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MEAT QUALITY AND FATTY ACID PROFILE OF PORK AND BACKFAT FROM AN INDIGENOUS BREED AND A COMMERCIAL HYBRID OF PIGS*

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Abstract

The aim of this study was to verify the hypothesis that carcass traits, quality and oxidative stability of meat, and fatty acids profile in intramuscular fat (IMF) of *M. longissimus lumborum et thoracis* (*MLLT*) and backfat (BF) are different between the observed genotypes of pigs. A total of 64 animals were included in the experiment, 32 pigs of native breed Prestice Black-Pied breed (PBP) and 32 pigs of hybrid combination Large White × Landrace sows × Duroc × Pietrain boars (LWLDP). PBP pigs showed higher values of IMF ($P\leq0.01$) and BF, lower lean meat content and drip loss value ($P\leq0.001$) than the LWLDP hybrid. The value of $pH_{45,24}$ was higher ($P\leq0.05$) in PBP pigs. The analysis of fatty acid profile in *MLLT* showed higher content of C8:0 ($P\leq0.01$), C10:0 ($P\leq0.01$), C15:0 ($P\leq0.01$), C22:0 ($P\leq0.05$), C18:1 *n-9* ($P\leq0.01$), C18:3 *n-6* ($P\leq0.001$), C20:3 *n-3* ($P\leq0.05$), C20:4 *n-6* ($P\leq0.01$), C22:4 *n-6* ($P\leq0.05$), C22:5 *n-3* ($P\leq0.01$) and C22:6 *n-3* ($P\leq0.01$) in LWLDP than in PBP pigs. The opposite trend was observed in C18:1 *n-9* ($P\leq0.01$) and C20:5 *n-3* ($P\leq0.01$). Higher content of MUFA as well as the MUFA/SFA ratio were found in PBP breed ($P\leq0.01$). Higher levels of C10:0 ($P\leq0.01$), C12:0 ($P\leq0.01$), C14:0 ($P\leq0.001$), C16:0 ($P\leq0.001$), C14:1 n-5 ($P\leq0.01$), C16:1 *n-7* ($P\leq0.05$), C18:1 *n-7* ($P\leq0.001$), C20:5 *n-3* ($P\leq0.01$) and C22:6 *n-3* ($P\leq0.05$) in BF were found in LWLDP pigs, however the content of C24:1 *n-9* ($P\leq0.01$), C18:2 *n-6* ($P\leq0.05$), C18: *n-3* ($P\leq0.05$), C20:4 *n-6* ($P\leq0.01$) and C22:5 *n-3* ($P\leq0.01$) was higher in PBP pigs. SFA content was higher ($P\leq0.001$) in LWLDP hybrid, but PUFA ($P\leq0.01$), *n-6* PUFA ($P\leq0.05$) and mainly *n-3* PUFA ($P\leq0.01$) were higher in PBP pigs. In BF, the MUFA/SFA ($P\leq0.05$) and PUFA/SFA ($P\leq0.001$) ratios were higher in PBP pigs; on the contrary the MUFA/PUFA ($P\leq0.05$) ratio was higher in LWLDP pigs.

Key words: pig, Prestice Black-Pied breed, four-breed hybrid, meat quality, fatty acids

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Currently, an increased interest in qualitative parameters of pork meat has been recorded. Consumers require tasty and healthy products of local origin. Cameron et al. (2000) state that higher share of fatty acids in pork meat, mainly PUFA, increases palatability. The authors documented that fatty acids C18:2, C20:4 and C22:6 increased the palatability of meat. According to Nuernberg et al. (2015), the quality of pork meat in terms of nutritional value, that is fatty acid content and their ratios, is currently not very favourable. It is characterized mainly by surplus of SFA and *n-6* fatty acids and associated inappropriate *n-6/n-3* fatty acids ratio. In terms of health, the most important fatty acids are the *n-3* PUFA, which play important roles in prevention of sudden cardiac events, positively influence immune system, decrease mortality caused by heart diseases and provide basic protection from these diseases even when present in small amounts. Higher concentrations of *n-3* PUFA have also hypocholesterolemic and anti-inflammatory effect and reduce cardiac arrhythmia. Optimal *n-6/n-3* ratio is considered to be approximately 4:1, however contemporary "western" diet does not reach this level (FAO, 2010). From the global perspective, mostly hybrid combinations of pigs are used for meat production. Scientific research (Kasprzyk et al., 2015; Matoušek et al., 2016) indicates that indigenous breeds of pigs are characterized by certain differences in meat quality when compared to hybrid pigs, particularly higher juiciness and better texture associated to higher fat cover of the pigs. These characteristics can lead to increased interest in this type of meat and processed products. According to Wood et al. (2004) the genotype of pigs influences growth rate and fat content in pig body. Modern breeds (Duroc, Pietrain, Large White) and their hybrids reach higher growth intensity and higher lean meat content in carcass than traditional pig breeds (such as Berkshire, Tamworth). Szulc et al. (2012) state that breed also affects intramuscular fat content, which is higher in traditional pigs than in hybrids. They documented these findings in Złotnicka Spotted vs. Złotnicka Spotted × Duroc. Meat of native breeds also shows more favourable pH value and drip loss value than commercially used pig genotypes (Grześkowiak et al., 2009; Kasprzyk et al., 2015).

Prestice Black-Pied pig (PBP) is an original Czech breed, which comes from the western region of the Czech Republic. In 1992 the breed was included in the genetic resources and belongs to the National program of genetic resources, coordinated by the European Regional Focal Point for Farm Animal Genetic Resources. PBP pig is characterized by very good reproductive qualities, undemanding nutrition, a high level of adaptability, resistance and low requirements for breeding regarding environmental conditions. The animals have medium body frame, very solid (hard) constitution and stress resistance. Their colour is black and white without definition of black or white body parts. High quality meat of Prestice pig with higher share of fat can be used for special meat products (Matoušek et al., 2016).

The aim of this study was to verify the hypothesis that parameters of carcass traits, quality and oxidative stability of meat, fatty acids profile in intramuscular fat of *M. longissimus lumborum et thoracis* and backfat are different between the original Czech breed Prestice Black-Pied pig and hybrid combination of Large White × Landrace × Duroc × Pietrain pigs, which is very popular in meat production not only in the Czech Republic, but also abroad.

Material and methods

Animals and diets

A total of 64 animals were included in the experiment, 32 pigs of native breed Prestice Black-Pied (PBP) and 32 pigs of hybrid combination Large White × Landrace sows × Duroc × Pietrain boars (LWLDP). In the experimental facility, the pigs were housed in groups of 16 animals in 4 pens. Males and females were balanced in the groups. Duration of the experimental period was 64 days in PBP pigs and 57 days in LWLDP pigs. The mean initial weight was 69.00±5.10 kg (at the age of 140 days) for PBP pigs and 65.67±7.04 kg (at the age of 125 days) for LWLDP pigs, while the slaughter weight was 111.63±6.41 kg (at the age of 204 days) for PBP pigs and 111.25±8.39 kg (at the age of 182 days) for LWLDP pigs. Water and feed intake was *ad libitum* for the duration of the experiment. The diet composition and nutrient content is presented in Table 1. Content of fatty acids in the feed mixture is shown in Table 2.

Table 1. Ingredients and nutrient composition of diets

Ingredients (%)	
wheat	63.4
barley	12
soybean meal, extracted	8
rapeseed meal	7
wheat bran	3
malt sprouts	3
rapeseed oil	0.2
limestone	1.45
salt	0.4
monocalcium phosphate	0.45
magnesium oxide	0.1
amino acids and vitamins	1
Nutrients (g/kg of feed mixture)	
dry matter	895.92
starch	439.60
crude protein	162.20
ash	50.70
fat	24.98
crude fibre	37.69
saccharose	27.86
lysine	9.16
ME (MJ/kg)	12.88

ME – metabolizable energy for pigs.

Table 2. Fatty acid composition (g/100 g of total fatty acids) of diets

C8:0	0.16
C10:0	0.14
C11:0	0.14
C12:0	0.13
C13:0	0.14
C14:0	0.77
C15:0	0.15
C16:0	22.90
C17:0	1.15
C18:0	7.79
C20:0	0.22
C15:1 *n-5*	0.21
C16:1 *n-7*	2.79
C17:1 *n-7*	0.14
C18:1 *n-9*	33.18
C20:1 *n-9*	0.65
C22:1 *n-9*	0.15
C18:2 *n-6*	25.66
C20:2 *n-6*	0.14
C18:3 *n-3*	2.65
C20:3 *n-6*	0.14
C20:4 *n-6*	0.44
C20:5 *n-3*	0.16
SFA	33.69
UFA	66.31
MUFA	37.12
PUFA	29.19

Provisions before slaughter and slaughter measurements

After termination of fattening, the pigs were transferred from the experimental facility to a slaughterhouse located within a distance of 40 km. On the day of slaughter, the pigs were not fed, water was available. The animals were left to rest for about two hours before slaughtering. The fatteners were stunned prior to slaughter.

Data on the lean meat content were obtained from the slaughterhouse, where carcasses were classified by the ZP method (Zwei-Punkt-Verfahren) of the SEUROP system (EU decision 2005/1/ES). The left side of each carcass was used to measure meat quality parameters. Samples of *Musculus longissimus lumborum et thoracis* (*MLLT*) and backfat from loin were collected 24 h after slaughter, between the second and the third last rib and transported in a portable fridge to the laboratory.

Analyses

Estimation of the drip loss was performed during the period of 24–48 h after slaughter, by weighing 150 g of meat hanging in a bag at 5°C. Samples were then packed in PE bags and stored at –20°C until analysis. The oxidative stability of meat and backfat was measured on the first, third and sixth day after the slaughter using the thiobarbituric acid method of Piette and Raymond (1999) and results were expressed as thiobarbituric acid reactive substances (TBARS) in mg of malondialdehyde per kg of meat. The content of intramuscular fat was determined according to CSN ISO 1444 (1997) by extraction in a Soxtec 1043 apparatus (FOSS Tecator AB, Hoganas, Sweden). Muscle pH was measured using a portable pH meter (pH 340i) equipped with a glass electrode at 45 min and 24 h post-mortem in fresh samples. Fatty acid composition of meat (represented by intramuscular fat in *MLLT* and backfat was determined after chloroform methanol extraction of total lipids (Folch et al., 1957). Fatty acid methyl esters were prepared in accordance with CSN ISO 5509 (1994) and analysed by gas chromatography (6890N Agilent Technologies) according to CSN ISO 5508 (1994). The gas chromatograph was equipped with DB-23 cyanopropyl-methylpolysiloxane column (60 m × 0.25 mm × 0.25 μm). Nitrogen was used as carrier gas (flow rate 0.8 ml/min). The temperature regime was the following: 120°C for 6 min, then the temperature was raised to 170°C (15°C/min) and to 210°C (3°C/min). This temperature was held for 13.5 min. Subsequently, the temperature was increased to 230°C (40°C/min) and kept constant for 7 min. FID detector temperature was 260°C. Fatty acids were determined by comparison with standards (37 Component FAME Mix, PUFA No. 1, PUFA No. 2, PUFA No. 3; Sigma-Aldrich). Results were expressed as percentages of the total fatty acid.

Statistical analysis

The data were analysed using software QC expert (TriloByte Statistical Software Ltd.). All data were expressed as mean±standard deviation. Student's t-test was used for analysis of the data. The differences among means in the t-test were considered significant only if the F-test was significant.

Results

Carcass traits, meat quality and oxidative stability parameters

Table 3 shows selected parameters of carcass traits, meat quality and oxidative stability. The findings indicate that pigs of LWLDP hybrid combination had 0.9% lower ($P \leq 0.01$) content of intramuscular fat (IMF), 7.81 mm lower ($P \leq 0.001$) backfat (BF) and 5.75% higher ($P \leq 0.001$) content of lean meat than PBP pigs. LWLDP hybrid pigs had higher ($P \leq 0.001$) drip loss (2.18%) than PBP pigs. Lower values were found for pH_{45} and pH_{24} ($P \leq 0.05$) in hybrids than in PBP pigs. Analysis of oxidative stability of fat in meat revealed significantly higher ($P \leq 0.05$) concentration of malondialdehyde on the first day after slaughter in LWLDP pigs than in PBP pigs. No significant differences were found in oxidative stability of meat between the groups on the third and sixth day after slaughter.

Table 3. Parameters of carcass traits, meat quality and oxidative stability in PBP and LWLDP pigs (Mean±SD)

Item	PBP	LWLDP	Sig.
Backfat thickness (mm)	23.54±3.23	15.73±3.66	***
Lean meat content (%)	51.76±1.89	57.51±3.44	***
Intramuscular fat (%)	2.89±0.42	1.99±0.41	**
Drip loss (%)	2.65±0.50	4.83±0.85	***
pH_{45}	6.12±0.27	5.95±0.26	**
pH_{24}	5.61±0.12	5.43±0.48	**
TBARS (malondialdehyde concentration mg/kg)			
day 1	0.04±0.01	0.06±0.05	*
day 3	0.07±0.01	0.07±0.05	ns
day 6	0.10±0.02	0.09±0.07	ns

TBARS – thiobarbituric acid-reactive substances.
Sig. – significance level; ns – non-significant P≥0.05; * – statistical significance P≤0.05; ** – statistical significance P≤0.01; *** – statistical significance P≤0.001.

Fatty acid composition of intramuscular fat and backfat

Results of fatty acid composition of IMF in *MLLT* and BF of evaluated pigs are shown in Table 4. Contents of 13 saturated fatty acids (SFA), 6 monounsaturated fatty acids (MUFA) and 12 polyunsaturated fatty acids (PUFA) were detected in the samples. Regardless of the type of sample and pig genotype, palmitic acid (C16:0), stearic acid (C18:0), oleic acid (C18:1 *n-9*) and linoleic acid (C18:2 *n-6*) were the most abundant. Analysis of fatty acid composition showed significant differences between the indigenous PBP breed and the commercially utilized hybrid LWLDP both in IMF and in BF.

Table 4. Fatty acid composition (g/100 g of total fatty acids) in *M. longissimus lumborum et thoracis* (*MLLT*) and backfat samples of PBP and LWLDP pigs (Mean±SD)

Item	MLLT			Backfat		
	PBP	LWLDP	sig.	PBP	LWLDP	sig.
1	2	3	4	5	6	7
C6:0	0.01±0.00	0.01±0.00	ns	0.01±0.00	0.01±0.01	ns
C8:0	0.01±0.00	0.02±0.01	**	0.01±0.00	0.01±0.00	ns
C10:0	0.06±0.01	0.13±0.05	**	0.05±0.01	0.07±0.01	**
C12:0	0.06±0.01	0.13±0.09	ns	0.06±0.00	0.08±0.01	**
C13:0	0.01±0.00	0.02±0.02	ns	0.01±0.00	0.01±0.01	ns
C14:0	1.61±0.16	1.52±0.55	ns	1.07±0.05	1.33±0.11	***
C15:0	0.06±0.01	0.10±0.03	**	0.05±0.00	0.08±0.03	ns
C16:0	22.46±1.60	23.90±1.55	ns	23.02±0.33	25.11±1.02	***
C17:0	0.24±0.03	0.33±0.11	ns	0.37±0.02	0.52±0.24	ns
C18:0	11.99±1.29	12.10±0.78	ns	15.00±0.52	15.52±1.33	ns
C20:0	0.21±0.01	0.19±0.03	ns	0.25±0.01	0.27±0.04	ns

Table 4 – contd.

1	2	3	4	5	6	7
C22:0	0.02±0.01	0.12±0.09	*	0.02±0.01	0.02±0.01	ns
C24:0	0.02±0.00	0.02±0.01	ns	0.01±0.00	0.01±0.00	ns
C14:1 *n-5*	0.02±0.00	0.06±0.04	ns	0.01±0.00	0.03±0.01	**
C16:1 *n-7*	2.89±0.52	3.42±0.33	ns	1.86±0.17	2.30±0.43	*
C18:1 *n-7*	3.93±0.42	4.31±0.61	ns	2.33±0.06	3.01±0.38	***
C18:1 *n-9*	42.63±0.64	39.30±2.10	**	41.35±2.07	39.45±1.41	ns
C20:1 *n-9*	0.77±0.12	0.72±0.11	ns	0.98±0.19	0.98±0.12	ns
C24:1 *n-9*	0.03±0.01	0.04±0.02	ns	0.02±0.00	0.01±0.00	**
C18:2 *n-6*	9.69±2.99	8.64±1.96.	ns	10.64±1.53	8.90±1.34	*
C20:2 *n-6*	0.32±0.06	0.31±0.10	ns	0.51±0.05	0.48±0.09	ns
C18:3 *n-3*	0.55±0.23	0.58±0.20	ns	1.46±0.68	0.97±0.24	*
C18:3 *n-6*	0.02±0.01	0.12±0.04	***	0.03±0.00	0.04±0.01	ns
C20:3 *n-3*	0.08±0.02	0.10±0.02	*	0.21±0.06	0.18±0.04	ns
C20:3 *n-6*	0.22±0.02	0.35±0.16	ns	0.09±0.01	0.09±0.02	ns
C20:4 *n-3*	0.02±0.00	0.04±0.02	ns	0.02±0.00	0.02±0.01	ns
C20:4 *n-6*	1.42±0.15	2.41±1.04	**	0.28±0.05	0.21±0.04	**
C22:4 *n-6*	0.24±0.03	0.44±0.24	*	0.09±0.01	0.08±0.03	ns
C20:5 *n-3*	0.12±0.04	0.03±0.02	**	0.04±0.01	0.10±0.01	**
C22:5 *n-3*	0.26±0.05	0.44±0.15	**	0.14±0.03	0.09±0.03	**
C22:6 *n*-3	0.03±0.01	0.10±0.04	**	0.01±0.00	0.02±0.01	*

sig. – significance level; ns – non-significant P≥0.05; * – statistical significance P≤0.05; ** – statistical significance P≤0.01; *** – statistical significance P≤0.001.

PBP pigs expressed lower content of C8:0 (P≤0.01), C10:0 (P≤0.01), C15:0 (P≤0.01) and C22:0 (P≤0.05) in *MLLT* and higher contents of C18:1 *n-9* (P≤0.01) and also C22:5 *n-3* (P≤0.01). In BF of PBP pigs, lower contents of C10:0 (P≤0.01), C12:0 (P≤0.01), C14:0 (P≤0.001) and C16:0 (P≤0.001) were recorded and also higher contents of C24:1 *n-9* (P≤0.01) and C18:2 *n-6* (P≤0.05). Also content of C18:3 *n-3* was higher in BF of PBP pigs, as well as contents of C20:4 *n-6* (P≤0.01) and C22:5 *n-3* (P≤0.01).

LWLDP pigs showed higher content of C18:3 *n-6* (P≤0.001) in *MLLT*. Similar trend was observed for C20:3 *n-3* (P≤0.05), C20:4 *n-6* (P≤0.01) and C22:4 *n-6* (P≤0.01). Also contents of C22:5 *n-3* and C22:6 *n-3* were significantly higher (P≤0.01) in pork of LWLDP pigs. Analysis of fatty acid composition in BF of LWLDP pigs proved higher contents of C14:1 *n-5* (P≤0.01), C16:1 *n-7* (P≤0.05) and C18:1 *n-7* (P≤0.001). Also contents of C20:5 *n-3* (P≤0.01) and C22:6 *n-3* (P≤0.05) were higher in the hybrid pigs.

Table 5 presents the groups of fatty acids and their ratios in *MLLT* and BF. In PBP pigs, *MLLT* contained higher shares of MUFA (P≤0.01) and more favourable MUFA/SFA ratio (P≤0.01) than in LWLDP pigs. In backfat of PBP pigs, significantly lower content of SFA (P≤0.001) and higher content of UFA were found. Also content of PUFA was higher (P≤0.01) in PBP pigs, which is valid for both *n-6* PUFA (P≤0.05) and *n-3* PUFA (P≤0.01). MUFA/SFA ratio in backfat was significantly more favourable (P≤0.05) in PBP pigs than in LWLDP pigs, as were MUFA/PUFA (P≤0.05) and PUFA/SFA (P≤0.001) ratios.

Table 5. Fatty acid groups (g/100 g of total fatty acids) in *M. longissimus lumborum et thoracis* (*MLLT*) and backfat samples of PBP and LWLDP pigs (Mean±SD)

Item	MLLT			Back fat		
	PBP	LWLDP	sig.	PBP	LWLDP	sig.
SFA	36.76±2.95	38.59±2.41	ns	39.93±0.81	43.04±1.68	***
UFA	63.24±2.95	61.41±2.41	ns	60.07±0.81	56.96±1.68	***
MUFA	50.27±0.55	47.86±2.09	**	46.55±2.32	45.78±1.34	ns
PUFA	12.97±3.37	13.55±3.46	ns	13.52±2.83	11.18±1.61	**
n-6 PUFA	11.91±2.90	12.26±3.40	ns	11.65±1.44	9.80±1.49	*
n-3 PUFA	1.06±0.33	1.29±0.21	ns	1.87±0.67	1.38±0.29	**
n-6/n-3 PUFA	11.24±1.96	9.51±2.91	ns	6.24±1.57	7.12±1.66	ns
MUFA/SFA	1.37±0.11	1.24±0.09	**	1.17±0.05	1.06±0.06	*
MUFA/PUFA	3.88±0.82	3.53±1.09	ns	3.44±0.80	4.09±0.64	*
PUFA/SFA	0.35±0.14	0.35±0.38	ns	0.34±0.08	0.26±0.05	***

sig. – significance level; SFA – saturated fatty acids; UFA – unsaturated fatty acids; MUFA – monounsaturated fatty acids, PUFA – polyunsaturated fatty acids.

ns – non-significant P≥0.05; * – statistical significance P≤0.05; ** – statistical significance P≤0.01; *** – statistical significance P≤0.001.

Discussion

Carcass traits, meat quality and oxidative stability parameters

The analysis of carcass traits and meat quality revealed that meat of PBP pigs contained higher amounts of BF and IMF and consequently the lean meat content was lower than in LWLDP hybrids. Similar trend in native breeds was documented in most studies (Grześkowiak et al., 2009; Zhang et al., 2009; Yu et al., 2013; Tomović et al., 2016). Szulc et al. (2012) found out that pigs of Złotnicka Spotted breed (202 days old, 119.20 kg) showed significantly higher BF thickness and lower lean meat content than hybrids of Złotnicka Spotted × Duroc (185 days old, 114.10 kg) (34.96 vs. 29.67 mm and 41.83 vs. 45.89%). Also Maiorono et al. (2013), who fattened pigs up to 330 days of age, state that pigs of Casertana breed (slaughter weight 140.1 kg) had significantly thicker BF (5.1 mm) and lower lean meat content (47.1%) than hybrid combination of (Landrace × Italian Large White) × Duroc (3.4 mm, 51.3%) with slaughter weight of 202.4 kg. Alfonso et al. (2005), who slaughtered Basque Black-Pied pigs with lower weight of 86.2 kg recorded higher BF thickness (26 mm) and MF content (3.22%) and loin eye area at the 5th rib level of 29.9 cm^2, compared to hybrid (Large White × Landrace) pigs slaughtered with 126.6 kg, with BF thickness 20 mm and IMF content 1.77% (loin eye area 44.0 cm^2). Optimal IMF content ranges between 2 and 3%, values above 3.5% appear risky in terms of consumer acceptance (Fernandez et al., 1999; Yu et al., 2013). Good meat quality in pigs from native breeds, including PBP, is confirmed by studies conducted by many authors (Franci et al., 2005; Kapelański et al., 2006; Matoušek et al., 2016). The results of our study document that PBP pigs reach better results in drip loss value and more favourable pH value against LWLDP pigs, which indicates that meat of native breeds could be characterized by slower pH decrease post-mortem. Similar findings were described by Kasprzyk et al. (2015) in Puławska breed when compared to Landrace (IMF content 2.58% vs. 1.60%). The authors reported the following results: drip loss value 3.71% vs. 4.85%, pH_{45} 6.15 vs. 5.77 and pH_{24} 5.59 vs. 5.45. Also Maiorono et al. (2013) described slower pH decrease in meat of native breed Casertana against hybrid combination of (Landrace × Italian Large White) × Duroc with values of pH_{45} 6.17 vs. 6.13 a pH_{24} 5.51 vs. 5.41. On the contrary, Franci et al. (2005) found no differences between Cinta Senese and Large White pigs, which indicates that meat stability is influenced not only by genotype, but also other factors, such as stress, nutrition and breeding conditions (Bečková and Václavková, 2010; Martino et al., 2014).

In our study, fat oxidation in meat was significantly influenced by genotype on the first day after slaughter. On the third and sixth day, concentrations of malondialdehyde were balanced in the pig groups. Yim et al. (2016) described significantly higher content of malondialdehyde (mg/kg) in hybrid combination Yorkshire × Berkshire × Duroc than in pigs of Yorkshire × Landrace × Duroc. In other studies (Bečková and Václavková, 2010; Rossi et al., 2013; Václavková et al., 2016), no effect of genotype on fat oxidative stability was proved.

Fatty acid composition of intramuscular fat

In our experiment, the PBP breed was characterized by lower content of C8:0, C10:0, C15:0, C22:0 in *MLLT* than LWLD hybrids. Content of MUFA was higher in PBP pigs, main difference was in C18:1 *n-9*. PUFA, which recorded differences between the pig genotypes were C20:4 *n-6*, C22:4 *n-6*, C20:5 *n-3*, C22:5 *n-3* and C22:6 *n-3*. Similar findings in *MLT* were described by Tomović et al. (2016), who slaughtered pigs with weight of 150 kg. They found significantly higher contents of C10:0, C22:0, C16:0, C18:0 in Large White pigs (age 244 days, IMF 2.56%) and in hybrids of Duroc × White Mangalica (age 364 days, IMF 4.35%) than in native breed White Mangalica (age 532 days, IMF 5.86%). They also proved higher content of MUFA, mainly C18:1 *n-9*. Their analysis of PUFA showed no significant differences. Kasprzyk et al. (2015) described similar differences between different genotypes at the age of 185 days and live-weight of 105 kg in *MLLT*, mainly in the content of MUFA between Puławska breed (IMF 2.58%) and Polish Landrace (IMF 1.60%). The total content of SFA was not influenced by genotype, which corresponds to the results of our experiment. The MUFA/SFA ratio was more favourable in Puławska breed, similarly to PBP breed in the present study. Also Serra et al. (2014) proved higher content of MUFA in native breed Cinta Senese than in modern breed Large White (slaughter weight 160 kg in both genotypes). They recorded lower contents of C22:5 *n-3* and C22:6 *n-3* from PUFA in Cinta Senese breed against hybrid, same as in PBP breed in the present experiment. Teixeira and Rodrigues (2013), who slaughtered experimental pigs with weight of 80–100 kg confirmed higher contents of C18:1 *n-9*, C16:0 and C11:1 *n-7* in *MLLT* of Preto Alentejano breed than in commercial Landrace ×

Large White (total fat 4.94 vs. 3.40 by 100 g of sample) as well as in MUFA content and statistically inconclusive difference in PUFA, which indicates, that native breeds are characterized by higher contents of MUFA. Tomović et al. (2016) emphasize that a higher proportion of MUFA in the intramuscular fat strongly influences the physical properties, leading to a soft and oily meat, which is highly appreciated by consumers. Fiego et al. (2005) suggest that differences in fatty acid composition between genotypes influence different metabolism of less and more fatty animals, which was confirmed by Lorenzo et al. (2012), who adds that less fatty animals have lower ability to synthesize fatty acids. Some studies showed different values than the present work. Yu et al. (2013) studied breeds Lantang (9 months of age, IMF 2.46%) vs. Landrase (6 months of age, IMF 1.43%) with slaughter weight 103 kg and recorded significantly more PUFA and less MUFA in Lantang breed than in Landrase. Furman et al. (2010) studied differences between Krškopolje breed (IMF 1.96%) and a commercial hybrid (IMF 1.70%) and observed significantly higher content of PUFA *n-3* and *n-6* as well as more favourable PUFA/SFA ratio in hybrid, which does not correspond to the findings in our study. Different results could be caused by different breeding conditions. According to Bečková and Václavková (2010) and Čítek et al. (2015), the fatty acid composition in IMF and BF is significantly influenced mostly by nutrition (corn, linseed diet). Furman et al. (2010) described differences between conventional and organic farms and some studies also suggest influence of gender (Teixeira and Rodrigues, 2013; Kasprzyk et al., 2015).

Fatty acid composition of backfat

Analysis of fatty acids composition in BF of the experimental animals revealed differences from IMF. Cava et al. (2003) and Lorenzo et al. (2012) suggest that these differences can be caused by higher metabolic activity of IMF than BF and different functions of neutral lipids and phospholipids contained in fat from different parts. In the present study, the analysis of BF revealed higher contents of C10:0, C12:0 C14:0, C16:0 and the total content of SFA. The total content of MUFA and contents of PUFA, mainly C22:6 *n-3* and C18:3 *n-3*, and also MUFA/SFA, PUFA/SFA and *n-6/n-3* PUFA ratios were more favourable for PBP pigs. Studies on this subject (Lo Fiego et al., 2005; Renaudeau et al., 2005; Furman et al., 2010; Robina et al., 2013; Madzimure et al., 2017) give conflicting results. Similar findings to our experiment were documented by Serra et al. (2014) in Cinta Senese breed against Large White breed. Large White pigs showed significantly more SFA, mainly C16:0, same as LWLDP pigs in the present study. On the contrary, Cinta Senese pigs were characterized by significantly more MUFA and comparable content of PUFA. Also Robina et al. (2013) presented lower content of SFA, higher content of MUFA and comparable content of PUFA in Iberian pigs (age 324 days, 135 kg, BF 66 mm) when compared to Duroc pigs (age 289 days, 151 kg, BF 45 mm). Different results were described by Furman et al. (2010), even though they observed higher content of MUFA in Krškopolje pigs (BF 33 mm) than in hybrid pigs (BF 16 mm), the content of PUFA and *n-6/n-3* PUFA ratio were in favour of hybrid pigs. Renaudeau et al. (2005) state that Creole pigs slaughtered at the age of 147 days with weight of 59 kg and BF 17.5 cm reached higher content of SFA, lower concentrations of linoleic and linolenic acid, but lower PUFA content in BF than Large White pigs (151 days, 90 kg, BF 11.3 mm). Also Madzimure et al. (2017) observed higher content of SFA, lower content of PUFA and less favourable PUFA/SFA ratio in original African Windsnyer pigs, when compared to modern pig genotype. These different results suggest that fatty acid composition in BF of pigs can depend not only on breeding conditions, but also on different proportions of pigs from different regions or continents.

Conclusion

The experiment demonstrated that Prestice Black-Pied pigs have significantly more intramuscular fat and backfat and consequently lower lean meat content when compared to the commercially utilized four-breed hybrid pig. The meat of Prestice Black-Pied pigs is characterized by better qualitative parameters, namely lower drip loss value and slower pH decrease post-mortem, than the commercial hybrid. The oxidative stability was comparable in both evaluated pig genotypes. The analysis of fatty acid profile documented that the PBP pigs had lower share of SFA, mainly in backfat. On the contrary, the content of MUFA was higher in intramuscular fat from the PBP pigs than from the hybrids. Significant differences in the content of PUFA were observed in backfat in favour of the PBP pigs. In backfat, higher values of *n-6* and mainly *n-3* PUFA were recorded in the PBP pigs.

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