Technological Characteristics of the Longissimus Dorsi Muscle of Pig Depending on the Genetic Type

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Abstract
The processes of technological processing of meat carried out in optimal conditions, require a good knowledge of the water capacity of bearings by the raw material that makes the manufacturing processes of the various preparations. Technological characteristics of pigmeat analyzed in this paper are represented by water retention ability, capacity of hydration and the degree of perselation. The researches have been conducted on 40 samples, taken from the muscle of the longissimus dorsi from breeds Marele Alb, Landrace, Line S 345 Periş, Duroc, Hampshire and Perhib, F1 hybrids (Marele AlbxLandrace) xPietrain and F1 (Marele AlbxLandrace) xSeghers. Water retention capacity has been appreciated by many indicators obtained from the pressing of the sample, according to the method Grau-Hamm. The largest capacity aircraft meets the breed Duroc (47.631), followed by the great white (43.33), LSP 345 Periş (42.87) and the hybrid Perhib (42.731). Water retention capacity, expressed as wet surface, stated on the first Landrace breed (30.012), followed by the Hampshire breed and F1xSeghers (29.602) hybrid Perhib (28.6) breed of LSP 345 Periş (28.361), the lowest value is passed to the race Duroc (22.344).

Keywords: hydration capacity, pig meat, water retention ability

1. Introduction

Technological and sensorial quality of pork meat is influenced by various factors, especially genetic factors [1]. So the colour, water retention capacity, boiling losses, etc., are the parameters influenced mainly by genetic factors [2, 3]. The quality of meat can also be influenced by genetic type, different researchers [4] underlined differences between breeds, such as a greater degree perselation on Duroc breed. In this paper we study the genetic type influence on technological parameters of pig meat.

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2. Materials and methods

In this paper work, water retention capacity is appreciated by many indicators obtained from sample pressing, according to Grau-Hamm method, namely: S_2 (wet free surface), S_1+S_2 (total surface), S_1 (the area covered by the pressed sample), $(S_1+S_2)/S_1$ ratio, and mainly water retention indicators, namely wet surface (S_2/g sample) and "free water". In order to evaluate the water retention capacity were determined also loss of weight of meat due to the action of heat, according to Lohse-Schröder method. The method is used in order to establish capacity of meat to incorporate and maintains, after thermal processing, a certain quantity of added water. Sensitive assessment of the perselation degree was

executed taking into account of the density of striated bands of fat on the cut muscle surface (maximum score-5 for high density of striated bands: minimum score -1 for the muscles without striated bands, or very little visible). Researched biological material is represented by the 8 samples of pig genetic type (5 purebred and 3 hybrids) from within RST Peris SA. The sample size was set to 40 units of observation, ensuring the statistic validity of the results. Data statistic processing was made using classical methods.

3. Results and discussion

The values of analyzed technological parameters are presented in Table 1.

On Large White breed, the boiling losses present an average value of 35.3% from weight of the sample, and the hydration capacity of 43.33%. The indicators of water retention capacity present normal values and the ratio of covered area: total area is 1:4.622.

On Landrace breed, water content is close to that of Large White breed, but it has higher values of boiling losses (45.611%) and lowers hydration capacity (42.40%). Also, the percentage of free water is distinguished by a high value (38.90%), similar to that of combinations F1xPietrain and F1xSeghers.

Water holding capacity expressed by total moistened area is 10.912 ± 0189 cm^2, and the value of the two component surfaces recorded values of 2.300 ± 0.058 cm^2 and 8.463 ± 0.180 cm^2. Whattman paper moistened surface, converted 1 g of sample, recording in Landrace breed average maximum of the entire biological material analyzed.

On Synthetic Line 345 Peris, samples from individuals belonging to this genetic type showed very similar water content in Large White and Landrace breeds, but lower than Duroc breed (73.212%).

In terms of hydration capacity, value of 42.870% is lower than Large White and closer by Landrace breed.

Losses in boiling present a value of 45.88%, higher than the value it presents Large White breed. Mean wetted surface in cm^2/g (28.361) is superior to Large White and Landrace and much higher than average of Duroc breed.

Free water has a high value, close to the Large White and Landrace, obviously higher than Duroc breed. These features place the meat of this genetic type in category of those with good technology meat, without exceeding Duroc and Large White.

On Duroc breed, the percentage of water from longissimus dorsi muscle is lower than other breeds (69.892%), while the boiling losses presents the lowest value (34.3%) with better hydration capacity (47.631%).

Water holding capacity measured in terms of size Whattman paper wetted surfaces, is found a ratio between surfaces of 1:3.993.

The wetted surface that is free, from 1 g of sample is very small in this breed (22.344%). Also, free water removed by pressure due to muscle tissue analyzed, has a low average value (32.318%), which proves a good water binding.

These values highlight the superiority of Duroc breed, compared to other breeds and genetic combinations, in terms of meat quality.

On Hampshire breed, after performing analysis results can fit the meat from this genetic type in "meats acid" category, as demonstrated by values of boiling losses which are the greatest of all genetic types studied (47.526%), a very low hydrate capacity (37.895%), just like hybrid combination F1xSeghers (37.996%) and high value loss of "bound water" (29.602%) and "free water" (37.931%).

The values of these parameters fit the breed, from the viewpoint of technological properties of meat, in a lower group.

Comparing hybrids between them, in terms of technological properties of meat, is found Perhib hybrid superiority (F1xLS 345 Peris).

Table 1. Technological characteristics of longissimus dorsi muscle in pig breeds

Large White								
Water % $\bar{X} \pm S_{\bar{x}}$	Boilling losses % $\bar{X} \pm S_{\bar{x}}$	Hydration capacity % $\bar{X} \pm S_{\bar{x}}$	Water retention capacity					Raw water %
			$S_1(cm^2)$	$S_2(cm^2)$	S_1+S_2 (cm^2)	$(S_1+S_2)/S_1$	S_2/g proba (cm^2/g)	
73.35 ±0.625	35.30±0.442	43.33±1.02	2.45 ±0.09	8.876 ±0.19	11.326 ±0.19	4.622±0.11	27.705 ±0.70	37.831 ±0.99
Landrace								
Water % $\bar{X} \pm S_{\bar{x}}$	Boilling losses % $\bar{X} \pm S_{\bar{x}}$	Hidratation capacity % $\bar{X} \pm S_{\bar{x}}$	Water retention capacity					Raw water %
			$S_1(cm^2)$	$S_2(cm^2)$	S_1+S_2 (cm^2)	$(S_1+S_2)/S_1$	S_2/g proba (cm^2/g)	
73.121 ±0.39	45.611±0.35	42.40±1.65	2.30 ±0.05	8.643 ±0.18	10.912 ±0.18	4.84±0.14	30.012 ±0.60	38.90 ±0.84
LS 345 Peris								
Water % $\bar{X} \pm S_{\bar{x}}$	Boilling losses % $\bar{X} \pm S_{\bar{x}}$	Hidratation capacity % $\bar{X} \pm S_{\bar{x}}$	Water retention capacity					Raw water %
			$S_1(cm^2)$	$S_2(cm^2)$	S_1+S_2 (cm^2)	$(S_1+S_2)/S_1$	S_2/g proba (cm^2/g)	
73.212 ±0.45	45.88±0.44	42.87±1.90	2.315 ±0.03	7.926 ±0.219	10.241± 0.195	4.424 ±0.135	28.361 ±0.61	37.65 ±0.049
Duroc								
Water % $\bar{X} \pm S_{\bar{x}}$	Boilling losses % $\bar{X} \pm S_{\bar{x}}$	Hidratation capacity % $\bar{X} \pm S_{\bar{x}}$	Water retention capacity					Raw water %
			$S_1(cm^2)$	$S_2(cm^2)$	S_1+S_2 (cm^2)	$(S_1+S_2)/S_1$	S_2/g proba (cm^2/g)	
69.892 ±0.6	34.3±0.23	47.631±1.21	2.265± 0.051	6.607 ±0.142	9.046 ±0.131	3.993 ±0.105	22.344 ±0.457	32.318 ±0.972
Hampshire								
Water % $\bar{X} \pm S_{\bar{x}}$	Boilling losses % $\bar{X} \pm S_{\bar{x}}$	Hidratation capacity % $\bar{X} \pm S_{\bar{x}}$	Water retention capacity					Raw water %
			$S_1(cm^2)$	$S_2(cm^2)$	S_1+S_2 (cm^2)	$(S_1+S_2)/S_1$	S_2/g proba (cm^2/g)	
71.926 ±0.366	47.526 ±0.344	37.895±1.62	2.23 ±0.101	8.529 ±0.196	10.759 ±0.191	4.825 ±0.121	29.602 ±0.652	37.931 ±1.001
Perhib:F_1xL.S. 345 Peris								
Water % $\bar{X} \pm S_{\bar{x}}$	Boilling losses % $\bar{X} \pm S_{\bar{x}}$	Hidratation capacity % $\bar{X} \pm S_{\bar{x}}$	Water retention capacity					Raw water %
			$S_1(cm^2)$	$S_2(cm^2)$	S_1+S_2 (cm^2)	$(S_1+S_2)/S_1$	S_2/g proba (cm^2/g)	
73.64 ±0.465	43.64±0.224	42.731 ±1.722	2.42 ±0.05	7.587 ±0.188	10.007 ±0.187	4.135 ±0.122	28.6±0.549	39.101 ±0.929
F_1xPietrain								
Water % $\bar{X} \pm S_{\bar{x}}$	Boilling losses % $\bar{X} \pm S_{\bar{x}}$	Hidratation capacity % $\bar{X} \pm S_{\bar{x}}$	Water retention capacity					Raw water %
			$S_1(cm^2)$	$S_2(cm^2)$	S_1+S_2 (cm^2)	$(S_1+S_2)/S_1$	S_2/g proba (cm^2/g)	
70.425 ±0.565	42.627 ±0.352	40.123 ±1.722	2.758 ±0.125	6.601 ±0.235	9.359 ±0.135	3.393 ±0.119	23.11 ±0.502	33.211 ±0.826
F_1xSeghers								
Water % $\bar{X} \pm S_{\bar{x}}$	Boilling losses % $\bar{X} \pm S_{\bar{x}}$	Hidratation capacity % $\bar{X} \pm S_{\bar{x}}$						Raw water %
			$S_1(cm^2)$	$S_2(cm^2)$	S_1+S_2 (cm^2)	$(S_1+S_2)/S_1$	S_2/g proba (cm^2/g)	
73.127 ±0.426	47.326 ±0.358	37.996 ±1.620	2.321 ±0.03	8.547 ±0.192	10.868±0.2	4.682±0.12	29.602 ±0.723	38.626 ±0.998

Regarding the perselation degree of longissimus dorsi muscle on the analyzed genetic types, values of determinations are presented in tables 2.

From the dates analysis presented in Table 2 can be observed the following: - at the sample of Large White, the perselation degree as 5-point scale, shows the value of 2.31, a value that ensures proper juicy and tenderness – at the sample of breed Landrace perselation level is 1.72, although lower than the Large White breed, these breeds meat placed in the normal range - the Duroc breed stands highest value (score) the degree of perselation (3.84), consistent with the values found and other researchers - the LS 345 Peris,

perselartion degree (2.30) falls within the normal meat - the Hampshire breed is not discernible perselartion special values of the degree, as seen in other technological parameters analyzed - the genetic types representing combinations of breed, perselation parameter values analyzed show a good degree, but high variability recorded should work to standardize the biological material.

Table 2. Perselation degree in longissimus dorsi muscle on analyzed pig genetic types

Breed	n	$\bar{x} \pm s_{\bar{x}}$	c.v.%	Variability limits
Large White	40	2.31 ± 0.089	24.25	1.0 – 4.0
Landrace	40	1.72 ± 0.115	42.10	1.0 – 3.0
Duroc	40	3.84 ± 0.195	32.05	3.0 – 5.0
LS 345 Peris	40	2.30 ± 0.190	49.74	1.0 – 4.0
Hampshire	40	2.58 ± 0.122	34.87	2.0 – 3.0
F_1xLS 345 Peris	40	2.22 ± 0.189	53.73	1.0 – 4.0
F_1xPietrain	40	2.35 ± 0.091	24.41	1.0 – 4.0
F_1xSeghers	40	2.35 ± 0.187	50.16	1.0 – 4.0

4. Conclusions

Meat quality, with regard to parameters analyzed, the RST Peris SA can be considered as being normal, corresponding to almost all breeds and hybrids in the study. Technological features raised mainly by boiling and loss of hydration capacity present values are according of quality meat, except race and hybrid F1xPietrain Hampshire. High variability reported for the perselation degree of work required to standardize biological material.

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