

EFFECT OF BREED TYPE ON CARCASS QUALITY OF CULL COWS

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SUMMARY: Sixty-seven cows varying in age from 4 to 11 years of age from British, Zebu and Dairy type were selected for this study. The aim was to verify the differences in carcass and meat quality of the experimental animals. The lowest muscle score was exhibited by the Dairy cows whilst Zebu showed more advanced bone maturity. Zebu also displayed a lower amount of marbling than the other two types. No difference was found for texture of the lean. Steaks from British cows were more tender both by objective and subjective evaluations. Total protein, moisture, myofibrillar protein, total and soluble collagen, pH and sarcomere length determinations, were similar for the three types. Zebu displayed a lower amount of sarcoplasmic protein and also a smaller number of fragmented muscle fibers. Those last two parameters, sarcoplasmic protein and muscle fiber fragmentation together with marbling, might help to explain the lower tenderness score found in the Zebu cows.

INTRODUCTION: Meat that comes from cull cows due to advanced age or reproduction problems, represents a high proportion of the red meat consumed in many Countries.

The consumer wants first of all, to buy a piece of meat that presents after cooking good tenderness, it is juicy and palatable.

What concerns breeds, Zebu cattle is by far the most raised breed type in the world. Comparisons between the meat from steers of different breeds, are abundant in the literature. This kind of work however, is limited in relation to cow meat.

Carpenter et al. (1955) found a decrease in tenderness with an increase in the percentage of Brahman breeding. Palmer et al. (1961) also reported Hereford steers to be more tender than Hereford

Brahman crossbred steers. Additional evidence indicating Brahman cattle to be less tender and more variable in tenderness than British breeds was presented by Cartwright (1957).

Moletta et al. (1987) in a work conducted in Brasil, compared Zebu (Nelore) steers with Angus, Charolais and Water Buffalo and found that Zebu presented tougher meat than the other 3 groups. In another work, Quadros et al. (1989) using Hereford x Zebu steers in different blood percentages, reported that as the Zebu percentage increased in the crosses the meat became less tender.

The same kind of result was obtained by Felten et al. (1989) when comparing Charolais, Zebu steers and their crosses. There was a tendency for Zebu steers to present tougher meat although the difference was not significant.

That Zebu steers produce meat less desirable in quality was also the conclusion of Crouse et al. (1989) when comparing Bos indicus and Bos taurus crosses. They found that in general marbling decreased as the percentage of Zebu breeding increased and the steers were less tender and more variable in tenderness.

The aim of this work was to compare meat quality and characteristics of Brahman, British and Dairy cows.

MATERIALS AND METHODS: A total of 67 cows were used in this study that were selected from cows over 4 years of age of British (mainly Hereford), Zebu (Brahman) and Dairy (Holstein) breeding type, that were slaughtered at the Lykes Packing Co. Plant at Plant City, Florida, USA. After 24 hs chill, the carcasses were ribbed between the 12th and 13th rib and marbling and lean texture evaluated. A portion of the shortloin from each carcass was transported to the Meat Laboratory at Gainesville, wrapped and stored at - 20 C until used for palatability and laboratory analyses.

Four steaks 2.5 cm thick were cut from the frozen shortloins;

numbered from anterior to posterior, steak 1 was used for Warner-Braztler shear evaluation, steak 2 for taste panel, steak 3 for chemical determinations and steak 4 for histological measurements.

The steaks for palatability determination were oven broiled to an internal temperature of 70 C. Total protein by Kjeldahl, extract content and moisture were determined following the standard procedure (A.O.A.C., 1960).

The method employed for determining myofibrillar and sarcoplasmic protein, was that described by Helander (1957). Soluble collagen fractions were separated according to the procedure of Hill (1966).

The pH measurements were taken from a suspension of 5 g of frozen, powdered muscle in 25 ml of distilled water. Sarcomere length and degree of fragmentation of the muscle fibers were determined following the procedure described by Berry (1972).

RESULTS AND DISCUSSION: The effect of breed type on certain carcass characteristics is presented in Table 1.

Table 1.- Least square means for certain carcass characteristics according to breed type

	Zebu n=14		British n=30		Dairy n=23	
	Mean	SE	Mean	SE	Mean	SE
Muscle score ^c	12.6ab	.73	13.2a	.48	11.7b	.60
Bone maturity ^d	12.2a	.58	11.8ab	.38	11.6b	.48
Marbling amount ^e	11.7b	.74	14.0a	.48	13.1a	.61
Lean texture ^f	3.9	.32	4.4	.21	4.1	.26

^{ab} Means bearing the same superscripts are not (P .05) significantly different

^c 10= Standard minus, 12= Standard plus, 13= Good minus

^d 11= D, 12= D plus, 13= E minus

^e 11= Small, 12= Small +, 13= Modest -, 14= Modest

^f 3= Coarse, 4= Slightly coarse, 5= Moderately fine

British carcasses presented a higher muscling score than Dairy and Zebu whereas Zebu cows were slightly more mature in bone ossification. Both British and Dairy carcasses exhibited higher marbling scores than Zebu carcasses.

Müller et al. (1984) reported that cull Charolais and Devon cows presented small amounts of marbling. The same kind of result was also reported by Müller and Grassi (1986) in Charolais and Angus cows. That Zebu carcasses present lower amounts of marbling than British breeds was the conclusion of Crouse et al. (1989). No significant difference was found for texture of lean although there was a tendency for Zebu to present meat a little more coarse.

The results of palatability comparisons among breed groups are presented in Table 2.

Table 2.- Least square means for organoleptic characteristics according to breed type

	Zebu n=14		British n=30		Dairy n=23	
	Mean	SE	Mean	SE	Mean	SE
Shear value kg	8.4b	.75	7.0a	.45	8.4b	.62
Panel tenderness ^c	11.6b	1.30	15.1a	.85	12.4b	1.07
Panel juiciness ^c	15.5	.97	14.8	.64	14.4	.80
Panel flavor ^c	14.4ab	.53	15.2a	.35	14.1b	.44

ab Means bearing the same superscripts are not (P .05) significantly different

- c 1= inedible, extremely dry, undesirable
- 14= average
- 27= Extremely tender, ext. juicy, ext. desirable

Steaks from British carcasses were significantly more tender when evaluated by the panel and through the Warner-Bratzler shear device, although considerable variation was found within each breed

group. That Zebu carcasses present less tender meat than British was also reported by Palmer (1963), Moletta et al. (1987), Quadros et al. (1989) and Crouse et al. (1989). Müller et al. (1984) reported shear value of 9.2 for Charolais and Devon cows whilst Müller Grassi found a shear value of 7.5 for Charolais and Angus cows.

Chemical determinations showed a few important differences, Table 3.

Table 3.- Least square means for chemical characteristics according to breed group^d

	Zebu n= 14		British n= 30		Dairy n= 23	
	Mean	SE	Mean	SE	Mean	SE
Total protein	% 21.50	.28	21.13	.18	21.27	.23
Moisture	% 73.78	.53	72.43	.34	73.04	.44
Ether extractable fat%	3.43 ^c	.55	5.50 ^a	.36	4.41 ^b	.46
Miofibrillar protein						
mg/g	121.95	4.61	124.15	4.54	117.12	6.00
Sarcoplasmic protein						
mg/g	77.27 ^b	2.04	81.94 ^a	2.00	82.38 ^a	2.65

abc Means bearing the same superscripts are not (P .05) significantly different

^d All the chemical determinations are expressed on a whole tissue basis.

Ether extractable fat was significantly higher in British cows, followed by the Dairy group with the Zebu carcasses having the lowest amount. These results are in agreement with the findings of Cole et al. (1964). No significant difference was found for the miofibrillar protein content but Zebu cows displayed a lower amount of sarcoplasmic protein in relation to the other two groups. In the present study a simple correlation coefficient of .44 (P .05) was obtained between amount of sarcoplasmic protein and panel tenderness.

Some other chemical and histological determination are presented in Table 4.

Table 4.- Least square means for chemical and histological characteristics according to breed type ^c

		<u>Zebu n= 14</u>		<u>British n= 30</u>		<u>Dairy n= 23</u>	
		<u>Mean</u>	<u>SE</u>	<u>Mean</u>	<u>SE</u>	<u>Mean</u>	<u>SE</u>
Total collagen	mg/g	4.33	.79	4.76	.78	4.97	1.03
Soluble collagen	%	7.02	.76	6.53	.75	6.79	.99
pH		5.57	.08	5.59	.08	5.53	.10
Number muscle fibers		14.10 ^b	3.07	22.60 ^a	3.02	20.75 ^a	4.00
Sarcomere length		1.88	.04	1.88	.05	1.94	.06

^{ab} Means bearing the same superscripts are not (P .05) significantly different

^c All the determinations are expressed on a whole tissue basis

There was no significant difference for collagen content (total and soluble), pH and sarcomere length between the 3 groups. The number of fragmented muscle fibers, however, was significantly lower for the Zebu cows in comparison with British and Dairy. Fukazawa et al. (1969) reported a close association between the amount of sarcoplasmic protein and muscle fiber fragmentation. As reported by Crouse et al. (1989), Bos indicus carcasses presented lower fragmentation scores when compared with Bos taurus. In the present work a correlation coefficient of .43 (P .05) was found between degree of muscle fiber fragmentation and marbling. -.78 with shear value and .75 (P .01) with panel tenderness.

CONCLUSIONS: It can be concluded from this study that Zebu cows produce less tender meat than British, mainly due to a lower deposition of intramuscular fat, less amount of sarcoplasmic protein and a higher degree of cohesion among muscle fibers. Dairy cows also pre-

sented similar values with relation to these 3 parameters to British, but did not differ in tenderness with Zebu cows.

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