	229.6
Angus					424	30.8	316	224.0
Difference						3.5**		5.6**
Amen et al. (2007a)								
Brahman			141	290.5	141	38.4	134	236.1
Angus			137	282.7	139	34.3	132	229.8
Difference				7.8*		4.1 NS		6.3 NS
Thrift et al. (1999)								
Brahman					718	28.9	550	162.5
Hereford					2,276	30.4	2,107	161.0
Difference						−1.5 NS		1.5 NS
Baker et al. (2001a)								
Brahman						38.4		250.7
Hereford						34.5		232.2
Difference						3.9 NS		18.5 NS
Cundiff (2005)								
Brahman	436	89.4	436	291.4	436	44.3	436	245.9

Continued

Table 1 (Continued). Preweaning trait comparisons involving progeny sired by subtropically adapted beef sire breeds

	Trait[1]							
Sire breed comparison	N	%UC	N	GL	N	Birth wt, kg	N	Weaning wt, kg
Hereford	1,064	97.3	1,064	284.4	1,064	41.0	1,064	239.0
Difference		−7.9*		7.0*		3.3*		6.9*
Brahman vs. other *Bos indicus* sire breeds								
Gregory et al. (1979)								
Brahman	349	87.0	349	291.9	349	40.6	330	215.0
Sahiwal	325	90.8	325	294.2	325	37.7	309	204.0
Difference		−3.8*		−2.3**		2.9**		11.0**
Paschal et al. (1991)								
Gray Brahman	48	87.0	48	291.0	48	37.1	44	212.9
Red Brahman	55	92.0	55	290.0	55	37.4	47	214.4
Difference		−5.0 NS		1.0 NS		−0.3 NS		−1.5 NS
Paschal et al. (1991)								
Gray Brahman	48	87.0	48	291.0	48	37.1	44	212.9
Gir	49	94.0	49	289.0	49	33.0	45	197.8
Difference		−7.0 NS		2.0 NS		4.1*		15.1*
Paschal et al. (1991)								
Gray Brahman	48	87.0	48	291.0	48	37.1	44	212.9
Indu-Brazil	47	78.0	47	290.0	47	39.1	42	205.1
Difference		9.0 NS		1.0 NS		−2.0*		7.8 NS
Paschal et al. (1991)								
Gray Brahman	48	87.0	48	291.0	48	37.1	44	212.9
Nellore	51	86.0	51	294.0	50	36.7	46	206.3
Difference		1.0 NS		−3.0*		0.4 NS		6.6 NS
Cundiff (2005)								
Brahman	436	89.4	436	291.4	436	44.3	436	245.9
Nellore	196	94.6	196	292.9	196	42.7	196	243.1
Difference		−5.2*		−1.5 NS		1.6*		2.8 NS
Herring et al. (1996)								
Brahman			101	288.6	101	44.0	97	234.3
Boran			104	289.7	103	40.3	95	217.1
Difference				−1.1 NS		3.7*		17.2*
Cundiff (2005)								
Brahman	436	89.4	436	291.4	436	44.3	436	245.9
Boran	456	94.1	456	291.2	456	41.2	456	229.1
Difference		−4.7*		0.2 NS		3.1*		16.8*
Brahman vs. *B. indicus*-derivative sire breeds								
Cundiff (2005)								
Brahman	436	89.4	436	291.4	436	44.3	436	245.9
Brangus	214	97.5	214	285.8	214	40.4	214	242.2
Difference		−8.1*		5.6*		3.9*		3.7 NS
Brown et al. (1997)								
Brahman					57	41.0	55	235.0
Beefmaster					30	43.0	27	238.0
Difference						−2.0 NS		−3.0 NS
Cundiff (2005)								
Brahman	436	89.4	436	291.4	436	44.3	436	245.9
Beefmaster	222	96.1	222	287.4	222	42.7	222	247.7
Difference		−6.7*		4.0*		1.6*		−1.8 NS

Continued

Table 1 (Continued). Preweaning trait comparisons involving progeny sired by subtropically adapted beef sire breeds

Sire breed comparison	Trait[1]							
	N	%UC	N	GL	N	Birth wt, kg	N	Weaning wt, kg
Brahman vs. non-*B. indicus* subtropically adapted sire breeds								
Browning et al. (1995)								
Brahman			99	293.7	99	31.2	99	198.8
Tuli			75	288.4	75	29.1	75	200.4
Difference				5.3**		2.1 NS		−1.6 NS
Herring et al. (1996)								
Brahman			101	288.6	101	44.0	97	234.3
Tuli			103	286.8	103	36.4	99	209.1
Difference				1.8 NS		7.6*		25.2*
Chase et al. (2000)								
Brahman	82	86.8	82	283.6	82	36.0	75	203.3
Tuli	91	100.0	91	282.0	91	31.2	88	175.4
Difference		−13.2**		1.6 NS		4.8**		27.9**
Baker et al. (2001a)								
Brahman						38.4		250.7
Tuli						33.8		226.3
Difference						4.6**		24.4**
Holloway et al. (2002)								
Brahman					168	39.5	168	196.8
Tuli					167	33.6	167	180.4
Difference						5.9*		16.4*
Cundiff (2005)								
Brahman	436	89.4	436	291.4	436	44.3	436	245.9
Tuli	492	95.7	492	289.5	492	36.7	492	223.2
Difference		−6.3*		1.9*		7.6*		22.7*
Cundiff (2005)								
Brahman	436	89.4	436	291.4	436	44.3	436	245.9
Romosinuano	207	99.7	207	289.7	207	37.7	207	223.6
Difference		−10.3*		1.7*		6.6*		22.3*
Riley et al. (2007)								
Brahman					427	34.3	394	229.6
Romosinuano					486	29.8	439	213.6
Difference						4.5**		16.0**
Cundiff (2005)								
Brahman	436	89.4	436	291.4	436	44.3	436	245.9
Bonsmara	207	98.3	207	287.5	207	40.3	207	235.4
Difference		−8.9*		3.9*		4.0*		10.5*
Sanders et al. (1987)[2]								
Zebu			250	289.6	249	34.7	224	210.2
Senepol			49	286.3	48	30.6	44	188.9
Difference				3.3 NT		4.1 NT		21.3 NT
Chase et al. (2000)								
Brahman	82	86.8	82	283.6	82	36.0	75	203.3
Senopol	85	97.6	85	281.8	85	33.0	80	176.6
Difference		−10.8**		1.8 NS		3.0**		26.7**
Baker et al. (2001a)								
Brahman						38.4		250.7
Senepol						35.3		236.2
Difference						3.1**		14.5**
Holloway et al. (2002)								
Brahman					168	39.5	168	196.8
Senepol					167	36.1	167	186.2
Difference						3.4*		10.6*

Continued

Table 1 (Continued). Preweaning trait comparisons involving progeny sired by subtropically adapted beef sire breeds

	Trait[1]							
Sire breed comparison	N	%UC	N	GL	N	Birth wt, kg	N	Weaning wt, kg
B. indicus-derivative vs. traditional *B. taurus* sire breeds								
Wheeler et al. (2006)								
Brangus	214	96.9	214	284.9	214	41.1	214	249.0
Angus	208	97.2	208	281.6	208	39.5	208	245.4
Difference		−0.3 NS		3.3*		1.6*		3.6 NS
Wheeler et al. (2006)								
Brangus	214	96.9	214	284.9	214	41.1	214	249.0
Hereford	212	94.4	212	283.7	212	41.3	212	242.2
Difference		2.5 NS		1.2 NS		−0.2 NS		6.8*
Wheeler et al. (2006)								
Beefmaster	222	95.6	222	286.6	222	43.3	222	254.0
Angus	208	97.2	208	281.6	208	39.5	208	245.4
Difference		−1.6 NS		5.0*		3.8*		8.6*
Wheeler et al. (2006)								
Beefmaster	222	95.6	222	286.6	222	43.3	222	254.0
Hereford	212	94.4	212	283.7	212	41.3	212	242.2
Difference		1.2 NS		2.9*		2.0*		11.8*
Oxford et al. (2006)								
Santa Gertrudis					103	32.8	103	192.5
Angus					109	27.3	109	184.2
Difference						5.5*		8.3*
Oxford et al. (2006)								
Santa Gertrudis					123	31.2	123	215.4
Hereford					130	29.8	130	196.0
Difference						1.4*		19.4**
Oxford et al. (2006)								
Santa Gertrudis					226	32.0	226	204.0
Charolais					162	32.1	162	206.5
Difference						−0.1 NS		−2.5 NS
Oxford et al. (2006)								
Santa Gertrudis					226	32.0	226	204.0
Red Poll					244	27.6	244	191.9
Difference						4.4*		12.1**
Non-*B. indicus* subtropically adapted vs. traditional *B. taurus* sire breeds								
Browning et al. (1995)								
Tuli			75	288.4	75	29.1	75	200.4
Angus			68	284.0	68	30.3	68	220.9
Difference				4.4**		−1.2 NS		−20.5**
Baker et al. (2001a)								
Tuli						32.8		226.1
Angus						32.5		239.8
Difference						0.3 NS		−13.7**
Cundiff (2005)								
Tuli	492	95.7	492	289.5	492	36.7	492	223.2
Angus	1,021	97.6	1,021	282.5	1,021	38.7	1,021	240.0
Difference		−1.9 NS		7.0*		−2.0*		−16.8*
Cundiff (2005)								
Tuli	492	95.7	492	289.5	492	36.7	492	223.2
Hereford	1,064	97.3	1,064	284.4	1,064	41.0	1,064	239.0
Difference		−1.6 NS		5.1*		−4.3*		−15.8*
Baker et al. (2001a)								

Continued

Table 1 (Continued). Preweaning trait comparisons involving progeny sired by subtropically adapted beef sire breeds

	Trait[1]							
Sire breed comparison	N	%UC	N	GL	N	Birth wt, kg	N	Weaning wt, kg
Tuli						32.8		226.1
Hereford						34.3		243.3
Difference						−1.5 NS		−17.2**
Riley et al. (2007)								
Romosinuano					486	29.8	439	213.6
Angus					424	30.8	316	224.0
Difference						−1.0**		−10.4**
Cundiff (2005)								
Romosinuano	207	99.7	207	289.7	207	37.7	207	223.6
Angus	1,021	97.6	1,021	282.5	1,021	38.7	1,021	240.0
Difference		2.1 NS		7.2*		−1.0*		−16.4*
Wheeler et al. (2006)								
Romosinuano	207	99.2	207	288.9	207	38.4	207	230.0
Angus	208	97.2	208	281.6	208	39.5	208	245.4
Difference		2.0 NS		7.3*		−1.1 NS		−15.4*
Cundiff (2005)								
Romosinuano	207	99.7	207	289.7	207	37.7	207	223.6
Hereford	1,064	97.3	1,064	284.4	1,064	41.0	1,064	239.0
Difference		2.4 NS		5.3*		−3.3*		−15.4*
Wheeler et al. (2006)								
Romosinuano	207	99.2	207	288.9	207	38.4	207	230.0
Hereford	212	94.4	212	283.7	212	41.3	212	242.2
Difference		4.8*		5.2*		−2.9*		−12.2*
Brown and Lalman (2008)								
Romosinuano					57	39.0	55	224.0
Hereford					70	41.0	64	234.0
Difference						−2.0*		−10.0*
Brown and Lalman (2008)								
Romosinuano					57	39.0	55	224.0
Gelbvieh					68	42.0	67	241.0
Difference						−3.0*		−17.0*
Brown and Lalman (2008)								
Romosinuano					57	39.0	55	224.0
Charolais					68	45.0	62	247.0
Difference						−6.0*		−23.0*
Cundiff (2005)								
Bonsmara	207	98.3	207	287.5	207	40.3	207	235.4
Angus	1,021	97.6	1,021	282.5	1,021	38.7	1,021	240.0
Difference		0.7 NS		5.0*		1.6*		−4.6 NS
Wheeler et al. (2006)								
Bonsmara	207	97.7	207	286.7	207	41.0	207	241.8
Angus	208	97.2	208	281.6	208	39.5	208	245.4
Difference		0.5 NS		5.1*		1.5*		−3.6 NS
Cundiff (2005)								
Bonsmara	207	98.3	207	287.5	207	40.3	207	235.4
Hereford	1,064	97.3	1,064	284.4	1,064	41.0	1,064	239.0
Difference		1.0 NS		3.1*		−0.7 NS		−3.6 NS
Wheeler et al. (2006)								
Bonsmara	207	97.7	207	286.7	207	41.0	207	241.8
Hereford	212	94.4	212	283.7	212	41.3	212	242.2
Difference		3.3 NS		3.0*		−0.3 NS		−0.4 NS
Brown and Lalman (2008)								
Bonsmara					91	41.0	86	236.0
Hereford					70	41.0	64	234.0

Continued

Table 1 (Continued). Preweaning trait comparisons involving progeny sired by subtropically adapted beef sire breeds

	Trait[1]							
Sire breed comparison	N	%UC	N	GL	N	Birth wt, kg	N	Weaning wt, kg
Difference						0.0 NS		2.0 NS
Brown and Lalman (2008)								
Bonsmara					91	41.0	86	236.0
Gelbvieh					68	42.0	67	241.0
Difference						−1.0 NS		−5.0 NS
Brown and Lalman (2008)								
Bonsmara					91	41.0	86	236.0
Charolais					68	45.0	62	247.0
Difference						−4.0*		−11.0*
Sanders et al. (1987)								
Senepol			49	286.3	48	30.6	44	188.9
Angus			94	281.3	93	30.3	85	198.8
Difference				5.0 NT		0.3 NT		−9.9 NT
Baker et al. (2001a)								
Senepol						34.5		238.6
Angus						32.5		239.8
Difference						2.0 NS		−1.2 NS
Thrift et al. (1986), Kentucky study								
Senepol					119	34.3	113	182.5
Hereford					83	33.0	79	179.4
Difference						1.3*		3.1 NS
Chase et al. (1998), phase I								
Senepol					194	34.1	194	214.0
Hereford					383	32.1	383	183.0
Difference						2.0**		31.0**
Chase et al. (1998), phase II								
Senepol					174	34.0	174	212.0
Hereford					204	33.5	204	211.5
Difference						0.5 NS		0.5 NS
Baker et al. (2001a)								
Senepol						34.5		238.6
Hereford						34.3		243.3
Difference						0.2 NS		−4.7 NS
Thrift et al. (1986), Louisiana study								
Senepol					150	28.1	136	196.0
Red Poll					163	29.3	146	208.0
Difference						−1.2**		−12.0**

[1]%UC = percentage of unassisted calvings; GL = gestation length.

[2]Zebu collectively refers to average for Gray Brahman, Red Brahman, Gir, Indu-Brazil, and Nellore.

**P < 0.01; *P < 0.05; NS = not significant (P > 0.10); NT = not tested.

Brahman Versus Traditional Bos taurus Sire Breeds. Relative to Angus and Hereford sires, Brahman sires can be expected to increase gestation length, increase birth weight, reduce the percentage of unassisted calvings, and increase weaning weight. In only 1 study (Browning et al., 1995) was weaning weight lower for Brahman-sired progeny. Results of the latter study probably are a reflection of the fact that the Brahman-sired progeny were straightbred, whereas the Angus-sired progeny were 2-breed crosses. Thus, direct genetic and direct heterotic effects are partially confounded in this comparison. Increased dystocia associated with the use of Brahman bulls has been addressed previously (Thrift et al., 2002).

Brahman Versus Other Bos indicus Sire Breeds. Compared with Brahman sires, Sahiwal sires contribute to a longer gestation length, lighter birth weights (resulting in a higher percentage of unassisted calvings), and lighter weaning weights. In the Texas study by Paschal et al. (1991), no difference was evident between Gray- and Red Brahman-sired progeny; however, relative to Gray Brahman, Indu-Brazil-sired progeny were heavier at birth, but not at weaning. Gir-sired progeny were lighter at birth and weaning than Gray Brahman-sired progeny. Nellore- and Gray Brahman-sired progeny performed similarly, with some indication that Nellore sires contributed to a slightly longer gestation length. In 2 studies (Herring et al., 1996; Cundiff, 2005), Brahman-sired progeny were heavier at birth and weaning than Boran-sired progeny.

Brahman Versus Bos indicus-Derivative Sire Breeds. Cundiff (2005) indicated that in the more temperate environment of Nebraska, Brahman sires contributed to a longer gestation length and higher birth weight (resulting in a lower percentage of unassisted calvings) but similar weaning weights compared with Brangus and Beefmaster sires. Birth and weaning weights were similar for Brahman- and Beefmaster-sired progeny in Arkansas (Brown et al., 1997).

Brahman Versus non-Bos indicus Subtropically Adapted Sire Breeds. Relative to Brahman sires, Tuli, Romosinuano, Bonsmara, and Senepol sires result in a shorter gestation length and substantially lighter birth and weaning weights. Because of the lighter birth weights, percentage of unassisted calvings consistently favors these subtropically adapted sire breeds over the Brahman. In the study by Browning et al. (1995), weaning weights were similar for Brahman- and Tuli-sired progeny. As indicated previously, these results are probably because the Brahman-sired progeny were straightbreds and the Tuli-sired progeny were 2-breed crosses.

Bos indicus-Derivative Versus Traditional Bos taurus Sire Breeds. In general, Brangus-, Beefmaster-, and Santa Gertrudis-sired progeny are consistently heavier at birth and weaning than Angus-, Hereford-, and Red Poll-sired progeny. In the study by Wheeler et al. (2006), Brangus and Beefmaster sires contributed to slightly longer gestation lengths and higher birth weights but percentage of unassisted calvings was similar to those for Angus and Hereford sires. In 1 study (Oxford et al., 2006), Santa Gertrudis-sired progeny were heavier at birth and weaning than Angus-, Hereford-, and Red Poll-sired progeny. Birth and weaning weights were similar for Santa Gertrudis- and Charolais-sired progeny.

Non-Bos indicus Subtropically Adapted Versus Traditional Bos taurus Sire Breeds. Relative to Angus and Hereford sires, Tuli, Romosinuano, Bonsmara, and Senepol sires increase the gestation length but do not consistently increase the birth weight. In the 3 cases (Cundiff, 2005; Wheeler et al., 2006; Thrift et al., 1986, Kentucky study) in which birth weights were greater for progeny of these non-*B. indicus* subtropical sire breeds, the increase averaged less than 1.5 kg. With the exception of the comparison involving Romosinuano and Hereford sires (Wheeler et al., 2006), in which Romosinuano-sired progeny experienced less dystocia, percentage of unassisted calvings was similar for the non-*B. indicus* subtropically adapted sire breeds and the *B. taurus* sire breeds. In 1 study (Brown and Lalman, 2008), Charolais-sired progeny were significantly heavier at birth than Romosinuano- and Bonsmara-sired progeny. In 11 studies, weaning weights were similar; however, in 16 studies, weaning weights were significantly lighter for the non-*B. indicus* subtropically adapted sire breeds relative to the *B. taurus* sire breeds.

Postweaning Traits

Postweaning trait (postweaning ADG, feedlot ADG, final feedlot BW) comparisons involving progeny sired by subtropically adapted beef sire breeds are summarized in Table 2. Results are summarized by comparing sire breed means for each trait.

Brahman Versus Traditional Bos taurus Sire Breeds. Results comparing postweaning ADG for Brahman- and Angus-sired progeny are inconsistent. Paschal et al. (1991) indicated that compared with Angus-sired progeny, Gray Brahman-sired progeny had a higher postweaning ADG; however, Brown et al. (1993a) indicated a lower postweaning ADG for Brahman-sired progeny. Most studies indicated similar feedlot ADG and final feedlot BW for Brahman- and *B. taurus*-sired progeny; however, Cundiff (2005) indicated lower feedlot ADG and final feedlot BW for Brahman-sired progeny. These latter results are as expected because cattle involved in the study by Cundiff (2005) were weaned in the fall and fed during the winter season at the US Meat Animal Research Center (Clay Center, NE). It has been established that Brahman-sired cattle have lower feedlot performance when fed at temperate locations during the winter season (Thrift and Thrift, 2005). In contrast to the results of Cundiff (2005), Paschal et al. (1991) indicated a postweaning advantage for Gray Brahman-sired over Angus-sired progeny fed during the winter season at a central Texas location.

Brahman Versus Other Bos indicus Sire Breeds Sahiwal-, Gir-, and Boran-sired progeny have lower postweaning performance than Brahman-sired progeny. Final feedlot BW appears to be reduced by slightly less than 40 kg. When evaluated under central Texas conditions, Red Brahman-, Indu-Brazil-, and Nellore-sired progeny performed similarly to Gray Brahman-sired progeny during the postweaning period (Paschal et al., 1995).

Brahman Versus Bos indicus-Derivative Sire Breeds. Cundiff (2005) indicated that Brangus- and Beefmaster-sired progeny expressed greater feedlot ADG and final feedlot BW than Brahman-sired progeny. As indicated previously, these results are likely associated with the lower feedlot performance of Brahman-sired progeny when fed during the winter season at a temperate location (Thrift and Thrift, 2005).

Brahman Versus non-Bos indicus Subtropically Adapted Sire Breeds. Brahman-sired progeny

Table 2. Postweaning trait comparisons involving progeny sired by subtropically adapted beef sire breeds

	Trait[1]					
	Postweaning		Feedlot			
Sire breed comparison	N	ADG, kg	N	ADG, kg	N	FBW, kg
Brahman vs. traditional *B. taurus* sire breeds						
Koch et al. (1982)						
Brahman					128	477.7
Angus/Hereford					140	466.5
Difference						11.2 NS
Sanders and Paschal (1987)[2]						
Zebu			79	1.49	79	489.5
Angus			28	1.58	28	480.8
Difference				−0.09 NT		8.7 NT
Paschal et al. (1995)						
Gray Brahman	42	0.39	20	1.60	20	499.7
Angus	33	0.22	18	1.57	18	468.4
Difference		0.17*		0.03 NS		31.3*
Brown et al. (1993a)						
Brahman	180	0.32				
Angus	251	0.37				
Difference		−0.05*				
Baker et al. (2001b)						
Brahman						573.8
Angus						576.3
Difference						−2.5 NS
Cundiff (2005)						
Brahman			119	1.20	119	544.8
Angus			467	1.42	467	594.7
Difference				−0.22*		−49.9*
Amen et al. (2007b)						
Brahman					133	508.2
Angus					128	524.4
Difference						−16.2 NS
Baker et al. (2001b)						
Brahman						573.8
Hereford						562.5
Difference						11.3 NS
Cundiff (2005)						
Brahman			119	1.20	119	544.8
Hereford			448	1.38	448	580.2
Difference				−0.18*		−35.4*
Brahman vs. other *B. indicus* sire breeds						
Koch et al. (1982)						
Brahman					128	477.7
Sahiwal					141	445.4
Difference						32.3*
Crouse et al. (1989)						
Brahman					84	460.0
Sahiwal					88	418.0
Difference						42.0*
Paschal et al. (1995)						
Gray Brahman	42	0.39	20	1.60	20	499.7
Red Brahman	43	0.39	21	1.57	21	511.0
Difference		0.00 NS		0.03 NS		−11.3 NS
Paschal et al. (1995)						
Gray Brahman	42	0.39	20	1.60	20	499.7

Continued

Table 2 (Continued). Postweaning trait comparisons involving progeny sired by subtropically adapted beef sire breeds

	Trait[1]					
	Postweaning		Feedlot			
Sire breed comparison	N	ADG, kg	N	ADG, kg	N	FBW, kg
Gir	42	0.37	27	1.47	27	471.9
Difference		0.02 NS		0.13 NS		27.8*
Paschal et al. (1995)						
Gray Brahman	42	0.39	20	1.60	20	499.7
Indu-Brazil	39	0.35	19	1.60	19	491.7
Difference		0.04*		0.00 NS		8.0 NS
Paschal et al. (1995)						
Gray Brahman	42	0.39	20	1.60	20	499.7
Nellore	46	0.36	21	1.50	21	480.1
Difference		0.03 NS		0.10 NS		19.6 NS
Cundiff (2005)						
Brahman			119	1.20	119	544.8
Nellore			101	1.26	101	557.5
Difference				−0.06 NS		−12.7 NS
Herring et al. (1996)						
Brahman			40	1.33	40	504.9
Boran			59	1.22	59	446.8
Difference				0.11*		58.1*
Cundiff (2005)						
Brahman			119	1.20	119	544.8
Boran			151	1.13	151	510.8
Difference				0.07*		34.0*
Brahman vs. *B. indicus*-derivative sire breeds						
Cundiff (2005)						
Brahman			119	1.20	119	544.8
Brangus			107	1.36	107	584.7
Difference				−0.16*		−39.9*
Cundiff (2005)						
Brahman			119	1.20	119	544.8
Beefmaster			103	1.41	103	602.4
Difference				−0.21*		−57.6*
Brahman vs. non-*B. indicus* subtropically adapted sire breeds						
Herring et al. (1996)						
Brahman			40	1.33	40	504.9
Tuli			43	1.18	43	454.3
Difference				0.15*		50.6*
Baker et al. (2001b)						
Brahman						573.8
Tuli						525.6
Difference						48.2*
Cundiff (2005)						
Brahman			119	1.20	119	544.8
Tuli			162	1.15	162	508.0
Difference				0.05*		36.8*
Cundiff (2005)						
Brahman			119	1.20	119	544.8
Romosinuano			102	1.23	102	535.2
Difference				−0.03 NS		9.6 NS
Cundiff (2005)						
Brahman			119	1.20	119	544.8

Continued

Table 2 (Continued). Postweaning trait comparisons involving progeny sired by subtropically adapted beef sire breeds

	Trait[1]					
	Postweaning		Feedlot			
Sire breed comparison	N	ADG, kg	N	ADG, kg	N	FBW, kg
Bonsmara			104	1.28	104	552.5
Difference				−0.08*		−7.7 NS
Sanders and Paschal (1987)[2]						
Zebu			79	1.49	79	489.5
Senepol			14	1.61	14	490.3
Difference				−0.12 NT		−0.8 NT
B. indicus-derivative vs. traditional *B. taurus* sire breeds						
DeRouen et al. (2000), Louisiana feedlot						
Brangus			27	1.17	27	551.0
Angus			30	1.17	30	577.0
Difference				0.00 NS		−26.0 NS
DeRouen et al. (2000), Oklahoma feedlot						
Brangus			39	1.68	39	557.0
Angus			30	1.62	30	562.0
Difference				0.06 NS		−5.0 NS
Wheeler et al. (2006)						
Brangus			107	1.36	107	569.7
Angus			103	1.43	103	582.0
Difference				−0.07*		−12.3 NS
Wheeler et al. (2006)						
Brangus			107	1.36	107	569.7
Hereford			102	1.37	102	564.7
Difference				−0.01 NS		5.0 NS
DeRouen et al. (2000), Louisiana feedlot						
Brangus			27	1.17	27	551.0
Gelbvieh			26	1.12	26	603.0
Difference				0.05 NS		−52.0*
DeRouen et al. (2000), Oklahoma feedlot						
Brangus			39	1.68	39	557.0
Gelbvieh			23	1.55	23	554.0
Difference				0.13 NS		3.0 NS
DeRouen et al. (2000), Louisiana feedlot						
Gelbray			31	0.86	31	527.0
Angus			30	1.17	30	577.0
Difference				−0.31*		−50.0*
DeRouen et al. (2000), Oklahoma feedlot						
Gelbray			25	1.61	25	549.0
Angus			30	1.62	30	562.0
Difference				−0.01 NS		−13.0 NS
DeRouen et al. (2000), Louisiana feedlot						
Gelbray			31	0.86	31	527.0
Gelbvieh			26	1.12	26	603.0
Difference				−0.26*		−76.0*
DeRouen et al. (2000), Oklahoma feedlot						
Gelbray			25	1.61	25	549.0
Gelbvieh			23	1.55	23	544.0
Difference				0.06 NS		5.0 NS
Wheeler et al. (2006)						
Beefmaster			103	1.41	103	587.9
Angus			103	1.43	103	582.0
Difference				−0.02 NS		5.9 NS

Continued

Table 2 (Continued). Postweaning trait comparisons involving progeny sired by subtropically adapted beef sire breeds

	Trait[1]					
	Postweaning		Feedlot			
Sire breed comparison	N	ADG, kg	N	ADG, kg	N	FBW, kg
Wheeler et al. (2006)						
Beefmaster			103	1.41	103	587.9
Hereford			102	1.37	102	564.7
Difference				0.04*		23.2*
B. indicus-derivative vs. non-*B. indicus* subtropically adapted sire breeds						
Wheeler et al. (2006)						
Brangus			107	1.36	107	569.7
Romosinuano			102	1.23	102	521.6
Difference				0.13*		48.1*
Wheeler et al. (2006)						
Brangus			107	1.36	107	569.7
Bonsmara			104	1.27	104	537.5
Difference				0.09*		32.2*
Wheeler et al. (2006)						
Beefmaster			103	1.41	103	587.9
Romosinuano			102	1.23	102	521.6
Difference				0.18*		66.3*
Wheeler et al. (2006)						
Beefmaster			103	1.41	103	587.9
Bonsmara			104	1.27	104	537.5
Difference				0.14*		50.4*
Non-*B. indicus* subtropically adapted vs. traditional *B. taurus* sire breeds						
Baker et al. (2001b)						
Tuli						525.6
Angus						576.3
Difference						−50.7*
Cundiff (2005)						
Tuli			162	1.15	162	508.0
Angus			142	1.42	467	594.7
Difference				−0.27*		−86.7*
Baker et al. (2001b)						
Tuli						525.6
Hereford						562.5
Difference						−36.9*
Cundiff (2005)						
Tuli			162	1.15	162	508.0
Hereford			448	1.38	448	580.2
Difference				−0.23*		−72.2*
Cundiff (2005)						
Bonsmara			104	1.27	104	552.5
Angus			467	1.42	467	594.7
Difference				−0.15*		−42.2*
Cundiff (2005)						
Bonsmara			104	1.27	104	552.5
Hereford			448	1.38	448	580.2
Difference				−0.11*		−27.7*
Sanders and Paschal (1987)						
Senepol			14	1.61	14	490.3

Continued

Table 2 (Continued). Postweaning trait comparisons involving progeny sired by subtropically adapted beef sire breeds

	Trait[1]					
	Postweaning		Feedlot			
Sire breed comparison	N	ADG, kg	N	ADG, kg	N	FBW, kg
Angus			28	1.58	28	480.8
Difference				0.03 NT		9.5 NT
Chase et al. (1998), phase II						
Senepol			56	1.21	56	414.0
Hereford			62	1.37	62	414.5
Difference				−0.16**		−0.5 NS
Cundiff (2005)						
Romosinuano			102	1.23	102	535.2
Angus			467	1.42	467	594.7
Difference				−0.19*		−59.5*
Phillips et al. (2006)						
Romosinuano	99	0.57	99	1.27	99	494.0
Angus	51	0.69	51	1.38	51	510.0
Difference		−0.12**		−0.11 NS		−16.0 NS
Cundiff (2005)						
Romosinuano			102	1.23	102	535.2
Hereford			448	1.38	448	580.2
Difference				−0.15*		−45.0*
Brown et al. (2008), heifers managed in drylot postweaning						
Romosinuano	12	0.84				
Hereford	12	1.04				
Difference		−0.20†				
Brown et al. (2008), heifers managed in drylot postweaning						
Romosinuano	12	0.84				
Gelbvieh	15	1.14				
Difference		−0.30†				
Brown et al. (2008), heifers managed in drylot postweaning						
Romosinuano	12	0.84				
Charolais	14	1.07				
Difference		−0.23†				
Brown et al. (2008), heifers managed in drylot postweaning						
Bonsmara	15	0.99				
Hereford	12	1.04				
Difference		−0.05 NS				
Brown et al. (2008), heifers managed in drylot postweaning						
Bonsmara	15	0.99				
Gelbvieh	15	1.14				
Difference		−0.15†				
Brown et al. (2008), heifers managed in drylot postweaning						
Bonsmara	15	0.99				
Charolais	14	1.07				
Difference		−0.08 NS				
Brown et al. (2008), heifers managed on wheat pasture postweaning						
Romosinuano	15	0.48				
Hereford	15	0.62				
Difference		−0.14†				
Brown et al. (2008), heifers managed on wheat pasture postweaning						
Romosinuano	15	0.48				
Gelbvieh	18	0.61				
Difference		−0.13†				

Continued

Table 2 (Continued). Postweaning trait comparisons involving progeny sired by subtropically adapted beef sire breeds

	Trait[1]					
	Postweaning		Feedlot			
Sire breed comparison	N	ADG, kg	N	ADG, kg	N	FBW, kg
Brown et al. (2008), heifers managed on wheat pasture postweaning						
Romosinuano	12	0.48				
Charolais	18	0.60				
Difference		−0.12†				
Brown et al. (2008), heifers managed on wheat pasture postweaning						
Bonsmara	17	0.50				
Hereford	12	1.04				
Difference		−0.54†				
Brown et al. (2008), heifers managed on wheat pasture postweaning						
Bonsmara	17	0.50				
Gelbvieh	18	0.61				
Difference		−0.11†				
Brown et al. (2008), heifers managed on wheat pasture postweaning						
Bonsmara	15	0.50				
Charolais	14	0.60				
Difference		−0.10†				
Brown et al. (2008), steers managed in drylot postweaning						
Romosinuano	13	1.02				
Hereford	14	1.02				
Difference		0.00 NS				
Brown et al. (2008), steers managed in drylot postweaning						
Romosinuano	13	1.02				
Gelbvieh	13	1.03				
Difference		−0.01 NS				
Brown et al. (2008), steers managed in drylot postweaning						
Romosinuano	13	1.02				
Charolais	12	1.15				
Difference		−0.13†				
Brown et al. (2008), steers managed in drylot postweaning						
Bonsmara	18	1.05				
Hereford	14	1.02				
Difference		0.03 NS				
Brown et al. (2008), steers managed in drylot postweaning						
Bonsmara	18	1.05				
Gelbvieh	13	1.03				
Difference		0.02 NS				
Brown et al. (2008), steers managed in drylot postweaning						
Bonsmara	18	1.05				
Charolais	12	1.15				
Difference		−0.10†				
Brown et al. (2008), steers managed on wheat pasture postweaning						
Romosinuano	15	0.63				
Hereford	23	0.74				
Difference		−0.11†				
Brown et al. (2008), steers managed on wheat pasture postweaning						
Romosinuano	15	0.63				

Continued

Table 2 (Continued). Postweaning trait comparisons involving progeny sired by subtropically adapted beef sire breeds

	Trait[1]					
	Postweaning		Feedlot			
Sire breed comparison	N	ADG, kg	N	ADG, kg	N	FBW, kg
Gelbvieh	16	0.71				
Difference		−0.08 NS				
Brown et al. (2008), steers managed on wheat pasture postweaning						
Romosinuano	15	0.63				
Charolais	15	0.72				
Difference		−0.09†				
Brown et al. (2008), steers managed on wheat pasture postweaning						
Bonsmara	30	0.68				
Hereford	23	0.74				
Difference		−0.06 NS				
Brown et al. (2008), steers managed on wheat pasture postweaning						
Bonsmara	30	0.68				
Gelbvieh	16	0.71				
Difference		−0.03 NS				
Brown et al. (2008), steers managed on wheat pasture postweaning						
Bonsmara	30	0.68				
Charolais	15	0.72				
Difference		−0.04 NS				

[1]FBW = final feedlot BW.

[2]Zebu collectively refers to average for Gray Brahman, Red Brahman, Gir, Indu-Brazil, and Nellore.

*P < 0.05; †P < 0.10; NS = not significant (P > 0.10); NT = not tested.

consistently outperform Tuli-sired progeny during the postweaning period. The final feedlot BW advantage for Brahman-sired progeny averaged approximately 45 kg. Romosinuano-, Bonsmara-, and Senepol-sired progeny performed similarly to Brahman-sired progeny.

Bos indicus-Derivative Versus Traditional Bos taurus Sire Breeds. In general, Brangus- and Beefmaster-sired progeny perform similarly to or slightly below Angus-, Hereford-, and Gelbvieh-sired progeny during the postweaning period. In contrast, Wheeler et al. (2006) indicated superior postweaning performance for Beefmaster-sired over Hereford-sired, but not Angus-sired, progeny. The results of DeRouen et al. (2000) were dependent on feedlot location, but in general indicated equal or subpar performance of Gelbray-sired progeny compared with Angus- or Gelbvieh-sired progeny.

Bos indicus-Derivative Versus non-Bos indicus Subtropically Adapted Sire Breeds. Wheeler et al. (2006) indicated superior postweaning performance for Brangus- and Beefmaster-sired progeny relative to Romosinuano- and Bonsmara-sired progeny. Specifically, advantages for final feedlot BW were substantial for the Brangus- and Beefmaster-sired progeny, averaging approximately 50 kg.

Non-Bos indicus Subtropically Adapted Versus Traditional Bos taurus Sire Breeds. Feedlot ADG and final feedlot BW of Tuli-, Bonsmara-, and Romosinuano-sired progeny are consistently lower than those of Angus- and Hereford-sired progeny. The results of Phillips et al. (2006), and the extensive results of Brown et al. (2008), indicate a consistent postweaning ADG advantage for Angus-, Hereford-, Gelbvieh-, and Charolais-sired progeny relative to Romosinuano- and Bonsmara-sired progeny.

Carcass Traits

Carcass trait comparisons (hot carcass weight, YG, QG, marbling score, Warner-Bratzler shear force value, LM area) involving progeny sired by subtropically adapted beef sire breeds are summarized in Table 3. Results are summarized by comparing sire breed means for each trait.

Brahman Versus Traditional Bos taurus Sire Breeds. Relative to Brahman-sired progeny, Angus-

Table 3. Carcass trait comparisons involving progeny sired by subtropically adapted beef sire breeds

		Trait[1]					
Sire breed comparison	**N**	**HCW, kg**	**YG**	**QG**	**MBS**	**WBS, kg**	**LM area, cm^2**
Brahman vs. traditional *B. taurus* sire breeds							
Koch et al. (1982)							
Brahman	128	308.2	3.7	8.8	9.4	3.9	70.5
Angus/Hereford	140	296.4	3.8	10.1	11.4	3.4	69.1
Difference		11.8 NS	−0.1 NS	−1.3*	−2.0*	0.5*	1.4 NS
Sanders and Paschal (1987)[2,3]							
Zebu	79	297.0	2.6	Gd	Sl		75.9
Angus	28	285.4	2.6	Ch	Sm		75.8
Difference		11.6 NT	0.0 NT	— NT	— NT		0.1 NT
Paschal et al. (1995)							
Gray Brahman	19	300.1	2.8	344.2	347.7		75.5
Angus	18	275.8	2.5	391.2	410.2		76.6
Difference		24.3*	0.3*	−47.0*	−62.5*		−1.1 NS
DeRouen et al. (1992)[4]							
Brahman	216	230.0			3.2	13.2	62.0
Angus	302	243.0			4.7	9.5	66.0
Difference		−13.0*			−1.5*	3.7*	−4.0*
Brown et al. (1999)							
Brahman	150	333.3	2.7		3.6		84.0
Angus	201	317.8	2.8		3.8		82.7
Difference		15.5 NS	−0.1 NS		−0.2 NS		1.3 NS
Baker et al. (2001b)							
Brahman		334.1	3.1		234.5	5.3	79.1
Angus		332.7	3.4		269.4	4.0	78.0
Difference		1.4 NS	−0.3*		−34.9*	1.3*	1.1 NS
Wheeler et al. (2001)[5]							
Brahman	119	332.0	3.3	30.0	472.9	6.0	72.9
Angus	127	352.0	3.5	84.0	553.0	4.1	75.8
Difference		−20.0*	−0.2 NS	−54.0*	−80.1*	1.9*	−2.9*
Amen et al. (2007b)							
Brahman	133	311.5			356.1	3.8	71.7
Angus	128	320.8			451.4	3.3	79.4
Difference		−9.3 NS			−95.3*	0.5 NS	−7.7*
DeRouen et al. (1992)[4]							
Brahman	216	230.0			3.2	13.2	62.0
Hereford	279	235.0			4.1	9.9	63.0
Difference		−5.0*			−0.9*	3.3*	−1.0 NS
Baker et al. (2001b)							
Brahman		334.1	3.1		234.5	5.3	79.1
Hereford		320.0	3.4		252.3	4.4	76.7
Difference		14.1*	−0.3 NS		−17.8 NS	0.9*	2.4 NS
Wheeler et al. (2001)[5]							
Brahman	119	332.0	3.3	30.0	472.9	6.0	72.9
Hereford	115	345.0	3.4	72.0	522.5	4.7	73.6
Difference		−13.0*	−0.1 NS	−42.0*	−49.6*	1.3*	−0.7 NS
DeRouen et al. (1992)[4]							
Brahman	216	230.0			3.2	13.2	62.0
Charolais	403	298.0			3.9	9.5	84.0
Difference		−68.0*			−0.7*	3.7*	−22.0*
Brahman vs. other *B. indicus* sire breeds							
Koch et al. (1982)							
Brahman	128	308.2	3.7	8.8	9.4	3.9	70.5
Sahiwal	141	284.7	3.5	9.1	9.8	4.3	69.0
Difference		23.5*	0.2 NS	−0.3 NS	−0.4 NS	−0.4 NS	1.5 NS

Continued

Table 3 (Continued). Carcass trait comparisons involving progeny sired by subtropically adapted beef sire breeds

	Trait[1]						
Sire breed comparison	**N**	**HCW, kg**	**YG**	**QG**	**MBS**	**WBS, kg**	**LM area, cm^2**
Crouse et al. (1989)							
Brahman	84	285.0			350.0	5.9	69.5
Sahiwal	88	258.0			355.0	6.9	67.3
Difference		27.0*			−5.0 NS	−1.0*	2.2 NS
Paschal et al. (1995)							
Gray Brahman	19	300.1	2.8	344.2	347.7		75.5
Red Brahman	21	307.4	2.7	347.0	345.5		77.0
Difference		−7.3 NS	0.1 NS	−2.8 NS	2.2 NS		−1.5 NS
Paschal et al. (1995)							
Gray Brahman	19	300.1	2.8	344.2	347.7		75.5
Gir	27	287.6	2.7	345.5	349.6		77.1
Difference		12.5 NS	0.1 NS	−1.3 NS	−1.9 NS		−1.6 NS
Paschal et al. (1995)							
Gray Brahman	19	300.1	2.8	344.2	347.7		75.5
Indu-Brazil	19	287.4	2.3	344.0	344.5		77.5
Difference		12.7 NS	0.5*	0.2 NS	3.2 NS		−2.0 NS
Paschal et al. (1995)							
Gray Brahman	19	300.1	2.8	344.2	347.7		75.5
Nellore	20	292.2	2.7	354.1	358.9		75.5
Difference		7.9 NS	0.1 NS	−9.9 NS	−11.2 NS		0.0 NS
Herring et al. (1996)							
Brahman	40	311.4	3.2		323.9	3.6	74.9
Boran	59	273.2	3.1		344.5	3.8	72.5
Difference		38.2*	0.1 NS		−20.6 NS	−0.2 NS	2.4 NS
Wheeler et al. (2001)[5]							
Brahman	119	332.0	3.3	30.0	472.9	6.0	72.9
Boran	151	310.0	3.1	47.0	503.3	5.1	74.0
Difference		22.0*	0.2 NS	−17.0*	−30.4*	0.9*	−1.1 NS
Brahman vs. non-*B. indicus* subtropically adapted sire breeds							
Sanders and Paschal (1987)[2,3]							
Zebu	79	297.0	2.6	Gd	Sl		75.9
Senepol	14	281.6	2.8	Gd	Sl		72.3
Difference		15.4 NT	−0.2 NT	— NT	— NT		3.6 NT
Herring et al. (1996)							
Brahman	40	311.4	3.2		323.9	3.6	74.9
Tuli	43	276.2	3.0		351.0	3.3	74.3
Difference		35.2*	0.2 NS		−27.1*	0.3 NS	0.6 NS
Baker et al. (2001b)							
Brahman		334.1	3.1		234.5	5.3	79.1
Tuli		304.2	3.0		257.6	4.2	78.8
Difference		29.9*	0.1 NS		−23.1*	1.1*	0.3 NS
Wheeler et al. (2001)[5]							
Brahman	119	332.0	3.3	30.0	472.9	6.0	72.9
Tuli	162	308.0	3.0	63.0	523.6	4.6	73.6
Difference		24.0*	0.3*	−33.0*	−50.7*	1.4*	−0.7 NS
B. indicus-derivative vs. traditional *B. taurus* sire breeds							
DeRouen et al. (2000), Louisiana feedlot							
Brangus	27	342.0	3.4	10.2	435.0	4.3	73.2
Angus	30	360.0	3.3	11.4	503.0	4.1	74.3
Difference		−18.0 NS	0.1 NS	−1.2*	−68.0*	0.2 NS	−1.1 NS
DeRouen et al. (2000), Oklahoma feedlot							

Continued

Table 3 (Continued). Carcass trait comparisons involving progeny sired by subtropically adapted beef sire breeds

Sire breed comparison	N	HCW, kg	YG	QG	MBS	WBS, kg	LM area, cm²
	Trait[1]						
Brangus	39	358.0	3.0	11.2	497.0	4.9	79.9
Angus	30	358.0	3.1	11.5	522.0	4.6	81.7
Difference		0.0 NS	−0.1 NS	−0.3 NS	−25.0 NS	0.3 NS	−1.8 NS
Bidner et al. (2002)							
Brangus	25	340.0	3.3	11.9	560.0	4.7	73.8
Angus	48	290.0	3.1	11.5	510.0	4.0	70.4
Difference		50.0*	0.2 NS	0.4 NS	50.0 NS	0.7 NS	3.4 NS
Wheeler et al. (2006)[5]							
Brangus	107	351.1	2.7	47.4	497.0	3.9	85.7
Angus	103	355.2	3.2	68.9	548.0	3.4	83.0
Difference		−4.1 NS	−0.5*	−21.5*	−51.0*	0.5*	2.7*
Wheeler et al. (2006)[5]							
Brangus	107	351.1	2.7	47.4	497.0	3.9	85.7
Hereford	102	343.4	2.9	51.6	515.0	3.7	81.7
Difference		7.7 NS	−0.2 NS	−4.2 NS	−18.0 NS	0.2 NS	4.0*
DeRouen et al. (2000), Louisiana feedlot							
Brangus	27	342.0	3.4	11.2	435.0	4.3	73.2
Gelbvieh	26	371.0	2.8	10.7	443.0	4.9	88.4
Difference		−29.0*	0.6 NS	0.5 NS	−8.0 NS	−0.6 NS	−15.2 NS
DeRouen et al. (2000), Oklahoma feedlot							
Brangus	39	358.0	3.0	11.2	497.0	4.9	79.9
Gelbvieh	23	353.0	2.4	10.7	456.0	5.3	87.5
Difference		5.0 NS	0.6 NS	0.5 NS	41.0 NS	−0.4 NS	−7.6 NS
DeRouen et al. (2000), Louisiana feedlot							
Gelbray	31	332.0	2.9	10.5	443.0	4.8	72.3
Angus	30	360.0	3.3	11.4	503.0	4.1	74.3
Difference		−28.0*	−0.4 NS	−0.9 NS	−60.0*	0.7 NS	−2.0 NS
DeRouen et al. (2000), Oklahoma feedlot							
Gelbray	25	344.0	2.8	10.8	460.0	5.0	80.0
Angus	30	358.0	3.1	11.5	522.0	4.6	81.7
Difference		−14.0 NS	−0.3 NS	−0.7 NS	−62.0*	0.4 NS	−1.7 NS
Bidner et al. (2002)							
Gelbray	19	354.0	2.5	10.8	461.0	4.7	86.7
Angus	48	290.0	3.1	11.5	510.0	4.0	70.4
Difference		64.0*	−0.6 NS	−0.7 NS	−49.0 NS	0.7 NS	16.3*
DeRouen et al. (2000), Louisiana feedlot							
Gelbray	31	332.0	2.9	10.5	443.0	4.8	72.3
Gelbvieh	26	371.0	2.8	10.7	443.0	4.9	88.4
Difference		−39.0*	0.1 NS	−0.2 NS	0.0 NS	−0.1 NS	−16.1 NS
DeRouen et al. (2000), Oklahoma feedlot							
Gelbray	25	344.0	2.8	10.8	460.0	5.0	80.0
Gelbvieh	23	353.0	2.4	10.7	456.0	5.3	87.5
Difference		−9.0 NS	0.4 NS	0.1 NS	4.0 NS	−0.3 NS	−7.5 NS
Bidner et al. (2002)							
Beefmaster	34	313.0	3.3	10.4	445.0	5.1	70.0
Angus	48	290.0	3.1	11.5	510.0	4.0	70.4
Difference		23.0 NS	0.2 NS	−1.1 NS	−65.0 NS	1.1 NS	−0.4 NS
Wheeler et al. (2006)[5]							
Beefmaster	103	357.9	3.1	32.1	483.0	4.1	82.3
Angus	103	355.2	3.2	68.9	548.0	3.4	83.0
Difference		2.7 NS	−0.1 NS	−36.8*	−65.0*	0.7*	−0.7 NS
Wheeler et al. (2006)[5]							
Beefmaster	103	357.9	3.1	32.1	483.0	4.1	82.3
Hereford	102	343.4	2.9	51.6	515.0	3.7	81.7

Continued

Table 3 (Continued). Carcass trait comparisons involving progeny sired by subtropically adapted beef sire breeds

		Trait[1]					
Sire breed comparison	**N**	**HCW, kg**	**YG**	**QG**	**MBS**	**WBS, kg**	**LM area, cm[2]**
Difference		14.5*	0.2 NS	−19.5*	−32.0*	0.4*	0.6 NS
Bidner et al. (2002)							
Simbrah	31	388.0	3.0	11.0	483.0	4.4	86.2
Angus	48	290.0	3.1	11.5	510.0	4.0	70.4
Difference		98.0*	−0.1 NS	−0.5 NS	−27.0 NS	0.4 NS	15.8*
B. indicus-derivative vs. non-*B. indicus* subtropically adapted sire breeds							
Wheeler et al. (2006)[5]							
Brangus	107	351.1	2.7	47.4	497.0	3.9	85.7
Romosinuano	100	318.4	2.3	33.7	488.0	3.8	83.6
Difference		32.7*	0.4 NS	13.7 NS	9.0 NS	0.1 NS	2.1 NS
Wheeler et al. (2006)[5]							
Brangus	107	351.1	2.7	47.4	497.0	3.9	85.7
Bonsmara	104	330.7	2.4	38.9	487.0	3.7	85.9
Difference		20.4*	0.3*	8.5 NS	10.0 NS	0.2*	−0.2 NS
Wheeler et al. (2006)[5]							
Beefmaster	103	357.9	3.1	32.1	483.0	4.1	82.3
Romosinuano	102	318.4	2.3	33.7	488.0	3.8	83.6
Difference		39.5*	0.8*	−1.6 NS	−5.0 NS	0.3*	−1.3 NS
Wheeler et al. (2006)[5]							
Beefmaster	103	357.9	3.1	32.1	483.0	4.1	82.3
Bonsmara	104	330.7	2.4	38.9	487.0	3.7	85.9
Difference		27.2*	0.7*	−6.8 NS	−4.0 NS	0.4*	−3.6*
Non-*B. indicus* subtropically adapted vs. traditional *B. taurus* sire breeds							
Baker et al. (2001b)							
Tuli		304.2	3.0		257.6	4.2	78.8
Angus		332.7	3.4		269.4	4.0	78.0
Difference		−28.5*	−0.4*		−11.8 NS	0.2 NS	0.8 NS
Baker et al. (2001b)							
Tuli		304.2	3.0		257.6	4.2	78.8
Hereford		320.0	3.4		252.3	4.4	76.7
Difference		−15.8*	−0.4*		5.3 NS	−0.2 NS	2.1 NS
Sanders and Paschal (1987)[3]							
Senepol	14	281.6	2.8	Gd	Sl		72.3
Angus	28	285.4	2.6	Ch	Sm		75.8
Difference		−3.8 NT	0.2 NT	— NT	— NT		−3.5 NT
Chase et al. (1998), phase II							
Senepol	56	261.0	2.7	566.0	369.5	4.9	69.9
Hereford	62	256.5	2.6	570.5	375.5	4.6	70.4
Difference		4.5 NS	0.1 NS	−4.5 NS	−6.0 NS	0.3 NS	−0.5 NS
Wheeler et al. (2006)[5]							
Romosinuano	102	318.4	2.3	33.7	488.0	3.8	83.6
Angus	103	355.2	3.2	68.9	548.0	3.4	83.0
Difference		−36.8*	−0.9*	−35.2*	−60.0*	0.4*	0.6 NS
Wheeler et al. (2006)[5]							
Romosinuano	100	318.4	2.3	33.7	488.0	3.8	83.6
Hereford	102	343.4	2.9	51.6	515.0	3.7	81.7
Difference		−25.0*	−0.6*	−17.9*	−27.0*	0.1*	1.9 NS
Phillips et al. (2006)							
Romosinuano	99	298.0	2.6	11.1	4.0		75.2
Angus	51	290.0	2.9	12.5	4.9		72.5

Continued

Table 3 (Continued). Carcass trait comparisons involving progeny sired by subtropically adapted beef sire breeds

		Trait[1]					
Sire breed comparison	N	HCW, kg	YG	QG	MBS	WBS, kg	LM area, cm²
Difference		8.0 NS	−0.3**	−1.4**	−0.9**		2.7*
Wheeler et al. (2006)[5]							
Bonsmara	104	330.7	2.4	38.9	487.0	3.7	85.9
Angus	103	355.2	3.2	68.9	548.0	3.4	83.0
Difference		−24.5*	−0.8 NS	−30.0*	−61.0*	0.3*	2.9*
Wheeler et al. (2006)[5]							
Bonsmara	104	330.7	2.4	38.9	487.0	3.7	85.9
Hereford	102	343.4	2.9	51.6	515.0	3.7	81.7
Difference		−12.7*	−0.5*	−12.7 NS	−28.0*	0.0 NS	4.2*

[1]HCW = hot carcass weight; MBS = marbling score; WBS = Warner-Bratzler shear force value.

[2]Zebu collectively refers to average for Gray Brahman, Red Brahman, Gir, Indu-Brazil, and Nellore.

[3]Gd = Good; Ch = Choice; Sl = Slight; Sm = Small.

[4]N values taken from Franke et al. (2001).

[5]QG refers to percentage of Choice carcasses.

***P* < 0.01; **P* < 0.05; NS= not significant (*P* > 0.10); NT = not tested.

and Hereford-sired progeny express higher marbling scores, higher QG, and lower Warner-Bratzler shear force values (indicating less carcass tenderness for Brahman-sired progeny). The lack of carcass tenderness expressed by Brahman-influenced cattle has been addressed previously (Thrift and Thrift, 2002).

Carcass YG and LM area tend to be similar for Brahman-, Angus-, and Hereford-sired progeny. With the exception of 2 studies (Paschal et al., 1995; Baker et al., 2001b), most studies have indicated similar or greater carcass weights for Angus-, Hereford-, or Charolais-sired progeny relative to Brahman-sired progeny.

Brahman Versus Other Bos indicus Sire Breeds. Brahman-sired progeny have greater carcass weights than Sahiwal- and Boran-sired progeny; however, carcass weight differences between Gray Brahman- and other *B. indicus*-sired progeny (Red Brahman, Gir, Indu-Brazil, Nellore) are small. All other carcass trait differences between Brahman and other *B. indicus* sire breeds appear small, although Wheeler et al. (2001) indicated advantages for Boran-sired progeny in terms of QG, marbling score, and Warner-Bratzler shear force value. These latter advantages for the Boran were not evident in the study by Herring et al. (1996).

Brahman Versus non-B. indicus Subtropically Adapted Sire Breeds. Brahman-sired progeny tend to have heavier carcass weights, lower marbling scores, similar or slightly higher Warner-Bratzler shear force values, and similar YG and LM area compared with Tuli-sired progeny. The slightly higher Warner-Bratzler shear force values for Brahman-sired progeny indicate a slight advantage for carcass tenderness of Tuli-sired progeny.

Bos indicus-Derivative Versus Traditional Bos taurus Sire Breeds. Relative to Angus- and Hereford-sired progeny, Brangus- and Beefmaster-sired progeny tend to have similar or lower marbling scores and QG. Overall, carcass weight, YG, Warner-Bratzler shear force value, and LM area tend to be similar for progeny of *B. indicus*-derivative and traditional *B. taurus* sire breeds. Carcass traits tend to be similar for Brangus- and Gelbvieh-sired progeny. With regard to marbling score, Gelbray- and Gelbvieh-sired progeny are similar; however, Gelbray-sired progeny have lower marbling scores than Angus-sired progeny.

Bos indicus-Derivative Versus non-Bos indicus Subtropically Adapted Sire Breeds. Brangus- and Beefmaster-sired progeny have greater carcass weights and higher Warner-Bratzler shear force values (indicating less carcass tenderness) than Romosinuano- and Bonsmara-sired progeny. Other carcass trait differences for these sire breed genetic types appear to be small.

Non-Bos indicus Subtropically Adapted Versus Traditional Bos taurus Sire Breeds. Tuli-, Romosinuano-, and Bonsmara-sired progeny have lighter carcass weights, lower marbling scores (especially true for Romosinuano and Bonsmara), and lower QG than Angus- or Hereford-sired progeny. Warner-Bratzler shear force values are similar for Tuli-, Angus-, and Hereford-sired progeny; however, Bonsmara- and Romosinuano-sired progeny tend to have higher Warner-Bratzler shear force values than Angus- or Hereford-sired progeny, indicating no advantage in carcass tenderness for these non-*B. indicus* subtropically adapted genetic types.

Carcass traits appear to be similar for Senepol-, Angus-, and Hereford-sired progeny.

IMPLICATIONS

Evaluation of several non-*B. indicus* subtropically adapted sire breeds suggests that some of these sire breeds may serve as alternatives to some *B. indicus* genetic types because of their ability to tolerate hot, humid conditions in the US Southeast and Gulf Coast areas. Specifically, considering Brahman as the standard *B. indicus* sire breed, results of this review indicate the non-*B. indicus* subtropically adapted sire breeds will contribute to less dystocia but are expected to sire progeny that weigh less at weaning, grow at a slower rate postweaning, and have lighter carcasses than Brahman-sired progeny. Further, progeny of non-*B. indicus* subtropically adapted sire breeds are expected to have slightly improved carcass merit, especially in regard to carcass tenderness, relative to Brahman-sired progeny. However, there appears to be no advantage in carcass merit for progeny of non-*B. indicus* subtropically adapted sire breeds relative to traditional *B. taurus* sire breeds such as the Angus and Hereford. Overall, the suitability of the non-*B. indicus* subtropically adapted sire breeds, as potential alternatives for *B. indicus* genetic types, can be determined only after maternal performance of F_1 females has been assessed. In addition, it is important to determine if price discounts, similar to those applied to *B. indicus*-influenced cattle, will be incurred for progeny of non-*B. indicus* subtropically adapted sire breeds when marketing occurs through traditional channels.

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