Bewertung der Qualität von rohem und gekochtem Muskel semimembranaceus Schweine

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Die Qualität der rohen Schweinemuskeln wird durch einige Wertmesseinheiten festgesetzt: T_1, pH_1, pH_{24}, $Farbe_1$, $Farbe_{24}$ und rigor mortis. Aber auch neben der grossen Zahl der Wertmesseinheiten und neben zahlreicher Prüfungen ist es bisher nicht gelungen ein einheitliches Verfahren zur Feststellung der Qualität von rohem Fleisch festzusetzen.

Da dieses Problem sehr bedeutend ist, wird auch weiterhin die Suche nach einem zuverlässigeren Verfahren zur Feststellung von PSE und DFD Muskel fortgeführt.

Aus diesen Gründen haben wir geprüft und in dieser Arbeit dargestellt, die durch parallele Prüfungen erreichten Ergebnisse der Eigenschaften von rohem und gekochtem Muskel semimembranaceus bei einer grösseren Zahl weisser, fleischiger Schweine. Zur Festsetzung der Eigenschaften des rohen Muskels wurden pH_1, pH_{24}, $Farbe_1$, $Farbe_{24}$ und WBV gemessen und des gekochten der Gewichtverlust beim Kochen, die Zartheit mit dem Warner Bratzelerapparat und organoleptisch die Zartheit und Saftigkeit.

In der Absicht die Zuverlässigkeit der Wertmesseinheiten festzustellen, die zur Festzetzng der Qualität des rohen Muskels genutzt wird, wurden Korelationen zwischen den Eigenschaften bestimmt, so wie auch zwischen dieser Eigenschaften und den Eigenschaften des gekochten Muskels.

Evaluation of quality of raw and cooked m. semimembranaceus of pigs

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The quality of raw pig muscle is estimated by measurements of several values: T_1, pH_1, pH_{24}, $colour_1$, $colour_{24}$ and rigor mortis. But, inspite of so many measured characteristics there is still not in use one commonly accepted criterion for meat quality evaluation.

Due to the importance of the problem of raw pork quality it is still going on with investigations asking for more accurate predictors for determination the PSE and DFD muscle.

That was the reason why we have investigated and present in this paper the results obtained by parallel evaluations of characteristics of raw and cooked m.semimembranaceus of larger number of commercial white meaty pigs. For quality of raw muscle determination pH_1, pH_{24}, $colour_1$, $colour_{24}$ have been measured and WHC and for cooked muscle quality cooking loss, tenderness by Warner-Bratzler shear press, and tenderness and juiciness by sensoric scores. In order to determine the reliability of values used as the predictors of raw muscle quality have been calculated the correlations between them, as well as between them and examined characteristics of cooked muscles.

L' apprèciation de la qualitè de la viande crue et cuite semimembranaceus des porcs

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On constate la qualite du muscle cru des porcs en mesurant quelques indicateurs: T_1, pH_1,pH_{24}, $couleur_1$, $couleur_{24}$ et rigor mortis.

Cependant, malgrè le gran nombre de ces indicateurs et maintes recherches, on n'a pas rèussi jusqu'à prèsent à fixer un procèdè unique pour dèterminer la qualitè de la viande crue.

Comme ce problême est bien important, on poursuit la recherche d'un procèdè plus sûr pour dèterminer PSE et DFD des muscles. C' est à cause de ces raisons que nous avons examinè et dèmontrè dans ce travail les rèsultats obtenus par une recherche parallêle des caractères de la viande crue et cuite semimembranaceus d'un grand nombre de porcs blancs du type charcutier. Pour dèterminer les propriètès de la viande crue on a mesurè pH_1,pH_{24}, la $couleur_1$, la $coleur_{24}$ et la capacitè d'hydratation, et quant à la viande cuite,le dèchet au cours de la cuisson,la soliditè par l'appareil Warner Bratzler et à l'aide des sens la soliditè et la succulence / la saveur /. Ayant l'intention de dèterminer la sûretè des indicateurs qu'on utilise pour fixer la qualitè de la viande crue, on a determinè les corrèlations entre ces caractères et aussi entre ces caractères et les propriètès de laviande cuite.

Оценка качества сырого и варенного m. semimembranaceus свиней

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Качество сырого мяса свиней устанавливается измерением нескольких показателей: T_1, pH_1, pH_{24}, $цвета_1$, $цвета_{24}$ и rigor mortis.

Однако, несмотря на многочисленность этих показателей и на многочисленные исследования, до сих пор не удалось установить единственный метод для определения качества сырого мяса. Потому что эта проблема очень значительна, искание более надежных методов для установления ПСЭ продолжается.

Из-за этих причин мы исследовали и в этой работе показали результаты полученные параллельными исследованиями свойств сырого и варенного m. semimembranaceus большего числа белых мясистых свиней для определения свойств сырого мускула мы измеряли pH_1, pH_{24}, $цвета_1$ и $цвета_{24}$ и способность гидратации, а варенного убыток веса во время варки, нежность при помощи аппарата Warner-Bratzler и чувственно нежность и сочность.

В намерении, чтобы установить надежность показателей используюмых для установления качества сырого мускула, мы определили корреляции между этими свойствами, а также и между этими свойствами и свойствами варенного мускула.

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Introduction

The problems of the PSE and DFD muscle are intensively studied due to the economic importance. Among these examinations the important place takes the early determination of the PSE and DFD muscle. As the possible predictors of these changes in meat quality are used T_1, pH_1, pH_{24}, $colour_1$ and $colour_{24}$ and rigor mortis of muscle. However, in spite of so many predictors and numerous investigations it was not possible to determine the reliable criterion which always insures the evaluation of meat quality by measuring the muscle characteristics on slaughtering line. It is known that muscle with low pH_1 will not always become pale and watery. Patricia Barton /1977/ reported that even 38% muscle with low pH_1 / < 5,9/ became dark in colour and were not watery. On contrary, our investigations show that some muscles with higher pH_1 became later post mortem pale and exudative.
These recognitions were the reason we started to investigate the relation of some characteristics of raw muscle, which are commonly used as the predictors of quality, and characteristics of cooked meat.

Material and Methods

During all four seasons /from 1976 to 1977/ the characteristics of raw and cooked m. semimembranaceus of left sides of carcasses of 437 commercial white meaty pigs were comparatively investigated. In raw muscle were measured T, pH and colour 45 min post mortem, as well as pH, colour and WHC 24 hours post mortem. In muscle, 24 hours post mortem was estimated the amount of water released at cooking, tenderness by Warner-Bratzler shear device and tenderness and juiciness by sensoric scores. All these investigations were performed in one slaughter-house.
The pigs were slaughtered in common way(electrically stunned and bleeded), and carcasses were chilled for 24 hours. Muscle temperature was measured by Gulton Tastotherm P 200 thermometer. pH was recorded with strengthened electrode of potentiometer "Gronert", type TM-5.
Colour was measured by Göfo photometer on the fresh cut surface of muscle. WHC was measured by compression according to method of Grau and Hamm /1953/. Cooking loss was determined by weighing about 100 g of muscle before and after cooking. Muscle was cut in square form, put in polyethilen bag and cooked in water bath for 60 min at 90°C.
Shear force was expressed as the mean value of 8 to 9 individual cutting of 1/2 inch cores of cooked meat.
Tenderness and juiciness were jugded by an panel of three to four members according to hedonic scale with scores from 1 to 9. By score 1 was estimated the extremely tough, or dry meat, by score 9 extremely tender, or juicy, and by score 7 optimal tender, or juicy meat.
Coefficients of linear correlations are calculated according to ordinary formula.

Results and discussion

The results of investigation performed are presented as mean values and standard deviations in Table 1, separately by seasons and for the whole year. Analysing these results by seasons it can be seen that the mean values of T_1 in spring and summer are nearly the same, and in winter are somewhat lower, but the coefficient of variation is the greatest /2,0/. Differences in mean values for pH_1 and pH_{24} are not more distinct although individual minimal and maximal values in summer were considerably different - for pH_1 5,2 and 7,1, and for pH_{24} 5,0 and 6,7. The $colour_1$ of samples investigated in autumn was the lightest /mean value 68,98/, and the coefficient of variation the highest /6,9/. Distinctly lowest individually measured value of $colour_1$ - 54 Göfo units appeared in autumn, while in other seasons the lowest value was 66 units. The differences between mean values for $colour_{24}$, WHC and cooking loss among individual seasons are not significant.

The coefficients of correlation for all investigated samples /Table 2/ suggest that the relation is not expressed or is very little expressed between pH_1, pH_{24}, $colour_1$ and $colour_{24}$ and predictors of meat quality, that is WHC, cooking loss, tenderness and juiciness of cooked muscle. The relation between T_1 and pH_1 and pH_{24} is not expressed either. As it can be seen from these results the relation between WHC and cooking loss is somewhat more expressed, and it is significantly expressed between tenderness measured by Warner-Bratzler device and by sensoric scores, as well as between tenderness and juiciness determined by sensoric scores.

Mean values and standard deviations of investigated characteristics of raw and cooked m. semimembranaceus of 437 left halves of pigs investigated during the year

Table 1.

Season	Characteristics investigated									
	T_1	pH_1	pH_{24}	$Colour_1$	$Colour_{24}$	WHC	Cooking loss	Tenderness W-B	By sensoric scores Tendern.	Juiciness
Spring 118	40,46 ±.548	6,47 ±.225	5,55 ±.237	74,40 ±3,89	63,14 ±3,68	8,65 ±1,16	39,88 ±4,58	6,15 ±1,25	5,38 ±1,47	5,35 ±1,60
Summer 113	40,29 ±.714	6,48 ±.278	5,52 ±.198	74,52 ±3,35	65,26 ±3,95	9,09 ±1,22	40,28 ±2,14	6,23 ±1,42	6,16 ±1,13	6,34 ±.868
Autumn 85		6,33 ±.402	5,77 ±.370	68,98 ±4,27	63,67 ±5,21	8,84 ±1,30	40,68 ±3,03	5,24 ±1,52	5,94 ±1,73	5,53 ±1,48
Winter 121	39,43 ±.787	6,49 ±.236	5,61 ±.164	73,40 ±2,86	62,88 ±4,74	8,51 ±.970	39,28 ±3,37	6,58 ±1,35	5,92 ±1,12	5,84 ±.996
Year 437	40,01[x] ±.838	6,45 ±.290	5,60 ±.259	72,97 ±4,17	63,63 ±4,55	8,76 ±1,18	39,96 ±3,48	6,11 ±1,45	5,84 ±1,39	5,78 ±1,32

[x] n=352

Correlations of investigated characteristics of raw and cooked m. semimembranaceus of 369 carcasses of pigs investigated during the year

Table 2.

	pH_1	pH_{24}	$Colour_1$	$Colour_{24}$	WHC	Cooking loss	Tenderness W-B	By sensoric scores	
								Tenderness	Juiciness
T_1	.29	.18	n.s.	n.s.	n.s.	.17	.18	n.s.	n.s.
pH_1		n.s.	.18	.13	n.s.	.17	.15	n.s.	n.s.
pH_{24}			.18	.14	.13	.27	.13	.12	n.s.
$Colour_1$				.11	n.s.	n.s.	.19	.12	n.s.
$Colour_{24}$					n.s.	n.s.	.13	n.s.	.11
WHC						.40	n.s.	n.s.	n.s.
Cooking loss							.18	.22	.21
Tenderness W-B								.71	.46
Tenderness									.67

One proof more in favour of such correlation between muscle characteristics measured on slaughtering line and technological characteristics of muscle, offer the correlations between pH_1 and WHC and cooking loss of samples investigated in individual seasons /Table 3/. Besides these data it is useful to present the frequency of incidence of the PSE and DFD conditions of m. semimembranaceus of left halves in 8000 pigs /Manojlović and Rahelić, 1978/ in various seasons, since the samples investigated in this paper were taken from these pigs.

Coefficients of correlation between pH_1 and WHC and cooking,loss, by seasons, with incidence of PSE and DFD muscles

Table 3.

Season	Coef. correl. between pH_1		P S E $pH_1 \leq 5,9$	D F D $pH_{24} \geq 6,3$
	WHC	Cooking loss		
Spring	n.s.	.26	10,71	20,21
Summer	.19	.15	6,74	0,41
Autumn	n.s.	.30	10,18	9,30
Winter	n.s.	n.s.	5,74	0,51

The similar pattern of correlation was determined between pH_{24} and these two characteristics.

Consequently, these data suggest that the values which are commonly measured on the slaughtering line /T_1, pH_1, $colour_1$, pH_{24} and $colour_{24}$/ are not the reliable predictors of meat quality.

One proof more that pH_1 is not always the reliable predictor of muscle condition 24 hours post mortem is also the finding /Manojlović, Rahelić, 1978/ that from m. semimembranaceus sides of of 1260 carcasses investigated in two slaughter-houses, 90 or 7,1 % were 24 hours post mortem pale and watery although pH_1 of these muscle was $\geqslant$ 6,0. In one of these muscles it was measured even pH_1 7,0, and 24 hours post mortem it was distinctly light in colour /51 Göfo units/ and watery appearance, although has pH_{24} 6,1. Patricia Barton /1977/ reported that determinations of muscle characteristics on slaughtering line do not offer enoughly reliable data for evaluation of meat quality. In the same paper it is suggested to the advantage of visual evaluation of structure and it is also mentioned that reflectance measuring is an advisable procedure for determination of the PSE changes. Kerstin Lundström et al. /1977/ reported the similar opinion that colour 24 hours post mortem is the reliable predictor of meat quality, because the correlation of colour and WHC determined by compression is fairly high /r = .56/. Birgitta Malmfors et al. /1977/ reported somewhat different data on values of colour as the predictors of meat quality; namely, they reported that the coefficient of correlation between colour and cooking loss was fairly high, but different, depending on the method of measuring: if the colour is measured by EEL, coefficient of correlation is lower /r = .17/ for pigs of one breed and r = .37 for pigs of another breed/, and when it is measured by Elrepho it is higher /r = .46, r = .60, respectively/. Walstra et al. /1976/ also reported the higher correlation between colour measured by Fahellpho reflectometer and the amount of released water /r = .54/.

In the previously mentioned paper /Lundström et al., 1977/ were also shown the differences in coefficient of correlation between colour and WHC measured by compression depending on the method of colour measuring, As it can be seen from the data in Table 2. in this paper was not find at all the significance of correlation between $colour_1$ or $colour_{24}$ and WHC and cooking loss. It is possible that the method of colour measuring used in these investigations influenced such finding.

At the end of this paper it can be concluded that results obtained in these investigations suggest that pH_1, pH_{24}, $colour_1$ and $colour_{24}$ of muscle are not the reliable predictors of meat quality (WHC, cooking loss, tenderness and juiciness) cooked 24 hours post mortem.

If the state of muscle is determined visually 24 hours post mortem, then it can be sometimes found the pale colour and waterness of muscle which 45 min post mortem had high or even very high pH_1.

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