

# Quality Characteristics of Angus Beef for the Japanese Market Derived from Different Sources

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**SUMMARY:** Carcass assessment was performed on 83 Angus steers lot fed for 400 days in preparation for the Japanese market. They had a mean ( $\pm$ S.D.) hot carcass weight of  $349 \pm 25.9$  kg and a P8 fat depth of  $19.7 \pm 4.81$  mm.

The majority of carcasses had marbling scores of 2 or 3 (on a 12 point scale) and a fat colour score of 0 (on a 9 point scale). Carcasses with higher marbling scores tended to have higher fat colour scores. Property origin did not have a significant effect on marbling or fat colour scores. Meat colour showed the greatest variation measured.

The implications of the findings for servicing the Japanese market are discussed.

**INTRODUCTION:** The high marbling scores of Japanese bred cattle (ISHIDA et al., 1988; HARDA et al., 1990) indicate a propensity to accumulate intramuscular fat in comparison with Australian cattle. With impending liberalisation of the Japanese beef market there is interest in identifying animals that carry gene(s) for marbling (JOHNSON, 1990). It has commonly been asserted that marbling is a highly sought after trait with some evidence that palatability increases with marbling (SAVELL et al., 1987). In view of the financial incentive to produce marbled beef there is interest in identifying cattle with a propensity to marble prior to feedlotting (JOHNSON, 1990). Apart from the use of ultrasound (HARDA et al., 1990) there is possibly scope to optimise selection for feedlotting based on the known performance of cattle from specific sources.

This paper details the quality characteristics of lot fed cattle sourced from different properties.

**MATERIALS AND METHODS:** Eighty-three Angus steers from 16 different properties were lot fed for 400 days. Two properties submitted four steers, one ten and the remainder five. Steers were slaughtered under commercial conditions and trimmed according to the specifications of AUS-MEAT (ANON 1987). Hot carcass weights and dentition were recorded subsequent to slaughter. After chilling for 24 hours the carcasses were quartered between the 5th/6th ribs.

Subcutaneous fat depth was measured with vernier calipers at a point corresponding to the widest point of the longissimus thoracis et lumborum (EM). The dimensions (length and width) of this muscle were measured and the area (EMA) determined using the grid technique. Fat depth at the P8 site as described by HOPKINS (1989) was measured on both sides of the carcass with a cut-and-measure knife and the highest value taken if the measurements differed. A visual assessment of fat distribution was given on a 15 point scale (1 = very poor distribution to 15 = excellent, even cover).

Carcass quality was determined by a qualified assessor using the Australian chiller assessment system (BALL, 1990). Marbling was assessed using colour photographs on a 12 point scale (1 = zero marbling to 12 = very highly marbled) on the surface of the longissimus

thoracis et lumborum at the quartered site. Meat colour was assessed at the same site at least 20 minutes after quartering using silicon chips on a 9 point scale (1 = very light red to 9 = very dark red). Fat colour was assessed at the intermuscular seam at the end of the longissimus thoracis et lumborum furthest from the midline using silicon chips on a 10 point scale (0 = polar white to 9 = creamy yellow).

Correlation analysis and analysis of variance were used to examine the relationship between subcutaneous fat depth at the two measured sites and marbling. Cross tabulation and chi-square analysis were used to examine the relationship between marbling, fat colour, dentition and property source.

RESULTS: Summary details of the carcasses are shown in Table 1.

Table 1. Means ( $\pm$  S.D.) and ranges of carcass characteristics (n = 83)

	Mean	$\pm$ S.D.	Range
Hot carcass weight (kg)	349.0	25.9	281 - 419
P8 fat depth (mm)	19.7	4.81	10 - 33
EM fat depth (mm) <sup>+</sup>	9.3	0.28	3 - 16
EMA (cm <sup>2</sup> )	39.0	4.90	26 - 51
Marbling score	2.4	0.69	1 - 5
Fat colour score	0.05	0.215	0 - 1
Fat distribution score	7.1	1.76	4 - 13
Meat colour score	1.7	0.99	1 - 7

<sup>+</sup> For 79 carcasses

Analysis of the data showed there was no correlation between subcutaneous fat depth at either the P8 or EM sites and marbling. The mean P8 measurements for each marbling score (1-5) were 19, 19, 21, 15 and 20mm respectively with 76 of the carcasses being either marbling score 2 or 3.

The distribution (number of carcasses) for marbling and fat colour scores according to the source property is shown in Table 2.

Table 2. Distribution of marbling, fat colour and meat colour scores according to property of origin.

Property No.	Marbling score					Fat colour score		Meat Colour Score						
	1	2	3	4	5	0	1	1	2	3	4	5	6	7
1			3	1		4		3	1					
2	1	1	1	1		3	1	2	2					
3	1	1	3			5			5					
4	2	3				5		3	2					
5		5				5		1	3		1			
6		1	3	1		5		1	4					
7		3	2			5		1	3	1				
8		3	1	1		5		3	1	1				
9		3	1		1	5		2	3					
10		1	3			4	1	2	2	1				
11		3	2			4	1	5						
12		3	2			5		2	1	2				
13		5	5			10		10						
14		3	2			4	1	4	1					
15		2	3			5		4	1					
16		4	1			5		1	2		1			1

The property source of the steers did not have a significant effect ( $P > 0.05$ ) on the marbling or fat colour scores of the carcasses as determined by the Chi-square test. Since the bulk of the carcasses had marbling scores of 2 or 3 and fat colour scores of 0 this is expected. As marbling score increased meat colour score decreased although the effect was

not significant ( $P > 0.05$ ). There was a tendency for marbling scores to be related to fat colour, the distribution being only just significant ( $P = 0.05$ ). Dentition was significantly related to marbling score with older steers having higher marbling scores ( $P < 0.05$ ).

DISCUSSION: Although there were some small differences for marbling between steers from the various sources there was no evidence that one property produced cattle with a propensity to marble. This in no way implies that a genetic effect does not exist as evidence is emerging that specific sires produce progeny with a propensity to marble (P. DUNDON pers. comm.).

In accordance with other studies (BERRY and LEDDY, 1990) the data presented here showed no association between marbling and subcutaneous fat depth. HARDA et al. (1990) reported that prediction of marbling scores in bulls was not aided by early estimates of subcutaneous fat depth. This implies that under feedlot conditions accumulation of subcutaneous fat will be an inefficient indicator of increases in marbling. Significant economies could be made if cattle could be identified by non-invasive techniques such as ultrasound (JOHNSON, 1990) once minimum specifications for weight, fatness and time on feed are reached.

The marbling scores reported here are no higher than those from cattle lot fed for half the time which is the usual practice at the feedlot used in this study (D.L. HOPKINS unpublished data). It is apparent length of feeding is not a critical factor in the attainment of marbling. However the significant association between marbling and dentition may indicate that the weight-age ratio at entry to the feedlot is of some importance.

Despite the emphasis on marbling it must be borne in mind that this trait is not the most important to Japanese consumers. A recent survey (ANON 1990) showed that when purchasing meat for home use Japanese ranked the following in order of importance: 1) Freshness; 2) Country of Origin; 3) Price; and 4) Marbling.

Marbling was shown as an indicator of tenderness in this study with meat colour being associated strongly with freshness. The carcasses in this experiment would be considered ideal for this market in terms of fat colour whereas the 12% of carcasses which had meat colour scores greater than 2 would not be well received by Japanese consumers.

CONCLUSIONS: Potential exists to increase the efficiency of feedlotting beef for Japan by developing techniques which enable in-vivo assessment for marbling. There is invariably product variation with scope for shifting the distribution of various characteristics, meat colour being the most apparent in this study.

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