EVOLUTION OF REFRIGERATED AND VACUUM-PACKAGED BEEF TEXTURE

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Abstract – The choice to buy beef depends on its tenderness and color as the acceptability of a product by the consumers depends on its general appearance. The texture of three beef muscles was observed for 90 days. They were vacuum-packaged and stored at 4ºC ± 1ºC. The cuts were obtained from the muscles *Longissimus lumborum, Semitendinosus, y Quadriceps femoris*. These were studied in triplicate, so 9 cuts could be obtained, divided in 11 equal parts. During the first 30 days, they were analyzed every 5 days and during the remaining 60 days, they were analyzed every 15 days. The most significant texture variation was observed during the first 30 days of storage. Afterwards, there was no variability.

Keywords: tenderness, meat maturation, bovine.

INTRODUCTION

Texture is the sensorial feature of food that is perceived by the senses of touch, sight and hearing. It is observed when the food undergoes a deformation [1].

Among the aspects of texture, tenderness is listed as the most important feature in relation to palatability of meat, followed by taste and juiciness. Texture is affected by factors such as age, sex and muscle location in the animal's body [3]; the size of the bundles of muscle fibers, the number and diameter of these as well as the quantity of connective tissue also have direct influence on texture [4]. In relation to this, Prändl et al. state that the pieces of meat with a higher level of marbling are less tough than those with less intramuscular fat.

I. MATERIALS AND METHODS

Beef from young bovine carcasses was used. The muscles *Longissimus lumborum*, *Semitendinosus* and *Quadriceps femoris* were considered for the study. The three cuts were obtained from the same carcass. The study was carried out in triplicate, because three randomly chosen half-carcasses were used, which finally produced 9 cuts. Each cut was divided in 11 parts and these were vacuum-packaged. They were refrigerated (4°C ± 1°C). In order to assess the texture of vacuum-packaged meat during storage, a 2 mm thick piece of meat was taken from each cut with a surface of 15.90 cm^2. All pieces were cut in longitudinal direction in relation to muscle fibers. This value was measured using a Kramer shear cell in the universal testing equipment INSTRON model 4451 with test samples with controlled thickness and surface. A repetition was carried out for each piece and each cut of fresh commercial beef in samples A, B and C. The fall rate was 10.00 mm min^{-1}. During the first 30 days, the pieces were analyzed every 5 days and during the remaining 60 days, they were analyzed every 15 days.

II. RESULTS AND DISCUSSION

When comparing and charting the muscle in the course of time, it is demonstrated that the three muscles tend to show the same behavior in the considered period. In the case of the peak or tensile strength, Figure 1 shows that the three muscles began with a higher tensile strength on the 1st day, which gradually decreased until the 20th day and remained relatively constant until the 90th day. Additionally, it is shown that *Longissimus lumborum* is tenderer than *Quadriceps femoris* and this is tenderer than *Semitendinosus* as the maximal strength on the 1st day is much higher in *Semitendinosus*. The irregularity of the curve for the 25th day in *Quadriceps femoris* and on the 30th day in *Semitendinosus* is caused by the specific characteristics of the pieces of meat, such as remaining nerves, fat and connective tissue.

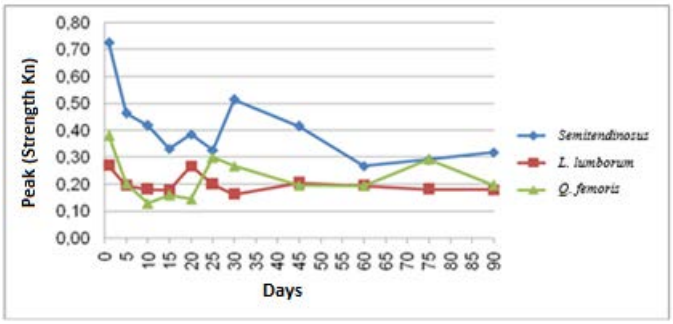

Figure 1. Tensile strength measured with INSTRON equipment during the 90 days of storage of vacuum-packaged meat at 4°C in the muscles *Longissimus lumborum*, *Semitendinosus* and *Quadriceps femoris.*

When charting the integral under the curve (Figure 2), the same result is obtained, so it is concluded that from the 30th day of refrigeration until the 90th day, there is no difference in relation to tenderness. This means that, only in consideration of this aspect, a piece of commercial meat should have a minimal storage of 30 days.

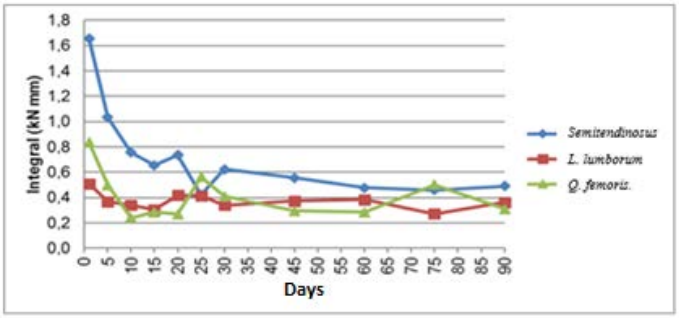

Figure 2. Evolution of toughness in the course of the vacuum-packaged storage of 90 days at 4°C in the muscles *Longissimus lumborum, Semitendinosus* and *Quadriceps femoris.*

Olivan *et al*. (2013) state that there is a general pattern of tenderization and, therefore, they recommend an aging period for bovine meat of 1-3 weeks, depending on the products, since not all pieces of meat have the same characteristics. For this reason, the tenderization process can have different rates based on the type of meat. Additionally, the muscles with diverse muscle fibers have different change patters during the transformation from muscle to meat, since, for example, type II fibers are predominant, glycolysis is fast, which leads to an accelerated pH decrease in the muscle [6].

III. CONCLUSION

In the 3 muscles observed in this study, the texture changes are observed during the first 20 days of vacuum-packaged storage at 4°C. From then on, no changes were observed in the course of time.

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