CHARACTERIZATION OF TEXTURE PROFILE IN HORSE MEAT SLAUGHTERED IN N-E ROMANIA

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Abstract

Regarded as an alternative to other meat, horse meat must capitalize on an important aspect for the final consumer, that being the meat tenderness. The complex process which forms the meat texture is influenced by the structure, integrity and other factors internal or external, factors that may influence this process negatively or positively.

In order to proposed determinations for characterize the texture of horse meat were studied two groups of muscle tissue: m. Longissimus dorsi, m. Semitendinosus, derived from four categories of animals: youth and adults ♂, respectively youth and adult ♀. To describe the textural profile of meat, in the study were analyzed the following parameters: hardness (N), cohesiveness, adhesiveness (J) gumminess (N), elasticity, chewing, specific parameters determined on the basis of mechanical tests that simulate conditions to which the meat is exposed to mastication.

The meanings of statistical analyzes for horse meat lots analyzed showed differences for parameters toughness and cohesiveness between lots from those of females and adults.

Key words: chewing, horse, texture

INTRODUCTION

Specialized literature mentions that there are few studies on color, texture and tenderness of horse meat, but suggests that appropriate tenderness is reached between the 4th and 5th day postmortem [3].

Thus, it is concluded that it is very important to define the term "aging time" because the organoleptic characteristics of meat can be significantly influenced by the time of sale. To this end, butchers specializing in the sale of horse meat they keep the meat to mature for 4 days, after that they sell it.

A high influence on tenderness muscles was recorded also in other species, and can be explained by different physiological muscle function in relation to anatomic position involving different histological characteristics: quality and solubility of collagen, sarcomere length [1] [4].

Texture or tenderness are the most important factors, essential for red meat consumer [2]. Tenderness expressed by shear forces (kgf) offers information about the meat hardness. *Longissimus lumborum* muscle was tender than *Semitendinosus* muscle and shear forces were lower, probably due to the high content of intramuscular fat and low connective tissue.

MATERIAL AND METHODS

In order to determine the texture profile of the studied samples it was necessary to apply a compressive force to the sample in order to obtain a deformation. The deformation operation was performed by Lloyd universal texturometer LFP Plus, composed of a cylinder with flat faces with 45 mm diameter, imitating the human jaw action.

Experimental samples were initially subjected to a heat treatment in bain and cutting them into a cylindrical shape with a diameter and height of 20 mm was carried out at room temperature to press the samples with a cylinder, parallel with the direction of muscle fibers.

RESULTS AND DISCUSSIONS

Regarded as an alternative to other meat, horse meat must capitalize on an important aspect to meet the consumer, that being the tenderness of meat. The complex process which forms the texture of meat is influenced by the structure, integrity and other internal and external factors, factors that could negatively or positively influence the process.

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Describing the textural profile of meat in the study were analyzed the following parameters: hardness (N), cohesiveness, adhesiveness (J) gumminess (N), elasticity, chewing, specific parameters on the basis of mechanical tests that simulate conditions when meat is exposed to mastication.

Analyzing the lots under study on M. *Longissimus dorsi* showed hardness values between 33.96 ± 2.41 (N) and 37.20 ± 2.65 (N) suitable for L1 and L4 lot. By calculating the coefficient of variation values were obtained values between 22.25 ÷ 24.06%, which exemplifies a character without uniformity. This differences for this parameter is due to the content of intramuscular fat, connective tissue structure, structure of the muscle fiber, protein and water content in the muscle.

The average for the second parameter - cohesiveness, ranged between 0.42 ± 0.007 0.48 ± 0.003, lows registered by the L3 lot, while L4 shows the higher ones.

Gumminess average values ranging between 15.56 ± 0.99, 17.71 ± 1.27 ÷ N, L1 muscle being at the minimum value and the maximum value being found in the L4 lot.

Average values for the elasticity of horse meat ranged from 0.41 ± 0.10 (L1) to 0.47 ± 0.12 (L3) values that are close to the characters studied.

Chewing parameter showed that both sex and age influenced the structure of muscle fibers with a minimum average to young females 6.80 ± 0.59 N and the maximum average 8.44 ± 0.77 N in adult males.

The meanings of statistical analyzes for *Longissimus dorsi M.* from horses showed significant differences in hardness and cohesiveness parameters between L1-L2 and L3-L4, and for gumminess, elasticity and chewing between L2 - L4.

Table 1 Characterization of horse meat texture (*Longissimus dorsi M.*) at slaughter by age and sex

Specification		Exp. lot	$\bar{X} \pm s_{\bar{x}}$	V%	Min. – Max.	Differences interpretation T-Test (2-tailed)	
Longissimus dorsi M.	Hardness (N)	L1	33.96±2.41	22.44	23.56 – 48.25	L1-L2	t = -6.43; p = 0.000***
		L2	35.00±2.46	22.25	24.36 – 49.52	L1-L3	t = -1.33; p = 0.218 ns.
		L3	34.52±2.62	24.06	22.36 – 47.96	L2-L4	t = -4.09; p = 0.003**
		L4	37.20±2.65	22.55	23.53 – 50.17	L3-L4	t = -8.54; p = 0.000***
	Cohesiveness	L1	0.42±0.008	6.25	0.37 – 0.45	L1-L2	t = -6.30; p = 0.000***
		L2	0.44±0.005	3.75	0.41 – 0.46	L1-L3	t = 0.22; p = 0.833ns.
		L3	0.42±0.007	5.54	0.39 – 0.46	L2-L4	t = -8.75; p = 0.000***
		L4	0.48±0.003	2.19	0.46 – 0.49	L3-L4	t = -7.26; p = 0.000***
	Adhesiveness (J)	L1	0.00023±0.000029	118.23	-0.00029 – 0.00076	L1-L2	t = -2.62; p = 0.028*
		L2	0.00024±0.00009	118.29	0.00080 – 0.00009	L1-L3	t = -1.80; p = 0.106ns.
		L3	0.00007±0.0001	476.25	0.00020 – 0.00010	L2-L4	t = -1.79; p = 0.108ns.
		L4	-0.00007±0.00011	471.94	0.00021 – 0.00011	L3-L4	t = 0.63; p = 0.543ns.
	Gumminess (N)	L1	15.56±0.99	20.05	11.03 – 20.27	L1-L2	t = -2.83; p = 0.020*
		L2	16.08±1.09	21.42	11.23 – 21.33	L1-L3	t = -4.01; p = 0.003**
		L3	16.20±1.06	20.64	10.98 – 21.53	L2-L4	t = -5.04; p = 0.001***
		L4	17.71±1.27	22.60	11.45 – 24.78	L3-L4	t = -3.72; p = 0.005**
	Elasticity	L1	0.41±0.10	8.20	0.36 – 0.48	L1-L2	t = -51.03; p = 0.000***
		L2	0.44±0.10	7.33	0.40 – 0.51	L1-L3	t = -4.12; p = 0.003**
		L3	0.47±0.11	7.51	0.41 – 0.53	L2-L4	t = -11.79; p = 0.000***
		L4	0.47±0.12	8.28	0.42 – 0.55	L3-L4	t = -0.131; p = 0.899ns.
	Chewing (N)	L1	6.80±0.59	27.75	4.03 – 11.03	L1-L2	t = -2.90; p = 0.018*
		L2	7.28±0.61	26.39	4.65 – 11.65	L1-L3	t = -2.03; p = 0.073ns.
		L3	7.12±0.65	28.96	3.96 – 11.65	L2-L4	t = -4.95; p = 0.001***
		L4	8.44±0.77	28.95	4.80 – 13.63	L3-L4	t = -5.41; p = 0.000***

L1=youth ♀; **L2**=youth ♂; **L3**=♀ adult; **L4**=♂ aduts

T- test (2 tailed) – for each character examined of the muscle texture profile compared on the experimental groups: ns. insignificant differences (p>0.05); * Significant differences (p<0.05); ** distinct significant differences (p<0.01); *** very significant differences (p<0.001).

In order to characterize the *Semitendinosus M.*, parameter values that express the muscle texture were lower than those retrieved at the *Longissimus dorsi M.*, hardness indicator fluctuated between a minimum 23.14 ± 3.12 N and maximum of 34.6 ± 1.36 N. After estimating the statistical significance of this parameter in all meat groups that were studied was found distinct significant differences. (Tab. 2)

Cohesiveness and the adhesion indicators were achieved the maximum values in the group of male adults, obtaining significant differences between groups L3-L4 and L1-L2 for cohesivity.

Gumminess averages varied between 12.66 ± 1.75 N (L1) and 14.49 ± 1.99 N (L4). They were revealed significant differences between L1-L2, L2-L4 and L3-L4. (Tab. 2)

Elasticity for studied lots presented higher values in male and female adults, due to accumulated collagen content and myofibrils tissue structures, values between 0.34 ± 0.01 ÷ 0.45 ± 0.01. There were significant differences between youth and adult males, and also between adult females and males' one.

The force determined for *Semitendinosus M.* chewability oscillated between 5.18 ± 0.74 to 6.67 ± 1.07 N lower values than those found in *Longissimus dorsi. M.*

There were significant differences in the groups L1-L2 and L1-L3 and distinct significantly between L2-L4 and L3-L4.

Table 2 Characterization of horse meat texture (M. Semitendinosus) on slaughter by age and sex

Specification		Exp. lot	$\bar{X} \pm s_{\bar{x}}$	V%	Min. – Max.	Differences interpretation T-Test (2-tailed)	
M. Semitendinosus	Hardness (N)	**L1**	23.14±3.12	42.67	12.57 – 43.53	**L1-L2**	t = -16.83; p = 0.000***
		L2	25.36±3.07	38.35	15.38 – 45.79	**L1-L3**	t = -8.95; p = 0.000***
		L3	34.6±1.36	12.40	25.66 – 40.26	**L2-L4**	t = -5.62; p = 0.000***
		L4	27.18±3.33	38.76	17.2 – 49.8	**L3-L4**	t = -7.51; p = 0.000***
	Cohesiveness	**L1**	0.45±0.01	7.01	0.40 – 0.49	**L1-L2**	t = -10.51; p = 0.000***
		L2	0.48±0.009	5.96	0.43 – 0.52	**L1-L3**	t = -0.29; p = 0.782ns.
		L3	0.49±0.012	8.58	0.39 – 0.50	**L2-L4**	t = 3.99; p = 0.003**
		L4	0.50±0.01	6.42	0.46 – 0.55	**L3-L4**	t = -10.48; p = 0.000***
	Adhesiveness (J)	**L1**	0.0001±0.000002	64.40	0.000013 – 0.00022	**L1-L2**	t = -1.81; p = 0.104ns.
		L2	0.0001±0.00003	61.29	0.000015 – 0.00021	**L1-L3**	t = -0.87; p = 0.408ns.
		L3	0.00013±0.00003	59.59	0.000015 – 0.00021	**L2-L4**	t = 1.93; p = 0.086ns.
		L4	0.00012±0.00002	62.30	0.00002 – 0.00021	**L3-L4**	t = 1.16; p = 0.277ns.
	Gumminess (N)	**L1**	12.66±1.75	43.67	7.02 – 24.23	**L1-L2**	t = -4.89; p = 0.001***
		L2	13.44±1.89	44.41	7.24 – 25.97	**L1-L3**	t = -1.34; p = 0.213ns.
		L3	12.9±1.9	46.60	6.86 – 25.65	**L2-L4**	t = -7.55; p = 0.000***
		L4	14.49±1.99	43.39	7.95 – 27.48	**L3-L4**	t = -10.79; p = 0.000***
	Elasticity	**L1**	0.34±0.01	13.30	0.29 – 0.42	**L1-L2**	t = -4.75; p = 0.001**
		L2	0.39±0.12	9.84	0.32 – 0.45	**L1-L3**	t = -3.09; p = 0.013*
		L3	0.39±0.009	7.56	0.33 – 0.42	**L2-L4**	t = -9.06; p = 0.000***
		L4	0.45±0.01	7.91	0.4 – 0.5	**L3-L4**	t = -9.37; p = 0.000***
	Chewing (N)	**L1**	5.18±0.74	45.16	2.01 – 9.6	**L1-L2**	t = -2.98; p = 0.015*
		L2	5.79±0.93	50.66	2.15 – 11.65	**L1-L3**	t = -2.89; p = 0.018*
		L3	5.88±0.87	47.00	3.06 – 11.63	**L2-L4**	t = -3.84; p = 0.004**
		L4	6.67±1.07	50.60	3.15 – 13.83	**L3-L4**	t = -3.45; p = 0.007**

L1=youth ♀; **L2**=youth ♂; **L3**=♀ adult; **L4**=♂ aduts

T- test (2 tailed) – for each character examined of the muscle texture profile compared on the experimental groups: ns. insignificant differences (p>0.05); * Significant differences (p<0.05); ** distinct significant differences (p<0.01); *** very significant differences (p<0.001)

CONCLUSIONS

Due to percentages that compose the muscle tissue, the hardness and chewability values found for the two muscles were higher in adult females than adult males.

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