AGING EFFECTS IN MEAT QUALITY TRAITS ON DIFFERENT MUSCLES OF CULL COWS

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Abstract – The Brazilian beef shows tenderness inconsistency. Moreover, most females slaughtered are cull cows, about six years which aggravates the lack of tenderness. There is the opportunity to mitigate this problem by meat ageing, but there is a question whether this would have impact on cows from *Bos indicus* genotype. The aim of this study was to evaluate the effects of ageing on the meat quality of adult females. Forty Nellore cull cows, between 4 and 12 years old were used. Statistical analyses were performed using the statistical program R. The instrumental (shear force) and sensory tenderness showed improvements over the ageing time.

Key Words – tenderness, proteolysis, Nellore.

I. INTRODUCTION

Cull cows represent a large proportion of cattle slaughtered in Brazil. The age at slaughter has a great impact on beef tenderness. This attribute is a major quality issue for consumers [1]. The use of techniques such as meat ageing helps to improve meat tenderness and it represents an important strategy to produce tender meat with more consistency.

The natural meat tenderization in refrigerated conditions is related to a proteolytic process, especially with the calpain system [2]. The activity of calpastatin 24 h post-slaughter was identified as the single indicator that shows the highest correlation with tenderness of beef verified by instrument (shear force), after 14 days ageing [3]. However, calpastatin activity 24 hours is higher for *Bos indicus* cattle [3], which limit the proteolysis extention and rate. The aim of this study was to evaluate the effects of ageing on the meat quality of Nellore cows.

II. MATERIALS AND METHODS

The experiment was conducted at the Brazilian National Beef Cattle Research Center/EMBRAPA. The muscles used in the analyses were removed from carcasses of 40 Nellore females with known age (4-12 years). Different muscles were evaluated based upon: tenderness expectation, easiness to obtain during boning and suitability for organoleptic evaluations. The muscles chosen were: *Longissimus dorsi* (LD), *Semitendinosus* (ST) and *Triceps brachii* (TB). The meat was vacuum packaged and aged for 1 and 14 days *post-mortem* at refrigerated conditions (4 ºC). After aging process, steaks of one inch width were obtained for the analysis. The organoleptic evaluations were carried out as described by Müller [4]. Panel scores were assigned by trained panelists according to a hedonic scale of 1 to 9, as the perception of tenderness, juiciness, palatability, ease of fragmentation and residuals. For the shear force analysis of steaks, subsamples were taken in longitudinal orientation of muscle fibers, and analyzed using a TA-texturometer TX Plus (Stable Microsystems). Statistical analyses were performed using the statistical program R [5].

III. RESULTS AND DISCUSSION

The ageing process yielded differences ($P < 0.05$) in the thawing, cooking and the total losses (Table 1). The objective (shear force) and sensory tenderness showed improvements over the ageing time. This effect is explained by the myofibrillar and cytoskeletal proteolysis by calpain [6]. The degradation of proteins cause weakening of myofibrils. There were differences ($P<0.05$) on

juiciness, due to increased water retention in meat subjected to ageing. The ease of fragmentation and residuals were also changed (P<0.05) demonstrating that the ageing improved the organoleptic attributes. However palatability did not show any improvement (P> 0.05).

Table 1 Sensory attributes *Longissimus dorsi* muscle from Nellore cull cows

Variables	Unit	Aged*	Not aged	Effect
Thawing loss	%	3.77	2.78	0.0261
Cooking loss	%	34.11	37.47	0.0001
Total loss	%	36.60	39.21	0.0001
Shear Force	kgf	6.66	9.45	0.0001
Tenderness[1]		14.24	18.10	0.0001
Juiciness[2]		16.83	15.91	0.0487
Palatability[3]		16.83	16.59	0.6658
Ease fragmentation		12.29	10.33	0.0001
Residual	%	42.10	54.13	0.0001

*aged for 14 days vacuum packaged under refrigerated conditions; [1]Values 1-27, 9 classes (1 = very hard to 9 = extremely tender) at three levels (less, typical and more); [2]Values 1-27, 9 classes (1 = very dry 9 = extremely juicy) at three levels (less, typical and more); [3]Values 1-27, 9 classes (1 = extremely unpleasant to 9 = extremely pleasant) at three levels (less, typical and more); [4]Values 1-21, and 7 classes (1 = not fragmented to complete fragmentation = 7) at three levels (less, typical and more).

There was interaction (P <0.05) between muscle and aging time for the variable shear force (Figure 1). The muscles *Triceps* b*rachi* and *Longissimus dorsi* showed significant drop in shear force after the ageing process. The *Semitendinosus*, however, showed only a slight reduction which may be related to higher amount of connective tissue unaltered by ageing [7]. Another reason is that the proteolytic process is not uniform for all muscles. Both levels of calpain and the calpastatin vary muscle to muscle [8], regulating muscle protein degradation during *post mortem* storage.

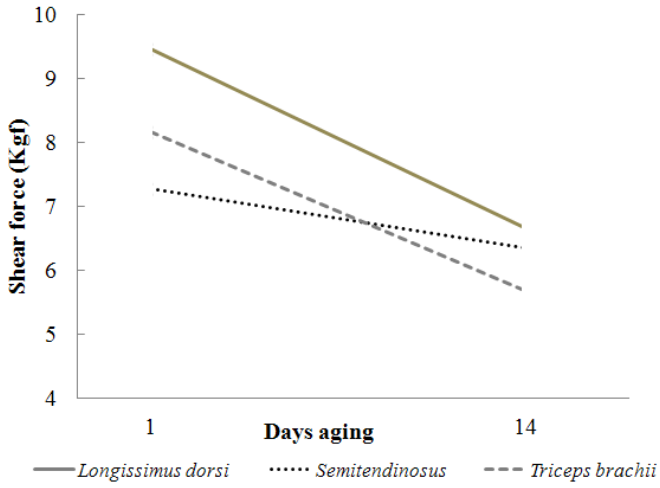

Figure 1. Shear force in three muscles, at 1 and 14 days of ageing, from Nellore cull cows

IV. CONCLUSION

Ageing is an effective process for improving the quality of meat from Nellore cull cows. On the other hand, the extension of the results is dependent on the type of muscle.

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