SENSORY CHARACTERISTICS OF MURRAH BUFFALOES MEAT SUBMITTED TO DIFFERENT PERIODS OF AGEING

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Abstract – The aim of this study was to evaluate the sensory characteristics of *Longissimus dorsi* muscle of Murrah buffaloes during different stages of ageing. Muscle samples were collected from ten 20 - 24 months animals at 24 hours *post mortem*. After the slaughtering, the samples were submitted to 0, 7, 14 and 21 days of aging, until the analyses time of pH, loss of weight by cooking, shear force, meat color and fat color. According to the results, it was observed that ageing alters pH values (P<0.05) and, although this change isn't linear, all pH values favor the ageing process, associated with increased activity of proteolytic enzymes. Ageing enhances the softness of Murrah buffaloes meat by significantly reducing the shear force (P<0.05). The 20.43 days presented the best values for softness, less that 5kgf, although meat's intensity of red and luminosity, and fat color changes were observed. Thus, it is concluded that the choice of the most suitable ageing time for buffalo meat depends on the attribute to be valued.

I. INTRODUCTION

Some meat quality parameters, such as tenderness, *flavor* and juiciness have fundamental impact on the choice of the product by the consumer. Nowadays, the use of alternative technologies that favor such attributes have been broadcast by many meat industries. Ageing is an alternative, which consists in keeping the meat, after the process of rigor mortis under 0-1°C for a period of time after slaughter, which may range from 7 to 28 days , aiming to improve the organoleptic characteristics of meat, including the most important ones such as tenderness, juiciness and *flavor* (1). In cattle, there are many studies evaluating different stages of ageing on beef tenderness. The industry uses an average ideal point of 14 days of aging, however, for buffaloes this data requires elucidation.

Thus, the present study aims to evaluate the effects of different ageing times on meat physical characteristics of young buffalo feedlot finished.

II. MATERIALS AND METHODS

For this research, ten 24 month-old male Murrah buffaloes were used. The animals were finished in feedlot and slaughtered at the slaughterhouse Fribordogue - SP, under State Inspection Service (SISP). Carcass remained in cooling chambers for 24 hours, after this period, was held section of *Longissimus dorsi*

muscle between the 8th and 13th ribs. All samples were transported to the Laboratory of Food Science in the Faculty of Animal Science, UNESP - Dracena, where were separated transverse sections with approximately 2.5 cm of width in BECCARO Band Saw model 255, following the protocol of sampling. Then each section was vacuum packaged in Packing JETVAC®, posteriorly, these samples remained under-refrigeration (0°C) in the maturation chamber for 0, 7, 14 and 21 days until the analyses time. A completely randomized design was used with four treatments and ten replicates per treatment, set out in split plots, being the plots consisted of the animals and the subplots days of ageing. The analyzes of the aged samples evaluated were: pH according to the method described by Beltran et al. (1997), weight loss by cooking (WLC) and shear force (SF) used the texturometer equipped with a Warner-Bratzler device (AMASA, 1995) and meat color and fat according to the methodology described by Honikel (1998). All analyzes were performed at the Department of Economics, Sociology and Technology Campus of UNESP-Botucatu - SP, Brazil. Data were submited to statistical analyzes using SAS (SAS Institute, 2008) program to achive a polynomial regression analysis for each variable, at 5%.

III. RESULTS AND DISCUSSION

Mean values for pH, weight losses by cooking, shear force, fat and meat color of Murrah buffaloes *Longissimus dorsi* muscle submitted to different periods of ageing are shown in Table 1.

According to data, it was observed that values of pH had significant quadratic regression (P<0.05). The final pH mean values found in all treatments, were higher than those observed by Andrade et al., (2010), that worked with Nellore and North Red cattle and found averages of 5.48 for both breeds. In terms of ageing, low pH values found by these authors are associated with low activity of proteolytic enzymes and low meat tenderness, since μ and m calpains present an optimal pH near 7 (2). Given this information, the pH values found in the present work could favor the ageing process, so that there are reductions in shear force over the same.

Table 1. Mean values of pH, weight losses by cooking, shear force, color of the fat and color of *Longissimus dorsi* muscle Murrah buffaloes submitted in different periods of ageing.

	Days of ageing				CV (%)	R
	0	7	14	21		
Softness						
pH	5,6	5,7	5,8	5,7	1,5	Q[1]
WLC	27,6	26,4	26,6	25,2	13,7	Ns
SF	8,7	7,6	6,0	4,9	18,6	L[2]
Color of the meat						
L*	32,1	34,3	35,4	36,7	4,6	L[3]
a*	16,3	15,2	12,9	15,6	12,2	Q[4]
b*	7,3	7,4	6,9	7,9	11,8	Ns
Color of the fat						
L*	75,8	71,1	67,9	66,7	3,16	Q[7]
a*	1,25	7,76	8,6	8,8	15,3	Q[8]
b*	6,3	7,5	7,8	8,1	13,4	L[9]

WLC = Weight losses by cooking (%); SF = shearing force (kgf); L * = Luminosity; a * = Intensity of red; b * = Intensity of yellow. CV – Coefficient of variation, R – Regression, Ns - Not significant; L – Linear; Q – Quadrátic.

Y1 = -0,0006x2 + 0,0153x + 5,6299 (R^2 = 0,55)
Y2 = -0,1854x + 8,7893 (R^2 = 0,99)
Y3 = 0,2147x + 32,372 (R^2 = 0,97)
Y4 = 0,0192x2 - 0,4664x + 16,654 (R^2 = 0,71)
Y5 = 0,1665x + 24,549 (R^2 = 0,68)
Y6 = -0,0146x + 2,2081 (R^2 = 0,75)
Y7 = 0,0179x2 - 0,8108x + 75,798 (R^2 = 0,99)
Y8 = -0,0119x2 + 0,4185x + 5,1774 (R^2 = 0,98)
Y9 = 0,0835x + 6,558 (R^2 = 0,88)

Weight loss by cooking (WLC) indicates the amount that the meat lost during the cooking process and may affect the juiciness of it. According to the data, the cooking loss wasn't affected by the different ageing times (P>0.05). These results differ from those found by

Andrade et al. (2010) that evaluated cattle meat aged for 1, 7, 14 and 21 days and observed that the average obtained at 14 days was higher than the averages obtained at 1, 7 and 21 days, explaining this variation by the vagueness of technical and changes of time/temperature during the cooking process, but also explains that the changes may have been due to ageing (3). However, these authors also justify that the higher weight loss by cooking at 14 days wasn't maintained at 21 days.

Regarding the shear force, according Felicio (1997), the values of shear force must be under 5.0 kgf from consider the meat soft. According to the data, only treatment with 21 days of maturation obtained the average value recommended by Felicio (1997). However, if we had considered in this paper, a value of 5.0 kgf as an ideal point of the ageing to consider the buffalo meat as soft, from that point through this process, it would be at 20, 43 days of ageing. Comparing the mean values of the treatment, there were significant reductions in shear force over time of ageing and there was a decreasing linear regression, so that reductions of 0 to 7 days, 7 and 14 days and between 14 and 21 days were 1.15; 1.58 and 1.07 kgf, respectively.

About the meat color, according to data, aging time interfered in mean values of L* and a* ($P<0.05$), and didn't change the mean values of b* ($P>0.05$). When evaluated the variable L* as a function of the ageing period, it is observed that mean values increased during the storage time, and presented increasing linear regression, which indicates an increase in Luminosity. These data corroborate to the ones found by Manço (2006), that evaluated aged beef cattle for 2, 7, 14, 21, 28, 35, 42 and 49 days, and justified the increase in the level of luminosity by the fact that the vacuum used in packaging tends to draw water from intra- and extracellular space of the muscle fiber and this water carries other components present in the cell, among them myoglobin which is soluble in water, giving the exudate. With longer storage times, there is formation of these exudate and, thus a higher amount of myoglobin is removed from the meat resulting in higher values of L *.

The variable a* indicates the intensity of red and is related to the oxymyoglobin content in muscle. The larger the value, more red is the meat (4). The variability found in the mean values of a* was statistically significant ($P>0.05$), indicating that there was a decrease in the average value of a* at 14 days of ageing, and at 21 days the intensity of red started to stabilize. Due to these variations in the average values of the intensity of red, the straight that best represented was the quadratic regression. These data differed from those reported by Manço (2006) that indicated stability of the color during the storage period. Moreover, Irurueta et al. (2008) observed that the intensity of red decreased during the ageing period.

As for the fat color, the mean values for Luminosity (L*) decreased over the ageing period, being explained by the quadratic regression equation. When evaluating the independent parameters of ageing, it is observed that the data for the luminosity of the fat in the samples that had not undergone the ageing process are similar to findings reported by Rodrigues et al., (2004), who found values of luminosity of 75.9 in Mediterranean buffaloes.

The intensity of red (a*) in the fat increased during ageing period, being explained by the quadratic regression equation, which allowed to find the point where the higher intensity of red in the fat occured (8.86) at 17 and 58 days of ageing. This increase in the intensity of red may have occurred due to the greater time that the meat fat was exposed to the exudate of the meat vacuum packaged.

The intensity of yellow (b*) increased throughout the ageing period, represented by the increasing linear regression. According Irie (2001) the highest intensity of yellow is mainly affected by absorption of carotene and derivatives of hemoglobin, which probably increased during the ageing.

IV. CONCLUSION

The ageing alters pH values and although this change isn't linear, all pH mean values favor the ageing process, associated with increased

activity of proteolytic enzymes, when compared to studies cited in the literature. Ageing enhances the softness of Murrah buffaloes meat by significantly reducing the shear force, and the best softness obtained values were at 20,43 days, less that 5kgf, and it modifies the intensity of red and luminosity of the meat and fat color. Thus, it is concluded that the choice of the ageing time most suitable for buffalo meat depends on the attribute valued.

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