Carcass and Meat Quality of Cattle and Buffalo (Bubalus bubalis)

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SUMMARY: Eleven Charolais and eight buffalo steers were used in this study. Both groups were slaughtered with 2 years of age and live weight of 434 and 435 for cattle and buffalo. The following data was obtained for cattle and buffalo respectively: hot carcass weight of 252 and 231, dressing % of 58 and 53, conformation Good and Standard. Charolais were younger in physiological maturity, presented larger Longissimus area, less external fat and shorter limbs. Charolais also presented better proportion in the major cuts and less forequarter. The physical composition showed that buffaloes had less lean and more bone. Buffaloes also displayed less marbling, coarser texture and darker color of lean. No significant difference was observed in tenderness, but Charolais meat was judged with more juice and flavour.

INTRODUCTION:Water buffalo (Bubalus bubalis) was first introduced in Brasil around the year 1890 and was explored with minimun care mainly in the northern portion of the Country. In the last few years, however, there is a growing interest in this specie in all regions of Brasil, due mainly to its hability to digest poor high-fiber grass and adaptation to wet lands where cattle does not perform well. Another point is the claim from buffalo breeders that the meat presents less cholesterol than other mammalian meat, which is supported by the work of YADAVA and SINGH (1974).

Differing from the rest of the world, this specie is being raised for meat production and only aventually for milk or/and labor. Normally this kind of meat is sold in butcher shops and supermarkets without any identification as was provenient from cattle.

Work comparing carcass quality of buffalo and cattle is limited. In a stydy conducted at the University of Florida, USA, by CARPENTER et al. (unpublished) it was found that buffaloes had lower dressing % than Angus x Brahman bulls, what was confirmed by ROBERTSON et al. (1986) and ARIMA et al. (1990) mainly due to its heavier hide, head and feet, when comparing them with Zebu. The first two works also found that buffalo meat was significantly darker in color. The Florida work also reported higher bone percentage in buffalo carcasses.

What concerns palatability the majority of the workers found little differences in tenderness, juiciness and flavour between the meat from buffalo and cattle, CARPENTER et al. (unpublished), CHARLES and JOHNSON (1972), CHARLES (1982) and ROBERTSON et al. (1984).

The objective of the present work was to compare carcass and meat quality from Charolais and Buffalo.

MATERIALS AND METHODS: Eleven Charolais and eight Mediterranean buffalo steers were used in this study. They were kept on grass and slaughtered at 2 years of age at same live weight. After 24 hs chill, the right side was utilized for objective and subjective measurements. The side was ribbed between the 12th and 13 th rib for evaluation of the Longissi-

mus dorsi area, fat thickness, marbling, color and texture of the lean.

A portion of the loin (9-10-11 rib cut) was used for estimating the physical composition of the carcass following the procedure of HANKINS and HOWE (1946). The left side was divided into the 3 major cuts as is used in Brasil: pistol cut (round, rump and loin with 8 ribs), forequarter (5 ribs) and side. A portion of the loin was transported to the Meat Laboratory at the University and stored in a freezer at - 20C until used for palatability studies. From each loin 2 steaks were removed and roasted to an internal temperature of 70C. Steak 1 for the taste panel (5 persons) and number 2 for objective determination of tenderness through the Warner-Bratzler shear device.

RESULTS AND DISCUSSION: Table 1 presents the carcass yield of the two species. The lower dressing percentage displayed by buffalo is in accordance with the work of CARPENTER et al. (umpublished), 59 versus 62% for cattle, ROBERTSON et al. (1986), 49.6 versus 52.6% and ARIMA et al. (1990), 52 and 56,8% for buffalo and Zebu steers. The higher chilling loss observed in the buffalo may be due to the lighter carcass weight and less amount of marbling (table 5). ARIMA et al. (1990) reported a chilling loss of 1.1% for buffalo and .8% for Zebu.

TABLE 1. CARCASS YIELD OF CHAROLAIS AND BUFFALO STEERS

		Charolais	n=11	Buffalo	n=8	
		Mean	SD	Mean	SD	
Live weight	kg	434.00	45.86	435.00	24.34	NS
Hot carcass weight	kg	251.78	20.59	230.78	11.65	*
Dressing percentage	%	57.88	1.89	53.09	1.84	**
Chilling loss	%	1.49	.19	2.15	.47	**

The results of several measurements can be seen in table 2.

TABLE 2. OBJECTIVE MEASUREMENTS IN THE CARCASSES OF CHAROLAIS AND BUFFALO STEERS

		Charolais	n=11	Buffalo	n=8	
		Mean	SD	Mean	SD	
Loin area	cm^2	72.90	6.61	50.16	3.00	**
Fat thickness	mm	3.36	1.74	5.32	2.20	NS
Carcass length	cm	122.86	3.84	123.68	3.12	NS
Leg length	cm	67.36	1.48	69.81	2.92	*
Arm Length	cm	37.95	2.95	40.87	1.72	*
Arm perimeter	cm	37.13	.77	34.87	.83	**
Thickness of cushion	cm	22.86	2.06	23.75	.84	NS

The smaller area in the Longissimus muscle displayed by buffaloes agrees with the work of CARPENTER et al. (unpublished) that found 68.4 cm^2 versus 86.9 from Brahman crosses. External fat and carcass lenth did not differ between the two species. Buffaloes however had significantly longer legs and arms. Arm perimeter, an expression of muscling, favored Charolais. No difference was found in the thickness of cushion.

As stated by BERG (1976), the water buffalo seems to have a greatly reduced proportion of total muscles surrounding the spinal column. The same author cites that BUTTERFIELD suggested that this in being associated with lumbar vertebrae, which are different from cattle. He also stated that buffaloes had longer limbs, which may reflect the greater agility of the buffalo in swampy ground.

Tabel 3 presents the proportion of the 3 major cuts in the carcass.

TABLE 3. PROPORTION OF THE THREE MAJOR CUTS IN THE CARCASSES OF CHAROLAIS AND BUFFALO STEERS.

		Charolais Mean	n=11 SD	Buffalo Mean	n=8 SD	
Pistol cut[a]	%	48.77	.68	47.37	1.01	**
Forequarter	%	37.03	1.09	37.94	.67	*
Side	%	14.17	.92	14.66	.71	NS

[a] Round, rump and loin with 8 ribs

Charolais presented a significantly higher percentage of pistol cut whilst buffaloes displayed heavier forequarter and side. The proportion of the 3 cuts for Charolais is somewhat different from data reported by MÜLLER (1982) that found 50.8, 36.0 and 13.2% for pistol cut, forequarter and side respectively. The carcass weight, however, was lighter, 221 kg, which may explain the differences. The results of this work for buffaloes, closely agree with the data reported by ARIMA et al. (1990): 47.1, 38,2 and 14,6%.

The physical composition of the carcasses is reported in table 4.

TABLE 4. PHYSICAL COMPOSITION OF THE CARCASSES OF CHAROLAIS AND BUFFALO STEERS

		Charolais Mean	n=11 SD	Buffalo Mean	n=8 SD	
Muscle	%	65.07	2.66	58.28	2.94	**
Fat	%	19.91	1.78	22.32	3.24	*
Bone	%	15.36	1.23	18.48	1.36	**

Buffaloes presented significantly lower proportion of muscle, more fat and heavier skeletal. The work conducted by CARPENTER et al. (unpublished) also found that buffaloes had higher proportion of bones: 22.56 versus 17.77 for cattle, no significant difference in lean and more fat in cattle, 29.91 versus 24.36%. The work, however, compared buffalo with early-maturing cattle (Angus crosses) whilst in the present study, a late-maturing breed of cattle was used.

Some subjective evaluations are displayed in table 5.

TABLE 5. SUBJECTIVE EVALUATIONS OF THE CARCASSES OF CHAROLAIS AND BUFFALO STEERS

	Charolais n=11		Buffalo n=8		
	Mean	SD	Mean	SD	
Conformation [a]	11.36	1.12	9.00	.92	**
Color of lean [b]	5.00	.10	3.00	.75	**
Texture of lean [b]	4.45	.52	2.62	.50	**
Marbling [c]	5.27	2.28	3.12	1.72	*
Physiological maturity [d]	12.72	.47	11.00	.53	**

[a] 1-3=Inferior, 7-9=Standard, 10-12=Good, 16-18=Superior

[b] 1=Very dark, very coarse, 5=Bright red, very fine

[c] 1-3=Traces, 4-6=Slight

[d] 10-12= B 13-15= A (USDA Systhem)

Charolais presented better conformation, brighter color of the lean, finer texture, more marbling and were physiologicaly more young than buffaloes. CARPENTER et al. (unpublished) also found that buffaloes were more mature, presented less marbling and were darker in color than cattle, but they did not report any difference in texture.

Organoleptic measurements of the meat is presented in table 6.

TABLE 6. ORGANOLEPTIC DETERMINATION OF CHAROLAIS AND BUFFALO MEAT

		Charolais n=11		Buffalo n=8		
		Mean	SD	Mean	SD	
Thawing losses	%	7.99	1.84	5.62	1.84	*
Cooking losses	%	27.57	2.31	30.22	3.17	*
Panel tenderness [a]		6.32	.71	5.90	.86	NS
Panel juiciness [a]		6.70	.64	5.20	.54	**
Panel flavour [a]		6.09	.34	5.27	.51	**
Shear force	kg	6.57	1.40	5.59	.84	NS

[a] 1=Ext. tough, dry, undesirable flavour, 5= Average
9=Ext. tender, juicy, flavorful

Buffaloes showed lower thawing but higher cooking losses. No significant difference was found in tenderness, either subjective or objectively, but the meat from Charolais was judged more juicy and with better flavour, CARPENTER et al. (umpublished), NASCIMENTO et al. (1978) and CHARLES (1982) also failed to detect any difference in palatability between cattle and buffalo. ROBERTSON (1984), however, reported that in the pressure-heated treated samples, the force values were significantly lower for beef than for buffalo, indicating that the latter has a tougher connective tissue. In a later work ROBERTSON et al. (1986)

stated that although differences in tenderness were not large, they were consistent in favor of beef due mainly to the greater contribution of connective tissue to the toughness of buffalo.

CONCLUSION: It can be concluded from this study that buffaloes produce a fairly good carcass with acceptable meat quality.

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