

## FRAGMENTATION INDEX AND SHEAR FORCE OF AGED LAMB MEAT

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**Abstract** – To evaluate changes in the fragmentation index and shear force of lamb meat, maturated for seven days, 48 lambs were used without defined breed, neutered, with an average weight of 15kg. The animals were slaughtered with 32kg and, approximated, five months. It was used a completely randomized design (CRD) in 2x2x2 factorial arrangement with two maturation times (0 and 7 days), two muscles (*Triceps brachii* and *Gluteos biceps*) and supplemented animals (0.7% of body weight) and not supplemented. The results were subjected to analysis of variance and, if significant, compared by Tukey test at 5%. The shear force decreased from 3.45 kgf/cm<sup>2</sup> to 2.74 kgf/cm<sup>2</sup> and myofibrillar fragmentation index increased from 115.04 to 139.78, both when meat was maturated for seven days, showing that maturation provides softness to the sheep meat.

### I. INTRODUCTION

Maturation is a process that occurs after the rigor mortis and consists of natural changes which occur in the meat during storage, involving the effect of temperature and storage period at temperatures close to 0° C. This process can cause changes in the organoleptic characteristics of the meat [1]. This, results the softening of the meat and the appearance of flavor and smells, important and desirable to the consumer while purchasing the product [2]. Meat from sheep features constant speed of maturation (k) 0.21 / day, reaching 80% maturity I 7.7 days and a temperature of 10° C. However, the meat of cattle has k = 0.17 / day, 9.5 days needed for the same maturation state.

### II. MATERIALS AND METHODS

*Triceps brachii* and *Glúteos biceps* muscles from 48 lambs, without defined breed (SPRD), non-castrated, acquired with an average weight of 15 kg and approximately four months of age were used. The animals were raised in a Tifton 85 forage [Cynodonlemfluensis Vanderyst ynodondactylon x (L) Pers], with residual leaf area index of 2.6. The lambs were kept overnight

in individual stalls when then received supplemental feeding referring to 0.7% of their body weight. A protein-energy concentrate with 18% crude protein, containing ground whole corn, cottonseed meal and mineral premix was used. Upon reaching an average weight of 32 kg and approximately five months, confinement were fasted solid diet and water for 16 hours. Later, they were stunned electronarcosis 220V for 8 seconds being severed the jugular veins and carotid arteries for bleeding, according to procedures that characterize the humane slaughter [3]. After the process of slaughter, the carcasses were weighed and chilled in the refrigerator at 4° C for 24 hours. After 24 hours post - mortem, muscle *Triceps brachii* and *Glúteus biceps* of the right half carcass were removed, identified, vacuum packed and aged at temperatures of 0 ± 1 ° C for seven days. Analysis of shear force and fragmentation index were performed before (control) and after the maturation process. To determine the shear force, the samples were previously baked in a preheated 175°C kiln, until the temperature at the geometric center of the samples, monitored by a thermocouple, reached 75°C. Sub-samples with 1.27cm of diameter were taken and subjected to cutting; a texturometer "Texture Analyzer model TA- XT2i" coupled to "Warner-Bratzler device" was used. Myofibrillar of fragmentation index was determined according Culler et al. [4].

### III. RESULTS AND DISCUSSION

The results for the fragmentation index and shear force are shown in table 1.

It is observed that the maturation increases mean values of MFI, being a characteristic of proteolytic processing of the meat, and reduces the shear force of the samples, indicating the softness after the maturation for seven days.

Table 1 Averages of the effects of maturation, muscles and feed supplementation in qualitative analyzes of myofibrillar fragmentation index (MFI) and shear force (SF)

	MFI	SF (kgf/cm <sup>2</sup> )
Maturation (M)		
No maturation	115.04 B	3.45 A
Maturation for 7 days	139.78 A	2.74 B
P-value (M)	0.0016	0.0002
Muscle (MS)		
<i>Triceps Brachii</i>	102.27 B	2.77 B
<i>Gluteos biceps</i>	152.55 A	3.42 A
P-value (MS)	<0.0001	0.0006
Supplementation (S)		
0 % PV	136.94 A	3.00
0.7 % PV	117.88 B	3.18
P-value (S)	0.0118	0.2845
P-value (MxMS)	0.0253	0.0302
P-value (MxS)	0.1184	0.2013
CV (%)	15.62	15.08

Means followed by different letters in the column differ at 5% probability. CV = coefficient of variation

Still, the *Triceps brachii* presented softer than the shank and non-supplemented animals present higher MFIs (136.94) than those supplemented (117.88). It wasn't observed a significant influence of supplementation in shear force. Pinheiro et al. [5] found a value of shear force of 2.00 kgf / cm<sup>2</sup> for lambs. This amount is closer to that found in this study, which was 2.77 kgf/cm<sup>2</sup>. According to the breakdown table (Table 2), it is observed that the *Triceps brachii* has a increased MFI and the shear force of the *Gluteos biceps* decreased after seven days of maturation. Therefore, maturation was only effective for muscle *Triceps brachii*, not interfering in the MFI of the *Gluteos biceps*. Gonçalves et al. [6] explain that when the values for shear force are already low, featuring a soft flesh, the influence of the maturation process is imperceptible. No influence of supplementation on HR was observed only for the MFI.

Table 2 Breakdown of the interaction between maturation and muscles for variables myofibrillar fragmentation index (MFI) and shear force

	IFM	
Maturation	<i>Triceps brachii</i>	<i>Gluteos biceps</i>
No maturation	81.54 Bb	148.53 Aa
Maturation for 7 days	122.99 Ab	156.58 Aa
FC		
No maturation	2.942 Ab	3.96 Aa
Maturation for 7 days	2.605 Aa	2.871 Ba

Means followed by different lowercase and uppercase letters in rows in columns differ by Tukey test (5%).

#### IV. CONCLUSION

The maturation of lamb meat for seven days provides an increase of the myofibrillar index fragmentation (MFI) probably causing the softness of the meat and a posterior shear force decrease. The different muscle groups show different behavior during maturation.

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