

QUALITY OF TRADITIONAL DRY-CURED LOIN FROM RUSTIC AND COMMERCIAL PIG BREEDS

Ewa Smagowska¹✉, Danuta Jaworska¹, Wiesław Przybylski¹, Rafał Wołosiak², Dorota Derewiaka², Katarzyna Nowicka¹

¹WULS-SGGW, Faculty of Human Nutrition and Consumer Sciences

²WULS-SGGW Faculty of Food Sciences

Summary. The aim of this study was to determine the relationship between chemical composition of traditional dry-cured loin produced in Poland and their objective sensory characteristic and to establish which pig breed is more suitable for the production of high quality dry-cured loin. Material varied depending on marbling, juiciness, tenderness, pH, colour parameters L* and a*, water, protein and calcium content. Dry-cured loins obtained from the meat of Złotnicka White pigs had higher overall quality, were more juicy and tender with lower protein, salt and zinc content comparing to loins obtained from meat of commercial crossbreed pigs and is more suitable to produce high quality dry-cured loins.

Key words: dry-cured loin, chemical composition, physical parameters, sensory quality

INTRODUCTION

An indication of a new trend in consumer's behaviour at the food market, implied by a need to preserve and emphasize values associated with cultural heritage, is growing interest in traditional food products. Foodstuff prepared using traditional manufacturing practices, referring to deep-rooted recipes, maintained by local societies is considered by consumers to be healthy, tasty, natural and fresh [Guerrero et al. 2010]. Some of the traditional products gaining more and more popularity among Polish consumers are well-

Danuta Jaworska <https://orcid.org/0000-0002-1242-5255>; Wiesław Przybylski <https://orcid.org/0000-0003-4949-370X>; Rafał Wołosiak <https://orcid.org/0000-0002-8322-1305>; Dorota Derewiaka <https://orcid.org/0000-0002-2817-6513>

✉ ewa_gorska1@sggw.pl

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known in the Mediterranean Europe dry-cured meat products [Olkiewicz et al. 2006]. Traditional salting and drying technologies have been used in Mediterranean countries since ancient times to produce high-quality dry-cured meat products, while in northern European countries like Germany, Poland and Lithuania such products usually undergo a cold smoking process to protect them from spoilage [Guerrero et al. 2010, Jiménez-Colmenero et al. 2010]. In Poland, the raw material for such production mainly originated from rustic breeds, of which Zlotnicka White is the most popular. However, due to the favorable parameters of meat quality commercial pig breeds, like crossbreed of Polish Large White and Polish Landrace, are also used for the production of dry-cured meat products [Olkiewicz et al. 2006, Grześkowiak et al. 2007]. The aim of this study was to determine the relationship between chosen objective sensory descriptors and chemical composition of traditional dry-cured loin as well as to establish which pig breed – rustic breed or commercially used crossbreed pigs – is more suitable for the production of high quality dry-cured loins.

MATERIAL AND METHODS

Material

In the study 15 dry-cured loins made from meat of Zlotnicka White pigs purchased from three different producers and 6 dry-cured loins obtained from meat of Polish Large White and Polish Landrace crossbreed pigs purchased from one producer have been used. Examined loins were produced by local manufacturers using the caudal half of the *Longissimus dorsi* muscle of all animals. All details regarding dry-cured loins production are presented in Górska et al. [2017].

Methods

Physical methods. The pH of dry-cured loin samples was measured in triplicate using WTW pH meter 330i type (WTW GmbH & Co, Weilheim, Germany).

Color parameters were measured at the light exposed surface using a Minolta Chroma-Meter Measuring Head CR-400 equipped with a Data Processor DP-301 (Minolta, Osaka, Japan). The apparatus was calibrated before each measurement against a white tile ($L = 90.7$, $a = 0.9$, $b = -0.1$). After 30 min of blooming each sample of dry-cured loin was studied in ten replicates.

Chemical methods. Moisture, fat, protein and connective tissue content were measured using near-infrared spectroscopy (NIRS) by a NIR Flex Solids N-500 apparatus (Büchi Labortechnik AG, Flawil, Switzerland). The measurements were performed in triplicate using a 16-fold scan.

Sodium chloride was determined by the Mohr method according to AOAC methods [Association of Official..., 2000]. Three replicates of each sample were analyzed.

Cholesterol. Cholesterol was determined according to Petrón et al. [2003] with some modifications. Each evaluation was conducted in triplicate. Analysis were performed by gas chromatography, using Agilent 7890 A with Flame Ionization Detection (GC-FID)

(Agilent Technologies, Santa Clara, CA, USA). Separation was done on a HP-5MS capillary column (30 m long, 0.25 mm ID, 0.25 μm df) (Agilent Technologies, Santa Clara, CA, USA). The detector was kept at 295°C. The carrier gas was helium, at a flow rate of 0.6 ml/min.

Tocopherols. Tocopherols content was determined according to the method described by Nowicka et al. [2018]. About 1 g of sample was dissolved in mixture of 3 ml of methanol, 6 ml of chloroform, 3 ml of saturated solution of sodium chloride and 0.5 ml of 200 mg l⁻¹ α -tocopherol acetate solution (internal standard) was added. Samples were centrifuged at 5000 rpm for 10 min. After addition 2 ml of the aliquot of hexane containing 200 mg l⁻¹ butylated hydroxytoluene, samples were homogenized (15 s). An aliquot of the precipitate layer was collected and evaporated under stream of nitrogen. Afterwards, 2 ml of 1% tetrahydrofuran in n-heptane was added. Samples were analyzed using HPLC with FLD detector (Agilent Technologies, Santa Clara, CA, USA). Analysis were performed at ambient temperature with a flow rate of 1 ml min⁻¹ using a LiChrospher 100 Diol column (Merck, Germany). The mobile phase was 1% tetrahydrofuran in n-heptane. Specific fluorescence detection parameters with excitation at 330 nm and emission at 295 nm were used. Quantification of tocopherols was performed by the internal standard method as well as based on calibration curves prepared with external standards of α -tocopherol, δ -tocopherol and γ -tocopherol (Supelco, USA).

Trace elements. Analyses were performed in triplicate according to the methodology presented by Lucarini et al. [2013] with modifications using atomic emission spectrometer ICP-AES Thermo Scientific iCAP 6500 DUO (Thermo Fisher Scientific, Waltham, MA, USA). Samples of approximately 0.5 g were previously incinerated (7 ml HNO₃ + 1 ml H₂O₂) in a microwave digestion system Milestone MLS 1200 Mega (Milestone Inc., Shelton, CT, USA) at 220°C for 20 min. After cooling to room temperature the solution was diluted to a fixed volume (volumetric flask, 25 ml) with deionized water. The spectrometer was calibrated for Fe, Mg, P and Zn determinations (at 238.204/259.940 nm; 279.079/279.553/280.270/285.213 nm; 177.495/178.766/213.618/178.284 nm and 206.200/213.856 nm, respectively).

Fatty acids. For the fatty acid analysis, methyl esters were prepared from isolated fat according to Sandler and Karo [1992]. FAMES were analyzed by gas chromatography, using Agilent GC gas chromatograph with Flame Ionization Detection (GC-FID) (Agilent Technologies, Santa Clara, CA, USA). Separation was done on a polyethyleneglycol capillary column (105 m long, 0.25 mm ID, 0.2 μm df) (Restek-2330, Restek Corporation, Bellefonte, PA, USA) maintained at 220°C for 60 min. The detector was kept at 300°C. The carrier gas was helium, at a flow rate of 1 ml min⁻¹. The fatty acid methyl esters were identified by comparison with authentic external standard mixtures (Supelco, F.A.M.E. mix C4-C24, lot 18919, 10mg/mL in hexane) analysed under the same conditions. Each evaluation was conducted in triplicate.

Sensory methods. The sensory analysis was conducted after opening the packages. For sensory evaluation, the Quantitative Descriptive Analysis (QDA) [ISO 13299.2:2003] was used and a scale of 100 mm was converted to numerical values (0-10 conventional units c.u.). The evaluation panel consisted of 10 people all of whom were familiarized with the scaling methods and trained in accordance to ISO standard [ISO 8586:2012].

Statistical methods. The results have been compiled STATISTICA software, version 10 (StatSoft, Inc. 2011). Principal component analysis (PCA) was applied for multivariate analysis of the results characterized sensory quality and physical as well as chemical composition of loins. Based on the results of this analysis 3 groups of samples varying in sensory quality and chemical composition have been identified. These results have been developed using one-way analysis of variance. The significance of differences between means was calculated on the basis of the least significant differences test (LSD) at $p < 0.05$. Simple Pearson correlation coefficients have been calculated between studied traits.

RESULTS AND DISCUSSION

Physical parameters. Results of physical analysis are shown in Table 1. All studied dry-cured loins were characterized by appropriate pH values (between 5.09 and 5.96), however differ significantly between groups. Obtained results were similar to pH values reported for dry-cured beef pastirma [Çakýcý et al. 2015], while slightly lower values have been reported for dry-cured sausages [Bañón et al. 2010].

Significant differences were found regarding color measurements (Table 1). Dry-cured loins with the lowest lightness were characterized by higher pH values and lower water content, which may suggest that drying process of those loins was longer. Dry-cured loins obtained from meat of rustic Zlotnicka White pigs had greater redness than those obtained from meat of commercial Polish Large White and Polish Landrace hybrid pigs. Nevertheless, all studied products were characterized by higher lightness and lower yellowness than those examined in other studies [Carrapiso and García 2008, Marušić et al. 2011]. Such differences might be a result of shorter ripening or drying time.

Chemical parameters and cholesterol. Obtained results regarding chemical parameters are shown in Table 1. Dry-cured meat products are an excellent source of high-biological value proteins as they contain essential amino acids in suitable ratios. Protein content is related to the fat content and the extent of drying and usually is about 30 g/100 g [Jiménez-Colmenero et al. 2010]. In conducted study protein content varied between distinguish groups from 21.7 to 36.0 g/100 g. Similar protein content was obtained in dry-cured hams made in Poland and Italy [Olkiewicz et al. 2006, Lucarini et al. 2013], while in Iberian dry-cured loin it reached 39.1 g/100 g [Lorido et al. 2016] and in Istrian dry-cured ham 41.4 g/100 g [Marušić et al. 2011]. In most studied loins sodium chloride content was high and ranged from 2.6 to 5.9% (Table 1). Higher salt content was found in loins with lower water content, which may be a result of higher water loss caused by drying and longer ripening time. Nevertheless, determined salt content was much lower than those obtained in other dry-cured meat products [Carrapiso and García 2008, Marušić et al. 2011, Çakýcý et al. 2015]. According to Marušić et al. [2011], salt content is higher in dry-cured products of lower weight, those with larger surface of muscle tissue not covered with fat and those intended to rapid drying. Studied loins were characterized by rather low fat content, however the relative high variability has been observed among this feature. Also, the content of cholesterol was low as ranged from 18.8 to 31.9 mg/100 g (Table 1). Commonly, cholesterol levels in dry-cured meat products are higher and range

Table 1. Characteristics of physical and chemical parameters of dry-cured loin differentiated by pig breed and separate groups

Tabela 1. Charakterystyka parametrów fizykochemicznych połówców surowych dojrzewających w zależności od rasy świń i wyodrębnionych grup

	Pig breed/group		
	PLW×PL (n = 6)	ZW_1 (n = 6)	ZW_2 (n = 9)
	Mean ±SD		
Physical parameters			
pH	5.96 ±0.07a	5.09 ±0.16b	5.63 ±0.10c
L* (lightness)	48.37 ±4.09a	59.40 ±2.72b	50.65 ±3.66a
a* (redness)	6.45 ±1.36a	8.26 ±2.31b	9.21 ±1.73b
b* (yellowness)	5.41 ±1.74a	8.15 ±0.83b	5.45 ±0.71a
Chemical parameters [%]			
Moisture	52.58 ±4.87a	70.35 ±2.51b	65.58 ±2.18b
Fat	4.34 ±1.02	4.63 ±2.14	2.91 ±1.85
Protein	35.97 ±3.68a	21.68 ±2.16b	26.83 ±1.35b
Connective tissue	0.89 ±1.14	1.22 ±0.43	1.26 ±0.50
NaCl	5.90 ±0.24	2.60 ±0.69	5.22 ±1.19
cholesterol [mg/100g]	31.92 ±1.00	22.99 ±1.58	18.82 ±0.87
alpha-tocopherol [mg/100g fat]	0.24 ±0.11a	0.40 ±0.20b	0.10 ±0.09c
Trace elements [mg/100 g]			
Fe	1.21 ±0.33	0.98 ±0.79	1.14 ±0.59
Mg	29.65 ±1.57	27.75 ±1.34	26.80 ±0.28
P	246.03 ±15.44	230.80 ±7.50	228.65 ±4.03
Zn	1.82 ±0.04	1.48 ±0.02	1.58 ±0.03

a, b, c – values followed by different letters are significantly different ($P < 0.05$); PVL×PL – crossbreed of Polish Large White and Polish Landrace pigs; ZW_1 and ZW_2 – Złotnicka White pigs

a, b, c – wartości, po których następują różne litery, są znacząco różne ($P < 0,05$); PVL×PL – krzyżówka świń rasy Wielkiej Białej Polskiej i Polskiej Zwisłouchej; ZW_1 and ZW_2 – świni rasy Złotnickiej Białej

around 60–70 mg/100 g. Lower content was found in fresh ham from Iberian pigs (approximately 40mg/100g), while in some dry-cured products after long process of ripening amount of cholesterol decreases to 30 mg/100 g [Jiménez-Colmenero et al. 2010].

Tocopherols content. Meat predominantly contains small amounts of vitamin E, which is mainly located in the fatty tissues. Nevertheless, in recent years concentrations of vitamin E have been increasing as a result of changes in animal diets. Meat from Polish Large White and Polish Landrace crossbreed pigs contains approximately 0.5 mg/100g while Iberian pig contains between 0.16 and 0.66 mg/100 g of α -tocopherol [Cava et al. 2003]. In dry-cured hams levels of α -tocopherol range from 0.08 to 0.67 mg/100 g [Jiménez-Colmenero et al. 2010, Lucarini et al. 2013]. Content of α -tocopherol in studied

dry-cured loins differ significantly between groups as varied between 0.10 mg/100g in ZW_2 group and 0.40 mg/100g in ZW_1 group (Table 1).

Trace elements. It is known that dry-cured meat products are a good source of zinc and iron, have considerable concentrations of potassium and phosphorus as well as significant amounts of other trace elements such as selenium and magnesium. Fresh loin usually contains between 2.8 and 5.2 mg iron/100 g while dry-cured ham contains between 0.9 and 3.3 mg/100 g [Jiménez-Colmenero et al. 2010, Lucarini et al. 2013]. Studied dry-cured loins contained between 0.98 and 1.2 mg iron/100 g (Table 1). Zinc is an essential mineral in the diet being indispensable in the structural composition and activity of more than 200 enzymes. Concentration of zinc in fresh loin varied between 1.41 and 1.74 mg/100 g. Studied dry-cured loins contain around 1.5–1.8 mg/100 g (Table 1). Higher levels of zinc (approximately 2.2–2.4 mg/100 g) have been found in dry-cured hams [Jiménez-Colmenero et al. 2010, Lucarini et al. 2013]. Dry-cured meat products are also a source of magnesium, which is a cofactor of various metabolic and enzymatic pathways, with major implications in neuromuscular activity. Studied dry-cured loins contain approximately 26.8–28.6 mg/100 g (Table 1). Similar content (around 18–24 mg/100 g) has been found in dry-cured ham [Jiménez-Colmenero et al. 2010]. The content of phosphorus was similar in all studied loins as ranged from 229 to 246 mg/100 g. Lower phosphorus content (approximately 180 mg/100 g) has been reported for dry-cured hams [Jiménez-Colmenero et al. 2010]. Higher concentration of phosphorus in studied loins may be the result of higher water loss caused by longer ripening and drying time.

Fatty acids composition. Fatty acid composition of studied loins is shown in Table 2. Similar fatty acid composition has been observed in dry-cured hams [Fernández et al. 2007, Carrapiso and García 2008], dry-cured sausages [Bañón et al. 2010] and dry-cured beef pastirma [Çakýcý et al. 2015].

On average, the fatty acid composition of lipids of dry-cured hams from white pigs includes 35–40% of saturated fatty acids (SFA), 45–50% of monounsaturated fatty acids (MUFA) and 10–15% of polyunsaturated fatty acids (PUFA). Dry-cured hams from rustic breeds, like Iberian or Zlotnicka White, present a higher proportion of MUFA (54–58%), but lower percentage of SFA (30–35%) and PUFA (8–12%) [Jiménez-Colmenero et al. 2010]. In presented study total content of SFA was comparable in all dry-cured loins regardless pig breed with amount of approximately 39–40% of total fatty acids (Table 2). Obtained amounts have been similar to that found in dry-cured ham but lower than in beef pastirma [Petrón et al. 2004, Çakýcý et al. 2015]. Loins from group PLW×PL and ZW_2 had significantly lower total content of MUFA and higher total content of PUFA compared to loins from ZW_1 group (Table 2). Obtained amounts were similar to those found in other dry-cured meat products [Lo Fiego et al. 2005, Fernández et al. 2007]. The profile of fatty acids affects essential properties of dry-cured meat products, such as proclivity to fat oxidation and texture deterioration. An excess of PUFA leads to soft, oxidisable fats that makes slicing more tough and lowers consumers acceptance of such product. The fatty acids profile is mostly determined by the pig's diet as there is no ruminal fermentation of lipids. Moreover, the content of oleic acid, which is the main fatty acid in a pig adipose tissue, increases with age [Bañón et al. 2010]. Obtained results showed that fatty acid composition varies depending on the pig breed and on rearing system.

Table 2. Fatty acid profile on dry-cured loins depending on the pig breed [% of total fatty acids]

Tabela 2. Profil kwasów tłuszczowych polędwic surowych dojrzewających w zależności od rasy świń [% całkowitych kwasów tłuszczowych]

	Pig breed/group		
	PLW×PL (n = 6)	ZW_1 (n = 6)	ZW_2 (n = 9)
	Mean ±SD		
C14:0 Myristic acid	1.28 ±0.11	1.32 ±0.22	1.32 ±0.10
C16:0 Palmitic acid	24.58 ±1.42	25.19 ±1.78	25.43 ±0.98
C16:1 (cis-9) Palmitoleic acid	3.26 ±0.80	3.37 ±0.41	3.09 ±0.45
C17:0 Margaric acid	0.08 ±0.13a	0.19 ±0.17b	0.19 ±0.13b
C17:1 (cis-10) Heptadecenoic acid	0.18 ±0.04a	0.28 ±0.08b	0.17 ±0.08a
C18:0 Stearic acid	13.50 ±1.66	12.40 ±0.26	13.65 ±1.26
C18:1 (cis-9) Oleic acid	41.69 ±2.98a	44.15 ±2.53b	41.89 ±2.15a
bC18:1 (cis-11)	4.31 ±0.93ab	4.66 ±0.23b	4.05 ±0.51a
bC18:2 (trans) izo1	0	0	0.00 ±0.01
C18:2 (all-cis- 9,12) Linoleic acid, n-6	6.66 ±3.44a	4.34 ±2.19b	6.08 ±2.39a
C20:0 Arachidic acid	0.18 ±0.02	0.17 ±0.04	0.18 ±0.02
C18:3 (all-cis-6,9,12) γ-Linolenic acid, n-6	0	0	0.01 ±0.03
bC18:3 (trans) izo2	0.02 ±0.03	0	0.01 ±0.02
C18:3 (all-cis-9,12,15) α-Linolenic acid, n-3	0.42 ±0.22a	0.28 ±0.14b	0.32 ±0.09b
C20:1 (cis-11) Eicosenoic acid	0.70 ±0.07a	0.80 ±0.22b	0.68 ±0.10a
bC18:2 (cis-9, trans-11) CLA	0.08 ±0.04a	0.13 ±0.02b	0.09 ±0.02b
C20:2 (all-cis-11,14) Eicosadienoic acid, n-6	0.32 ±0.14a	0.21 ±0.10b	0.26 ±0.07ab
C22:0 Behenic acid	0.01 ±0.04	0.02 ±0.03	0.02 ±0.03
C20:3 (all-cis-8,11,14) Eicosatrienoic acid, n-6	0.12 ±0.03a	0.08 ±0.03b	0.11 ±0.02a
C20:3 (all-cis-11,14,17) Eicosatrienoic acid, n-3	0.08 ±0.05a	0.02 ±0.04b	0.02 ±0.03b
C20:4 (all-cis-5,8,11,14) Arachidonic acid, n-6	0.53 ±0.18a	0.40 ±0.19b	0.52 ±0.14a
C23:0 Tricosylic acid	0.03 ±0.04	0.04 ±0.03	0.03 ±0.03
C20:5 (all-cis-5,8,11,14,17) Eicosapentaenoic acid (EPA), n-3	0.02 ±0.03	0	0
C22:6 (all-cis-4,7,10,13,16,19) Docosahexaenoic acid (DHA), n-3	0.01 ±0.03	0	0.01 ±0.03
Total SFA	39.66 ±2.54	39.32 ±2.24	40.83 ±2.01
Total MUFA	50.15 ±4.55a	53.26 ±2.57b	49.88 ±2.59a
Total PUFA	8.15 ±4.08a	5.34 ±2.67b	7.33 ±2.59c
Total n3 FA	0.53 ±0.32a	0.31 ±0.17b	0.35 ±0.11b
Total n6 FA	7.62 ±3.77a	5.03 ±2.50b	6.98 ±2.50c
n6/n3 ratio	15.35 ±3.12a	16.81 ±1.16b	19.99 ±3.98c

a, b, c – values followed by different letters are significantly different ($P < 0.05$); PLW×PL – crossbreed of Polish Large White and Polish Landrace pigs; ZW_1 and ZW_2 – Złotnicka White pigs

a, b, c – wartości, po których następują różne litery, są znacząco różne ($P < 0,05$); PLW×PL – krzyżówka świń rasy Wielkiej Białej Polskiej i Polskiej Zwiślouchej; ZW_1 and ZW_2 – świnie rasy Złotnickiej Białej

Sensory quality. Mean values of the gained results showed that all studied dry-cured loins were described by appropriate sensory quality, however differ significantly between groups. Loins made from meat of rustic Zlotnicka White pigs were more juicy and tender with higher marbling than those obtained from meat of commercial Polish Large White and Polish Landrace crossbreed pigs (Table 3). According to Fortin et al. [2005] juiciness and tenderness, as well as flavor and lack of off-flavors were key attributes affecting the sensory experience during meat consumption. Juiciness is one of the most essential attributes affecting the sensory experience during meat consumption, whereas appearance features, together with marbling and visible fat, are crucial before consumption. Juiciness seems to be mainly influenced by the content of intramuscular fat (IMF). Ventanas et al. [2007] reported that the higher IMF content of the assessed dry-cured loins, the better the scores given by the consumers for juiciness and overall preference.

Table 3. Characteristics of chosen attributes of sensory quality of dry-cured loin differentiated by pig breed

Tabela 3. Charakterystyka wybranych atrybutów jakości sensorycznej polędwic surowych dojrzewających w zależności od rasy świń

	Pig breed/group		
	PLW×PL (n = 6)	ZW_1 (n = 6)	ZW_2 (n = 9)
	Mean ±SD		
	Sensory characteristic [0–10 c.u.]		
Tone of colour	5.6 ±0.6a	3.9 ±0.7b	5.7 ±1.1a
Marbling	2.0 ±0.7a	5.1 ±0.7b	4.4 ±1.1c
Juiciness	4.8 ±1.7a	8.0 ±0.3b	6.3 ±0.8c
Tenderness	4.7 ±1.0a	7.3 ±0.8b	6.1 ±0.9c
Fibrousness	3.9 ±1.4	4.3 ±1.3	4.3 ±1.3
Overall quality	6.0 ±0.48a	6.2 ±0.6b	6.7 ±0.7c

a, b, c – values followed by different letters are significantly different ($P < 0.05$); PLW×PL – crossbreed of Polish Large White and Polish Landrace pigs; ZW_1 and ZW_2 – Zlotnicka White pigs

a, b, c – wartości, po których następują różne litery, są znacząco różne ($P < 0,05$); PLW×PL – krzyżówka świń rasy Wielkiej Białej Polskiej i Polskiej Zwislouchej; ZW_1 and ZW_2 – świnię rasy Złotnickiej Białej

For multivariate analysis of sensory descriptors in relation to chemical composition of studied product, the PCA analysis was applied. This method gives a possibility of analysis of variability in multiple surface based on relationship between analyzed traits. The results showed that 58,88% of total variability can be explained by two first principal component (Fig. 1). Interrelationships between variables showed that sensory quality descriptors (marbling, juiciness, tenderness, overall quality) were associated with color parameters, moisture and connective tissue content (Fig. 1) and simultaneously strongly and negatively with component 1. Whereas in opposition to above mentioned traits there were pH, protein and NaCl content, that were strongly and positively connected to com-

ponent 1. In relation to component 2 strong and positive association was observed for the fibrousness and tone of colour whereas negative for fat content. Describe above relations grouped the tested material into 3 clusters (PLW×PL, ZW_1, ZW_2). This is interesting that cluster 1 included PLW×PL breed and cluster 2 and cluster 3 ZW breed but differed in some traits of sensory quality (Table 3) and nutritional value (Tables 1 and 2). Similar results were obtained by Nowicka et al. (2018).

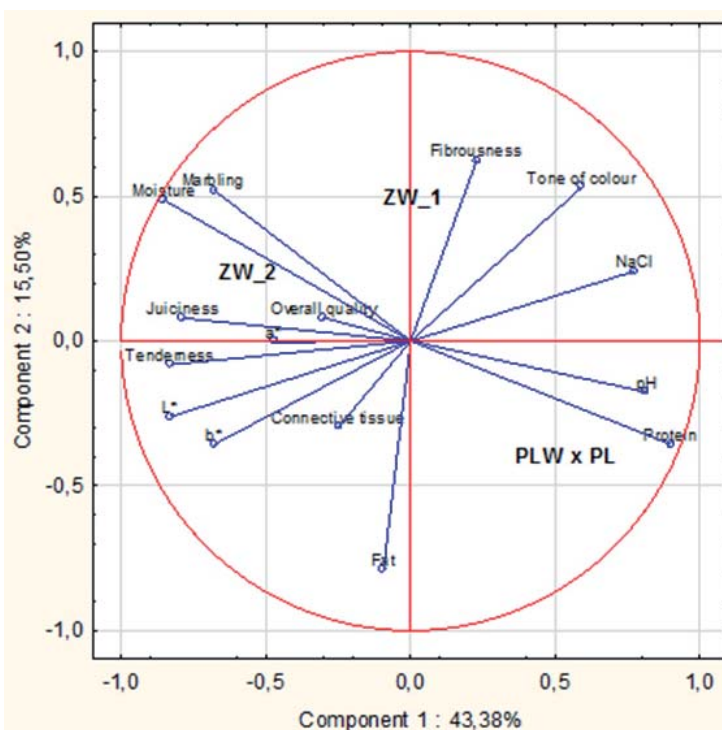


Fig. 1. Principal Component Analysis (PCA) matrix of the mean sensory attributes and chemical composition ratings across dry-cured loins made from meat of Zlotnicka White pigs (ZW_1 and ZW_2) and crossbreed of Polish Large White and Polish Landrace pigs (PLW×PL)

Rys. 1. Analiza składowych głównych (PCA) średnich atrybutów sensorycznych i składu chemicznego połowców surowych dojrzewających pozyskanych z mięsa świń rasy Złotnickiej Białej (ZW_1 i ZW_2) oraz z krzyżówki świń rasy Wielkiej Białej Polskiej i Polskiej Zwisłouchej (PLW×PL).

Variances in sensory quality of examined loins may be the result of differentiated raw material and slightly miscellaneous production methodology. As reported by Ventanas et al. [2007] and Carrapiso and García [2008] texture features of dry-cured meat products are mostly determined by the genetic factors of the breed, while overall quality is noticeably affected by processing technologies and ripening time.

Relationships. Relationships between measured traits indicated that dry-cured loins with greater marbling had lower pH values. According to Cannata et al. [2009] intramuscular fat content may affect the pH value. The results showed also that pH was negatively correlated with juiciness and tenderness. Further analysis revealed that pH was correlated with moisture ($r = -0.70$), protein ($r = 0.75$) and NaCl content ($r = 0.62$). Similar correlations were obtained by Jaworska et al. [2009], but opposite results were reported by Grześkowiak et al. [2007] and Ramos et al. [2007]. Significant correlations were also identified between pH and color parameters – L^* and b^* ($r = -0.68$ and 0.52 , respectively), which confirm tendency that higher ultimate pH is associated with darker color of pork [Ramos et al. 2007]. Dry-cured loins with higher lightness were more juicy and tender and further analysis showed that lightness (L^*) was correlated with moisture ($r = 0.56$), which stays in agreement with the results reported by Marušić et al. [2011]. This may suggest that drying process of those loins was shorter. Protein content was negatively correlated with marbling, juiciness and tenderness. Similar results were obtained by Grześkowiak et al. [2007]. Also salt content had a negative impact on juiciness and tenderness. Some authors reported that significant impact on texture features in dry-cured products had factors related to fat, like intramuscular fat content, fat distribution among muscle cells and intramuscular adipose tissue structure [Ventanas et al. 2007, Cannata et al. 2009], nonetheless, this study had not confirmed that observation.

CONCLUSIONS

1. Studied dry-cured product characterized by differences in ultimate pH, color parameters, water, protein and alfa-tocopherol content, fatty acid profile and sensory quality.
2. Principal Component Analysis (PCA) analysis of sensory descriptors in relation to chemical composition of studied products grouped the tested material into 3 clusters, that were adequate to breed and quality of studied product.
3. Taking into account nutritional value and sensory quality the loins obtained from Złotnicka White breed_1 group is more suitable for the production of high quality dry-cured loins.

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JAKOŚĆ TRADYCYJNYCH POŁĘDWIC SUROWYCH DOJRZEWAJĄCYCH WYPRODUKOWANYCH Z RODZIMYCH I KOMERCYJNYCH RAS ŚWIŃ

Streszczenie: Celem tego badania było określenie związku między składem chemicznym tradycyjnych polędwic surowych dojrzewających produkowanych w Polsce a ich obiektywną jakością sensoryczną oraz ustalenie, która rasa świń jest bardziej odpowiednia do produkcji polędwic surowych dojrzewających wysokiej jakości. Materiał różnił się z zakresie cech takich jak marmurkowatość, soczystość, kruchość, pH, parametry barwy L* i a*, zawartość wody, białka i wapnia. Polędwice surowe dojrzewające wyprodukowane z mięsa świń rasy Złotnickiej białej miały wyższą jakość ogólną, były bardziej soczyste i kruche, o niższej zawartości białka, soli i cynku w porównaniu do polędwic wyprodukowanych z mięsa świń komercyjnych krzyżówek. Mięso rodzimej rasy świń było więc bardziej odpowiednie do produkcji wysokiej jakości polędwic surowych dojrzewających.

Słowa kluczowe: polędwica surowa dojrzewająca, skład chemiczny, parametry fizyczne, jakość sensoryczna