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Researches Regarding the Meat Texture of *Simmental* Breed

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Abstract. This paper is part an extensive study regarding the indicators of cattle meat quality. Cattle meat quality is determined by a number of traits, among which the most important is tenderness. The criteria for assessing the quality of cattle meat are given mainly by tenderness, juiciness, flavor and aroma. The aim of this paper is to assess the texture of cattle meat. Researches were performed on a total of 12 samples heat treated from carcasses of *Simmental* cattle breeds randomly selected on the technological slaughter. Shear force was measured on *Longissimus dorsi* using a Warner-Bratzler device. The results obtained allow the qualitative assessment of Simmental breed meat regarding the texture being able to make a comparison with data from literature. Changes in tenderness begin immediately after slaughtering and continues to grow after rigor mortis stage. So, the time and conditions during the aging of meat increase quality by improving tenderness.

Keywords: tenderness, *Longissimus dorsi*, bovine carcasses, slaughtering, shear forces

INTRODUCTION

Verbeke *et al.* (2010) mention that tenderness is one of the most important factors regarding consumer perception of meat quality, with freshness, flavor, aroma and juiciness (Lynn Van Wezemael, 2013).

Identifying factors influence and give tenderness of bovine getting attention to all researchers, because meat texture assessment is considered one of the most important organoleptic and physical characteristics. Tenderness and other parameters related to the texture of the meat is directly associated with the myofibrillar proteins structure, with the connective tissue content and interaction between them.

Changes in beef tenderness can be assigned with the animal age, sex, live weight, muscle type, breed, ante-mortem stress and to technological treatments applied. Chilling meat in a short time immediately after slaughter causes strong contraction of muscle fibers and the occurence of the "cold shortening" phenomenon which requires a higher shear force (Razminowicz *et al.*, 2006).

Tenderness begins immediately after slaughtering and continues to grow after rigor mortis stage. In order to improve the uniformity of the meat quality on its tenderness, beef meat must be aged for least 14 days (in practice usually the meat is allowed only for 5 days).

Meat that is aged for long period of time develops and acquires strange odors and gain a tint of altered and spoiled meat. Tenderness is influenced by the cattle genetic material and it is necessary to achieved a genetic selection before being slaughtered in order to reduce problems related to variations in meat tenderness. Progressive degradation of myofibrils under the action of proteolytic enzymes in muscle produces an improvement in tenderness.

Sañudo *et al.* (2004) argued that the tenderness depends on the structure of myofibrils of muscle tissue, the collagen content and its stability to the action of heat. This

seems to be influenced mainly by the physiological processes involved in the growth rate of cattle and less than their genotype.

Tenderness can be determined by sensory methods using the help of consumer or instrumental methods (Hildrum *et al.*, 2009). The most common laboratory method, which determines the tenderness, is the measurement of Warner-Bratzler shear force.

MATERIALS AND METHODS

Warner Bratzler shear force was determined on *Longissimus dorsi* muscle samples, taken from 12 *Simmenta*l cattle breeds randomly selected, slaughtered in a slaughterhouse equipped according to European standards, from the Iasi County.

Muscle samples were collected after performing the operations included in the slaughter flow and chilling half-carcasses of cattle. Measurements were performed at 24 hours after cutting half-carcasses in distinct anatomical regions, thereby were taken about 100 g of each *Longissimus dorsi* being properly packed, labeled and transported under appropriate conditions.

The analyses were performed on samples taken from *Longissimus dorsi* muscle after 1 day and 7 days postmortem. Meat was preserved by chilling during the determinations, in appropriate circumstances at 4°C. Once with the process of aging meat the sensory qualities and organoleptic characteristics of meat are improved, therefore aging process is the main reason for tenderness increases.

Textural analysis were realized on the same samples used for cooking loss, carried out for 45 minutes at 75^{o}C in polythene bags, and then allowed to cool about 4 hours.

Using a Warner–Bratzler device with a triangular hole of 60° in the shear blade, mounted on a Lloyd TA Plus texture analyzer (Llyod, UK) the samples were cylinders 20 mm on diameter and cut perpendicularly to the fiber direction. Test speed was 100 mm/min., making cores of 7g each. This device is connected to software that automatically calculates the shear forces, according to the cutting - deforming curve and expressed in a diagram in the form of drops (Honikel, 1998). Were studied by five repetitions of each cattle in part, thus we realized a number of databases, with modifications for each series.

RESULTS AND DISCUSSIONS

Tenderness begins immediately after slaughtering and continues to grow immediately after rigor mortis phase (*Tab. 1*).

Table 1 presents the mean values and their variations depending on the time of aging the meat from *Simmental* breed. Thus, there is a clear increase in *Longissimus dorsi* muscle tenderness, from an average of 47.25 N, obtained from bovine no. 4, reaching 38.91 N, after the state of rigor mortis has passed.

Decrease of the diameter of muscle fibers occur immediately after meat processing because the tenderness is at a maximum level when the meat achieve an certain temperature, that differ from each muscle and animals.

Meat from sample no. 8 showed the highest toughness, requiring a shearing force of 67.08 N at one day after slaughter and 51.22 N at 7 days after slaughter.

Differences of WBSF values were found earlier in carcasses weighing less than the larger ones of the same breed. Meat aging process involves muscle proteolysis.

Even if Šárka Hanzelková *et al.* (2011) achieved higher results in terms of tenderness at different aging periods, the results allowed us qualitative assessment of meat from Simmental breed.

Tab. 1

Warner Bratzler shear force (N) of meat from Simmental breed at 1 and 7 days postmortem

Indi-cator	No. samples	1 day			7 days		
		$\overline{X} \pm s_{\bar{x}}$	V%	Min. – Max.	$\overline{X} \pm s_{\bar{x}}$	V%	Min. – Max.
WARNER BRATZLER shear force (N)	1	62.98 ± 1.011	3.588	60.35 – 66.57	50.57 ± 1.134	5.014	47.90 – 53.62
	2	52.40 ± 2.860	12.203	41.90 – 58.45	42.08 ± 0.574	3.050	40.63 – 43.76
	3	47.42 ± 1.254	5.914	44.65 – 51.82	38.97 ± 0.434	2.489	37.99 – 40.51
	4	47.25 ± 0.914	4.323	44.11 – 49.09	38.91 ± 0.825	4.742	37.07 – 41.91
	5	56.05 ± 6.048	24.127	45.77 – 79.80	47.65 ± 2.066	9.693	41.36 – 52.91
	6	55.58 ± 3.726	14.990	46.02 – 65.83	48.85 ± 2.461	11.267	40.75 – 54.76
	7	56.04 ± 3.158	12.601	47.81 – 65.75	46.77 ± 2.840	13.580	38.52 – 52.59
	8	51.47 ± 3.614	15.701	44.65 – 65.20	43.42 ± 1.077	5.547	40.65 – 46.00
	9	53.28 ± 3.496	14.674	46.02 – 65.83	44.78 ± 1.301	6.499	40.78 – 48.76
	10	67.08 ± 10.082	33.606	52.50 – 106.94	51.22 ± 0.899	3.926	49.24 – 53.93
	11	56.57 ± 2.869	11.340	48.93 – 62.79	48.73 ± 0.619	2.840	46.81 – 50.09
	12	56.82 ± 2.150	8.463	52.22 – 62.96	50.70 ± 0.799	3.525	48.25 – 53.00

CONCLUSION

Tenderness of the meat varies depending on a number of factors including aging time thereof. Such as the storage time under suitable conditions increases, the shear force values decrease. Hence, with a proper aging time we can increase the final quality of the cattle meat.

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