EVALUATION OF BRAHMANS AND TROPICALLY ADAPTED CROSSBREDS AND COMPOSITES FOR ECONOMICALLY IMPORTANT BEEF CATTLE TRAITS

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Abstract

This thesis compared straightbred Brahmans to tropically adapted composites for carcass quality, objective and sensory meat quality, feed efficiency, feeding behaviour and reproductive performance under tropical and subtropical conditions in northern Australian using typical commercial beef production practices. Straightbred Brahmans had carcasses up to 16% lighter than Continental (Charolais, Limousin) and British (Angus, Hereford, Shorthorn) sired crosses by Brahman dams ($P<0.001$), intermediate subcutaneous fat cover, retail beef yields and kilograms of retail primals, and low marbling. British and Belmont Red sired crossbreds had the highest marbling, while British and Santa Gertrudis sired crossbreds had the fattest carcasses. Continental crossbreds had the leanest, highest yielding carcasses with intermediate marbling. There was little difference between sire breeds for most objective and sensory meat quality traits. The exception was straightbred Brahmans with the highest LT shear force (5.39 ± 0.07; $P<0.001$), LT instron compression (1.89 ± 0.02; $P<0.05$) and LT and ST cooking loss ($P<0.05$). Straightbred Brahmans were the only breed that failed to meet minimum MSA (sensory) grading (CMQ4 = 38.3; $P<0.001$). Crossbreds with up to 75% Brahman content had acceptably tender beef (shear force < 5.0 kg, instron compression < 2.2 kg, CMQ4 score > 46.5). All measures of instron compression were below 2.2 kg indicating connective tissue toughness was not important in these animals slaughtered by an average of 24 months of age. There was little evidence of breed × finish and breed × market interactions. Straightbred Brahmans did not differ from Brahman crossbreds for residual feed intake (RFI). However, straightbred Brahmans had the lowest feed intake ($P<0.001$) and lowest average daily gain ($P<0.001$) overall. Angus × Brahman crosses were the least efficient feeders, consuming 35% and 13% ($P<0.001$) more feed than straightbred Brahmans and Charolais × Brahman crosses respectively. Charolais, Hereford, Limousin and Santa Gertrudis sired crosses were the most feed efficient (low RFI). Brahman females had lower pregnancy rates than composites when mated by AI (83.4% versus 76.9%; P=0.05), but breeds did not differ when joined by natural mating. Into mating weight, scanned subcutaneous rib fat depth and P8 fat depth significantly affected pregnancy rates and days to calving. Use of Brahmans crossbreds and tropically adapted composites would allow retention of adaptation and survival traits synonymous with the Brahman breed, coupled with improved carcass and meat quality, feed efficiency, and to some extent reproductive success, to ensure economic efficiency and profitability of beef production in northern Australia.

Certification

I certify that the substance of this thesis has not already been submitted for any degree and is not currently being submitted for any other degree or qualification.

I certify that any help received in preparing this thesis, and all sources used, have been acknowledged in this thesis.

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Signature

Table of Contents

List of Abbreviations and Acronyms

ABS	Australian Bureau of Statistics
ADG	Average daily gain by regression
AGE	Age at slaughter
AI	Artificial insemination
BCS	Body condition score
Beef CRC	Cooperative Research Centre for Beef Genetic Technologies
BREED	Breed
CLLT	Cooking loss percent of the LT muscle
CLST	Cooking loss percent of the ST muscle
CMQ4	MSA clipped meat quality score of 4 attributes
CWT	Hot standard carcass weight
DTC	Days to calving from first exposure to mating
EBV	Estimated breeding value
ENDWT	Liveweight at the end of the feed intake test period
expFI	Expected feed intake
FCR	Feed conversion ratio
FI	Daily feed intake adjusted to 12 MJ ME/kg DM
GLM	Generalised linear model
HGP	Hormonal growth promotant
HOTP8	Subcutaneous fat depth at the P8 rump site recorded on the hot carcass
HS	Hereford × Shorthorn

ICLT	Instron compression of the LT muscle
ICST	Instron compression of the ST muscle
IMF	Intramuscular chemical fat percentage of the LT muscle
IMWT	Into mating weight
KR	Kleiber ratio
LT	*M. longissimus thoracis et lumborum* muscle
MARC	Meat Animal Research Centre
ME	Metabolisable energy
MLA	Meat and Livestock Australia
MM	Mating method (AI, natural mating)
MMWT	Metabolic mid-weight
MP	Mating period
MSA	Meat Standards Australia
MWT	Average test period liveweight
NFI	Net feed intake
NIR	Near infrared spectrophotometry (used to measure IMF)
NM	Natural mating
ORIGIN	Property of origin
OSSIF	USDA ossification score
P8FAT	Scanned subcutaneous fat depth at the P8 rump site
pcRTPM	Retail primals as a percentage of hot standard carcass weight
PHLT	Ultimate pH of the LT muscle
PHST	Ultimate pH of the ST muscle

PLS	Previous lactation status
PR	Pregnancy rate
QTL	Quantitative trait loci
RBY	Adjusted retail beef yield percentage
RFI	Residual feed intake
RGR	Relative growth rate
RIBFAT	Scanned subcutaneous fat depth at the $12/13^{th}$ rib site
RTPM	Weight of 17 boneless retail primals
SESS	Number of feeding sessions per day
SFLT	Warner-Bratzler shear force of the LT muscle
SFST	Warner-Bratzler shear force of the ST muscle
SMART	Sensory Market Analysis and Research Technology
ST	*M. semitendinosus* muscle
STAGE	Age at start of the feed intake test period
STWT	Liveweight at the start of the feed intake test period
TIME	Time spent eating per day
TIMEkg	Time taken to eat 1 kg feed
USDA	United States Department of Agriculture
YEAR	Year of birth (carcass quality, meat quality, feed efficiency) or year of mating (fertility)